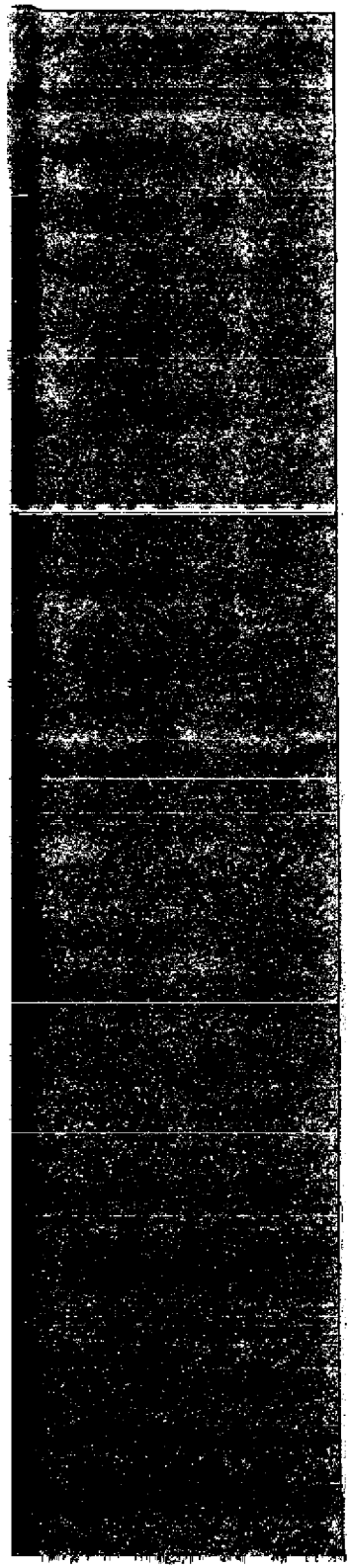

Wilmington 3-0578
50 Fordham Rd
phase V 2006

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WILMINGTON
50 FORDHAM RD.
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TRC
Customer-Focused Solutions

PHASE IV AS-BUILT CONSTRUCTION AND COMPLETION REPORT

TANK K AREA

Former GE Facility
RTN 3-0518
Wilmington, Massachusetts

Submitted to:

Massachusetts Department of
Environmental Protection – NERO
205 A Lowell Street
Wilmington, Massachusetts 01887

Prepared by:

TRC Environmental Corporation
Boott Mills South, Foot of John Street
Lowell, Massachusetts 01852
(978) 970-5600

TRC Project No. E9202-3602

March 2001

TRC

TRC Reference No. E9202-3602-02180

March 20, 2001

Ms Jennifer Eck
Project Manager
Bureau of Waste Site Cleanup
Massachusetts Department of Environmental Protection
205A Lowell Street
Wilmington, MA 01887

Subject: Phase IV As-Built Construction and Final Inspection Report
Tank K Area

Reference: Former GE Facility (RTN# 3-0518)
50 Fordham Road, Wilmington, MA

Dear Ms Eck:

Enclosed please find the Phase IV As-Built Construction and Final Inspection Report for the Tank K Area for the above referenced site.

In order to facilitate your review of the data, we are available to meet with you to discuss this report of findings, and any concerns or comments you may have. In the meantime, should you have any questions or comments, please feel free to contact Paola at (978) 656-3582.

Sincerely;

Bruce Hoskins, P.E.
Licensed Site Professional

Paola E. Macchiaroli, Ph.D.
Project Manager

Enclosure

cc: Frank Dardeno, Jr., Wilmington Realty Trust
Jennifer Stevens, Lockheed Martin
Bruce Hoskins, URS
Reading Town Library Repository
Gina Snyder, Key PIP Petitioner (w/o enclosure)
Frank Bomba, Wilmington Realty Trust (w/o enclosure)

TRC Environmental Corporation
Boott Mills South, Foot of John Street • Lowell, Massachusetts 01852
Telephone 978-970-5600 • Fax 978-453-1995

Customer-Focused Solutions

Michael Caira, Town Manager, Town of Wilmington (w/o enclosure)
Gregory Erickson, Board of Health, Town of Wilmington (w/o enclosure)
Thomas Younger, Town Administrator, Town of North Reading (w/o enclosure)
John Keeley, Conservation Commission, Town of Wilmington (w/o enclosure)
Martin Fair, Board of Health, Town of North Reading (w/o enclosure)
Peter Hechenbleikner, Town Manager, Town of Reading (w/o enclosure)
Mary Trudeau, Conservation Commission, Town of North Reading (w/o enclosure)
Jane Fiore, Board of Health, Town of Reading (w/o enclosure)
Ted McIntire, Dept. of Public Works, Town of Reading (w/o enclosure)

PHASE IV AS-BUILT CONSTRUCTION AND COMPLETION REPORT

TANK K AREA

Former GE Facility
RTN 3-0518
Wilmington, Massachusetts

Submitted to:

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(978) 970-5600

TRC Project No. E9202-3602

March 2001

Massachusetts Department of Environmental Protection

Bureau of Waste Site Cleanup

BWSC-108

COMPREHENSIVE RESPONSE ACTION TRANSMITTAL FORM & PHASE I COMPLETION STATEMENT

Pursuant to 310 CMR 40.0484 (Subpart D) and 40.0800 (Subpart H)

Release Tracking Number: 3 00518

A. SITE LOCATION:

Site Name: (optional) Former General Electric Facility (Tank K Area)

Street: 50 Fordham Road Location Aid:

City/Town: Wilmington ZIP Code: 01887

Related Release Tracking Numbers that this Form Addresses:

Tier Classification: (check one of the following) [X] Tier IA [ ] Tier IB [ ] Tier IC [ ] Tier II [ ] Not Tier Classified

If a Tier I Permit has been issued, state the Permit Number: 83052

B. THIS FORM IS BEING USED TO: (check all that apply)

- [ ] Submit a **Phase I Completion Statement**, pursuant to 310 CMR 40.0484 (complete Sections A, B, C, G, H, I and J).
- [ ] Submit a **Phase II Scope of Work**, pursuant to 310 CMR 40.0834 (complete Sections A, B, C, G, H, I and J).
- [ ] Submit a final **Phase II Comprehensive Site Report and Completion Statement**, pursuant to 310 CMR 40.0836 (complete Sections A, B, C, D, G, H, I and J).
- [ ] Submit a **Phase III Remedial Action Plan and Completion Statement**, pursuant to 310 CMR 40.0862 (complete Section A, B, C, G, H, I and J).
- [ ] Submit a **Phase IV Remedy Implementation Plan**, pursuant to 310 CMR 40.0874 (complete Sections A, B, C, G, H, I and J).
- [X] Submit a **As-Built Construction Report**, pursuant to 310 CMR 40.0875 (complete Sections A, B, C, G, H, I and J).
- [X] Submit a **Phase IV Final Inspection Report and Completion Statement**, pursuant to 310 CMR 40.0878 and 40.0879 (complete Sections A, B, C, E, G, H, I and J).
- [ ] Submit a periodic **Phase V Inspection & Monitoring Report**, pursuant to 310 CMR 40.0892 (complete Sections A, B, C, G, H, I and J).
- [ ] Submit a final **Phase V Final Inspection & Monitoring Report and Completion Statement**, pursuant to 310 CMR 40.0893 (complete Sections A, B, C, F, G, H, I and J).

You must attach all supporting documentation required for each use of form indicated, including copies of any Legal Notices and Notices to Public Officials required by 310 CMR 40.1400.

C. RESPONSE ACTIONS:

RECEIVED

MAR 2 0 2001

DEP

NORTHEAST REGIONAL OFFICE

- [ ] Check here if any response action(s) that serves as the basis for the Phase submittal(s) involves the use of Innovative Technologies. (DEP is interested in using this information to create an Innovative Technologies Clearinghouse.)

Describe Technologies:

D. PHASE II COMPLETION STATEMENT:

Specify the outcome of the Phase II Comprehensive Sites Assessment:

- [ ] Additional Comprehensive Response Actions are necessary at this Site, based on the results of the Phase II Comprehensive Site Assessment.
- [ ] The requirements of a Class A Response Action Outcome have been met and a completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.
- [ ] The requirements of a Class B Response Action Outcome have been met and a completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.
- [ ] Rescoring of this Site using the Numerical Ranking System is necessary, based on the results of the final Phase II Report.

E. PHASE IV COMPLETION STATEMENT:

Specify the outcome of the Phase IV activities:

- [X] Phase V operation, maintenance or monitoring of the Comprehensive Response Action is necessary to achieve a Response Action Outcome. (This site will be subject to a Phase V Operation, Maintenance and Monitoring Annual Compliance Fee.)
- [ ] The requirements of a Class A Response Action Outcome have been met. No additional operation, maintenance or monitoring is necessary to ensure the integrity of the Response Action Outcome. A completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.
- [ ] The requirements of a Class B Response Action Outcome have been met. No additional operation, maintenance or monitoring is necessary to ensure the integrity of the Response Action Outcome. A completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.

Section E is continued on the next page.

COMPREHENSIVE RESPONSE ACTION TRANSMITTAL FORM & PHASE I COMPLETION STATEMENT

Pursuant to 310 CMR 40.0484 (Subpart D) and 40.0800 (Subpart H)

Release Tracking Number: 3 00518

E. PHASE IV COMPLETION STATEMENT: (continued)

☐ The requirements of a Class C Response Action Outcome have been met. Further operation, maintenance or monitoring of the remedial action is necessary to ensure that conditions are maintained and that further progress is made toward a Permanent Solution. A completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.

Indicate whether the operation and maintenance will be Active or Passive. (Active Operation and Maintenance is defined at 310 CMR 40.0006.):

◯ Active Operation and Maintenance ◯ Passive Operation and Maintenance

(Active Operation and Maintenance makes the Site subject to a Post-RAO Class C Active Operation and Maintenance Annual Compliance Fee.)

F. PHASE V COMPLETION STATEMENT

Specify the outcome of Phase V activities:

☐ The requirements of a Class A Response Action outcome have been met and a completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.

☐ The requirements of a Class B Response Action Outcome have been met. No additional operation, maintenance or monitoring is necessary to ensure the integrity of the Response Action Outcome. A completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.

☐ The requirements of a Class C Response Action Outcome have been met. Further operation, maintenance or monitoring of the remedial action is necessary to ensure that conditions are maintained and that further progress is made toward a Permanent Solution. A completed Response Action Outcome Statement (BWSC-104) will be submitted to DEP.

Indicate whether the operation and maintenance will be Active or Passive. (Active Operation and Maintenance is defined at 310 CMR 40.0006.):

◯ Active Operation and Maintenance ◯ Passive Operation and Maintenance

(Active Operation and Maintenance makes the Site subject to a Post-RAO Class C Active Operation and Maintenance Annual Compliance Fee.)

G. LSP OPINION:

I attest under the pains and penalties of perjury that I have personally examined and am familiar with the information contained in this transmittal form, including any and all documents accompanying this submittal. In my professional opinion and judgement based upon application of (i) the standard of care in 309 CMR 4.02(1), (ii) the applicable provisions of 309 CMR 4.02(2) and (3), and (iii) the provisions of 309 CMR 4.03(5), to the best of my knowledge, information and belief,

> if Section B indicates that a **Phase I, Phase II, Phase III, Phase IV or Phase V Completion Statement** is being submitted, the response actions(s) that is (are) the subject of this submittal (i) has (have) been developed and implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes off such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) complies(y) with the identified provisions of all orders, permits, and approvals identified in this submittal;

> if Section B indicates that a **Phase II Scope of Work** or a **Phase IV Remedy Implementation Plan** is being submitted, the response action(s) that is (are) the subject of this submittal (i) has (have) been developed in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) complies(y) with the identified provisions of all orders, permits, and approvals identified in this submittal;

> if Section B indicates that as **As-Built Construction Report** or a **Phase V Inspection and Monitoring Report** is being submitted, the response action(s) that is (are) the subject of this submittal (i) is (are) being implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G. L. c. 21E and 310 CMR 40.0000, and (iii) complies(y) with the identified provisions of all orders, permits, and approvals identified in this submittal.

I am aware that significant penalties may result, including, but not limited to, possible fines and imprisonment, if I submit information which I know to be false, inaccurate or materially incomplete.

☐ Check here if the Response Action(s) on which this opinion is based, if any, are (were) subject to any order(s), permit(s) and/or approval(s) issued by DEP or EPA. If the box is checked, you MUST attach a statement identifying the applicable provisions thereof.

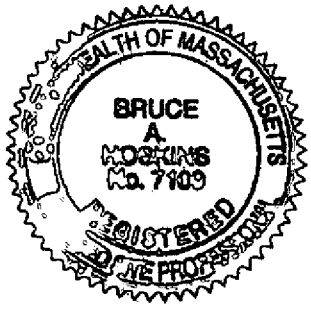
LSP Name: Bruce A. Hoskins LSP #: 7109 Stamp:

Telephone: (603) 893-0616 Ext.:

FAX: (optional) (603) 893-6240

Signature: R a Hoskins

Date: 3/19/01



Massachusetts Department of Environmental Protection **BWSC-108**
Bureau of Waste Site Cleanup

COMPREHENSIVE RESPONSE ACTION TRANSMITTAL FORM & PHASE I COMPLETION STATEMENT

Pursuant to 310 CMR 40.0484 (Subpart D) and 40.0800 (Subpart H)

Release Tracking Number: 3 - 00518

H. PERSON UNDERTAKING RESPONSE ACTION(S):

Name of Organization: TRC Environmental Corporation

Name of Contact: Joseph Yeasted Title: Vice President

Street: Boott Mills South, Foot of John Street

City/Town: Lowell State: MA ZIP Code: 01852

Telephone: (978) 970-5600 Ext.: FAX: (optional)

☐ Check here if there has been a change in the person undertaking the Response Action.

I. RELATIONSHIP TO SITE OF PERSON UNDERTAKING RESPONSE ACTION(S): (check one)

☒ RP or PRP Specify: ◯ Owner ◯ Operator ◯ Generator ◯ Transporter Other RP or PRP: Other legally responsible party

☐ Fiduciary, Secured Lender or Municipality with Exempt Status (as defined by M.G.L. c. 21E, s.2)

☐ Agency or Public Utility on a Right of Way (as defined by M.G.L. c. 21E, s.5(j))

☐ Any Other Person Undertaking Response Action Specify Relationship:

J. CERTIFICATION OF PERSON UNDERTAKING RESPONSE ACTION(S):

I Joseph Yeasted, attest under the pains and penalties of perjury (i) that I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this transmittal form, (ii) that based on my inquiry of those individuals immediately responsible for obtaining the information, the material information contained in this submittal is, to the best of my knowledge and belief, true, accurate and complete, and (iii) that I am fully authorized to make this attestation on behalf of the entity legally responsible for this submittal. I/the person or entity on whose behalf this submittal is made am/is aware that there are significant penalties, including, but not limited to, possible fines and imprisonment, for willfully submitting false, inaccurate, or incomplete information.

By: (signature) Title: Vice President

For: Joseph Yeasted - TRC Environmental Corp. Date: March 19, 2001
(print name of person or entity recorded in Section H)

Enter address of the person providing certification, if different from address recorded in Section H:

Street:

City/Town: State: ZIP Code:

Telephone: Ext.: Fax: (optional)

YOU MUST COMPLETE ALL RELEVANT SECTIONS OF THIS FORM OR DEP MAY RETURN THE DOCUMENT AS INCOMPLETE. IF YOU SUBMIT AN INCOMPLETE FORM, YOU MAY BE PENALIZED FOR MISSING A REQUIRED DEADLINE.

TABLE OF CONTENTS

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FIGURES

APPENDICES

1.0 INTRODUCTION

1.1 Purpose of Report

The following presents the As-Built Construction and Final Inspection Report for the Phase IV remediation activities of the Tank K Area at the former General Electric (GE) Facility site (Site) located at 50 Fordham Road in Wilmington, Massachusetts. This report conforms to the regulatory requirements under 310 CMR 40.0875 and 40.0878 of the Massachusetts Contingency Plan (MCP). The site is listed as a Tier IA site with Release Tracking Number 3-0518. Regulatory oversight is provided by the Massachusetts Department of Environmental Protection (MA DEP).

This report summarizes all activities and sampling results of work completed in accordance with the *Phase IV Remedy Implementation Plan Tank K Area* dated July 2000 (RIP), and modifications and requirements set forth by the MA DEP in the Conditional Approval letter dated October 31, 2000 and a supplemental letter dated December 18, 2000.

The Tank K Area, presented on Figure 1-1, is currently paved and utilized for parking by employees of GSI Lumonics (GSI), the current tenant within the Tank K area of the Site. Utilities including electrical, drainage and sanitary sewers are located within the targeted remediation area.

1.2 Overview of Remedy Implementation Plan

As described in the Phase IV RIP (July 2000), the remedial action for the Tank K area included the installation of a biosparging and soil-vapor extraction (SVE) system designed to remove/degrade gasoline-related compounds from the groundwater located around and hydraulically downgradient from the former Tank K location (i.e. the source area). The following tasks were required in order to install the remediation system at the Tank K area:

- Install additional groundwater monitoring wells in the parking lot around and hydraulically downgradient of the Tank K area.
- Collect and analyze groundwater samples to determine baseline volatile organic compound (VOC) concentrations.
- Install biosparging points in accordance with MA DEP-approved field screening criteria.
- Install air lines to the biosparge points, and slotted SVE collector pipe within excavated trenches.
- Construct a shed to house remediation equipment including biosparge and SVE blowers, equipment controls and granulated activated carbon (GAC) vapor treatment units.
- Conduct shake down procedures and start up of remediation system.

1.2.1 Targeted Remediation Area

The site property is an approximately 13-acre parcel of land located east of Fordham Road and north of Concord Street within an industrial park in Wilmington and North Reading, Massachusetts. The Wilmington Realty Trust currently owns the site and leases the buildings located on the property. The current tenants at the site are AMETEK (Building 1) and GSI (Building 2). The Tank K Area, as shown on Figure 1-1, is located on the north end of the site, east of Building 2. The conditions in the Tank K Area can be summarized as follows:

- The subsurface is characterized by 4 to 6 feet of fill underlain by silty fine to coarse sand. The top of bedrock is 30 to 50 feet below ground surface (bgs).

- The depth to groundwater is 3 to 5 feet bgs, near the interface of the fill and natural overburden material. Per previous investigations, the estimated hydraulic conductivity in the overburden aquifer is 17 feet per day, and the hydraulic gradient is approximately 0.07 feet per feet to the east.

- Volatile petroleum hydrocarbons (VPH) have been detected in Tank K Area groundwater and soils, with an apparent historic source from a former leaking underground gasoline storage tank (Tank K).

- Based on the most recent (1996) round of soil sampling in the area, no petroleum hydrocarbons or other VOCs currently exist in unsaturated soils at concentrations exceeding the applicable MCP Method 1 S-3/GW-1 standards (i.e., standards that are protective of potential drinking water aquifers, and where soils are isolated in the subsurface to a depth greater than 15 feet or are paved or otherwise covered with a barrier). Therefore, because the area is paved, remediation of the unsaturated soils in the Tank K Area is not required.

- Benzene, toluene, ethylbenzene, xylenes (BTEX) constituents and methyl-tert-butyl ether (MTBE) are the primary compounds of concern in groundwater in the Tank K Area, as their concentrations in monitoring wells in the area exceed GW-1 standards (i.e. drinking water standards).

The area of concern, as illustrated on Figure 1-2, is the target area for enhancing biodegradation through the implementation of the biosparging/SVE system. This area was defined based primarily on observations and measurements made during TRC's recent pilot test, with consideration given to both the direction of groundwater flow and groundwater analytical results. The groundwater analytical results for the wells in the target area as presented in the RIP are also shown on Figure 1-2.

The area of concern is centered around monitoring well WE-4S. This area was defined by an observed deficiency in dissolved oxygen and elevated VOC levels in groundwater monitoring wells. The current location of the area of concern is consistent with the anticipated eastward migration of contamination along the observed direction of groundwater flow in this area.

1.2.2 Remedial Action Goals and Performance Requirements

Response actions in the Tank K Area are limited to groundwater, with the MCP Method 1 GW-1 standards serving as the corresponding remedial action goals. The emphasis is on remediation of the area with elevated concentrations of BTEX and MTBE in the vicinity of the historic release from Tank K. As such, this action is considered to be a remedial action for the Tank K area of concern and does not address all areas of MCL exceedances in groundwater across the site. The latter will be addressed at a later date as part of the sitewide groundwater remedial action program and related risk evaluation.

2.0 REMEDY IMPLEMENTATION

2.1 Summary of Performed Actions

The implementation of the remedy was conducted by TRC between November 14, 2000 and February 21, 2001. TRC geologists installed the additional monitoring wells and collected groundwater samples for field screening and laboratory analyses. Following MA DEP approval of the field screening criteria to locate the biosparge points, TRC then proceeded to install the points across the targeted remediation area. Construction and installation of remediation equipment and lines was performed by Innovative Engineering Solutions, Inc. (IES) of Needham, Massachusetts under the direct supervision of TRC.

A project timeline summarizing the major construction activities completed to implement the remedy is presented below.

Project Timeline

Activity	Date
Mobilize to site	Nov. 14, 2000
Install additional monitoring wells	Nov. 14, 2000
Collect baseline groundwater samples	Nov. 28 & 29, 2000
Install biosparge points	Dec. 18 – 21, 2000
Construct remediation equipment shed	Dec. 21, 2000
Excavate trenches and install SVE/biosparge lines	Jan. 2 – 11, 2001
Install remediation equipment	Jan. 4, 2001
Install electric service, wire equipment and install controls and remote monitoring system	Jan. 29 – Feb. 5, 2001
Initial system Startup/shakedown	Feb. 7, 2001
Equipment failure and system repair	Feb. 7 – 20, 2001
Final system start-up	Feb. 21, 2001

2.2 Installation of Additional Monitoring Well Points

In accordance with the MA DEP Conditional Approval Letter dated October 31, 2000, on November 14, 2000 TRC and ADH Environmental Sampling Services installed three additional groundwater monitoring wells hydraulically downgradient of the target remediation zone. These wells, designated TRC-104, TRC-105S and TRC-105D, are located on the Site Plan presented in Figure 2-1.

The three 1.25-inch diameter PVC monitoring wells were installed using direct push methods in accordance with the MA DEP guidance procedures for micro-wells. The two shallow wells (TRC-104 and TRC-105S) are installed to 10 feet below grade with 9 feet of slotted PVC well

screen and an adequate length of riser so that the screen extends across the water table. The well screen of monitoring well TRC-105D was installed from 15 to 20 feet below grade to monitor slightly deeper groundwater conditions in the lower portion of the overburden aquifer.

TRC was unable to locate well WE-2S (see section 2.3), and believes that this well was destroyed sometime in the past. To close this potential gap in the monitoring well network, TRC directed New Hampshire Boring, Inc. to install a replacement well (TRC-106) in the same general location on December 21, 2000 using a direct push drilling method. The monitoring well was constructed so that the screen extended across the water table by installing 10 feet of 1.25-inch diameter well screen and two feet of riser. During drilling, the TRC geologist observed PVC well materials in the drill cuttings and concluded that the material most likely belonged to the destroyed monitoring well WE-2S.

Boring logs and monitoring well construction logs are provided in Appendix A.

In general, the subsurface materials encountered in the monitoring well borings consisted of 5 to 6 feet of non-native fill overlying a native fine to medium sand deposit. At monitoring well TRC-104, a one-foot thick layer of organic silt and peat was found between the fill and the native sand deposit. In addition, a very fine sand and silt deposit was encountered at TRC-105D below the native sand deposit at a depth of 14 to 20 feet below grade.

2.3 Baseline Groundwater Conditions

On November 29 and 30, 2000, TRC collected groundwater samples and one duplicate sample for VPH analysis (including MTBE, benzene, toluene, ethylbenzene and xylene compounds) from groundwater monitoring wells WE-4S, WE-4D, WE-7, WE-8, WE-9, PZ-8S, TRC-104, TRC-105S, and TRC-105D.

As previously mentioned, monitoring well WE-2S could not be located when baseline in-field groundwater data was collected on November 28 and 29, 2000. However, TRC did proceed to collect a groundwater sample from replacement well TRC-106 on February 12, 2001 for baseline analysis.

To assure representative formation water was being sampled, the monitoring wells were purged until the pH, specific conductance, oxidation reduction potential, and temperature of the groundwater stabilized to within ten percent variation. A calibrated YSI 600XL Multi-Parameter Water Quality Meter was used to monitor these in-field groundwater parameters. Observations made in the field, including notes on color, odor, turbidity, and measurements obtained during well evacuation were recorded in the project field book and groundwater sampling data record sheets.

Groundwater samples were collected from all wells using a peristaltic pump. The pump was adjusted so that a steady flow of groundwater was purged from each well in order to minimize the possibility of volatilization of VOCs. Samples were transferred directly from tubing into laboratory supplied sample containers and preserved in accordance with the method protocol.

Each sample container was filled carefully to minimize dissolved air in the sample and to completely fill the container leaving no headspace or air bubbles.

Samples were labeled with the appropriate sample number, site name, date of collection, time of collection, preservative used, and requested analysis. Samples were packaged on ice in a shipping cooler, accompanied by a completed chain-of-custody form, and delivered to the laboratory for analysis.

Both in-field groundwater monitoring data and laboratory analytical results are presented in Table 2-1. As shown in Table 2-1, the results reveal that, with the exception of the samples collected from wells PZ-8S and TRC-105S, concentrations of two or more VOCs were above the GW-1 criteria in samples collected from the shallow monitoring wells. Concentrations of all VOCs were below the GW-1 criteria in the samples collected from PZ-8S and TRC-105S. These wells are located hydraulically downgradient from the former tank area, and therefore, define the downgradient extent of the contaminant plume. Concentrations of VOCs were also below the GW-1 criteria in the samples collected from the deep monitoring wells WE-4D and TRC-105D. The highest concentration of total BTEX (9,430 ug/l) was detected in the sample collected from TRC-106 located immediately downgradient of the former tank grave. Figure 2-1 presents total BTEX and MTBE baseline groundwater concentrations. For reference purposes, historical data for crossgradient well GZA-5 and former wells WE-1 and WE-3 are also included.

Based on in-field groundwater monitoring data, the groundwater hydraulically downgradient of the Tank K is slightly acidic (5< pH<7) and exhibits low, generally negative values of oxidation/reduction potential (Eh). The negative values of Eh are consistent with the low levels of dissolved oxygen (0.0 to 2.0 mg/l) measured in the groundwater samples.

2.4 Data Validation

TRC performed a limited validation of the VPH analytical data associated with this sampling event. Samples included in this review are listed below.

WE-4S	TRC-104
WE-4D	TRC-105S
WE-7	TRC-105D
WE-8	WE-4S-2 (field duplicate of WE-4S)
WE-9	TRC-106
PZ-8S	

The sample results were assessed using the "USEPA Contract Laboratory Program (CLP) National Functional Guidelines for Organic Data Review" (10/99). Modification of the Functional Guidelines was done to accommodate the non-CLP methodology used by the laboratory. Qualification of sample data was not performed.

The limited validation was based upon the following parameters: holding times, cooler temperatures, blanks (laboratory method blanks and trip blanks), surrogate spike recoveries, laboratory control sample (LCS) results, field duplicate results and an evaluation of sample

quantitation limits. These parameters provide an adequate assessment of overall precision and accuracy of the data set.

In general, the data appear to be valid as reported and may be used for decision-making purposes. With the exception of minor surrogate nonconformances, all accuracy and precision requirements were met.

Accuracy

All samples were received with cooler temperatures within the method-specified range. All samples were analyzed within the method-specified holding time. Target analytes were not detected in any laboratory method blanks. Two trip blanks were evaluated with this data set; target analytes were not detected in these trip blanks.

With the exception of the undiluted analyses of samples WE-4S, WE-4S-2 and TRC-106, all samples exhibited acceptable surrogate recoveries. The undiluted analyses of these samples yielded slightly high recovery of the surrogate from the photoionization detector (PID) portion of the analysis. Since the PID portion of the analysis is used to report the aromatic fraction only, results for aromatic compounds reported from these undiluted analyses were affected. The associated analytes were toluene in samples WE-4S and WE-4S-2 and MTBE and naphthalene in sample TRC-106; the results for these analytes may be biased slightly high. The MTBE and toluene results were below the GW-1 standards and therefore were not adversely affected by the potential high bias. The naphthalene result was approximately 5x higher than the GW-1 standard; it is unlikely that the high bias increased the naphthalene result to the extent that it would exceed the GW-1 standard. That is, the result for naphthalene most likely would have still exceeded the GW-1 standard if the surrogate was within the acceptance limits.

Two VPH LCSs were evaluated with this data set. Both LCSs yielded acceptable recoveries of all spiked analytes.

Precision

Samples WE-4S and WE-4S-2 were submitted as a field duplicate pair with this sample set. The relative percent differences (RPDs) of all detected analytes were within the acceptance limits (<30), indicating acceptable precision.

Quantitation Limits

Several samples (TRC-106, WE-4S, WE-7, WE-8, WE-9, WE-4S-2) were analyzed on dilution due to target analytes which exceeded the calibration range in the initial undiluted analysis. In the case of samples WE-4S, WE-8, WE-4S-2 and TRC-106, the results of both the diluted and undiluted analyses were combined in order to report the lowest possible quantitation limits and all results within the calibration range. In the case of samples WE-7 and WE-9, only results from the diluted analyses were reported since all analytes were detected within the calibration range in these analyses.

WILMINGTON
50 FORDHAM
3-518

Copies of all groundwater analytical reports are provided in Appendix B.

2.5 Field Screening Correlation

As outlined in the RIP, the actual location (and number) of all biosparge points would be determined using an in-field headspace screening method. However, per the October 31, 2000 MA DEP Conditional Approval letter, TRC needed to demonstrate to MA DEP the accuracy of the field screening method prior to installing the biosparge points.

Per the MA DEP Conditional Approval letter, TRC collected duplicate baseline groundwater samples and screened the samples using the headspace field screening procedure. TRC then compared the field screening results to the baseline laboratory analytical results.

Results of the correlation are presented in the Field Screening Correlation letter to the MA DEP dated December 12, 2000 (Appendix C). In summary, a good correlation was found between the total VOC concentration determined by laboratory analysis and the calculated total VOC concentration using the field screening method.

Following the submission of the December 12, 2000 letter, TRC identified a lab error that required re-calculation of some of the analyte concentrations. This resulted in an increase in some of the concentrations already reported in the letter. However, these changes did not affect the overall assumptions and conclusions of the field screening methodology. In fact, it further refined the correlation of the field screening results to the laboratory results. The final (corrected) baseline data is reported in Table 2-1, with the corresponding laboratory reports presented in Appendix B.

2.6 Biosparge Point and SVE Piping Installation

As described in the RIP, the generalized array of biosparge points represented in the RIP would be modified to reflect the in-field screening results. Any change in the number or location of the biosparge points would not be considered a deviation or significant modification from the RIP. The MA DEP Conditional Approval Letter required that biosparge points be installed at each boring location where field screening of the groundwater revealed a total VOC concentration of >10 ppm on the PID. Further, and be installed to a depth of 15 feet bgs rather than a depth of 10 feet bgs (per the RIP). In addition, MADEP requested that the western-most row of sparge points be moved further west (and closer to the GSI building) to include the former tank grave area within the treatment zone of the biosparging/SVE system.

Because of the proximity to the building and concerns regarding vapor intrusion into the GSI building, MA DEP later approved limiting the depth of western-most biosparge to 10 feet bgs. All other points were installed to 15 feet bgs.

The biosparge points were installed by New Hampshire Boring, Inc. using a direct push drilling method between December 18 and 21, 2000. A TRC geologist supervised the drilling activities and performed the headspace field screening procedure to determine the placement of biosparge points. As shown in Figure 2-2, a total of 22 borings were drilled in the area of concern to

collect discrete groundwater samples for headspace screening. Groundwater samples for the headspace screening were collected using a peristaltic pump from a 10 foot section of well screen that was temporarily placed within the drilling rods. Results of the headspace screening procedure are presented in Table 2-2.

As shown on Figure 2-3, a total of 15 biosparge points were installed. Twelve of the biosparge locations revealed total VOC concentrations exceeding the 10 ppm criteria. Three biosparge points revealed the presence of a sheen on the water table. TRC did not perform field screening of these samples because of the obvious presence of contamination. The final three biosparge points (A-4, B-1 and C-1) were installed first, without referring to the field screening results, to prevent prolonged interference with traffic and GSI truck deliveries. Post installation field screening results revealed that none of these biosparge points exceeded the 10 ppm criteria. Even though biosparge/SVE treatment at these points is unnecessary, TRC included biosparge points B-1 and C-1 in the system layout given that they are located within the requisite piping trenches.

Sparge point construction details are presented on Figures 2-4 and 2-5.

The compressed air tubing to the sparge points, and the PVC SVE lines were installed as described in the RIP between January 2 and 11, 2001. The actual layout of the sparge and SVE system as constructed is presented on the As-Built drawings presented in Appendix D.

3.0 DEVIATIONS OR SIGNIFICANT MODIFICATIONS FROM REMEDY IMPLEMENTATION PLAN

Deviations and modifications from the RIP were limited to 1) the total depth of the sparge points located alongside the GSI Lumonics building, and 2) the location of the treatment shed.

As previously described in Section 2.5, MADEP requested that the western-most row of sparge points be moved further west to include the former tank grave area within the treatment zone of the biosparging/SVE system. This adjustment therefore required that the sparge points be installed closer to the GSI Lumonics building. Given the potential for VOC vapors to enter the building, TRC limited the depth of the sparge points located adjacent to the GSI building to 10 feet below ground surface. The remaining sparge points were installed to 15 feet. This modification was approved by MADEP prior to installation procedures.

In addition, the location of the treatment shed was moved further west from the originally proposed location to avoid interference with two utility poles located at the corner of the access road and the parking lot.

4.0 SYSTEM STARTUP OPERATIONS

IES conducted the system start up and shakedown procedures on February 7. However, a mechanical malfunction (described below) delayed the final system start up until a replacement part could be installed. The system was fully operational by February 21, 2001. Details of the start up and system performance monitoring are presented in the IES report presented in Appendix D, and summarized below.

4.1 Startup/Shakedown

The biosparge and SVE system was activated on February 7, 2001 to perform system checks and shakedown procedures. The system components were found to be operational, and the system was deactivated pending the initiation of full-scale startup with performance monitoring.

Full-scale system start up was then initiated on February 9, 2001. However, a crack in sparge blower caused the system to shut down sometime over the weekend of February 10 and 11, 2001. The system was de-energized on February 12, 2001. Following the installation of a replacement biosparge blower, the final start up program was initiated on February 21, 2001.

4.2 System Monitoring

On February 21, 2001, the system was restarted with each biosparge points running at 0.8 cubic feet per minute (CFM). The air injection rates were slightly increased to 0.9 CFM per sparge point on February 23, 2001. The air injection rates were further increased to 1.2 CFM, 1.3 CFM, and 1.5 CFM during subsequent site visits on February 27, March 2, and March 7. Since this time, system operation monitoring has been checked daily over the phone via a remote monitoring device.

In-field groundwater parameters were measured on February 27, 2001. Organic vapors were not detected in the extracted soil gas. The absence of vapors may have been due to the frozen conditions of the vadose zone during the winter period. The in-field monitoring data as presented in Table 4-1 indicates that of the 10 groundwater wells monitored, the dissolved oxygen has increased in seven wells and the oxidation/reduction potential (measured as Eh) has increased in nine wells. A measurable change in air pressure was detected in two wells WE-2S and TRC-106 indicating that an air flow pathway exists between the sparge injection system and the well screens. Air-tight caps will be maintained on these wells to prevent short circuiting of the injected air.

4.3 Modifications or Adjustments

During initial system operation on February 9, 2001, it was noted that three biosparge points had no detectable air flow. After the biosparge blower was replaced, additional three points exhibited no air flow during the February 21, 2001 monitoring event. It was determined that the biosparge point screens had become clogged with silt and sand particles. To clear the screened intervals, these points were developed on February 27, 2001 by injecting and pumping water directly into the biosparge points. Since these activities, five of the six clogged wells resumed

normal operations. Currently biosparge point C-1 exhibits no flow conditions. Given that biosparge point C-1 did not exceed the installation field screening criteria, this point does not require treatment, and therefore does not need to be an operational biosparge point. Currently, all air injection rates for the other biosparge points are at the design value of approximately 1.6 cfm.

TRC believes that the screened sections of the sparge point became clogged when silt-laden groundwater was drawn into the PVC pipe as a result of the sudden release of air pressure due to starting and stopping the biosparge blower. The development procedure performed on the affected sparge points should have created a stable filter around the screened sections and should prevent future clogging problems. However, to ensure that clogging does not reoccur, the air pressure to the biosparge points will be slowly reduced prior to deactivating the biosparge blower. This will decrease the chance of drawing silty water into the sparge points as a result of a sudden loss of pressure.

4.4 Groundwater Elevation Monitoring

Groundwater levels measured during the baseline monitoring and at the end of the first week of monitoring are presented in Table 2-3. The probe used to measure water levels would not fit into wells PZ-8S and TRC-105S due to the small well diameter and a slightly bent casing, respectively. A smaller diameter water level probe will be used in future monitoring events to obtain data from these wells. Groundwater levels varied one-tenth of a foot or less between the two monitoring events, and therefore reveal minimal groundwater mounding in the area.

5.0 FINAL INSPECTION AND PHASE IV COMPLETION

5.1 Final Inspection

A Final Inspection of the Tank K system was performed by the Licensed Site Professional (LSP) of Record for this site (Mr. Bruce Hoskins of URS Corporation) on February 28, 2001. This inspection was performed to ensure that the Tank K system was installed in accordance with the RIP specifications and/or any appropriate modifications and MADEP approvals. All system elements were inspected. The system was installed as specified in the RIP with the modifications described previously in Sections 2.0 and 3.0. These modifications were deemed to be acceptable to the LSP as they did not adversely impact the overall system design standards.

During the inspection, it was observed that one biosparge point (C-1) exhibited no flow conditions. The LSP was made aware that condition had been discovered earlier and was due to biosparge points becoming clogged by silt and sand particles. Previously clogged biosparge points had to be redeveloped (see Appendix D for further discussion of this issue). The clogging of biosparge points appears to be due to the starting and stopping of the biosparge blower. A specific shut down procedure will be implemented for future biosparge maintenance to reduce the chance of clogging.

The LSP found the Tank K system to be in full operational mode and functioning to meet the projected design standards.

5.2 Phase IV Completion

This report fulfills the MCP requirements for both the As-Built Construction Report and Final Inspection Report under 310 CMR 40.0875 and 40.0878. As discussed in the previous sections, the activities completed for the Tank K Area were in accordance with the Tank K RIP and associated MADEP conditions and approvals. The objective of the RIP was to install a remediation system capable of achieving the GW-1 standards for compounds related to the former gasoline release in the Tank K Area. The system is intended to achieve the GW-1 standards after a period of sustained operation. The RIP objective has been achieved, as the intended remedial system has been installed and undergone startup procedures. Continued operation and maintenance of this system can now take place under Phase V of the MCP (see Section 6).

Because of the achievement of the RIP goals, MCP Phase IV response actions for the Tank K Area are considered to be completed with the submission of this report. Additional Tank K Area response actions will be conducted under Phase V.

6.0 SCHEDULE FOR PHASE V OPERATION, MAINTENANCE AND MONITORING

The operation, maintenance and monitoring (OM&M) program will consist of three components: systems maintenance monitoring, systems performance monitoring and groundwater monitoring. A more detailed description of each OM&M component is provided below.

6.1 Systems Maintenance Monitoring

The purpose of systems maintenance monitoring is to ensure that the systems are operating in a balanced and optimal manner. Systems monitoring will include regularly scheduled remote monitoring of the system to ensure that it is operational, and site visits to inspect treatment system equipment and perform repairs as needed.

Records will be prepared and maintained to demonstrate continued operation of the systems and air emission compliance, including:

1. VOC concentrations in air prior to control and after control
2. Overall VOC reduction efficiency of the air pollution control system in percent by weight
3. Maintenance records of the system
4. Monthly operating hours of the system
5. Repair records.

Systems monitoring will be conducted at the following frequency for the duration of system operation after startup:

First Month	Three (3) times the first week Two (2) times the second and third week One (1) time the fourth week
Second Month	Every two (2) weeks
Remaining Duration	Monthly

6.2 Systems Performance Monitoring

The purpose of systems performance monitoring is to evaluate the efficacy of the air injection system by periodically measuring groundwater parameters in the target area that are indicative of increased dissolved oxygen levels. Groundwater observation wells WE-4S, WE-4D, WE-7, WE-8, WE-9 and TRC-106 (all located within the core of the VOC plume area) will be monitored as part of the in-field parameter testing. These wells will be sampled for the following parameters:

- Depth to groundwater
- Dissolved Oxygen (DO)
- Oxidation/Reduction Potential (ORP)
- pH

- Temperature
- Pressure

In-field groundwater monitoring will be conducted at the following frequency:

First Month	End of the first week of operation Fourth week of operation
First Year	Quarterly
Remaining Duration	Semi-annually

A summary of this monitoring program is provided in Table 6-1.

WE-4D, TRC-104, TRC-105S & TRC-105D

6.3 Groundwater Monitoring

The purpose of the groundwater monitoring program is to evaluate the degradation of contaminants in the target area induced by biosparging/SVE treatment. Groundwater samples will be collected from groundwater monitoring wells WE-4S, WE-7, WE-8, WE-9, and TRC-106 and will be sent to a Massachusetts certified laboratory for VPH analysis with MTBE and BTEX. Sample collection will be conducted in accordance with MA DEP sampling protocols.

After start-up, analytical testing of groundwater will be conducted every six months. Given that the system was started at the end of February, the first groundwater sample round should be occur in August 2001. However, in an attempt to streamline site-wide monitoring, TRC proposes to conduct the first sampling event concurrently with other scheduled sampling in September 2001. Future sampling will occur during the months of March and September. A summary of this monitoring program is provided in Table 6-1.

6.4 Inspection and Monitoring Reports

Information and data collected as part of the operation, maintenance, and monitoring of the remedial actions at the Tank K Area will be documented in routine Inspection and Monitoring Reports. These reports will be prepared and submitted to the Massachusetts Department of Environmental Protection in accordance with 310 CMR 40.0892(5) of the MCP. These Inspection and Monitoring Reports will be submitted every six months following start-up of the Tank K remedial system.

6.5 Post Operations Sampling

Per MA DEP's Conditional Approval Letter dated October 31, 2000, the remediation system will be operated until two consecutive rounds of groundwater sampling (as presented above in Section 6.3) indicate that remediation has reduced contaminant levels to less than Method 1 GW-1 standards. At that time, the system will be deactivated and groundwater samples will be collected every three months for one year to confirm that Method 1 GW-1 standards have been met. This program is also summarized in Table 6-1.

TABLES

Table 2-1
Baseline Groundwater Monitoring Data
November 28 - 29, 2000
Samples Collected 11/29, 11/30 & 2/12/01 (for TRC-106)

Tank K Area
Former GE Site
Wilmington, Massachusetts

Constituents (ug/l)	GW-1 Standards	WE-4S	WE-4S-2[1]	WE-4D	WE-7	WE-8	WE-9	PZ-8S	TRC-104	TRC-105S	TRC-105D	TRC-106
Screened Interval of Well		3-13'	3-13'	20-30'	2-12'	2-17'	2-12'	7-12'	1-10'	1-10'	15-20'	2-10'
VPH												
C5-C8 Aliphatics	400	**1,900**	**1,700**	240 U	**3,000**	**2,000**	**4,700**	240 U	320	240 U	240 U	**10,000**
C9-C12 Aliphatics	4,000	2,900	2,900	240	1,400	**4,900**	**4,300**	210	240	170	140	3,900
C9-C10 Aromatics	200	**4,500**	**4,400**	70 U	**6,600**	**6,900**	**8,000**	70 U	70 U	70 U	70 U	**6,100**
Unadjusted C5-C8 Aliphatics	--	2,400	2,300	240 U	4,000	4,800 U	7,000	240 U	580	240 U	240 U	U
Unadjusted C9-C12 Aliphatics	--	9,900	9,800	240	14,000	17,000	15,000	430	240	170	140	16,000
MTBE	70	**94**	**95**	5 U	**100**	13	**150**	5 U	**260**	5 U	5 U	51
Benzene	5	**440**	**470**	5 U	**290**	**120**	**430**	5 U	**9**	5 U	5 U	**300**
Toluene	1,000	41	42	15 U	630	30	**1,800**	15 U	15 U	15 U	15 U	**3,400**
Ethylbenzene	700	590	650	5 U	470	110	520	7	5 U	5 U	5 U	**730**
m&p Xylene	--	1,000	1,100	10 U	4,100	4,900	1,200	31	10 U	10 U	10 U	3,400
o-Xylene	--	890	740	10 U	1,100	380	1,500	13	10 U	10 U	10 U	1,600
Xylenes-Total	10,000	1,890	1,840	10 U	5,200	5,370	2,700	44	10 U	10 U	10 U	5,000
Napthalene	20	**190**	**190**	10 U	**240**	**120**	**290**	10 U	10 U	10 U	10 U	**110**
Field Water Quality Measurements												
pH (standard units)		6.1	6.1	5.0	5.9	5.8	6.0	5.9	6.5	6.1	5.9	7.1
Eh (millivolts)		-217.0	-217.0	98.0	-86.0	-74.3	-181.7	-96.3	-620.0	-265.0	-550.0	112.0
Conductivity (µohms/cm)		346.0	346.0	347.0	442.0	150.0	464.0	276.0	442.0	270.0	549.0	405.0
Temperature (C)		15.6	15.6	15.5	11.7	15.9	14.2	16.0	13.6	13.3	15.5	6.7
Turbidity (NTU)		0.0	0.0	4.0	1.0	2.0	1.0	3.0	0.2	8.0	2.3	4.0
Dissolved Oxygen (mg/L)		0.0	0.0	0.5	0.3	0.2	0.0	1.0	1.4	1.7	2.0	6.6

Notes:
(1) WE-4S-2 is a duplicate of WE-4S.
Analytical results presented in **bold** and shaded exceed the GW-1 Standard.
U = Undetected at the specified quantitation limit.

WE-2 & WE-2D Not sampled
TRC-106 = replacement well for WE-2 + WE-2D, which were abandoned.

Table 2-2
Groundwater Headspace VOC Concentrations and Biosparge Point Installation Details

Tank K Area
Former GE Site
Wilmington, Massachusetts

Boring ID	Drilling Date	Sparge Point ID	Depth of Sparge Point (ft bgs)	Headspace VOC Result (ppm)
SP-A1	12/20/00	A-4	10	<1
SP-A2	12/20/00	A-3	10	Sheen[1]
SP-A3	12/20/00	A-2	10	15
SP-A4	12/20/00	A-1[2]	10	30
SP-A5	12/20/00	--	---	<1
SP-B-1	12/19/00	B-5	15	21
SP-B-2	12/21/00	--	---	<1
SP-B1	12/19/00	B-4	15	150
SP-B2	12/19/00	B-3	15	Sheen[1]
SP-B3	12/19/00	B-2	15	Sheen[1]
SP-B4	12/20/00	B-1[2]	15	4
SP-C-1	12/19/00	C-6	15	15
SP-C-2	12/21/00	--	---	<1
SP-C1	12/19/00	C-5	15	16
SP-C2	12/18/00	C-4	15	40
SP-C3	12/18/00	C-3	15	60
SP-C4	12/18/00	C-2	15	34
SP-C5	12/18/00	C-1[2]	15	6
SP-D1	12/20/00	--	---	<1
SP-D2	12/21/00	--	---	2
SP-D3	12/21/00	--	---	2
SP-D4	12/21/00	--	---	2

Notes:
[1] Field screening was not performed due to the presence of a sheen on the water sample.
[2] Biosparge Point installed even though field screening did not exceed 10 ppm to minimize delays and interference in traffic lane.
-- Sparge point not installed

Table 4-1
In-Field Groundwater Monitoring Data

Tank K Area
Former GE Site
Wilmington, Massachusetts

Constituents (ug/l) Screened Interval of Well	**WE-4S** 3-13'		**WE-4D** 20-30'		**WE-7** 2-12'		**WE-8** 2-17'		**WE-9** 2-12'	
Sample Date	11/29/00	2/27/01	11/29/00	2/27/01	11/29/00	2/27/01	11/29/00	2/27/01	11/29/00	2/27/01
Depth to Water (feet below top of riser)	3.39	3.37	3.41	3.35	3.16	3.09	3.17	3.11	3.19	3.24
pH (standard units)	6.1	5.3	5.0	5.1	5.9	6.1	5.8	6.3	6.0	6.1
Eh (millivolts)	-217.0	306.4	98.0	249.1	-86.0	16.8	-74.3	-24.2	-181.7	9.1
Temperature (C)	15.6	6.3	15.5	10.2	11.7	4.8	15.9	9.0	14.2	6.1
Dissolved Oxygen (mg/L)	0.0	11.8	0.5	1.8	0.3	1.4	0.2	0.9	0.0	1.9
Pressure in w.c.	NA[3]	12.5	NA[3]	0.0	NA[3]	0.0	NA[3]	0.0	NA[3]	0.0

Constituents (ug/l) Screened Interval of Well	**PZ-8S** 7-12'		**TRC-104** 1-10'		**TRC-105S** 1-10'		**TRC-105D** 15-20'		**TRC-106** 2-10'	
Sample Date	11/30/00	2/27/01	11/30/00	2/27/01	11/30/00	2/27/01	11/30/00	2/27/01	2/12/01	2/27/01
Depth to Water (feet below top of riser)	0	NS[1]	2.82	2.82	2.71	NS[2]	2.8	2.88	3.55	3.45
pH (standard units)	5.9	6.0	6.5	5.8	6.1	5.9	5.9	5.9	7.1	6.51
Eh (millivolts)	-96.3	67.8	-620.0	146.9	-265.0	223.4	-550.0	112.2	112.0	45.9
Temperature (C)	16.0	12.9	13.6	6.7	13.3	5.3	15.5	11.3	6.7	8.17
Dissolved Oxygen (mg/L)	1.0	0.6	1.4	1.7	1.7	4.6	2.0	0.8	6.6	4.55
Pressure in w.c.	NA[3]	0.0	NA[3]	0.0	NA[3]	0.0	NA[3]	0.0	NA[3]	2.3

Notes:

[1] Well diameter too small for probe.

[2] Well casing bent. Probe will not lower to water table.

[3] Measurement was taken prior to system start-up.

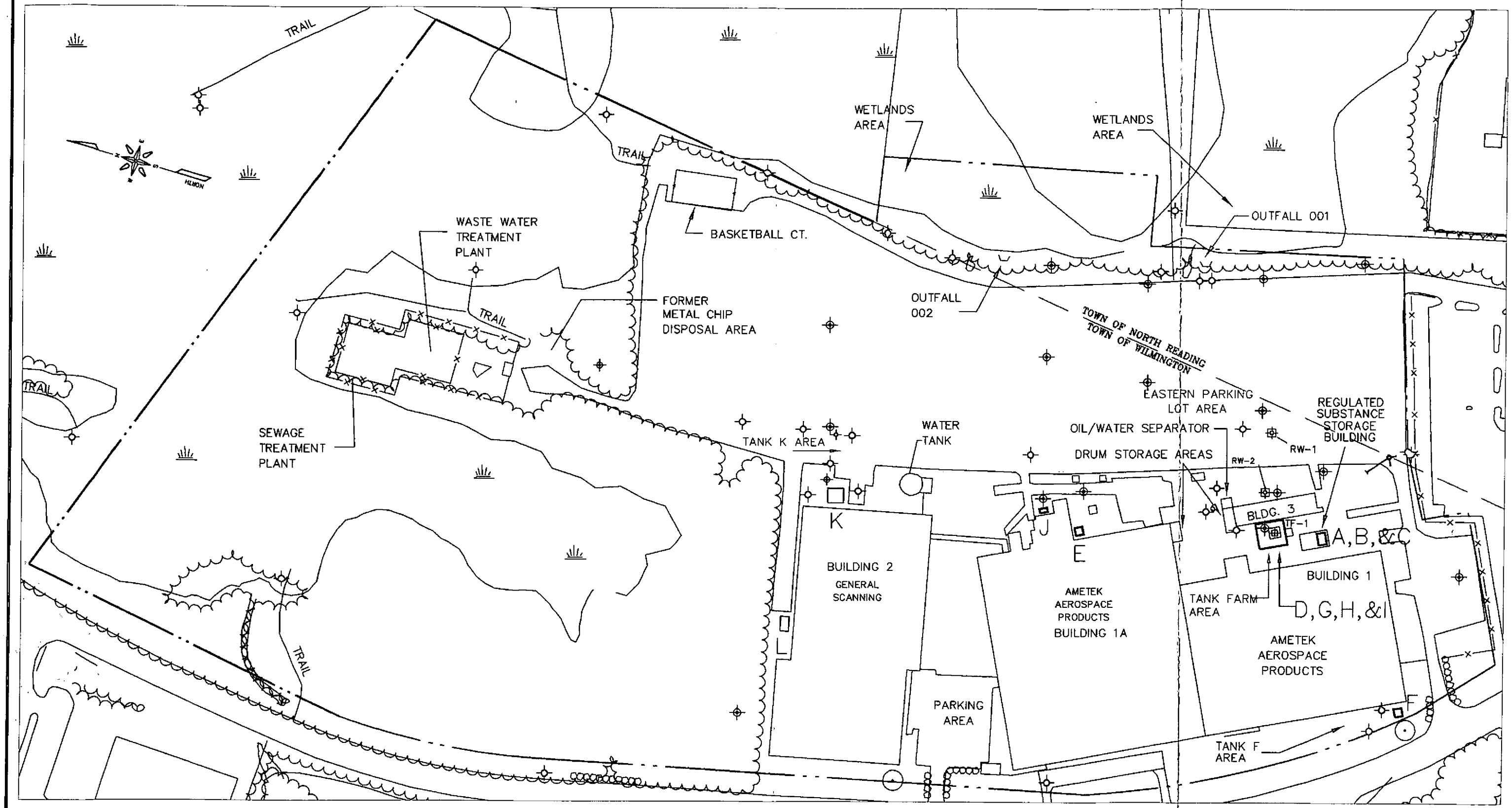
Table 6-1
Summary of In-Field Groundwater Monitoring and Groundwater Sampling Program

Tank K Area
Former GE Facility
Wilmington, Massachusetts

Well Category	Monitoring Well	In Field Testing	Semi-Annual Lab Analyses	Lab Analyses for Post-Operations O&M
SHALLOW OVERBURDEN				
Core of Plume	WE-4S	X	X	X
	WE-7	X	X	X
	WE-8	X	X	X
	WE-9	X	X	X
	TRC-106*	X	X	X
Downgradient	TRC-104			X
	TRC-105S**			X
	PZ-8S**			X
DEEP OVERBURDEN				
Core of Plume	WE-4D**	X		X
Downgradient	TRC-105D**			X

* = Replacement well for WE-2S
** = Concentrations of BTEX, VOCs, and MTBE are below Method 1, GW-1 standards in baseline samples.

FIGURES



NOTES

1. TOPOGRAPHIC AND PLANIMETRIC FEATURES SHOWN WERE COMPILED PHOTOGRAMMETRICALLY FROM AERIAL PHOTOGRAPHY DATED APRIL 16, 1992 BY EAST COAST MAPPING INC., CONCORD, NEW HAMPSHIRE. MAPPING GROUND CONTROL ESTABLISHED BY FIELD SURVEYS CONDUCTED IN APRIL 1992.
2. THE GRID SYSTEM DEPICTED ON THIS PLAN IS BASED ON THE MASSACHUSETTS STATE PLAN COORDINATE SYSTEM NORTH AMERICAN DATUM OF 1929.
3. ELEVATIONS ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929.
4. MONITORING WELL LOCATIONS ARE APPROXIMATE.
5. PROPERTY AND TOWN LINE BOUNDARIES WERE ADAPTED FROM "REGIONAL EXPLORATION PLAN, GENERAL ELECTRIC COMPANY, 50 FORDHAM ROAD PROPERTY, WILMINGTON/NORTH READING, MASS., BY GOLDBERG – ZOINO & ASSOCIATES, INC., DATED APRIL 1990.

0 50 100 150 200 250
GRAPHIC SCALE

LEGEND

- BUILDING
- APPROXIMATE PROPERTY LINE
- APPROXIMATE TOWN LINE
- APPROXIMATE EDGE OF WATER/STREAM
- APPROXIMATE EDGE OF WETLANDS/SWAMP
- FENCE LINE
- CATCH BASIN
- WATER SUPPLY WELL
- STM-5 MULTI-LEVEL MONITORING WELL/PIEZOMETER LOCATION
- MW-4A SINGLE-LEVEL MONITORING WELL/PIEZOMETER LOCATION
- E FORMER LOCATION OF TANK E
- RW RECOVERY WELL
- TF GROUNDWATER RECOVERY WELL

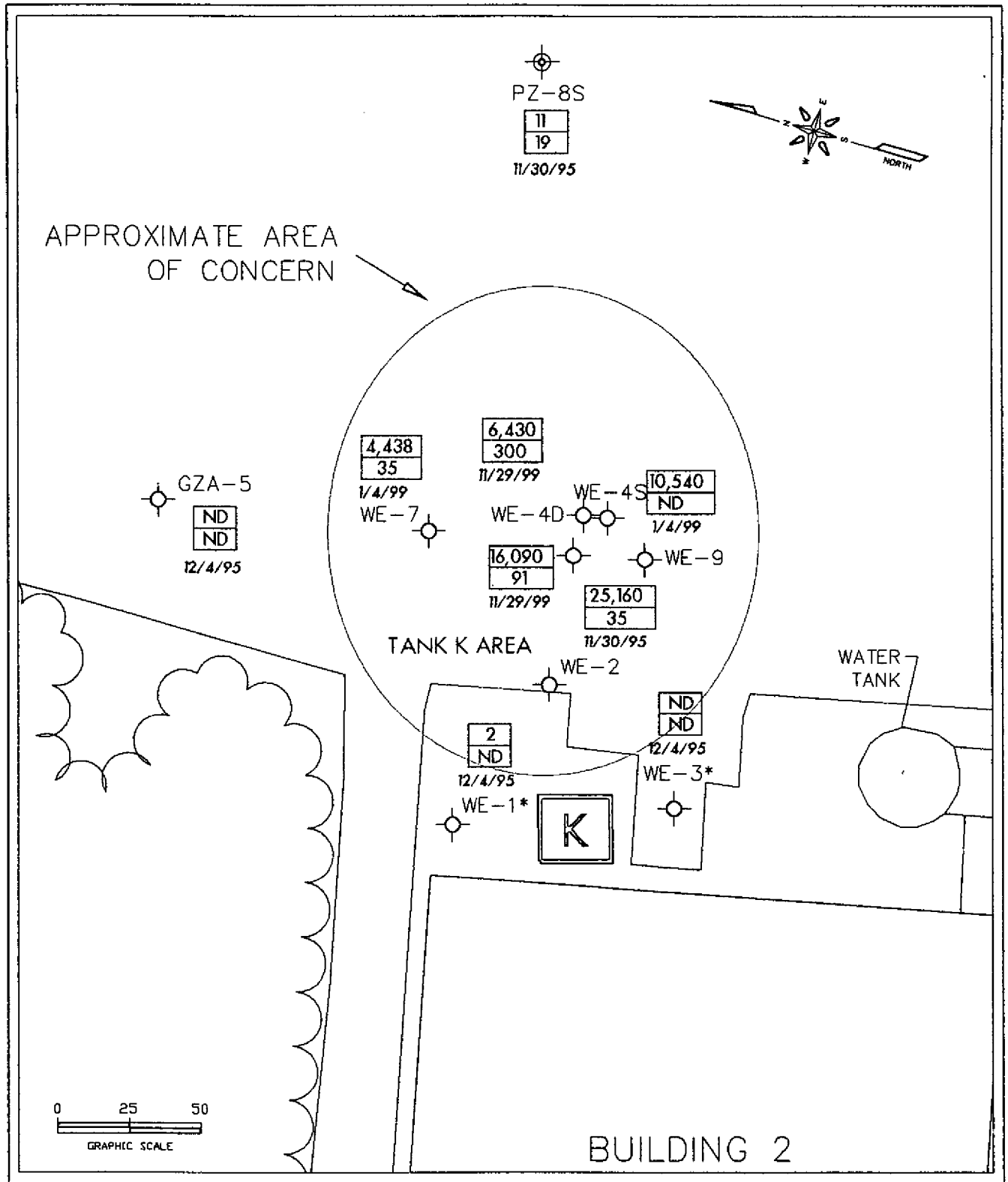
TRC Environmental Corporation
Boot Mills South
Foot of John Street
Lowell, MA 01852
(978) 970-5600

FORMER GE SITE
WILMINGTON/NORTH READING, MASSACHUSETTS

FIGURE 1-1
SITE PLAN

Date: 03/01 | Project No. E9202

e9202\tank_k\completion report\mini_site_plan



LEGEND

- BUILDING
- APPROXIMATE PROPERTY LINE
- APPROXIMATE TOWN LINE
- APPROXIMATE EDGE OF WATER/STREAM
- APPROXIMATE EDGE OF WETLANDS/SWAMP
- K — FORMER LOCATION OF TANK K
- TOTAL BTEX / MTBE
- 11-30/95 — SAMPLING DATE
- STM-5 — MULTI-LEVEL MONITORING WELL/ PIEZOMETER LOCATION
- MW-4A — SINGLE-LEVEL MONITORING WELL/ PIEZOMETER LOCATION

NOTE: '#' INDICATES ABANDONED WELL

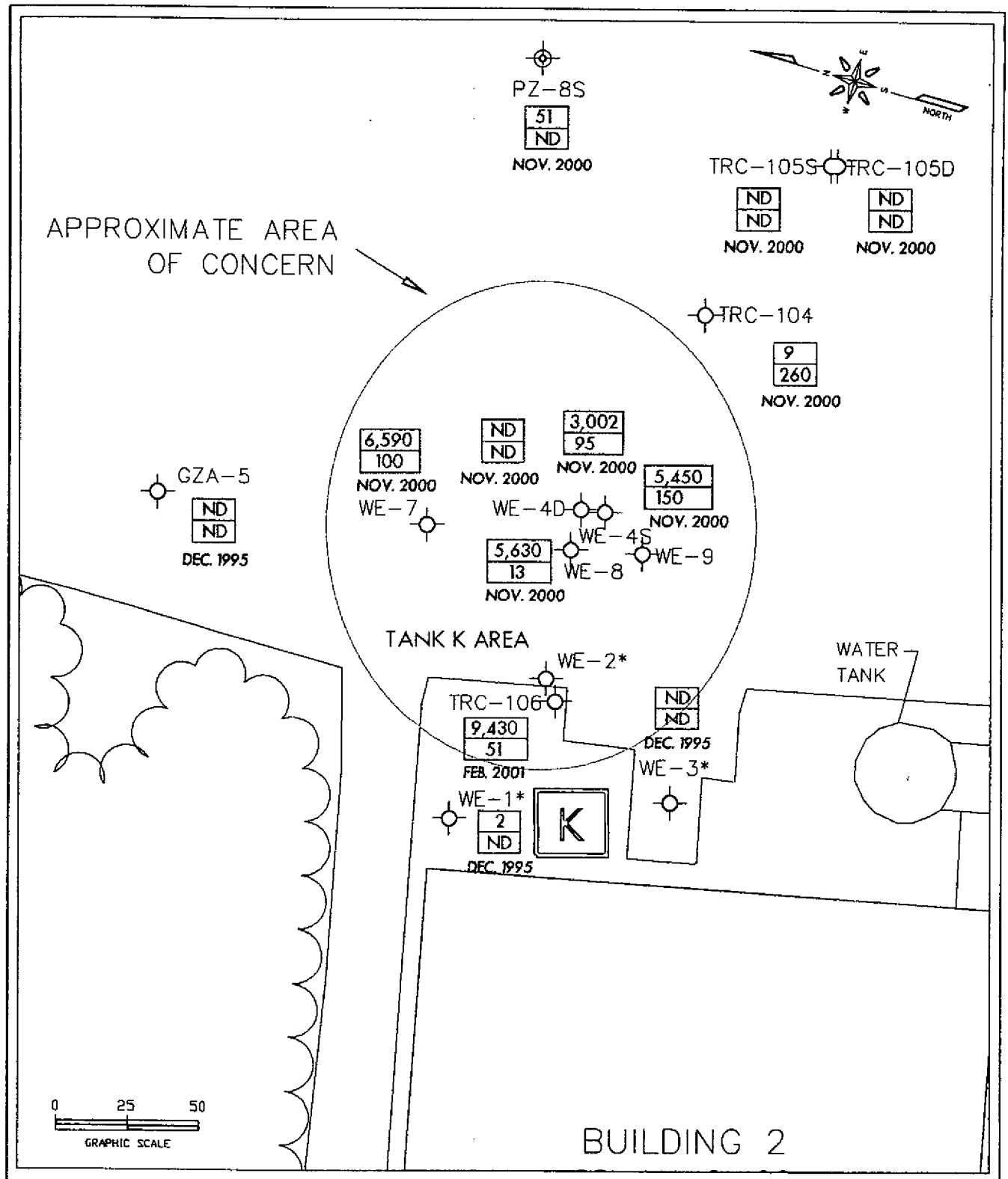
TRC

Boot Mills South
Foot of John Street
Lowell, MA 01852
(978) 970-5600

FORMER GE SITE
WILMINGTON/NORTH READING, MASSACHUSETTS

FIGURE 1-2
GENERAL AREA OF REMEDIATION

Date: 03/01 | Project No. E9202



LEGEND

- BUILDING
- APPROXIMATE PROPERTY LINE
- APPROXIMATE TOWN LINE
- APPROXIMATE EDGE OF WATER/STREAM
- APPROXIMATE EDGE OF WETLANDS/SWAMP
- K — FORMER LOCATION OF TANK K
- TOTAL BTEX (ug/L) / MTBE (ug/L)
- NOV. 2000 — SAMPLING DATE
- SM-5 — MULTI-LEVEL MONITORING WELL/ PIEZOMETER LOCATION
- MW-4A — SINGLE-LEVEL MONITORING WELL/ PIEZOMETER LOCATION

NOTE: '*' INDICATES WELL ABANDONED OR NOT LOCATED

TRC
Boot Mills South
Foot of John Street
Lowell, MA 01852
(978) 970-5600

FORMER GE SITE
WILMINGTON/NORTH READING, MASSACHUSETTS

FIGURE 2-1
BASELINE GROUNDWATER VOC CONCENTRATIONS

Date: 03/01 | Project No. E9202

LEGEND:

- BUILDING
- SP-D2 / 2 ppm — GROUNDWATER SAMPLE LOCATION FOR IN-FIELD SCREENING; IN-FIELD SCREENING RESULT IN ppm TOTAL VOC'S
- △ DRILLING LOCATION SPARGE POINT INSTALLED
- □ DRILLING LOCATION SPARGE POINT NOT INSTALLED
- STM-5 — MULTI-LEVEL MONITORING WELL/PIEZOMETER LOCATION
- MW-4A — SINGLE-LEVEL MONITORING WELL/PIEZOMETER LOCATION

NOTE: '*' INDICATES WELL ABANDONED OR NOT LOCATED

NORTH

TRC-104

SP-D4 2 ppm
SP-D3 2 ppm
SP-D2 2 ppm
SP-D1 <1 ppm

no air flow situation

GZA-5

SP-C5 6 ppm
SP-C4 34 ppm
SP-C3 60 ppm
SP-C2 40 ppm
SP-C1 19 ppm
SP-C-1 15 ppm
SP-C-2 <1 ppm

WE-7
WE-4D
WE-4S
WE-8
WE-9

SP-B4 4 ppm
SP-B3 SHEEN
SP-B2 SHEEN
SP-B1 150 ppm
SP-B-1 21 ppm
SP-B-2 <1 ppm

WE-2*
TANK K AREA
TRC-106

SP-A5 <1 ppm
SP-A4 30 ppm
SP-A3 15 ppm
SP-A2 SHEEN
SP-A1 <1 ppm

WE-3*
WE-1*

WATER TANK

BUILDING 2
GSI-LUMONICS

0 15 30
GRAPHIC SCALE

TRC
Boot Mills South
Foot of John Street
Lowell, MA 01852
(978) 970-5600

FORMER GE SITE
WILMINGTON/NORTH READING, MASSACHUSETTS

FIGURE 2-2
IN-FIELD GROUNDWATER SCREENING RESULTS

Date: 03/01 | Project No. E9202

I:\E_CAD\TANK K\COMPLETION_REPORT\TNKSURVEY

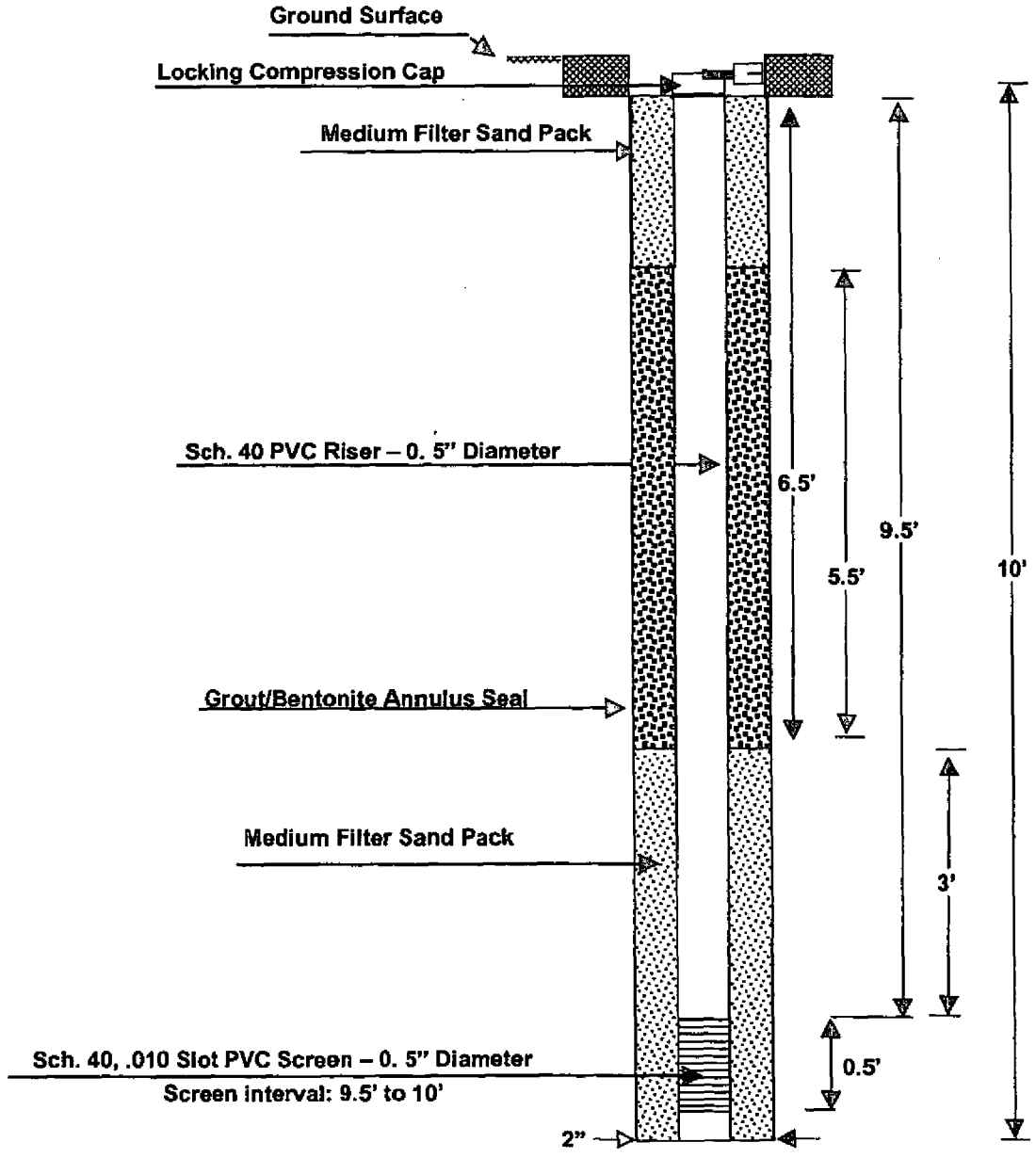
TRC

FIGURE 2-4

Biosparge Point Construction Log-10 Feet

Depth
10 feet

Project: Former GE Facility **No.:** E9202-3502-02500	**Reference Elevation:** NA
Client: **Date Completed:** 12/20/00	**Reference Description:** NA
Location: Tank K Biosparge system	**Depth to water:** 3 to 4 feet
Drilling Contractor: NH Boring **Method:** Direct push	**Development Date:** NA
TRC Geologist: Chris Rudzinski	**Development Method:** NA



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TRC

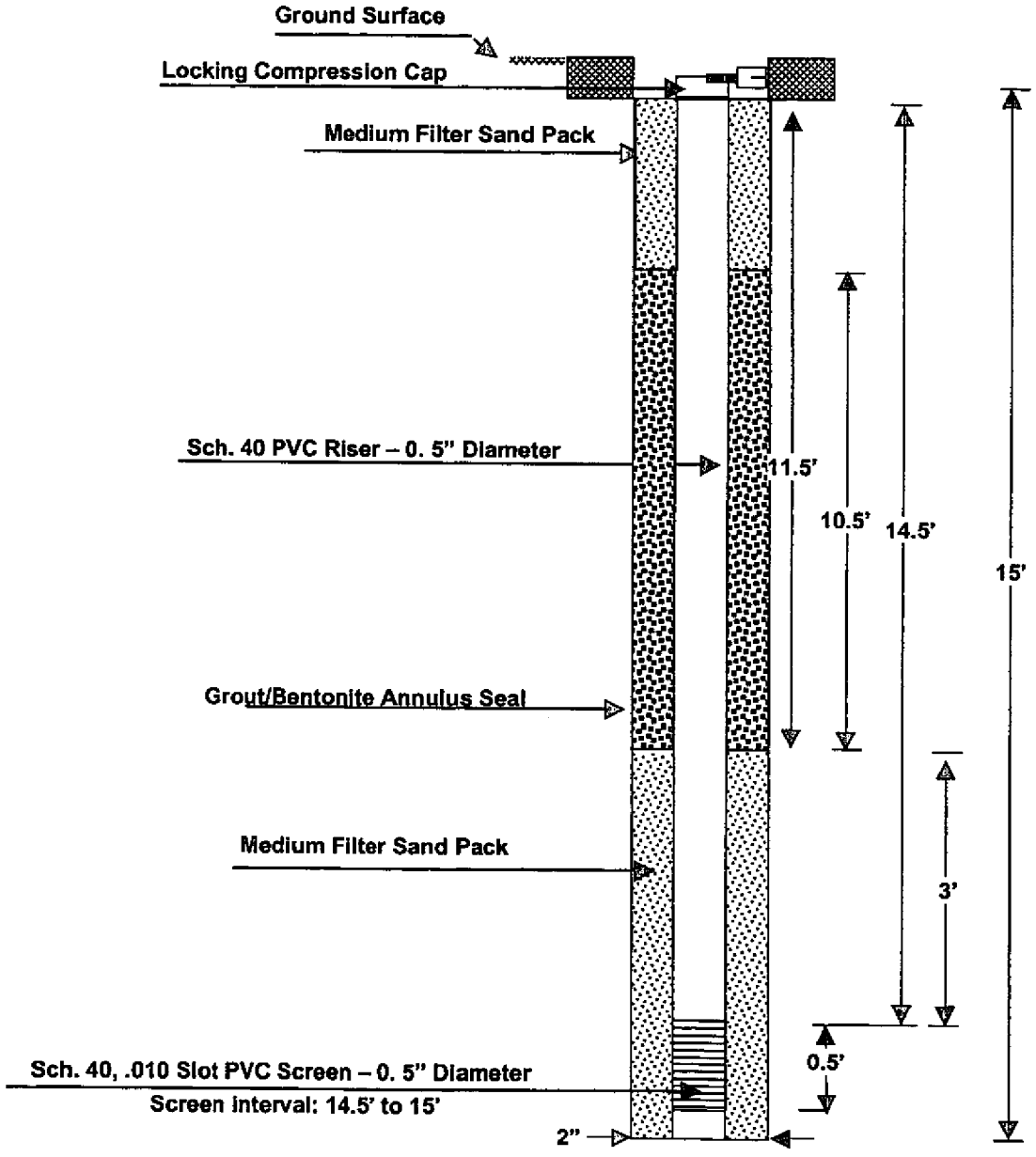
FIGURE 2-5

Biosparge Point Construction Log-15 Feet

Depth: 15 feet

Project: Former GE Facility No.: E9202-3502-02500
Client: Date Completed: 12/(18/19)/00
Location: Tank K Biosparge system
Drilling Contractor: NH Boring Method: Direct push
TRC Geologist: Chris Rudzinski

Reference Elevation: NA
Reference Description: NA
Depth to water: 3 to 4 feet
Development Date: NA
Development Method: NA



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APPENDIX A

BORING/WELL CONSTRUCTION LOGS

BORING LOG

TRC

PROJECT NUMBER	E9202	**BORING/WELL NUMBER**	TRC-104
LOCATION	Former GE facility	**DATE DRILLED**	11/14/00
DRILLING CONTRACTOR	ADH Environmental	**CASING TYPE/DIAMETER**	1.25" Sch. 40 PVC
DRILLING METHOD	Direct push	**SCREEN TYPE/SLOT**	Sch. 40 PVC .010 slot
SAMPLING METHOD	5 foot macro sampler	**FILTER PACK TYPE**	Medium silica sand
GROUND ELEVATION		**SEAL TYPE**	Bentonite
TOP OF RISER	79.34 feet	**DEPTH TO WATER (Feet)**	2.82
LOGGED BY	C. Rudzinski	**GROUND WATER ELEVATION**	
REMARKS	See well construction log for well details		

DEPTH (ft. BGL)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	Field Screening (ppm)	Lab Sample Number	WELL DIAGRAM
					Asphalt and Subbase			
1		3	S 1		Brown, medium to coarse SAND, some fine Gravel, some Silt, trace Crushed stone, moist FILL	<1		
2								
3					As above, blacker in color and saturated	<1		
4								
5						<1		
6		3	S 2		Organic SILTS and PEAT, saturated	<1		
7					Grey fine to medium SAND, little Silt, well sorted, sub-angular, saturated	<1		
8								
9						<1		
10					End of boring			

BORING LOG

TRC

PROJECT NUMBER	E9202	**BORING/WELL NUMBER**	TRC-105S
LOCATION	Former GE facility	**DATE DRILLED**	11/14/00
DRILLING CONTRACTOR	ADH Environmental	**CASING TYPE/DIAMETER**	1.25" Sch. 40 PVC
DRILLING METHOD	Direct push	**SCREEN TYPE/SLOT**	Sch. 40 PVC .010 slot
SAMPLING METHOD	5 foot macro sampler	**FILTER PACK TYPE**	Medium silica sand
GROUND ELEVATION		**SEAL TYPE**	Bentonite
TOP OF RISER	79.28 feet	**DEPTH TO WATER (Feet)**	3.00
LOGGED BY	C. Rudzinski	**GROUND WATER ELEVATION**	
REMARKS	See well construction log for well details		

DEPTH (ft. BGL)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	Field Screening (ppm)	Lab Sample Number	WELL DIAGRAM
					Asphalt and Subbase			
1		3	S 1		Brown, medium to coarse SAND, some fine Gravel, some Silt, trace Crushed stone, moist FILL	<1		
2								
3					As above, blacker in color and saturated ▼	<1		
4						<1		
5					Grey fine to medium SAND, little Silt, well sorted, sub-angular, saturated	<1		
6		3	S 2					
7						<1		
8								
9						<1		
10					End of boring			

BORING LOG

TRC

PROJECT NUMBER	E9202	**BORING/WELL NUMBER**	TRC-105D
LOCATION	Former GE facility	**DATE DRILLED**	11/14/00
DRILLING CONTRACTOR	ADH Environmental	**CASING TYPE/DIAMETER**	1.25" Sch. 40 PVC
DRILLING METHOD	Direct push	**SCREEN TYPE/SLOT**	Sch. 40 PVC .010 slot
SAMPLING METHOD	5 foot macro sampler	**FILTER PACK TYPE**	Medium silica sand
GROUND ELEVATION		**SEAL TYPE**	Bentonite
TOP OF RISER	79.21 feet	**DEPTH TO WATER (Feet)**	2.80
LOGGED BY	C. Rudzinski	**GROUND WATER ELEVATION**	
REMARKS	See well construction log for well details		

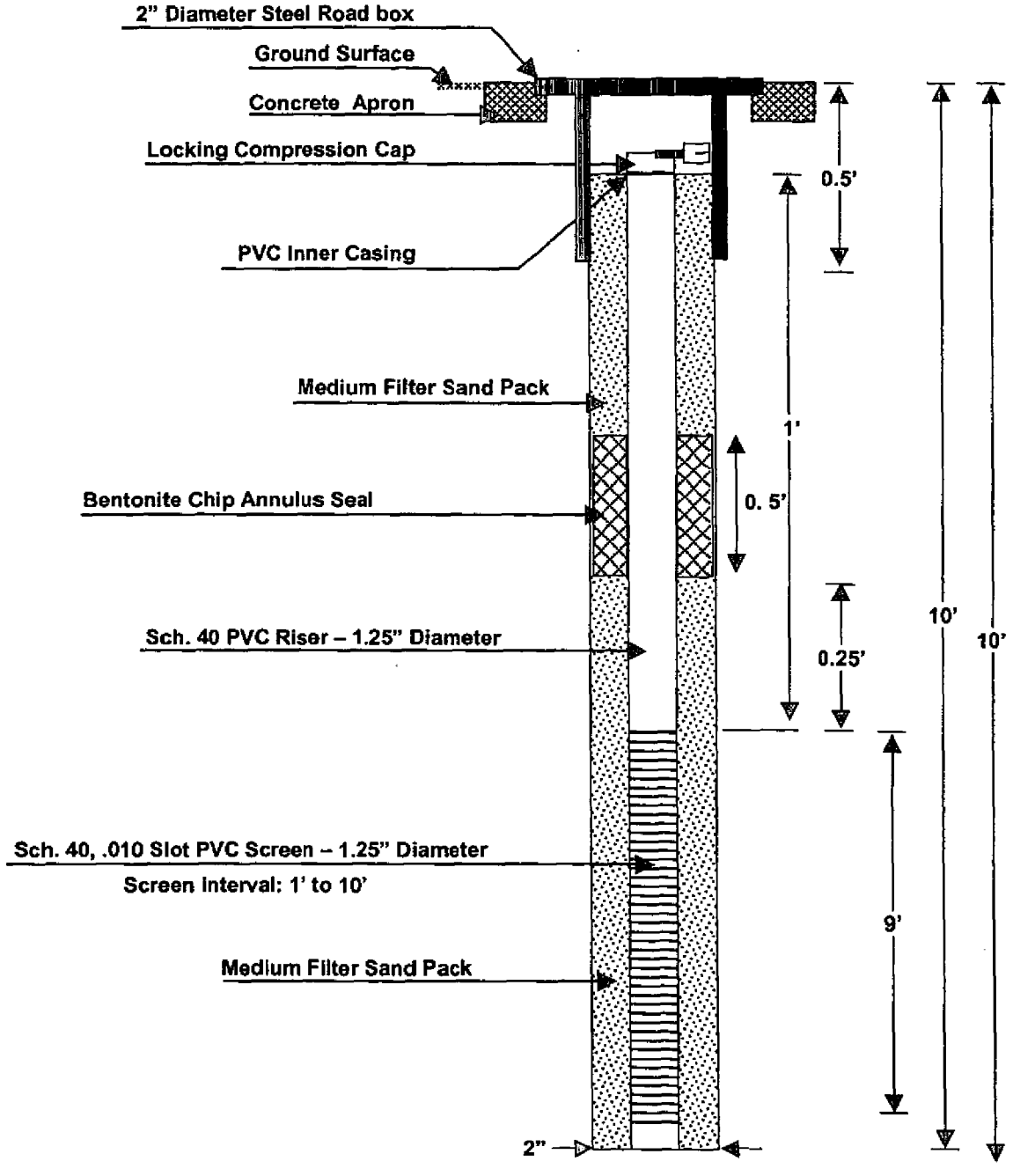
DEPTH (ft. BGL)	BLOW COUNTS	RECOVERY (inches)	SAMPLE ID.	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	Field Screening (ppm)	Lab Sample Number	WELL DIAGRAM
0					Asphalt and Subbase			
1		3	S 1		Brown, medium to coarse SAND, some fine Gravel, some Silt, trace Crushed stone, moist FILL	<1		
2								
3					As above, blacker in color and saturated ▼	<1		
4								
5					Grey fine to medium SAND, little Silt, well sorted, sub-angular, saturated	<1		
6		3	S 2					
7						<1		
8								
9						<1		
10								
11		3	S 3			<1		
12								
13						<1		
14					Grey to light brown, very fine SAND and SILT, saturated			
15						<1		
16		3	S 4					
17						<1		
18								
19						<1		
20					End of boring			

TRC

Flush Mount Overburden Monitoring Well Construction Log

Well No. TRC-104

Project: Former GE Facility	**No.:** E9202-3502-02500
Client:	**Date Completed:** 11/14/00
Location: Tank K	
Drilling Contractor: ADH Environmental	**Method:** Direct push
TRC Geologist: Chris Rudzinski	
Reference Elevation: 79.34 feet	
Reference Description: PVC (TOR)	
Depth to water: 2.82 feet	
Development Date: 11/17/00	
Development Method: Peristaltic pump	



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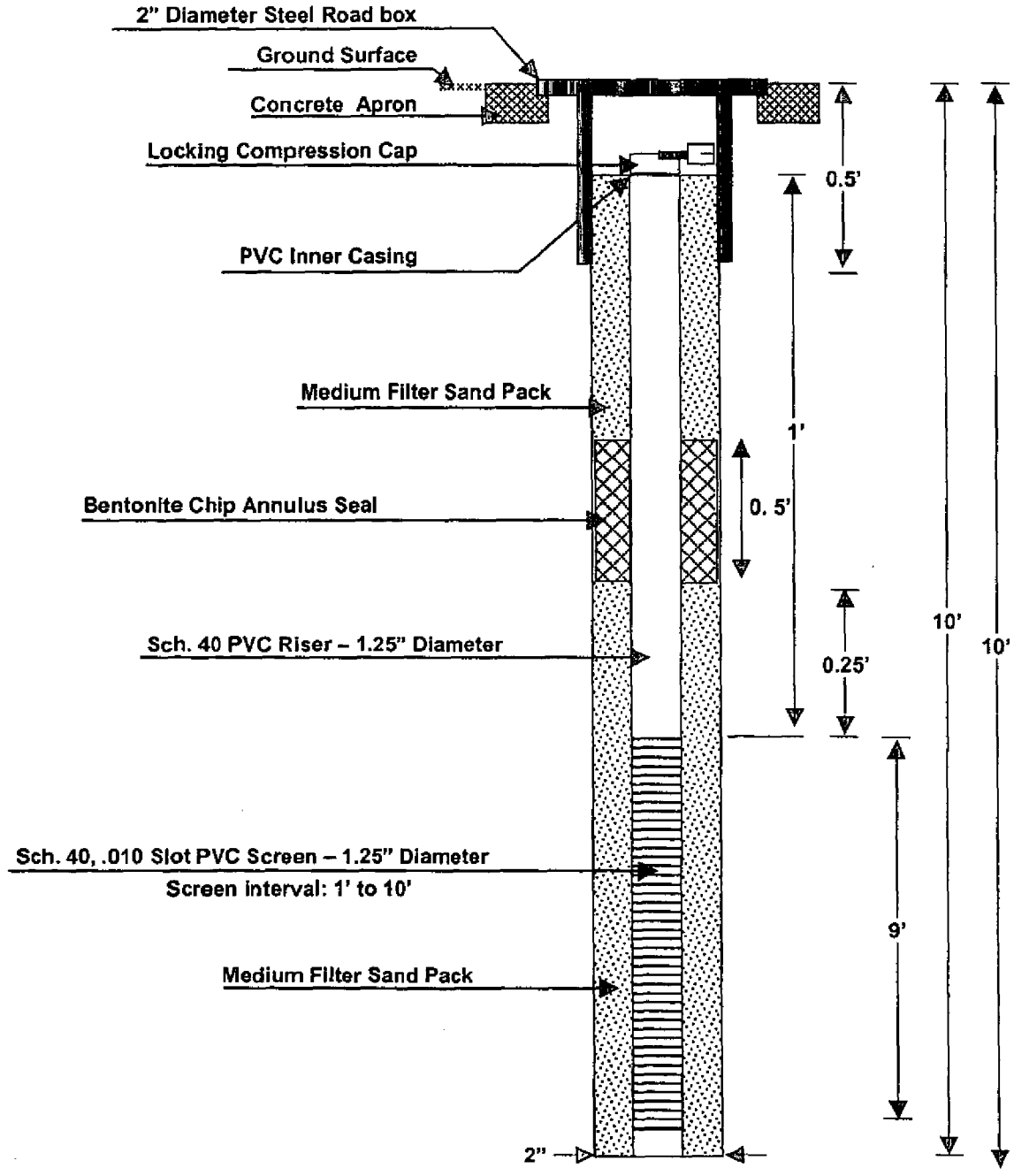
TRC

Flush Mount Overburden Monitoring Well Construction Log

Well No. TRC-105s

Project: Former GE Facility **No.:** E9202-3502-02500	**Reference Elevation:** 79.28 feet
Client: **Date Completed:** 11/14/00	**Reference Description:** PVC (TOR)
Location: Tank K	**Depth to water:** 2.41 feet
Drilling Contractor: ADH Environmental **Method:** Direct push	**Development Date:** 11/17/00
TRC Geologist: Chris Rudzinski	**Development Method:** Peristaltic pump



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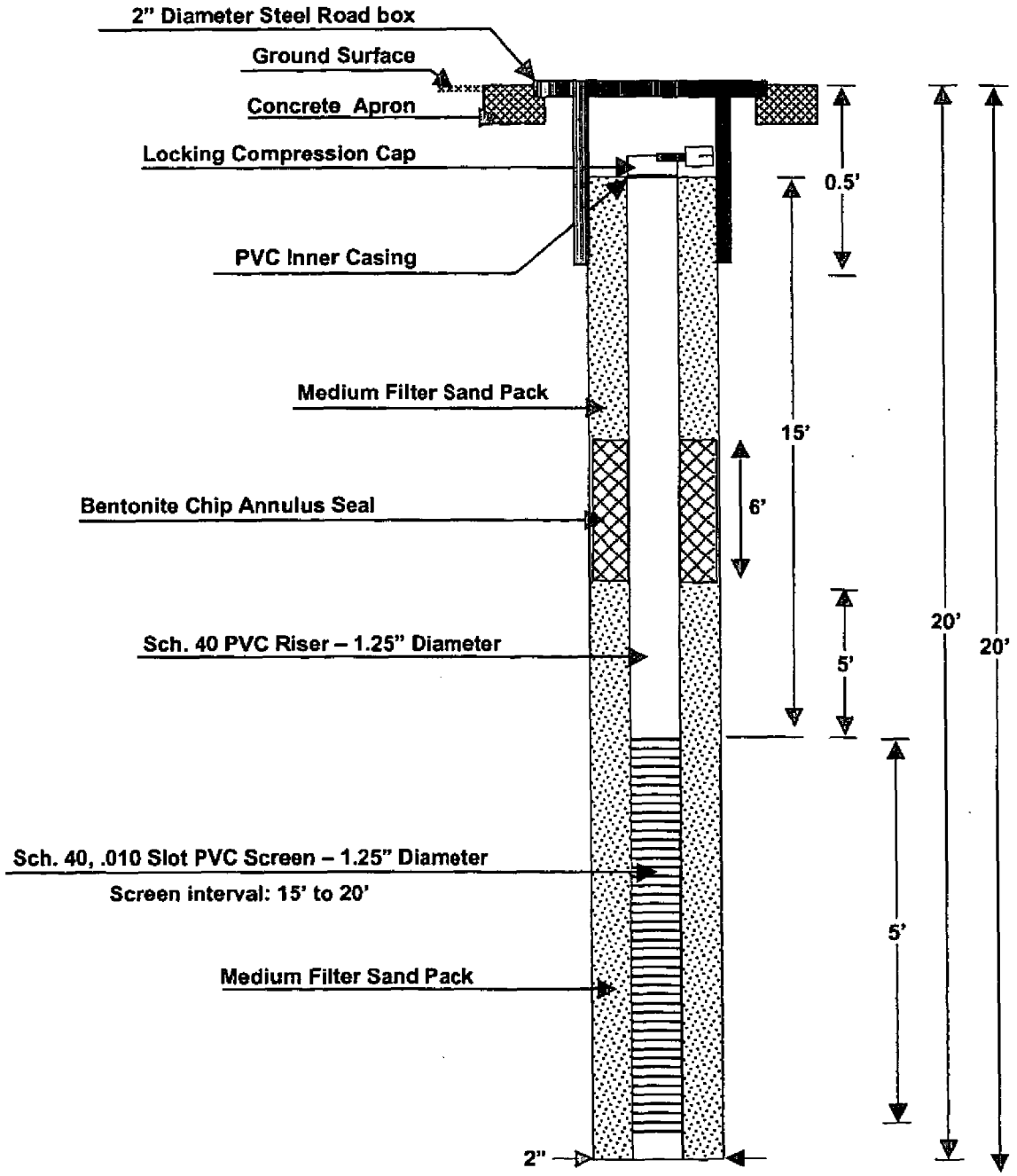
TRC

Flush Mount Overburden Monitoring Well Construction Log

Well No. TRC-105D

Project: Former GE Facility **No.:** E9202-3502-02500
Client: **Date Completed:** 11/14/00
Location: Tank K
Drilling Contractor: ADH Environmental **Method:** Direct push
TRC Geologist: Chris Rudzinski

Reference Elevation: 79.21 feet
Reference Description: PVC (TOR)
Depth to water: 2.80 feet
Development Date: 11/17/00
Development Method: Peristaltic pump



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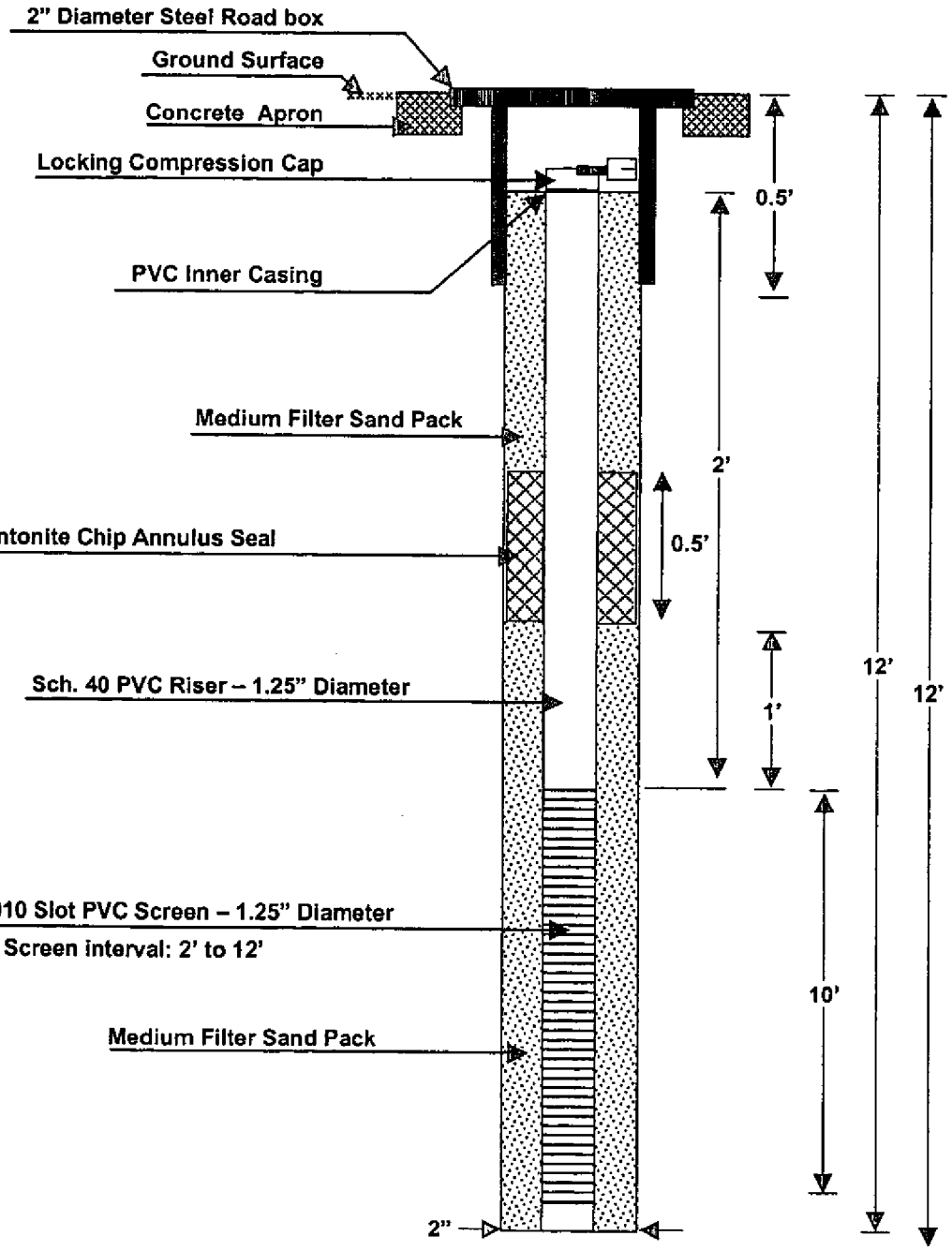
TRC

Flush Mount Overburden Monitoring Well Construction Log

Well No. TRC-106

Project: Former GE Facility **No.:** E9202-3502-02500	**Reference Elevation:** 80.41
Client: **Date Completed:** 11/21/00	**Reference Description:** PVC (TOR)
Location: Tank K	**Depth to water:** 3.5 to 4 feet
Drilling Contractor: NH Boring **Method:** Direct push	**Development Date:** 11/21/00
TRC Geologist: Chris Rudzinski	**Development Method:** Peristaltic pump



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APPENDIX B

GROUNDWATER ANALYTICAL REPORTS

Woods Hole Group

Environmental Laboratories

ANALYTICAL REPORT

Prepared for:

TRC Environmental
Boott Mills South, Foot of John Street
Lowell, MA 01852

Project:	Lockheed Wilmington
ETR:	00045226
Report Date:	12/11/2000

Certificates

Massachusetts MA030
Connecticut PH-0141
New Hampshire 220699
Rhode Island 64
New Jersey 59015
Maine MA030

CASE NARRATIVE

Woods Hole Group Environmental Laboratories

ETR: 45226
Project: Lockheed Wilmington

All analyses were performed according to Woods Hole Group's documented Standard Operating Procedures (SOPs), within holding time and with appropriate quality control measures except where noted. Blank correction of results is not performed in the laboratory for any parameter. Soil/sediment samples are reported on a dry weight basis unless otherwise noted.

Volatile Petroleum Hydrocarbons

1. Samples WE-4S (45226-01), WE-7 (45226-03), WE-8 (45226-04) and WE-9 (45226-05) were analyzed at the dilutions indicated below.

Sample ID	Laboratory ID	Dilution
WE-4S	45226-01	1:5
WE-7	45226-03	1:10
WE-8	45226-04	1:20
WE-9	45226-05	1:5

The enclosed results of analyses are representative of the samples as received by the laboratory. Woods Hole Group makes no representations or certifications as to the method of sample collection, sample identification, or transporting/handling procedures used prior to the receipt of samples by Woods Hole Group. To the best of my knowledge, the information contained in this report is accurate and complete.

Approved by: Edith Hutchinson Date: 12/11/00
Woods Hole Group Environmental Laboratories

Woods Hole Group Environmental Laboratories 375 Paramount Drive, Suite 2, Raynham, MA 02767-5150 Ph: 508-822-9300

VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 45226

TRC Environmental

Lab ID Number: 45226-01

Lockheed Wilmington

Associated Blank: VW1207B1

Sample ID: WE-4S					
Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
12/1/00	5 mL	N/A	12/8/00	5	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	1900	
C_9-C_{12} Aliphatics [1,3]	2900	
C_9-C_{10} Aromatics [1]	4500	
Unadjusted C_5-C_8 Aliphatics [1]	2400	
Unadjusted C_9-C_{12} Aliphatics [1]	9900	

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	94	
Benzene	C_5 - C_8	440	
Toluene	C_5 - C_8	75	U
Ethylbenzene	C_9 - C_{12}	590	
m & p Xylene	C_9 - C_{12}	1000	
o-Xylene	C_9 - C_{12}	890	
Naphthalene	N/A	190	

SURROGATE RECOVERY

	PID		FID	
Surrogate	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	115%	70%-130%	102%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 45226

TRC Environmental

Lab ID Number: 45226-01

Lockheed Wilmington

Associated Blank: VW1207B1

Sample ID: WE-4S

Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
12/01/2001	5 mL	N/A	12/07/2000	1	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	1400	
C_9-C_{12} Aliphatics [1,3]	3500	
C_9-C_{10} Aromatics [1]	N/A	E
Unadjusted C_5-C_8 Aliphatics[1]	1700	
Unadjusted C_9-C_{12} Aliphatics[1]	4200	

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	67	
Benzene	C_5 - C_8	240	
Toluene	C_5 - C_8	41	
Ethylbenzene	C_9 - C_{12}	190	
m & p Xylene	C_9 - C_{12}	230	
o-Xylene	C_9 - C_{12}	280	
Naphthalene	N/A	130	

SURROGATE RECOVERY

	PID		FID	
Surrogate	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	160% *	70%-130%	103%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

** Surrogate value outside control limits.*

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Environmental Laboratories
375 Paramount Drive • Suite 2
Raynham, MA 02767-5154 • USA
Phone: 508-822-9300
Fax: 508-822-3288

VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 45226

TRC Environmental

Lab ID Number: 45226-02

Lockheed Wilmington

Associated Blank: VW1207B1

Sample ID: WE-4D

Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
12/1/00	5 mL	N/A	12/7/00	1	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	240	U
C_9-C_{12} Aliphatics [1,3]	240	
C_9-C_{10} Aromatics [1]	70	U
Unadjusted C_5-C_8 Aliphatics[1]	240	U
Unadjusted C_9-C_{12} Aliphatics[1]	240	

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	5	U
Benzene	C_5 - C_8	5	U
Toluene	C_5 - C_8	15	U
Ethylbenzene	C_9 - C_{12}	5	U
m & p Xylene	C_9 - C_{12}	10	U
o-Xylene	C_9 - C_{12}	10	U
Naphthalene	N/A	10	U

SURROGATE RECOVERY

	PID		FID	
Surrogate	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	101%	70%-130%	104%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

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Phone: 508-822-9300
Fax: 508-822-3288

VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 45226

TRC Environmental

Lockheed Wilmington

Lab ID Number: 45226-03

Associated Blank: VW1207B1

Sample ID: WE-7

Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
12/01/2000	5 mL	N/A	12/08/2000	10	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	3000	
C_9-C_{12} Aliphatics [1,3]	1400	
C_9-C_{10} Aromatics [1]	6600	
Unadjusted C_5-C_8 Aliphatics [1]	4000	
Unadjusted C_9-C_{12} Aliphatics [1]	14000	

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	100	
Benzene	C_5 - C_8	290	
Toluene	C_5 - C_8	630	
Ethylbenzene	C_9 - C_{12}	470	
m & p Xylene	C_9 - C_{12}	4100	
o-Xylene	C_9 - C_{12}	1100	
Naphthalene	N/A	240	

SURROGATE RECOVERY

	PID		FID	
Surrogate	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	121%	70%-130%	123%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 45226

TRC Environmental

Lab ID Number: 45226-04

Lockheed Wilmington

Associated Blank: VW1207B1

Sample ID: WE-8

Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
12/1/01	5 mL	N/A	12/8/00	1	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	2000	
C_9-C_{12} Aliphatics [1,3]	3000	
C_9-C_{10} Aromatics [1]	N/A	E
Unadjusted C_5-C_8 Aliphatics [1]	2100	
Unadjusted C_9-C_{12} Aliphatics [1]	3900	

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	13	
Benzene	C_5 - C_8	95	
Toluene	C_5 - C_8	30	
Ethylbenzene	C_9 - C_{12}	110	
m & p Xylene	C_9 - C_{12}	N/A	E
o-Xylene	C_9 - C_{12}	240	
Naphthalene	N/A	120	

SURROGATE RECOVERY

	PID		FID	
Surrogate	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	108%	70%-130%	109%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 45226

TRC Environmental

Lab ID Number: 45226-04

Lokheed Wilmington

Associated Blank: VW1207B1

Sample ID: WE-8

Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
12/1/00	5 mL	N/A	12/8/00	20	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	4800	U
C_9-C_{12} Aliphatics [1,3]	4900	
C_9-C_{10} Aromatics [1]	6900	
Unadjusted C_5-C_8 Aliphatics[1]	4800	U
Unadjusted C_9-C_{12} Aliphatics[1]	17000	

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	100	U
Benzene	C_5 - C_8	120	
Toluene	C_5 - C_8	300	U
Ethylbenzene	C_9 - C_{12}	100	U
m & p Xylene	C_9 - C_{12}	4900	
o-Xylene	C_9 - C_{12}	380	
Naphthalene	N/A	200	U

SURROGATE RECOVERY

	PID		FID	
Surrogate	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	106%	70%-130%	106%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 45226

TRC Environmental

Lab ID Number: 45226-05

Lockheed Wilmington

Associated Blank: VW1207B1

Sample ID: WE-9					
Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
12/01/2000	5 mL	N/A	12/08/2000	5	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	4700	
C_9-C_{12} Aliphatics [1,3]	4300	
C_9-C_{10} Aromatics [1]	8000	
Unadjusted C_5-C_8 Aliphatics [1]	7000	
Unadjusted C_9-C_{12} Aliphatics [1]	15000	

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	150	
Benzene	C_5 - C_8	430	
Toluene	C_5 - C_8	1800	
Ethylbenzene	C_9 - C_{12}	520	
m & p Xylene	C_9 - C_{12}	1200	
o-Xylene	C_9 - C_{12}	1500	
Naphthalene	N/A	290	

SURROGATE RECOVERY

	PID		FID	
Surrogate	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	108%	70%-130%	123%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 45226

TRC Environmental

Lab ID Number: 45226-06

Lockheed Wilmington

Associated Blank: VW1207B1

Sample ID: PZ-8S					
Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
12/1/00	5 mL	N/A	12/8/00	1	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	240	U
C_9-C_{12} Aliphatics [1,3]	210	
C_9-C_{10} Aromatics [1]	170	
Unadjusted C_5-C_8 Aliphatics [1]	240	U
Unadjusted C_9-C_{12} Aliphatics [1]	430	

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	5	U
Benzene	C_5 - C_8	5	U
Toluene	C_5 - C_8	15	U
Ethylbenzene	C_9 - C_{12}	7	
m & p Xylene	C_9 - C_{12}	31	
o-Xylene	C_9 - C_{12}	13	
Naphthalene	N/A	10	U

SURROGATE RECOVERY

	PID		FID	
Surrogate	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	103%	70%-130%	119%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

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VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 45226

TRC Environmental

Lab ID Number: 45226-07

Lockheed Wilmington

Associated Blank: VW1207B1

Sample ID: TRC-104					
Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
12/1/00	5 mL	N/A	12/8/00	1	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	320	
C_9-C_{12} Aliphatics [1,3]	240	
C_9-C_{10} Aromatics [1]	70	U
Unadjusted C_5-C_8 Aliphatics[1]	580	
Unadjusted C_9-C_{12} Aliphatics[1]	240	

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	260	
Benzene	C_5 - C_8	9	
Toluene	C_5 - C_8	15	U
Ethylbenzene	C_9 - C_{12}	5	U
m & p Xylene	C_9 - C_{12}	10	U
o-Xylene	C_9 - C_{12}	10	U
Naphthalene	N/A	10	U

SURROGATE RECOVERY

	PID		FID	
Surrogate	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	103%	70%-130%	103%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

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VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 45226

TRC Environmental

Lab ID Number: 45226-08

Lockheed Wilmington

Associated Blank: VW1207B1

Sample ID: TRC-105S

Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
12/1/00	5 mL	N/A	12/8/00	1	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	240	U
C_9-C_{12} Aliphatics [1,3]	170	
C_9-C_{10} Aromatics [1]	70	U
Unadjusted C_5-C_8 Aliphatics[1]	240	U
Unadjusted C_9-C_{12} Aliphatics[1]	170	

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	5	U
Benzene	C_5 - C_8	5	U
Toluene	C_5 - C_8	15	U
Ethylbenzene	C_9 - C_{12}	5	U
m & p Xylene	C_9 - C_{12}	10	U
o-Xylene	C_9 - C_{12}	10	U
Naphthalene	N/A	10	U

SURROGATE RECOVERY

Surrogate	PID		FID	
	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	100%	70%-130%	98%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

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VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 45226

TRC Environmental

Lab ID Number: 45226-09

Lockheed Wilmington

Associated Blank: VW1207B1

Sample ID: TRC-105D

Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
12/1/00	5 mL	N/A	12/8/00	1	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	240	U
C_9-C_{12} Aliphatics [1,3]	140	
C_9-C_{10} Aromatics [1]	70	U
Unadjusted C_5-C_8 Aliphatics[1]	240	U
Unadjusted C_9-C_{12} Aliphatics[1]	140	

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	5	U
Benzene	C_5 - C_8	5	U
Toluene	C_5 - C_8	15	U
Ethylbenzene	C_9 - C_{12}	5	U
m & p Xylene	C_9 - C_{12}	10	U
o-Xylene	C_9 - C_{12}	10	U
Naphthalene	N/A	10	U

SURROGATE RECOVERY

	PID		FID	
Surrogate	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	101%	70%-130%	103%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 45226

TRC Environmental

Lab ID Number: 45226-10

Lockheed Wilmington

Associated Blank: VW1207B1

Sample ID: WE-4S-2

Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
12/01/2000	5 mL	N/A	12/08/2000	1	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	1300	
C_9-C_{12} Aliphatics [1,3]	3400	
C_9-C_{10} Aromatics [1]	N/A	E
Unadjusted C_5-C_8 Aliphatics [1]	1700	
Unadjusted C_9-C_{12} Aliphatics [1]	4300	

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	71	
Benzene	C_5 - C_8	250	
Toluene	C_5 - C_8	42	
Ethylbenzene	C_9 - C_{12}	230	
m & p Xylene	C_9 - C_{12}	330	
o-Xylene	C_9 - C_{12}	320	
Naphthalene	N/A	140	

SURROGATE RECOVERY

	PID		FID	
Surrogate	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	133% *	70%-130%	100%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

** Surrogate value outside control limits.*

VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 45226

TRC Environmental

Lab ID Number: 45226-10

Lockheed Wilmington

Associated Blank: VW1207B1

Sample ID: WE-4S-2					
Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
12/1/00	5 mL	N/A	12/8/00	5	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	1700	
C_9-C_{12} Aliphatics [1,3]	2900	
C_8-C_{10} Aromatics [1]	4400	
Unadjusted C_5-C_8 Aliphatics [1]	2300	
Unadjusted C_9-C_{12} Aliphatics [1]	9800	

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	95	
Benzene	C_5 - C_8	470	
Toluene	C_5 - C_8	75	U
Ethylbenzene	C_9 - C_{12}	650	
m & p Xylene	C_9 - C_{12}	1100	
o-Xylene	C_9 - C_{12}	740	
Naphthalene	N/A	190	

SURROGATE RECOVERY

	PID		FID	
Surrogate	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	92%	70%-130%	128%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_8-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

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VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 45226

TRC Environmental

Lab ID Number: 45226-11

Lockheed Wilmington

Associated Blank: VW1207B1

Sample ID: Trip Blank

Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
12/1/00	5 mL	N/A	12/7/00	1	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	240	U
C_9-C_{12} Aliphatics [1,3]	100	U
C_9-C_{10} Aromatics [1]	70	U
Unadjusted C_5-C_8 Aliphatics[1]	240	U
Unadjusted C_9-C_{12} Aliphatics[1]	100	U

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	5	U
Benzene	C_5 - C_8	5	U
Toluene	C_5 - C_8	15	U
Ethylbenzene	C_9 - C_{12}	5	U
m & p Xylene	C_9 - C_{12}	10	U
o-Xylene	C_9 - C_{12}	10	U
Naphthalene	N/A	10	U

SURROGATE RECOVERY

	PID		FID	
Surrogate	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	100%	70%-130%	97%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

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VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

Quality Control Report

Lab ID Number: VW1207B1

Sample ID: Method Blank					
Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
N/A	5 mL	N/A	12/7/00	1	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	240	U
C_9-C_{12} Aliphatics [1,3]	100	U
C_9-C_{10} Aromatics [1]	70	U
Unadjusted C_5-C_8 Aliphatics[1]	240	U
Unadjusted C_9-C_{12} Aliphatics[1]	100	U

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	5	U
Benzene	C_5 - C_8	5	U
Toluene	C_5 - C_8	15	U
Ethylbenzene	C_9 - C_{12}	5	U
m & p Xylene	C_9 - C_{12}	10	U
o-Xylene	C_9 - C_{12}	10	U
Naphthalene	N/A	10	U

SURROGATE RECOVERY

	PID		FID	
Surrogate	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	100%	70%-130%	99%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

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VOLATILE PETROLEUM HYDROCARBONS
LABORATORY CONTROL SPIKE

Sample ID: VW1207L1				
Date Analyzed	Time Analyzed	Analyst	Result File ID	Instrument ID
12/7/00	1:07 PM	AL	T:\TC4\DATA\DECVPH\OD07002.RST	HP-PID
12/7/00	1:07 PM	AL	T:\TC4\DATA\DECVPH\PD07002.RST	HP-PID

VOLATILE PETROLEUM HYDROCARBONS in: µg/L (ppb)

Parameter	Target Conc.	Actual Conc.	Percent Recovery	QC Limits
MTBE	150	148	98%	70% - 130%
Benzene	50	50	101%	70% - 130%
Toluene	150	150	100%	70% - 130%
Ethylbenzene	50	53	107%	70% - 130%
m- & p-Xylene	200	194	97%	70% - 130%
o-Xylene	100	101	101%	70% - 130%
Naphthalene	100	103	103%	70% - 130%
1,2,4-Trimethylbenzene	100	101	101%	70% - 130%
Pentane	100	110	110%	70% - 130%
2-Methylpentane	150	150	100%	70% - 130%
2,2,4-Trimethylpentane	150	148	98%	70% - 130%
n-Nonane	100	119	119%	70% - 130%

SURROGATE RECOVERY

	PID		FID	
Surrogate	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	104%	70%-130%	101%	70%-130%

VPH
SAMPLE INFORMATION

Client: TRCENV ETR Number: 45226

Matrix:	☒ Aqueous ☐ Soil ☐ Sediment ☐ Other:
Containers:	☒ Satisfactory ☐ Broken ☐ Leaking
Sample Preservatives:	Aqueous ☑ pH ≤ 2 ☐ pH > 2 ☐ Sample vials containing acid for field preservation were supplied by the laboratory.**
	Soil or Sediment ☐ N/A ☐ Samples NOT preserved in Methanol or air-tight container
	☐ Samples received in methanol. Soil Covered? ☐ Y ☐ N — mL Methanol/g soil ☐ 1:1 +/- 25% ☐ Other
	☐ Samples received in air-tight container.
	☒ Trip Blank Received.
Temperature:	☒ Received on ice ☒ Received at 4°C (± 2°C) ☐ Other:
Comments:	

CERTIFICATION

Were all QA/QC procedures REQUIRED by the VPH Method followed? ☑ Yes ☐ No *

Were all performance/acceptance standards for the required QA/QC procedures achieved? ☑ Yes ☐ No *

Were any significant modifications made to the VPH method, as specified in Section 11.3? ☑ Yes# ☐ No

 # - VPH Method Modifications:
1. The surrogate 1,4-difluorobenzene is substituted for the surrogate 2,5-dibromotoluene

** See Narrative portion of report for details.*
*** Per MADEP-VPH-98-1.*
I attest under the pains and penalties of perjury that based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: _____ POSITION: Organic Section Head

PRINTED NAME: Normand Lauriano Jr. DATE: December 13, 2000

Chain-of-Custody Record

Woods Hole Group
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FAX: (508) 822-3288

43226

COMPANY INFORMATION

Name: TRC Environmental
Address: Booth Mill South
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Lowell, MA 01852
Telephone: (978) 970-5600
Facsimile: (978) 453-1995
Contact Name: Liz Denly/Paola Marchiero QA/QC / Proj. Manager

COMPANY'S PROJECT INFORMATION

Regulatory Protocol: Groundwater GW-1
For the State of: Massachusetts
Project Name: Tank K Lockheed-Wilmington, MA
Project Number: E9203-3502-02500
P.O. #:
Sampler Name(s): Chris Rudzinski, Chris Brady

SHIPPING INFORMATION

Carrier: Woods Hole Group Courier
Airbill Number: NA
Date Shipped: 12/1/00
Quote #: 0010167 / 11/22/2000

TAT — 10 Day X 5 Day — 3 Day — 48 Hr — 24 Hr — Other

WHG LAB #	SAMPLE ID (NOTE 1)	COLLECTION DATE	COLLECTION TIME	COMPOSITE GRAB	MATRIX	ANALYSIS/REMARKS (NOTE 2, 3)	VOLUME/CONTAINER TYPE/PRESERVATIVE (NOTE 4): NUMBER OF CONTAINERS (40ml / VOA / HCl pH<2)
-1 - 5	WE-4S	11/29/00	1040	Grab	Ground Water	Need to analyze all samples for:	3
-2 - 9	WE-4D	11/29/00	~~1055~~ 1055	Grab	Ground Water	MADEP VPH analysis including	3
-3 - 10	WE-7	11/29/00	1530	Grab	Ground Water	Target Compounds (BTEX and	3
-4 - 11	WE-8	11/29/00	1250	Grab	Ground Water	MTBE. MCP GW-1 Standards	3
-5 - 12	WE-9	11/29/00	1445	Grab	Ground Water	apply. Need a quick-	3
-6 - 13	PZ-8S	11/30/00	1455	Grab	Ground Water	turnaround on all samples	3
-7 - 14	TRC-104	11/30/00	1305	Grab	Ground Water	(5 days).	3
-8 - 15	TRC-105S	11/30/00	1130	Grab	Ground Water		3
-9 - 16	TRC-105D	11/30/00	0930 ~~1050~~	Grab	Ground Water		3
-10 - 17	WE-4S-2	11/29/00	1040	Grab	Ground Water		3

Relinquished by: (signature)	DATE	TIME	Received by: (signature)
[signature]	12/1/00	1545	Ed Butler
Relinquished by: (signature)	DATE	TIME	Received by: (signature)
[signature]	12/1/00	5:30	
Relinquished by: (signature)	DATE	TIME	Received for Laboratory by: (signature)

NOTES TO SAMPLER (S): (1) Limit Sample Identification to 6 characters, if possible; (2) Indicate designated Lab Q.C. sample and type (e.g.; MS/MSD/REP) and provide sufficient sample; (3) Field duplicates are separate sample; (4) e.g.; 40ml/glass/H_2SO_4

Notes to Lab: Sample Time for sample WE-4S-2 should be 1040. Listed as 1045 on the bottle label. Custody seal of Trip Blank broken by C. Rudzinski on 12/1/00.

We cannot accept verbal changes - Please Fax written changes to (508) 822-3288

Chain-of-Custody Record

Woods Hole Group Environmental Laboratories

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Raynham, MA 02767

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FAX: (508) 822-3288

45226

COMPANY INFORMATION

Name: TRC Environmental
Address: Boott Mill South c/o Lowell, MA 01852 Foot of John Street
Telephone: (978) 970-5600
Facsimile: (978) 453-1995
Contact Name: Liz Denly / QA/QC ; Paolo Macchiaroli / Proj. Manager

COMPANY'S PROJECT INFORMATION

Regulatory Protocol: Groundwater GW-1
For the State of: Massachusetts
Project Name: Lockheed ~~Martin~~ Tank K
Project Number: E9202-3502-03500
P.O. #
Sampler Name(s): Chris Rudzinski, Chris Brady

SHIPPING INFORMATION

Carrier: Woods Hole Group Courier
Airbill Number: Wilmington, MA NA
Date Shipped: 12/1/00
Quote #: 0010167 / 11/22/2000

TAT __ 10 Day X 5 Day __ 3 Day __ 48 Hr __ 24 Hr __ Other

VOLUME/CONTAINER TYPE/PRESERVATIVE (NOTE 4): 40ml / VOA / HCl pH<2

WHG LAB #	SAMPLE ID (NOTE 1)	COLLECTION DATE	COLLECTION TIME	COMPOSITE GRAB	MATRIX	ANALYSIS/REMARKS (NOTE 2, 3)	NUMBER OF CONTAINERS
-11- ~~18~~	Trip Blank	11/27/00	Lab Prep	Lab Prepared	Aqueous		2

Relinquished by: (signature)	DATE	TIME	Received by: (signature)
[signature]	12/1/00	1545	Ed Butler
Ed Butler	12/1/00	5:30	
			Received for Laboratory by: (signature)

NOTES TO SAMPLER (S): (1) Limit Sample Identification to 6 characters, if possible; (2) Indicate designated Lab Q.C. sample and type (e.g.; MS/MSD/REP) and provide sufficient sample; (3) Field duplicates are separate sample; (4) e.g.; 40ml/glass/H_2SO_4

Notes to Lab:

We cannot accept verbal changes - Please Fax written changes to (508) 822-3288

Woods Hole Group
Environmental Laboratories

ANALYTICAL REPORT

Prepared for:

TRC Environmental
Boott Mills South, Foot of John Street
Lowell, MA 01852

Project:	Lockheed- Tank K E9202
ETR:	00145444
Report Date:	03/01/2001

Certificates
Massachusetts MA030
Connecticut PH-0141
New Hampshire 220699
Rhode Island 64
New Jersey 59015
Maine MA030

CASE NARRATIVE

Woods Hole Group Environmental Laboratories

ETR: 45444
Project: Lockheed-Tank K E9202

All analyses were performed within holding time and with appropriate quality control measures except where noted. Blank correction of results is not performed in the laboratory for any parameter. Soil/sediment samples are reported on a dry weight basis unless otherwise noted.

Volatile Petroleum Hydrocarbons

1. The opening CCV associated with both samples had a high bias for the non-target compounds pentane and 2-methylpentane, which could have biased the C5-C8 aliphatic range high for, sample TRC-106 (45444-01).

2. Sample TRC-106 (45444-01) was analyzed without dilution resulting in compounds exceeding the instrument calibration range. The sample was reanalyzed at a 1:20 dilution. Only results from the 1:20 analysis is reported.

The enclosed results of analyses are representative of the samples as received by the laboratory. Woods Hole Group makes no representations or certifications as to the method of sample collection, sample identification, or transporting/handling procedures used prior to the receipt of samples by Woods Hole Group. To the best of my knowledge, the information contained in this report is accurate and complete.

Approved by: Edith Holdsworth Date: 3/1/01
Woods Hole Group Environmental Laboratories

Woods Hole Group
Environmental Laboratories

375 Paramount Drive • Suite 2
Raynham, MA 02767-5154 • USA
Phone: 508-822-9300
Fax: 508-822-3288

VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 45444

TRC Environmental

Lab ID Number: 45444-01

Project: Lockheed- Tank K E9202

Associated Blank: VW0223B1

Sample ID: TRC-106

Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
02/12/2001	5 mL	N/A	02/23/2001	20	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	10000	
C_9-C_{12} Aliphatics [1,3]	3900	
C_9-C_{10} Aromatics [1]	6100	
Unadjusted C_5-C_8 Aliphatics [1]	14000	
Unadjusted C_9-C_{12} Aliphatics [1]	16000	

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	100	U* — SEE ATTACHMENT
Benzene	C_5 - C_8	300	
Toluene	C_5 - C_8	3400	
Ethylbenzene	C_9 - C_{12}	730	
m & p Xylene	C_9 - C_{12}	3400	
o-Xylene	C_9 - C_{12}	1600	
Naphthalene	N/A	200.	U* — SEE ATTACHMENT

SURROGATE RECOVERY

	PID		FID	
Surrogate	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	128%	70%-130%	120%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

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Fax: 508-822-3288

VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 45444

TRC Environmental

Lab ID Number: 45444-02

Project: Lockheed- Tank K E9202

Associated Blank: VW0223B1

Sample ID: Trip Blank- 2/01

Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
02/12/2001	5 mL	N/A	02/23/2001	1	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	240	U
C_9-C_{12} Aliphatics [1,3]	100	U
C_9-C_{10} Aromatics [1]	70	U
Unadjusted C_5-C_8 Aliphatics[1]	240	U
Unadjusted C_9-C_{12} Aliphatics[1]	100	U

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	5	U
Benzene	C_5 - C_8	5	U
Toluene	C_5 - C_8	15	U
Ethylbenzene	C_9 - C_{12}	5	U
m & p Xylene	C_9 - C_{12}	10	U
o-Xylene	C_9 - C_{12}	10	U
Naphthalene	N/A	10	U

SURROGATE RECOVERY

	PID		FID	
Surrogate	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	125%	70%-130%	121%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

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VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

Quality Control Report

Lab ID Number: VW0223B1

Sample ID: Method Blank

Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
N/A	5 mL	N/A	02/23/2001	1	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	240	U
C_9-C_{12} Aliphatics [1,3]	100	U
C_9-C_{10} Aromatics [1]	70	U
Unadjusted C_5-C_8 Aliphatics[1]	240	U
Unadjusted C_9-C_{12} Aliphatics[1]	100	U

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	5	U
Benzene	C_5 - C_8	5	U
Toluene	C_5 - C_8	15	U
Ethylbenzene	C_9 - C_{12}	5	U
m & p Xylene	C_9 - C_{12}	10	U
o-Xylene	C_9 - C_{12}	10	U
Naphthalene	N/A	10	U

SURROGATE RECOVERY

	PID		FID	
Surrogate	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	121%	70%-130%	118%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

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VOLATILE PETROLEUM HYDROCARBONS
LABORATORY CONTROL SPIKE

Sample ID: VW0223L1				
Date Analyzed	Time Analyzed	Analyst	Result File ID	Instrument ID
02/23/2001	5:20 PM	AL	T:\TC4\DATA\FEBVPH\O223003.RST	HP-PID
02/23/2001	5:20 PM	AL	T:\TC4\DATA\FEBVPH\P223003.RST	HP-PID

VOLATILE PETROLEUM HYDROCARBONS in: µg/L (ppb)

Parameter	Target Conc.	Actual Conc.	Percent Recovery	QC Limits
MTBE	150	145	97%	70% - 130%
Benzene	50	52	104%	70% - 130%
Toluene	150	138	92%	70% - 130%
Ethylbenzene	50	51	102%	70% - 130%
m- & p-Xylene	200	184	92%	70% - 130%
o-Xylene	100	102	102%	70% - 130%
Naphthalene	100	98	98%	70% - 130%
1,2,4-Trimethylbenzene	100	103	103%	70% - 130%
Pentane	100	119	119%	70% - 130%
2-Methylpentane	150	178	119%	70% - 130%
2,2,4-Trimethylpentane	150	167	112%	70% - 130%
n-Nonane	100	108	108%	70% - 130%

SURROGATE RECOVERY

Surrogate	PID		FID	
	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	120%	70%-130%	118%	70%-130%

Client: TRCENV ETR Number: 45444

Matrix:	☑ Aqueous ☐ Soil ☐ Sediment ☐ Other:
Containers:	☑ Satisfactory ☐ Broken ☐ Leaking
Sample Preservatives:	Aqueous ☐ pH ≤ 2 ☐ pH > 2 ☑ Sample vials containing acid for field preservation were supplied by the laboratory.**
	Soil or Sediment ☒ N/A ☐ Samples NOT preserved in Methanol or air-tight container
	☐ Samples received in methanol. Soil Covered? ☐ Y ☐ N — mL Methanol/g soil ☐ 1:1 +/- 25% ☐ Other
	☐ Samples received in air-tight container.
	☒ Trip Blank Received.
Temperature:	☐ Received on ice ☑ Received at 4°C (± 2°C) ☐ Other:
Comments:	

CERTIFICATION

Were all QA/QC procedures REQUIRED by the VPH Method followed? ☑ Yes ☐ No *

Were all performance/acceptance standards for the required QA/QC procedures achieved? ☐ Yes ☑ No *

Were any significant modifications made to the VPH method, as specified in Section 11.3? ☑ Yes# ☐ No

 # - VPH Method Modifications:
1. The surrogate 1,4-difluorobenzene is substituted for the surrogate 2,5-dibromotoluene

** See Narrative portion of report for details.*
*** Per MADEP-VPH-98-1.*
I attest under the pains and penalties of perjury that based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

SIGNATURE: Marcia Motta POSITION: QA Specialist

PRINTED NAME: Marcia Motta DATE: 2/28/01

Client: TRC	Receipt Date: 2/12/01
Project: Lockheed	Log-in Date: 2/12/01
ETR #: 45444	Inspection/ Log-in by: NAL

Comments / Notes

Were Samples shipped? Yes, FedEx / UPS / Other:_____
No, Courier Pick-up / Hand Delivered

Is Bill of lading retained? Yes, Tracking #:_____
No, Unavailable / N/A

Indicate Cooler Temperature upon opening:

Temperature taken from: 04° IR Gun 04 Temp. Blank / N/A

Were Samples on Ice? Yes / No

Chain-of-Custody present? Yes / No

Complete? Yes / No

Custody Seals present on Cooler? Yes / No

on Bottles? Yes / No

Intact? Yes / No / N/A

Were Sample Containers Intact? Yes / No

Did the VOAs contain Headspace? Yes / No If Yes. List Samples--->

If chemical preservation is appropriate-
Were Samples Field Preserved? Yes / No / N/A

☒ H=HCl ☐ N=HNO3 ☐ S=H2SO4 ☐ Other._____ ☐ U= Unknown

Were 5035 VOC soils or VPH soils covered with MeOH? Yes / No
If NO. List Samples---------->

Preservation (pH) Verified at Lab for EVERY Bottle? (Not VOA/VPH/Sulfide)
YES <2 >12 (CN) / NO

If NO. Why?:

Preservation (pH) Verified for Sample #(s):

Were Samples Received Within Hold Time? Yes / No

Discrepancy Between Bottle Labels & Chain? Yes / No

Was Project Manager Notified of Any Problems? Yes / No / N/A

Project Manager Acknowledgement:

Chain-of-Custody Record

Woods Hole Group
Environmental Laboratories
375 Paramount Drive
Raynham, MA 02767
TEL: (508) 822-9300
FAX: (508) 822-3288

45444

PAGE 1 OF 1

COMPANY INFORMATION

Name: TRC Environmental
Address: Booth Mills South
Foot of John Street
Lowell, MA 01852
Telephone: (978) 970-5600
Facsimile: (978) 453-1995
Contact Name: Liz Denly/Kim Plunkett

COMPANY'S PROJECT INFORMATION

Regulatory Protocol: GW sample
For the State of: Massachusetts
Project Name: Lockheed Tank K
Project Number: E9202
P.O. #:
Sampler Name(s): TSW

SHIPPING INFORMATION

Carrier: Courier
Airbill Number:
Date Shipped: 2/12/01
Quote #:

TAT X 10 Day ~~X~~ 5 Day ___ 3 Day ___ 48 Hr ___ 24 Hr ___ Other

WHG LAB #	SAMPLE ID (NOTE 1)	COLLECTION DATE	COLLECTION TIME	COMPOSITE GRAB	MATRIX	ANALYSIS/REMARKS (NOTE 2, 3)	VOLUME/CONTAINER TYPE/ PRESERVATIVE (NOTE 4) NUMBER OF CONTAINERS
-01	TRC-106	2/12/01	0855	Grab	GW	VPH - MADEP analysis including MTBE	3
-02	TRIP BLANK-2/01	2/12/01		Lab water	LW	VPH - " " BTEX	2

Relinquished by: (signature)	DATE	TIME	Received by: (signature)
Thomas S. Wyatt	2/12/01	1155	Ed Butler
Relinquished by: (signature)	DATE	TIME	Received by: (signature)
Ed Butler			
Relinquished by: (signature)	DATE	TIME	Received for Laboratory by: (signature)

NOTES TO SAMPLER (S): (1) Limit Sample Identification to 6 characters, if possible; (2) Indicate designated Lab Q.C. sample and type (e.g.; MS/MSD/REP) and provide sufficient sample; (3) Field duplicates are separate sample; (4) e.g.; 40ml/glass/H_2SO_4

Notes to Lab: TEMP BLANK INSIDE

We cannot accept verbal changes - Please Fax written changes to (508) 822-3288

CASE NARRATIVE
Addendum 1
Woods Hole Group Environmental Laboratories

ETR: 45444
Project: Lockheed-Tank K E9202

Volatile Petroleum Hydrocarbons

1. Sample TRC-106 (45444-01) was initially analyzed without dilution resulting with concentrations of all target analytes with the exception of MTBE and naphthalene exceeding the calibration range of the instrument. Except for the MTBE and naphthalene, concentrations of the other target analytes and the hydrocarbon ranges could not be determined. The sample was reanalyzed at a 1:20 dilution.

Approved by: Edith Hatchinson Date: 3/12/01
Woods Hole Group Environmental Laboratories

Woods Hole Group
Environmental Laboratories
375 Paramount Drive • Suite 2
Raynham, MA 02767-5154 • USA
Phone: 508-822-9300
Fax: 508-822-3288

VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 45444

TRC Environmental

Lab ID Number: 45444-01

Project: Lockheed- Tank K E9202

Associated Blank: VW0215B1

Sample ID: TRC-106

Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
02/12/2001	5 mL	N/A	02/15/2001	1	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	7800	
C_9-C_{12} Aliphatics [1,3]	1100	
C_9-C_{10} Aromatics [1]	2200	
Unadjusted C_5-C_8 Aliphatics[1]	8200	
Unadjusted C_9-C_{12} Aliphatics[1]	3700	

Rerun 1:20

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	51	
Benzene	C_5 - C_8	~~160~~	
Toluene	C_5 - C_8	~~210~~	
Ethylbenzene	C_9 - C_{12}	~~180~~	
m & p Xylene	C_9 - C_{12}	~~180~~	
o-Xylene	C_9 - C_{12}	~~67~~	
Naphthalene	N/A	110	

Rerun 1:20

SURROGATE RECOVERY

Surrogate	PID		FID	
	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	152% *	70%-130%	130%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

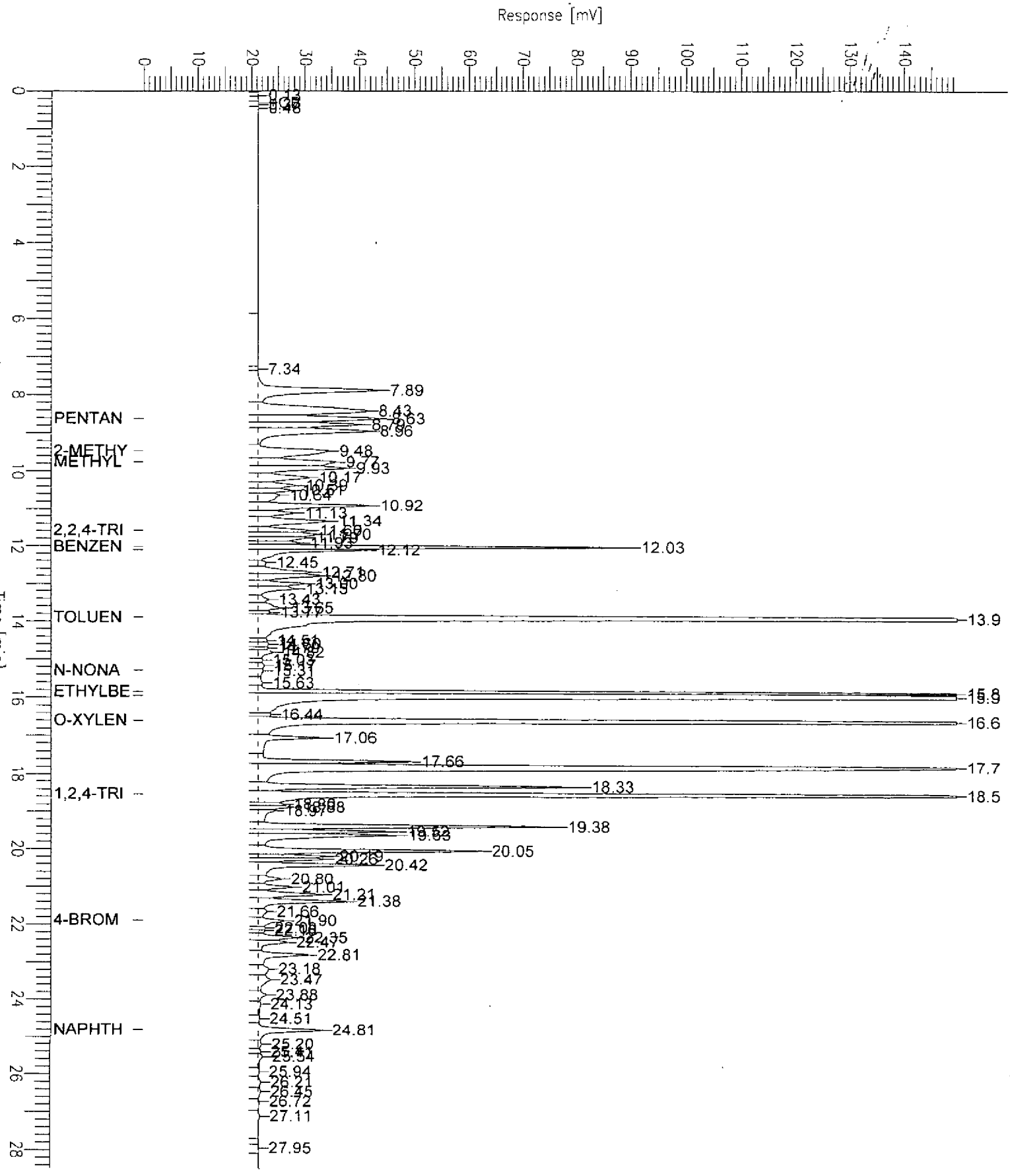
U = Analyzed but not detected.

** Surrogate value outside control limits.*

Chromatogram

Sample Name : 45444-01
FileName : T:\TC4\DATA\FEBVPH\0215008.raw
Method : HPPIDINS
Start Time : 0.00 min End Time : 28.49 min
Scale Factor: 0.0 Plot Offset: 0 mV

Sample #: 8 Page 1 of 1
Date : 02/16/2001 09:00 AM
Time of Injection: 02/15/2001 05:11 PM
Low Point : 0.00 mV High Point : 150.00 mV
Plot Scale: 150.0 mV



APPENDIX C

TRC FIELD SCREENING CORRELATION LETTER DATED DECEMBER 12, 2000

TRC

Customer-Focused Solutions

TRC Reference No. E9202-3501-02500

December 12, 2000

Ms Jennifer Eck
Project Manager
Bureau of Waste Site Cleanup
Massachusetts Department of Environmental Protection
205A Lowell Street
Wilmington, MA 01887

Subject: Field Screening Correlation
Biosparging/SVE Remedy Implementation Plan (RIP)
Tank K Area

Reference: Former GE Facility (RTN# 3-0518)
50 Fordham Road, Wilmington, MA

Dear Ms Eck:

Enclosed please find documentation regarding the field screening and laboratory analytical results for the Tank K Area at the above-referenced site.

As shown on Figure 1, there appears to be a good correlation between the field screening procedures outlined in the Phase IV RIP and the laboratory analytical results for both the targeted analytes and the total VOC concentrations. Given the original objective to install the biosparging points within the core of the contaminant plume, TRC believes that this field screening method will adequately delineate the targeted area for installation.

Please note that TRC was unable to locate monitoring wells WE-2S and WE-2D for sampling. It appears that at least one of the wells may be located under a lock box at the site. This box will be relocated to provide access for system installation. At that time, TRC will then obtain a sample for baseline analysis. The second of the two wells may be "abandoned". TRC is looking into this, and will notify your office with our findings.

We will call you to discuss these results. In the mean time, please feel free to call me at (978) 656-3582

Sincerely;

Paola E. Macchiaroli, Ph.D.
Project Manager

Attachment

TRC Companies, Inc.
Boott Mills South, Foot of John Street • Lowell, Massachusetts 01852
Telephone 978-970-5600 • Fax 978-453-1995

DRAFT

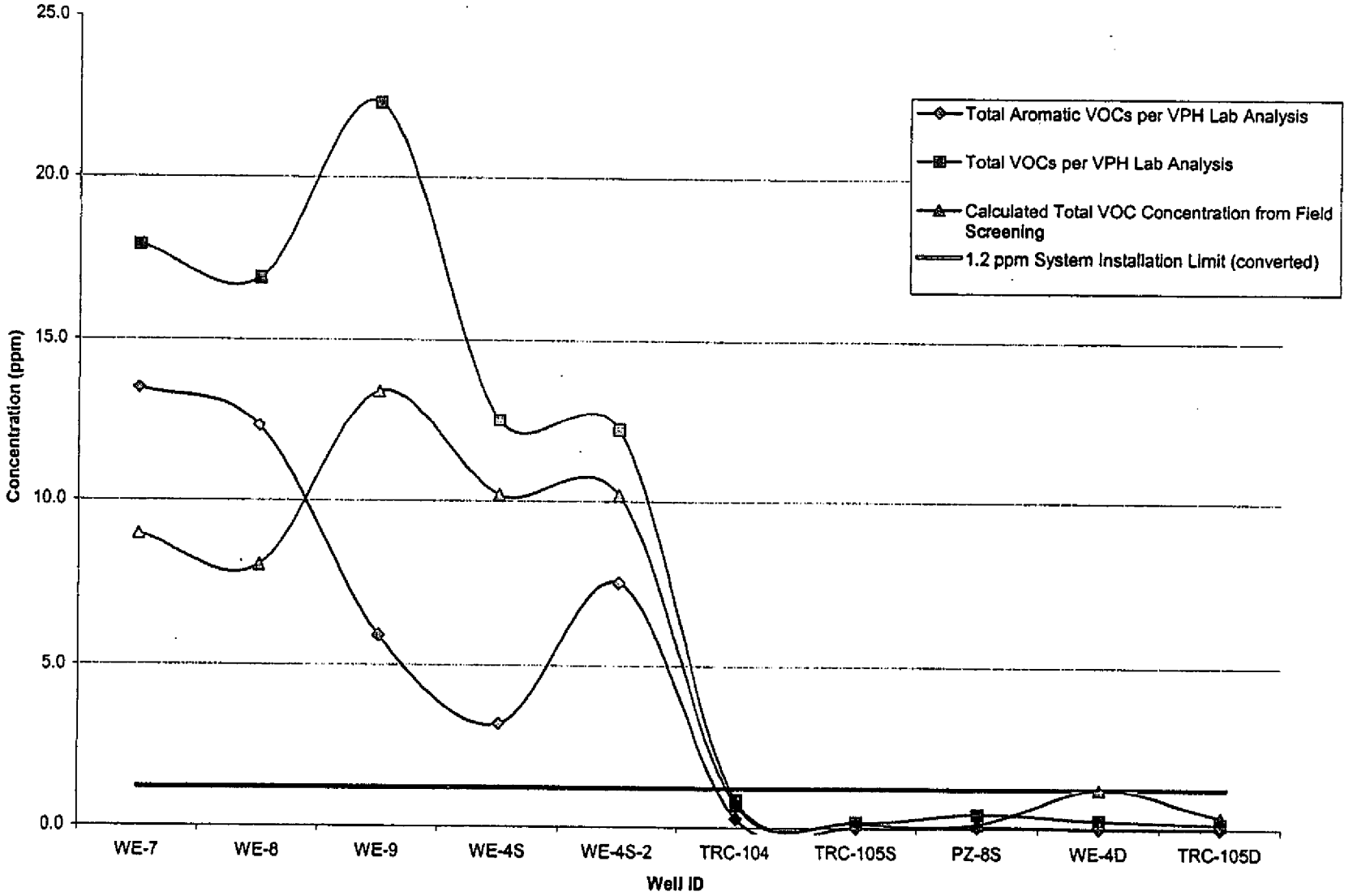
Table 1
Comparison of Calculated Field Screening Values vs. Analytical Total VOCs using VPH Method
Tank K Area
Former GE Site
Wilmington, Massachusetts

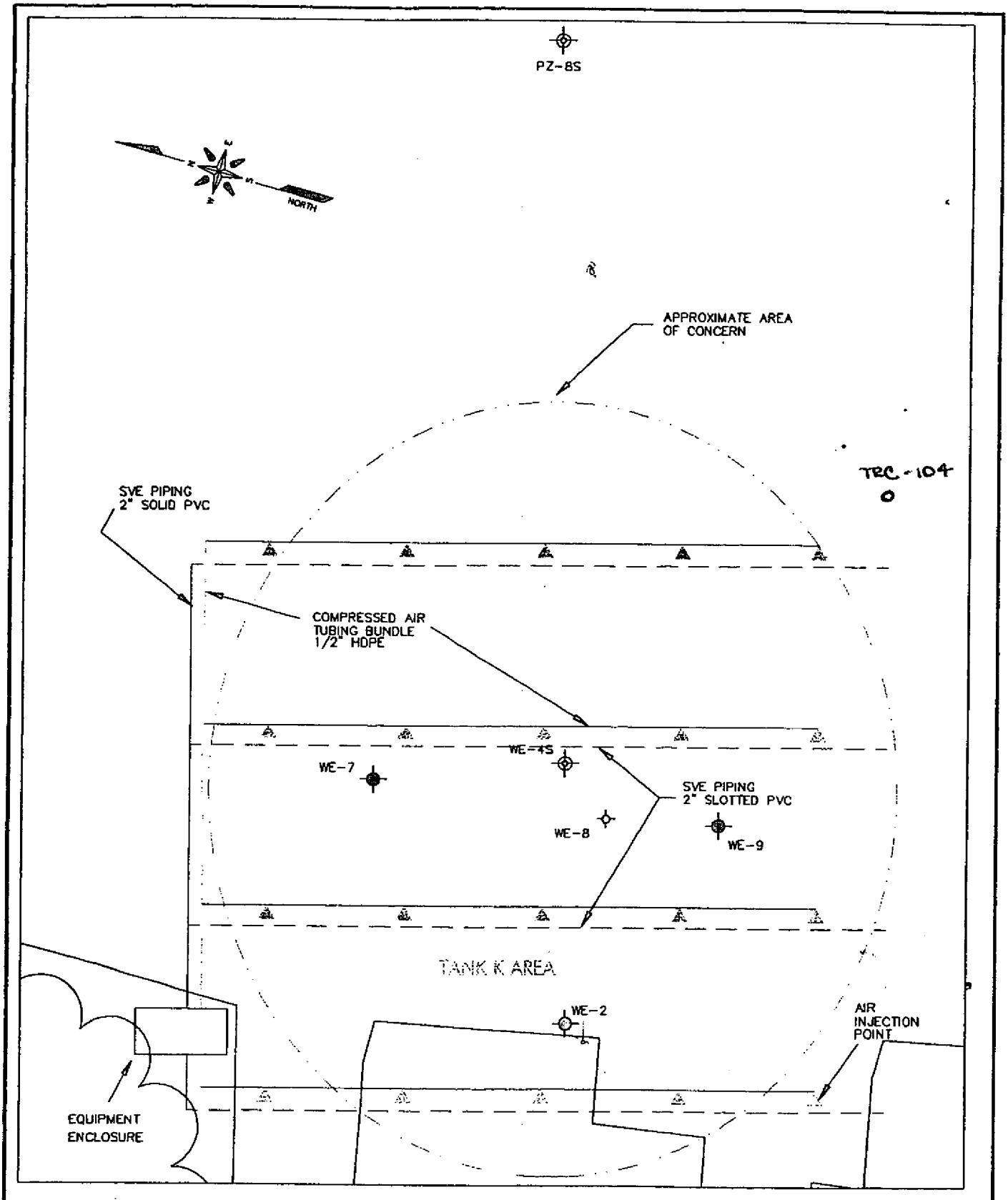
Well ID	PID Readings, ppmv 11/29-30/00				Calculated Total VOCs[1]	Total Aromatics[2]	Total VOCs[2] 11/29-30/00
	#1	#2	#3	Average	(ppm)	(ppm)	(ppm)
WE-7	103	103	95	100.3	9.0	13.5	17.9
WE-8	78	80	111	89.7	8.0	12.3	16.9
WE-9	130	160	160	150.0	13.4	5.9	22.3
WE-4S	127	90	125	114	10.2	3.2	12.5
WE-4S-2	--	--	--	--	--	7.5	12.2
TRC-104	8	7.6	7.8	7.8	0.7	0.269	0.829
TRC-105S	1.5	1.5	1.7	1.6	0.1	ND	0.170
PZ-8S	2	2	0.5	1.5	0.1	0.051	0.431
WE-4D	15	13	12	13.3	1.2	ND	0.240
TRC-105D	3.5	4	4	3.8	0.3	ND	0.140

(1) Concentrations calculated using PID readings per method described in RIP dated July 2000.
(2) Per VPH Method.
WE-4S-2 is a duplicate sample.

DRAFT

Figure 1
Field Screening vs Lab Analysis





TRC105 5
0

TRC-104
0

LEGEND

BUILDING

MULTI-LEVEL MONITORING WELL/PIEZOMETER LOCATION

SINGLE-LEVEL MONITORING WELL/PIEZOMETER LOCATION

0 15 30

GRAPHIC SCALE

TRC
Boot Mills South
Foot of John Street
Lowell, MA 01852
(978) 970-5600

FORMER GE SITE
WILMINGTON/NORTH READING, MASSACHUSETTS

FIGURE 3-1
REMEDIATION SYSTEM LAYOUT

Date: 07/00 | Project No. E9202

Woods Hole Group
Environmental Laboratories
375 Paramount Drive • Suite 2
Raynham, MA 02767-5154 • USA
Phone: 508-822-9300
Fax: 508-822-3288

VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 45226

TRC Environmental

Lokheed Wilmington

Lab ID Number: 45226-04

Associated Blank: VW1207B1

Sample ID: WE-8

Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
12/01/2000	5 mL	N/A	12/08/2000	20	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	4800	U
C_9-C_{12} Aliphatics [1,3]	4600	
C_9-C_{10} Aromatics [1]	6800	
Unadjusted C_5-C_8 Aliphatics [1]	4800	U
Unadjusted C_9-C_{12} Aliphatics [1]	17000	

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	100	U
Benzene	C_5 - C_8	120	
Toluene	C_5 - C_8	300	U
Ethylbenzene	C_9 - C_{12}	100	U
m & p Xylene	C_9 - C_{12}	4900	
o-Xylene	C_9 - C_{12}	470	
Naphthalene	N/A	200	U

SURROGATE RECOVERY

	PID		FID	
Surrogate	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	113%	70%-130%	106%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

Woods Hole Group
Environmental Laboratories

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Fax: 508-822-3288

VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 44226

TRC Environmental

Lab ID Number: 45226-05

Locheed Wilmington

Associated Blank: VW1207BI

Sample ID: WE-9

Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
12/1/00	5 mL	N/A	12/8/00	5	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	4700	
C_9-C_{12} Aliphatics [1,3]	12000	
C_9-C_{10} Aromatics [1]	350	U
Unadjusted C_5-C_8 Aliphatics [1]	7000	
Unadjusted C_9-C_{12} Aliphatics [1]	15000	

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	150	
Benzene	C_5 - C_8	430	
Toluene	C_5 - C_8	1800	
Ethylbenzene	C_9 - C_{12}	540	
m & p Xylene	C_9 - C_{12}	1200	
o-Xylene	C_9 - C_{12}	1500	
Naphthalene	N/A	290	

SURROGATE RECOVERY

Surrogate	PID		FID	
	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	108%	70%-130%	123%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

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VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 44226

TRC Environmental

Lockheed Wilmington

Lab ID Number: 45226-10

Associated Blank: VW1207B1

Sample ID: WE-4S-2

Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
12/1/00	5 mL	N/A	12/8/00	1	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	1700	
C_9-C_{12} Aliphatics [1,3]	3000	
C_5-C_{10} Aromatics [1]	4300	
Unadjusted C_5-C_8 Aliphatics [1]	2300	
Unadjusted C_9-C_{12} Aliphatics [1]	9800	

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	95	
Benzene	C_5 - C_8	470	
Toluene	C_5 - C_8	75	U
Ethylbenzene	C_9 - C_{12}	650	
m & p Xylene	C_9 - C_{12}	1100	
o-Xylene	C_9 - C_{12}	740	
Naphthalene	N/A	190	

SURROGATE RECOVERY

	PID		FID	
Surrogate	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	93%	70%-130%	128%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

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VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 44226

TRC Environmental

Lab ID Number: 45226-01

Lockheed Wilmington

Associated Blank: VW1207B1

Sample ID: WE-4S

Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
12/1/00	5 mL	N/A	12/8/00	5	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	1900	
C_9-C_{12} Aliphatics [1,3]	7400	
C_9-C_{10} Aromatics [1]	350	U
Unadjusted C_5-C_8 Aliphatics [1]	2400	
Unadjusted C_9-C_{12} Aliphatics [1]	9900	

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	94	
Benzene	C_5 - C_8	440	
Toluene	C_5 - C_8	75	U
Ethylbenzene	C_9 - C_{12}	590	
m & p Xylene	C_9 - C_{12}	1000	
o-Xylene	C_9 - C_{12}	890	
Naphthalene	N/A	190	

SURROGATE RECOVERY

Surrogate	PID		FID	
	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	96%	70%-130%	102%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

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VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 44226

TRC Environmental

Lockheed Wilmington

Lab ID Number: 45226-03

Associated Blank: VW1207B1

Sample ID: WE-7					
Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
12/1/00	5 mL	N/A	12/8/00	10	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	3000	
C_9-C_{12} Aliphatics [1,3]	1400	
C_9-C_{10} Aromatics [1]	6600	
Unadjusted C_5-C_8 Aliphatics [1]	4000	
Unadjusted C_9-C_{12} Aliphatics [1]	14000	

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	100	
Benzene	C_5 - C_8	290	
Toluene	C_5 - C_8	630	
Ethylbenzene	C_9 - C_{12}	470	
m & p Xylene	C_9 - C_{12}	4100	
o-Xylene	C_9 - C_{12}	1100	
Naphthalene	N/A	240	

SURROGATE RECOVERY

	PID		FID	
Surrogate	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	121%	70%-130%	123%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

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VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 45226

TRC Environmental

Lab ID Number: 45226-02

Lockheed Wilmington

Associated Blank: VW1207B1

Sample ID: WE-4D

Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
12/1/00	5 mL	N/A	12/7/00	1	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	240	U
C_9-C_{12} Aliphatics [1,3]	240	
C_9-C_{10} Aromatics [1]	70	U
Unadjusted C_5-C_8 Aliphatics [1]	240	U
Unadjusted C_9-C_{12} Aliphatics [1]	240	

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	5	U
Benzene	C_5 - C_8	5	U
Toluene	C_5 - C_8	15	U
Ethylbenzene	C_9 - C_{12}	5	U
m & p Xylene	C_9 - C_{12}	10	U
o-Xylene	C_9 - C_{12}	10	U
Naphthalene	N/A	10	U

SURROGATE RECOVERY

Surrogate	PID		FID	
	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	101%	70%-130%	104%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

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VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 45226

TRC Environmental

Lab ID Number: 45226-06

Lockheed Wilmington

Associated Blank: VW1207B1

Sample ID: PZ-8S

Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
12/1/00	5 mL	N/A	12/8/00	1	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	240	U
C_9-C_{12} Aliphatics [1,3]	380	
C_9-C_{10} Aromatics [1]	70	U
Unadjusted C_5-C_8 Aliphatics[1]	240	U
Unadjusted C_9-C_{12} Aliphatics[1]	430	

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	5	U
Benzene	C_5 - C_8	5	U
Toluene	C_5 - C_8	15	U
Ethylbenzene	C_9 - C_{12}	7	
m & p Xylene	C_9 - C_{12}	31	
o-Xylene	C_9 - C_{12}	13	
Naphthalene	N/A	10	U

SURROGATE RECOVERY

	PID		FID	
Surrogate	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	103%	70%-130%	119%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

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VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 45226

TRC Environmental

Lab ID Number: 45226-07

Lockheed Wilmington

Associated Blank: VW1207B1

Sample ID: TRC-104

Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
12/1/00	5 mL	N/A	12/8/00	1	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	320	
C_9-C_{12} Aliphatics [1,3]	240	
C_9-C_{10} Aromatics [1]	70	U
Unadjusted C_5-C_8 Aliphatics [1]	580	
Unadjusted C_9-C_{12} Aliphatics [1]	240	

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	260	
Benzene	C_5 - C_8	9	
Toluene	C_5 - C_8	15	U
Ethylbenzene	C_9 - C_{12}	5	U
m & p Xylene	C_9 - C_{12}	10	U
o-Xylene	C_9 - C_{12}	10	U
Naphthalene	N/A	10	U

SURROGATE RECOVERY

	PID		FID	
Surrogate	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	103%	70%-130%	103%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

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VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 45226

TRC Environmental

Lab ID Number: 45226-08

Lockheed Wilmington

Associated Blank: VW1207B1

Sample ID: TRC-105S

Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
12/1/00	5 mL	N/A	12/8/00	1	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	240	U
C_9-C_{12} Aliphatics [1,3]	170	
C_9-C_{10} Aromatics [1]	70	U
Unadjusted C_5-C_8 Aliphatics [1]	240	U
Unadjusted C_9-C_{12} Aliphatics [1]	170	

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	5	U
Benzene	C_5 - C_8	5	U
Toluene	C_5 - C_8	15	U
Ethylbenzene	C_9 - C_{12}	5	U
m & p Xylene	C_9 - C_{12}	10	U
o-Xylene	C_9 - C_{12}	10	U
Naphthalene	N/A	10	U

SURROGATE RECOVERY

Surrogate	PID		FID	
	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	100%	70%-130%	98%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

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VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 45226

TRC Environmental

Lab ID Number: 45226-09

Lockheed Wilmington

Associated Blank: VW1207B1

Sample ID: TRC-105D

Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
12/1/00	6 mL	N/A	12/8/00	1	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	240	U
C_9-C_{12} Aliphatics [1,3]	140	
C_9-C_{10} Aromatics [1]	70	U
Unadjusted C_5-C_8 Aliphatics[1]	240	U
Unadjusted C_9-C_{12} Aliphatics[1]	140	

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	5	U
Benzene	C_5 - C_8	5	U
Toluene	C_5 - C_8	15	U
Ethylbenzene	C_9 - C_{12}	5	U
m & p Xylene	C_9 - C_{12}	10	U
o-Xylene	C_9 - C_{12}	10	U
Naphthalene	N/A	10	U

SURROGATE RECOVERY

	PID		FID	
Surrogate	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	101%	70%-130%	103%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

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VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

ETR Number: 45226

TRC Environmental

Lab ID Number: 45226-11

Lockheed Wilmington

Associated Blank: VW1207B1

Sample ID: Trip Blank

Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
12/1/00	5 mL	N/A	12/7/00	1	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	240	U
C_9-C_{12} Aliphatics [1,3]	100	U
C_9-C_{10} Aromatics [1]	70	U
Unadjusted C_5-C_8 Aliphatics [1]	240	U
Unadjusted C_9-C_{12} Aliphatics [1]	100	U

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	5	U
Benzene	C_5 - C_8	5	U
Toluene	C_5 - C_8	15	U
Ethylbenzene	C_9 - C_{12}	5	U
m & p Xylene	C_9 - C_{12}	10	U
o-Xylene	C_9 - C_{12}	10	U
Naphthalene	N/A	10	U

SURROGATE RECOVERY

	PID		FID	
Surrogate	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	100%	70%-130%	97%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

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VOLATILE PETROLEUM HYDROCARBON (VPH) ANALYSIS
MADEP-VPH-98-1 Rev. 0

Quality Control Report

Lab ID Number: VWI207B1

Sample ID: Method Blank					
Date Received	Sample Amount	% Solids	Date Analyzed	Dilution Factor	Analyst
N/A	5 mL	N/A	12/7/00	1	AL

VOLATILE PETROLEUM HYDROCARBONS (VPH) in µg/L

Analyte	Amount	Qualifier
C_5-C_8 Aliphatics [1,2]	240	U
C_9-C_{12} Aliphatics [1,3]	100	U
C_9-C_{10} Aromatics [1]	70	U
Unadjusted C_5-C_8 Aliphatics[1]	240	U
Unadjusted C_9-C_{12} Aliphatics[1]	100	U

TARGETED VPH ANALYTES in µg/L

Analyte	Elution Range	Amount	Qualifier
MTBE	C_5 - C_8	5	U
Benzene	C_5 - C_8	5	U
Toluene	C_5 - C_8	15	U
Ethylbenzene	C_9 - C_{12}	5	U
m & p Xylene	C_9 - C_{12}	10	U
o-Xylene	C_9 - C_{12}	10	U
Naphthalene	N/A	10	U

SURROGATE RECOVERY

	PID		FID	
Surrogate	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	100%	70%-130%	99%	70%-130%

[1] *Hydrocarbon Range data exclude concentrations of any surrogate(s) and/or internal standards eluting in that range.*

[2] *C_5-C_8 Aliphatic Hydrocarbons exclude the concentration of Target Analytes eluting in that range.*

[3] *C_9-C_{12} Aliphatic Hydrocarbons exclude concentration of Target Analytes eluting in that range AND concentration of C_9-C_{10} Aromatic Hydrocarbons.*

U = Analyzed but not detected.

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Fax: 508-822-3288

VOLATILE PETROLEUM HYDROCARBONS
LABORATORY CONTROL SPIKE

Sample ID: VW1207L1				
Date Analyzed	Time Analyzed	Analyst	Result File ID	Instrument ID
12/7/00	1:07 PM	AL	T:\TC4\DATA\DECVPH\OD07002.RST	HP-PID
12/7/00	1:07 PM	AL	T:\TC4\DATA\DECVPH\PD07002.RST	HP-PID

VOLATILE PETROLEUM HYDROCARBONS in: ug/L (ppb)

Parameter	Target Conc.	Actual Conc.	Percent Recovery	QC Limits
MTBE	150	148	98%	70% - 130%
Benzene	50	50	101%	70% - 130%
Toluene	150	150	100%	70% - 130%
Ethylbenzene	50	53	107%	70% - 130%
m- & p-Xylene	200	194	97%	70% - 130%
o-Xylene	100	101	101%	70% - 130%
Naphthalene	100	103	103%	70% - 130%
1,2,4-Trimethylbenzene	100	101	101%	70% - 130%
Pentane	100	110	110%	70% - 130%
2-Methylpentane	150	150	100%	70% - 130%
2,2,4-Trimethylpentane	150	148	98%	70% - 130%
n-Nonane	100	119	119%	70% - 130%

SURROGATE RECOVERY

	PID		FID	
Surrogate	% Recovery	Range	% Recovery	Range
1,4-Difluorobenzene	104%	70%-130%	101%	70%-130%

APPENDIX D

IES, INC. START UP DATA REPORT AND AS-BUILT DRAWINGS

March 9, 2001

Paola Macchiaroli, PhD
TRC Environmental Corporation
Boot Mills South
Lowell, Massachusetts 01852

Subject: Tank K Area GW Remediation System Start-up, Former GE Facility, 50 Fordham Road, Wilmington, Massachusetts
RTN 3-518

Dear Paola:

This letter covers the Tank K Groundwater Remediation System start-up period between February 8 and March 7. The IESI personnel monitored the system operation seven times (2/8, 2/9, 2/21, 2/23, 2/27, 3/2, 3/7) during the start-up period. In addition several repair site visits were required to replace the failed blower and install the new one.

GENERAL SYSTEM OPERATION

The Tank K Groundwater Remediation System began operation on February 8, 2001. Initially, only the SVE component of the system was turned on to establish the baseline conditions. The SVE The next day the biosparging wells were turned on at the low air injection rate of 0.8 cubic feet per minute (CFM) per sparge point.

During the weekend of February 10-11 the biosparging blower failed and the system shut down. After the new blower was installed the system was restarted on February 21, 2001 with the biosparging wells running at 0.8 CFM per sparge point. The air injection rates were slightly increased to 0.9 CFM per sparge point on February 23, 2001. The air injection rates were further increased to 1.2 CFM, 1.3 CFM, and 1.5 CFM during the subsequent site visits on February 27, March 2, and March 7.

The system operated without interruption during the period between February 21 and March 7, 2001. In-Field Groundwater Parameters were measured and recorded on February 27, 2001. A remote monitoring device was installed on March 2, 2001. Subsequently the system operation was checked daily over the phone.

No organic vapors were detected in the extracted soil gas over the reported period. The absence of the vapors may be due to the frozen conditions of the vadose zone during the winter period.

OPERATIONAL PROBLEMS

During the weekend of February 10-11 a crack developed in the body of the biosparging blower. The blower subsequently failed and ceased operation. The blower's manufacturer sent the replacement blower that was subsequently installed by the IESI personnel. IESI believes that the blower failure was random and does not indicate an inferior design/manufacturing quality.

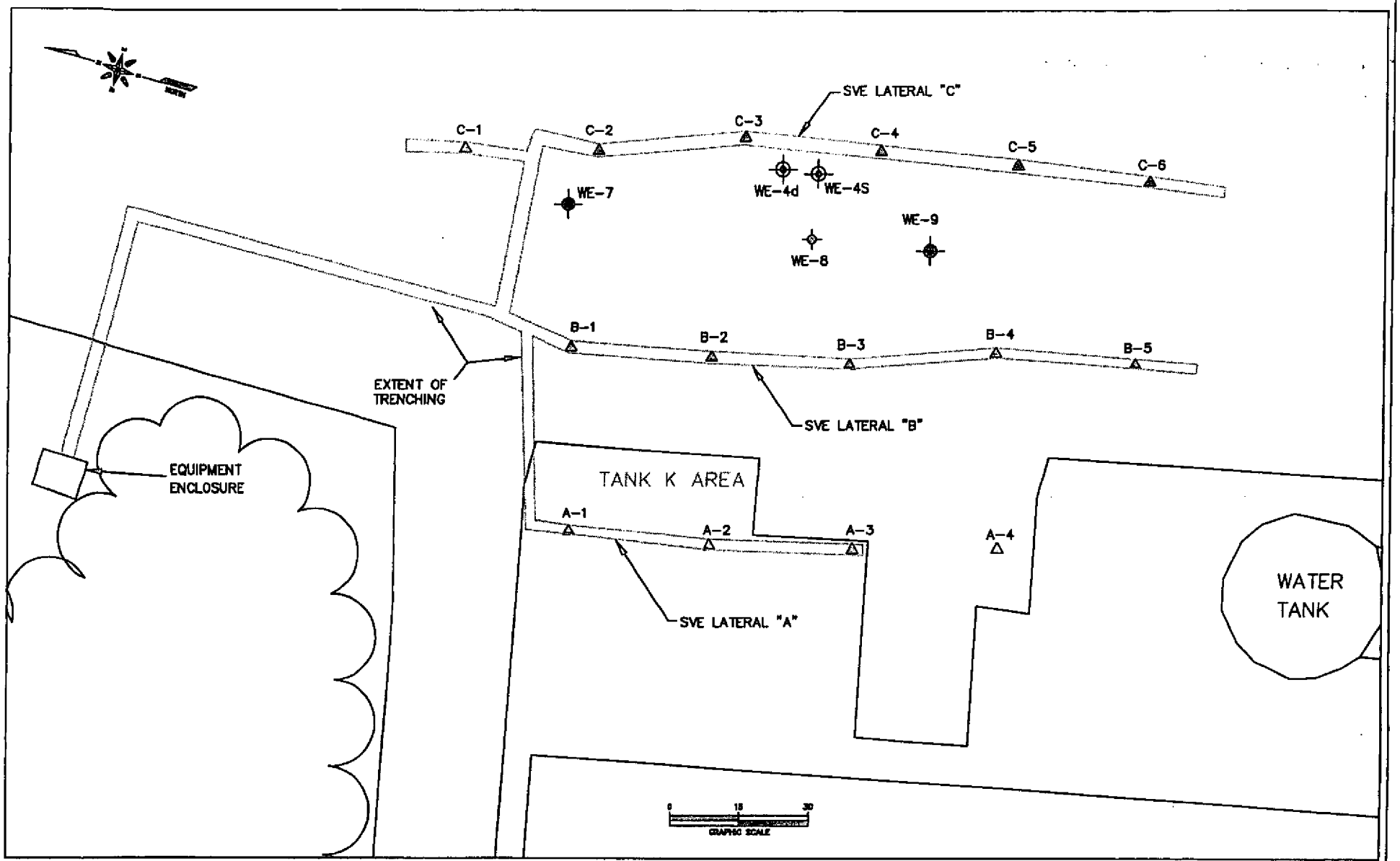
It was noted that three sparge points had no detectable air flow when the biosparging system began operation (see the 02/09/01 field monitoring form). Later three more sparge points exhibited no air flow conditions (see the 02/21 through 2/23 field monitoring forms). It was judged that the screens of the sparge point became clogged by silt and sand particles. The clogged sparge points were developed on February 27, 2001. The development consisted of inserting a 3/8-inch tubing to the bottom of the sparge point, pumping fresh water into the tubing and forcing the silt and sand particles out of the well by water flow. It was noted that up to 10 inches of sediment was evacuated from the clogged sparge points. The sparge points were further developed by evacuating water by a peristaltic pump. After the development five out of six sparge points resumed normal operation (see the 2/27 field monitoring form). Currently only the sparge point C-1 exhibits no flow conditions.

Should you have any questions or require further information, please contact Boris Dynkin at (781) 455-8456ext226.

Very truly yours,

Innovative Engineering Solutions, Inc.

Boris Dynkin, P.E.
Principal Engineer

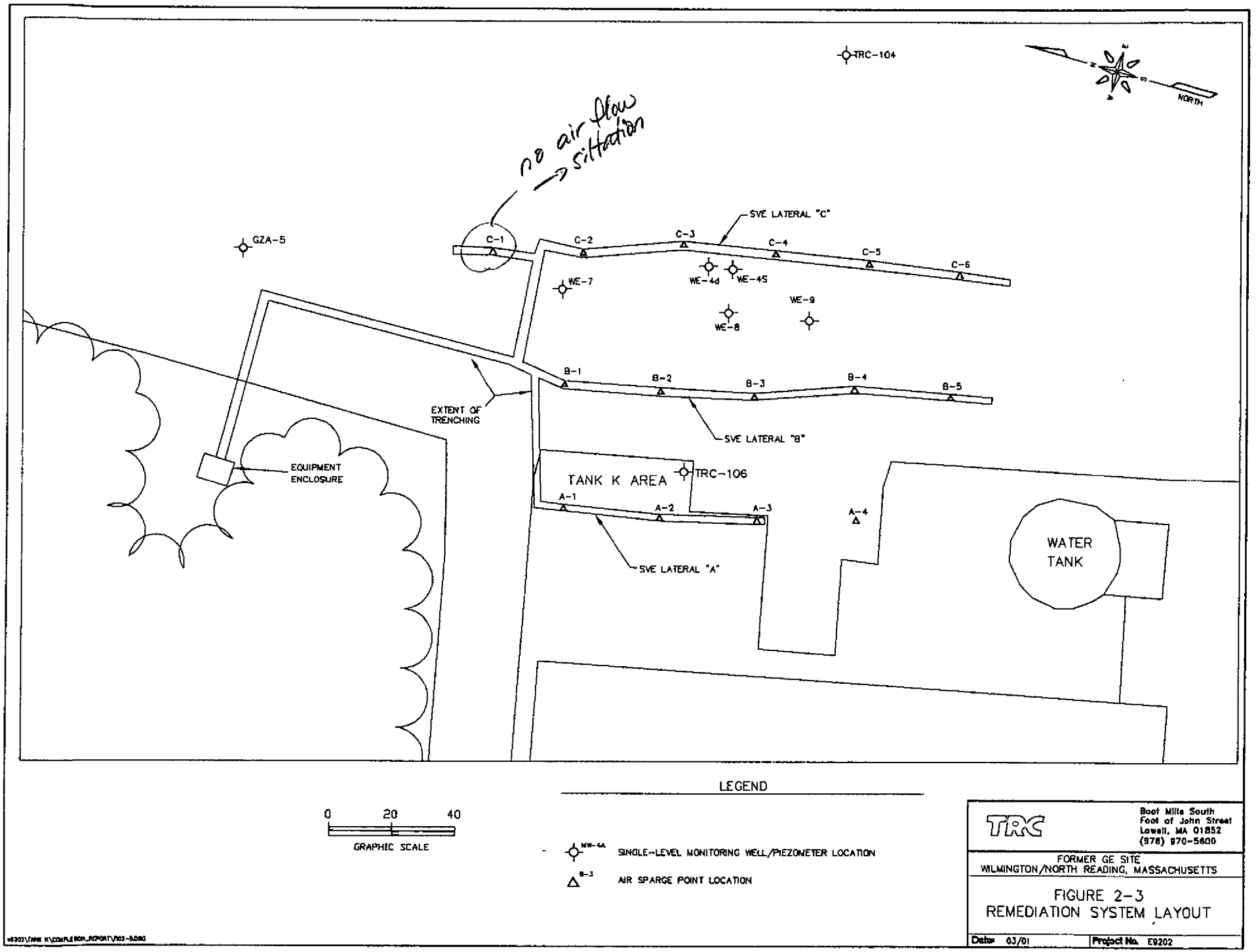


LEGEND

- STM-5 — MULTI-LEVEL MONITORING WELL/PIEZOMETER LOCATION
- MW-4A — SINGLE-LEVEL MONITORING WELL/PIEZOMETER LOCATION
- B-3 — AIR SPARGE POINT LOCATION

IESI Innovative Engineering Solutions, Inc. Bright Ideas
17 Avery Square, Suite G
Needham, MA 02194

TITLE	SURVEY LOCATIONS
PROJECT	TANK K GROUNDWATER REMEDIATION
SITE	FORMER GE SITE WILMINGTON/NORTH READING, MASSACHUSETTS
CLIENT	TRC
DESIGNED	RD
DRAWN	BD
CHECKED	SF
SCALE	
DATE	MARCH 01
FILE NO	fay-asbuilt
PLATE NO	1



TRC

Boot Mills South
Foot of John Street
Lowell, MA 01852
(978) 970-5600

FORMER GE SITE
WILMINGTON/NORTH READING, MASSACHUSETTS

FIGURE 2-3
REMEDIATION SYSTEM LAYOUT

Date 03/01

Project No. E9202

B-1 — BIOSPARGE BLOWER POSITIVE DISPLACEMENT 7.5 HP, 3PH, 230VAC 50 SCFM @ 12PSI

MF-1 AND 2 — INLET/OUTLET SILENCERS 2-INCH CONNECTIONS STODDARD, D33H MODEL

B-2 — SVE BLOWER REGENERATIVE 1.5 HP, 3PH, 230VAC 100 SCFM @ 30in.w.c.

GAC-1 AND 2 — GAC VESSEL 55 GAL VAPOR PHASE

MS-1 — MOISTURE SEPARATOR 30 GALLON

FM-A1 TO E5 — VARIABLE AREA AIR FLOW METERS

RPS-1 — REMOTE PRESSURE SENSOR (0 TO 15 PSI

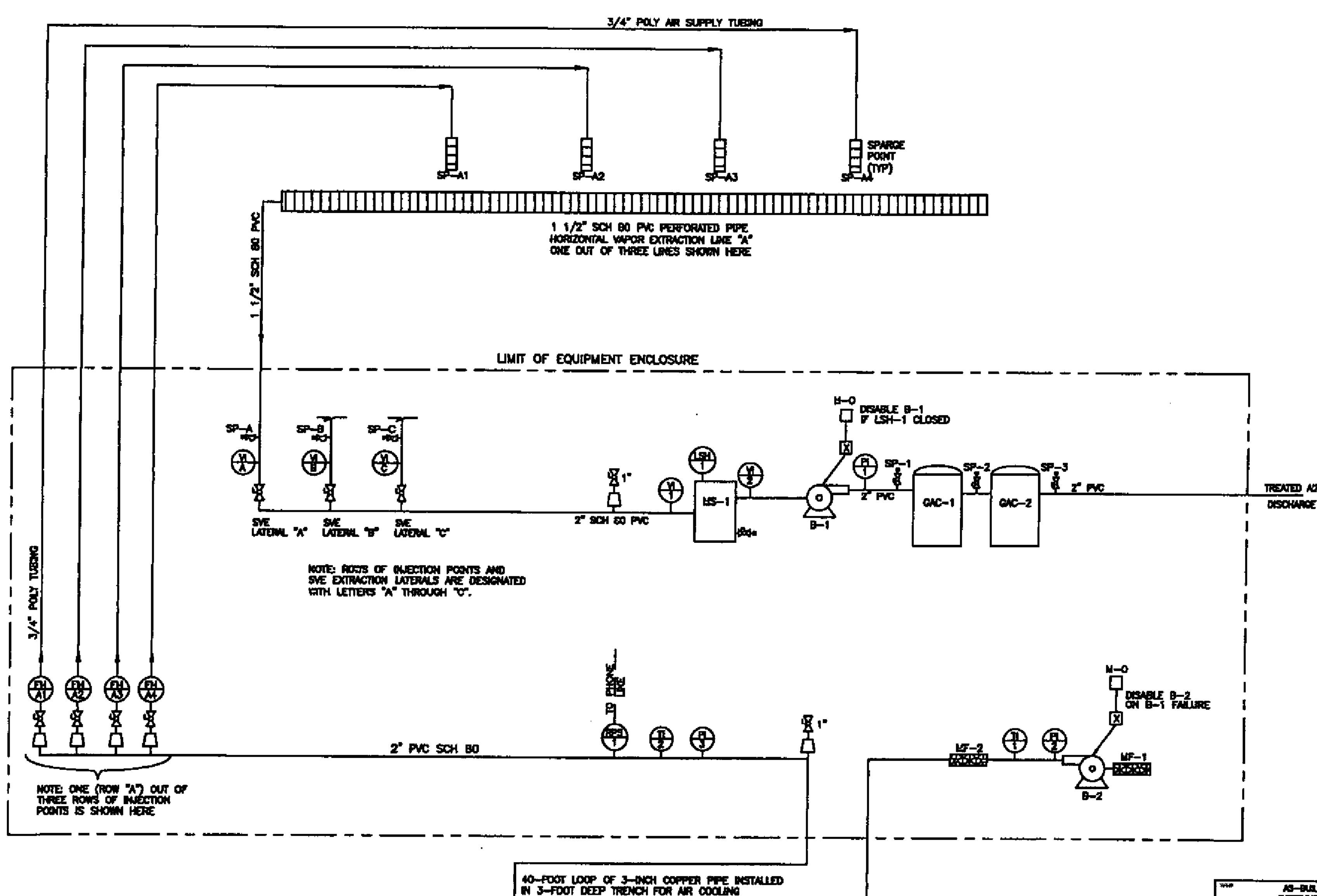
PI-1 TO 2 — PRESSURE INDICATORS (TYPICAL)

VI- — VACUUM INDICATORS (TYPICAL)

TI-1 TO 2 — TEMPERATURE INDICATORS (TYPICAL)

LSH-1 — HIGH LEVEL SWITCH

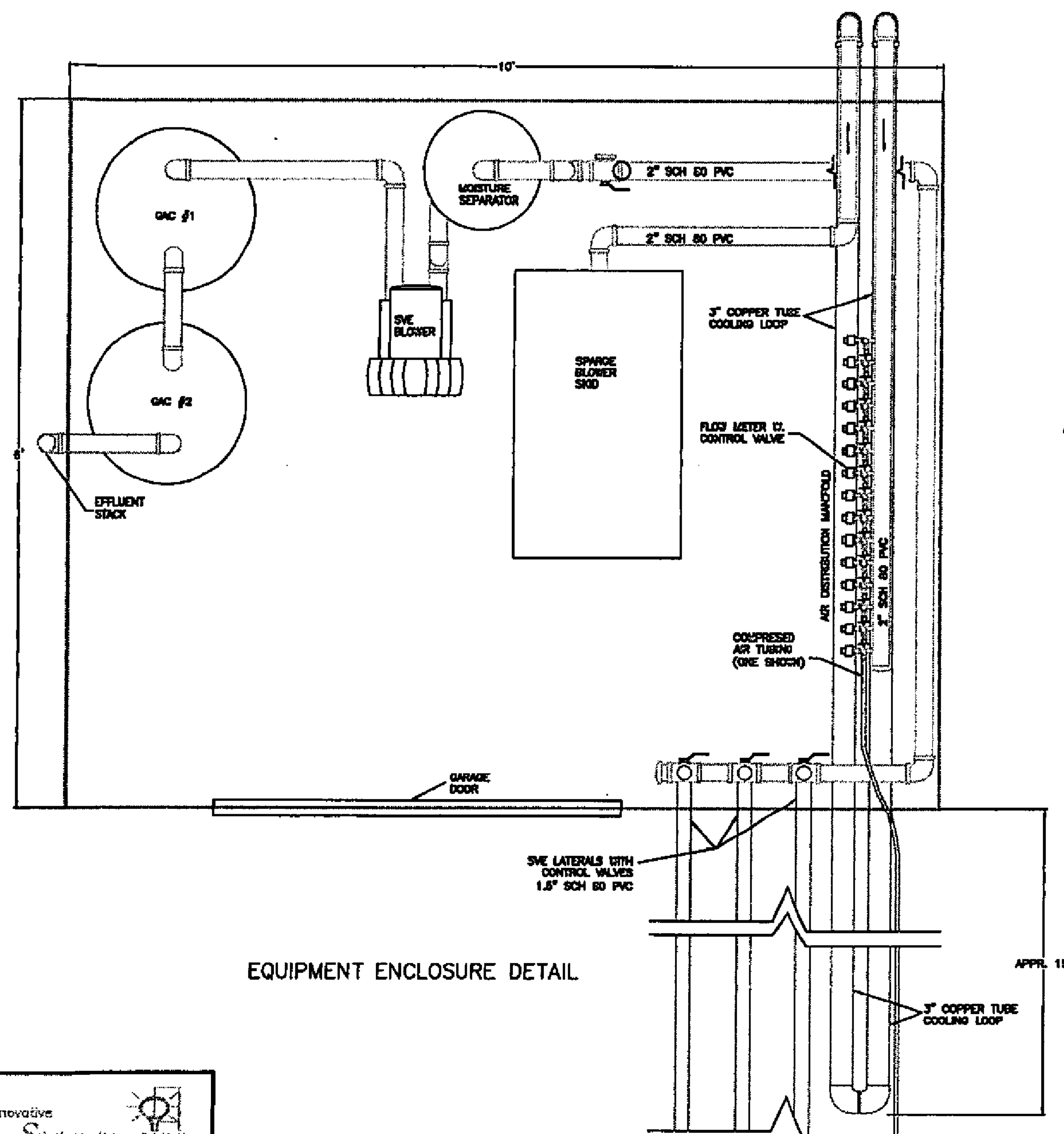
SP- — SAMPLING PORTS



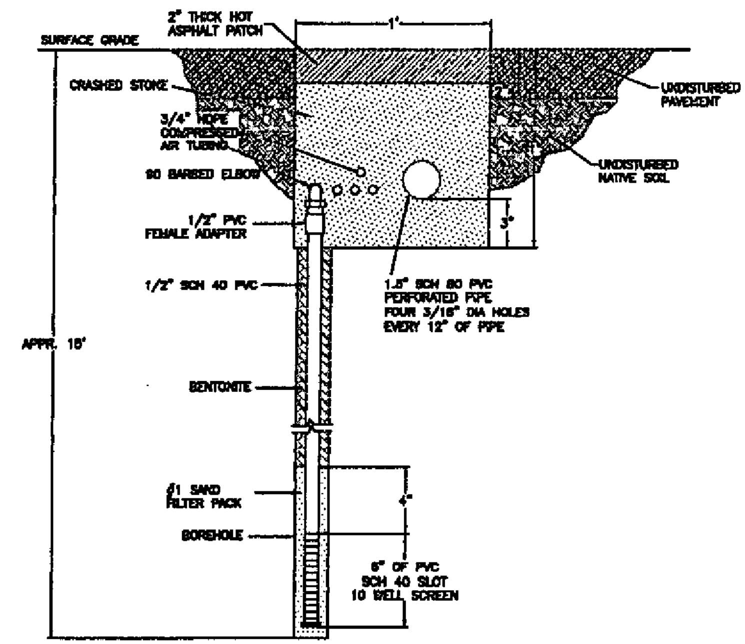
IES Innovative Engineering Solutions, Inc.

AS-BUILT PROCESS AND INSTRUMENTATION DIAGRAM

N.T.S. — MARCH 01 — 3



EQUIPMENT ENCLOSURE DETAIL



TRENCH CROSS-SECTION DETAIL

IES Innovative Engineering Solutions, Inc.

EQUIPMENT SCHEMATIC AND SUBSURFACE DETAILS (AS BUILT)			
N.T.S.	MARCH 01	SF	2

Tank K Biospargin and SVE Systems OM&M Field Monitoring Form
Wilmington, Ma
Date: 03/07/01
9:50am

Name: Doris Dykia

BIOSPARGING COMPONENT

Cooling Loop Inlet Pressure psi	Cooling Loop Outlet Pressure psi	Cooling Loop Inlet Temperature °F	Cooling Loop Outlet Temperature °F	Depth to water in WE-4S feet	Comments	
9.0	8.8	230	108	3.15		

Sparge Point	Flow, CFM	Press. psi
A1	1.6	3.5
A2	1.6	5.4
A3	1.6	5.2
B1	1.6	5.4
B2	1.6	6.8
B3	1.6	8.2
B4	1.6	6.5
B5	1.6	6.2
C1	no flow	—
C2	1.6	7.0
C3	1.6	5.0
C4	1.6	7.0
C5	1.6	6.1
C6	1.6	7.7

Adjusted flow up to 1.6 C.f.m in all sparge wells.

SVE COMPONENT

Knockout Inlet Vacuum in.w.c.	Knockout Outlet Vacuum in.w.c.	Blower Discharge Pressure in.w.c.	GAC Inlet Vapor Conc. ppm	Midstream GAC Vapor Conc. ppm	GAC Outlet Vapor Conc. ppm	Comments
20	20	23	<1	<1	<1	

Lateral ID	Vacuum in.w.c.	Vapor Conc. ppm	Comments
Lateral A	15	<1	
Lateral B	16	<1	
Lateral C	16	<1	

Tank K Biospargin and SVE Systems OM&M Field Monitoring Form
Wilmington, Ma
Date: 02/02/01
14:30 pm

Name: Bob's Dyakin

BIOSPARGING COMPONENT

Cooling Loop Inlet Pressure psi	Cooling Loop Outlet Pressure psi	Cooling Loop Inlet Temperature ^0F	Cooling Loop Outlet Temperature ^0F	Depth to water in WE-4S feet	Comments
9.5	9.0	225	100	3.32	

Sparge Point	Flow, CFM	Pressure, psi
A1	1.3	3.3
A2	1.3	3.2
A3	1.3	5.0
B1	1.3	5.2
B2	1.3	6.6
B3	1.3	8.0
B4	1.3	6.3
B5	1.3	6.0
C1	no flow	
C2	1.3	6.8
C3	1.3	4.8
C4	1.3	6.8
C5	1.3	6.0
C6	1.3	7.5

Adjusted flow up to 1.3 cfm in Sparge wells. Verizon installed a phone line. A remote monitoring unit (subcontracting installation tested - worked OK.

SVE COMPONENT

Knockout Inlet Vacuum in.w.c.	Knockout Outlet Vacuum in.w.c.	Blower Discharge Pressure in.w.c.	GAC Inlet Vapor Conc. ppm	Midstream GAC Vapor Conc. ppm	GAC Outlet Vapor Conc. ppm	Comments
20	22	22	<1	<1	<1	

Lateral ID	Vacuum in.w.c.	Vapor Conc. ppm	Comments
Lateral A	15	<1	
Lateral B	16	<1	
Lateral C	16	<1	

Tank K Biospargin and SVE Systems OM&M Field Monitoring Form
Wilmington, Ma
Date: 2/27/01
16:30 pm

Name: Boris Dyakin

BIOSPARGING COMPONENT

Cooling Loop Inlet Pressure psi	Cooling Loop Outlet Pressure psi	Cooling Loop Inlet Temperature ^0F	Cooling Loop Outlet Temperature ^0F	Depth to water in WE-4S feet	Comments
9.5	9.0	225	102	3.37	Performed In-Field GW Monitoring in ten monitoring wells.

Sparge Point	Flow, CFM	Pressure, psi
A1	1.2	3.3
A2	1.2	5.5
A3	1.2	5.0
A4	Not connected	
B1	1.2	5.2
B2	1.2	6.5
B3	1.2	7.5
B4	1.2	6.0
B5	1.2	6.0
C1	no flow	
C2	1.2	6.5
C3	1.2	4.5
C4	1.2	6.5
C5	1.2	6.0
C6	1.2	7.0

Sparge wells are found in the same condition as during 2/22/01 site visit with 6 sparge wells clogged (A2, A3, B4, C1, C2, C5). The wells with no flow were developed. Development included washing-out silt and pumping water from the wells. The data recorded here are collected after development. The flow adjusted to 1.2 cfm. The development procedure was effective in un-clogging 5 wells out of 6. Well C1 is still clogged.

SVE COMPONENT

Knockout Inlet Vacuum in.w.c.	Knockout Outlet Vacuum in.w.c.	Blower Discharge Pressure in.w.c.	GAC Inlet Vapor Conc. ppm	Midstream GAC Vapor Conc. ppm	GAC Outlet Vapor Conc. ppm	Comments
20	24	23	<1	<1	<1	

Lateral ID	Vacuum in.w.c.	Vapor Conc. ppm	Comments
Lateral A	15	<1	
Lateral B	16	<1	
Lateral C	16	<1	

Tank K Biospargin and SVE Systems OM&M Field Monitoring Form
Wilmington, Ma
Date: 2/8/01
Time: 11:30 am

Name: Doris Dykstra

BIOSPARGING COMPONENT

Cooling Loop Inlet Pressure psi	Cooling Loop Outlet Pressure psi	Cooling Loop Inlet Temperature °F	Cooling Loop Outlet Temperature °F	Depth to water in WE-4S feet	Comments
				3.52	

Sparge Point	Flow, CFM	Pressure, psi
A1		
A2		
A3		
B1		
B2		
B3		
B4		
B5		
C1		
C2		
C3		
C4		
C5		
C6		

start-up period.
Biosparging component off.
SVE only

SVE COMPONENT

Knockout Inlet Vacuum in.w.c.	Knockout Outlet Vacuum in.w.c.	Blower Discharge Pressure in.w.c.	GAC Inlet Vapor Conc. ppm	Midstream GAC Vapor Conc. ppm	GAC Outlet Vapor Conc. ppm	Comments
21	25	23	<1	<1	<1	

Lateral ID	Vacuum in.w.c.	Vapor Conc. ppm	Comments
Lateral A	15	<1	
Lateral B	16	<1	
Lateral C	16	<1	

Measurements taken 2.0 hours after SVE start-up.

Tank K Biospargin and SVE Systems OM&M Field Monitoring Form
Wilmington, Ma
Date: 2/9/01 Name: Boris Dynkin
Time: 12:30 pm

BIOSPARGING COMPONENT

Cooling Loop Inlet Pressure psi	Cooling Loop Outlet Pressure psi	Cooling Loop Inlet Temperature ^0F	Cooling Loop Outlet Temperature ^0F	Depth to water in WE-4S feet	Comments
4	9.2	200	66	2.85	Need to replace cooling loop p. gauge

Sparge Point	Flow, CFM	Pressure, psi
A1	0.8	5.5
A2	0.8	5.5
A3	0.8	6.0
B1	0.8	5.5
B2	0.8	6.5
B3	0	9.2
B4	0.5	8.5
B5	0.8	6.0
C1	0	9.2
C2	0.5	8.0
C3	0.8	5.0
C4	0.8	6.0
C5	0	9.2
C6	0.8	6.75

Start-up period. Started sparging at low injection rate after SVE only for 1 day. Measurements are taken 3 hours after sparging system start-up. Note that wells C3, C1 and C5 have no flow.

SVE COMPONENT

Knockout Inlet Vacuum in.w.c.	Knockout Outlet Vacuum in.w.c.	Blower Discharge Pressure in.w.c.	GAC Inlet Vapor Conc. ppm	Midstream GAC Vapor Conc. ppm	GAC Outlet Vapor Conc. ppm	Comments
20	24	24	<1	<1	<1	

Lateral ID	Vacuum in.w.c.	Vapor Conc. ppm	Comments
Lateral A	14	<1	
Lateral B	15	<1	
Lateral C	15	<1	

Tank K Biospargin and SVE Systems OM&M Field Monitoring Form
Wilmington, Ma
Date: 2/21/01 Name: Boris Dykan
Time: 13:30pm

BIOSPARGING COMPONENT

Cooling Loop Inlet Pressure psi	Cooling Loop Outlet Pressure psi	Cooling Loop Inlet Temperature ^0F	Cooling Loop Outlet Temperature ^0F	Depth to water in WE-4S feet	Comments
9.5	9.0	225	95	3.12	

Sparge Point	Flow, CFM	Pressure, psi
A1	0.8	6.0
A2	0.8	5.5
A3	0.8	6.0
B1	0.8	5.5
B2	0.8	6.0
B3	0	9.0
B4	0.5	8.0
B5	0.8	6.0
C1	0	9.0
C2	0	9.0
C3	0.8	4.5
C4	0.8	6.0
C5	0	9.0
C6	0.8	6.5

The system shut-down during 2/10-11 weekend due to defective sparge blower. New blower was installed during week of 2/12. The system was restarted on 2/21 with the same settings as before the shutdown. Static DTW in WE-4S just before system start-up was 3.48 feet. Note that four wells have no flow: A3, C1, C2. Suspect siltation and therefore need to develop those wells.

SVE COMPONENT

Knockout Inlet Vacuum in.w.c.	Knockout Outlet Vacuum in.w.c.	Blower Discharge Pressure in.w.c.	GAC Inlet Vapor Conc. ppm	Midstream GAC Vapor Conc. ppm	GAC Outlet Vapor Conc. ppm	Comments
20	24	23	<1	<1	<1	

Lateral ID	Vacuum in.w.c.	Vapor Conc. ppm	Comments
Lateral A	15	<1	
Lateral B	16	<1	
Lateral C	16	<1	

Tank K Biospargin and SVE Systems OM&M Field Monitoring Form
Wilmington, Ma
Date: 2/23/01 Name: Aoni Dgukiu
Time: 10:00 am

BIOSPARGING COMPONENT

Cooling Loop Inlet Pressure psi	Cooling Loop Outlet Pressure psi	Cooling Loop Inlet Temperature °F	Cooling Loop Outlet Temperature °F	Depth to water in WE-4S feet	Comments
9.0	8.75	225	100	3.20	

Sparge Point	Flow, CFM	Pressure, psi
A1	0.9	5.0
A2	0.9	5.0
A3	0.9	5.0
A4	Not connected	
B1	0.9	5.5
B2	0	8.5
B3	0	8.5
B4	0	8.5
B5	0.8	5.5
C1	0	8.5
C2	0	8.5
C3	0.9	4.5
C4	0.9	5.5
C5	0	8.5
C6	0.8	6.0

More sparge wells found with no flow conditions. Development is scheduled for next visit.

SVE COMPONENT

Knockout Inlet Vacuum in.w.c.	Knockout Outlet Vacuum in.w.c.	Blower Discharge Pressure in.w.c.	GAC Inlet Vapor Conc. ppm	Midstream GAC Vapor Conc. ppm	GAC Outlet Vapor Conc. ppm	Comments
20	24	23	<1	<1	<1	

Lateral ID	Vacuum in.w.c.	Vapor Conc. ppm	Comments
Lateral A	15	<1	
Lateral B	16	<1	
Lateral C	16	<1	

Tank K Remediation System In-Field Groundwater Monitoring Form
Wilmington, Ma
Date: 2/27/01 Name:
8:10am to 16:30 pm

Monitoring Well ID	DTW feet	ORP mV	DO ppm	Temp °F	pH	Pressure in.w.c.	Comments
WE-4S	3.37	306.4	11.83	6.29	5.29	12.5	Air bubbles is water observed
WE-4D	3.35	349.1	1.82	10.15	5.09	0.0	
WE-7	3.09	16.8	1.41	4.8	6.07	0.0	
WE-8	3.11	-24.2	0.90	8.99	6.26	0.0	
WE-9	3.24	9.1	1.91	6.14	6.07	0.0	
PZ-8S	NA	67.8	0.61	12.9	5.98	0.0	Well ID too small for DTW probe
TRC-106	3.45	45.9	4.55	8.17	6.51	2.3	
TRC-104S	2.82	146.9	1.74	6.74	5.81	0.0	
TRC-105D	2.88	112.2	0.75	11.27	5.84	0.0	
TRC-105S	NA	223.4	4.63	5.32	5.90	0.0	well casing bent - DTW probe can not be lowered