Massachusetts Department of Environmental Protection **BWSC-105**
Bureau of Waste Site Cleanup

IMMEDIATE RESPONSE ACTION (IRA) TRANSMITTAL FORM

Pursuant to 310 CMR 40.0424 - 40.0427 (Subpart D)

RECEIVED APR 17 2001 DEP SOUTHEAST REGION

Release Tracking Number: 4 - 1334

SCANNED

A. RELEASE OR THREAT OF RELEASE LOCATION:

Release Name: (optional) Buzzards Bay Mobil

Street: 246 Main Street Location Aid: Perry Ave.

City/Town: Bourne ZIP Code: 02532-0000

☐ Check here if a Tier Classification Submittal has been provided to DEP for this Release Tracking Number.

☐ Check here if this location is Adequately Regulated, pursuant to 310 CMR 40.0110-0114.

Specify Program: ☐ CERCLA ☐ HSWA Corrective Action ☐ Solid Waste Management ☐ RCRA State Program (21C Facilities)

Related Release Tracking Numbers That This IRA Addresses:

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

☐ Submit an **IRA Plan** (complete Sections A, B, C, D, E, H, I, J and K).

☐ Check here if this IRA Plan is an update or modification of a previously approved written IRA Plan. Date Submitted: 10/16/97

☐ Submit an **Imminent Hazard Evaluation** (complete Sections A, B, C, F, H, I, J and K).

☑ Submit an **IRA Status Report** (complete Sections A, B, C, E, H, I, J and K).

☐ Submit a **Request to Terminate an Active Remedial System and/or Terminate a Continuing Response Action(s) Taken to Address an Imminent Hazard** (complete Sections A, B, C, D, E, H, I, J and K).

☐ Submit an **IRA Completion Statement** (complete Sections A, B, C, D, E, G, H, I, J and K).

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. RELEASE OR THREAT OF RELEASE CONDITIONS THAT WARRANT IRA:

Identify Media and Receptors Affected: (check all that apply)

☐ Air ☑ Groundwater ☐ Surface Water ☐ Sediments ☑ Soil

☐ Wetland ☐ Storm Drain ☐ Paved Surface ☐ Private Well ☐ Public Water Supply ☐ Zone 2 ☐ Residence

☐ School ☐ Unknown ☐ Other Specify:

Identify Conditions That Require IRA, Pursuant to 310 CMR 40.0412: (check all that apply)

☐ 2 Hour Reporting Condition(s)

☑ 72 Hour Reporting Condition(s) ☐ Substantial Release Migration ☐ Other Condition(s)

Describe: greater than 0.5 inches of NAPL on Groundwater at MW-2 and MW-4

Identify Oils and Hazardous Materials Released: (check all that apply)

☐ Oils ☐ Chlorinated Solvents ☐ Heavy Metals

☑ Others Specify: Gasoline

D. DESCRIPTION OF RESPONSE ACTIONS: (check all that apply)

☐ Assessment and/or Monitoring Only

☐ Excavation of Contaminated Soils

☐ Re-use, Recycling or Treatment

○ On Site ○ Off Site Est. Vol.: _____ cubic yards

Describe:

☐ Store ○ On Site ○ Off Site Est. Vol.: _____ cubic yards

☐ Landfill ○ Cover ○ Disposal Est. Vol.: _____ cubic yards

☐ Removal of Drums, Tanks or Containers

Describe:

☐ Deployment of Absorbent or Containment Materials

☐ Temporary Covers or Caps

☐ Bioremediation

☐ Soil Vapor Extraction

☐ Structure Venting System

☐ Product or NAPL Recovery

☐ Groundwater Treatment Systems

☐ Air Sparging

☐ Temporary Water Supplies

SECTION D IS CONTINUED ON THE NEXT PAGE.

IMMEDIATE RESPONSE ACTION (IRA) TRANSMITTAL FORM

Pursuant to 310 CMR 40.0424 - 40.0427 (Subpart D)

Release Tracking Number: 4 - 1334

D. DESCRIPTION OF RESPONSE ACTIONS (continued):

- [ ] Removal of Other Contaminated Media
- [ ] Temporary Evacuation or Relocation of Residents
- Specify Type and Volume: _____
- [ ] Fencing and Sign Posting
- [ ] Other Response Actions — Describe: _____
- [ ] Check here if this IRA involves the use of Innovative Technologies (DEP is interested in using this information to aid in creating an Innovative Technologies Clearinghouse).

Describe Technologies: _____

E. TRANSPORT OF REMEDIATION WASTE:

(if Remediation Waste has been sent to an off-site facility, answer the following questions)

Name of Facility: Not Applicable

Town and State: _____

Quantity of Remediation Waste Transported to Date: _____

F. IMMINENT HAZARD EVALUATION SUMMARY:

(check one of the following)

- [ ] Based upon an evaluation, an Imminent Hazard exists in connection with this Release or Threat of Release.
- [ ] Based upon an evaluation, an Imminent Hazard does not exist in connection with this Release or Threat of Release.
- [ ] Based upon an evaluation, it is unknown whether an Imminent Hazard exists in connection with this Release or Threat of Release, and further assessment activities will be undertaken.
- [ ] Based upon an evaluation, it is unknown whether an Imminent Hazard exists in connection with this Release or Threat of Release. However, response actions will address those conditions that could pose an Imminent Hazard.

G. IRA COMPLETION STATEMENT:

- [ ] Check here if future response actions addressing this Release or Threat of Release will be conducted as part of the Response Actions planned for a Site that has already been Tier Classified under a different Release Tracking Number, or a Site that is identified on the Transition List as described in 310 CMR 40.0600 (i. e., a Transition Site, which includes Sites with approved Waivers). These additional response actions must occur according to the deadlines applicable to the earlier Release Tracking Number (i. e., Site ID Number).

State Release Tracking Number (i. e., Site ID Number) of Tier Classified Site or Transition Site: _____

If any Remediation Waste will be stored, treated, managed, recycled or reused at the site following submission of the IRA Completion Statement, you must submit either a Release Abatement Measure (RAM) Plan or a Phase IV Remedy Implementation Plan, along with the appropriate transmittal form, as an attachment to the IRA Completion Statement.

H. LSP OPINION:

I attest under the pains and penalties of perjury that I have personally examined and am familiar with this transmittal form, including any and all documents accompanying this submittal. In my professional opinion and judgment 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 of this form indicates that an **Immediate Response Action 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 of this form indicates that an **Imminent Hazard Evaluation** is being submitted*, this Imminent Hazard Evaluation was developed in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and the assessment activity(ies) undertaken to support this Imminent Hazard Evaluation complies(y) with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000;

> *if Section B of this form indicates that an **Immediate Response Status 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;

> *If Section B of this form indicates that an **Immediate Response Action Completion Statement** or a **Request to Terminate an Active Remedial System and/or Terminate a Continuing Response Action(s) Taken to Address an Imminent Hazard** is being submitted*, the response action(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 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.

SECTION H IS CONTINUED ON THE NEXT PAGE.

Massachusetts Department of Environmental Protection **BWSC-105**
Bureau of Waste Site Cleanup

IMMEDIATE RESPONSE ACTION (IRA) TRANSMITTAL FORM

Pursuant to 310 CMR 40.0424 - 40.0427 (Subpart D)

Release Tracking Number: 4 - 1334

H. LSP Opinion (continued):

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: Michael J. Pierdinock LSP #: 407

Telephone: 508-747-7900 Ext.: 12

FAX: (optional) 508-747-3658

Signature: Michael J. Pierdinock

Date: April 16, 2001

COMMONWEALTH OF MASSACHUSETTS MICHAEL PIERDINOCK No REGISTERED LICENSED SITE PROFESSIONAL

COMMONWEALTH OF MASSACHUSETTS MICHAEL PIE No REGISTERED LICENSED SITE PROFESSIONAL

I. PERSON UNDERTAKING IRA:

Name of Organization: MPG Corporation

Name of Contact: Bruce G. Garrett Title: Treasurer

Street: One Roberts Road

City/Town: Plymouth State: MA ZIP Code: 02360-0000

Telephone: 508-747-3778 Ext.: 124 FAX: (optional)

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

J. RELATIONSHIP TO RELEASE OR THREAT OF RELEASE OF PERSON UNDERTAKING IRA: (check one)

☑ RP or PRP Specify: ○ Owner ◉ Operator ○ Generator ○ Transporter Other RP or PRP:

☐ 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 IRA Specify Relationship:

K. CERTIFICATION OF PERSON UNDERTAKING IRA:

I, Bruce G. Garrett, 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: Treasurer

For MPG Corporation (print name of person or entity recorded in Section I) Date: 4-13-01

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

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.

H. LSP Opinion (order(s), permit(s) and/or approvals)

- DEP granted presumptive approval of the October 21, 1997 IRA Plan, prepared by RAM Environmental on behalf of MPG Corporation, to conduct a soil vapor extraction/air sparge ("SVE/AS") pilot test.

- DEP granted presumptive approval of the February 18, 1998 IRA Plan Modification to install an SVE/AS remediation system to remediate impacted soil and groundwater at the disposal site.

- DEP granted presumptive approval of the December 13, 1999 IRA Plan Modification to modify the SVE/AS remediation system at the disposal site and to perform remedial activities at the adjacent property located at 6 Perry Avenue.

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)~~

RECEIVED
DEP
SOUTHEAST REGION

Release Tracking Number
4 - 1334

A. SITE LOCATION:

Site Name: (optional) Buzzards Bay Mobil

Street: 246 Main Street

Location Aid: Perry Avenue

City/Town: Bourne

ZIP Code: 02532-0000

Related Release Tracking Numbers that this Form Addresses:

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

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

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 Sections 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).

Submit an **As-Built Construction Report**, pursuant to 310 CMR 40.0875 (complete Sections A, B, C, G, H, I and J).

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 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:

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 Site 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 Phase IV activities:

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 C 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

Release Tracking Number
4 - 1334

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

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 C 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 judgment 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 action(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 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 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 an* ***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: Michael J. Pierdinock LSP #: 4078 Stamp:

Telephone: 508-747-7900 Ext.: 127

FAX: (optional) 508-747-3658

Signature: Michael J. Pierdinock

Date: April 16, 2001

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
4 - 1334

H. PERSON UNDERTAKING RESPONSE ACTION(S):

Name of Organization: MPG Corporation

Name of Contact: Bruce G. Garrett Title: Treasurer

Street: One Roberts Road

City/Town: Plymouth State MA ZIP Code: 02360-0000

Telephone: 508-747-3778 Ext.: 124 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:

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, Bruce G. Garrett, 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: Bruce G. Garrett Title: Treasurer
(signature)

For MPG Corporation Date: 4-13-01
(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.

G. LSP Opinion (order(s), permit(s) and/or approvals)

- DEP granted presumptive approval of the October 21, 1997 IRA Plan, prepared by RAM Environmental on behalf of MPG Corporation, to conduct a soil vapor extraction/air sparge ("SVE/AS") pilot test.

- DEP granted presumptive approval of the February 18, 1998 IRA Plan Modification to install an SVE/AS remediation system to remediate impacted soil and groundwater at the disposal site.

- DEP granted presumptive approval of the December 13, 1999 IRA Plan Modification to modify the SVE/AS remediation system at the disposal site and to perform remedial activities at the adjacent property located at 6 Perry Avenue.

RAM
ENVIRONMENTAL
REMEDIATION • ASSESSMENT • MANAGEMENT

April 16, 2001

Ms. Deborah Marshall
Commonwealth of Massachusetts
Department of Environmental Protection
Southeast Regional Office
Bureau of Waste Site Cleanup
20 Riverside Drive
Lakeville, Massachusetts 02347

Re: Immediate Response Action Status Report and
Phase V - Operation, Maintenance, and/or Monitoring Report
Buzzards Bay Mobil
246 Main Street
Bourne, Massachusetts 02532
RTN: 4-1334
RAM Ref. No. 101.20.3

Dear Ms. Marshall:

On behalf of MPG Corporation, RAM Environmental, LLC submits to the Commonwealth of Massachusetts, Department of Environmental Protection, the enclosed documents:

- *Immediate Response Action Status Report and Phase V - Operation, Maintenance, and/or Monitoring Report*;
- Immediate Response Action (IRA) Transmittal Form (BWSC-105);
- Comprehensive Response Action Transmittal Form & Phase I Completion Statement (BWSC-108);
- Remedial Monitoring Transmittal Form; and
- Notification letters to the Town of Bourne Board of Selectman and Board of Health.

RAM
ENVIRONMENTAL
REMEDIATION • ASSESSMENT • MANAGEMENT

If you have any questions regarding this matter, please contact Timothy Condon or Michael J. Pierdinock at (508) 747-7900, extensions 130 and 127, respectively.

Very truly yours,

RAM Environmental, LLC

Timothy Condon, P.E., CHMM
Associate

Michael J. Pierdinock, LSP, CHMM
Principal

Enclosures

cc: Mr. Bruce G. Garrett, MPG Corporation (with enclosures)

RAM
ENVIRONMENTAL
REMEDIATION • ASSESSMENT • MANAGEMENT

April 16, 2001

Ms. Cynthia Coffin
Board of Health
Bourne Town Hall
24 Perry Avenue
Buzzards Bay, Massachusetts 02352

Re: Immediate Response Action Status Report and
Phase V - Operation, Maintenance, and/or Monitoring Report
Buzzards Bay Mobil
246 Main Street
Bourne, Massachusetts 02532
RTN: 4-1334
RAM Ref. No. 101.20.3

Dear Ms. Coffin:

Pursuant to 310 CMR 40.1403(3)(e), this letter serves as notification that an *Immediate Response Action Status Report and Phase V - Operation, Maintenance, and/or Monitoring Report*, has been submitted to the Commonwealth of Massachusetts, Department of Environmental Protection ("DEP"), Southeast Regional Office in Lakeville, Massachusetts in connection with the above referenced site.

If you have any questions regarding this matter, please contact Timothy Condon or Michael J. Pierdinock at (508) 747-7900, extensions 130 and 127, respectively.

Very truly yours,

RAM Environmental, LLC

Timothy Condon, P.E., CHMM
Associate

Michael J. Pierdinock, LSP, CHMM
Principal

cc: Ms. Deborah Marshall, Massachusetts DEP, Southeast Regional Office
Mr. Bruce G. Garrett, MPG Corporation

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RAM
ENVIRONMENTAL
REMEDIATION • ASSESSMENT • MANAGEMENT

April 16, 2001

Board of Selectman
Bourne Town Hall
24 Perry Avenue
Buzzards Bay, Massachusetts 02352

Re: Immediate Response Action Status Report and
Phase V - Operation, Maintenance, and/or Monitoring Report
Buzzards Bay Mobil
246 Main Street
Bourne, Massachusetts 02532
RTN: 4-1334
RAM Ref. No. 101.20.3

Dear Sirs:

On behalf of RAM Environmental, LLC, this letter serves to notify you, as chief municipal officer for the Town of Bourne, of the completion and availability of the *Immediate Response Action Status Report and Phase V - Operation, Maintenance, and/or Monitoring Report*, for the Buzzards Bay Mobil Station located at 246 Main Street in Bourne, Massachusetts. The report is available at the Commonwealth of Massachusetts, Department of Environmental Protection ("DEP"), Southeast Regional Office in Lakeville, Massachusetts for public review. This notification is being sent to you to comply with the Public Involvement requirements of the Massachusetts Contingency Plan 310 CMR 40.1403 in connection with the above referenced site.

If you have any questions regarding this matter, please contact Timothy Condon or Michael J. Pierdinock at (508) 747-7900, extensions 130 and 127, respectively.

Very truly yours,

RAM Environmental, LLC

Timothy Condon, P.E., CHMM
Associate

Michael J. Pierdinock, LSP, CHMM
Principal

cc: Ms. Deborah Marshall, Massachusetts DEP, Southeast Regional Office
Mr. Bruce G. Garrett, MPG Corporation

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RAM
ENVIRONMENTAL
REMEDIATION • ASSESSMENT • MANAGEMENT

April 16, 2001

Ms. Anne L. Eldridge
6 Perry Avenue
Buzzards Bay, Massachusetts 02532

Re: Immediate Response Action Status Report and
Phase V - Operation, Maintenance, and/or Monitoring Report
Buzzards Bay Mobil
246 Main Street
Bourne, Massachusetts 02532
RTN: 4-1334
RAM Ref. No. 101.20.3

Dear Ms. Eldridge:

On behalf of MPG Corporation ("MPG"), RAM Environmental, LLC provides to you (the "Neighbor"), a copy of the enclosed documents, pursuant to the Agreement for Site Access between MPG and the Neighbor, executed on March 17, 2000:

- *Immediate Response Action Status Report and Phase V - Operation, Maintenance, and/or Monitoring Report*;
- Immediate Response Action (IRA) Transmittal Form (BWSC-105);
- Comprehensive Response Action Transmittal Form & Phase I Completion Statement (BWSC-108);
- Remedial Monitoring Transmittal Form; and
- Notification letters to the Town of Bourne Board of Selectman and Board of Health.

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If you have any questions regarding this matter, please contact Timothy Condon or Michael J. Pierdinock at (508) 747-7900, extensions 130 and 127, respectively.

Very truly yours,

RAM Environmental, LLC

Timothy Condon, P.E., CHMM
Associate

Michael J. Pierdinock, LSP, CHMM
Principal

cc: Mr. Bruce G. Garrett, MPG Corporation

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IMMEDIATE RESPONSE ACTION STATUS REPORT AND PHASE V - OPERATION, MAINTENANCE, AND/OR MONITORING REPORT

Buzzards Bay Mobil
246 Main Street
Bourne, Massachusetts 02532

RTN No. 4-1334
(RAM Ref. No. 101.20.3)

April 16, 2001

Prepared for:

MPG Corporation
One Roberts Road
Plymouth, Massachusetts 02360

Prepared by:

RAM Environmental, LLC
One Roberts Road
Plymouth, Massachusetts 02360

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1.0 INTRODUCTION

On behalf of MPG Corporation ("MPG"), RAM Environmental, LLC ("RAM Environmental"), has prepared this *Immediate Response Action Status Report*, pursuant to 310 CMR 40.0425, and a *Phase V - Operations, Maintenance, and/or Monitoring Report* (the "Phase V Report") pursuant to 310 CMR 40.0890, in connection with the disposal site located at the Buzzards Bay Mobil, 246 Main Street in Buzzards Bay, Massachusetts (the "Site"). A Site Locus Map is attached as Figure 1-1, Appendix A. Pursuant to 310 CMR 40.0891(1) the provisions of a Phase V apply to disposal sites where Phase IV response actions have been conducted, a Response Action Outcome ("RAO") has not yet been achieved, and operation, maintenance, and/or monitoring of the Comprehensive Remedial Action ("CRA") is necessary to achieve a RAO.

The Site is currently a gasoline station located at the corner of Perry Avenue and Main Street, in Buzzards Bay, Massachusetts. The disposal site is defined as the portion of the Site that has been impacted by the release of oil and/or hazardous material ("OHM"). The Commonwealth of Massachusetts Department of Environmental Protection ("DEP") has assigned Release Tracking Number ("RTN") 4-1334 to the Site. A Disposal Site Map, depicting the disposal site boundaries, is attached as Figure 1-2, Appendix A.

Pursuant to 310 CMR 40.0424 (1)(d), an Immediate Response Action ("IRA") was required, due to the presence of greater than 0.5 inches of non-aqueous phase liquid ("NAPL") on the groundwater at the Site. An IRA Plan was submitted to the DEP on October 16, 1997, and an IRA Modification Plan was submitted to the DEP on February 26, 1998, proposing the installation of a soil vapor extraction and air sparging ("SVE/AS") remedial system. An IRA Modification Plan was submitted to the DEP on December 13, 1999 proposing SVE/AS system modifications and bioinoculation at 6 Perry Avenue (the "Adjacent Property"). IRA Status Reports were submitted to the DEP on April 14 and October 14, 2000 describing the response actions conducted since the December 13, 1999 IRA Modification Plan.

Pursuant to 310 CMR 40.0871, the *Phase IV Implementation of the Selected Remedial Action Alternative Report* (the "Phase IV Report"), dated October 25, 2000, detailing the design, construction and implementation of the CRA alternative selected in the *Phase III Identification, Evaluation, and Selection of Comprehensive Response Action Alternatives Report* (the "Phase III Report") was submitted to the DEP on October 25, 2000. As set forth in the Phase III Report, RAM Environmental, on behalf of MPG, recommended SVE/AS as the CRA to address OHM impact at the disposal site. RAM Environmental also recommended the implementation of Oxygen Release Compound ("ORC") technology to remediate impacted groundwater at the Adjacent Property.

The IRA Status Report and Phase V Report summarize the response actions conducted at the disposal site during the reporting period between October 14, 2000 and April 14, 2001, as set forth below:

- the operation, maintenance, and monitoring of the SVE/AS remedial system at the Site;
- bioremediation at the Adjacent Property;
- quarterly groundwater and surface water sampling;
- monthly groundwater and surface water elevation measurements, and NAPL thickness measurements at the Site and the Adjacent Property; and
- indoor air surveys conducted in the basement of the Adjacent Property.

The results of the response actions conducted are set forth below.

2.0 INSPECTION AND MONITORING REPORT

Pursuant to 310 CMR 40.0892(1) through (6), Phase V inspections and monitoring activities conducted at the disposal site during the operational period (October 14, 2000 through April 14, 2001) are set forth below.

2.1 GENERAL OPERATING PROCEDURES

Pursuant to 310 CMR 40.0892(1), RAM Environmental performs monthly operation and maintenance on the SVE/AS remedial equipment, which includes the following tasks:

- Change oil on all positive displacement blowers;
- Grease bearings on all positive displacement blowers;
- Check and/or adjust belt tension on drive shives;
- Replace air filters as required, but not more than monthly;
- Clean basket strainers;
- Clean and check operation of float switches;
- Record runtime for remedial equipment;
- Measure and record operational data (vacuum, pressure, flow);
- A master control panel operates the remedial equipment and alerts RAM Environmental via facsimile if key components of the system shutdown. If key components of the system shutdown, the entire SVE/AS system is automatically shutdown. RAM Environmental responds to shutdowns upon receiving notification;
- Measure Destruction Removal Efficiency ("DRE") of SVE off-gas consistent with 310 CMR 40.0049(5) and the DEP's *Off-Gas Treatment of Point Source Remedial Air Emissions (WSC-94-150)*;
- Measure and record groundwater elevations and NAPL thickness, if present, in monitoring wells, MW-1 through MW-5, ORC-1, ORC-2, ORC-4, and ORC-5, as indicated on Figure 1-2, Appendix A;
- Measure and record surface water elevation in Bourne Pond;
- Provide necessary personal protective equipment to perform sampling (assume Level D protection); and
- Conduct indoor air survey of the basement of the residential building at the Adjacent Property.

RAM Environmental performs quarterly groundwater monitoring and sampling which includes the following tasks:

- Purge and sample groundwater from MW-1 through MW-5, ORC-1, ORC-2, and ORC-4;
- Collect a surface water sample from Bourne Pond using a laboratory supplied bottle;
- Submit groundwater samples collected from MW-1 through MW-5, and the surface water sample collected from Bourne Pond, to a Massachusetts certified analytical laboratory for volatile petroleum hydrocarbons ("VPH") with target volatile organic compounds ("VOCs") analyses;
- Submit groundwater samples collected from ORC-1, ORC-2, and ORC-4 to a Commonwealth of Massachusetts certified analytical laboratory for VPH with target VOCs, extractable petroleum hydrocarbons ("EPH") with polynuclear aromatic hydrocarbons ("PAHs"), biochemical oxygen demand ("BOD"), nitrate, sulfate, dissolved iron, and dissolved manganese analyses;
- Trip blank, equipment blank, field blank, duplicate samples, matrix spike and matrix spike duplicate samples are prepared or collected and submitted for laboratory analysis for Quality Assurance/Quality Control ("QA/QC") purposes.

Additionally, RAM Environmental replaces the ORC socks at the Adjacent Property on a semi-annual basis.

2.2 SIGNIFICANT MODIFICATIONS OF INSPECTION AND/OR MONITORING PROGRAM

Pursuant to 310 CMR 40.0892(2), a description of any significant modifications to the Inspection and/or Monitoring Program ("IMP"), made since the submission of the preceding Inspection and Monitoring Report is set forth below.

No significant modifications have been made to the IMP. Pursuant to 310 CMR 40.0893(2)(e), this Phase V Report is being submitted within six months of the Phase IV Report. This is the first Phase V Report submitted to the DEP in connection with RTN 4-1334.

2.3 CONDITIONS OR PROBLEMS AFFECTING THE PERFORMANCE OF THE REMEDIAL ACTIONS

Pursuant to 310 CMR 40.0892(3), a description of any conditions or problems noted during the inspection and/or monitoring period, which are or may be affecting the performance of the remedial action, is set forth below.

No conditions or problems have been noted or recorded during this operational period which would affect the remedial actions being conducted at the disposal site.

2.4 MEASUREMENTS TAKEN TO CORRECT CONDITIONS WHICH ARE AFFECTING THE PERFORMANCE OF THE REMEDIAL ACTIONS

Pursuant to 310 CMR 40.0892(4), a description of any measures taken to correct the conditions which are affecting the performance of the remedial action is set forth below.

On November 16, 2000, a drop in ambient temperature caused the temperature within the catalytic oxidizer to fall below operational limits, triggering an automatic shutdown of the system. On November 20, 2000, a dilution value, used to adjust the temperature of the air flowing through the SVE system, was adjusted to reduce the flow of ambient air into the system and the SVE/AS system was restarted.

2.5 RESULTS OF SAMPLING ANALYSIS AND SCREENING CONDUCTED AS PART OF THE INSPECTION AND/OR MONITORING PROGRAM

Pursuant to 310 CMR 40.0892(5), the results of the sampling analyses and the screening, conducted as part of the IMP, are set forth below.

The results of the sampling analyses and the screening, conducted as part of the IMP, are set forth in Sections 3.0 and 6.0.

2.6 NAME, LICENSE NUMBER, SIGNATURE, AND SEAL OF THE LICENSED SITE PROFESSIONAL

Pursuant to 310 CMR 40.0892(6), the name and license number, and seal of the Licensed Site Professional ("LSP") are set forth below.

The LSP-of-record for the disposal site, is set forth on forms BWSC-105, BWSC-108 and the Remedial Monitoring Transmittal Form, being submitted concurrently with the IRA Status Report and the Phase V Report.

3.0 STATUS OF ASSESSMENT AND/OR REMEDIAL ACTIONS

Pursuant to 310 CMR 40.0425(3)(a), the status of assessment and/or remedial actions conducted at the Site is set forth below.

3.1 MONTHLY GROUNDWATER, SURFACE WATER, AND NON-AQUEOUS PHASE LIQUID GAUGING RESULTS

RAM Environmental has conducted monthly depth to groundwater and NAPL thickness gauging of monitoring wells MW-1 through MW-5, ORC-1, ORC-2, ORC-4, and ORC-5, and surface water elevation measurements in Bourne Pond. Monitoring well locations and the surface water elevation measurement location (stream gauge) are indicated on Figure 1-2, Appendix A.

3.1.1 Groundwater

Based upon the historical data, groundwater elevations have fluctuated seasonally from 2.2 to 4.7 feet above mean sea level. Groundwater elevations decreased slightly between September and November of 2000 and increased slightly from November 2000 to February 2001, consistent with seasonal trends. Historical groundwater elevations for each well location are attached in Appendix B.

3.1.2 Surface Water

The surface water elevation at the Bourne Pond gauge location is approximately 3.2 to 3.8 feet above mean sea level and has remained relatively constant since the initial measurement in January of 1998. Historical surface water elevations are attached in Appendix B.

3.1.3 Non-aqueous Phase Liquid

On August 27, 1999, approximately 3.72 inches of NAPL was detected at monitoring well MW-2. Prior to August 27, 1999, NAPL had not been detected at MW-2 since the startup of the SVE/AS system on October 1, 1998. On September 23, 1999, the NAPL measured at MW-2 decreased from what was measured in August of 1999 to approximately 0.84 inches. NAPL has not been detected at MW-2 since September 23, 1999.

Historically, NAPL has been detected at MW-4 with thickness generally increasing when on-Site groundwater elevations have decreased. NAPL has historically been observed in well MW-4 on all but three occasions from December 12, 1996 to September 25, 1998. No NAPL has been detected at MW-4 since September 25, 1998. NAPL thicknesses observed over time at MW-4 are attached in Appendix B. NAPL has not been detected at the Adjacent Property.

3.2 QUARTERLY GROUNDWATER AND SURFACE WATER SAMPLING

RAM Environmental has conducted quarterly groundwater sampling at the Site and at the Adjacent Property, and performed surface water sampling in Bourne Pond. Monitoring well locations and the surface water location are indicated on Figure 1-2, Appendix A.

3.2.1 Groundwater Analytical Results

Consistent with the December 13, 1999 IRA Modification Plan, quarterly groundwater samples were collected from monitoring wells MW-1 through MW-5, ORC-1, ORC-2, and ORC-4 on November 1, 2000 and January 24, 2001. Sampling locations are indicated on Figure 1-2, Appendix A. Each well was purged of five well volumes prior to the collection of groundwater samples utilizing disposable polyethylene bailers. Groundwater samples at the Site were collected and submitted to a Commonwealth of Massachusetts certified, analytical laboratory for VPH with target VOCs analyses. Groundwater samples collected from ORC-1 through ORC-4 were also submitted to a Commonwealth of Massachusetts certified analytical laboratory for VPH with target VOCs, EPH with PAHs, BOD, nitrate, sulfate, dissolved iron, and dissolved manganese analyses. Analytical summary tables and graphs are attached as Appendix C. Laboratory analytical data packages are attached as Appendix D.

VPH and target VOCs were detected at concentrations below the applicable Method 1 GW-2/3 Groundwater Cleanup Standards in monitoring wells MW-1, MW-2 and MW-5, as set forth in Appendix C. Select analytes were detected at concentrations above Method 1 GW-2/3 Groundwater Cleanup Standards in monitoring wells MW-3 and MW-4, as indicated in Appendix C.

VPH and target VOCs were detected at concentrations above applicable Method 1 GW-1/2/3 Groundwater Cleanup Standards in wells ORC-1, ORC-2 and ORC-4. EPH C_{11}-C_{22} aromatic fraction, naphthalene and 2-methylnaphthalene were detected at concentrations above Method 1 GW-1/2/3 Groundwater Cleanup Standards in wells ORC-1, ORC-2 and ORC-4, as indicated in Appendix C. BOD, nitrate, sulfate, dissolved iron, and dissolved manganese results are presented in tabular form in Table 3-1, Appendix E.

As indicated in Appendix C, EPH and target PAH concentrations were detected at concentrations an order of magnitude below VPH and target VOC concentrations. Therefore, EPH with target PAHs analysis will not be included in future quarterly groundwater sampling events. However, EPH with target PAH analysis will be included in post remediation groundwater sampling events

The SVE/AS remediation system began operating on October 1st, 1998. As set forth above, ten rounds of groundwater sampling have been completed since initiation of SVE/AS remediation. Groundwater samples were collected on October 22, 1998 (Round 1), January 19, 1999 (Round 2), April 23, 1999 (Round 3), July 22, 1999 (Round 4), October 21, 1999 (Round 5), February 4, 2000 (Round 6), April 28, 2000 (Round 7), August 1, 2000 (Round 8), November 1, 2000 (Round 9), and January 24, 2001 (Round 10). In general, concentrations of VPH and target VOCs in groundwater have decreased at the Site since the startup of the SVE/AS system, as indicated in Appendix C. An increase in VPH and target VOC concentrations were observed at MW-1 during the August 1, 2000 sampling round, and noted in the October 14, 2000 IRA Status Report. Concentrations detected at MW-1 have decreased, on average, since August 1, 2000.

3.2.2 Surface Water Analytical Results

Consistent with the most recent IRA Modification Plan, quarterly surface water samples are collected from Bourne Pond, from the location indicated on Figure 1-2, Appendix and submitted to a Commonwealth of Massachusetts certified analytical laboratory for VPH with target VOCs, and EPH with target PAHs analyses. The results are set forth in Appendix C. Laboratory analytical data packages are attached as Appendix D.

Surface water samples were collected from Bourne Pond on November 1, 2000 and January 24, 2001 utilizing disposable polyethylene bailers. No VPH aliphatic or aromatic fractions, target VOCs, EPH aliphatic or aromatic fractions, or target PAHs were detected above the analytical reporting limits during the November 1, 2000 sampling event, with the exception of chrysene detected at 0.2 parts per billion ("ppb"), slightly above the analytical reporting.

During the January 24, 2001 sampling event, select target VOCs (methyl *tert*-butyl ether "MTBE") and PAHs (chrysene, benzo(b)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)anthracene, and benzo(g,h,i)perylene) were detected at concentrations slightly above the laboratory reporting limits (28 ppb, 0.2 ppb, 0.3 ppb, 0.2 ppb, 0.1 ppb and 0.1 ppb, respectively). Analytical summary tables and graphs are attached as Appendix C. The laboratory analytical data packages are attached as Appendix D.

Select PAHs were detected above the laboratory detection limits, three orders of magnitude below the lowest ambient water quality criteria used by the DEP (*Background Documentation for the Development of the MCP Numerical Standards, April, 1994*) to derive the Method 1 GW-3 Groundwater Cleanup Standards. Sources of the PAHs detected in the surface water include: stormwater runoff, car exhaust, and/or other combustion byproducts released in the vicinity of Bourne Pond. Due to the non-detection of the EPH aliphatic and aromatic fractions, the release of OHM detected at the Site and at the Adjacent Property, is unlikely to be the source of PAHs detected in the surface water of Bourne Pond.

3.3 SEMI-ANNUAL BIOREMEDIATION WITH OXYGEN RELEASE COMPOUND

Use of ORC at the Adjacent Property was proposed in the IRA Modification Plan prepared by RAM Environmental, and dated December 13, 1999. The ORC application was proposed at the adjacent property given the degree of impact to soil and groundwater, the geologic conditions and the limited Site access.

On January 21, 2000, ORC socks were first inserted into wells ORC-1 through ORC-6, as indicated on Figure 1-2, Appendix A. As outlined in the IRA Modification Plan, the ORC material spans the entire water column at each well and has an estimated radius of influence of approximately 15 feet. As indicated on Figure 1-2, Appendix A, wells ORC-1 through ORC-6 are located approximately 20 feet apart, therefore 15 foot radii of influence overlap.

The next scheduled replacement of the ORC socks is on May 1, 2001.

3.4 QUALITY ASSURANCE/QUALITY CONTROL RESULTS

The results of RAM Environmental's for QA/QC program are set forth below.

3.4.1 Trip Blanks

Trip blanks (RAM-QA/QC-100), for the quarterly sampling events, were submitted to a Commonwealth of Massachusetts certified analytical laboratory for VPH with target VOCs analysis. No target analytes were detected in the trip blanks (RAM-QA/QC-100).

3.4.2 Equipment Blanks

Equipment blanks (RAM-QA/QC-200), for the quarterly sampling events, were prepared by running deionized water over field decontaminated sampling equipment. Equipment blanks were submitted to a Commonwealth of Massachusetts certified analytical laboratory for VPH with target VOCs analysis. No target analytes were detected in the equipment blanks (RAM-QA/QC-200).

3.4.3 Field Blank

A field blank (RAM-QA/QC-300) consists of a sample of the de-ionized water used to decontaminate the sampling equipment. The de-ionized water, for both the groundwater and the surface water sampling area, was from the same source and, therefore, one field blank sample was submitted. The field blank sample was submitted to a Commonwealth of Massachusetts certified analytical laboratory for VPH with target VOCs analysis. No target analytes were detected in the field blank (RAM-QA/QC-300).

3.4.4 Duplicate Samples

RAM Environmental collected sample duplicates (RAM-QA/QC-500 and RAM-QA/QC-501) during the November 1, 2000 quarterly groundwater sampling event. The relative percent differences in the concentrations of the samples and their duplicate samples were within 20%.

3.4.5 Surrogate Recovery

RAM Environmental reviewed the surrogate recoveries for each of the groundwater and surface water samples collected from the Site. Surrogate recoveries were all within acceptable limits.

3.4.6 Matrix Spike/Matrix Spike Duplicate

Matrix spike and matrix spike duplicate samples (RAM-QA/QC-700 and RAM-QA/QC-701) were collected during the January 24, 2001 sampling round from monitoring well ORC-1. A matrix spike sample is prepared by adding a known mass of a target analyte to a specified amount of the sample. Spiked samples are used to determine the effect of the matrix on the analytical method's ability to recover the target compound. Matrix spike recoveries and relative percent differences were outside of the recommended limits for MTBE, benzene, toluene, xylenes, and

naphthalene due to the high concentration of the spike analyte in the sample. The data, however, is suitable for assessing groundwater conditions at the Site.

3.4.7 Laboratory Quality Control Evaluation

RAM Environmental compared the format of the laboratory analytical data sheets to the Licensed Site Professional Association's ("LSPA") *VPH and EPH: Required Content of Laboratory Reports*, revised on September 18, 1998. The analytical data sheets were prepared consistent with the LSPA's document, with the exception that each data sheet was not signed by a responsible person at the laboratory. According to a representative at the analytical laboratory (Groundwater Analytical), a signed cover letter was provided to serve the same purpose. The cover letter was signed "under the pains and penalties of perjury" by a "responsible person," Jonathan R. Sanford, President of Groundwater Analytical.

The laboratory analytical data package includes a statement regarding the laboratory's QA/QC program. RAM Environmental reviewed the QA/QC results for the groundwater, surface water and sediment samples set forth above. All of the QA/QC methods were within acceptable limits.

3.5 INDOOR AIR SURVEY AT THE ADJACENT PROPERTY

Consistent with the IRA Modification Plan, RAM Environmental has conducted indoor air surveys for the basement of the residential building located on the Adjacent Property. Indoor air within the basement was field screened for total organic vapors ("TOV") with a photoionization detector ("PID"). Indoor air TOV concentrations were measured directly with the PID in the area of the basement indicated on Figure 1-2, Appendix A. The sample port of the PID was placed in the ambient air and next to the cracks in the cinder block walls, and along the joint of the walls and the concrete floor, to assess the indoor air at these locations.

Indoor air surveys were conducted every two weeks, after the additional SVE/AS wells were activated, until March 2000 when the sampling frequency was reduced to monthly. Surveys were conducted on January 21, February 4, February 18, April 11, April 28, May 25, November 30, and December 20, 2000, January 24, February 21, and March 21, 2001. Sampling was not conducted during the summer months consistent with the latest IRA Modification Plan. To date, no TOV concentrations have been detected at concentrations greater than the minimum detection limit (0.2 ppmv) of the PID, and no olfactory evidence of indoor air impact has been observed by RAM Environmental or the homeowner.

4.0 SIGNIFICANT NEW SITE INFORMATION OR DATA

Pursuant to 310 CMR 40.0425 (3)(b), significant new site information is set forth above and in Section 6.0.

5.0 DETAILS OF/OR PLANS FOR THE MANAGEMENT OF REMEDIATION WASTE, REMEDIAL WASTEWATER AND/OR REMEDIAL ADDITIVES

Pursuant to 310 CMR 40.0425 (3)(c), details and/or plans for the management of remediation waste, remedial wastewater and/or remedial additives is set forth below.

5.1 AIR EMISSIONS/VAPOR-PHASE CARBON

Prior to the discharge of SVE air emissions into the atmosphere, the SVE off-gas is treated with a catalytic oxidation unit to ensure a minimum 95% DRE, pursuant to 310 CMR 40.0049 (5) and the DEP's *Off-Gas Treatment of Point Source Remedial Air Emissions (WSC-94-150)*. Before January 21, 2000, SVE off-gas was treated with two 1,000-pound, vapor-phase carbon vessels to achieve a minimum 95% DRE. Spent vapor-phase carbon has not been generated or transported off-Site since the catalytic oxidizer was activated on January 21, 2000. Air emission monitoring details are set forth in Section 3.5.

5.2 PURGED GROUNDWATER, PROCESS WATER AND PRODUCT

Pursuant to 310 CMR 40.0045 (7), purged groundwater from well sampling is returned to the point of withdrawal at each well location. Processed water from the SVE condensate and collected pure-phase product is drummed, pre-characterized, transported, and disposed of at a Massachusetts licensed facility. No SVE condensate or pure-phase product has been collected, and/or disposed of, since the last IRA Status Report.

5.3 SOIL

Impacted soil has not been generated, stored on-Site, or transported off-Site since the last IRA Status Report.

6.0 MONITORING DATA RELATED TO THE OPERATION OF REMEDIAL SYSTEMS

Pursuant to 310 CMR 40.0425(3)(d), monitoring data related to the operation of remedial systems is set forth below.

6.1 SOIL VAPOR EXTRACTION/AIR SPARGING REMEDIAL SYSTEM

RAM Environmental initiated the start-up of the SVE/AS system on October 1, 1998 ("Day One"). During the first month of operation the system was balanced to optimize remedial performance.

Wells SVE-1 through SVE-8, as indicated on Figure 1-2, Appendix A, are utilized as SVE wells. Wells AS-1 through AS-7 are utilized as AS wells. Wells SVE/AS-9 through SVE/AS-15 are utilized as dual SVE and AS wells. The SVE wells are constructed of 2-inch schedule 40 PVC riser with ten feet of 0.010 slot PVC screen. The AS wells were constructed of 1.5 inch black iron pipe with 2 feet of 0.010 slot stainless steel screen, installed approximately 20 feet below grade. At the SVE/AS well locations, AS wells were constructed of 1-inch black iron with a 2.5 foot long 0.020 slot stainless steel screen, located 10 feet beneath the groundwater table, approximately 22.5 feet below grade. SVE wells were constructed of 2-inch schedule 40 PVC with 7.5 feet of 0.010 slot screen, placed from 4.5 to 12 feet below grade.

During this reporting period, the SVE/AS system was down between November 16 and 20, 2000. A drop in ambient temperature caused the temperature within the catalytic oxidizer to fall below operational limits, triggering an automatic shut-down of the system. The volume of ambient air flows to the catalytic oxidizer was adjusted and the SVE/AS system has operated without interruption since November 20, 2000.

6.1.1 Soil Vapor Extraction/Air Sparging Influent and Effluent Air Sampling

Pursuant to the DEP's *Off-Gas Treatment of Point Source Remedial Emission Policy No. WSC-94-150, 5, (1)*, dated May 25, 1994, vapor emission samples are required to be collected on operational Days 1, 7, 14, 28, and monthly thereafter. Based upon the initial estimated mass removal rates, RAM Environmental increased the frequency of vapor sample collections to Day 1, Day 4, Day 7, Day 8, Day 15, Day 18, Day 20, Day 29, Day 42, Day 49, and monthly thereafter. Samples were collected from the influent, mid-point and effluent sampling ports for TOV concentrations utilizing a PID, and are summarized in Table 6-1, Appendix E.

During this reporting period DRE sampling was conducted on operational Days 733, 736, 741, 775, 777, 783, 796, 846, 874, 882, and 893. Since a catalytic oxidizer was activated on January 21, 2000 for off-gas treatment, a DRE greater than 95% has consistently been recorded. Assuming that greater than 95% DRE will continue to be achieved, RAM Environmental will continue a monthly DRE sampling frequency of the air emissions.

6.1.2 Mass Removal

The SVE/AS system has been in operation continuously since the start-up on October 1, 1998, with the exception of some short duration shut downs for maintenance and carbon replacement. Vapor influent concentrations within the SVE/AS process stream have been measured to estimate the petroleum mass removal rate from the disposal site, due to the extracted vapors, as indicated in Table 6-1, Appendix E. Petroleum constituents removed have been plotted per day, as indicated on Figure 6-1, Appendix A. Approximately 6,625 pounds (approximately 1,054 gallons) of petroleum constituents have been removed from the release site in this vapor-phase.

6.2 ORC REMEDIAL SYSTEM

On January 21, 2000, ORC socks were inserted into wells ORC-1 through ORC-6, as indicated on Figure 1-2, Appendix A. The ORC socks were replaced by RAM Environmental on November 1, 2000. The next scheduled replacement of the ORC socks is on May 1, 2001.

VPH and target VOCs concentrations in groundwater have generally decreased at wells ORC-1, ORC-2 and ORC-4 since ORC remediation began on January 21, 2000. EPH and target PAHs concentrations in groundwater have decreased on average in wells ORC-2 and ORC-4 and have increased in well ORC-1 since ORC remediation began on January 21, 2000, as indicated in analytical summary tables attached as Appendix C.

7.0 REMEDY OPERATION STATUS

Pursuant to 310 CMR 40.0893(1), Remedy Operation Status ("ROS") applies to disposal sites where a remedial system, which relies upon Active Operation and Maintenance, is being operated for the purpose of achieving a Permanent Solution, pursuant to 310 CMR 40.0890.

Consistent with the Phase IV Report submitted to the DEP on October 23, 2000, IRA Plans submitted to the DEP on October 16, 1997 and February 28, 1998, and an IRA Modification Plan submitted to the DEP on December 13, 1999, on behalf of MPG, RAM Environmental, is currently operating an SVE/AS remedial system and utilizing ORC inoculation at the Site.

7.1 PERFORMANCE STANDARDS FOR REMEDY OPERATION STATUS

Pursuant to 310 CMR 40.0893(2), the Performance Standards for maintaining ROS at the disposal site are set forth below:

(a) *The remedial system shall be adequately designed in accordance with 310 CMR 40.0870 to achieve a Permanent Solution.*

RAM Environmental designed and installed the SVE/AS remedial system and ORC inoculation system, as set forth in the Phase IV Report submitted to the DEP on October 23, 2000, to achieve a permanent solution.

(b) *The remedial system shall be operated and maintained in accordance with the requirements of 310 CMR 40.0890.*

As set forth in this Phase V Report, on behalf of MPG, RAM Environmental, is operating and maintaining the SVE/AS remedial system and ORC inoculation system in accordance with 310 CMR 40.0890.

(c) *Each source of [OHM] shall be eliminated or controlled in accordance with 310 CMR 40.1003(5).*

As set forth in the *Phase II - Comprehensive Site Assessment Report* prepared by RAM Environmental and submitted to the DEP on January 28, 2000, the gasoline Underground Storage Tanks ("USTs") were removed in June of 1992.

(d) *Any substantial hazard shall be eliminated.*

The implementation of the SVE/AS remedial system and ORC inoculation at the disposal site has stabilized the impacts to the environment, therefore, a substantial hazard does not exist at the disposal site.

(e) *At a minimum, information and data on operation and maintenance, and/or monitoring shall be gathered and submitted to the DEP every six months in a report as described in 310 CMR 40.0892.*

On behalf of MPG, RAM Environmental will submit operation and maintenance, and/or monitoring reports, every six months to the DEP, pursuant to 310 CMR 40.0983(2)(c).

7.2 TERMINATION OF REMEDY OPERATION STATUS

Pursuant to 310 CMR 40.0893(5)(a) and (b), ROS shall terminate if the person providing the ROS opinion fails to meet the requirements of 310 CMR 40.0893(2), or the person providing the ROS opinion notifies the DEP in accordance with 310 CMR 40.0893(5)(c), that such person intends to discontinue the remedial system.

A Termination of ROS does not presently exist at the disposal site.

8.0 OTHER INFORMATION REQUIRED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION AS PART OF IMMEDIATE RESPONSE ACTION APPROVAL

The DEP has not required the submittal of any additional information as part of the IRA approval for the Site.

9.0 LIMITATIONS

1. RAM Environmental is not responsible for the accuracy of information provided to RAM Environmental by third-parties. Except as otherwise stated in this report, RAM Environmental has not attempted to verify the accuracy or completeness of any such information.

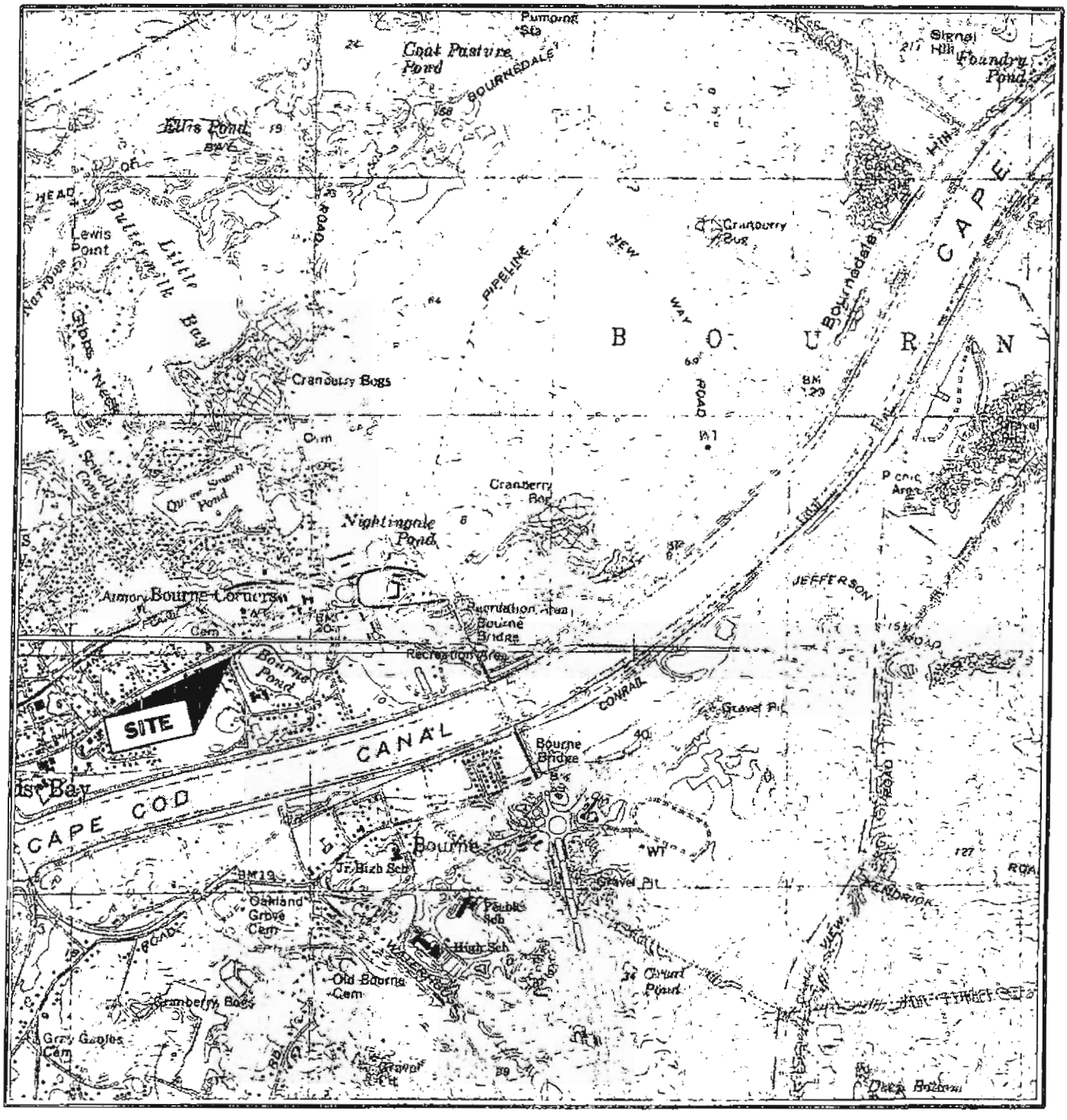
2. The data presented in this report, and RAM Environmental's opinions based on such data, is provided in accordance with RAM Environmental's proposal for professional services and the terms of the Agreement between RAM Environmental and MPG Corporation, pursuant to the services rendered. The data reported and findings, observations and conclusions expressed in this report are limited by RAM Environmental's scope of work and the Agreement, including the extent of subsurface exploration and other tests.

3. This report is for the sole use of the MPG Corporation. Any reuse or reliance on this report by any other third party shall be done only with the written consent of RAM Environmental.

4. The findings, observations, opinions, conclusions, and recommendations are not intended to, and do not imply, a warranty, or a guarantee and are based solely upon site conditions at the time of RAM Environmental's investigation. The findings, observations, opinions, conclusions, and recommendations should not be considered an opinion concerning the compliance of any past or present owner, or operator of the Site, with any federal, state or local law or regulation. Nothing in this report constitutes a legal opinion or legal service and should not be relied upon as such.

APPENDIX A

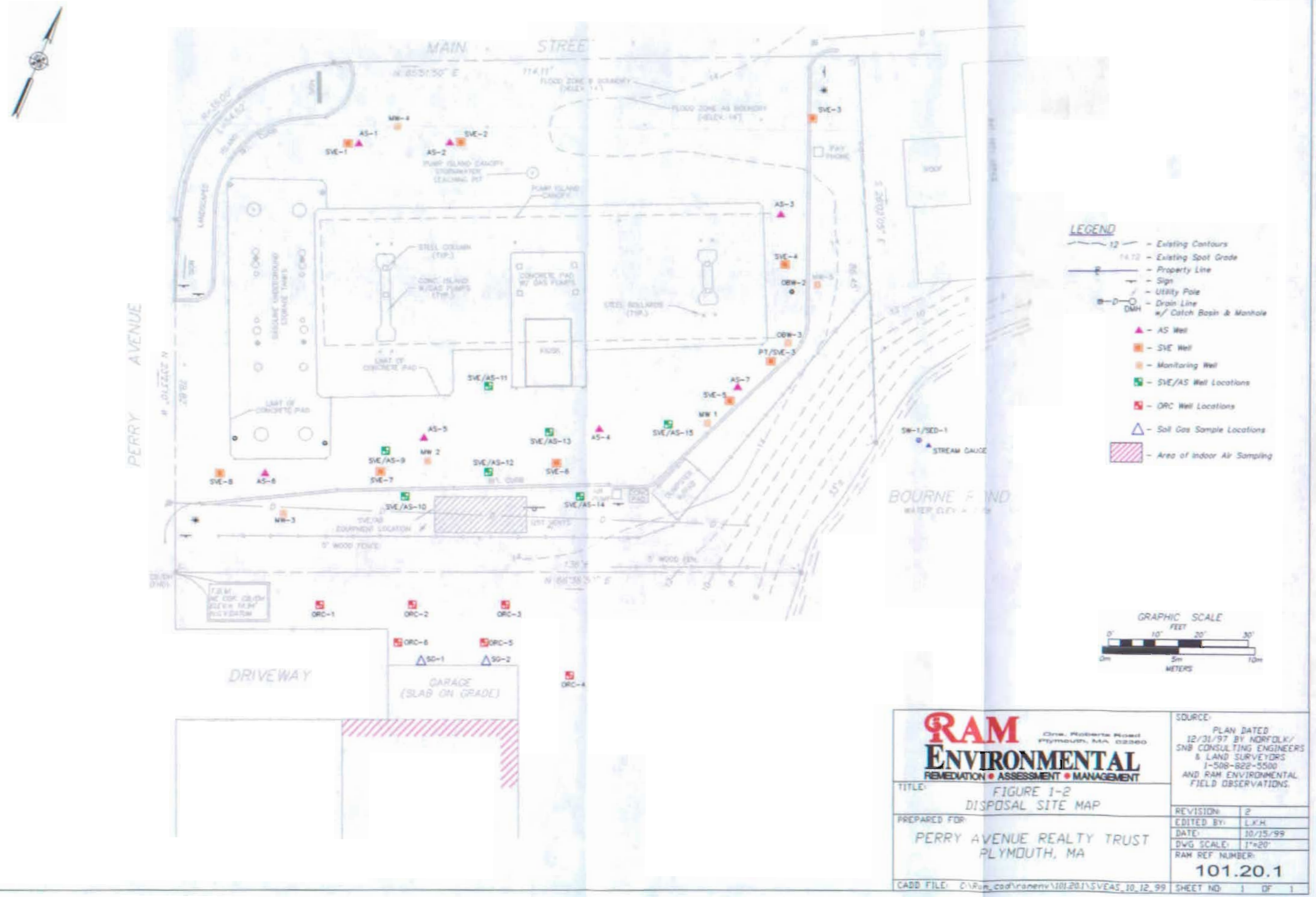
FIGURES



RAM ENVIRONMENTAL

N

Figure 1-1
Site Locus Map
246 Main St.
Buzzard's Bay, Massachusetts
Source: U.S.G.S. Pocasset/Sagamore, MA
1 : 24,000



RAM ENVIRONMENTAL
One Roberts Road
Plymouth, MA 02360
REMEDIATION • ASSESSMENT • MANAGEMENT

TITLE: FIGURE 1-2
DISPOSAL SITE MAP

PREPARED FOR:
PERRY AVENUE REALTY TRUST
PLYMOUTH, MA

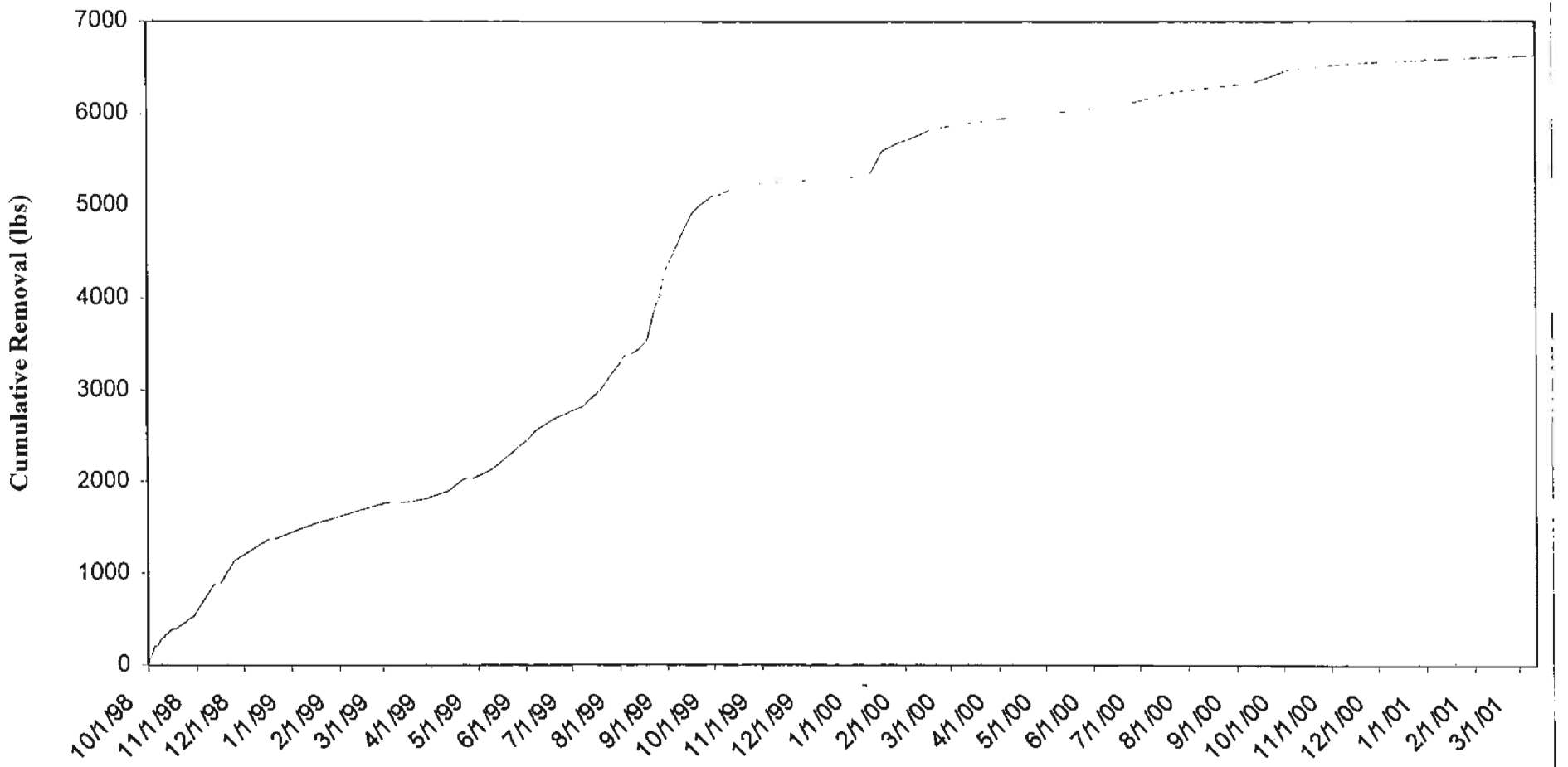
CADD FILE: C:\Ram_cad\ramenv\101.20.1\SVEAS_10_12_99

SOURCE:
PLAN DATED 12/31/97 BY NORFOLK/ SNB CONSULTING ENGINEERS & LAND SURVEYORS 1-508-822-5500 AND RAM ENVIRONMENTAL FIELD OBSERVATIONS.

REVISION:	2
EDITED BY:	LKH
DATE:	10/15/99
DWG SCALE:	1"=20'
RAM REF NUMBER:	101.20.1
SHEET NO:	1 OF 1

Figure 6-1

CUMULATIVE SVE/AS VAPOR PHASE VOC MASS REMOVAL vs. ELAPSED TIME



RAM Ref. No.
101.20.3

APPENDIX B

NON-AQUEOUS PHASE LIQUID THICKNESS AND GROUNDWATER ELEVATION GRAPHS AND TABLES

Buzzards Bay BP Station - Groundwater Elevation Summary
RAM Ref. No. 101.20.3

MW-1

Date	T.O.P.C. elev.	PVC elev	Depth to air-oil	Depth to oil-water	Depth to bottom	NAPL thickness	Corrected oil-water	Air-oil elev.	Oil-water elev.
12/12/96		13.75	9.51	9.51		0	4.24	4.24	4.24
1/27/97		13.75	10.04	10.04		0	3.71	3.71	3.71
3/27/97		13.75	10.24	10.24	14.90	0	3.51	3.51	3.51
4/25/97		13.75	9.59	9.59		0	4.16	4.16	4.16
6/2/97		13.75	9.90	9.90		0	3.85	3.85	3.85
6/26/97		13.75	10.40	10.40		0	3.35	3.35	3.35
7/21/97		13.75	10.90	10.90		0	2.85	2.85	2.85
8/27/97		13.75	10.47	10.47		0	3.28	3.28	3.28
10/6/97		13.75	10.75	10.75	14.90	0	3.00	3.00	3.00
10/22/97		13.75	10.80	10.80	14.74	0	2.95	2.95	2.95
11/19/97		13.75	10.08	10.08		0	3.67	3.67	3.67
12/17/97		13.75	10.65	10.65		0	3.10	3.10	3.10
1/14/98		13.75	10.30	10.30	14.75	0	3.45	3.45	3.45
2/20/98		13.75	9.39	9.39		0	4.36	4.36	4.36
4/23/98		13.75	9.74	9.74	14.75	0	4.01	4.01	4.01
5/27/98		13.75	9.88	9.88	14.75	0	3.87	3.87	3.87
6/19/98		13.75	9.65	9.65	14.73	0	4.10	4.10	4.10
7/23/98		13.75	10.97	10.97	14.79	0	2.78	2.78	2.78
8/24/98		13.75	10.79	10.79	14.76	0	2.96	2.96	2.96
9/25/98		13.75	10.92	10.92	14.76	0	2.83	2.83	2.83
10/22/98		13.75	10.03	10.03	14.85	0	3.72	3.72	3.72
11/25/98		13.75	10.40	10.40	14.85	0	3.35	3.35	3.35
12/18/98		13.75	10.63	10.63	14.85	0	3.12	3.12	3.12
1/19/99		13.75	11.50	11.50	14.80	0	2.25	2.25	2.25
2/19/99		13.75	11.60	11.60	14.85	0	2.15	2.15	2.15
3/22/99		13.75	9.60	9.60	14.80	0	4.15	4.15	4.15
4/23/99		13.75	10.00	10.00	14.70	0	3.75	3.75	3.75
6/2/99		13.75	10.79	10.79	14.72	0	2.96	2.96	2.96
6/24/99		13.75	10.53	10.53	14.70	0	3.22	3.22	3.22
7/22/99		13.75	10.65	10.65	14.70	0	3.10	3.10	3.10
8/27/99		13.75	10.88	10.88	14.82	0	2.87	2.87	2.87
9/23/99		13.75	11.31	11.31	14.84	0	2.44	2.44	2.44
10/21/99		13.75	10.92	10.92	14.75	0	2.83	2.83	2.83
11/22/99		13.75	10.80	10.80	14.85	0	2.95	2.95	2.95
1/5/00		13.75	11.16	11.16	14.82	0	2.59	2.59	2.59
2/4/00		13.75	11.06	11.06	14.79	0	2.69	2.69	2.69
3/1/00		13.75	10.59	10.59	14.72	0	3.16	3.16	3.16
3/23/00		13.75	10.18	10.18	14.68	0	3.57	3.57	3.57
4/28/00		13.75	9.59	9.59	14.68	0	4.16	4.16	4.16
5/25/00		13.75	9.72	9.72	14.68	0	4.03	4.03	4.03
6/22/00		13.75	10.40	10.40	14.75	0	3.35	3.35	3.35
8/1/00		13.75	10.54	10.54	14.69	0	3.21	3.21	3.21
8/23/00		13.75	10.82	10.82	14.69	0	2.93	2.93	2.93
9/20/00		13.75	10.84	10.84	14.75	0	2.91	2.91	2.91
11/1/00		13.75	10.93	10.93	14.75	0	2.82	2.82	2.82
11/30/00		13.75	10.90	10.90	14.79	0	2.85	2.85	2.85
12/20/00		13.75	10.79	10.79	14.76	0	2.96	2.96	2.96
1/24/01		13.75	10.84	10.84	14.73	0	2.91	2.91	2.91
2/21/01		13.75	10.74	10.74	14.79	0	3.01	3.01	3.01
3/12/01		13.75	9.98	9.98	14.75	0	3.77	3.77	3.77

Elevations are feet above mean sea level

T.O.P.C = Top of Protective Casing

NAPL thickness confirmed with visual inspection

Formula RAM Environmental used to correct groundwater elevation for depression by NAPL

Corrected Elevation = oil/water elevation + (NAPL Thickness * Specific Gravity of NAPL)

Specific Gravity for gasoline = 0.74 (Taken from Merck Index Eleventh Edition, 1989)

Monitoring wells resurveyed on 9/28/99

Buzzards Bay BP Station - Groundwater Elevation Summary
RAM Ref. No. 101.20.3

MW-2

Date	T.O.P.C. elev	PVC elev	Depth to air/oil	Depth to oil/water	Depth to bottom	NAPL thickness	Corrected oil/water	Air/oil elev	Oil/water elev
12/12/96		13.69	6.84	6.84		0	6.85	6.85	6.85
1/27/97		13.69	10.41	10.41		0	3.28	3.28	3.28
3/27/97		13.69	10.28	10.28	14.18	0	3.41	3.41	3.41
4/25/97		13.69	9.45	9.45		0	4.24	4.24	4.24
6/2/97		13.69	7.40	11.90		4.50	5.12	6.29	1.79
6/26/97		13.69	10.33	10.33		0	3.36	3.36	3.36
7/21/97		13.69	11.05	11.05		0	2.64	2.64	2.64
8/27/97		13.69	10.53	10.54		0.01	3.16	3.16	3.15
10/6/97		13.69	10.72	10.72	14.05	0	2.97	2.97	2.97
10/22/97		13.69	11.11	11.11	13.95	0	2.58	2.58	2.58
11/19/97		13.69	10.36	10.36		0	3.33	3.33	3.33
12/17/97		13.69	10.51	10.51		0	3.18	3.18	3.18
1/14/98		13.69	10.18	10.18	13.71	0	3.51	3.51	3.51
2/20/98		13.69	8.99	8.99		0	4.70	4.70	4.70
3/18/98		13.69	9.11	9.11	13.80	0	4.58	4.58	4.58
4/23/98		13.69	9.45	9.45	13.75	0	4.24	4.24	4.24
5/27/98		13.69	9.60	9.60	13.78	0	4.09	4.09	4.09
6/19/98		13.69	9.31	9.31	13.74	0	4.38	4.38	4.38
7/23/98		13.69	9.97	9.97	13.86	0	3.72	3.72	3.72
8/24/98		13.69	10.54	10.54	13.80	0	3.15	3.15	3.15
9/25/98		13.69	10.70	10.70	13.80	0	2.99	2.99	2.99
10/22/98		13.69	10.82	10.82	13.93	0	2.87	2.87	2.87
11/25/98		13.69	11.04	11.04	13.93	0	2.65	2.65	2.65
12/18/98		13.69	11.12	11.12	13.93	0	2.57	2.57	2.57
1/19/99		13.69	10.80	10.80	13.82	0	2.89	2.89	2.89
2/19/99		13.69	10.40	10.40	13.88	0	3.29	3.29	3.29
3/22/99		13.69	9.85	9.85	13.75	0	3.84	3.84	3.84
4/23/99		13.69	10.35	10.35	13.80	0	3.34	3.34	3.34
6/2/99		13.69	10.59	10.59	13.77	0	3.10	3.10	3.10
6/24/99		13.69	11.00	11.00	13.78	0	2.69	2.69	2.69
7/22/99		13.69	11.23	11.23	13.80	0	2.46	2.46	2.46
8/27/99		13.69	11.18	11.49	13.90	0.31	2.43	2.51	2.20
9/23/99		13.69	11.08	11.15	13.88	0.07	2.59	2.61	2.54
10/21/99		13.69	10.81	10.81	13.83	0	2.88	2.88	2.88
11/22/99		13.69	11.00	11.00	13.90	0	2.69	2.69	2.69
1/5/00		13.69	11.12	11.12	13.91	0	2.57	2.57	2.57
2/4/00		13.69	11.04	11.04	13.84	0	2.65	2.65	2.65
3/1/00		13.69	10.61	10.61	13.67	0	3.08	3.08	3.08
3/23/00		13.69	10.11	10.11	13.69	0	3.58	3.58	3.58
4/28/00		13.69	9.39	9.39	13.73	0	4.30	4.30	4.30
5/25/00		13.69	9.56	9.56	13.70	0	4.13	4.13	4.13
6/22/00		13.69	10.28	10.28	13.71	0	3.41	3.41	3.41
8/1/00		13.69	10.50	10.50	13.71	0	3.19	3.19	3.19
8/23/00		13.69	10.65	10.65	13.71	0	3.04	3.04	3.04
9/20/00		13.69	10.89	10.89	13.79	0	2.80	2.80	2.80
11/1/00		13.69	10.95	10.95	13.80	0	2.74	2.74	2.74
11/30/00		13.69	10.94	10.94	13.82	0	2.75	2.75	2.75
12/20/00		13.69	10.78	10.78	13.81	0	2.91	2.91	2.91
1/24/01		13.69	10.83	10.83	13.85	0	2.86	2.86	2.86
2/21/01		13.69	10.69	10.69	13.84	0	3.00	3.00	3.00
3/12/01		13.69	10.03	10.03	13.85	0	3.66	3.66	3.66

Elevations are feet above mean sea level

T.O.P.C = Top of Protective Casing

NAPL thickness confirmed with visual inspection

Formula RAM Environmental used to correct groundwater elevation for depression by NAPL

Corrected Elevation = oil/water elevation + (NAPL Thickness * Specific Gravity of NAPL).

Specific Gravity for gasoline = 0.74 (Taken from Merek Index Eleventh Edition, 1989)

06/02/97 NAPL thickness not confirmed, measurement is presumed incorrect and the result of human error.

08/27/97 NAPL thickness not confirmed by visual inspection

Monitoring wells resurveyed on 9/28/99

Buzzards Bay BP Station - Groundwater Elevation Summary
RAM Ref. No. 101.20.3

MW-3

Date	TOPC elev	PVC elev	Depth to air oil	Depth to oil water	Depth to bottom	NAPL thickness	Corrected oil water	Air oil elev	Oil water elev
12/12/96		14.16	9.82	9.82		0	4.34	4.34	4.34
1/27/97		14.16	10.59	10.59		0	3.57	3.57	3.57
3/27/97		14.16	10.72	10.72	14.68	0	3.44	3.44	3.44
4/25/97		14.16	9.69	9.69		0	4.47	4.47	4.47
6/2/97		14.16	10.50	10.50		0	3.66	3.66	3.66
6/26/97		14.16	10.85	10.85		0	3.31	3.31	3.31
7/21/97		14.16	11.25	11.25		0	2.91	2.91	2.91
8/27/97		14.16	10.91	10.91		0	3.25	3.25	3.25
10/6/97		14.16	11.24	11.24	14.50	0	2.92	2.92	2.92
10/22/97		14.16	11.31	11.31	14.36	0	2.85	2.85	2.85
11/19/97		14.16	10.59	10.59		0	3.57	3.57	3.57
12/17/97		14.16	10.99	10.99		0	3.17	3.17	3.17
1/14/98		14.16	10.65	10.65	14.42	0	3.51	3.51	3.51
2/20/98		14.16	9.46	9.46		0	4.70	4.70	4.70
3/18/98		14.16	9.59	9.59	14.45	0	4.57	4.57	4.57
4/23/98		14.16	9.92	9.92	14.41	0	4.24	4.24	4.24
5/27/98		14.16	10.06	10.06	14.46	0	4.10	4.10	4.10
6/19/98		14.16	9.77	9.77	14.38	0	4.39	4.39	4.39
7/23/98		14.16	10.44	10.44	14.44	0	3.72	3.72	3.72
8/24/98		14.16	11.02	11.02	14.43	0	3.14	3.14	3.14
9/25/98		14.16	11.19	11.19	14.76	0	2.97	2.97	2.97
10/22/98		14.16	11.25	11.25	14.45	0	2.91	2.91	2.91
11/25/98		14.16	11.50	11.50	14.45	0	2.66	2.66	2.66
12/18/98		14.16	11.57	11.57	14.45	0	2.59	2.59	2.59
1/19/99		14.16	11.25	11.25	14.45	0	2.91	2.91	2.91
2/19/99		14.16	11.30	11.30	14.45	0	2.86	2.86	2.86
3/22/99		14.16	10.30	10.30	14.45	0	3.86	3.86	3.86
4/23/99		14.16	10.82	10.82	14.38	0	3.34	3.34	3.34
6/2/99		14.16	11.14	11.14	14.35	0	3.02	3.02	3.02
6/24/99		14.16	11.49	11.49	14.39	0	2.67	2.67	2.67
7/22/99		14.16	11.70	11.70	14.38	0	2.46	2.46	2.46
8/27/99		14.16	11.71	11.71	14.49	0	2.45	2.45	2.45
9/23/99		14.16	11.59	11.59	14.48	0	2.57	2.57	2.57
10/21/99		14.16	11.28	11.28	14.40	0	2.88	2.88	2.88
11/22/99		14.16	11.45	11.45	14.40	0	2.71	2.71	2.71
1/5/00		14.16	11.57	11.57	14.45	0	2.59	2.59	2.59
2/4/00		14.16	11.49	11.49	14.43	0	2.67	2.67	2.67
3/1/00		14.16	11.17	11.17	14.42	0	2.99	2.99	2.99
3/23/00		14.16	10.57	10.57	14.39	0	3.59	3.59	3.59
4/28/00		14.16	9.87	9.87	14.39	0	4.29	4.29	4.29
5/25/00		14.16	10.05	10.05	14.38	0	4.11	4.11	4.11
6/22/00		14.16	10.75	10.75	14.40	0	3.41	3.41	3.41
8/1/00		14.16	10.99	10.99	14.40	0	3.17	3.17	3.17
8/23/00		14.16	11.15	11.15	14.40	0	3.01	3.01	3.01
9/20/00		14.16	11.36	11.36	14.45	0	2.80	2.80	2.80
11/1/00		14.16	11.44	11.44	14.42	0	2.72	2.72	2.72
11/30/00		14.16	11.42	11.42	14.41	0	2.74	2.74	2.74
12/20/00		14.16	11.26	11.26	14.45	0	2.90	2.90	2.90
1/24/01		14.16	11.31	11.31	14.45	0	2.85	2.85	2.85
2/21/01		14.16	11.18	11.18	14.46	0	2.98	2.98	2.98
3/12/01		14.16	10.52	10.52	14.45	0	3.64	3.64	3.64

Elevations are feet above mean sea level

T.O.P.C = Top of Protective Casing

Formula RAM Environmental used to correct groundwater elevation for depression by NAPL.

Corrected Elevation = oil/water elevation + (NAPL Thickness * Specific Gravity of NAPL).

Specific Gravity for gasoline = 0.74 (Taken from Merck Index Eleventh Edition, 1989).

Monitoring wells resurveyed on 9/28/99

Buzzards Bay BP Station - Groundwater Elevation Summary
RAM Ref. No. 101.20.1

MW-4

Date	TOPC elev	PVC elev	Depth to air/oil	Depth to oil/water	Depth to bottom	NAPL thickness	Corrected oil/water	Air/oil elev	Oil/water elev
12/12/96		13.87	9.61	10.18		0.57	4.11	4.26	3.69
1/27/97		13.87	10.01	10.55		0.54	3.72	3.86	3.32
3/27/97		13.87	10.63	10.63		0.00	3.24	3.24	3.24
4/25/97		13.87	9.45	10.22		0.77	4.22	4.42	3.65
6/2/97		13.87	10.40	12.20		1.80	3.00	3.47	1.67
6/26/97		13.87	10.72	10.90		0.18	3.10	3.15	2.97
7/21/97		13.87	9.90	10.30		0.40	3.87	3.97	3.57
8/27/97		13.87	10.80	10.95		0.15	3.03	3.07	2.92
10/6/97		13.87	11.39	11.42	14.70	0.03	2.47	2.48	2.45
10/22/97		13.87	11.18	11.47	14.44	0.29	2.61	2.69	2.40
11/19/97		13.87	10.64	10.67		0.03	3.22	3.23	3.20
12/17/97		13.87	10.62	10.75		0.13	3.22	3.25	3.12
1/14/98		13.87	10.29	10.44	14.30	0.15	3.54	3.58	3.43
2/20/98		13.87	9.11	9.34		0.23	4.70	4.76	4.53
3/18/98		13.87	9.97	10.62	14.45	0.65	3.73	3.90	3.25
4/23/98		13.87	9.46	9.51		0.05	4.40	4.41	4.36
5/27/98		13.87	10.05	10.05	14.45	0.00	3.82	3.82	3.82
6/19/98		13.87	9.88	9.88	14.27	0.00	3.99	3.99	3.99
7/23/98		13.87	10.49	10.63	14.46	0.14	3.34	3.38	3.24
8/24/98		13.87	10.86	10.88	14.26	0.02	3.00	3.01	2.99
9/25/98		13.87	11.04	11.10	14.35	0.06	2.81	2.83	2.77
10/22/98		13.87	11.30	11.30	14.35	0.00	2.57	2.57	2.57
11/25/98		13.87	11.22	11.22	14.35	0.00	2.65	2.65	2.65
12/18/98		13.87	11.28	11.28	14.35	0.00	2.59	2.59	2.59
1/19/99		13.87	11.10	11.10	14.30	0.00	2.77	2.77	2.77
2/19/99		13.87	10.60	10.60	14.28	0.00	3.27	3.27	3.27
3/22/99		13.87	10.00	10.00	14.45	0.00	3.87	3.87	3.87
4/23/99		13.87	10.50	10.50	14.28	0.00	3.37	3.37	3.37
6/2/99		13.87	10.81	10.81	14.30	0.00	3.06	3.06	3.06
6/24/99		13.87	11.17	11.17	14.35	0.00	2.70	2.70	2.70
7/22/99		13.87	11.38	11.38	14.35	0.00	2.49	2.49	2.49
8/27/99		13.87	11.47	11.47	14.40	0.00	2.40	2.40	2.40
9/23/99		13.87	11.28	11.28	14.39	0.00	2.59	2.59	2.59
10/21/99		13.87	11.00	11.00	14.32	0.00	2.87	2.87	2.87
11/22/99		13.87	11.12	11.12	14.40	0.00	2.75	2.75	2.75
1/5/00		13.87	11.30	11.30	14.42	0.00	2.57	2.57	2.57
2/4/00		13.87	11.10	11.10	14.34	0.00	2.77	2.77	2.77
3/1/00		13.87	10.86	10.86	14.30	0.00	3.01	3.01	3.01
3/23/00		13.87	10.25	10.25	14.34	0.00	3.62	3.62	3.62
4/28/00		13.87	9.55	9.55	14.33	0.00	4.32	4.32	4.32
5/25/00		13.87	9.70	9.70	14.34	0.00	4.17	4.17	4.17
6/22/00		13.87	10.35	10.35	14.34	0.00	3.52	3.52	3.52
8/1/00		13.87	10.60	10.60	14.35	0.00	3.27	3.27	3.27
8/23/00		13.87	10.82	10.82	14.35	0.00	3.05	3.05	3.05
9/20/00		13.87	11.05	11.05	14.34	0.00	2.82	2.82	2.82
11/1/00		13.87	11.14	11.14	14.34	0.00	2.73	2.73	2.73
11/30/00		13.87	11.13	11.13	14.37	0.00	2.74	2.74	2.74
12/20/00		13.87	10.96	10.96	14.36	0.00	2.91	2.91	2.91
1/24/01		13.87	11.01	11.01	14.35	0.00	2.86	2.86	2.86
2/21/01		13.87	10.85	10.85	14.35	0.00	3.02	3.02	3.02
3/12/01		13.87	10.14	10.14	14.35	0.00	3.73	3.73	3.73

Elevations are feet above mean sea level

T.O.P.C = Top of Protective Casing

NAPL thickness confirmed with visual inspection.

Formula RAM Environmental used to correct groundwater elevation for depression by NAPL.

Corrected Elevation = oil/water elevation + (NAPL Thickness * Specific Gravity of NAPL).

Specific Gravity for gasoline = 0.74 (Taken from Merck Index Eleventh Edition, 1989).

08/27/97 NAPL thickness NOT confirmed with visual inspection.

10/06/97 NAPL thickness in bailer was approximately 0.11 inches.

07/23/98 Oil/water interface probe nonfunctional

Water level was interpolated from the average change in groundwater elevation in monitoring wells MW-1, MW-2, MW-3 and MW-5

Monitoring wells resurveyed on 9/28/99

Buzzards Bay BP Station - Groundwater Elevation Summary
RAM Ref. No. 101.20.3

MW-5

Date	TOPC elev.	PVC elev	Depth to air-oil	Depth to oil-water	Depth to bottom	NAPL thickness	Corrected oil-water	Air-oil elev	Oil-water elev.
12/12/96		14.25	9.63	9.63		0	4.62	4.62	4.62
1/27/97		14.25	9.95	9.95		0	4.30	4.30	4.30
3/27/97		14.25	9.93	9.93	12.95	0	4.32	4.32	4.32
4/25/97		14.25	9.79	9.79		0	4.46	4.46	4.46
6/2/97		14.25	9.75	9.75		0	4.50	4.50	4.50
6/26/97		14.25	10.33	10.33		0	3.92	3.92	3.92
7/21/97		14.25	10.50	10.50		0	3.75	3.75	3.75
8/27/97		14.25	10.08	10.08		0	4.17	4.17	4.17
10/6/97		14.25	10.33	10.33	14.75	0	3.92	3.92	3.92
10/22/97		14.25	10.43	10.43	14.57	0	3.82	3.82	3.82
11/19/97		14.25	9.88	9.88		0	4.37	4.37	4.37
12/17/97		14.25	10.65	10.65		0	3.60	3.60	3.60
1/14/98		14.25	10.81	10.81	13.71	0	3.44	3.44	3.44
2/20/98		14.25	10.40	10.40		0	3.85	3.85	3.85
3/18/98		14.25	10.58	10.58	15.68	0	3.67	3.67	3.67
4/23/98		14.25	10.70	10.70	15.65	0	3.55	3.55	3.55
5/27/98		14.25	10.85	10.85	15.70	0	3.40	3.40	3.40
6/19/98		14.25	10.62	10.62	15.69	0	3.63	3.63	3.63
7/23/98		14.25	10.97	10.97	15.73	0	3.28	3.28	3.28
8/24/98		14.25	11.23	11.23	15.78	0	3.02	3.02	3.02
9/25/98		14.25	11.19	11.19	15.78	0	3.06	3.06	3.06
10/22/98		14.25	11.28	11.28	15.85	0	2.97	2.97	2.97
11/25/98		14.25	11.38	11.38	15.85	0	2.87	2.87	2.87
12/18/98		14.25	11.60	11.60	15.85	0	2.65	2.65	2.65
1/19/99		14.25	10.95	10.95	15.82	0	3.30	3.30	3.30
2/19/99		14.25	11.05	11.05	15.75	0	3.20	3.20	3.20
3/22/99		14.25	10.55	10.55	15.75	0	3.70	3.70	3.70
4/23/99		14.25	10.96	10.96	15.73	0	3.29	3.29	3.29
6/2/99		14.25	11.24	11.24	15.71	0	3.01	3.01	3.01
6/24/99		14.25	11.61	11.61	15.78	0	2.64	2.64	2.64
7/22/99		14.25	12.00	12.00	15.75	0	2.25	2.25	2.25
8/27/99		14.25	11.93	11.93	15.86	0	2.32	2.32	2.32
9/23/99		14.25	11.70	11.70	15.85	0	2.55	2.55	2.55
10/21/99		14.25	10.93	10.93	15.77	0	3.32	3.32	3.32
11/22/99		14.25	11.23	11.23	15.85	0	3.02	3.02	3.02
1/5/00		14.25	11.37	11.37	15.84	0	2.88	2.88	2.88
2/4/00		14.25	11.29	11.29	15.76	0	2.96	2.96	2.96
3/1/00		14.25	10.68	10.68	15.78	0	3.57	3.57	3.57
3/23/00		14.25	10.78	10.78	15.79	0	3.47	3.47	3.47
4/28/00		14.25	10.41	10.41	15.80	0	3.84	3.84	3.84
5/25/00		14.25	10.50	10.50	15.80	0	3.75	3.75	3.75
6/22/00		14.25	11.03	11.03	15.81	0	3.22	3.22	3.22
8/1/00		14.25	10.83	10.83	15.81	0	3.42	3.42	3.42
8/23/00		14.25	11.36	11.36	15.81	0	2.89	2.89	2.89
9/20/00		14.25	11.27	11.27	15.81	0	2.98	2.98	2.98
11/1/00		14.25	10.94	10.94	15.84	0	3.31	3.31	3.31
11/30/00		14.25	11.33	11.33	15.81	0	2.92	2.92	2.92
12/20/00		14.25	10.77	10.77	15.83	0	3.48	3.48	3.48
1/24/01		14.25	11.05	11.05	15.80	0	3.20	3.20	3.20
2/21/01		14.25	11.10	11.10	15.82	0	3.15	3.15	3.15
3/12/01		14.25	10.49	10.49	15.82	0	3.76	3.76	3.76

Elevations are feet above mean sea level

T.O.P.C = Top of Protective Casing

Formula RAM Environmental used to correct groundwater elevation for depression by NAPL.

Corrected Elevation = oil/water elevation + (NAPL Thickness * Specific Gravity of NAPL).

Specific Gravity for gasoline = 0.74 (Taken from Merck Index Eleventh Edition, 1989).

Monitoring wells resurveyed on 9/28/99

Buzzards Bay BP Station - Surfacewater Elevation Summary
RAM Ref. No. 101.20.3

SW

Date	Gauge elev.	Gauge height	Surface water elevation
1/14/98	5.57	1.48	3.55
2/20/98	5.57	1.64	3.71
6/19/98	5.57	1.68	3.75
7/23/98	5.57	1.55	3.62
8/24/98	5.57	1.44	3.51
9/25/98	5.57	1.40	3.47
10/22/98	5.57	1.35	3.42
11/25/98	5.57	1.37	3.44
12/18/98	5.57	1.36	3.43
1/19/99	5.57	1.48	3.55
2/19/99	5.57	1.58	3.65
3/22/99	5.57	1.60	3.67
4/23/99	5.57	1.45	3.52
6/2/99	5.57	1.38	3.45
7/22/99	5.57	1.32	3.39
8/27/99	5.57	1.30	3.37
9/23/99	5.57	1.35	3.42
10/21/99	5.57	1.58	3.65
11/22/99	5.57	1.46	3.53
1/5/00	5.57	1.42	3.49
2/4/00	5.57	1.33	3.40
3/1/00	5.57	1.37	3.44
3/23/00	5.57	1.45	3.52
4/28/00	5.57	1.43	3.50
5/25/00	5.57	1.42	3.49
6/22/00	5.57	1.25	3.32
8/1/00	5.57	1.50	3.57
8/23/00	5.57	1.25	3.32
9/20/00	5.57	1.29	3.36
11/1/00	5.57	1.47	3.54
11/30/00	5.57	1.35	3.42
12/20/00	5.57	1.74	3.81
1/24/01	5.57	1.25	3.32
2/21/01	5.57	1.19	3.26
3/21/01	5.57	1.70	3.77

Elevations are feet above mean sea level

6 Perry Avenue - Groundwater Elevation Summary
RAM Ref. No. 101.20.3

ORC-1

Date	TOPC elev.	PVC elev.	Depth to air/oil	Depth to oil/water	Depth to bottom	NAPL thickness	Corrected oil/water	Air/oil elev.	Oil/water elev.
11/11/99		14.11	11.40	11.40	14.25	0	2.71	2.71	2.71
1/5/00		14.11	11.57	11.57	14.25	0	2.54	2.54	2.54
1/21/00		14.11	11.36	11.36	14.25	0	2.75	2.75	2.75
2/4/00		14.11	11.36	11.36	14.23	0	2.75	2.75	2.75
4/11/00		14.11	10.65	10.65	14.09	0	3.46	3.46	3.46
4/28/00		14.11	9.81	9.81	14.09	0	4.30	4.30	4.30
5/25/00		14.11	10.02	10.02	14.05	0	4.09	4.09	4.09
6/22/00		14.11	10.73	10.73	14.06	0	3.38	3.38	3.38
8/1/00		14.11	10.92	10.92	14.08	0	3.19	3.19	3.19
9/20/00		14.11	11.34	11.34	14.14	0	2.77	2.77	2.77
11/1/00		14.11	11.41	11.41	14.11	0	2.70	2.70	2.70
11/30/00		14.11	11.36	11.36	14.12	0	2.75	2.75	2.75
12/20/00		14.11	11.22	11.22	14.14	0	2.89	2.89	2.89
1/24/01		14.11	11.30	11.30	14.10	0	2.81	2.81	2.81
2/21/01		14.11	11.12	11.12	14.20	0	2.99	2.99	2.99
3/21/01		14.11	10.54	10.54	14.20	0	3.57	3.57	3.57

Elevations are feet above mean sea level

T.O.P.C = Top of Protective Casing

Formula RAM Environmental used to correct groundwater elevation for depression by NAPL.

Corrected Elevation = oil/water elevation + (NAPL Thickness * Specific Gravity of NAPL).

Specific Gravity for gasoline = 0.74 (Taken from Merck Index Eleventh Edition, 1989).

ORC wells surveyed on 11/11/99

6 Perry Avenue - Groundwater Elevation Summary
RAM Ref. No. 101.20.3

ORC-2

Date	TOPC elev.	PVC elev.	Depth to air/oil	Depth to oil/water	Depth to bottom	NAPL thickness	Corrected oil/water	Air/oil elev.	Oil water elev.
11/11/99		13.62	10.95	10.95	14.40	0	2.67	2.67	2.67
1/5/00		13.62	11.10	11.10	14.40	0	2.52	2.52	2.52
1/21/00		13.62	10.90	10.90	14.30	0	2.72	2.72	2.72
2/4/00		13.62	10.90	10.90	14.28	0	2.72	2.72	2.72
4/11/00		13.62	10.19	10.19	13.89	0	3.43	3.43	3.43
4/28/00		13.62	9.34	9.34	13.83	0	4.28	4.28	4.28
5/25/00		13.62	9.50	9.50	13.84	0	4.12	4.12	4.12
6/22/00		13.62	10.23	10.23	13.82	0	3.39	3.39	3.39
8/1/00		13.62	10.46	10.46	13.82	0	3.16	3.16	3.16
9/20/00		13.62	10.87	10.87	13.85	0	2.75	2.75	2.75
11/1/00		13.62	10.93	10.93	13.85	0	2.69	2.69	2.69
11/30/00		13.62	10.90	10.90	13.98	0	2.72	2.72	2.72
12/20/00		13.62	10.74	10.74	13.97	0	2.88	2.88	2.88
1/24/01		13.62	10.78	10.78	14.10	0	2.84	2.84	2.84
2/21/01		13.62	10.66	10.66	13.95	0	2.96	2.96	2.96
3/21/01		13.62	10.06	10.06	13.95	0	3.56	3.56	3.56

Elevations are feet above mean sea level

T.O.P.C = Top of Protective Casing

Formula RAM Environmental used to correct groundwater elevation for depression by NAPL.

Corrected Elevation = oil/water elevation + (NAPL Thickness * Specific Gravity of NAPL).

Specific Gravity for gasoline = 0.74 (Taken from Merck Index Eleventh Edition, 1989).

ORC wells surveyed on 11/11/99

6 Perry Avenue - Groundwater Elevation Summary
RAM Ref. No. 101.20.3

ORC-4

Date	TOPC elev.	PVC elev.	Depth to air/oil	Depth to oil/water	Depth to bottom	NAPL thickness	Corrected oil/water	Air/oil elev.	Oil/water elev.
11/11/99		13.85	11.20	11.20	19.40	0	2.65	2.65	2.65
1/5/00		13.85	11.32	11.32	18.87	0	2.53	2.53	2.53
1/21/00		13.85	11.20	11.20	19.40	0	2.65	2.65	2.65
2/4/00		13.85	11.20	11.20	18.83	0	2.65	2.65	2.65
4/11/00		13.85	10.44	10.44	18.72	0	3.41	3.41	3.41
4/28/00		13.85	9.56	9.56	18.68	0	4.29	4.29	4.29
5/25/00		13.85	9.76	9.76	18.68	0	4.09	4.09	4.09
6/22/00		13.85	10.50	10.50	18.64	0	3.35	3.35	3.35
8/1/00		13.85	10.68	10.68	18.55	0	3.17	3.17	3.17
9/20/00		13.85	11.09	11.09	18.60	0	2.76	2.76	2.76
11/1/00		13.85	11.15	11.15	18.39	0	2.70	2.70	2.70
11/30/00		13.85	11.13	11.13	18.38	0	2.72	2.72	2.72
12/20/00		13.85	10.94	10.94	18.54	0	2.91	2.91	2.91
1/24/01		13.85	11.01	11.01	18.48	0	2.84	2.84	2.84
2/21/01		13.85	10.89	10.89	18.61	0	2.96	2.96	2.96
3/21/01		13.85	10.31	10.31	18.61	0	3.54	3.54	3.54

Elevations are feet above mean sea level

T.O.P.C = Top of Protective Casing

Formula RAM Environmental used to correct groundwater elevation for depression by NAPL.

Corrected Elevation = oil/water elevation + (NAPL Thickness * Specific Gravity of NAPL).

Specific Gravity for gasoline = 0.74 (Taken from Merck Index Eleventh Edition, 1989).

ORC wells surveyed on 11/11/99

6 Perry Avenue - Groundwater Elevation Summary
RAM Ref. No. 101.20.3

ORC-5

Date	TOPC elev.	PVC elev.	Depth to air oil	Depth to oil/water	Depth to bottom	NAPL thickness	Corrected oil water	Air/oil elev.	Oil/water elev.
11/11/99		13.98	NA	NA	NA	NA	NA	NA	NA
1/5/00		13.98	11.40	11.40	18.80	0	2.58	2.58	2.58
1/21/00		13.98	11.30	11.30	18.70	0	2.68	2.68	2.68
2/4/00		13.98	11.40	11.40	18.73	0	2.58	2.58	2.58
4/11/00		13.98	10.56	10.56	18.62	0	3.42	3.42	3.42
4/28/00		13.98	9.69	9.69	18.59	0	4.29	4.29	4.29
5/25/00		13.98	9.89	9.89	18.55	0	4.09	4.09	4.09
6/22/00		13.98	10.59	10.59	18.57	0	3.39	3.39	3.39
8/1/00		13.98	10.79	10.79	18.59	0	3.19	3.19	3.19
9/20/00		13.98	11.21	11.21	18.58	0	2.77	2.77	2.77
11/1/00		13.98	11.25	11.25	18.34	0	2.73	2.73	2.73
11/30/00		13.98	11.25	11.25	18.30	0	2.73	2.73	2.73
12/20/00		13.98	11.07	11.07	18.27	0	2.91	2.91	2.91
1/24/01		13.98	11.12	11.12	18.16	0	2.86	2.86	2.86
2/21/01		13.98	10.99	10.99	18.13	0	2.99	2.99	2.99
3/21/01		13.98	10.40	10.40	18.13	0	3.58	3.58	3.58

Elevations are feet above mean sea level

T.O.P.C = Top of Protective Casing

Formula RAM Environmental used to correct groundwater elevation for depression by NAPL.

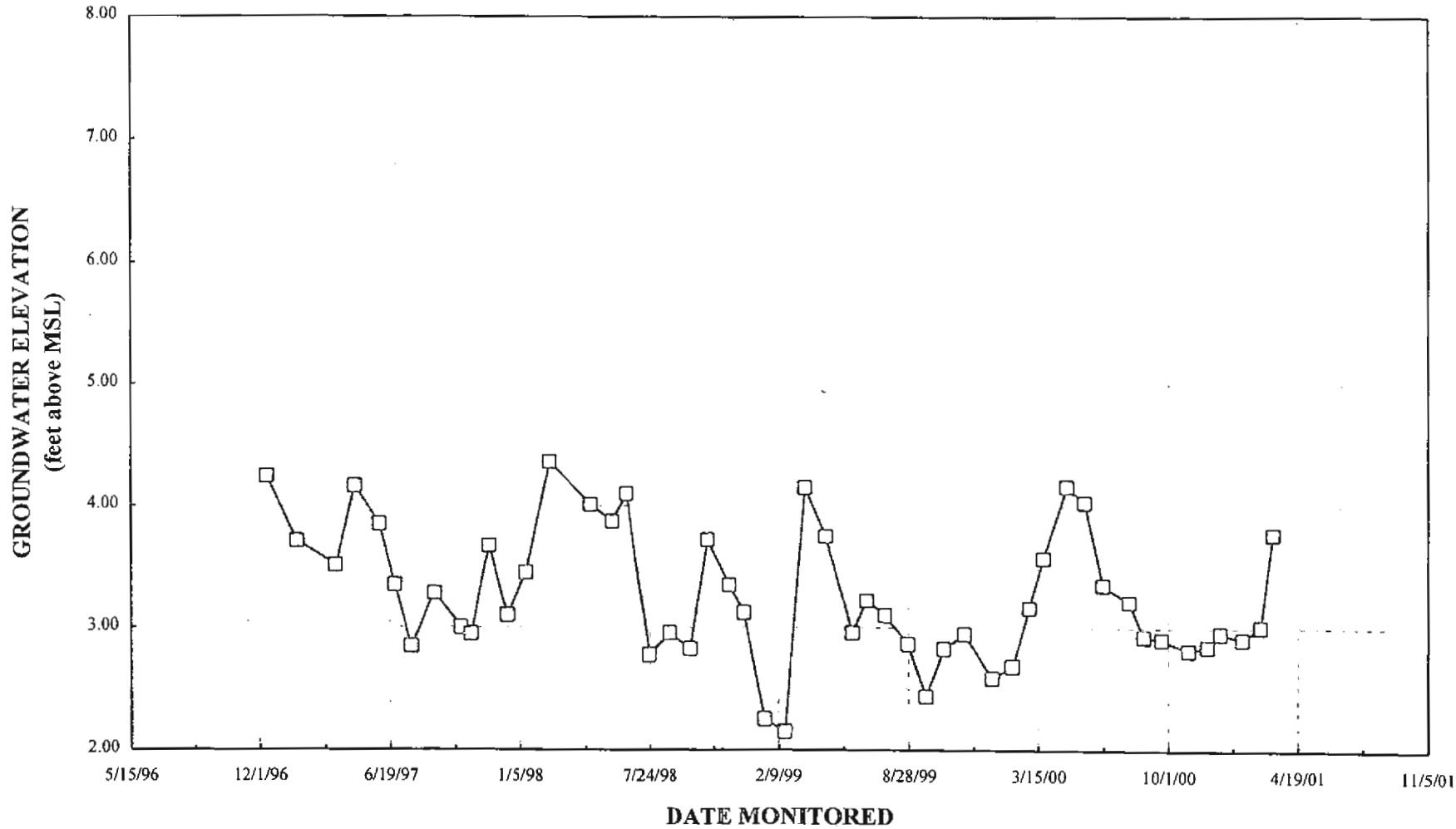
Corrected Elevation = oil/water elevation + (NAPL Thickness * Specific Gravity of NAPL).

Specific Gravity for gasoline = 0.74 (Taken from Merck Index Eleventh Edition, 1989).

ORC wells surveyed on 11/11/99

MW-1 CORRECTED GROUNDWATER ELEVATION vs.TIME

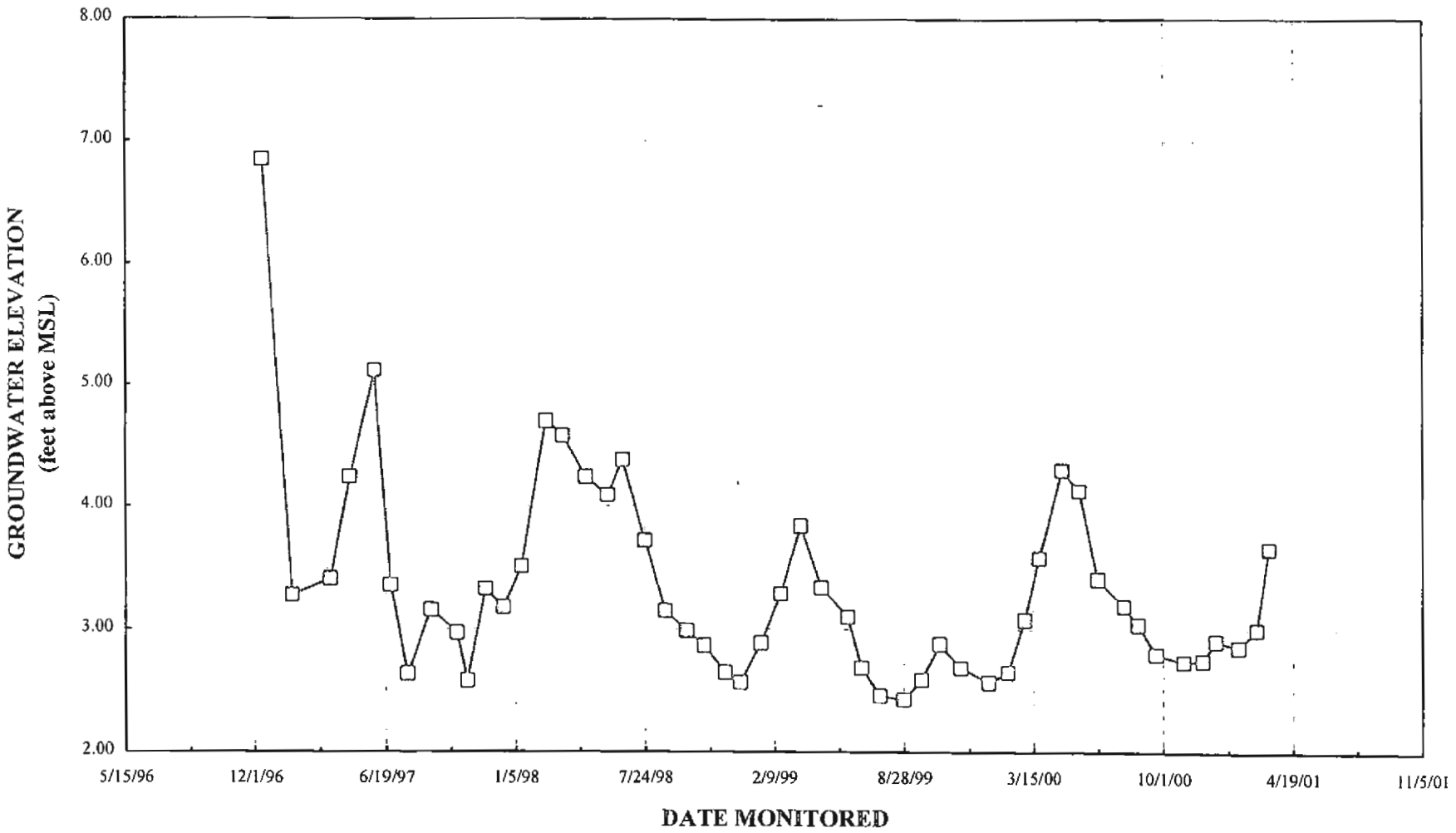
Perry Ave Realty Trust (101.20.3), Buzzards Bay, MA



Groundwater elevation corrected for water level depression by NAPL

MW-2 CORRECTED GROUNDWATER ELEVATION vs.TIME

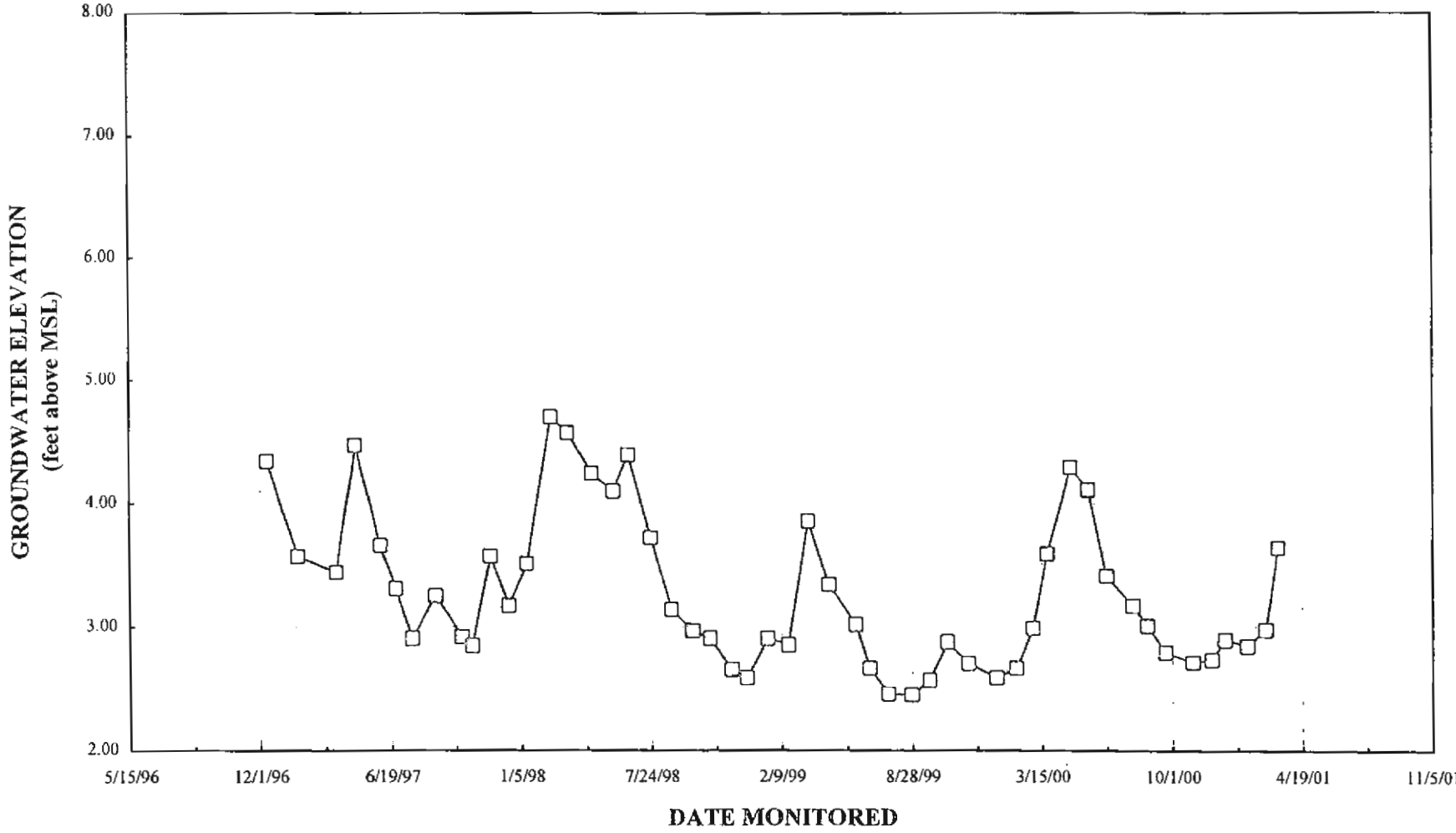
Perry Ave Realty Trust (101.20.3), Buzzards Bay, MA



Groundwater elevation corrected for water level depression by NAPL

MW-3 CORRECTED GROUNDWATER ELEVATION vs.TIME

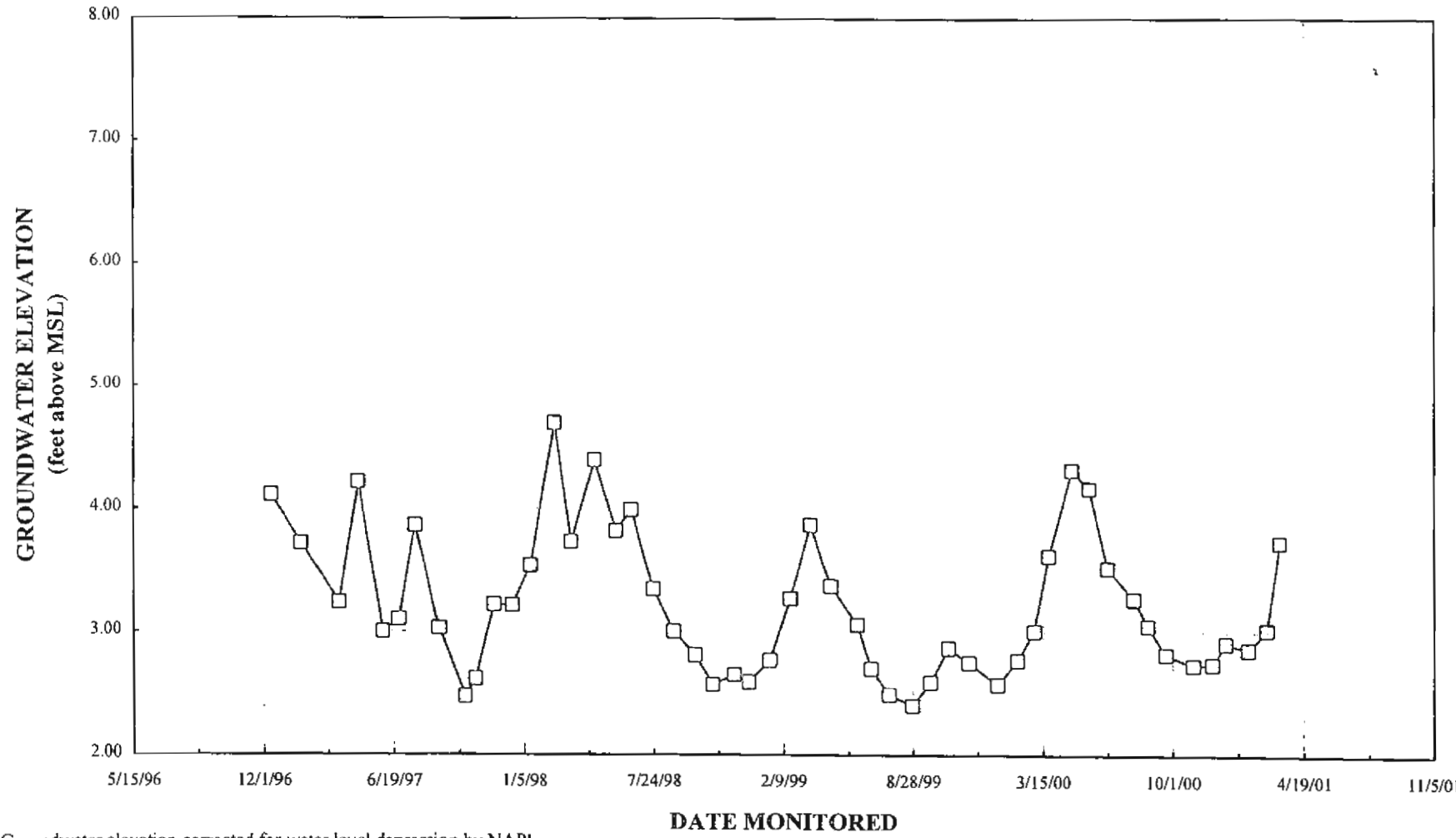
Perry Ave Realty Trust (101.20.3), Buzzards Bay, MA



Groundwater elevation corrected for water level depression by NAPL

MW-4 CORRECTED GROUNDWATER ELEVATION vs.TIME

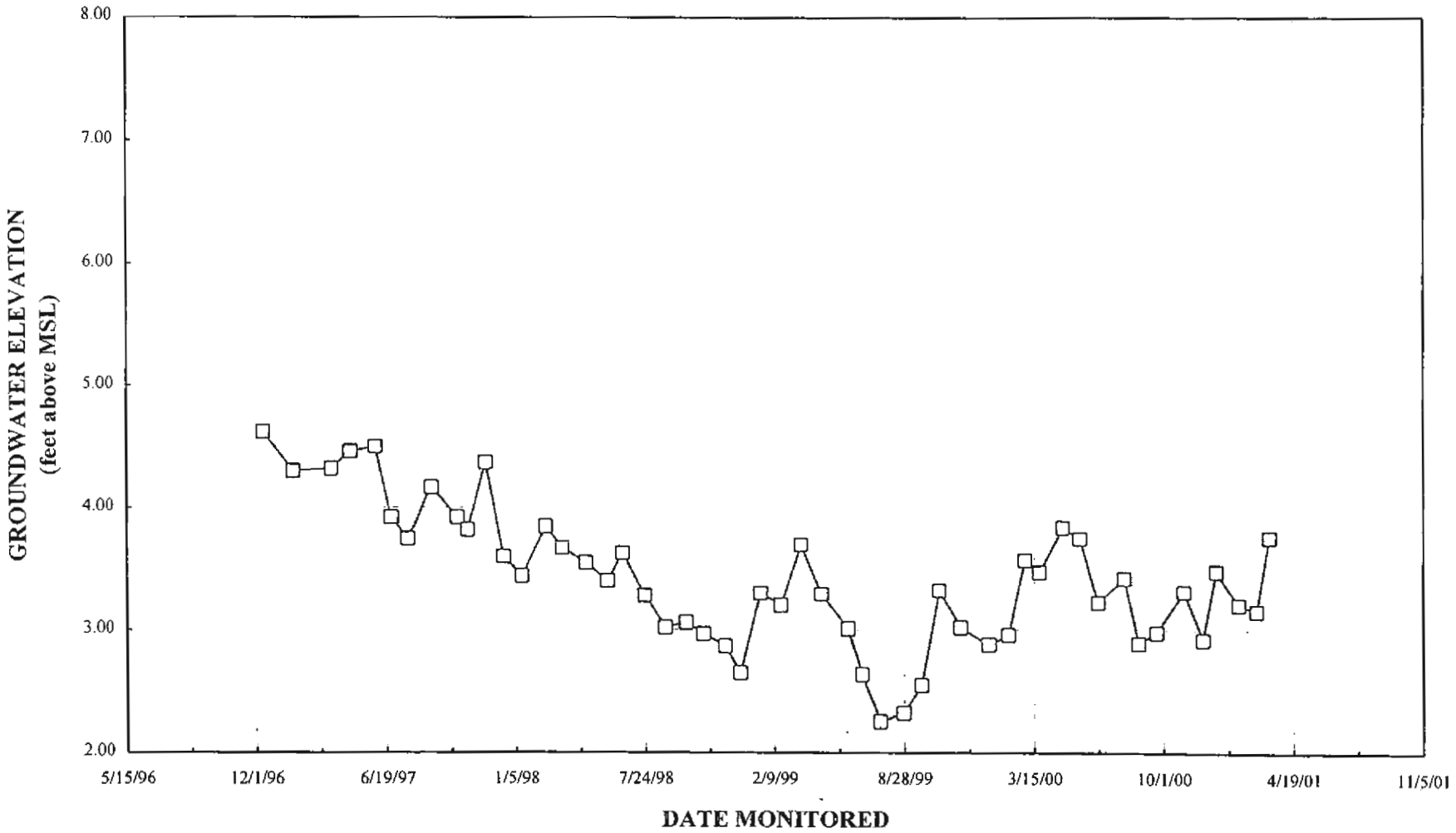
Perry Ave Realty Trust (101.20.3), Buzzards Bay, MA



Groundwater elevation corrected for water level depression by NAPL

MW-5 CORRECTED GROUNDWATER ELEVATION vs.TIME

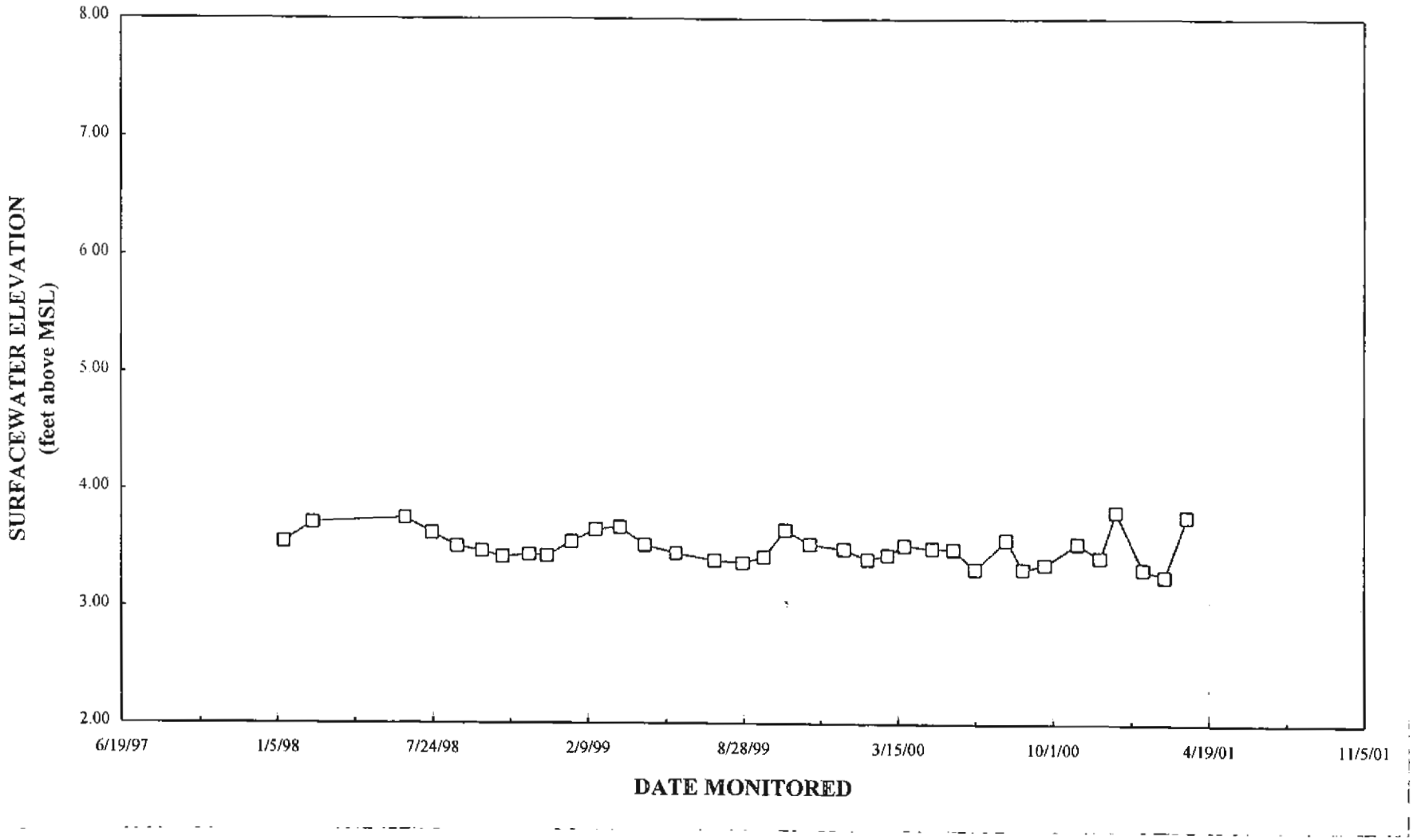
Perry Ave Realty Trust (101.20.3), Buzzards Bay, MA



Groundwater elevation corrected for water level depression by NAPL

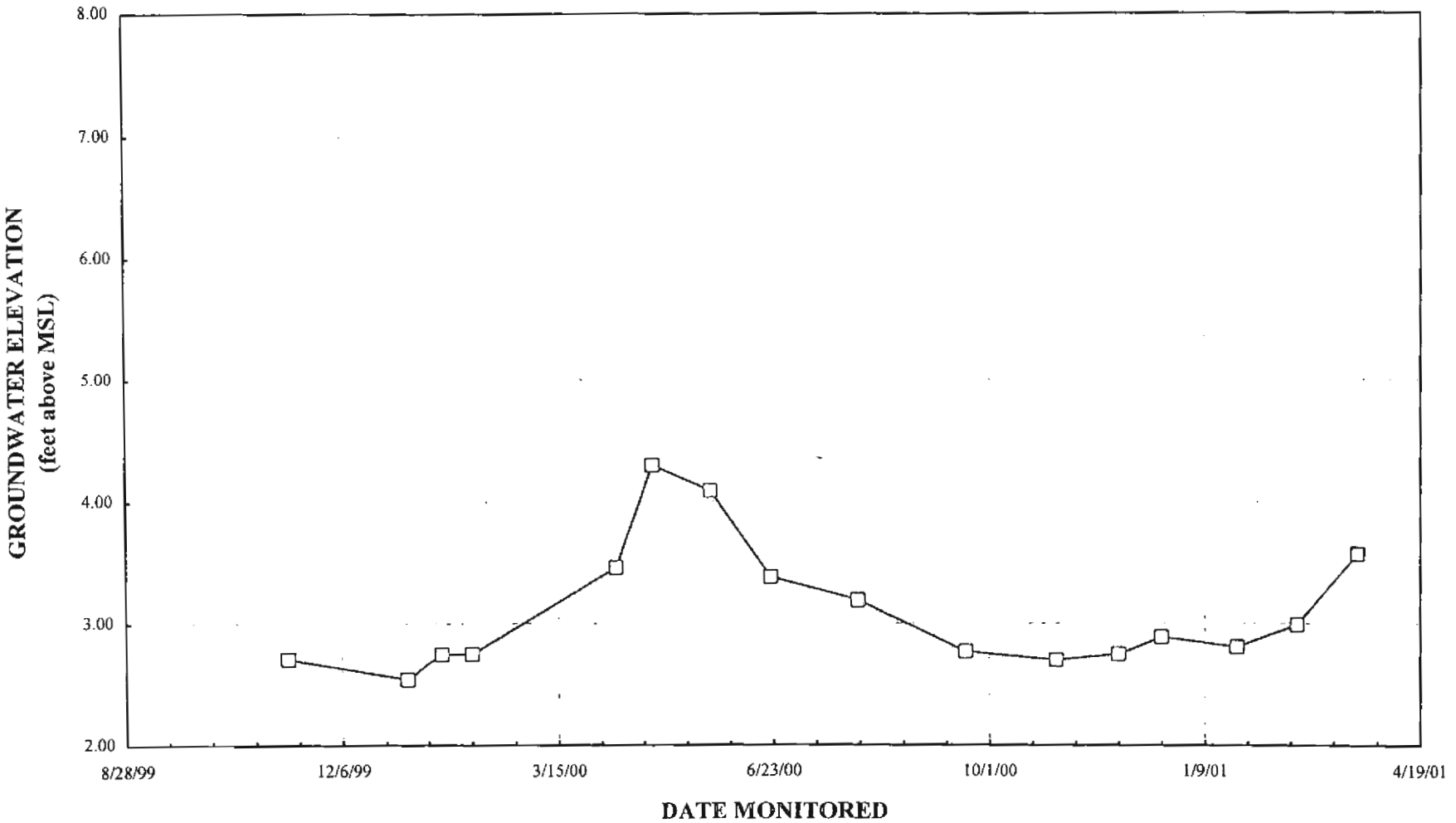
SURFACEWATER ELEVATION vs.TIME

Perry Ave Realty Trust (101.20.3), Buzzards Bay, MA



ORC-1 CORRECTED GROUNDWATER ELEVATION vs.TIME

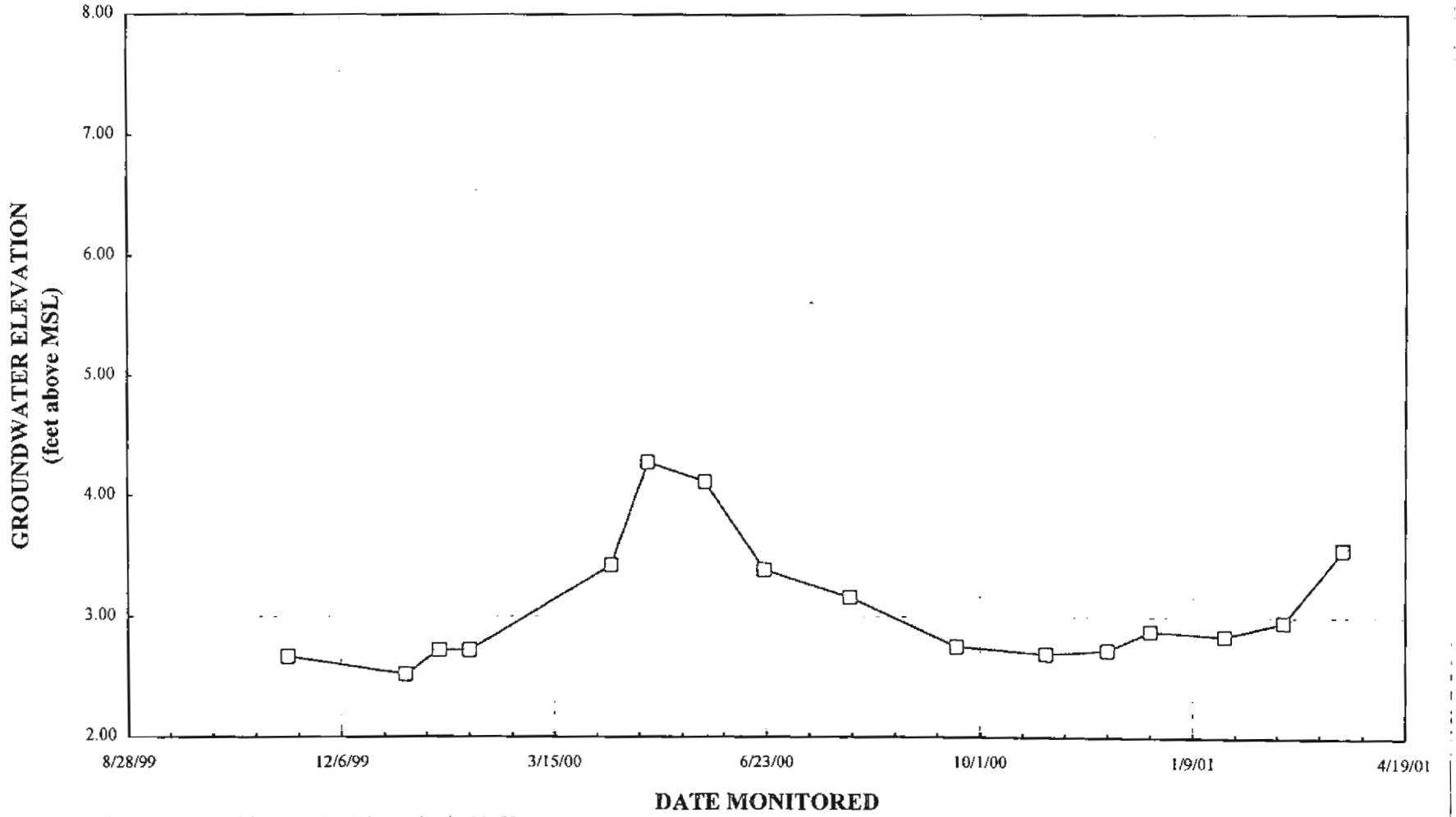
Perry Ave Realty Trust (101.20.3), Buzzards Bay, MA



Groundwater elevation corrected for water level depression by NAPL

ORC-2 CORRECTED GROUNDWATER ELEVATION vs.TIME

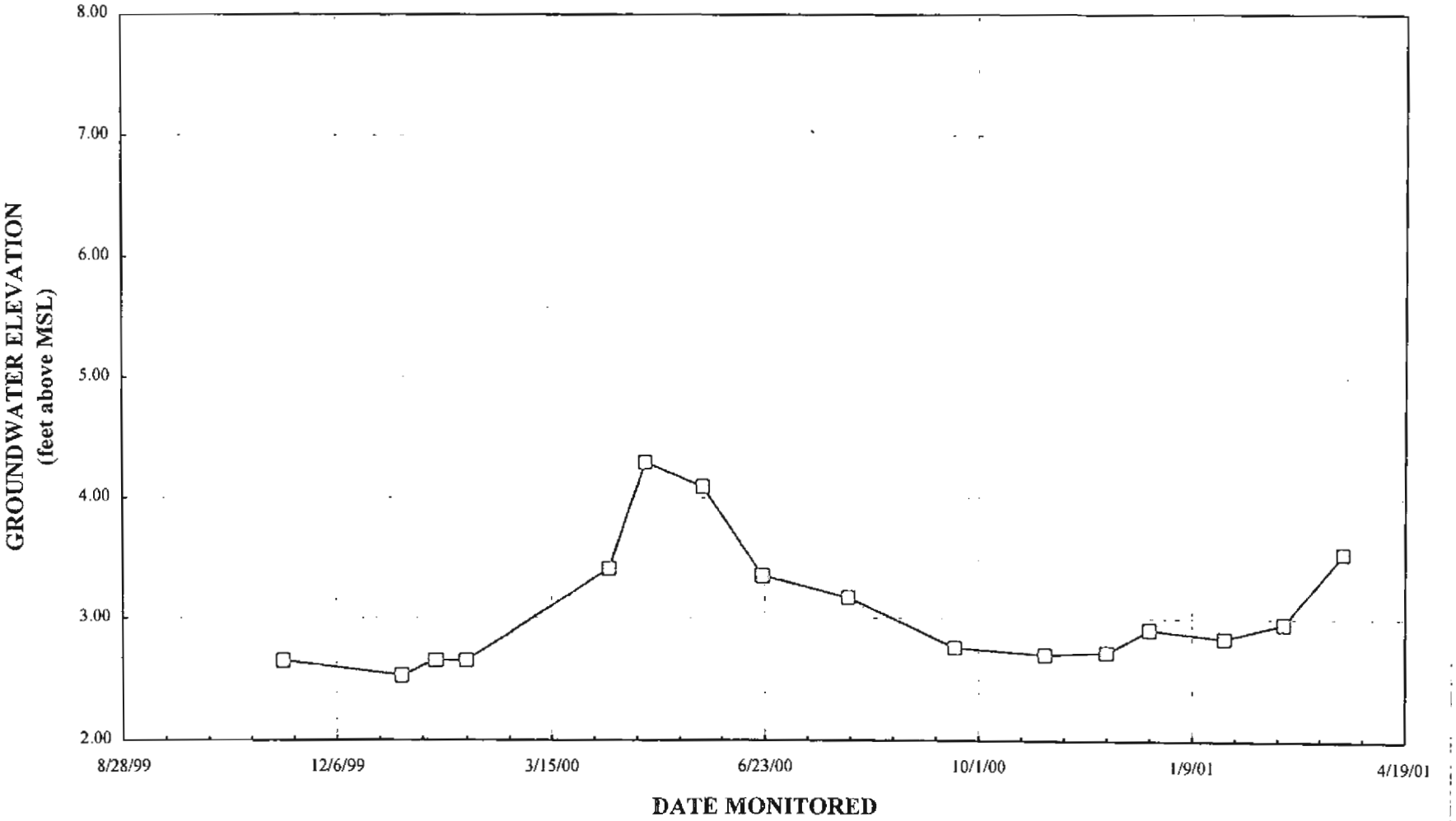
Perry Ave Realty Trust (101.20.3), Buzzards Bay, MA



Groundwater elevation corrected for water level depression by NAPL

ORC-4 CORRECTED GROUNDWATER ELEVATION vs.TIME

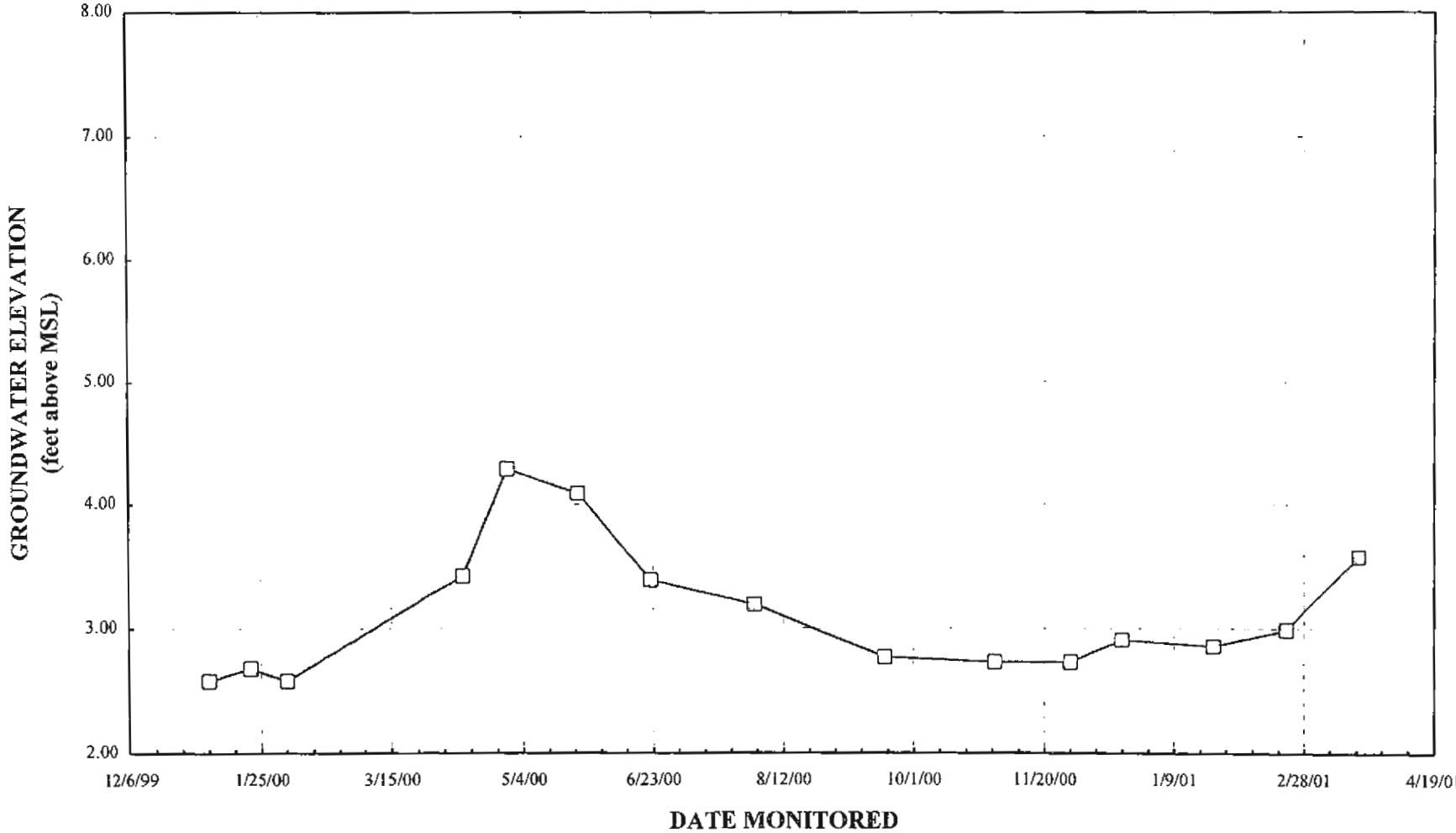
Perry Ave Realty Trust (101.20.3), Buzzards Bay, MA



Groundwater elevation corrected for water level depression by NAPL

ORC-5 CORRECTED GROUNDWATER ELEVATION vs.TIME

Perry Ave Realty Trust (101.20.3), Buzzards Bay, MA



Groundwater elevation corrected for water level depression by NAPL

APPENDIX C

GROUNDWATER AND SURFACE WATER ANALYTICAL SUMMARY TABLES AND GRAPHS

Buzzard's Bay
Ram Ref. No. 101.20

MW-1 GROUNDWATER CONCENTRATIONS

TOC=15.19

MW-1	Concentrations (ppb)																
Date	Top of PVC	Depth to Air/Oil (ft.)	Depth to Oil/Water (ft.)	NAPL Thickness	Corrected GW Elevation (ft.)	Benzene	Ethyl Benzene	Toluene	Total Xylenes	Total BTEX	MTBE	Naphthalene	VPH Target List	C5-C8 Aliphatics	C9-C12 Aliphatics	C9-C10 Aromatics	Total VPH
10/22/97	13.75	10.80	10.80	0	2.95	280	140	24	313	757	NA	NA	NA	NA	NA	NA	NA
1/14/98	13.75	10.30	10.30	0	3.45	57	13	1	17	88	95	9	192	150	82	200	624
4/21/98	13.75	9.74	9.74	0	4.01	480	300	30	570	1380	300	170	1850	1,700	BRL	2,900	6450
7/23/98	13.75	10.97	10.97	0	2.78	680	440	63	1,031	2214	220	150	2584	2,000	2,500	1,200	8284
10/22/98	13.75	10.03	10.03	0	3.72	1	<5	<5	<10	1	13	6	20	25	27	30	102
1/19/99	13.75	11.50	11.50	0	2.25	<1	<5	<5	<10	ND	<5	<5	ND	<20	<20	<20	ND
4/23/99	13.75	10.00	10.00	0	3.75	<1	<5	<5	<10	ND	43	<5	43	<20	<20	<20	43
7/22/99	13.75	10.65	10.65	0	3.10	<1	<5	<5	<10	ND	62	<5	62	<20	<20	<20	62
10/21/99	13.75	10.92	10.92	0	2.83	<1	<5	<5	<10	ND	5	<5	5	<20	<20	<20	5
2/4/00	13.75	11.06	11.06	0	2.69	<1	<5	<5	<10	ND	<5	<5	ND	<20	<20	<20	ND
4/28/00	13.75	9.59	9.59	0	4.16	<1	<5	<5	12	12	26	<5	38	160	70	69	337
8/1/00	13.75	10.54	10.54	0	3.21	180	72	10	11	273	1,100	27	1400	2,200	380	520	4500
11/1/00	13.75	10.93	10.93	0	2.82	16	<5	<5	<10	16	220	9	245	440	120	160	965
1/24/01	13.75	10.84	10.84	0	2.91	5	<5	<5	<10	5	110	<5	115	240	51	40	446
Method 1 GW-2/3 Groundwater Cleanup Standards						1,000	1,000	6,000	6,000		50,000	6,000		1,000	1,000	4,000	

NA = Not analyzed
ND = not detected above laboratory detection limit
< = below laboratory detection limit, detection limit is after < symbol.
VPH Target list = summation of BTEX, Naphthalene, and MTBE.
Total VPH in accordance with MA DEP Method for the Determination of Volatile Petroleum Hydrocarbons Including Target List and all Carbon Chains.
RAM Formula used to correct groundwater elevation for free product.
Corrected Elevation = Oil/Water elevation + (NAPL Thickness * Specific Gravity of NAPL).
Specific Gravity for gasoline = 0.74 (Taken from Merck Index Eleventh Edition, 1989).
Bold = Concentration meets or exceeds Method 1 GW-2/3 Groundwater Cleanup Standard.
Method 1 GW-2/3 Groundwater Cleanup Standard = most stringent standards between GW-2 and GW-3.

Buzzard's Bay
Ram Ref. No. 101.20

MW-2 GROUNDWATER CONCENTRATIONS

TOC=15.60

MW-2	Concentrations (ppb)																
Date	Top of PVC	Depth to Air/Oil (ft.)	Depth to Oil/Water (ft.)	NAPL Thickness	Corrected GW Elevation (ft.)	Benzene	Ethyl Benzene	Toluene	Total Xylenes	Total-BTEX	MTBE	Naphthalene	VPH Target List	C5-C8 Aliphatics	C9-C12 Aliphatics	C9-C10 Aromatics	Total VPH
10/22/97	13.69	11.11	11.11	0	2.58	660	1600	490	3850	6600	NA	NA	NA	NA	NA	NA	NA
1/14/98	13.69	10.18	10.18	0	3.51	630	660	1,600	1,550	4440	<50	64	4504	1,500	1,200	840	8044
4/23/98	13.69	9.45	9.45	0	4.24	530	520	1,400	2,500	4950	240	94	5284	1,400	<100	6,300	12984
7/23/98	13.69	9.97	9.97	0	3.72	690	770	2,800	3,800	8060	430	180	8670	3,000	6,600	2,100	20370
10/22/98	13.69	10.82	10.82	0	2.87	330	1,000	850	2,820	5000	<25	210	5210	2,300	4,800	3,000	15310
1/19/99	13.69	10.80	10.80	0	2.89	240	650	120	1,400	2410	<25	120	2530	990	2,900	2,100	8520
4/23/99	13.69	10.35	10.35	0	3.34	150	340	440	870	1800	200	64	2064	880	1,200	890	5034
7/22/99	13.69	11.23	11.23	0	2.46	170	1,000	470	1,360	3000	8,100	150	11250	3,000	3,800	3,600	21650
10/21/99	13.69	10.81	10.81	0	2.88	840	1,300	1,400	3,000	6540	100,000	<1,250	106540	5,700	<5,000	7,600	119840
2/4/00	13.69	11.04	11.04	0	2.65	90	400	820	3,400	4710	15,000	430	20140	10,000	9,800	7,500	47440
4/28/00	13.69	9.39	9.39	0	4.30	<5	<25	32	250	282	1,100	29	1411	650	710	880	3651
8/1/00	13.69	10.50	10.50	0	3.19	790	1,300	<500	2,690	4780	14,000	<500	18780	44,000	2,600	4,800	70180
11/1/00	13.69	10.95	10.95	0	2.74	1	10	21	78	110	10	7	127	130	120	150	527
1/24/01	13.69	10.83	10.83	0	2.86	<2	21	13	114	148	360	11	519	770	250	320	1859
Method 1 GW-2/3 Groundwater Cleanup Standards						2,000	4,000	6,000	6,000		50,000	6,000		1,000	1,000	1,000	

NA = Not analyzed
ND = not detected above laboratory detection limit
< = below laboratory detection limit, detection limit is after < symbol.
VPH Target list = summation of BTEX, Naphthalene, and MTBE.
Total VPH in accordance with MA DEP Method for the Determination of Volatile Petroleum Hydrocarbons. Including Target List and all Carbon Chains.
RAM Formula used to correct groundwater elevation for free product.
Corrected Elevation = Oil/Water elevation + (NAPL Thickness * Specific Gravity of NAPL).
Specific Gravity for gasoline = 0.74 (Taken from Merck Index Eleventh Edition, 1989).
Bold = Concentration meets or exceeds Method 1 GW-2/3 Groundwater Cleanup Standard.
Method 1 GW-2/3 Groundwater Cleanup Standard = most stringent standards between GW-2 and GW-3.
Data represents highest concentrations detected between sample as labeled and duplicate sample (RAM-QA/QC-500)

Buzzard's Bay
Ram Ref. No. 101.20

MW-3 GROUNDWATER CONCENTRATIONS

TOC=15.11

MW-3						Concentrations (ppb)											
Date	Top of PVC	Depth to Air/Oil (ft.)	Depth to Oil/Water (ft.)	NAPL Thickness	Corrected GW Elevation (ft.)	Benzene	Ethyl Benzene	Toluene	Total Xylenes	Total BTEX	MTBE	Naphthalene	VPH Target List	C5-C8 Aliphatics	C9-C12 Aliphatics	C9-C10 Aromatics	Total VPH
10/22/97	14.16	11.31	11.31	0	2.85	25	280	67	235	607	NA	NA	NA	NA	NA	NA	NA
1/14/98	14.16	10.65	10.65	0	3.51	55	60	5	13	133	17	5	155	1,100	200	360	1815
4/23/98	14.16	9.92	9.92	0	4.24	64	<25	27	<50	91	3,400	<25	3491	120	<100	640	4251
7/23/98	14.16	10.44	10.44	0	3.72	51	76	15	10	152	470	9	631	1,300	440	380	2751
10/22/98	14.16	11.25	11.25	0	2.91	5	24	<10	<20	29	21	12	62	1,000	250	310	1622
1/19/99	14.16	11.25	11.25	0	2.91	<1	<5	<5	<10	ND	7	<5	7	410	120	150	687
4/23/99	14.16	10.82	10.82	0	3.34	<1	<5	<5	<10	ND	320	<5	320	540	84	150	1094
7/22/99	14.16	11.70	11.70	0	2.46	<5	<25	<25	<50	ND	3,100	<25	3100	930	270	320	4620
10/21/99	14.16	11.28	11.28	0	2.88	<1	<5	<5	<10	ND	28	<5	28	630	100	240	998
2/4/00	14.16	11.49	11.49	0	2.67	<10	<50	<50	<100	ND	2,600	<50	2600	<200	<200	210	2810
4/28/00	14.16	9.87	9.87	0	4.29	61	36	<25	<50	97	2,300	<25	2397	1,300	160	200	4057
8/1/00	14.16	10.99	10.99	0	3.17	81	34	<25	320	435	2,300	130	2865	580	540	840	4825
11/1/00	14.16	11.44	11.44	0	2.72	35	77	<25	570	682	1,900	210	2792	1,500	550	1,300	6142
1/24/01	14.16	11.31	11.31	0	2.85	12	40	<10	270	322	1,000	130	1452	860	520	660	3492
Method 1 GW-2/3 Groundwater Cleanup Standards						2,000	4,000	6,000	6,000		50,000	6,000		1,000	1,000	1,000	

NA = Not analyzed
ND = not detected above laboratory detection limit
< = below laboratory detection limit, detection limit is after < symbol.
VPH Target list = summation of BTEX, Naphthalene, and MTBE.
Total VPH in accordance with MA DEP Method for the Determination of Volatile Peroleum Hydrocarbons. Including Target List and all Carbon Chains.
RAM Formula used to correct groundwater elevation for free product.
Corrected Elevation = Oil/Water elevation + (NAPL Thickness * Specific Gravity of NAPL).
Specific Gravity for gasoline = 0.74 (Taken from Merck Index Eleventh Edition, 1989).
Bold = Concentration meets or exceeds Method 1 GW-2/3 Groundwater Cleanup Standard.
Method 1 GW-2/3 Groundwater Cleanup Standard = most stringent standards between GW-2 and GW-3.

Buzzard's Bay
Ram Ref. No. 101.20

MW-4 GROUNDWATER CONCENTRATIONS

TOC=15.30

MW-4	Concentrations (ppb)																
Date	Top of PVC	Depth to Air/Oil (ft.)	Depth to Oil/Water (ft.)	NAPL Thickness	Corrected GW Elevation (ft.)	Benzene	Ethyl Benzene	Toluene	Total Xylenes	Total BTEX	MTBE	Naphthalene	VPH Target List	C5-C8 Aliphatics	C9-C12 Aliphatics	C9-C10 Aromatics	Total VPH
10/22/97	13.87	11.18	11.47	0.29	2.48	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/14/98	13.87	10.29	10.44	0.15	3.47	240	3,600	17,000	13,200	34040	<500	540	34,580	14,000	15,000	12,000	75580
4/23/98	13.87	9.46	9.51	0.05	4.37	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7/23/98	13.87	10.49	10.63	0.14	3.28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10/22/98	13.87	11.30	11.30	0	2.57	180	2,500	8,800	11,900	23380	<100	2,500	25,880	8,400	19,000	14,000	67,280
1/19/99	13.87	11.10	11.10	0	2.77	31	1,500	2,200	6,400	10131	<50	580	10,711	4,500	10,000	11,000	36,211
4/23/99	13.87	10.50	10.50	0	3.37	24	430	1,500	2,320	4274	<25	220	4,494	3,000	4,800	6,700	18,994
7/22/99	13.87	11.38	11.38	0	2.49	530	3,300	17,000	14,100	34930	<100	450	35,380	18,000	20,000	13,000	86,380
10/21/99	13.87	11.00	11.00	0	2.87	150	1,200	5,100	5,000	11450	<100	240	11,690	5,500	6,400	7,400	30,990
2/4/00	13.87	11.10	11.10	0	2.77	57	1,700	3,500	6,900	12157	<50	410	12,567	6,500	18,000	10,000	47,067
4/28/00	13.87	9.55	9.55	0	4.32	19	640	2,700	2,530	5889	<25	100	5,989	3,200	4,900	3,600	17,689
8/1/00	13.87	10.60	10.60	0	3.27	47	1,600	4,700	6,300	12647	<25	380	13,027	7,400	11,000	9,800	41,227
11/1/00	13.87	11.14	11.14	0	2.73	130	2,000	9,200	8,500	19830	<100	520	20,350	8,500	8,000	7,900	44,750
1/24/01	13.87	11.01	11.01	0	2.86	10	770	1,200	2,340	4,320	<25	150	4,470	4,200	3,300	4,400	16,370
Method 1 GW-2/3 Groundwater Cleanup Standards						2,689	1,000	6,036	6,000		50,000	6,000		1,000	1,000	1,000	

NA = Not analyzed
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< = below laboratory detection limit, detection limit is after < symbol
VPH Target list = summation of BTEX, Naphthalene, and MTBE.
Total VPH in accordance with MA DEP Method for the Determination of Volatile Petroleum Hydrocarbons. Including Target List and all Carbon Chains.
RAM Formula used to correct groundwater elevation for free product.
Corrected Elevation = Oil/Water elevation + (NAPL Thickness * Specific Gravity of NAPL)
Specific Gravity for gasoline = 0.74 (Taken from Merck Index Eleventh Edition, 1989).
Bold = Concentration meets or exceeds Method 1 GW-2/3 Groundwater Cleanup Standard.
Method 1 GW-2/3 Groundwater Cleanup Standard = most stringent standards between GW-2 and GW-3.
10/22/98 - Data represents highest concentrations detected between sample as labeled and duplicate sample (RAM-QA/QC-500)

Buzzard's Bay
Ram Ref. No. 101.20

MW-5 GROUNDWATER CONCENTRATIONS

TOC=15.69

MW-5	Concentrations (ppb)																
Date	Top of PVC	Depth to Air/Oil (ft.)	Depth to Oil/Water (ft.)	NAPL Thickness	Corrected GW Elevation (ft.)	Benzene	Ethyl Benzene	Toluene	Total Xylenes	Total BTEX	MTBE	Naphthalene	VPH Target List	C5-C8 Aliphatics	C9-C12 Aliphatics	C9-C10 Aromatics	Total VPH
10/22/97	14.25	10.43	10.43	0	3.82	5	<0.5	<0.5	313	318	NA	NA	NA	NA	NA	NA	NA
1/14/98	14.25	10.81	10.81	0	3.44	<1	<1	<1	4	4	<5	<5	4	170	<5	<5	174
4/23/98	14.25	10.70	10.70	0	3.55	22	<5	<5	20	42	<5	<5	42	320	<20	63	425
7/23/98	14.25	10.97	10.97	0	3.28	42	<5	<5	32	74	10	<5	84	390	85	44	603
10/22/98	14.25	11.28	11.28	0	2.97	1	<5	<5	<10	1	<5	<5	1	370	<20	<20	371
1/19/99	14.25	10.95	10.95	0	3.30	<1	16	22	71	109	<5	56	165	330	240	170	905
4/23/99	14.25	10.96	10.96	0	3.29	<1	<5	<5	<10	ND	<5	<5	ND	120	<20	<20	120
7/22/99	14.25	12.00	12.00	0	2.25	2	<5	<5	<10	2	<5	<5	2	140	<20	<20	142
10/21/99	14.25	10.93	10.93	0	3.32	<1	<5	<5	<10	ND	11	<5	11	100	<20	<20	111
2/4/00	14.25	11.29	11.29	0	2.96	<1	<5	<5	<10	ND	<5	<5	ND	87	<20	<20	87
4/28/00	14.25	10.41	10.41	0	3.84	<1	<5	<5	<10	ND	<5	<5	ND	98	<20	<20	98
8/1/00	14.25	10.83	10.83	0	3.42	<1	<5	<5	<10	ND	<5	<5	ND	23	<20	<20	23
11/1/00	14.25	10.94	10.94	0	3.31	<1	<5	<5	<10	ND	<5	<5	ND	82	<20	<20	82
1/24/01	14.25	11.05	11.05	0	3.20	<1	<5	<5	<10	ND	<5	<5	ND	66	<20	<20	66
Method 1 GW-2/3 Groundwater Cleanup Standards						2,000	4,800	6,800	6,000		50,000	6,000		1,000	1,000	4,000	

NA = Not analyzed
ND = not detected above laboratory detection limit
< = below laboratory detection limit, detection limit is after < symbol.
VPH Target list = summation of BTEX, Naphthalene, and MTBE
Total VPH in accordance with MA DEP Method for the Determination of Volatile Petroleum Hydrocarbons. Including Target List and all Carbon Chains
RAM Formula used to correct groundwater elevation for free product.
Corrected Elevation = Oil/Water elevation + (NAPL Thickness * Specific Gravity of NAPL).
Specific Gravity for gasoline = 0.74 (Taken from Merck Index Eleventh Edition, 1989).
Bold = Concentration meets or exceeds Method 1 GW-2/3 Groundwater Cleanup Standard.
Method 1 GW-2/3 Groundwater Cleanup Standard = most stringent standards between GW-2 and GW-3.

Buzzard's Bay
Ram Ref. No. 101.20

SW-1 WATER CONCENTRATIONS

Stream Gauge=5.57

SW-1	Concentrations (ppb)												
Date	SW Elevation (ft.)	Benzene	Ethyl Benzene	Toluene	Total Xylenes	Total BTEX	MTBE	Naphthalene	VPH Target List	C5-C8 Aliphatics	C9-C12 Aliphatics	C9-C10 Aromatics	Total VPH
10/22/97		<0.25	<0.25	<0.25	<0.5	ND	NA	NA	NA	NA	NA	NA	NA
1/14/98	3.55	<1	<1	<1	<2	ND	<5	<5	ND	<5	<5	<5	ND
4/23/98		<1	<5	<5	<10	ND	<5	<5	ND	<20	<20	<20	ND
7/23/98	3.62	<1	<5	<5	<10	ND	<5	<5	ND	<20	<20	<20	ND
10/22/98	3.42	<1	<5	<5	<10	ND	<5	<5	ND	<20	<20	<20	ND
1/19/99	3.55	<1	<5	<5	<10	ND	<5	<5	ND	<20	<20	<20	ND
4/23/99	3.52	<1	<5	<5	<10	ND	<5	<5	ND	<20	<20	<20	ND
7/22/99	3.39	<1	<5	<5	<10	ND	<5	<5	ND	<20	<20	<20	ND
10/21/99	3.65	<1	<5	<5	<10	ND	<5	<5	ND	<20	<20	<20	ND
2/4/00	3.40	<1	<5	<5	<10	ND	<5	<5	ND	<20	<20	<20	ND
4/28/00	3.50	<1	<5	<5	<10	ND	<5	<5	ND	<20	<20	<20	ND
8/1/00	3.57	<1	<5	<5	<10	ND	<5	<5	ND	<20	<20	<20	ND
11/1/00	3.54	<1	<5	<5	<10	ND	<5	<5	ND	<20	<20	<20	ND
1/24/01	3.32	<1	<5	<5	<10	ND	28	<5	28	<20	<20	<20	28
FW Acute		5,300	32,000	17,500	NP		NP	2,300		NP	NP	NP	
FW Chronic		NP	NP	NP	NP		NP	620		NP	NP	NP	

NA = Not analyzed
ND = not detected above laboratory detection limit
< = below laboratory detection limit, detection limit is after < symbol.
VPH Target list = summation of BTEX, Naphthalene, and MTBE.
Total VPH in accordance with MA DEP Method for the Determination of Volatile Petroleum Hydrocarbons. Including Target List and all Carbon Chains.

Buzzard's Bay
Ram Ref. No. 101.20

ORC-1 GROUNDWATER VPH AND TARGET VOCS CONCENTRATIONS

ORC-1	Concentration (ppb)															
Date	Top of PVC	Depth to Air/Oil (ft.)	Depth to Oil/Water (ft.)	NAPL Thickness	Corrected GW Elevation (ft.)	Benzene	Ethyl Benzene	Toluene	Total Xylenes	Total BTEX	MTBE	Naphthalene	VPH Target List	C5-C8 Aliphatics	C9-C12 Aliphatics	C9-C10 Aromatics	Total VPH
2/4/00	14.11	11.36	11.36	0	2.75	77	440	200	3,150	3,867	4,800	220	8,887	5,100	14,000	11,000	38,987
4/28/00	14.11	9.81	9.81	0	4.30	20	270	95	1,780	2,165	400	120	2,685	3,500	6,900	7,900	20,985
8/1/00	14.11	10.92	10.92	0	3.19	34	350	75	2,050	2,509	450	170	3,129	3,200	5,800	9,700	21,829
11/1/00	14.11	11.41	11.41	0	2.70	87	370	89	2,320	2,866	3,800	250	6,916	6,500	5,100	9,400	27,916
1/24/01	14.11	11.30	11.30	0	2.81	75	330	63	2,130	2,598	1,700	230	4,528	5,300	4,600	7,600	22,028
Method 1 GW-1 Groundwater Cleanup Standard						5	700	1,000	10,000		70	20		400	4,000	200	
Method 1 GW-2/3 Groundwater Cleanup Standards						1,000	4,000	6,000	6,000		50,000	6,000		1,000	1,000	4,000	

NA = Not analyzed
ND = not detected above laboratory detection limit
< = below laboratory detection limit, detection limit is after < symbol.
VPH Target list = summation of BTEX, Naphthalene, and MTBE.
Total VPH in accordance with MA DEP Method for the Determination of Volatile Petroleum Hydrocarbons. Including Target List and all Carbon Chains.
RAM Formula used to correct groundwater elevation for free product.
Corrected Elevation = Oil/Water elevation + (NAPL Thickness * Specific Gravity of NAPL).
Specific Gravity for gasoline = 0.74 (Taken from Merck Index Eleventh Edition, 1989)
Bold = Concentration meets or exceeds Method 1 GW-1 Groundwater Cleanup Standard.
Method 1 GW-2/3 Groundwater Cleanup Standard = most stringent standards between GW-2 and GW-3

Buzzard's Bay
Ram Ref. No. 101.20

ORC-2 GROUNDWATER VPH AND TARGET VOCS CONCENTRATIONS

ORC-2	Concentrations (ppb)																
Date	Top of PVC	Depth to Air/Oil (ft.)	Depth to Oil/Water (ft.)	NAPL Thickness	Corrected GW Elevation (ft.)	Benzene	Ethyl Benzene	Toluene	Total Xylenes	Total BTEX	MTBE	Naphthalene	VPH Target List	C5-C8 Aliphatics	C9-C12 Aliphatics	C9-C10 Aromatics	Total VPH
2/4/00	13.62	10.90	10.90	0	2.72	**200**	**1,100**	<250	4,900	6,200	**8,600**	**330**	15,130	**7,700**	**18,000**	**12,000**	52,830
4/28/00	13.62	9.34	9.34	0	4.28	**43**	**860**	52	3,600	4,555	**130**	**240**	4,925	**4,400**	**12,000**	**12,000**	33,325
8/1/00	13.62	10.46	10.46	0	3.16	<5	**750**	51	3,400	4,201	**240**	**320**	4,761	**2,900**	**8,500**	**13,000**	29,161
11/1/00	13.62	10.93	10.93	0	2.69	**120**	600	54	2,860	3,634	**4,700**	**290**	8,624	**5,600**	**5,500**	**10,000**	29,724
1/24/01	13.62	10.78	10.78	0	2.84	**29**	540	<50	1,520	2,089	**750**	**230**	3,069	**4,700**	**5,000**	**7,900**	20,669
Method 1 GW-1 Groundwater Cleanup Standard						**5**	**700**	**1,000**	**10,000**		**70**	**20**		**400**	**1,000**	**200**	
Method 1 GW-2/3 Groundwater Cleanup Standards						**2,000**	**4,000**	**6,000**	**6,000**		**50,000**	**6,000**		**1,000**	**1,000**	**4,000**	

NA = Not analyzed
ND = not detected above laboratory detection limit
< = below laboratory detection limit, detection limit is after < symbol.
VPH Target list = summation of BTEX, Naphthalene, and MTBE.
Total VPH in accordance with MA DEP Method for the Determination of Volatile Petroleum Hydrocarbons. Including Target List and all Carbon Chains.
RAM Formula used to correct groundwater elevation for free product.
Corrected Elevation = Oil/Water elevation + (NAPL Thickness * Specific Gravity of NAPL)
Specific Gravity for gasoline = 0.74 (Taken from Merck Index Eleventh Edition, 1989).
Bold = Concentration meets or exceeds Method 1 GW-1 Groundwater Cleanup Standard.
Method 1 GW-2/3 Groundwater Cleanup Standard = most stringent standards between GW-2 and GW-3

Buzzard's Bay
Ram Ref. No. 101.20

ORC-4 GROUNDWATER VPH AND TARGET VOCS CONCENTRATIONS

ORC-4	Concentrations (ppb)																
Date	Top of PVC	Depth to Air/Oil (ft.)	Depth to Oil/Water (ft.)	NAPL Thickness	Corrected GW Elevation (ft.)	Benzene	Ethyl Benzene	Toluene	Total Xylenes	Total BTEX	MTBE	Naphthalene	VPH Target List	C5-C8 Aliphatics	C9-C12 Aliphatics	C9-C10 Aromatics	Total VPH
2/4/00	13.85	11.20	11.20	0	2.65	31	1,700	1,500	9,100	12,331	<50	340	12,671	6,600	23,000	13,000	55,271
4/28/00	13.85	9.56	9.56	0	4.29	3	410	250	2,310	2,973	11	78	3,062	2,400	6,000	4,000	15,462
8/1/00	13.85	10.68	10.68	0	3.17	25	940	390	4,400	5,755	1,300	260	7,315	4,000	9,300	9,500	30,115
11/1/00	13.85	11.15	11.15	0	2.70	25	1,000	420	4,900	6,345	350	280	6,975	4,800	6,400	9,700	27,875
1/24/01	13.85	11.01	11.01	0	2.84	<10	1,100	620	5,900	7,620	290	220	8,130	4,400	7,200	8,400	28,130
Method 1 GW-1 Groundwater Cleanup Standard						5	700	1,500	10,000		70	20		400	1,000	200	
Method 1 GW-2/3 Groundwater Cleanup Standards						2,000	4,000	6,000	6,000		50,000	6,000		1,000	1,000	4,000	

NA = Not analyzed
ND = not detected above laboratory detection limit
< = below laboratory detection limit, detection limit is after < symbol
VPH Target list = summation of BTEX, Naphthalene, and MTBE.
Total VPH in accordance with MA DEP Method for the Determination of Volatile Petroleum Hydrocarbons. Including Target List and all Carbon Chains.
RAM Formula used to correct groundwater elevation for free product.
Corrected Elevation = Oil/Water elevation + (NAPL Thickness * Specific Gravity of NAPL).
Specific Gravity for gasoline = 0.74 (Taken from Merck Index Eleventh Edition, 1989).
Bold = Concentration meets or exceeds Method 1 GW-1 Groundwater Cleanup Standard.
Method 1 GW-2/3 Groundwater Cleanup Standard = most stringent standards between GW-2 and GW-3.

Buzzard's Bay

Ram Ref. No. 101.28

ORC-1 GROUNDWATER EPH AND TARGET PAHs CONCENTRATIONS

ORC-1						Concentration (ppb)																				
Date	Top of PVC	Depth to Oil/Well (ft.)	Depth to Oil/Water (ft.)	NAPL Thickness	Corrected GW Elevation (ft.)	Naphthalene	2-Methylnaphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-cd)pyrene	Dibenz(a,h)anthracene	Benzo(g,h,i)perylene	Total EPH Target List	C9-C18 Aliphatics	C19-C36 Aliphatics	C11-C22 Aromatics	Total EPH
2/4/00	14.11	11.36	11.36	0	2.75	73	81	<0.1	1.0	1.8	1.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	158	1,200	<500	310	1,668
4/28/00	14.11	9.81	9.81	0	4.30	36	52	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	88	<500	<500	440	528
8/1/00	14.11	10.92	10.92	0	3.19	41	53	<0.5	0.7	1.3	1.1	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	97	920	<500	450	1,467
11/1/00	14.11	11.41	11.41	0	2.70	83	73	<0.5	0.9	1.6	0.9	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	159	<500	<500	280	439
1/24/01	14.11	11.30	11.30	0	2.81	92	78	<0.5	0.9	1.2	0.8	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	173	1,500	<500	630	2,303
Method 1 GW-1 Groundwater Cleanup Standard						20	10	300	2,000	300	300	2,000	200	200	5	1	5	1	5	1	0.3	1,000		5,000	2,000	300
Method 1 GW-2/3 Groundwater Cleanup Standard						20	10	300	2,000	300	300	2,000	200	200	5	1	5	1	5	1	0.3	1,000		5,000	2,000	300

NA = Not analyzed

ND = not detected above laboratory detection limit

< = below laboratory detection limit, detection limit is after < symbol.

EPH Target list = summation of EPH analytes

Total EPH in accordance with MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons. Including Target List and all Carbon Chains.

RAM Formula used to correct groundwater elevation for free product.

Corrected Elevation = Oil/Water elevation + (NAPL Thickness * Specific Gravity of NAPL).

Specific Gravity for gasoline = 0.74 (Taken from Merck Index Eleventh Edition, 1989).

Bold = Concentration meets or exceeds Method 1 GW-1 Groundwater Cleanup Standard.

Method 1 GW-2/3 Groundwater Cleanup Standard = most stringent standards between GW-2 and GW-3.

Buzzard's Bay
Ram Ref. No. 101.20

ORC-2 GROUNDWATER EPH AND TARGET PAHS CONCENTRATIONS

ORC-2

Date	Top of PVC	Depth to Oil/Water Interface (ft.)	Depth to Groundwater (ft.)	NAPL Thickness	Corrected GW Elev. No. (ft.)		Concentrations (ppb)																			
							2-Methylnaphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Phenanthrene	Pyrene	Total EPH Target List	C9-C18 Aliphatics	C19-C36 Aliphatics	C11-C22 Aromatics	Total EPH
2/4/00	13.62	10.90	10.90	0	2.72	120	110	<0.1	1.7	3.0	2.3	0.2	0.3	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	238	1,900	< 500	520	2,658
4/28/00	13.62	9.34	9.34	0	4.28	78	63	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	141	< 500	< 500	370	511
8/1/00	13.62	10.46	10.46	0	3.16	61	67	< 0.5	1.0	1.6	1.1	< 0.5	< 0.5	< 0.5	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	132	600	< 500	480	1,212
11/1/00	13.62	10.93	10.93	0	2.69	70	69	< 0.5	0.8	1.5	1.1	< 0.5	< 0.5	< 0.5	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	142	< 500	< 500	230	372
1/24/01	13.62	10.78	10.78	0	2.84	79	68	< 0.5	0.8	1.2	1.0	< 0.5	< 0.5	< 0.5	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	150	840	<500	630	1,620
Method 1 GW-1 Groundwater Cleanup Standard																											
Method 1 GW-2/3 Groundwater Cleanup Standard																											

NA = Not analyzed
ND = not detected above laboratory detection limit
< = below laboratory detection limit, detection limit is after < symbol.
EPH Target list = summation of EPH analytes
Total EPH in accordance with MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons. Including Target List and all Carbon Chains
RAM Formula used to correct groundwater elevation for free product.
Corrected Elevation = Oil/Water elevation + (NAPL Thickness * Specific Gravity of NAPL).
Specific Gravity for gasoline = 0.74 (Taken from Merck Index Eleventh Edition, 1989).
Bold = Concentration meets or exceeds Method 1 GW-1 Groundwater Cleanup Standard.
Method 1 GW-2/3 Groundwater Cleanup Standard = most stringent standards between GW-2 and GW-3.

Buzzard's Bay

Rem Ref. No. 101.20

ORC-4 GROUNDWATER EPH AND TARGET PAHS CONCENTRATIONS

ORC 4																									
Date	Top of PVC	Depth to Air/Oil (ft.)	Depth to Oil/Water (ft.)	NAPL Thickness	Corrected GW Elevation (ft.)	Naphthalene	2-Methylnaphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-cd)pyrene	Dibenz(a,h)anthracene	Benzo(g,h,i)perylene	Total EPH Target List	C9-C18 Aliphatics	C19-C36 Aliphatics	C11-C22 Aromatics	Total EPH
2/4/00	14.11	11.36	11.36	0	2.75	110	69	<0.1	1.0	2.1	1.3	0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	184	3,100	<500	670	3,954
4/28/00	14.11	9.56	9.56	0	4.55	38	22	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	60	1,200	<500	530	1,790
8/1/00	14.11	10.68	10.68	0	3.43	60	36	<0.5	<0.5	0.8	<0.5	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	97	1,000	<500	430	1,527
11/1/00	14.11	11.15	11.15	0	2.96	59	35	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	95	<500	<500	<200	95
1/24/01	14.11	11.01	11.01	0	3.10	66	35	<0.5	<0.5	0.5	<0.5	<0.5	<0.5	<0.5	<0.1	<0.1	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	102	1,300	<500	770	2,172
Method 1 GW-1 Groundwater Cleanup Standard						20	10	NS	2	NS	3	NS	3	NS	0.9	NS	1	1	1	1	0.2	0.5	0.1	4,000	5,000	2,000	
Method 1 GW-2/3 Groundwater Cleanup Standard						20	10	NS	2	NS	3	NS	3	NS	0.9	NS	1	1	1	1	0.2	0.5	0.1	4,000	5,000	2,000	

NA = Not analyzed

ND = not detected above laboratory detection limit

< = below laboratory detection limit, detection limit is after < symbol.

EPH Target list = summation of EPH analytes

Total EPH in accordance with MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons. Including Target List and all Carbon Chains.

RAM Formula used to correct groundwater elevation for free product.

Corrected Elevation = Oil/Water elevation + (NAPL Thickness * Specific Gravity of NAPL).

Specific Gravity for gasoline = 0.74 (Taken from Merck Index Eleventh Edition, 1989).

Bold = Concentration meets or exceeds Method 1 GW-1 Groundwater Cleanup Standard.

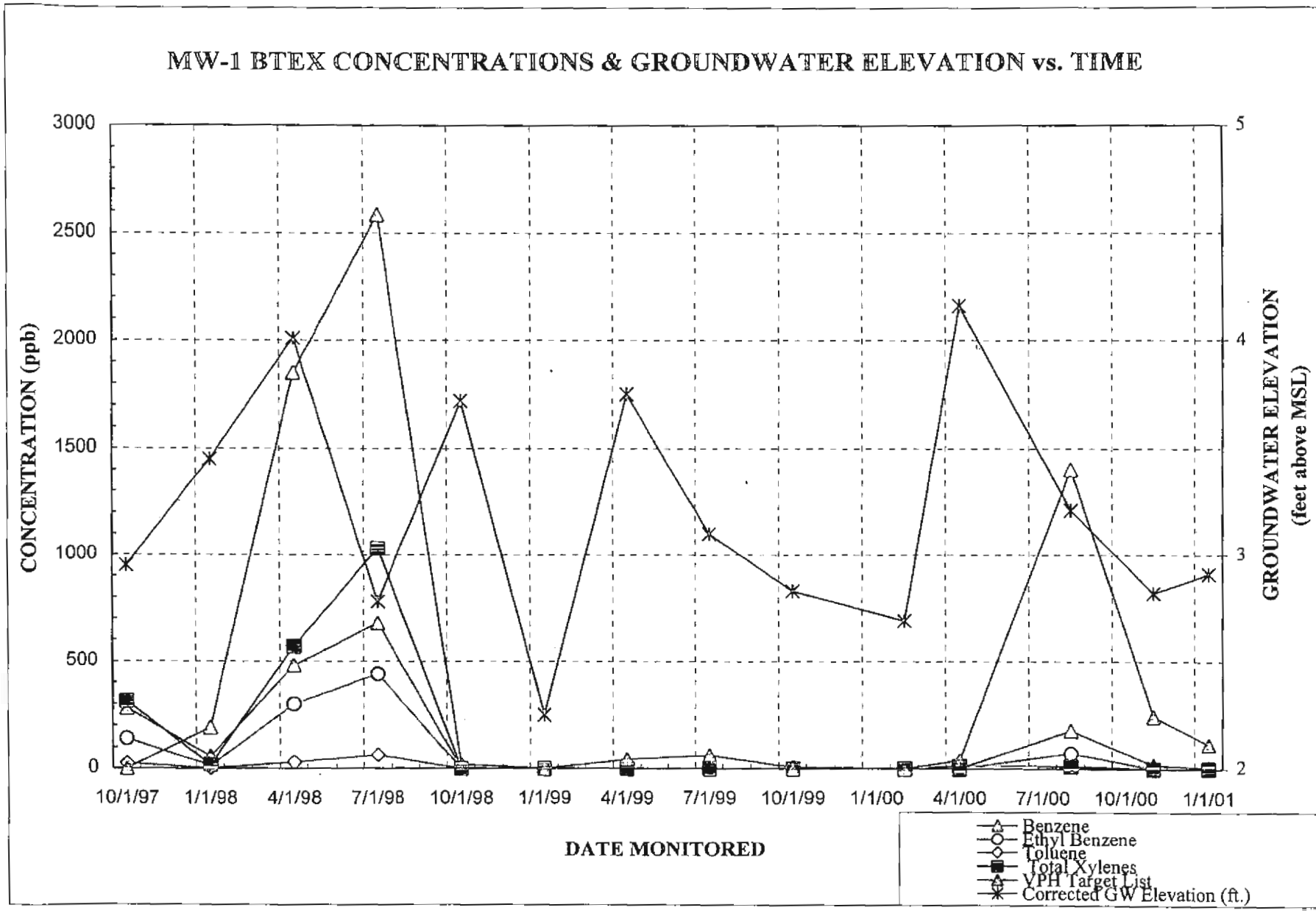
Method 1 GW-2/3 Groundwater Cleanup Standard = most stringent standards between GW-2 and GW-3.

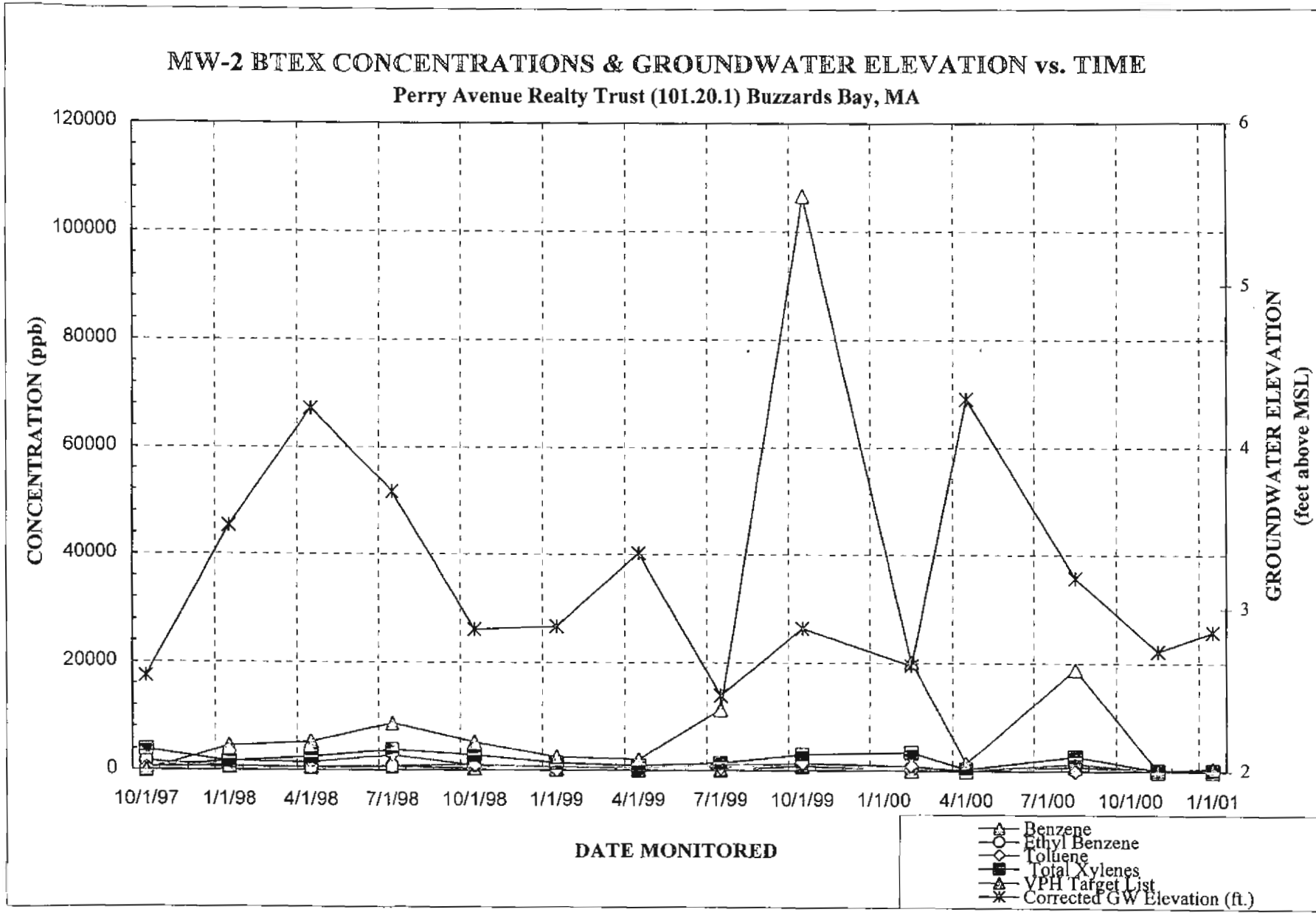
Buzzard's Bay
Rem Ref. No. 101.20

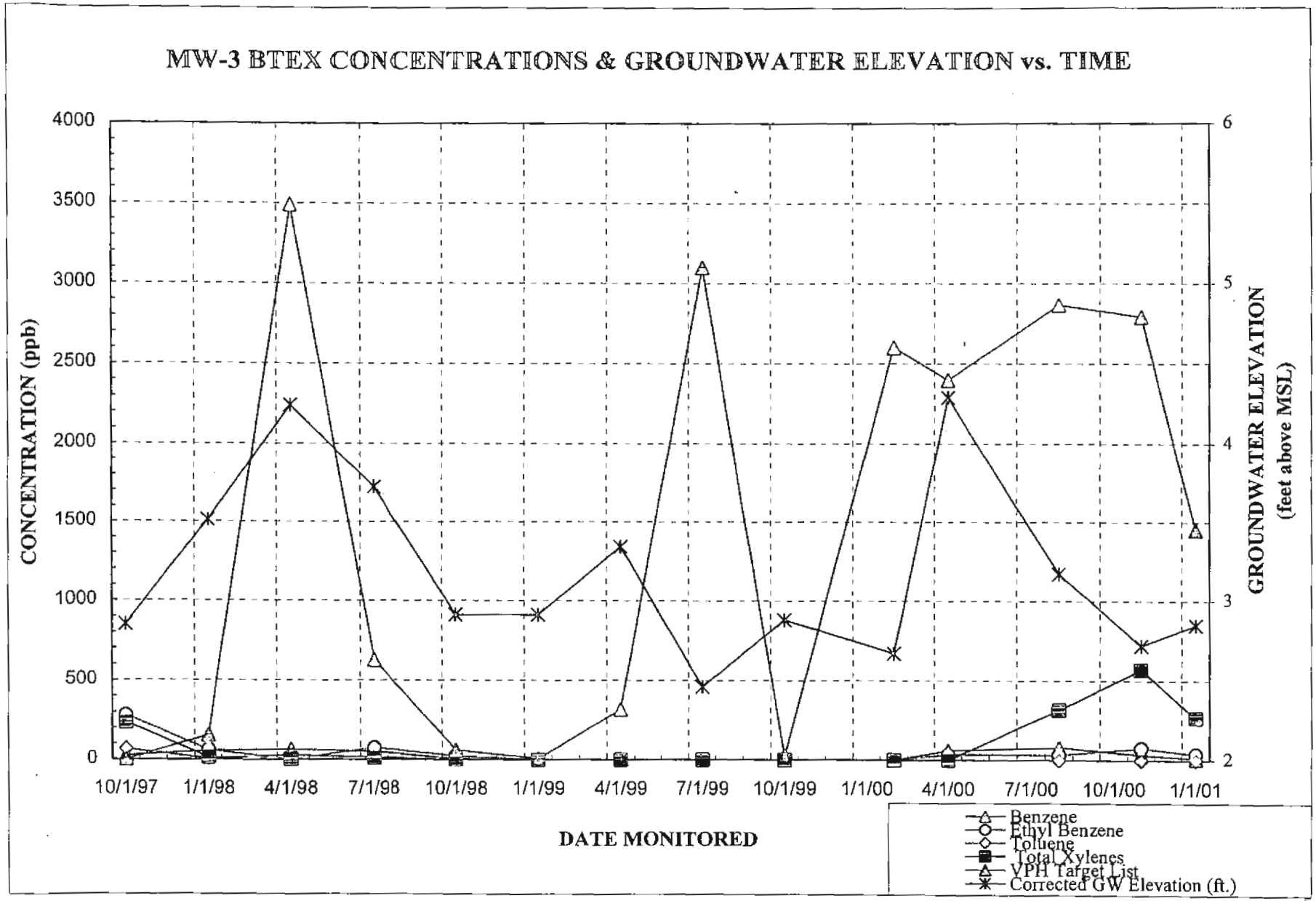
SURFACE WATER EPH AND TARGET PAHS CONCENTRATIONS

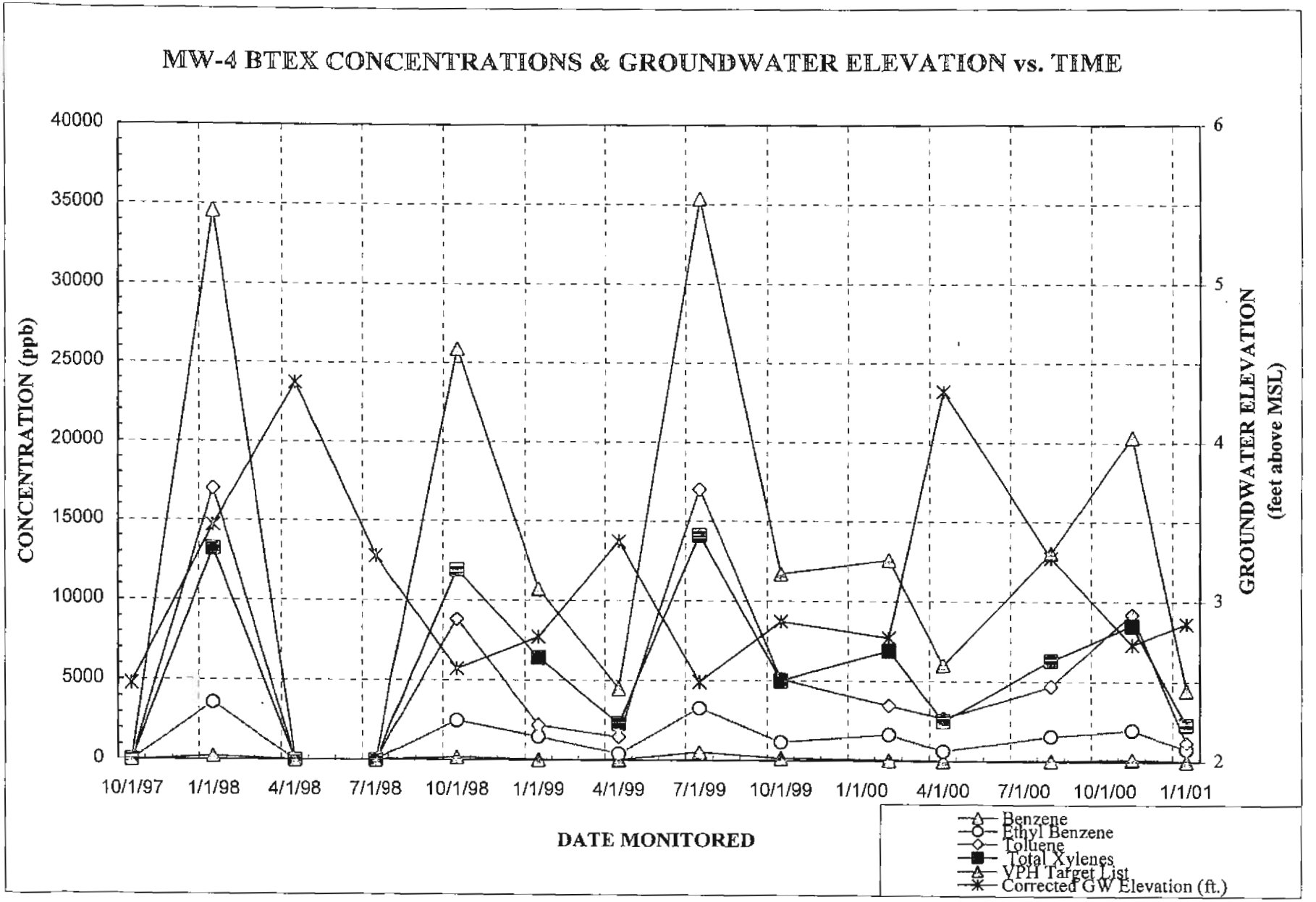
SW		Concentrations (ppb)																			
Date	SW Elevation (ft.)	Naphthalene	2-Methylnaphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-cd)pyrene	Dibenz(a,h)anthracene	Benzo(g,h,i)perylene	Total EPH Target List	C9-C18 Aliphatics	C19-C36 Aliphatics	C11-C22 Aromatics	Total EPH
2/4/00	3.40	0.1	< 0.1	0.1	0.6	0.1	0.5	< 0.1	1.1	0.8	0.2	0.5	0.8	0.3	0.4	0.4	< 0.1	0.4	6.3	< 500	< 500	< 200	6.3
4/28/00	3.50	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.2	< 0.1	< 0.1	< 0.1	< 0.1	0.0	< 510	< 510	< 200	0.0
8/1/00	3.57	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.0	< 500	< 500	< 500	0.0
11/1/00	3.54	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.2	0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2	< 500	< 500	< 200	0.2
1/24/01	3.32	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.1	0.2	0.3	< 0.1	0.2	0.1	< 0.1	0.1	0.9	< 500	< 500	< 200	0.9
FW Acute																							
FW Chronic																							

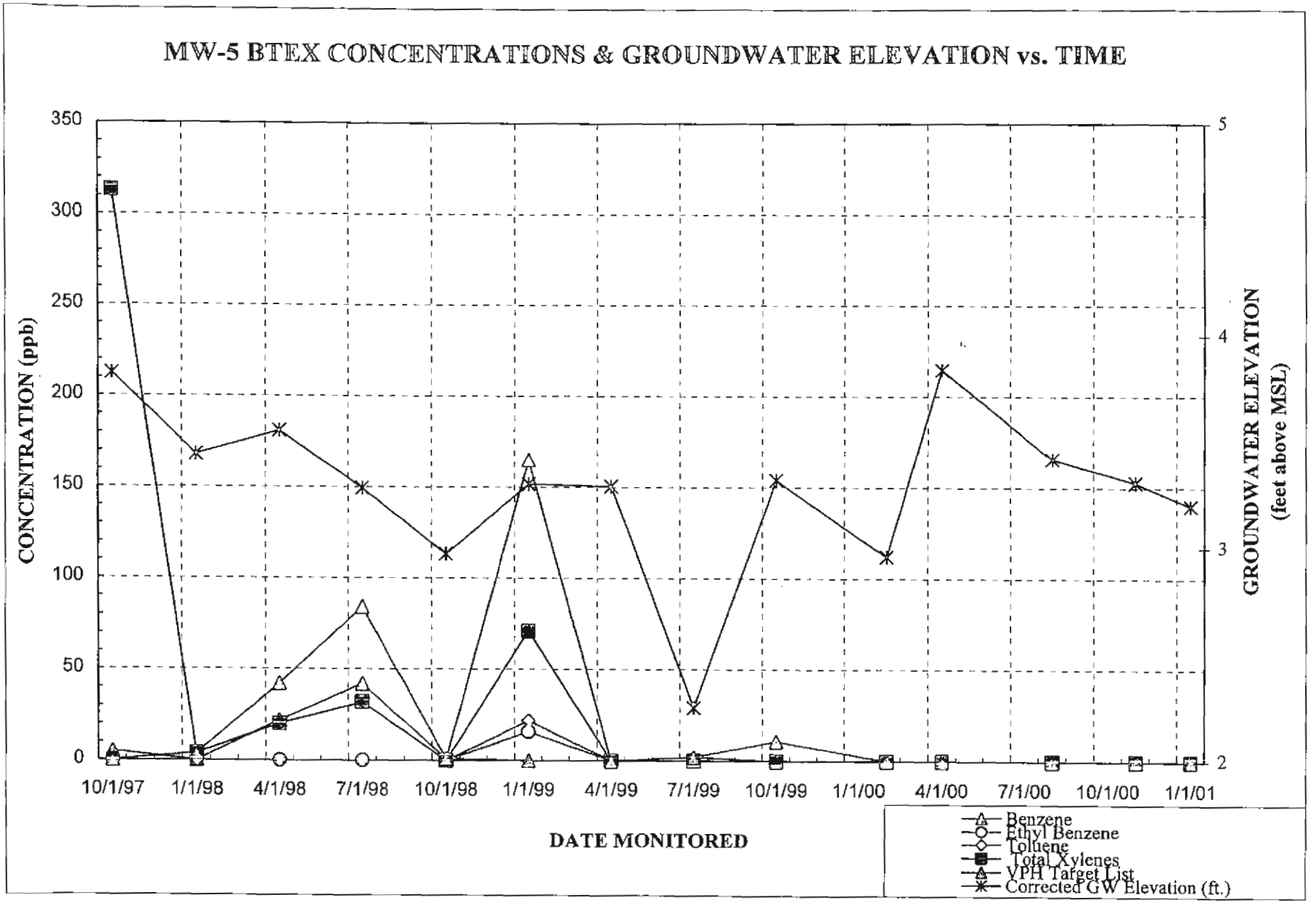
NA = Not analyzed
ND = not detected above laboratory detection limit
< = below laboratory detection limit, detection limit is after < symbol.
EPH Target list = summation of all target analytes.
Total EPH in accordance with MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons. Including Target List and all Carbon Chains.

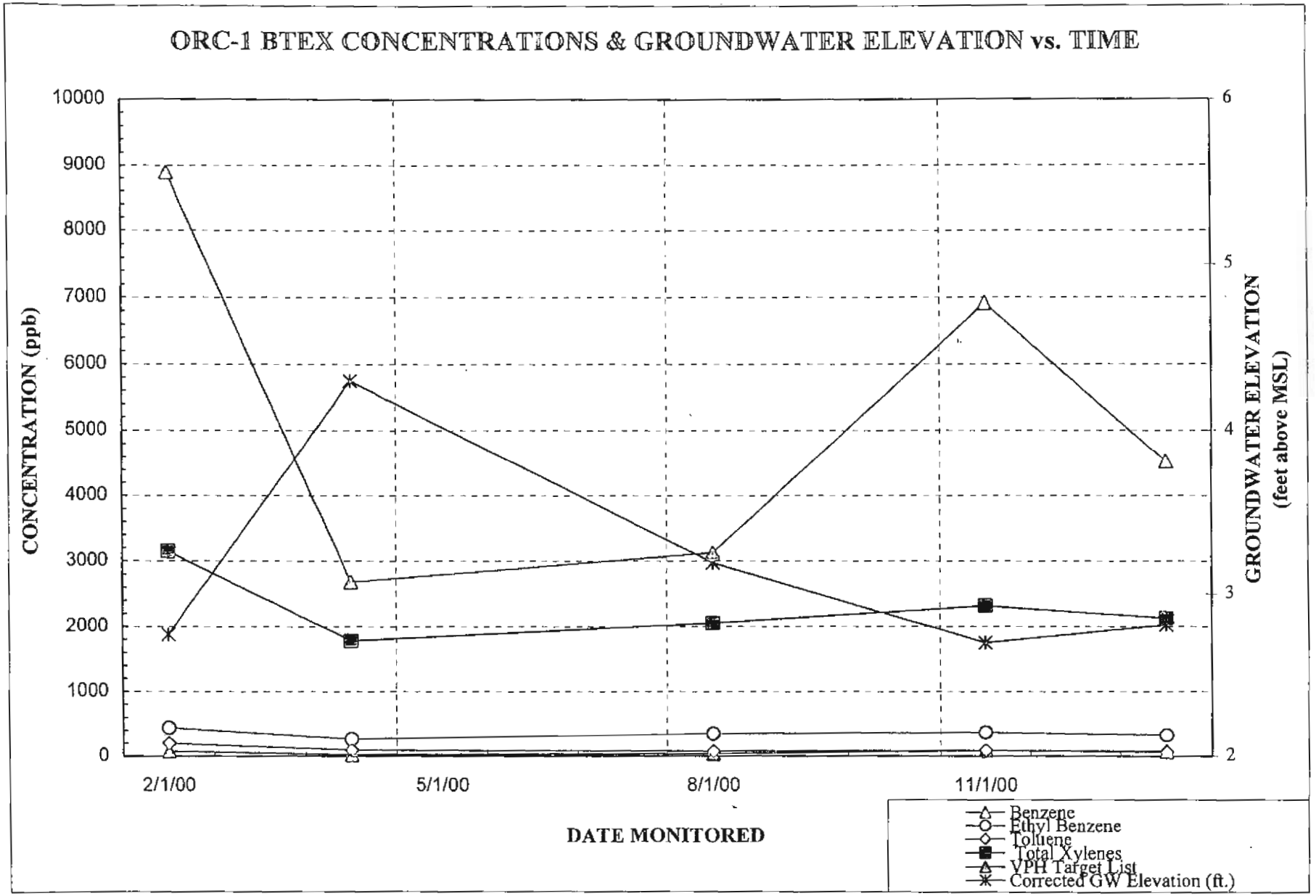

MW-1 BTEX CONCENTRATIONS & GROUNDWATER ELEVATION vs. TIME
CONCENTRATION (ppb)
3000
2500
2000
1500
1000
500
0
GROUNDWATER ELEVATION (feet above MSL)
5
4
3
2
10/1/97
1/1/98
4/1/98
7/1/98
10/1/98
1/1/99
4/1/99
7/1/99
10/1/99
1/1/00
4/1/00
7/1/00
10/1/00
1/1/01
DATE MONITORED
Benzene
Ethyl Benzene
Toluene
Total Xylenes
VPH Target List
Corrected GW Elevation (ft.)

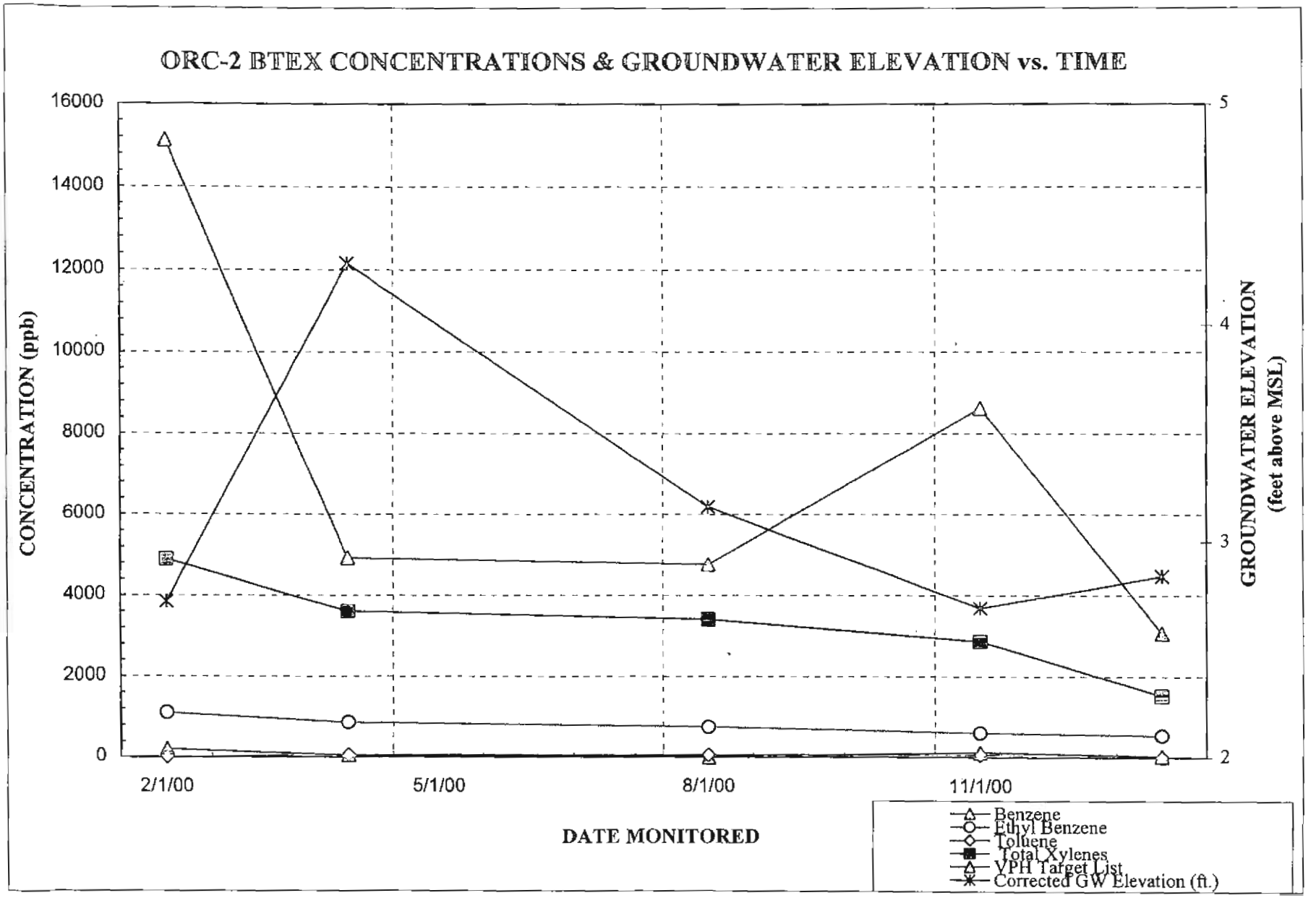

MW-2 BTEX CONCENTRATIONS & GROUNDWATER ELEVATION vs. TIME
Perry Avenue Realty Trust (101.20.1) Buzzards Bay, MA
CONCENTRATION (ppb)
120000
100000
80000
60000
40000
20000
0
GROUNDWATER ELEVATION (feet above MSL)
6
5
4
3
2
10/1/97
1/1/98
4/1/98
7/1/98
10/1/98
1/1/99
4/1/99
7/1/99
10/1/99
1/1/00
4/1/00
7/1/00
10/1/00
1/1/01
DATE MONITORED
Benzene
Ethyl Benzene
Toluene
Total Xylenes
VPH Target List
Corrected GW Elevation (ft.)

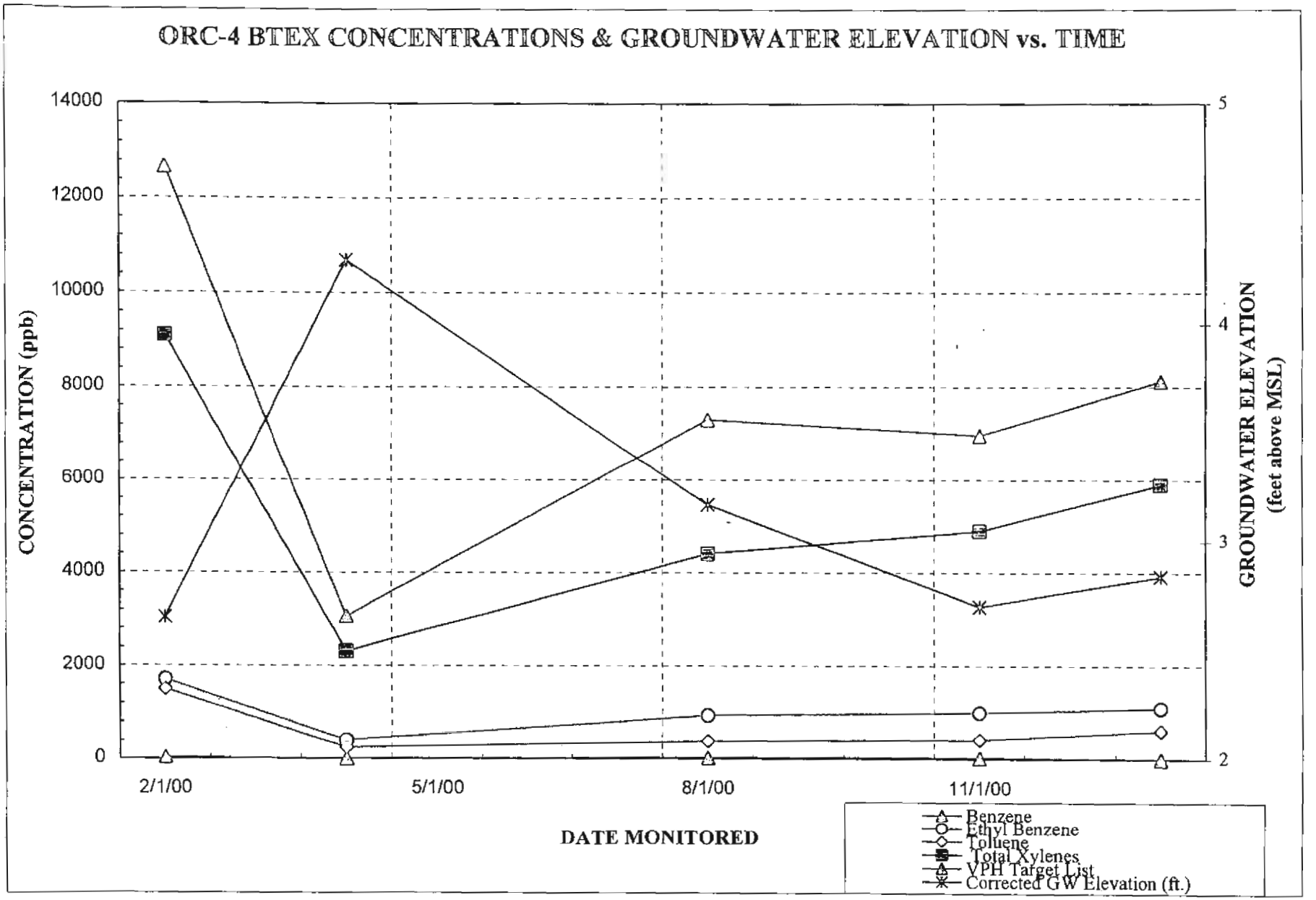

MW-3 BTEX CONCENTRATIONS & GROUNDWATER ELEVATION vs. TIME
CONCENTRATION (ppb)
4000
3500
3000
2500
2000
1500
1000
500
0
GROUNDWATER ELEVATION (feet above MSL)
6
5
4
3
2
10/1/97
1/1/98
4/1/98
7/1/98
10/1/98
1/1/99
4/1/99
7/1/99
10/1/99
1/1/00
4/1/00
7/1/00
10/1/00
1/1/01
DATE MONITORED
Benzene
Ethyl Benzene
Toluene
Total Xylenes
VPH Target List
Corrected GW Elevation (ft.)


MW-4 BTEX CONCENTRATIONS & GROUNDWATER ELEVATION vs. TIME
CONCENTRATION (ppb)
40000
35000
30000
25000
20000
15000
10000
5000
0
GROUNDWATER ELEVATION (feet above MSL)
6
5
4
3
2
10/1/97
1/1/98
4/1/98
7/1/98
10/1/98
1/1/99
4/1/99
7/1/99
10/1/99
1/1/00
4/1/00
7/1/00
10/1/00
1/1/01
DATE MONITORED
Benzene
Ethyl Benzene
Toluene
Total Xylenes
VPH Target List
Corrected GW Elevation (ft.)


MW-5 BTEX CONCENTRATIONS & GROUNDWATER ELEVATION vs. TIME
CONCENTRATION (ppb)
350
300
250
200
150
100
50
0
GROUNDWATER ELEVATION (feet above MSL)
5
4
3
2
10/1/97
1/1/98
4/1/98
7/1/98
10/1/98
1/1/99
4/1/99
7/1/99
10/1/99
1/1/00
4/1/00
7/1/00
10/1/00
1/1/01
DATE MONITORED
Benzene
Ethyl Benzene
Toluene
Total Xylenes
VPH Target List
Corrected GW Elevation (ft.)


ORC-1 BTEX CONCENTRATIONS & GROUNDWATER ELEVATION vs. TIME
CONCENTRATION (ppb)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
6
5
4
3
2
GROUNDWATER ELEVATION (feet above MSL)
2/1/00
5/1/00
8/1/00
11/1/00
DATE MONITORED
Benzene
Ethyl Benzene
Toluene
Total Xylenes
VPH Target List
Corrected GW Elevation (ft.)


ORC-2 BTEX CONCENTRATIONS & GROUNDWATER ELEVATION vs. TIME
CONCENTRATION (ppb)
16000
14000
12000
10000
8000
6000
4000
2000
0
GROUNDWATER ELEVATION (feet above MSL)
5
4
3
2
2/1/00
5/1/00
8/1/00
11/1/00
DATE MONITORED
Benzene
Ethyl Benzene
Toluene
Total Xylenes
VPH Target List
Corrected GW Elevation (ft.)


ORC-4 BTEX CONCENTRATIONS & GROUNDWATER ELEVATION vs. TIME
CONCENTRATION (ppb)
14000
12000
10000
8000
6000
4000
2000
0
5
4
3
2
GROUNDWATER ELEVATION
(feet above MSL)
2/1/00
5/1/00
8/1/00
11/1/00
DATE MONITORED
Benzene
Ethyl Benzene
Toluene
Total Xylenes
VPH Target List
Corrected GW Elevation (ft.)

APPENDIX D

LABORATORY ANALYTICAL DATA PACKAGES

GROUNDWATER ANALYTICAL

Groundwater Analytical, Inc.
P.O. Box 1200
228 Main Street
Buzzards Bay, MA 02532

Telephone (508) 759-4441
FAX (508) 759-4475

November 8, 2000

Mr. Tim Condon
RAM Environmental
One Roberts Road
Plymouth, MA 02360

Project: **Buzzards Bay/101.20.3**
Lab ID: **37104**
Sampled: **11-01-00**

Dear Tim:

Enclosed are the Metals, Extractable Petroleum Hydrocarbons, Semivolatile Organics, Volatile Petroleum Hydrocarbons, Nitrate, Sulfate and BOD Analyses performed for the above referenced project. This project was processed Priority One Week turnaround.

This letter authorizes the release of the analytical results, and should be considered a part of this report. This report contains a project narrative indicating project changes and non-conformances, a brief description of the Quality Assurance/Quality Control procedures employed by our laboratory, and a statement of our state certifications.

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.

Should you have any questions concerning this report, please do not hesitate to contact me.

Sincerely,

Jonathan R. Sanford
President

JRS/myr
Enclosures

GROUNDWATER ANALYTICAL

Massachusetts DEP VPH Method
Volatile Petroleum Hydrocarbons by GC/PID/FID

Field ID:	**RAM-MW-1**	Laboratory ID:	**37104-16**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**VG3-1295-W**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**40 mL Glass Vial**	Received:	**11-01-00**
Preservation:	**HCl / Cool**	Analyzed:	**11-07-00**
Matrix:	**Aqueous**	Dilution Factor:	**1**

VPH Ranges	Concentration	Units	Reporting Limit
n-C5 to n-C8 Aliphatic Hydrocarbons †◊	**440**	ug/L	20
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	**120**	ug/L	20
n-C9 to n-C10 Aromatic Hydrocarbons †	**160**	ug/L	20
Unadjusted n-C5 to n-C8 Aliphatic Hydrocarbons †	680	ug/L	20
Unadjusted n-C9 to n-C12 Aliphatic Hydrocarbons †	280	ug/L	20

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
1634-04-4	Methyl *tert*-butyl Ether ¤	**220**	ug/L	5
71-43-2	Benzene ‡	**16**	ug/L	1
108-88-3	Toluene ¤	BRL	ug/L	5
100-41-4	Ethylbenzene ‡	BRL	ug/L	5
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene ‡	BRL	ug/L	5
95-47-6	*ortho*- Xylene ‡	BRL	ug/L	5
91-20-3	Naphthalene	**9**	ug/L	5

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	**111 %**	70 - 130 %
2,5-Dibromotoluene (FID)	**105 %**	70 - 130 %

QA/QC Certification	
1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.2.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C5 to n-C8 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations.

⊗ n-C9 to n-C12 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations and the concentration for the n-C9 to n-C10 Aromatic Hydrocarbons range.

¤ Analyte elutes in the n-C5 to n-C8 Aliphatic Hydrocarbons range.

‡ Analyte elutes in the n-C9 to n-C12 Aliphatic Hydrocarbons range.

GROUNDWATER ANALYTICAL

Massachusetts DEP VPH Method
Volatile Petroleum Hydrocarbons by GC/PID/FID

Field ID:	**RAM-MW-2**	Laboratory ID:	**37104-15**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**VG3-1295-W**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**40 mL Glass Vial**	Received:	**11-01-00**
Preservation:	**HCl / Cool**	Analyzed:	**11-07-00**
Matrix:	**Aqueous**	Dilution Factor:	**1**

VPH Ranges	Concentration	Units	Reporting Limit
n-C5 to n-C8 Aliphatic Hydrocarbons †◊	**130**	ug/L	20
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	**100**	ug/L	20
n-C9 to n-C10 Aromatic Hydrocarbons †	**140**	ug/L	20
Unadjusted n-C5 to n-C8 Aliphatic Hydrocarbons †	160	ug/L	20
Unadjusted n-C9 to n-C12 Aliphatic Hydrocarbons †	320	ug/L	20

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
1634-04-4	Methyl *tert*-butyl Ether ¤	**10**	ug/L	5
71-43-2	Benzene ¤	**1**	ug/L	1
108-88-3	Toluene ¤	**18**	ug/L	5
100-41-4	Ethylbenzene ‡	**10**	ug/L	5
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene ‡	**37**	ug/L	5
95-47-6	*ortho*- Xylene ‡	**29**	ug/L	5
91-20-3	Naphthalene	**7**	ug/L	5

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	**104 %**	70 - 130 %
2,5-Dibromotoluene (FID)	**99 %**	70 - 130 %

QA/QC Certification

1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.2.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations:

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† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C5 to n-C8 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations.

⊗ n-C9 to n-C12 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations and the concentration for the n-C9 to n-C10 Aromatic Hydrocarbons range.

¤ Analyte elutes in the n-C5 to n-C8 Aliphatic Hydrocarbons range.

‡ Analyte elutes in the n-C9 to n-C12 Aliphatic Hydrocarbons range.

GROUNDWATER ANALYTICAL

Massachusetts DEP VPH Method
Volatile Petroleum Hydrocarbons by GC/PID/FID

Field ID:	**RAM-MW-3**	Laboratory ID:	**37104-14**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**VG3-1295-W**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**40 mL Glass Vial**	Received:	**11-01-00**
Preservation:	**HCl / Cool**	Analyzed:	**11-07-00**
Matrix:	**Aqueous**	Dilution Factor:	**5**

VPH Ranges	Concentration	Units	Reporting Limit
n-C5 to n-C8 Aliphatic Hydrocarbons †◊	**1,500**	ug/L	100
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	**550**	ug/L	100
n-C9 to n-C10 Aromatic Hydrocarbons †	**1,300**	ug/L	100
Unadjusted n-C5 to n-C8 Aliphatic Hydrocarbons †	3,400	ug/L	100
Unadjusted n-C9 to n-C12 Aliphatic Hydrocarbons †	2,500	ug/L	100

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
1634-04-4	Methyl *tert*-butyl Ether ¤	**1,900**	ug/L	25
71-43-2	Benzene ¤	**35**	ug/L	5
108-88-3	Toluene ¤	BRL	ug/L	25
100-41-4	Ethylbenzene ‡	77	ug/L	25
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene ‡	**190**	ug/L	25
95-47-6	*ortho*- Xylene ‡	**380**	ug/L	25
91-20-3	Naphthalene	**210**	ug/L	25

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	**99 %**	70 - 130 %
2,5-Dibromotoluene (FID)	**92 %**	70 - 130 %

QA/QC Certification

1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.2.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations:

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† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C5 to n-C8 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations.

⊗ n-C9 to n-C12 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations and the concentration for the n-C9 to n-C10 Aromatic Hydrocarbons range.

¤ Analyte elutes in the n-C5 to n-C8 Aliphatic Hydrocarbons range.

‡ Analyte elutes in the n-C9 to n-C12 Aliphatic Hydrocarbons range.

GROUNDWATER ANALYTICAL

Massachusetts DEP VPH Method
Volatile Petroleum Hydrocarbons by GC/PID/FID

Field ID:	**RAM-MW-4**	Laboratory ID:	**37104-18**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**VG3-1295-W**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**40 mL Glass Vial**	Received:	**11-01-00**
Preservation:	**HCl / Cool**	Analyzed:	**11-07-00**
Matrix:	**Aqueous**	Dilution Factor:	**20**

VPH Ranges	Concentration	Units	Reporting Limit
n-C5 to n-C8 Aliphatic Hydrocarbons †◊	**8,500**	ug/L	400
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	**8,000**	ug/L	400
n-C9 to n-C10 Aromatic Hydrocarbons †	**7,900**	ug/L	400
Unadjusted n-C5 to n-C8 Aliphatic Hydrocarbons †	18,000	ug/L	400
Unadjusted n-C9 to n-C12 Aliphatic Hydrocarbons †	26,000	ug/L	400

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
1634-04-4	Methyl *tert*-butyl Ether ¤	BRL	ug/L	100
71-43-2	Benzene ¤	**130**	ug/L	20
108-88-3	Toluene ¤	**9,200**	ug/L	100
100-41-4	Ethylbenzene ‡	**2,000**	ug/L	100
108-38-3 and 106-42-3	*meta*- Xylene and *para*- Xylene ‡	**5,800**	ug/L	100
95-47-6	*ortho*- Xylene ‡	**2,700**	ug/L	100
91-20-3	Naphthalene	**520**	ug/L	100

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	**91 %**	70 - 130 %
2,5-Dibromotoluene (FID)	**87 %**	70 - 130 %

QA/QC Certification	
1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.2.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations:

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† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C5 to n-C8 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations.

⊗ n-C9 to n-C12 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations and the concentration for the n-C9 to n-C10 Aromatic Hydrocarbons range.

¤ Analyte elutes in the n-C5 to n-C8 Aliphatic Hydrocarbons range.

‡ Analyte elutes in the n-C9 to n-C12 Aliphatic Hydrocarbons range.

GROUNDWATER ANALYTICAL

Massachusetts DEP VPH Method
Volatile Petroleum Hydrocarbons by GC/PID/FID

Field ID:	**RAM-MW-5**	Laboratory ID:	**37104-17**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**VG3-1295-W**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**40 mL Glass Vial**	Received:	**11-01-00**
Preservation:	**HCl / Cool**	Analyzed:	**11-07-00**
Matrix:	**Aqueous**	Dilution Factor:	1

VPH Ranges	Concentration	Units	Reporting Limit
n-C5 to n-C8 Aliphatic Hydrocarbons †◊	82	ug/L	20
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	BRL	ug/L	20
n-C9 to n-C10 Aromatic Hydrocarbons †	BRL	ug/L	20
Unadjusted n-C5 to n-C8 Aliphatic Hydrocarbons †	83	ug/L	20
Unadjusted n-C9 to n-C12 Aliphatic Hydrocarbons †	BRL	ug/L	20

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
1634-04-4	Methyl *tert*-butyl Ether ¤	BRL	ug/L	5
71-43-2	Benzene ¤	BRL	ug/L	1
108-88-3	Toluene ¤	BRL	ug/L	5
100-41-4	Ethylbenzene ‡	BRL	ug/L	5
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene ‡	BRL	ug/L	5
95-47-6	*ortho*- Xylene ‡	BRL	ug/L	5
91-20-3	Naphthalene	BRL	ug/L	5

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	101 %	70 - 130 %
2,5-Dibromotoluene (FID)	96 %	70 - 130 %

QA/QC Certification	
1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.2.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

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† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C5 to n-C8 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations.

⊗ n-C9 to n-C12 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations and the concentration for the n-C9 to n-C10 Aromatic Hydrocarbons range.

¤ Analyte elutes in the n-C5 to n-C8 Aliphatic Hydrocarbons range.

‡ Analyte elutes in the n-C9 to n-C12 Aliphatic Hydrocarbons range.

GROUNDWATER ANALYTICAL

Massachusetts DEP VPH Method
Volatile Petroleum Hydrocarbons by GC/PID/FID

Field ID:	**RAM-SW**	Laboratory ID:	**37104-19**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**VG3-1295-W**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**40 mL Glass Vial**	Received:	**11-01-00**
Preservation:	**HCl / Cool**	Analyzed:	**11-07-00**
Matrix:	**Aqueous**	Dilution Factor:	**1**

VPH Ranges	Concentration	Units	Reporting Limit
n-C5 to n-C8 Aliphatic Hydrocarbons †◊	BRL	ug/L	20
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	BRL	ug/L	20
n-C9 to n-C10 Aromatic Hydrocarbons †	BRL	ug/L	20
Unadjusted n-C5 to n-C8 Aliphatic Hydrocarbons †	BRL	ug/L	20
Unadjusted n-C9 to n-C12 Aliphatic Hydrocarbons †	BRL	ug/L	20

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
1634-04-4	Methyl *tert*-butyl Ether ¤	BRL	ug/L	5
71-43-2	Benzene ¤	BRL	ug/L	1
108-88-3	Toluene ¤	BRL	ug/L	5
100-41-4	Ethylbenzene ‡	BRL	ug/L	5
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene ‡	BRL	ug/L	5
95-47-6	*ortho*- Xylene ‡	BRL	ug/L	5
91-20-3	Naphthalene	BRL	ug/L	5

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	98 %	70 - 130 %
2,5-Dibromotoluene (FID)	92 %	70 - 130 %

QA/QC Certification	
1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.2.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

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† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C5 to n-C8 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations.

⊗ n-C9 to n-C12 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations and the concentration for the n-C9 to n-C10 Aromatic Hydrocarbons range.

¤ Analyte elutes in the n-C5 to n-C8 Aliphatic Hydrocarbons range.

‡ Analyte elutes in the n-C9 to n-C12 Aliphatic Hydrocarbons range.

GROUNDWATER ANALYTICAL

Massachusetts DEP VPH Method
Volatile Petroleum Hydrocarbons by GC/PID/FID

Field ID:	**RAM-ORC-1**	Laboratory ID:	**37104-20**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**VG3-1295-W**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**40 mL Glass Vial**	Received:	**11-01-00**
Preservation:	**HCl / Cool**	Analyzed:	**11-07-00**
Matrix:	**Aqueous**	Dilution Factor:	**10**

VPH Ranges	Concentration	Units	Reporting Limit
n-C5 to n-C8 Aliphatic Hydrocarbons †◊	**6,500**	ug/L	200
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	**5,100**	ug/L	200
n-C9 to n-C10 Aromatic Hydrocarbons †	**9,400**	ug/L	200
Unadjusted n-C5 to n-C8 Aliphatic Hydrocarbons †	11,000	ug/L	200
Unadjusted n-C9 to n-C12 Aliphatic Hydrocarbons †	17,000	ug/L	200

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
1634-04-4	Methyl *tert*-butyl Ether ¤	**3,800**	ug/L	50
71-43-2	Benzene ¤	**87**	ug/L	10
108-88-3	Toluene ¤	**89**	ug/L	50
100-41-4	Ethylbenzene ‡	**370**	ug/L	50
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene ‡	**1,700**	ug/L	50
95-47-6	*ortho*- Xylene ‡	**620**	ug/L	50
91-20-3	Naphthalene	**250**	ug/L	50

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	**88 %**	70 - 130 %
2,5-Dibromotoluene (FID)	**85 %**	70 - 130 %

QA/QC Certification

1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.2.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C5 to n-C8 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations.

⊗ n-C9 to n-C12 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations and the concentration for the n-C9 to n-C10 Aromatic Hydrocarbons range.

¤ Analyte elutes in the n-C5 to n-C8 Aliphatic Hydrocarbons range.

‡ Analyte elutes in the n-C9 to n-C12 Aliphatic Hydrocarbons range.

GROUNDWATER ANALYTICAL

Massachusetts DEP VPH Method
Volatile Petroleum Hydrocarbons by GC/PID/FID

Field ID:	**RAM-ORC-2**	Laboratory ID:	**37104-21**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**VG3-1295-W**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**40 mL Glass Vial**	Received:	**11-01-00**
Preservation:	**HCl / Cool**	Analyzed:	**11-07-00**
Matrix:	**Aqueous**	Dilution Factor:	**10**

VPH Ranges	Concentration	Units	Reporting Limit
n-C5 to n-C8 Aliphatic Hydrocarbons †◊	**5,600**	ug/L	200
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	**5,500**	ug/L	200
n-C9 to n-C10 Aromatic Hydrocarbons †	**10,000**	ug/L	200
Unadjusted n-C5 to n-C8 Aliphatic Hydrocarbons †	10,000	ug/L	200
Unadjusted n-C9 to n-C12 Aliphatic Hydrocarbons †	19,000	ug/L	200

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
1634-04-4	Methyl *tert*-butyl Ether ¤	**4,700**	ug/L	50
71-43-2	Benzene ¤	**120**	ug/L	10
108-88-3	Toluene ¤	**54**	ug/L	50
100-41-4	Ethylbenzene ‡	**600**	ug/L	50
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene ‡	**1,900**	ug/L	50
95-47-6	*ortho*- Xylene ‡	**960**	ug/L	50
91-20-3	Naphthalene	**290**	ug/L	50

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	**85 %**	70 - 130 %
2,5-Dibromotoluene (FID)	**79 %**	70 - 130 %

QA/QC Certification

1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.2.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C5 to n-C8 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations.

⊗ n-C9 to n-C12 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations and the concentration for the n-C9 to n-C10 Aromatic Hydrocarbons range.

¤ Analyte elutes in the n-C5 to n-C8 Aliphatic Hydrocarbons range.

‡ Analyte elutes in the n-C9 to n-C12 Aliphatic Hydrocarbons range.

GROUNDWATER ANALYTICAL

Massachusetts DEP VPH Method
Volatile Petroleum Hydrocarbons by GC/PID/FID

Field ID:	**ORC-4**	Laboratory ID:	**37104-22**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**VG3-1296-W**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**40 mL Glass Vial**	Received:	**11-01-00**
Preservation:	**HCl / Cool**	Analyzed:	**11-08-00**
Matrix:	**Aqueous**	Dilution Factor:	**10**

VPH Ranges	Concentration	Units	Reporting Limit
n-C5 to n-C8 Aliphatic Hydrocarbons †◊	**4,800**	ug/L	200
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	**6,400**	ug/L	200
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	**9,700**	ug/L	200
Unadjusted n-C5 to n-C8 Aliphatic Hydrocarbons †	5,600	ug/L	200
Unadjusted n-C9 to n-C12 Aliphatic Hydrocarbons †	22,000	ug/L	200

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
1634-04-4	Methyl *tert*-butyl Ether ¤	**350**	ug/L	50
71-43-2	Benzene ¤	**25**	ug/L	10
108-88-3	Toluene ¤	**420**	ug/L	50
100-41-4	Ethylbenzene ‡	**1,000**	ug/L	50
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene ‡	**3,600**	ug/L	50
95-47-6	*ortho*- Xylene ‡	**1,300**	ug/L	50
91-20-3	Naphthalene	**280**	ug/L	50

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	**79 %**	70 - 130 %
2,5-Dibromotoluene (FID)	**75 %**	70 - 130 %

QA/QC Certification	
1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.2.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C5 to n-C8 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations.

⊗ n-C9 to n-C12 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations and the concentration for the n-C9 to n-C10 Aromatic Hydrocarbons range.

¤ Analyte elutes in the n-C5 to n-C8 Aliphatic Hydrocarbons range.

‡ Analyte elutes in the n-C9 to n-C12 Aliphatic Hydrocarbons range.

GROUNDWATER ANALYTICAL

Massachusetts DEP VPH Method
Volatile Petroleum Hydrocarbons by GC/PID/FID

Field ID:	**RAM-QAQC-100**	Laboratory ID:	**37104-23**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**VG3-1295-W**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**40 mL Glass Vial**	Received:	**11-01-00**
Preservation:	**HCl / Cool**	Analyzed:	**11-07-00**
Matrix:	**Aqueous**	Dilution Factor:	1

VPH Ranges	Concentration	Units	Reporting Limit
n-C5 to n-C8 Aliphatic Hydrocarbons †◊	BRL	ug/L	20
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	BRL	ug/L	20
n-C9 to n-C10 Aromatic Hydrocarbons †	BRL	ug/L	20
Unadjusted n-C5 to n-C8 Aliphatic Hydrocarbons †	BRL	ug/L	20
Unadjusted n-C9 to n-C12 Aliphatic Hydrocarbons †	BRL	ug/L	20

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
1634-04-4	Methyl *tert*-butyl Ether ¤	BRL	ug/L	5
71-43-2	Benzene ¤	BRL	ug/L	1
108-88-3	Toluene ¤	BRL	ug/L	5
100-41-4	Ethylbenzene ‡	BRL	ug/L	5
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene ‡	BRL	ug/L	5
95-47-6	*ortho*- Xylene ‡	BRL	ug/L	5
91-20-3	Naphthalene	BRL	ug/L	5

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	98 %	70 - 130 %
2,5-Dibromotoluene (FID)	92 %	70 - 130 %

QA/QC Certification	
1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.2.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C5 to n-C8 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations.

⊗ n-C9 to n-C12 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations and the concentration for the n-C9 to n-C10 Aromatic Hydrocarbons range.

¤ Analyte elutes in the n-C5 to n-C8 Aliphatic Hydrocarbons range.

‡ Analyte elutes in the n-C9 to n-C12 Aliphatic Hydrocarbons range.

GROUNDWATER ANALYTICAL

Massachusetts DEP VPH Method
Volatile Petroleum Hydrocarbons by GC/PID/FID

Field ID:	**RAM-QAQC-500**	Laboratory ID:	**37104-24**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**VG3-1295-W**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**40 mL Glass Vial**	Received:	**11-01-00**
Preservation:	**HCl / Cool**	Analyzed:	**11-07-00**
Matrix:	**Aqueous**	Dilution Factor:	**1**

VPH Ranges	Concentration	Units	Reporting Limit
n-C5 to n-C8 Aliphatic Hydrocarbons †◊	**130**	ug/L	20
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	**120**	ug/L	20
n-C9 to n-C10 Aromatic Hydrocarbons †	**150**	ug/L	20
Unadjusted n-C5 to n-C8 Aliphatic Hydrocarbons †	160	ug/L	20
Unadjusted n-C9 to n-C12 Aliphatic Hydrocarbons †	360	ug/L	20

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
1634-04-4	Methyl *tert*-butyl Ether ¤	**10**	ug/L	5
71-43-2	Benzene ¤	**1**	ug/L	1
108-88-3	Toluene ¤	**21**	ug/L	5
100-41-4	Ethylbenzene ‡	**10**	ug/L	5
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene ‡	**43**	ug/L	5
95-47-6	*ortho*- Xylene ‡	**35**	ug/L	5
91-20-3	Naphthalene	**6**	ug/L	5

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	**101 %**	70 - 130 %
2,5-Dibromotoluene (FID)	**99 %**	70 - 130 %

QA/QC Certification	
1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.2.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C5 to n-C8 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations.

⊗ n-C9 to n-C12 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations and the concentration for the n-C9 to n-C10 Aromatic Hydrocarbons range.

¤ Analyte elutes in the n-C5 to n-C8 Aliphatic Hydrocarbons range.

‡ Analyte elutes in the n-C9 to n-C12 Aliphatic Hydrocarbons range.

GROUNDWATER ANALYTICAL

Massachusetts DEP VPH Method
Volatile Petroleum Hydrocarbons by GC/PID/FID

Field ID:	**RAM-QAQC-501**	Laboratory ID:	**37104-25**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**VG3-1295-W**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**40 mL Glass Vial**	Received:	**11-01-00**
Preservation:	**HCl / Cool**	Analyzed:	**11-07-00**
Matrix:	**Aqueous**	Dilution Factor:	**10**

VPH Ranges	Concentration	Units	Reporting Limit
n-C5 to n-C8 Aliphatic Hydrocarbons †◊	**4,800**	ug/L	200
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	**5,100**	ug/L	200
n-C9 to n-C10 Aromatic Hydrocarbons †	**9,100**	ug/L	200
Unadjusted n-C5 to n-C8 Aliphatic Hydrocarbons †	8,600	ug/L	200
Unadjusted n-C9 to n-C12 Aliphatic Hydrocarbons †	17,000	ug/L	200

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
1634-04-4	Methyl *tert*-butyl Ether ¤	**3,700**	ug/L	50
71-43-2	Benzene ¤	**94**	ug/L	10
108-88-3	Toluene ¤	**52**	ug/L	50
100-41-4	Ethylbenzene ‡	**540**	ug/L	50
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene ‡	**1,800**	ug/L	50
95-47-6	*ortho*- Xylene ‡	**840**	ug/L	50
91-20-3	Naphthalene	**260**	ug/L	50

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	**94 %**	70 - 130 %
2,5-Dibromotoluene (FID)	**89 %**	70 - 130 %

QA/QC Certification	
1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.2.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C5 to n-C8 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations.

⊗ n-C9 to n-C12 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations and the concentration for the n-C9 to n-C10 Aromatic Hydrocarbons range.

¤ Analyte elutes in the n-C5 to n-C8 Aliphatic Hydrocarbons range.

‡ Analyte elutes in the n-C9 to n-C12 Aliphatic Hydrocarbons range.

GROUNDWATER ANALYTICAL

Massachusetts DEP VPH Method
Volatile Petroleum Hydrocarbons by GC/PID/FID

Field ID:	**RAM-QAQC-200**	Laboratory ID:	**37104-26**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**VG3-1295-W**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**40 mL Glass Vial**	Received:	**11-01-00**
Preservation:	**HCl / Cool**	Analyzed:	**11-07-00**
Matrix:	**Aqueous**	Dilution Factor:	**1**

VPH Ranges	Concentration	Units	Reporting Limit
n-C5 to n-C8 Aliphatic Hydrocarbons †◊	BRL	ug/L	20
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	BRL	ug/L	20
n-C9 to n-C10 Aromatic Hydrocarbons †	BRL	ug/L	20
Unadjusted n-C5 to n-C8 Aliphatic Hydrocarbons †	BRL	ug/L	20
Unadjusted n-C9 to n-C12 Aliphatic Hydrocarbons †	BRL	ug/L	20

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
1634-04-4	Methyl *tert*-butyl Ether ¤	BRL	ug/L	5
71-43-2	Benzene ¤	BRL	ug/L	1
108-88-3	Toluene ¤	BRL	ug/L	5
100-41-4	Ethylbenzene ‡	BRL	ug/L	5
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene ‡	BRL	ug/L	5
95-47-6	*ortho*- Xylene ‡	BRL	ug/L	5
91-20-3	Naphthalene	BRL	ug/L	5

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	99 %	70 - 130 %
2,5-Dibromotoluene (FID)	93 %	70 - 130 %

QA/QC Certification	
1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.2.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C5 to n-C8 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations.

⊗ n-C9 to n-C12 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations and the concentration for the n-C9 to n-C10 Aromatic Hydrocarbons range.

¤ Analyte elutes in the n-C5 to n-C8 Aliphatic Hydrocarbons range.

‡ Analyte elutes in the n-C9 to n-C12 Aliphatic Hydrocarbons range.

GROUNDWATER ANALYTICAL

Massachusetts DEP VPH Method
Volatile Petroleum Hydrocarbons by GC/PID/FID

Field ID:	**RAM-QAQC-300**	Laboratory ID:	**37104-27**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**VG3-1295-W**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**40 mL Glass Vial**	Received:	**11-01-00**
Preservation:	**HCl / Cool**	Analyzed:	**11-08-00**
Matrix:	**Aqueous**	Dilution Factor:	**1**

VPH Ranges	Concentration	Units	Reporting Limit
n-C5 to n-C8 Aliphatic Hydrocarbons †◊	BRL	ug/L	20
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	BRL	ug/L	20
n-C9 to n-C10 Aromatic Hydrocarbons †	BRL	ug/L	20
Unadjusted n-C5 to n-C8 Aliphatic Hydrocarbons †	BRL	ug/L	20
Unadjusted n-C9 to n-C12 Aliphatic Hydrocarbons †	BRL	ug/L	20

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
1634-04-4	Methyl *tert*-butyl Ether ¤	BRL	ug/L	5
71-43-2	Benzene ¤	BRL	ug/L	1
108-88-3	Toluene ¤	BRL	ug/L	5
100-41-4	Ethylbenzene ‡	BRL	ug/L	5
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene ‡	BRL	ug/L	5
95-47-6	*ortho*- Xylene ‡	BRL	ug/L	5
91-20-3	Naphthalene	BRL	ug/L	5

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	**102 %**	70 - 130 %
2,5-Dibromotoluene (FID)	**96 %**	70 - 130 %

QA/QC Certification	
1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.2.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C5 to n-C8 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations.

⊗ n-C9 to n-C12 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations and the concentration for the n-C9 to n-C10 Aromatic Hydrocarbons range.

¤ Analyte elutes in the n-C5 to n-C8 Aliphatic Hydrocarbons range.

‡ Analyte elutes in the n-C9 to n-C12 Aliphatic Hydrocarbons range.

GROUNDWATER ANALYTICAL

Massachusetts DEP EPH Method
Extractable Petroleum Hydrocarbons by GC/FID

Field ID:	**RAM-ORC-1**	Laboratory ID:	**37104-08**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**EP-756-F**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**1 L Amber Glass**	Received:	**11-01-00**
Preservation:	**H2SO4 / Cool**	Extracted:	**11-02-00**
Matrix:	**Aqueous**	Analyzed:	**11-06-00**
		Dilution Factor:	**Aliphatic: 1 Aromatic: 1**

EPH Ranges	Concentration	Units	Reporting Limit
n-C9 to n-C18 Aliphatic Hydrocarbons †	BRL	ug/L	500
n-C19 to n-C36 Aliphatic Hydrocarbons †	BRL	ug/L	500
n-C11 to n-C22 Aromatic Hydrocarbons †◊	280	ug/L	200
Unadjusted n-C11 to n-C22 Aromatic Hydrocarbons †	490	ug/L	200

QC Surrogate Compounds		Recovery	QC Limits
Fractionation:	2-Fluorobiphenyl	77 %	40 - 140 %
	2-Bromonaphthalene	77 %	40 - 140 %
Extraction:	Chloro-octadecane	74 %	40 - 140 %
	ortho-Terphenyl	63 %	40 - 140 %

QA/QC Certification	
1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (1998). Extraction performed utilizing separatory funnel technique.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C11 to n-C22 Aromatic Hydrocarbons range data excludes the method target analyte concentrations.

GROUNDWATER ANALYTICAL

Massachusetts DEP EPH Method
Extractable Petroleum Hydrocarbons by GC/FID

Field ID:	**RAM-ORC-2**	Laboratory ID:	**37104-09**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**EP-756-F**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**1 L Amber Glass**	Received:	**11-01-00**
Preservation:	**H2SO4 / Cool**	Extracted:	**11-02-00**
Matrix:	**Aqueous**	Analyzed:	**11-06-00**
		Dilution Factor:	**Aliphatic: 1 Aromatic: 1**

EPH Ranges	Concentration	Units	Reporting Limit
n-C9 to n-C18 Aliphatic Hydrocarbons †	BRL	ug/L	500
n-C19 to n-C36 Aliphatic Hydrocarbons †	BRL	ug/L	500
n-C11 to n-C22 Aromatic Hydrocarbons †◊	**230**	ug/L	200
Unadjusted n-C11 to n-C22 Aromatic Hydrocarbons †	400	ug/L	200

QC Surrogate Compounds		Recovery	QC Limits
Fractionation:	2-Fluorobiphenyl	**80 %**	40 - 140 %
	2-Bromonaphthalene	**81 %**	40 - 140 %
Extraction:	Chloro-octadecane	**63 %**	40 - 140 %
	ortho-Terphenyl	**56 %**	40 - 140 %

QA/QC Certification	
1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (1998). Extraction performed utilizing separatory funnel technique.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C11 to n-C22 Aromatic Hydrocarbons range data excludes the method target analyte concentrations.

GROUNDWATER ANALYTICAL

Massachusetts DEP EPH Method
Extractable Petroleum Hydrocarbons by GC/FID

Field ID:	**RAM-ORC-4**	Laboratory ID:	**37104-10**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**EP-756-F**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**1 L Amber Glass**	Received:	**11-01-00**
Preservation:	**H2SO4 / Cool**	Extracted:	**11-02-00**
Matrix:	**Aqueous**	Analyzed:	**11-06-00**
		Dilution Factor:	**Aliphatic: 1 Aromatic: 1**

EPH Ranges	Concentration	Units	Reporting Limit
n-C9 to n-C18 Aliphatic Hydrocarbons †	BRL	ug/L	500
n-C19 to n-C36 Aliphatic Hydrocarbons †	BRL	ug/L	500
n-C11 to n-C22 Aromatic Hydrocarbons †◊	BRL	ug/L	200
Unadjusted n-C11 to n-C22 Aromatic Hydrocarbons †	330	ug/L	200

QC Surrogate Compounds		Recovery	QC Limits
Fractionation:	2-Fluorobiphenyl	77 %	40 - 140 %
	2-Bromonaphthalene	77 %	40 - 140 %
Extraction:	Chloro-octadecane	68 %	40 - 140 %
	ortho-Terphenyl	61 %	40 - 140 %

QA/QC Certification

1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (1998). Extraction performed utilizing separatory funnel technique.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C11 to n-C22 Aromatic Hydrocarbons range data excludes the method target analyte concentrations.

GROUNDWATER ANALYTICAL

Massachusetts DEP EPH Method
Extractable Petroleum Hydrocarbons by GC/FID

Field ID:	**RAM-SW**	Laboratory ID:	**37104-07**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**EP-756-F**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**1 L Amber Glass**	Received:	**11-01-00**
Preservation:	**H2SO4 / Cool**	Extracted:	**11-02-00**
Matrix:	**Aqueous**	Analyzed:	**11-06-00**
		Dilution Factor:	**Aliphatic: 1 Aromatic: 1**

EPH Ranges	Concentration	Units	Reporting Limit
n-C9 to n-C18 Aliphatic Hydrocarbons †	BRL	ug/L	500
n-C19 to n-C36 Aliphatic Hydrocarbons †	BRL	ug/L	500
n-C11 to n-C22 Aromatic Hydrocarbons †◊	BRL	ug/L	200
Unadjusted n-C11 to n-C22 Aromatic Hydrocarbons †	BRL	ug/L	200

QC Surrogate Compounds		Recovery	QC Limits
Fractionation:	2-Fluorobiphenyl	**92 %**	40 - 140 %
	2-Bromonaphthalene	**87 %**	40 - 140 %
Extraction:	Chloro-octadecane	**85 %**	40 - 140 %
	ortho-Terphenyl	**86 %**	40 - 140 %

QA/QC Certification	
1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (1998). Extraction performed utilizing separatory funnel technique.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C11 to n-C22 Aromatic Hydrocarbons range data excludes the method target analyte concentrations.

GROUNDWATER ANALYTICAL

Massachusetts DEP EPH Method
Extractable Petroleum Hydrocarbons by GC/FID

Field ID:	**RAM-QAQC-501**	Laboratory ID:	**37104-11**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**EP-756-F**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**1 L Amber Glass**	Received:	**11-01-00**
Preservation:	**H2SO4 / Cool**	Extracted:	**11-02-00**
Matrix:	**Aqueous**	Analyzed:	**11-06-00**
		Dilution Factor:	**Aliphatic: 1 Aromatic: 1**

EPH Ranges	Concentration	Units	Reporting Limit
n-C9 to n-C18 Aliphatic Hydrocarbons †	BRL	ug/L	500
n-C19 to n-C36 Aliphatic Hydrocarbons †	BRL	ug/L	500
n-C11 to n-C22 Aromatic Hydrocarbons †◊	280	ug/L	200
Unadjusted n-C11 to n-C22 Aromatic Hydrocarbons †	470	ug/L	200

QC Surrogate Compounds		Recovery	QC Limits
Fractionation:	2-Fluorobiphenyl	77 %	40 - 140 %
	2-Bromonaphthalene	77 %	40 - 140 %
Extraction:	Chloro-octadecane	76 %	40 - 140 %
	ortho-Terphenyl	60 %	40 - 140 %

QA/QC Certification

1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (1998). Extraction performed utilizing separatory funnel technique.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C11 to n-C22 Aromatic Hydrocarbons range data excludes the method target analyte concentrations.

GROUNDWATER ANALYTICAL

Massachusetts DEP EPH Method
Extractable Petroleum Hydrocarbons by GC/FID

Field ID:	**RAM-QAQC-200**	Laboratory ID:	**37104-12**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**EP-756-F**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**1 L Amber Glass**	Received:	**11-01-00**
Preservation:	**H2SO4 / Cool**	Extracted:	**11-02-00**
Matrix:	**Aqueous**	Analyzed:	**11-07-00**
		Dilution Factor:	**Aliphatic: 1 Aromatic: 1**

EPH Ranges	Concentration	Units	Reporting Limit
n-C9 to n-C18 Aliphatic Hydrocarbons †	BRL	ug/L	530
n-C19 to n-C36 Aliphatic Hydrocarbons †	BRL	ug/L	530
n-C11 to n-C22 Aromatic Hydrocarbons †◊	BRL	ug/L	200
Unadjusted n-C11 to n-C22 Aromatic Hydrocarbons †	BRL	ug/L	200

QC Surrogate Compounds		Recovery	QC Limits
Fractionation:	2-Fluorobiphenyl	91 %	40 - 140 %
	2-Bromonaphthalene	86 %	40 - 140 %
Extraction:	Chloro-octadecane	85 %	40 - 140 %
	ortho-Terphenyl	87 %	40 - 140 %

QA/QC Certification	
1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (1998). Extraction performed utilizing separatory funnel technique.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C11 to n-C22 Aromatic Hydrocarbons range data excludes the method target analyte concentrations.

GROUNDWATER ANALYTICAL

Massachusetts DEP EPH Method
Extractable Petroleum Hydrocarbons by GC/FID

Field ID:	**RAM-QAQC-300**	Laboratory ID:	**37104-13**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**EP-756-F**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**1 L Amber Glass**	Received:	**11-01-00**
Preservation:	**H2SO4 / Cool**	Extracted:	**11-02-00**
Matrix:	**Aqueous**	Analyzed:	**11-07-00**
		Dilution Factor:	**Aliphatic: 1 Aromatic: 1**

EPH Ranges	Concentration	Units	Reporting Limit
n-C9 to n-C18 Aliphatic Hydrocarbons †	BRL	ug/L	500
n-C19 to n-C36 Aliphatic Hydrocarbons †	BRL	ug/L	500
n-C11 to n-C22 Aromatic Hydrocarbons †◊	BRL	ug/L	200
Unadjusted n-C11 to n-C22 Aromatic Hydrocarbons †	BRL	ug/L	200

QC Surrogate Compounds		Recovery	QC Limits
Fractionation:	2-Fluorobiphenyl	**91 %**	40 - 140 %
	2-Bromonaphthalene	**85 %**	40 - 140 %
Extraction:	Chloro-octadecane	**84 %**	40 - 140 %
	ortho-Terphenyl	**82 %**	40 - 140 %

QA/QC Certification	
1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (1998). Extraction performed utilizing separatory funnel technique.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C11 to n-C22 Aromatic Hydrocarbons range data excludes the method target analyte concentrations.

GROUNDWATER ANALYTICAL

EPA Method 8270C (Modified)
MA DEP EPH Polynuclear Aromatic Hydrocarbons by GC/MS-SIM

Field ID:	**RAM-ORC-1**	Laboratory ID:	**37104-08**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**EP-0756-F**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**1L Amber Glass**	Preserved:	**11-01-00**
Preservation:	**H_2SO_4 / Cool**	Received:	**11-01-00**
Matrix:	**Aqueous**	Extracted:	**11-02-00**
		Analyzed:	**11-07-00**
		Dilution Factor:	1

CAS Number	Analyte	Concentration		Units	Reporting Limit
91-20-3	Naphthalene	**83**	ee	ug/L	10
91-57-6	2-Methylnaphthalene	**73**	ee	ug/L	10
208-96-8	Acenaphthylene	BRL		ug/L	0.5
83-32-9	Acenaphthene	**0.9**		ug/L	0.5
86-73-7	Fluorene	**1.6**		ug/L	0.5
85-01-8	Phenanthrene	**0.9**		ug/L	0.5
120-12-7	Anthracene	BRL		ug/L	0.5
206-44-0	Fluoranthene	BRL		ug/L	0.5
129-00-0	Pyrene	BRL		ug/L	0.5
56-55-3	Benzo[a]anthracene	BRL		ug/L	0.1
218-01-9	Chrysene	BRL		ug/L	0.1
205-99-2	Benzo[b]fluoranthene	BRL		ug/L	0.1
207-08-9	Benzo[k]fluoranthene	BRL		ug/L	0.1
50-32-8	Benzo[a]pyrene	BRL		ug/L	0.1
193-39-5	Indeno[1,2,3-c,d]pyrene	BRL		ug/L	0.1
53-70-3	Dibenzo[a,h]anthracene	BRL		ug/L	0.1
191-24-2	Benzo[g,h,i]perylene	BRL		ug/L	0.1

QC Surrogate Compound	Recovery	QC Limits
ortho-Terphenyl	**68 %**	40 - 140 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996). Analyte list as specified by the target analytes of the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons. Method modified by use of selected ion monitoring (SIM) in accordance with Section 7.5.5 of the method. Method protocol modified to include acidification and the surrogate compound in accordance with the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

ee Analyte response exceeded calibration range. Analyte result was quantified on the basis of a separate analytical run with the mass spectrometer operating in the full scan mode.

GROUNDWATER ANALYTICAL

EPA Method 8270C (Modified)
MA DEP EPH Polynuclear Aromatic Hydrocarbons by GC/MS-SIM

Field ID:	**RAM-ORC-2**	Laboratory ID:	**37104-09**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**EP-0756-F**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**1L Amber Glass**	Preserved:	**11-01-00**
Preservation:	**H_2SO_4 / Cool**	Received:	**11-01-00**
Matrix:	**Aqueous**	Extracted:	**11-02-00**
		Analyzed:	**11-07-00**
		Dilution Factor:	**1**

CAS Number	Analyte	Concentration	Units	Reporting Limit
91-20-3	Naphthalene	64 ee	ug/L	10
91-57-6	2-Methylnaphthalene	62 ee	ug/L	10
208-96-8	Acenaphthylene	BRL	ug/L	0.5
83-32-9	Acenaphthene	0.7	ug/L	0.5
86-73-7	Fluorene	1.3	ug/L	0.5
85-01-8	Phenanthrene	1.0	ug/L	0.5
120-12-7	Anthracene	BRL	ug/L	0.5
206-44-0	Fluoranthene	BRL	ug/L	0.5
129-00-0	Pyrene	BRL	ug/L	0.5
56-55-3	Benzo[a]anthracene	BRL	ug/L	0.1
218-01-9	Chrysene	BRL	ug/L	0.1
205-99-2	Benzo[b]fluoranthene	BRL	ug/L	0.1
207-08-9	Benzo[k]fluoranthene	BRL	ug/L	0.1
50-32-8	Benzo[a]pyrene	BRL	ug/L	0.1
193-39-5	Indeno[1,2,3-c,d]pyrene	BRL	ug/L	0.1
53-70-3	Dibenzo[a,h]anthracene	BRL	ug/L	0.1
191-24-2	Benzo[g,h,i]perylene	BRL	ug/L	0.1

QC Surrogate Compound	Recovery	QC Limits
ortho-Terphenyl	58 %	40 - 140 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996). Analyte list as specified by the target analytes of the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons. Method modified by use of selected ion monitoring (SIM) in accordance with Section 7.5.5 of the method. Method protocol modified to include acidification and the surrogate compound in accordance with the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

ee Analyte response exceeded calibration range. Analyte result was quantified on the basis of a separate analytical run with the mass spectrometer operating in the full scan mode.

GROUNDWATER ANALYTICAL

EPA Method 8270C (Modified)
MA DEP EPH Polynuclear Aromatic Hydrocarbons by GC/MS-SIM

Field ID:	**RAM-ORC-4**	Laboratory ID:	**37104-10**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**EP-0756-F**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**1L Amber Glass**	Preserved:	**11-01-00**
Preservation:	**H_2SO_4 / Cool**	Received:	**11-01-00**
Matrix:	**Aqueous**	Extracted:	**11-02-00**
		Analyzed:	**11-07-00**
		Dilution Factor:	**1**

CAS Number	Analyte	Concentration		Units	Reporting Limit
91-20-3	Naphthalene	**59**	ee	ug/L	10
91-57-6	2-Methylnaphthalene	**35**	ee	ug/L	10
208-96-8	Acenaphthylene	BRL		ug/L	0.5
83-32-9	Acenaphthene	BRL		ug/L	0.5
86-73-7	Fluorene	**0.6**		ug/L	0.5
85-01-8	Phenanthrene	BRL		ug/L	0.5
120-12-7	Anthracene	BRL		ug/L	0.5
206-44-0	Fluoranthene	BRL		ug/L	0.5
129-00-0	Pyrene	BRL		ug/L	0.5
56-55-3	Benzo[a]anthracene	BRL		ug/L	0.1
218-01-9	Chrysene	BRL		ug/L	0.1
205-99-2	Benzo[b]fluoranthene	BRL		ug/L	0.1
207-08-9	Benzo[k]fluoranthene	BRL		ug/L	0.1
50-32-8	Benzo[a]pyrene	BRL		ug/L	0.1
193-39-5	Indeno[1,2,3-c,d]pyrene	BRL		ug/L	0.1
53-70-3	Dibenzo[a,h]anthracene	BRL		ug/L	0.1
191-24-2	Benzo[g,h,i]perylene	BRL		ug/L	0.1

QC Surrogate Compound	Recovery	QC Limits
ortho-Terphenyl	57 %	40 - 140 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996). Analyte list as specified by the target analytes of the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons. Method modified by use of selected ion monitoring (SIM) in accordance with Section 7.5.5 of the method. Method protocol modified to include acidification and the surrogate compound in accordance with the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

ee Analyte response exceeded calibration range. Analyte result was quantified on the basis of a separate analytical run with the mass spectrometer operating in the full scan mode.

GROUNDWATER ANALYTICAL

EPA Method 8270C (Modified)
MA DEP EPH Polynuclear Aromatic Hydrocarbons by GC/MS-SIM

Field ID:	**RAM-SW**	Laboratory ID:	**37104-07**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**EP-0756-F**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**1L Amber Glass**	Preserved:	**11-01-00**
Preservation:	**H_2SO_4 / Cool**	Received:	**11-01-00**
Matrix:	**Aqueous**	Extracted:	**11-02-00**
		Analyzed:	**11-07-00**
		Dilution Factor:	**1**

CAS Number	Analyte	Concentration	Units	Reporting Limit
91-20-3	Naphthalene	BRL	ug/L	0.5
91-57-6	2-Methylnaphthalene	BRL	ug/L	0.5
208-96-8	Acenaphthylene	BRL	ug/L	0.5
83-32-9	Acenaphthene	BRL	ug/L	0.5
86-73-7	Fluorene	BRL	ug/L	0.5
85-01-8	Phenanthrene	BRL	ug/L	0.5
120-12-7	Anthracene	BRL	ug/L	0.5
206-44-0	Fluoranthene	BRL	ug/L	0.5
129-00-0	Pyrene	BRL	ug/L	0.5
56-55-3	Benzo[a]anthracene	BRL	ug/L	0.1
218-01-9	Chrysene	0.2	ug/L	0.1
205-99-2	Benzo[b]fluoranthene	BRL	ug/L	0.1
207-08-9	Benzo[k]fluoranthene	BRL	ug/L	0.1
50-32-8	Benzo[a]pyrene	BRL	ug/L	0.1
193-39-5	Indeno[1,2,3-c,d]pyrene	BRL	ug/L	0.1
53-70-3	Dibenzo[a,h]anthracene	BRL	ug/L	0.1
191-24-2	Benzo[g,h,i]perylene	BRL	ug/L	0.1

QC Surrogate Compound	Recovery	QC Limits
ortho-Terphenyl	101 %	40 - 140 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996). Analyte list as specified by the target analytes of the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons. Method modified by use of selected ion monitoring (SIM) in accordance with Section 7.5.5 of the method. Method protocol modified to include acidification and the surrogate compound in accordance with the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

EPA Method 8270C (Modified)
MA DEP EPH Polynuclear Aromatic Hydrocarbons by GC/MS-SIM

Field ID:	**RAM-QAQC-501**	Laboratory ID:	**37104-11**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**EP-0756-F**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**1L Amber Glass**	Preserved:	**11-01-00**
Preservation:	**H_2SO_4 / Cool**	Received:	**11-01-00**
Matrix:	**Aqueous**	Extracted:	**11-02-00**
		Analyzed:	**11-07-00**
		Dilution Factor:	**1**

CAS Number	Analyte	Concentration		Units	Reporting Limit
91-20-3	Naphthalene	**70**	ee	ug/L	10
91-57-6	2-Methylnaphthalene	**69**	ee	ug/L	10
208-96-8	Acenaphthylene	BRL		ug/L	0.5
83-32-9	Acenaphthene	**0.8**		ug/L	0.5
86-73-7	Fluorene	**1.5**		ug/L	0.5
85-01-8	Phenanthrene	**1.1**		ug/L	0.5
120-12-7	Anthracene	BRL		ug/L	0.5
206-44-0	Fluoranthene	BRL		ug/L	0.5
129-00-0	Pyrene	BRL		ug/L	0.5
56-55-3	Benzo[a]anthracene	BRL		ug/L	0.1
218-01-9	Chrysene	BRL		ug/L	0.1
205-99-2	Benzo[b]fluoranthene	BRL		ug/L	0.1
207-08-9	Benzo[k]fluoranthene	BRL		ug/L	0.1
50-32-8	Benzo[a]pyrene	BRL		ug/L	0.1
193-39-5	Indeno[1,2,3-c,d]pyrene	BRL		ug/L	0.1
53-70-3	Dibenzo[a,h]anthracene	BRL		ug/L	0.1
191-24-2	Benzo[g,h,i]perylene	BRL		ug/L	0.1

QC Surrogate Compound	Recovery	QC Limits
ortho-Terphenyl	**62 %**	40 - 140 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996). Analyte list as specified by the target analytes of the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons. Method modified by use of selected ion monitoring (SIM) in accordance with Section 7.5.5 of the method. Method protocol modified to include acidification and the surrogate compound in accordance with the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

ee Analyte response exceeded calibration range. Analyte result was quantified on the basis of a separate analytical run with the mass spectrometer operating in the full scan mode.

GROUNDWATER ANALYTICAL

EPA Method 8270C (Modified)
MA DEP EPH Polynuclear Aromatic Hydrocarbons by GC/MS-SIM

Field ID:	**RAM-QAQC-200**	Laboratory ID:	**37104-12**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**EP-0756-F**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**1L Amber Glass**	Preserved:	**11-01-00**
Preservation:	**H_2SO_4 / Cool**	Received:	**11-01-00**
Matrix:	**Aqueous**	Extracted:	**11-02-00**
		Analyzed:	**11-07-00**
		Dilution Factor:	**1**

CAS Number	Analyte	Concentration	Units	Reporting Limit
91-20-3	Naphthalene	BRL	ug/L	0.5
91-57-6	2-Methylnaphthalene	BRL	ug/L	0.5
208-96-8	Acenaphthylene	BRL	ug/L	0.5
83-32-9	Acenaphthene	BRL	ug/L	0.5
86-73-7	Fluorene	BRL	ug/L	0.5
85-01-8	Phenanthrene	BRL	ug/L	0.5
120-12-7	Anthracene	BRL	ug/L	0.5
206-44-0	Fluoranthene	BRL	ug/L	0.5
129-00-0	Pyrene	BRL	ug/L	0.5
56-55-3	Benzo[a]anthracene	BRL	ug/L	0.1
218-01-9	Chrysene	BRL	ug/L	0.1
205-99-2	Benzo[b]fluoranthene	BRL	ug/L	0.1
207-08-9	Benzo[k]fluoranthene	BRL	ug/L	0.1
50-32-8	Benzo[a]pyrene	BRL	ug/L	0.1
193-39-5	Indeno[1,2,3-c,d]pyrene	BRL	ug/L	0.1
53-70-3	Dibenzo[a,h]anthracene	BRL	ug/L	0.1
191-24-2	Benzo[g,h,i]perylene	BRL	ug/L	0.1

QC Surrogate Compound	Recovery	QC Limits
ortho-Terphenyl	95 %	40 - 140 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996). Analyte list as specified by the target analytes of the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons. Method modified by use of selected ion monitoring (SIM) in accordance with Section 7.5.5 of the method. Method protocol modified to include acidification and the surrogate compound in accordance with the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

EPA Method 8270C (Modified)
MA DEP EPH Polynuclear Aromatic Hydrocarbons by GC/MS-SIM

Field ID:	**RAM-QAQC-300**	Laboratory ID:	**37104-13**
Project:	**Buzzards Bay/101.20.3**	QC Batch ID:	**EP-0756-F**
Client:	**RAM Environmental**	Sampled:	**11-01-00**
Container:	**1L Amber Glass**	Preserved:	**11-01-00**
Preservation:	**H_2SO_4 / Cool**	Received:	**11-01-00**
Matrix:	**Aqueous**	Extracted:	**11-02-00**
		Analyzed:	**11-07-00**
		Dilution Factor:	**1**

CAS Number	Analyte	Concentration	Units	Reporting Limit
91-20-3	Naphthalene	BRL	ug/L	0.5
91-57-6	2-Methylnaphthalene	BRL	ug/L	0.5
208-96-8	Acenaphthylene	BRL	ug/L	0.5
83-32-9	Acenaphthene	BRL	ug/L	0.5
86-73-7	Fluorene	BRL	ug/L	0.5
85-01-8	Phenanthrene	BRL	ug/L	0.5
120-12-7	Anthracene	BRL	ug/L	0.5
206-44-0	Fluoranthene	BRL	ug/L	0.5
129-00-0	Pyrene	BRL	ug/L	0.5
56-55-3	Benzo[a]anthracene	BRL	ug/L	0.1
218-01-9	Chrysene	BRL	ug/L	0.1
205-99-2	Benzo[b]fluoranthene	BRL	ug/L	0.1
207-08-9	Benzo[k]fluoranthene	BRL	ug/L	0.1
50-32-8	Benzo[a]pyrene	BRL	ug/L	0.1
193-39-5	Indeno[1,2,3-c,d]pyrene	BRL	ug/L	0.1
53-70-3	Dibenzo[a,h]anthracene	BRL	ug/L	0.1
191-24-2	Benzo[g,h,i]perylene	BRL	ug/L	0.1

QC Surrogate Compound	Recovery	QC Limits
ortho-Terphenyl	**89 %**	40 - 140 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996). Analyte list as specified by the target analytes of the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons. Method modified by use of selected ion monitoring (SIM) in accordance with Section 7.5.5 of the method. Method protocol modified to include acidification and the surrogate compound in accordance with the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Inorganic Chemistry

Field ID: **RAM-ORC-1**
Project: **Buzzards Bay/101.20.3**
Client: **RAM Environmental**

Matrix: **Aqueous**
Sampled: **11-01-00**
Received: **11-01-00**

Lab ID: **37104-34** Container: **1L Plastic** Preservation: **Cool**

Analyte	Result	Units	Reporting Limit	Analyzed	QC Batch	Method
Biochemical Oxygen Demand	**10**	mg/L	8	11-02-00	BOD-0814-W	EPA 405.1

Lab ID: **37104-28** Container: **250 mL Plastic** Preservation: **Cool**

Analyte	Result	Units	Reporting Limit	Analyzed	QC Batch	Method
Nitrate (as Nitrogen)	**0.07**	mg/L	0.02	11-01-00	NI-0952-W	EPA 353.2
Sulfate	**7**	mg/L	5	11-03-00	SU-0439-W	EPA 375.2

Method References: Methods for Chemical Analysis of Water and Wastes, US EPA, EPA-600/4-790-020, Revised (1983), and Methods for the Determination of Inorganic Substances in Environmental Samples, US EPA, EPA/600/R-93/100, (1993), and Standard Methods for the Examination of Water and Wastewater, APHA, Eighteenth Edition (1992).

Report Notations: BRL Indicates result, if any, is below reporting limit for analyte. Reporting limit is the lowest value that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Inorganic Chemistry

Field ID:	**RAM-ORC-2**	Matrix:	**Aqueous**
Project:	**Buzzards Bay/101.20.3**	Sampled:	**11-01-00**
Client:	**RAM Environmental**	Received:	**11-01-00**

Lab ID: **37104-35** Container: **1L Plastic** Preservation: **Cool**

Analyte	Result	Units	Reporting Limit	Analyzed	QC Batch	Method
Biochemical Oxygen Demand	BRL	mg/L	20	11-02-00	BOD-0814-W	EPA 405.1

Lab ID: **37104-29** Container: **250 mL Plastic** Preservation: **Cool**

Analyte	Result	Units	Reporting Limit	Analyzed	QC Batch	Method
Nitrate (as Nitrogen)	**0.10**	mg/L	0.02	11-01-00	NI-0952-W	EPA 353.2
Sulfate	**8**	mg/L	5	11-03-00	SU-0439-W	EPA 375.2

Method References: Methods for Chemical Analysis of Water and Wastes, US EPA, EPA-600/4-790-020, Revised (1983), and Methods for the Determination of Inorganic Substances in Environmental Samples, US EPA, EPA/600/R-93/100, (1993), and Standard Methods for the Examination of Water and Wastewater, APHA, Eighteenth Edition (1992).

Report Notations: BRL Indicates result, if any, is below reporting limit for analyte. Reporting limit is the lowest value that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Inorganic Chemistry

Field ID: **RAM-ORC-4**
Project: **Buzzards Bay/101.20.3**
Client: **RAM Environmental**

Matrix: **Aqueous**
Sampled: **11-01-00**
Received: **11-01-00**

Lab ID: **37104-36** Container: **1L Plastic** Preservation: **Cool**

Analyte	Result	Units	Reporting Limit	Analyzed	QC Batch	Method
Biochemical Oxygen Demand	BRL	mg/L	8	11-02-00	BOD-0814-W	EPA 405.1

Lab ID: **37104-30** Container: **250 mL Plastic** Preservation: **Cool**

Analyte	Result	Units	Reporting Limit	Analyzed	QC Batch	Method
Nitrate (as Nitrogen)	**0.24**	mg/L	0.02	11-01-00	NI-0952-W	EPA 353.2
Sulfate	**9**	mg/L	5	11-03-00	SU-0439-W	EPA 375.2

Method References: Methods for Chemical Analysis of Water and Wastes, US EPA, EPA-600/4-790-020, Revised (1983), and Methods for the Determination of Inorganic Substances in Environmental Samples, US EPA, EPA/600/R-93/100, (1993), and Standard Methods for the Examination of Water and Wastewater, APHA, Eighteenth Edition (1992).

Report Notations: BRL Indicates result, if any, is below reporting limit for analyte. Reporting limit is the lowest value that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Inorganic Chemistry

Field ID:	**RAM-QAQC-501**	Matrix:	**Aqueous**
Project:	**Buzzards Bay/101.20.3**	Sampled:	**11-01-00**
Client:	**RAM Environmental**	Received:	**11-01-00**

Lab ID: **37104-37** Container: **1L Plastic** Preservation: **Cool**

Analyte	Result	Units	Reporting Limit	Analyzed	QC Batch	Method
Biochemical Oxygen Demand	BRL	mg/L	20	11-02-00	BOD-0814-W	EPA 405.1

Lab ID: **37104-31** Container: **250 mL Plastic** Preservation: **Cool**

Analyte	Result	Units	Reporting Limit	Analyzed	QC Batch	Method
Nitrate (as Nitrogen)	**0.04**	mg/L	0.02	11-01-00	NI-0952-W	EPA 353.2
Sulfate	7	mg/L	5	11-03-00	SU-0439-W	EPA 375.2

Method References: Methods for Chemical Analysis of Water and Wastes, US EPA, EPA-600/4-790-020, Revised (1983), and Methods for the Determination of Inorganic Substances in Environmental Samples, US EPA, EPA/600/R-93/100, (1993), and Standard Methods for the Examination of Water and Wastewater, APHA, Eighteenth Edition (1992).

Report Notations: BRL Indicates result, if any, is below reporting limit for analyte. Reporting limit is the lowest value that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Inorganic Chemistry

Field ID:	**RAM-QAQC-200**	Matrix:	**Aqueous**
Project:	**Buzzards Bay/101.20.3**	Sampled:	**11-01-00**
Client:	**RAM Environmental**	Received:	**11-01-00**

Lab ID: **37104-38** Container: **1L Plastic** Preservation: **Cool**

Analyte	Result	Units	Reporting Limit	Analyzed	QC Batch	Method
Biochemical Oxygen Demand	BRL	mg/L	2	11-02-00	BOD-0814-W	EPA 405.1

Lab ID: **37104-32** Container: **250 mL Plastic** Preservation: **Cool**

Analyte	Result	Units	Reporting Limit	Analyzed	QC Batch	Method
Nitrate (as Nitrogen)	BRL	mg/L	0.02	11-01-00	NI-0952-W	EPA 353.2
Sulfate	BRL	mg/L	5	11-03-00	SU-0439-W	EPA 375.2

Method References: Methods for Chemical Analysis of Water and Wastes, US EPA, EPA-600/4-790-020, Revised (1983), and Methods for the Determination of Inorganic Substances in Environmental Samples, US EPA, EPA/600/R-93/100, (1993), and Standard Methods for the Examination of Water and Wastewater, APHA, Eighteenth Edition (1992).

Report Notations: BRL .Indicates result, if any, is below reporting limit for analyte. Reporting limit is the lowest value that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Inorganic Chemistry

Field ID: **RAM-QAQC-300**
Project: **Buzzards Bay/101.20.3**
Client: **RAM Environmental**

Matrix: **Aqueous**
Sampled: **11-01-00**
Received: **11-01-00**

Lab ID: **37104-39** Container: **1L Plastic** Preservation: **Cool**

Analyte	Result	Units	Reporting Limit	Analyzed	QC Batch	Method
Biochemical Oxygen Demand	BRL	mg/L	2	11-02-00	BOD-0814-W	EPA 405.1

Lab ID: **37104-33** Container: **250 mL Plastic** Preservation: **Cool**

Analyte	Result	Units	Reporting Limit	Analyzed	QC Batch	Method
Nitrate (as Nitrogen)	BRL	mg/L	0.02	11-01-00	NI-0952-W	EPA 353.2
Sulfate	BRL	mg/L	5	11-03-00	SU-0439-W	EPA 375.2

Method References: Methods for Chemical Analysis of Water and Wastes, US EPA, EPA-600/4-790-020, Revised (1983), and Methods for the Determination of Inorganic Substances in Environmental Samples, US EPA, EPA/600/R-93/100, (1993), and Standard Methods for the Examination of Water and Wastewater, APHA, Eighteenth Edition (1992).

Report Notations: BRL Indicates result, if any, is below reporting limit for analyte. Reporting limit is the lowest value that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Trace Metals by ICP-AES and CVAA

Field ID:	**RAM-ORC-1**	Laboratory ID:	**37104-01**
Project:	**Buzzards Bay/101.20.3**	Sampled:	**11-01-00**
Client:	**RAM Environmental**	Received:	**11-01-00**
Container:	**250 mL Plastic**	Preserved:	**11-01-00**
Preservation:	**HNO3 / Cool**	Filtered:	**11-01-00**
Matrix:	**Aqueous**		

CAS Number	Analyte	Concentration	Units	Reporting Limit	Analyzed	QC Batch	Method
7439-89-6	Iron, Dissolved	**5.4**	mg/L	0.05	11-06-00	MM-1191-W	6010B
7439-96-5	Manganese, Dissolved	**0.85**	mg/L	0.05	11-06-00	MM-1191-W	6010B

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Trace Metals by ICP-AES and CVAA

Field ID:	**RAM-ORC-2**	Laboratory ID:	**37104-02**
Project:	**Buzzards Bay/101.20.3**	Sampled:	**11-01-00**
Client:	**RAM Environmental**	Received:	**11-01-00**
Container:	**250 mL Plastic**	Preserved:	**11-01-00**
Preservation:	**HNO3 / Cool**	Filtered:	**11-01-00**
Matrix:	**Aqueous**		

CAS Number	Analyte	Concentration	Units	Reporting Limit	Analyzed	QC Batch	Method
7439-89-6	Iron, Dissolved	11	mg/L	0.05	11-06-00	MM-1191-W	6010B
7439-96-5	Manganese, Dissolved	1.2	mg/L	0.05	11-06-00	MM-1191-W	6010B

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Trace Metals by ICP-AES and CVAA

Field ID:	**RAM-ORC-4**	Laboratory ID:	**37104-03**
Project:	**Buzzards Bay/101.20.3**	Sampled:	**11-01-00**
Client:	**RAM Environmental**	Received:	**11-01-00**
Container:	**250 mL Plastic**	Preserved:	**11-01-00**
Preservation:	**HNO3 / Cool**	Filtered:	**11-01-00**
Matrix:	**Aqueous**		

CAS Number	Analyte	Concentration	Units	Reporting Limit	Analyzed	QC Batch	Method
7439-89-6	Iron, Dissolved	**19**	mg/L	0.05	11-06-00	MM-1191-W	6010B
7439-96-5	Manganese, Dissolved	**1.5**	mg/L	0.05	11-06-00	MM-1191-W	6010B

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Trace Metals by ICP-AES and CVAA

Field ID:	**RAM-QAQC-501**	Laboratory ID:	**37104-04**
Project:	**Buzzards Bay/101.20.3**	Sampled:	**11-01-00**
Client:	**RAM Environmental**	Received:	**11-01-00**
Container:	**250 mL Plastic**	Preserved:	**11-01-00**
Preservation:	**HNO3 / Cool**	Filtered:	**11-01-00**
Matrix:	**Aqueous**		

CAS Number	Analyte	Concentration	Units	Reporting Limit	Analyzed	QC Batch	Method
7439-89-6	Iron, Dissolved	**8.4**	mg/L	0.05	11-06-00	MM-1191-W	6010B
7439-96-5	Manganese, Dissolved	**1.2**	mg/L	0.05	11-06-00	MM-1191-W	6010B

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Trace Metals by ICP-AES and CVAA

Field ID:	**RAM-QAQC-200**	Laboratory ID:	**37104-05**
Project:	**Buzzards Bay/101.20.3**	Sampled:	**11-01-00**
Client:	**RAM Environmental**	Received:	**11-01-00**
Container:	**250 mL Plastic**	Preserved:	**11-01-00**
Preservation:	**HNO3 / Cool**	Filtered:	**11-01-00**
Matrix:	**Aqueous**		

CAS Number	Analyte	Concentration	Units	Reporting Limit	Analyzed	QC Batch	Method
7439-89-6	Iron, Dissolved	BRL	mg/L	0.05	11-06-00	MM-1191-W	6010B
7439-96-5	Manganese, Dissolved	BRL	mg/L	0.05	11-06-00	MM-1191-W	6010B

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Trace Metals by ICP-AES and CVAA

Field ID:	**RAM-QAQC-300**	Laboratory ID:	**37104-06**
Project:	**Buzzards Bay/101.20.3**	Sampled:	**11-01-00**
Client:	**RAM Environmental**	Received:	**11-01-00**
Container:	**250 mL Plastic**	Preserved:	**11-01-00**
Preservation:	**HNO3 / Cool**	Filtered:	**11-01-00**
Matrix:	**Aqueous**		

CAS Number	Analyte	Concentration	Units	Reporting Limit	Analyzed	QC Batch	Method
7439-89-6	Iron, Dissolved	BRL	mg/L	0.05	11-06-00	MM-1191-W	6010B
7439-96-5	Manganese, Dissolved	BRL	mg/L	0.05	11-06-00	MM-1191-W	6010B

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Project Narrative

Project: **Buzzards Bay/101.20.3**
Client: **RAM Environmental**

Lab ID: **37104**
Received: **11-01-00**

A. Physical Condition of Sample(s)

This project was received by the laboratory in satisfactory condition, and the sample(s) were received undamaged in appropriate containers with the correct preservation, except for the following non-conformance(s):

1. Samples 37104-01 through -06 for Dissolved Metals Analysis were not received filtered. Thesamples were filtered by the laboratory upon receipt.
2. Samples 37104-01 through -06 for Dissolved Metals Analysis were received without preservation. The samples were preserved with HNO3 by the laboratory upon receipt.

B. Project Documentation

This project was accompanied by satisfactory Chain of Custody documentation. The sample container label(s) agreed with the Chain of Custody.

C. Analysis of Sample(s)

No analytical anomalies or non-conformances were noted by the laboratory during the processing of these sample(s). All data contained within this report are released without qualification.

GROUNDWATER ANALYTICAL

228 Main Street, P.O. Box 1200
Buzzards Bay, MA 02532
Telephone (508) 759-4441
FAX (508) 759-4475

CHAIN-OF-CUSTODY RECORD AND WORK ORDER

№ 45904

Project Name: Buzzards Bay
Firm: RAM Environmental
Project Number: 101.20.3
Address: One Roberts Road
Sampler Name: T. Speak / J. McGinley
City / State / Zip: Plymouth, MA 02360
Project Manager: Tim Condon
Telephone: 508-747-7400

TURNAROUND

- ☐ STANDARD (10 Business Days)
- ☒ PRIORITY (5 Business Days)
- ☐ RUSH (RAN-________) (Rush requires Rush Authorization Number)

Please FAX ☒ YES ☐ NO
FAX Number: 508-747-3658

BILLING

Purchase Order No.:
GWA Reference No.:

INSTRUCTIONS: Use separate line for each container (except replicates).

ANALYSIS REQUEST (selected): Metals – ☒ Dissolved, ☒ Specify: Fe, Mn; ☒ MA DEP EPH; ☒ MA DEP VPH with targets; ☒ Nitrate ☒ Chloride ☒ Sulfate; ☒ BOD

Date	Time	Sample Identification	Water	Grab	Number	40mL VOA Vial	1L/32 oz Amber Glass	250mL/8 oz Plastic	500mL/16 oz Plastic	1L/32 oz Plastic	HCl	H_2SO_4	Ice	Filtered: No	Laboratory Number (Lab Use Only) 37104	Metals (Fe, Mn)	MA DEP EPH	MA DEP VPH	Nitrate/Chloride/Sulfate	BOD
11/1	0940	RAM-MW-3	X	X	3	3					X		X	X	14			X		
	1030	RAM-MW-2	X	X	3	3					X		X	X	15			X		
	1050	RAM-MW-1	X	X	3	3					X		X	X	16			X		
	1115	RAM-MW-5	X	X	3	3					X		X	X	17			X		
	1108	RAM-MW-4	X	X	3	3					X		X	X	18			X		
	1200	RAM-SW	X	X	5	3	2				X	X	X	X	7 19		X	X		
	1145	RAM-ORC-1	X	X	8	3	2	1	1	1	X	X	X	X	1 8 20 28 34	X	X	X	X	X
	1130	RAM-ORC-2	X	X	8	3	2	1	1	1	X		X	X	2 9 21 29 35	X	X	X	X	X
	1215	RAM-ORC-4	X	X	8	3	2	1	1	1	X	X	X	X	3 10 22 30 36	X	✓	X	X	X
		RAM-QAQC-100	X	X	2	2					X		X	X	23			X		
	1030	RAM-QAQC-300	X	X	3	3					X		X	X	24			X		
	1130	RAM-QAQC-301	X	X	8	3	2	1	1	1	X	X	X	X	4 11 25 31 37	X	X	X	X	X

REMARKS / SPECIAL INSTRUCTIONS

Page One of 2

DATA QUALITY OBJECTIVES

Regulatory Program

- ☐ Safe Drinking Water Act ☐ MA DEP Form
- ☐ NPDES/Clean Water Act Specify State: ____
- ☐ RCRA/Haz. Waste Char.
- ☒ MA MCP (310 CMR 40) Reportable Concentrations ☒ RCGW - 1 ☐ RCS - 1 ☐ RCGW - 2 ☐ RCS - 2
- ☐ MA Dredge Disposal
- ☐ NH ☐ RI ☐ CT ☐ ME Specify Category: ____

Project Specific QC

Many regulatory programs and EPA methods require project specific QC. Project specific QC includes Sample Duplicates, Matrix Spikes, and/or Matrix Spike Duplicates. Laboratory QC is not project specific unless prearranged. Project specific QC samples are charged on a per sample basis. For water samples, each MS, MSD and Sample Duplicate requires an additional sample aliquot.

Project Specific QC Required: ☐ Sample Duplicate ☐ Matrix Spike ☐ Matrix Spike Duplicate
Selection of QC Sample: ☐ Selected by laboratory ☐ Please use sample: ____

CHAIN-OF-CUSTODY RECORD

NOTE: All samples submitted subject to Standard Terms and Conditions on reverse hereof.

Relinquished by	Date	Time	Received by
Sampler: Tom Speak	11/1	1440	[signature]
Relinquished by:	Date	Time	Received by:
Relinquished by:	Date	Time	Received by Laboratory:

Receipt Temperature: 10°
Shipping/Airbill Number:
Custody Seal/Cooler Serial Number:

Method of Shipment: ☐ GWA Courier ☐ Express Mail ☐ Federal Express ☐ UPS ☐ Hand ☐ ____

GROUNDWATER ANALYTICAL

228 Main Street, P.O. Box 1200
Buzzards Bay, MA 02532
Telephone (508) 759-4441
FAX (508) 759-4475

CHAIN-OF-CUSTODY RECORD AND WORK ORDER

№ 45510

Project Name: Buzzards Bay

Firm: RAM Environmental

Project Number: 101.20.3

Address: One Roberts Road

Sampler Name: T. Spark / J. McGinley

City / State / Zip: Plymouth, MA 02360

Project Manager: Tim Condon

Telephone: 508-747-7900

INSTRUCTIONS: Use separate line for each container (except replicates).

TURNAROUND

☐ STANDARD (10 Business Days)
☒ PRIORITY (5 Business Days)
☐ RUSH (RAN-________)
(Rush requires Rush Authorization Number)

Please FAX ☒ YES ☐ NO
FAX Number: 508-747-3658

BILLING

Purchase Order No.:

GWA Reference No.:

ANALYSIS REQUEST

Volatiles | Semivolatiles | Pest/Herb/PCBs | Metals | Petroleum Hydrocarbon | Haz. Waste | General Chemistry | Other

Sampling DATE	TIME	SAMPLE IDENTIFICATION	Matrix: WATER	Type: GRAB	Containers: NUMBER	40mL VOA Vial	1L/32 oz Amber Glass	250mL/8 oz Plastic	500mL/16 oz Plastic	1L/32 oz Plastic	Preservation: HCl	H₂SO₄	ICE	Filtered: NO	LABORATORY NUMBER (Lab Use Only) 37104	Metals: Specify: Fe, Mn	MA DEP EPH	MA DEP VPH	Nitrate/Chloride/Sulfate	TSS
11/1	0820	RAM-QAQC-200	X	X	8	3	2	1	1	1	X	X	X	X	5 12 26 32 38	X	X	X	X	X
↓	0830	RAM-QAQC-300	X	X	8	3	2	1	1	1	X	X	X	X	6 13 27 33 39	X	X	X	X	X

REMARKS / SPECIAL INSTRUCTIONS

Page 2 of 2

DATA QUALITY OBJECTIVES

Regulatory Program

☐ Safe Drinking Water Act
☐ MA DEP Form
☐ NPDES/Clean Water Act
Specify State: ______
☐ RCRA/Haz. Waste Char.
☒ MA MCP (310 CMR 40)
Reportable Concentrations
☒ RCGW - 1 ☐ RCS - 1
☐ RCGW - 2 ☐ RCS - 2
☐ MA Dredge Disposal
☐ NH ☐ RI ☐ CT ☐ ME
Specify Category: ______

Project Specific QC

Many regulatory programs and EPA methods require project specific QC. Project specific QC includes Sample Duplicates, Matrix Spikes, and/or Matrix Spike Duplicates. Laboratory QC is not project specific unless prearranged. Project specific QC samples are charged on a per sample basis. For water samples, each MS, MSD and Sample Duplicate requires an additional sample aliquot.

Project Specific QC Required
☐ Sample Duplicate
☐ Matrix Spike
☐ Matrix Spike Duplicate

Selection of QC Sample
☐ Selected by laboratory
☐ Please use sample: ______

CHAIN-OF-CUSTODY RECORD

NOTE: All samples submitted subject to Standard Terms and Conditions on reverse hereof.

Relinquished by	Date	Time	Received by
Relinquished by Sampler: Tony Spark	11/1	1440	Received by: [signature]
Relinquished by:	Date	Time	Received by:
Relinquished by:	Date	Time	Received by Laboratory:

Receipt Temperature: 10°C

Shipping/Airbill Number:

Custody Seal/ Cooler Serial Number:

Method of Shipment: ☐ GWA Courier ☐ Express Mail ☐ Federal Express ☐ UPS ☐ Hand ☐ ______

GROUNDWATER ANALYTICAL

Quality Assurance/Quality Control

A. Program Overview

Groundwater Analytical conducts an active Quality Assurance program to ensure the production of high quality, valid data. This program closely follows the guidance provided by *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans*, US EPA QAMS-005/80 (1980), and *Test Methods for Evaluating Solid Waste*, US EPA, SW-846, Update III (1996).

Quality Control protocols include written Standard Operating Procedures (SOPs) developed for each analytical method. SOPs are derived from US EPA methodologies and other established references. Standards are prepared from commercially obtained reference materials of certified purity, and documented for traceability.

Quality Assessment protocols for most organic analyses include a minimum of one laboratory control sample, one method blank, one matrix spike sample, and one sample duplicate for each sample preparation batch. All samples, standards, blanks, laboratory control samples, matrix spikes and sample duplicates are spiked with internal standards and surrogate compounds. All instrument sequences begin with an initial calibration verification standard and a blank; and excepting GC/MS sequences, all sequences close with a continuing calibration standard. GC/MS systems are tuned to appropriate ion abundance criteria daily, or for each 12 hour operating period, whichever is more frequent.

Quality Assessment protocols for most inorganic analyses include a minimum of one laboratory control sample, one method blank, one matrix spike sample, and one sample duplicate for each sample preparation batch. Standard curves are derived from one reagent blank and four concentration levels. Curve validity is verified by standard recoveries within plus or minus ten percent of the curve.

B. Definitions

Batches are used as the basic unit for Quality Assessment. A Batch is defined as twenty or fewer samples of the same matrix which are prepared together for the same analysis, using the same lots of reagents and the same techniques or manipulations, all within the same continuum of time, up to but not exceeding 24 hours.

Laboratory Control Samples are used to assess the accuracy of the analytical method. A Laboratory Control Sample consists of reagent water or sodium sulfate spiked with a group of target analytes representative of the method analytes. Accuracy is defined as the degree of agreement of the measured value with the true or expected value. Percent Recoveries for the Laboratory Control Samples are calculated to assess accuracy.

Method Blanks are used to assess the level of contamination present in the analytical system. Method Blanks consist of reagent water or an aliquot of sodium sulfate. Method Blanks are taken through all the appropriate steps of an analytical method. Sample data reported is not corrected for blank contamination.

Surrogate Compounds are used to assess the effectiveness of an analytical method in dealing with each sample matrix. Surrogate Compounds are organic compounds which are similar to the target analytes of interest in chemical behavior, but which are not normally found in environmental samples. Percent Recoveries are calculated for each Surrogate Compound.

GROUNDWATER ANALYTICAL

Quality Control Report
Laboratory Control Sample

Category: **Inorganic Chemistry**
Matrix: **Aqueous**

Analyte	Method	QC Batch	Units	Spiked	Measured	Recovery	QC Limits
Biochemical Oxygen Demand	EPA 405.1	BOD-0814-W	mg/L	198	197	**99 %**	80 - 120 %
Nitrate (as Nitrogen)	EPA 353.2	NI-0952-W	mg/L	0.50	0.51	**103 %**	80 - 120 %
Sulfate	EPA 375.2	SU-0439-W	mg/L	50	59	**119 %**	80 - 120 %

Method References: Methods for Chemical Analysis of Water and Wastes, US EPA, EPA-600/4-790-020, Revised (1983), and Methods for the Determination of Inorganic Substances in Environmental Samples, US EPA, EPA/600/R-93/100, (1993), and Standard Methods for the Examination of Water and Wastewater, APHA, Eighteenth Edition (1992).

Report Notations: All calculations performed prior to rounding. Quality Control Limits are defined by the methodology, or alternatively based upon the historical average recovery plus or minus three standard deviation units.

GROUNDWATER ANALYTICAL

Quality Control Report
Method Blank

Category: **Inorganic Chemistry**
Matrix: **Aqueous**

Analyte	Result	Units	Reporting Limit	QC Batch	Method
Biochemical Oxygen Demand	BRL	mg/L	2	BOD-0814-W	EPA 405.1
Nitrate (as Nitrogen)	BRL	mg/L	0.02	NI-0952-W	EPA 353.2
Sulfate	BRL	mg/L	5	SU-0439-W	EPA 375.2

Method References: Methods for Chemical Analysis of Water and Wastes, US EPA, EPA-600/4-790-020, Revised (1983), and Methods for the Determination of Inorganic Substances in Environmental Samples, US EPA, EPA/600/R-93/100, (1993), and Standard Methods for the Examination of Water and Wastewater, APHA, Eighteenth Edition (1992).

Report Notations: BRL Indicates result, if any, is below reporting limit for analyte. Reporting limit is the lowest value that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Quality Control Report
Laboratory Control Sample

Category: **MA DEP VPH Method**
QC Batch ID: **VG3-1296-W**
Matrix: **Aqueous**
Units: **ug/L**

CAS Number	Analyte	Spiked	Measured	Recovery	QC Limits
1634-04-4	Methyl *tert*-butyl Ether	50	36	**72%**	70 - 130 %
71-43-2	Benzene	50	45	**90%**	70 - 130 %
108-88-3	Toluene	50	47	**95%**	70 - 130 %
100-41-4	Ethylbenzene	50	43	**86%**	70 - 130 %
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene	100	96	**96%**	70 - 130 %
95-47-6	*ortho*- Xylene	50	47	**94%**	70 - 130 %
91-20-3	Naphthalene	50	45	**91%**	70 - 130 %

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	**78 %**	70 - 130 %
2,5-Dibromotoluene (FID)	**74 %**	70 - 130 %

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations: All calculations performed prior to rounding. Quality Control Limits are defined by the methodology, or alternatively based upon the historical average recovery plus or minus three standard deviation units.

GROUNDWATER ANALYTICAL

Quality Control Report
Method Blank

Category: **MA DEP VPH Method**
QC Batch ID: **VG3-1296-W**
Matrix: **Aqueous**

VPH Ranges	Concentration	Units	Reporting Limit
n-C5 to n-C8 Aliphatic Hydrocarbons †◊	BRL	ug/L	20
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	BRL	ug/L	20
n-C9 to n-C10 Aromatic Hydrocarbons †	BRL	ug/L	20
Unadjusted n-C5 to n-C8 Aliphatic Hydrocarbons †	BRL	ug/L	20
Unadjusted n-C9 to n-C12 Aliphatic Hydrocarbons †	BRL	ug/L	20

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
1634-04-4	Methyl *tert*-butyl Ether ¤	BRL	ug/L	5
71-43-2	Benzene ¤	BRL	ug/L	1
108-88-3	Toluene ¤	BRL	ug/L	5
100-41-4	Ethylbenzene ‡	BRL	ug/L	5
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene ‡	BRL	ug/L	5
95-47-6	*ortho*- Xylene ‡	BRL	ug/L	5
91-20-3	Naphthalene	BRL	ug/L	5

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	97 %	70 - 130 %
2,5-Dibromotoluene (FID)	91 %	70 - 130 %

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C5 to n-C8 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations.

⊗ n-C9 to n-C12 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations and the concentration for the n-C9 to n-C10 Aromatic Hydrocarbons range.

¤ Analyte elutes in the n-C5 to n-C8 Aliphatic Hydrocarbons range.

‡ Analyte elutes in the n-C9 to n-C12 Aliphatic Hydrocarbons range.

GROUNDWATER ANALYTICAL

Quality Control Report
Laboratory Control Sample

Category: **EPA Method 8270C (Modified) - EPH PAHs by GC/MS-SIM**
QC Batch ID: **EP-0756-FL**
Matrix: **Aqueous**
Units: **ug/L**

CAS Number	Analyte	Spiked	Measured	Recovery	QC Limits
91-20-3	Naphthalene	5.0	3.2	**65 %**	40 - 140 %
83-32-9	Acenaphthene	5.0	3.1	**61 %**	40 - 140 %
120-12-7	Anthracene	5.0	4.2	**84 %**	40 - 140 %
129-00-0	Pyrene	5.0	3.9	**78 %**	40 - 140 %
218-01-9	Chrysene	5.0	4.2	**84 %**	40 - 140 %

QC Surrogate Compound	Recovery	QC Limits
ortho-Terphenyl	**109 %**	40 - 140 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996). Analyte list as specified by the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons. Method modified by use of selected ion monitoring (SIM) in accordance with Section 7.5.5 of the method. Method protocol modified to include acidification and the surrogate compound in accordance with the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons.

Report Notations: All calculations performed prior to rounding. Quality Control Limits are defined by the methodology, or alternatively based upon the historical average recovery plus or minus three standard deviation units.

GROUNDWATER ANALYTICAL

Quality Control Report
Method Blank

Category: **EPA Method 8270C (Modified) - EPH PAHs by GC/MS-SIM**
QC Batch ID: **EP-0756-FB**
Matrix: **Aqueous**

CAS Number	Analyte	Concentration	Units	Reporting Limit
91-20-3	Naphthalene	BRL	ug/L	0.5
91-57-6	2-Methylnaphthalene	BRL	ug/L	0.5
208-96-8	Acenaphthylene	BRL	ug/L	0.5
83-32-9	Acenaphthene	BRL	ug/L	0.5
86-73-7	Fluorene	BRL	ug/L	0.5
85-01-8	Phenanthrene	BRL	ug/L	0.5
120-12-7	Anthracene	BRL	ug/L	0.5
206-44-0	Fluoranthene	BRL	ug/L	0.5
129-00-0	Pyrene	BRL	ug/L	0.5
56-55-3	Benzo[a]anthracene	BRL	ug/L	0.1
218-01-9	Chrysene	BRL	ug/L	0.1
205-99-2	Benzo[b]fluoranthene	BRL	ug/L	0.1
207-08-9	Benzo[k]fluoranthene	BRL	ug/L	0.1
50-32-8	Benzo[a]pyrene	BRL	ug/L	0.1
193-39-5	Indeno[1,2,3-c,d]pyrene	BRL	ug/L	0.1
53-70-3	Dibenzo[a,h]anthracene	BRL	ug/L	0.1
191-24-2	Benzo[g,h,i]perylene	BRL	ug/L	0.1

QC Surrogate Compound	Recovery	QC Limits
ortho-Terphenyl	112 %	40 - 140 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996). Analyte list as specified by the target analytes of the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons. Method modified by use of selected ion monitoring (SIM) in accordance with Section 7.5.5 of the method. Method protocol modified to include acidification and the surrogate compound in accordance with the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Quality Control Report
Laboratory Control Sample

Category: **Metals**
Matrix: **Aqueous**

CAS Number	Analyte	Method	QC Batch	Units	Spiked	Measured	Recovery	QC Limits
7439-89-6	Iron	6010B	MM-1191-W	mg/L	1.00	0.96	**96 %**	80 - 120 %
7439-96-5	Manganese	6010B	MM-1191-W	mg/L	1.00	0.92	**92 %**	80 - 120 %

Method References: Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Update III (1996).

Report Notations: All calculations performed prior to rounding. Quality Control Limits are defined by the methodology, or alternatively based upon the historical average recovery plus or minus three standard deviation units.

GROUNDWATER ANALYTICAL

Quality Control Report
Method Blank

Category: **Metals**
Matrix: **Aqueous**

CAS Number	Analyte	Result	Units	Reporting Limit	QC Batch	Method
7439-89-6	Iron	BRL	mg/L	0.05	MM-1191-W	6010B
7439-96-5	Manganese	BRL	mg/L	0.05	MM-1191-W	6010B

Method References: Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Update III (1996).

Report Notations: BRL Indicates result, if any, is below reporting limit for analyte. Reporting limit is the lowest value that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Quality Control Report
Laboratory Control Sample

Category: **MA DEP VPH Method**
QC Batch ID: **VG3-1295-W**
Matrix: **Aqueous**
Units: **ug/L**

CAS Number	Analyte	Spiked	Measured	Recovery	QC Limits
1634-04-4	Methyl *tert*-butyl Ether	50	36	**72%**	70 - 130 %
71-43-2	Benzene	50	46	**91%**	70 - 130 %
108-88-3	Toluene	50	48	**96%**	70 - 130 %
100-41-4	Ethylbenzene	50	43	**87%**	70 - 130 %
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene	100	97	**97%**	70 - 130 %
95-47-6	*ortho*- Xylene	50	47	**95%**	70 - 130 %
91-20-3	Naphthalene	50	45	**90%**	70 - 130 %

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	**80 %**	70 - 130 %
2,5-Dibromotoluene (FID)	**76 %**	70 - 130 %

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations: All calculations performed prior to rounding. Quality Control Limits are defined by the methodology, or alternatively based upon the historical average recovery plus or minus three standard deviation units.

GROUNDWATER ANALYTICAL

Quality Control Report
Method Blank

Category: **MA DEP VPH Method**
QC Batch ID: **VG3-1295-W**
Matrix: **Aqueous**

VPH Ranges	Concentration	Units	Reporting Limit
n-C5 to n-C8 Aliphatic Hydrocarbons †◊	BRL	ug/L	20
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	BRL	ug/L	20
n-C9 to n-C10 Aromatic Hydrocarbons †	BRL	ug/L	20
Unadjusted n-C5 to n-C8 Aliphatic Hydrocarbons †	BRL	ug/L	20
Unadjusted n-C9 to n-C12 Aliphatic Hydrocarbons †	BRL	ug/L	20

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
1634-04-4	Methyl *tert*-butyl Ether ¤	BRL	ug/L	5
71-43-2	Benzene ¤	BRL	ug/L	1
108-88-3	Toluene ¤	BRL	ug/L	5
100-41-4	Ethylbenzene ‡	BRL	ug/L	5
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene ‡	BRL	ug/L	5
95-47-6	*ortho*- Xylene ‡	BRL	ug/L	5
91-20-3	Naphthalene	BRL	ug/L	5

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	**100 %**	70 - 130 %
2,5-Dibromotoluene (FID)	**94 %**	70 - 130 %

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C5 to n-C8 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations.

⊗ n-C9 to n-C12 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations and the concentration for the n-C9 to n-C10 Aromatic Hydrocarbons range.

¤ Analyte elutes in the n-C5 to n-C8 Aliphatic Hydrocarbons range.

‡ Analyte elutes in the n-C9 to n-C12 Aliphatic Hydrocarbons range.

GROUNDWATER ANALYTICAL

Quality Control Report
Laboratory Control Sample

Category: **MA DEP EPH Method**
QC Batch ID: **EP-0756-F**
Matrix: **Water**
Units: **ug/L**

CAS Number	Analyte	Spiked	Measured	Recovery	QC Limits
111-84-2	n-Nonane (C9)	50	22	**44 %**	40 - 140 %
629-59-4	n-Tetradecane (C14)	50	41	**81 %**	40 - 140 %
629-92-5	n-Nonadecane (C19)	50	41	**83 %**	40 - 140 %
112-95-8	n-Eicosane (C20)	50	44	**88 %**	40 - 140 %
630-02-4	n-Octacosane (C28)	50	40	**80 %**	40 - 140 %

QC Surrogate Compounds		Recovery	QC Limits
Fractionation:	2-Fluorobiphenyl	**88 %**	40 - 140 %
	2-Bromonaphthalene	**87 %**	40 - 140 %
Extraction:	Chloro-octadecane	**79 %**	40 - 140 %
	ortho-Terphenyl	**89 %**	40 - 140 %

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (1998).

Report Notations: All calculations performed prior to rounding. Quality Control Limits are defined by the methodology, or alternatively based upon the historical average recovery plus or minus three standard deviation units.

GROUNDWATER ANALYTICAL

Quality Control Report
Method Blank

Category: **MA DEP EPH Method**
QC Batch ID: **EP-0756-F**
Matrix: **Water**

EPH Ranges	Concentration	Units	Reporting Limit
n-C9 to n-C18 Aliphatic Hydrocarbons †	BRL	ug/L	500
n-C19 to n-C36 Aliphatic Hydrocarbons †	BRL	ug/L	500
n-C11 to n-C22 Aromatic Hydrocarbons †◊	BRL	ug/L	200
Unadjusted n-C11 to n-C22 Aromatic Hydrocarbons †	BRL	ug/L	200

QC Surrogate Compounds		Recovery	QC Limits
Fractionation:	2-Fluorobiphenyl	91 %	40 - 140 %
	2-Bromonaphthalene	87 %	40 - 140 %
Extraction:	Chloro-octadecane	72 %	40 - 140 %
	ortho-Terphenyl	85 %	40 - 140 %

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (1998).

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C11 to n-C22 Aromatic Hydrocarbons range data excludes the method target analyte concentrations.

GROUNDWATER ANALYTICAL

Certifications and Approvals

CONNECTICUT, Department of Health Services, PH-0586

Potable Water, Wastewater/Trade Waste, Sewage/Effluent, and Soil

pH, Conductivity, Acidity, Alkalinity, Hardness, Chloride, Fluoride, Ammonia, Kjeldahl Nitrogen, Nitrate, Nitrite, Orthophosphate, Total Dissolved Solids, Cyanide, Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Total Chromium, Hexavalent Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Tin, Titanium, Vanadium, Zinc, Purgeable Halocarbons, Purgeable Aromatics, Pesticides, PCBs, PCBs in Oil, Ethylene Dibromide, Phenols, Oil and Grease.

MAINE, Department of Human Services, MA103

Drinking Water

Reciprocal certification in accordance with Massachusetts certification for drinking water analytes.

Waste Water

Reciprocal certification in accordance with Massachusetts certification for waste water analytes.

MASSACHUSETTS, Department of Environmental Protection, M-MA-103

Potable Water

Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Thallium, Nitrate-N, Nitrite-N, Fluoride, Sodium, Sulfate, Cyanide, Turbidity, Residual Free Chlorine, Calcium, Total Alkalinity, Total Dissolved Solids, pH, Trihalomethanes, Volatile Organic Compounds, 1,2-Dibromoethane, 1,2-Dibromo-3-chloropropane, Total Coliform, Fecal Coliform, Heterotrophic Plate Count, E-Coli

Non-Potable Water

Aluminum, Antimony, Arsenic, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Strontium, Thallium, Titanium, Vanadium, Zinc, pH, Specific Conductance, Total Dissolved Solids, Total Hardness, Calcium, Magnesium, Sodium, Potassium, Total Alkalinity, Chloride, Fluoride, Sulfate, Ammonia-N, Nitrate-N, Kjeldahl-N, Orthophosphate, Total Phosphorus, Chemical Oxygen Demand, Biochemical Oxygen Demand, Total Cyanide, Non-Filterable Residue, Total Residual Chlorine, Oil and Grease, Total Phenolics, Volatile Halocarbons, Volatile Aromatics, Chlordane, Aldrin, Dieldrin, DDD, DDE, DDT, Heptachlor, Heptachlor Epoxide, Polychlorinated Biphenyls (water), Polychlorinated Biphenyls (oil).

MICHIGAN, Department of Environmental Quality

Drinking Water

Trihalomethanes, Regulated and Unregulated Volatile Organic Compounds by EPA Method 524.2; 1,2-Dibromoethane, 1,2-Dibromo-3-chloropropane by EPA Method 504.1

NEW HAMPSHIRE, Department of Environmental Services, 202798

Drinking Water

Metals by Graphite Furnace, Metals by ICP, Mercury, Nitrite-N, Orthophosphate, Residual Free Chlorine, Turbidity, Total Filterable Residue, Calcium Hardness, pH, Alkalinity, Sodium, Sulfate, Total Cyanide, Insecticides, Herbicides, Base/Neutrals, Trihalomethanes, Volatile Organics, Vinyl Chloride, DBCP, EDB, Nitrate-N.

Wastewater

Metals by Graphite Furnace, Metals by ICP, Mercury, pH, Specific Conductivity, TDS, Total Hardness, Calcium, Magnesium, Sodium, Potassium, Total Alkalinity, Chloride, Fluoride, Sulfate, Ammonia-N, Nitrate-N, Orthophosphate, TKN, Total Phosphorus, COD, BOD, Non-Filterable Residue, Oil & Grease, Total Phenolics, Total Residual Chlorine, PCBs in Water, PCBs in Oil, Pesticides, Volatile Organics, Total Cyanide.

RHODE ISLAND, Department of Health, 54

Surface Water, Air, Wastewater, Potable Water, Sewage

Chemistry: Organic and Inorganic

GROUNDWATER ANALYTICAL

Groundwater Analytical, Inc.
P.O. Box 1200
228 Main Street
Buzzards Bay, MA 02532

Telephone (508) 759-4441
FAX (508) 759-4475

January 31, 2001

Mr. Timothy Condon
RAM Environmental
One Roberts Road
Plymouth, MA 02360

Project: **Buzzard's Bay/101.20.3**
Lab ID: **38683**
Sampled: **01-24-01**

Dear Tim:

Enclosed are the Volatile Petroleum Hydrocarbons, Extractable Petroleum Hydrocarbons, Nitrate, Sulfate, BOD and Metals Analyses performed for the above referenced project. This project was processed for Priority One Week turnaround.

This letter authorizes the release of the analytical results, and should be considered a part of this report. This report contains a project narrative indicating project changes and non-conformances, a brief description of the Quality Assurance/Quality Control procedures employed by our laboratory, and a statement of our state certifications.

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.

Should you have any questions concerning this report, please do not hesitate to contact me.

Sincerely,

Jonathan R. Sanford
President

JRS/ss
Enclosures

GROUNDWATER ANALYTICAL

Massachusetts DEP VPH Method
Volatile Petroleum Hydrocarbons by GC/PID/FID

Field ID:	**RAM-MW-1**	Laboratory ID:	**38683-01**
Project:	**Buzzard's Bay/101.20.3**	QC Batch ID:	**VG3-1342-W**
Client:	**RAM Environmental**	Sampled:	**01-24-01**
Container:	**40 mL Glass Vial**	Received:	**01-24-01**
Preservation:	**HCl / Cool**	Analyzed:	**01-27-01**
Matrix:	**Aqueous**	Dilution Factor:	**1**

VPH Ranges	Concentration	Units	Reporting Limit
n-C5 to n-C8 Aliphatic Hydrocarbons †◊	**240**	ug/L	20
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	**51**	ug/L	20
n-C9 to n-C10 Aromatic Hydrocarbons †	**40**	ug/L	20
Unadjusted *n*-C5 to *n*-C8 Aliphatic Hydrocarbons †	360	ug/L	20
Unadjusted n-C9 to n-C12 Aliphatic Hydrocarbons †	92	ug/L	20

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
1634-04-4	Methyl *tert*-butyl Ether ¤	**110**	ug/L	5
71-43-2	Benzene ¤	5	ug/L	1
108-88-3	Toluene ¤	BRL	ug/L	5
100-41-4	Ethylbenzene ‡	BRL	ug/L	5
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene ‡	BRL	ug/L	5
95-47-6	*ortho*- Xylene ‡	BRL	ug/L	5
91-20-3	Naphthalene	BRL	ug/L	5

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	**107 %**	70 - 130 %
2,5-Dibromotoluene (FID)	**110 %**	70 - 130 %

QA/QC Certification	
1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.2.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C5 to n-C8 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations.

⊗ n-C9 to n-C12 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations and the concentration for the n-C9 to n-C10 Aromatic Hydrocarbons range.

¤ Analyte elutes in the n-C5 to n-C8 Aliphatic Hydrocarbons range.

‡ Analyte elutes in the n-C9 to n-C12 Aliphatic Hydrocarbons range.

GROUNDWATER ANALYTICAL

Massachusetts DEP VPH Method
Volatile Petroleum Hydrocarbons by GC/PID/FID

Field ID:	**RAM-MW-2**	Laboratory ID:	**38683-02**
Project:	**Buzzard's Bay/101.20.3**	QC Batch ID:	**VG3-1342-W**
Client:	**RAM Environmental**	Sampled:	**01-24-01**
Container:	**40 mL Glass Vial**	Received:	**01-24-01**
Preservation:	**HCl / Cool**	Analyzed:	**01-26-01**
Matrix:	**Aqueous**	Dilution Factor:	2

VPH Ranges	Concentration	Units	Reporting Limit
n-C5 to n-C8 Aliphatic Hydrocarbons †◊	770	ug/L	40
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	250	ug/L	40
n-C9 to n-C10 Aromatic Hydrocarbons †	320	ug/L	40
Unadjusted n-C5 to n-C8 Aliphatic Hydrocarbons †	1,100	ug/L	40
Unadjusted n-C9 to n-C12 Aliphatic Hydrocarbons †	710	ug/L	40

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
1634-04-4	Methyl *tert*-butyl Ether ¤	360	ug/L	10
71-43-2	Benzene ¤	BRL	ug/L	2
108-88-3	Toluene ¤	13	ug/L	10
100-41-4	Ethylbenzene ‡	21	ug/L	10
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene ‡	63	ug/L	10
95-47-6	*ortho*- Xylene ‡	51	ug/L	10
91-20-3	Naphthalene	11	ug/L	10

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	100 %	70 - 130 %
2,5-Dibromotoluene (FID)	102 %	70 - 130 %

QA/QC Certification	
1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.2.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C5 to n-C8 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations.

⊗ n-C9 to n-C12 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations and the concentration for the n-C9 to n-C10 Aromatic Hydrocarbons range.

¤ Analyte elutes in the n-C5 to n-C8 Aliphatic Hydrocarbons range.

‡ Analyte elutes in the n-C9 to n-C12 Aliphatic Hydrocarbons range.

GROUNDWATER ANALYTICAL

Massachusetts DEP VPH Method
Volatile Petroleum Hydrocarbons by GC/PID/FID

Field ID:	**RAM-MW-3**	Laboratory ID:	**38683-03**
Project:	**Buzzard's Bay/101.20.3**	QC Batch ID:	**VG3-1342-W**
Client:	**RAM Environmental**	Sampled:	**01-24-01**
Container:	**40 mL Glass Vial**	Received:	**01-24-01**
Preservation:	**HCl / Cool**	Analyzed:	**01-26-01**
Matrix:	**Aqueous**	Dilution Factor:	**2**

VPH Ranges	Concentration	Units	Reporting Limit
n-C5 to n-C8 Aliphatic Hydrocarbons †◊	**860**	ug/L	40
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	**520**	ug/L	40
n-C9 to n-C10 Aromatic Hydrocarbons †	**660**	ug/L	40
Unadjusted n-C5 to n-C8 Aliphatic Hydrocarbons †	1,900	ug/L	40
Unadjusted n-C9 to n-C12 Aliphatic Hydrocarbons †	1,600	ug/L	40

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
1634-04-4	Methyl *tert*-butyl Ether ¤	**1,000**	ug/L	10
71-43-2	Benzene ¤	**12**	ug/L	2
108-88-3	Toluene ¤	BRL	ug/L	10
100-41-4	Ethylbenzene ‡	**40**	ug/L	10
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene ‡	**120**	ug/L	10
95-47-6	*ortho*- Xylene ‡	**250**	ug/L	10
91-20-3	Naphthalene	**130**	ug/L	10

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	**100 %**	70 - 130 %
2,5-Dibromotoluene (FID)	**99 %**	70 - 130 %

QA/QC Certification

1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.2.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations:

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† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C5 to n-C8 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations.

⊗ n-C9 to n-C12 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations and the concentration for the n-C9 to n-C10 Aromatic Hydrocarbons range.

¤ Analyte elutes in the n-C5 to n-C8 Aliphatic Hydrocarbons range.

‡ Analyte elutes in the n-C9 to n-C12 Aliphatic Hydrocarbons range.

GROUNDWATER ANALYTICAL

Massachusetts DEP VPH Method
Volatile Petroleum Hydrocarbons by GC/PID/FID

Field ID:	**RAM-MW-4**	Laboratory ID:	**38683-04**
Project:	**Buzzard's Bay/101.20.3**	QC Batch ID:	**VG3-1342-W**
Client:	**RAM Environmental**	Sampled:	**01-24-01**
Container:	**40 mL Glass Vial**	Received:	**01-24-01**
Preservation:	**HCl / Cool**	Analyzed:	**01-26-01**
Matrix:	**Aqueous**	Dilution Factor:	**5**

VPH Ranges	Concentration	Units	Reporting Limit
n-C5 to n-C8 Aliphatic Hydrocarbons ‡◊	**4,200**	ug/L	100
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	**3,300**	ug/L	100
n-C9 to n-C10 Aromatic Hydrocarbons †	**4,400**	ug/L	100
Unadjusted n-C5 to n-C8 Aliphatic Hydrocarbons †	5,400	ug/L	100
Unadjusted n-C9 to n-C12 Aliphatic Hydrocarbons †	11,000	ug/L	100

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
1634-04-4	Methyl *tert*-butyl Ether ¤	BRL	ug/L	25
71-43-2	Benzene ¤	**10**	ug/L	5
108-88-3	Toluene ¤	**1,200**	ug/L	25
100-41-4	Ethylbenzene ‡	**770**	ug/L	25
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene ‡	**1,600**	ug/L	25
95-47-6	*ortho*- Xylene ‡	**740**	ug/L	25
91-20-3	Naphthalene	**150**	ug/L	25

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	74 %	70 - 130 %
2,5-Dibromotoluene (FID)	72 %	70 - 130 %

QA/QC Certification

1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.2.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations:

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† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C5 to n-C8 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations.

⊗ n-C9 to n-C12 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations and the concentration for the n-C9 to n-C10 Aromatic Hydrocarbons range.

¤ Analyte elutes in the n-C5 to n-C8 Aliphatic Hydrocarbons range.

‡ Analyte elutes in the n-C9 to n-C12 Aliphatic Hydrocarbons range.

GROUNDWATER ANALYTICAL

Massachusetts DEP VPH Method
Volatile Petroleum Hydrocarbons by GC/PID/FID

Field ID:	**RAM-MW-5**	Laboratory ID:	**38683-05**
Project:	**Buzzard's Bay/101.20.3**	QC Batch ID:	**VG3-1342-W**
Client:	**RAM Environmental**	Sampled:	**01-24-01**
Container:	**40 mL Glass Vial**	Received:	**01-24-01**
Preservation:	**HCl / Cool**	Analyzed:	**01-27-01**
Matrix:	**Aqueous**	Dilution Factor:	1

VPH Ranges	Concentration	Units	Reporting Limit
n-C5 to n-C8 Aliphatic Hydrocarbons †◊	66	ug/L	20
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	BRL	ug/L	20
n-C9 to n-C10 Aromatic Hydrocarbons †	BRL	ug/L	20
Unadjusted n-C5 to n-C8 Aliphatic Hydrocarbons †	67	ug/L	20
Unadjusted n-C9 to n-C12 Aliphatic Hydrocarbons †	BRL	ug/L	20

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
1634-04-4	Methyl *tert*-butyl Ether ¤	BRL	ug/L	5
71-43-2	Benzene ‡	BRL	ug/L	1
108-88-3	Toluene ‡	BRL	ug/L	5
100-41-4	Ethylbenzene ‡	BRL	ug/L	5
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene ‡	BRL	ug/L	5
95-47-6	*ortho*- Xylene ‡	BRL	ug/L	5
91-20-3	Naphthalene	BRL	ug/L	5

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	99 %	70 - 130 %
2,5-Dibromotoluene (FID)	99 %	70 - 130 %

QA/QC Certification	
1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.2.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations:

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† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C5 to n-C8 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations.

⊗ n-C9 to n-C12 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations and the concentration for the n-C9 to n-C10 Aromatic Hydrocarbons range.

¤ Analyte elutes in the n-C5 to n-C8 Aliphatic Hydrocarbons range.

‡ Analyte elutes in the n-C9 to n-C12 Aliphatic Hydrocarbons range.

GROUNDWATER ANALYTICAL

Massachusetts DEP VPH Method
Volatile Petroleum Hydrocarbons by GC/PID/FID

Field ID:	**RAM-ORC-1**	Laboratory ID:	**38683-06**
Project:	**Buzzard's Bay/101.20.3**	QC Batch ID:	**VG3-1342-W**
Client:	**RAM Environmental**	Sampled:	**01-24-01**
Container:	**40 mL Glass Vial**	Received:	**01-24-01**
Preservation:	**HCl / Cool**	Analyzed:	**01-26-01**
Matrix:	**Aqueous**	Dilution Factor:	**10**

VPH Ranges	Concentration	Units	Reporting Limit
n-C5 to n-C8 Aliphatic Hydrocarbons †◊	**5,300**	ug/L	200
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	**4,600**	ug/L	200
n-C9 to n-C10 Aromatic Hydrocarbons †	**7,600**	ug/L	200
Unadjusted n-C5 to n-C8 Aliphatic Hydrocarbons †	7,000	ug/L	200
Unadjusted n-C9 to n-C12 Aliphatic Hydrocarbons †	15,000	ug/L	200

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
1634-04-4	Methyl *tert*-butyl Ether ¤	**1,700**	ug/L	50
71-43-2	Benzene ¤	**75**	ug/L	10
108-88-3	Toluene ¤	**63**	ug/L	50
100-41-4	Ethylbenzene ‡	**330**	ug/L	50
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene ‡	**1,600**	ug/L	50
95-47-6	*ortho*- Xylene ‡	**530**	ug/L	50
91-20-3	Naphthalene	**230**	ug/L	50

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	**89 %**	70 - 130 %
2,5-Dibromotoluene (FID)	**89 %**	70 - 130 %

QA/QC Certification

1. Were all QA/QC procedures required by the method followed? Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved? Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.2.1? No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations:

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† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C5 to n-C8 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations.

⊗ n-C9 to n-C12 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations and the concentration for the n-C9 to n-C10 Aromatic Hydrocarbons range.

¤ Analyte elutes in the n-C5 to n-C8 Aliphatic Hydrocarbons range.

‡ Analyte elutes in the n-C9 to n-C12 Aliphatic Hydrocarbons range.

GROUNDWATER ANALYTICAL

Massachusetts DEP VPH Method
Volatile Petroleum Hydrocarbons by GC/PID/FID

Field ID:	**RAM-ORC-2**	Laboratory ID:	**38683-09**
Project:	**Buzzard's Bay/101.20.3**	QC Batch ID:	**VG3-1342-W**
Client:	**RAM Environmental**	Sampled:	**01-24-01**
Container:	**40 mL Glass Vial**	Received:	**01-24-01**
Preservation:	**HCl / Cool**	Analyzed:	**01-26-01**
Matrix:	**Aqueous**	Dilution Factor:	**10**

VPH Ranges	Concentration	Units	Reporting Limit
n-C5 to n-C8 Aliphatic Hydrocarbons †◊	**4,700**	ug/L	200
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	**5,000**	ug/L	200
n-C9 to n-C10 Aromatic Hydrocarbons †	**7,900**	ug/L	200
Unadjusted n-C5 to n-C8 Aliphatic Hydrocarbons †	5,500	ug/L	200
Unadjusted n-C9 to n-C12 Aliphatic Hydrocarbons †	16,000	ug/L	200

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
1634-04-4	Methyl *tert*-butyl Ether ¤	**750**	ug/L	50
71-43-2	Benzene ¤	**29**	ug/L	10
108-88-3	Toluene ¤	BRL	ug/L	50
100-41-4	Ethylbenzene ‡	**540**	ug/L	50
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene ‡	**1,700**	ug/L	50
95-47-6	*ortho*- Xylene ‡	**820**	ug/L	50
91-20-3	Naphthalene	**230**	ug/L	50

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	**92 %**	70 - 130 %
2,5-Dibromotoluene (FID)	**91 %**	70 - 130 %

QA/QC Certification

1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.2.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations:

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† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C5 to n-C8 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations.

⊗ n-C9 to n-C12 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations and the concentration for the n-C9 to n-C10 Aromatic Hydrocarbons range.

¤ Analyte elutes in the n-C5 to n-C8 Aliphatic Hydrocarbons range.

‡ Analyte elutes in the n-C9 to n-C12 Aliphatic Hydrocarbons range.

GROUNDWATER ANALYTICAL

Massachusetts DEP VPH Method
Volatile Petroleum Hydrocarbons by GC/PID/FID

Field ID:	**RAM-ORC-4**	Laboratory ID:	**38683-10**
Project:	**Buzzard's Bay/101.20.3**	QC Batch ID:	**VG3-1342-W**
Client:	**RAM Environmental**	Sampled:	**01-24-01**
Container:	**40 mL Glass Vial**	Received:	**01-24-01**
Preservation:	**HCl / Cool**	Analyzed:	**01-26-01**
Matrix:	**Aqueous**	Dilution Factor:	**10**

VPH Ranges	Concentration	Units	Reporting Limit
n-C5 to n-C8 Aliphatic Hydrocarbons †◊	**4,400**	ug/L	200
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	**7,200**	ug/L	200
n-C9 to n-C10 Aromatic Hydrocarbons †	**8,400**	ug/L	200
Unadjusted n-C5 to n-C8 Aliphatic Hydrocarbons †	5,300	ug/L	200
Unadjusted n-C9 to n-C12 Aliphatic Hydrocarbons †	23,000	ug/L	200

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
1634-04-4	Methyl *tert*-butyl Ether ¤	**290**	ug/L	50
71-43-2	Benzene ¤	BRL	ug/L	10
108-88-3	Toluene ¤	**620**	ug/L	50
100-41-4	Ethylbenzene ‡	**1,100**	ug/L	50
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene ‡	**4,100**	ug/L	50
95-47-6	*ortho*- Xylene ‡	**1,800**	ug/L	50
91-20-3	Naphthalene	**220**	ug/L	50

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	74 %	70 - 130 %
2,5-Dibromotoluene (FID)	73 %	70 - 130 %

QA/QC Certification

1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.2.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C5 to n-C8 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations.

⊗ n-C9 to n-C12 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations and the concentration for the n-C9 to n-C10 Aromatic Hydrocarbons range.

¤ Analyte elutes in the n-C5 to n-C8 Aliphatic Hydrocarbons range.

‡ Analyte elutes in the n-C9 to n-C12 Aliphatic Hydrocarbons range.

GROUNDWATER ANALYTICAL

Massachusetts DEP VPH Method
Volatile Petroleum Hydrocarbons by GC/PID/FID

Field ID:	**RAM-SW-1**	Laboratory ID:	**38683-11**
Project:	**Buzzard's Bay/101.20.3**	QC Batch ID:	**VG3-1342-W**
Client:	**RAM Environmental**	Sampled:	**01-24-01**
Container:	**40 mL Glass Vial**	Received:	**01-24-01**
Preservation:	**HCl / Cool**	Analyzed:	**01-27-01**
Matrix:	**Aqueous**	Dilution Factor:	**1**

VPH Ranges	Concentration	Units	Reporting Limit
n-C5 to n-C8 Aliphatic Hydrocarbons †◊	BRL	ug/L	20
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	BRL	ug/L	20
n-C9 to n-C10 Aromatic Hydrocarbons †	BRL	ug/L	20
Unadjusted n-C5 to n-C8 Aliphatic Hydrocarbons †	40	ug/L	20
Unadjusted n-C9 to n-C12 Aliphatic Hydrocarbons †	BRL	ug/L	20

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
1634-04-4	Methyl *tert*-butyl Ether ¤	28	ug/L	5
71-43-2	Benzene ¤	BRL	ug/L	1
108-88-3	Toluene ¤	BRL	ug/L	5
100-41-4	Ethylbenzene ‡	BRL	ug/L	5
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene ‡	BRL	ug/L	5
95-47-6	*ortho*- Xylene ‡	BRL	ug/L	5
91-20-3	Naphthalene	BRL	ug/L	5

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	99 %	70 - 130 %
2,5-Dibromotoluene (FID)	98 %	70 - 130 %

QA/QC Certification	
1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.2.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C5 to n-C8 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations.

⊗ n-C9 to n-C12 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations and the concentration for the n-C9 to n-C10 Aromatic Hydrocarbons range.

¤ Analyte elutes in the n-C5 to n-C8 Aliphatic Hydrocarbons range.

‡ Analyte elutes in the n-C9 to n-C12 Aliphatic Hydrocarbons range.

GROUNDWATER ANALYTICAL

Massachusetts DEP VPH Method
Volatile Petroleum Hydrocarbons by GC/PID/FID

Field ID:	**RAM-QA/QC-100**	Laboratory ID:	**38683-12**
Project:	**Buzzard's Bay/101.20.3**	QC Batch ID:	**VG3-1342-W**
Client:	**RAM Environmental**	Sampled:	**01-24-01**
Container:	**40 mL Glass Vial**	Received:	**01-24-01**
Preservation:	**HCl / Cool**	Analyzed:	**01-27-01**
Matrix:	**Aqueous**	Dilution Factor:	1

VPH Ranges	Concentration	Units	Reporting Limit
n-C5 to n-C8 Aliphatic Hydrocarbons †◊	BRL	ug/L	20
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	BRL	ug/L	20
n-C9 to n-C10 Aromatic Hydrocarbons †	BRL	ug/L	20
Unadjusted n-C5 to n-C8 Aliphatic Hydrocarbons †	BRL	ug/L	20
Unadjusted n-C9 to n-C12 Aliphatic Hydrocarbons †	BRL	ug/L	20

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
1634-04-4	Methyl *tert*-butyl Ether ¤	BRL	ug/L	5
71-43-2	Benzene ¤	BRL	ug/L	1
108-88-3	Toluene ¤	BRL	ug/L	5
100-41-4	Ethylbenzene ‡	BRL	ug/L	5
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene ‡	BRL	ug/L	5
95-47-6	*ortho*- Xylene ‡	BRL	ug/L	5
91-20-3	Naphthalene	BRL	ug/L	5

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	100 %	70 - 130 %
2,5-Dibromotoluene (FID)	99 %	70 - 130 %

QA/QC Certification	
1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.2.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C5 to n-C8 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations.

⊗ n-C9 to n-C12 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations and the concentration for the n-C9 to n-C10 Aromatic Hydrocarbons range.

¤ Analyte elutes in the n-C5 to n-C8 Aliphatic Hydrocarbons range.

‡ Analyte elutes in the n-C9 to n-C12 Aliphatic Hydrocarbons range.

GROUNDWATER ANALYTICAL

Quality Control Report
Matrix Spike and Matrix Spike Duplicate

Field ID:	**RAM-QA/QC-700/701**	Category:	**MA DEP VPH**
Project:	**Buzzard's Bay/101.20.3**	QC Batch ID:	**VG3-1342-W**
Client	**Ram Environmental**	Sampled:	**01-24-01**
Matrix:	**Aqueous**	Received:	**01-24-01**
Units:	**ug/L**		

Matrix Spike - Lab ID 38683-07

CAS Number	Analyte	Spiked	Sample Concentration	Measured	Recovery	QC Limits
1634-04-4	Methyl *tert*-butyl Ether	50	1,700	**1,600**	**200% s**	70 - 130 %
71-43-2	Benzene	50	75	**130**	**110%**	70 - 130 %
108-88-3	Toluene	50	63	**120**	**114%**	70 - 130 %
100-41-4	Ethylbenzene	50	330	**370**	**80%**	70 - 130 %
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene	100	1,600	**1,600**	**s**	70 - 130 %
95-47-6	*ortho*- Xylene	50	530	**560**	**60% s**	70 - 130 %
91-20-3	Naphthalene	50	230	**270**	**80%**	70 - 130 %

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	**100 %**	70 - 130 %
2,5-Dibromotoluene (FID)	**100 %**	70 - 130 %

Matrix Spike Duplicate - Lab ID 38603-08

CAS Number	Analyte	Spiked	Measured	Recovery	RPD		QC Limits
1634-04-4	Methyl *tert*-butyl Ether	50	1,800	**200% s**	**400% s**	50	70 - 130 %
71-43-2	Benzene	50	140	**130%**	**20% s**	50	70 - 130 %
108-88-3	Toluene	50	120	**114%**	**s**	50	70 - 130 %
100-41-4	Ethylbenzene	50	410	**160% s**	**80**	50	70 - 130 %
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene	100	1,800	**200% s**	**200% s**	50	70 - 130 %
95-47-6	*ortho*- Xylene	50	620	**180% s**	**120**	50	70 - 130 %
91-20-3	Naphthalene	50	310	**160% s**	**80**	50	70 - 130 %

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	**100 %**	70 - 130 %
2,5-Dibromotoluene (FID)	**100 %**	70 - 130 %

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (1998).

Report Notations: All calculations performed prior to rounding. Quality Control Limits are defined by the methodology, or alternatively based upon the historical average recovery plus or minus three standard deviation units.

s Matrix spike recovery outside recommended limits due to high concentration or spike analyte native to the sample.

GROUNDWATER ANALYTICAL

Trace Metals by ICP-AES and CVAA

Field ID:	**RAM-ORC-1**	Laboratory ID:	**38683-13**
Project:	**Buzzard's Bay/101.20.3**	Sampled:	**01-24-01**
Client:	**RAM Environmental**	Received:	**01-24-01**
Container:	**500 mL Plastic**	Preserved:	**01-25-01**
Preservation:	**HNO3 / Cool**	Filtered:	**01-25-01**
Matrix:	**Aqueous**		

CAS Number	Analyte	Concentration	Units	Reporting Limit	Analyzed	QC Batch	Method
7439-89-6	Iron, Dissolved	**1.8**	mg/L	0.05	01-25-01	MM-1238-W	6010B
7439-96-5	Manganese, Dissolved	**1.0**	mg/L	0.05	01-25-01	MM-1238-W	6010B

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Trace Metals by ICP-AES and CVAA

Field ID:	**RAM-ORC-2**	Laboratory ID:	**38683-16**
Project:	**Buzzard's Bay/101.20.3**	Sampled:	**01-24-01**
Client:	**RAM Environmental**	Received:	**01-24-01**
Container:	**500 mL Plastic**	Preserved:	**01-25-01**
Preservation:	**HNO3 / Cool**	Filtered:	**01-25-01**
Matrix:	**Aqueous**		

CAS Number	Analyte	Concentration	Units	Reporting Limit	Analyzed	QC Batch	Method
7439-89-6	Iron, Dissolved	**1.7**	mg/L	0.05	01-25-01	MM-1238-W	6010B
7439-96-5	Manganese, Dissolved	**1.4**	mg/L	0.05	01-25-01	MM-1238-W	6010B

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Trace Metals by ICP-AES and CVAA

Field ID:	**RAM-ORC-4**	Laboratory ID:	**38683-17**
Project:	**Buzzard's Bay/101.20.3**	Sampled:	**01-24-01**
Client:	**RAM Environmental**	Received:	**01-24-01**
Container:	**500 mL Plastic**	Preserved:	**01-25-01**
Preservation:	**HNO3 / Cool**	Filtered:	**01-25-01**
Matrix:	**Aqueous**		

CAS Number	Analyte	Concentration	Units	Reporting Limit	Analyzed	QC Batch	Method
7439-89-6	Iron, Dissolved	**0.11**	mg/L	0.05	01-25-01	MM-1238-W	6010B
7439-96-5	Manganese, Dissolved	**0.15**	mg/L	0.05	01-25-01	MM-1238-W	6010B

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Quality Control Report
Matrix Spike and Matrix Spike Duplicate

Field ID:	**RAM-QA/QC-700/701**	Category:	**Metals**
Project:	**Buzzard's Bay/101.20.3**	Sampled:	**01-24-01**
Client	**RAM Environmental**	Received:	**01-24-01**
Matrix:	**Aqueous**		
Units:	**mg/L**		

Matrix Spike - Lab ID 38683-14

CAS Number	Analyte	Spiked	Sample Concentration	Measured	Recovery	QC Limits
7439-89-6	Iron, Dissolved	1.0	1.8	**2.7**	**91%**	80-120
7439-96-5	Manganese, Dissolved	1.0	1.0	**1.9**	**90%**	80-120

Matrix Spike Duplicate - Lab ID 38683-15

CAS Number	Analyte	Spiked	Measured	Recovery	RPD		QC Limits
7439-89-6	Iron, Dissolved	1.0	2.9	**110 %**	19 %	50	80-120
7439-96-5	Manganese, Dissolved	1.0	1.9	**90 %**	0 %	50	80-120

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996). Results are reported on a dry weight basis.

Report Notations: All calculations performed prior to rounding. Quality Control Limits are defined by the methodology, or alternatively based upon the historical average recovery plus or minus three standard deviation units.

GROUNDWATER ANALYTICAL

Inorganic Chemistry

Field ID:	**RAM-ORC-1**	Matrix:	**Aqueous**
Project:	**Buzzard's Bay/101.20.3**	Sampled:	**01-24-01**
Client:	**RAM Environmental**	Received:	**01-24-01**

Lab ID: **38683-23** Container: **1L Glass** Preservation: **Cool**

Analyte	Result	Units	Reporting Limit	Analyzed	QC Batch	Method
Biochemical Oxygen Demand	**103**	mg/L	40	01-24-01	BOD-0856-W	EPA 405.1

Lab ID: **38683-18** Container: **500 mL Plastic** Preservation: **Cool**

Analyte	Result	Units	Reporting Limit	Analyzed	QC Batch	Method
Nitrate (as Nitrogen)	**0.92**	mg/L	0.02	01-25-01	NI-1018-W	EPA 353.2
Sulfate	BRL	mg/L	5	01-25-01	SU-0462-W	EPA 375.2

Method References: Methods for Chemical Analysis of Water and Wastes, US EPA, EPA-600/4-790-020, Revised (1983), and Methods for the Determination of Inorganic Substances in Environmental Samples, US EPA, EPA/600/R-93/100, (1993), and Standard Methods for the Examination of Water and Wastewater, APHA, Eighteenth Edition (1992).

Report Notations: BRL Indicates result, if any, is below reporting limit for analyte. Reporting limit is the lowest value that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Quality Control Report
Matrix Spike and Matrix Spike Duplicate

Field ID:	**RAM-QA/QC-700/701**	Category:	**Inorganics**
Project:	**Buzzard's Bay/101.20.3**	QC Batch ID:	**SU-0462-W**
Client	**RAM Environmental**	Sampled:	**01-24-01**
Matrix:	**Aqueous**	Received:	**01-24-01**
Units:	**mg/L**		

Matrix Spike - Lab ID 38683-19

Analyte	Method	Spiked	Sample Concentration	Measured	Recovery	QC Limits
Sulfate	375.2	50	BRL	53	**107%**	80 - 120 %

Matrix Spike Duplicate - Lab ID 38683-20

Analyte	Method	Spiked	Measured	Recovery	RPD		QC Limits
Sulfate	375.2	50	60	**119**	**13**	30	80 - 120 %

Method References: Methods for Chemical Analysis of Water and Wastes, US EPA, EPA-600/4-790-020, Revised (1983), and Methods for the Determination of Inorganic Substances in Environmental Samples, US EPA, EPA/600/R-93/100, (1993), and Standard Methods for the Examination of Water and Wastewater, APHA, Eighteenth Edition (1992).

Report Notations: All calculations performed prior to rounding. Quality Control Limits are defined by the methodology, or alternatively based upon the historical average recovery plus or minus three standard deviation units.

GROUNDWATER ANALYTICAL

Inorganic Chemistry

Field ID:	**RAM-ORC-2**	Matrix:	**Aqueous**
Project:	**Buzzard's Bay/101.20.3**	Sampled:	**01-24-01**
Client:	**RAM Environmental**	Received:	**01-24-01**

Lab ID: **38683-26** Container: **1L Glass** Preservation: **Cool**

Analyte	Result	Units	Reporting Limit	Analyzed	QC Batch	Method
Biochemical Oxygen Demand	**84**	mg/L	40	01-24-01	BOD-0856-W	EPA 405.1

Lab ID: **38683-21** Container: **500 mL Plastic** Preservation: **Cool**

Analyte	Result	Units	Reporting Limit	Analyzed	QC Batch	Method
Nitrate (as Nitrogen)	**0.04**	mg/L	0.02	01-25-01	NI-1018-W	EPA 353.2
Sulfate	7	mg/L	5	01-25-01	SU-0462-W	EPA 375.2

Method References: Methods for Chemical Analysis of Water and Wastes, US EPA, EPA-600/4-790-020, Revised (1983), and Methods for the Determination of Inorganic Substances in Environmental Samples, US EPA, EPA/600/R-93/100, (1993), and Standard Methods for the Examination of Water and Wastewater, APHA, Eighteenth Edition (1992).

Report Notations: BRL Indicates result, if any, is below reporting limit for analyte. Reporting limit is the lowest value that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Inorganic Chemistry

Field ID:	**RAM-ORC-4**	Matrix:	**Aqueous**
Project:	**Buzzard's Bay/101.20.3**	Sampled:	**01-24-01**
Client:	**RAM Environmental**	Received:	**01-24-01**

Lab ID: **38683-27** Container: **1L Glass** Preservation: **Cool**

Analyte	Result	Units	Reporting Limit	Analyzed	QC Batch	Method
Biochemical Oxygen Demand	**58**	mg/L	40	01-24-01	BOD-0856-W	EPA 405.1

Lab ID: **38683-22** Container: **500 mL Plastic** Preservation: **Cool**

Analyte	Result	Units	Reporting Limit	Analyzed	QC Batch	Method
Nitrate (as Nitrogen)	**0.79**	mg/L	0.02	01-25-01	NI-1018-W	EPA 353.2
Sulfate	**22**	mg/L	5	01-25-01	SU-0462-W	EPA 375.2

Method References: Methods for Chemical Analysis of Water and Wastes, US EPA, EPA-600/4-790-020, Revised (1983), and Methods for the Determination of Inorganic Substances in Environmental Samples, US EPA, EPA/600/R-93/100, (1993), and Standard Methods for the Examination of Water and Wastewater, APHA, Eighteenth Edition (1992).

Report Notations: BRL Indicates result, if any, is below reporting limit for analyte. Reporting limit is the lowest value that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Massachusetts DEP EPH Method
Extractable Petroleum Hydrocarbons by GC/FID

Field ID:	**RAM-ORC-1**	Laboratory ID:	**38683-28**
Project:	**Buzzard's Bay/101.20.3**	QC Batch ID:	**EP-0793-F**
Client:	**RAM Environmental**	Sampled:	**01-24-01**
Container:	**1 L Amber Glass**	Received:	**01-24-01**
Preservation:	**H2SO4 / Cool**	Extracted:	**01-26-01**
Matrix:	**Aqueous**	Analyzed:	**01-27-01**
		Dilution Factor:	**Aliphatic: 1 Aromatic: 1**

EPH Ranges	Concentration	Units	Reporting Limit
n-C9 to n-C18 Aliphatic Hydrocarbons †	**1,500**	ug/L	500
n-C19 to n-C36 Aliphatic Hydrocarbons †	BRL	ug/L	500
n-C11 to n-C22 Aromatic Hydrocarbons †◊	**630**	ug/L	200
Unadjusted n-C11 to n-C22 Aromatic Hydrocarbons †	840	ug/L	200

QC Surrogate Compounds		Recovery	QC Limits
Fractionation:	2-Fluorobiphenyl	**89 %**	40 - 140 %
	2-Bromonaphthalene	**63 %**	40 - 140 %
Extraction:	Chloro-octadecane	**72 %**	40 - 140 %
	ortho-Terphenyl	**83 %**	40 - 140 %

QA/QC Certification

1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (1998). Extraction performed utilizing separatory funnel technique.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C11 to n-C22 Aromatic Hydrocarbons range data excludes the method target analyte concentrations.

GROUNDWATER ANALYTICAL

Massachusetts DEP EPH Method
Extractable Petroleum Hydrocarbons by GC/FID

Field ID:	**RAM-ORC-2**	Laboratory ID:	**38683-31**
Project:	**Buzzard's Bay/101.20.3**	QC Batch ID:	**EP-0793-F**
Client:	**RAM Environmental**	Sampled:	**01-24-01**
Container:	**1 L Amber Glass**	Received:	**01-24-01**
Preservation:	**H2SO4 / Cool**	Extracted:	**01-26-01**
Matrix:	**Aqueous**	Analyzed:	**01-29-01**
		Dilution Factor:	**Aliphatic: 1 Aromatic: 1**

EPH Ranges	Concentration	Units	Reporting Limit
n-C9 to n-C18 Aliphatic Hydrocarbons †	**840**	ug/L	500
n-C19 to n-C36 Aliphatic Hydrocarbons †	BRL	ug/L	500
n-C11 to n-C22 Aromatic Hydrocarbons †◊	**630**	ug/L	200
Unadjusted n-C11 to n-C22 Aromatic Hydrocarbons †	880	ug/L	200

QC Surrogate Compounds		Recovery	QC Limits
Fractionation:	2-Fluorobiphenyl	**97 %**	40 - 140 %
	2-Bromonaphthalene	**96 %**	40 - 140 %
Extraction:	Chloro-octadecane	**76 %**	40 - 140 %
	ortho-Terphenyl	**86 %**	40 - 140 %

QA/QC Certification

1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (1998). Extraction performed utilizing separatory funnel technique.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C11 to n-C22 Aromatic Hydrocarbons range data excludes the method target analyte concentrations.

GROUNDWATER ANALYTICAL

Massachusetts DEP EPH Method
Extractable Petroleum Hydrocarbons by GC/FID

Field ID:	**RAM-ORC-4**	Laboratory ID:	**38683-32**
Project:	**Buzzard's Bay/101.20.3**	QC Batch ID:	**EP-0793-F**
Client:	**RAM Environmental**	Sampled:	**01-24-01**
Container:	**1 L Amber Glass**	Received:	**01-24-01**
Preservation:	**H2SO4 / Cool**	Extracted:	**01-26-01**
Matrix:	**Aqueous**	Analyzed:	**01-30-01**
		Dilution Factor:	**Aliphatic: 1 Aromatic: 1**

EPH Ranges	Concentration	Units	Reporting Limit
n-C9 to n-C18 Aliphatic Hydrocarbons †	**1,300**	ug/L	500
n-C19 to n-C36 Aliphatic Hydrocarbons †	BRL	ug/L	500
n-C11 to n-C22 Aromatic Hydrocarbons †◊	**640**	ug/L	200
Unadjusted n-C11 to n-C22 Aromatic Hydrocarbons †	770	ug/L	200

QC Surrogate Compounds		Recovery	QC Limits
Fractionation:	2-Fluorobiphenyl	**89 %**	40 - 140 %
	2-Bromonaphthalene	**65 %**	40 - 140 %
Extraction:	Chloro-octadecane	**75 %**	40 - 140 %
	ortho-Terphenyl	**85 %**	40 - 140 %

QA/QC Certification	
1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (1998). Extraction performed utilizing separatory funnel technique.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C11 to n-C22 Aromatic Hydrocarbons range data excludes the method target analyte concentrations.

GROUNDWATER ANALYTICAL

Massachusetts DEP EPH Method
Extractable Petroleum Hydrocarbons by GC/FID

Field ID:	**RAM-SW-1**	Laboratory ID:	**38683-33**
Project:	**Buzzard's Bay/101.20.3**	QC Batch ID:	**EP-0793-F**
Client:	**RAM Environmental**	Sampled:	**01-24-01**
Container:	**1 L Amber Glass**	Received:	**01-24-01**
Preservation:	**H2SO4 / Cool**	Extracted:	**0-26**
Matrix:	**Aqueous**	Analyzed:	**01-29-01**
		Dilution Factor:	**Aliphatic: 1 Aromatic: 1**

EPH Ranges	Concentration	Units	Reporting Limit
n-C9 to n-C18 Aliphatic Hydrocarbons †	BRL	ug/L	500
n-C19 to n-C36 Aliphatic Hydrocarbons †	BRL	ug/L	500
n-C11 to n-C22 Aromatic Hydrocarbons †◊	BRL	ug/L	200
Unadjusted n-C11 to n-C22 Aromatic Hydrocarbons †	BRL	ug/L	200

QC Surrogate Compounds		Recovery	QC Limits
Fractionation:	2-Fluorobiphenyl	87 %	40 - 140 %
	2-Bromonaphthalene	86 %	40 - 140 %
Extraction:	Chloro-octadecane	92 %	40 - 140 %
	ortho-Terphenyl	93 %	40 - 140 %

QA/QC Certification	
1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (1998). Extraction performed utilizing separatory funnel technique.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C11 to n-C22 Aromatic Hydrocarbons range data excludes the method target analyte concentrations.

GROUNDWATER ANALYTICAL

EPA Method 8270C (Modified)
MA DEP EPH Polynuclear Aromatic Hydrocarbons by GC/MS-SIM

Field ID:	**RAM-ORC-1**	Laboratory ID:	**38683-28**
Project:	**Buzzard's Bay/101.20.3**	QC Batch ID:	**EP-0793-F**
Client:	**RAM Environmental**	Sampled:	**01-24-01**
Container:	**1 L Amber Glass**	Received:	**01-24-01**
Preservation:	**H2SO4 / Cool**	Extracted:	**01-26-01**
Matrix:	**Aqueous**	Analyzed:	**01-26-01**
		Dilution Factor:	**1**

CAS Number	Analyte	Concentration		Units	Reporting Limit
91-20-3	Naphthalene	**92**	ee	ug/L	10
91-57-6	2-Methylnaphthalene	**78**	ee	ug/L	10
208-96-8	Acenaphthylene	BRL		ug/L	0.5
83-32-9	Acenaphthene	**0.9**		ug/L	0.5
86-73-7	Fluorene	**1.2**		ug/L	0.5
85-01-8	Phenanthrene	**0.8**		ug/L	0.5
120-12-7	Anthracene	BRL		ug/L	0.5
206-44-0	Fluoranthene	BRL		ug/L	0.5
129-00-0	Pyrene	BRL		ug/L	0.5
56-55-3	Benzo[a]anthracene	BRL		ug/L	0.1
218-01-9	Chrysene	BRL		ug/L	0.1
205-99-2	Benzo[b]fluoranthene	BRL		ug/L	0.1
207-08-9	Benzo[k]fluoranthene	BRL		ug/L	0.1
50-32-8	Benzo[a]pyrene	BRL		ug/L	0.1
193-39-5	Indeno[1,2,3-c,d]pyrene	BRL		ug/L	0.1
53-70-3	Dibenzo[a,h]anthracene	BRL		ug/L	0.1
191-24-2	Benzo[g,h,i]perylene	BRL		ug/L	0.1

QC Surrogate Compound	Recovery	QC Limits
ortho-Terphenyl	**87 %**	40 - 140 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996). Analyte list as specified by the target analytes of the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons. Method modified by use of selected ion monitoring (SIM) in accordance with Section 7.5.5 of the method. Method protocol modified to include acidification and the surrogate compound in accordance with the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

ee Analyte response exceeded calibration range. Analyte result was quantified on the basis of a separate analytical run with the mass spectrometer operating in the full scan mode.

GROUNDWATER ANALYTICAL

EPA Method 8270C (Modified)
MA DEP EPH Polynuclear Aromatic Hydrocarbons by GC/MS-SIM

Field ID:	**RAM-ORC-2**	Laboratory ID:	**38683-31**
Project:	**Buzzard's Bay/101.20.3**	QC Batch ID:	**EP-0793-F**
Client:	**RAM Environmental**	Sampled:	**01-24-01**
Container:	**1 L Amber Glass**	Received:	**01-24-01**
Preservation:	**H2SO4 / Cool**	Extracted:	**01-26-01**
Matrix:	**Aqueous**	Analyzed:	**01-26-01**
		Dilution Factor:	**1**

CAS Number	Analyte	Concentration		Units	Reporting Limit
91-20-3	Naphthalene	**79**	ee	ug/L	10
91-57-6	2-Methylnaphthalene	**68**	ee	ug/L	10
208-96-8	Acenaphthylene	BRL		ug/L	0.5
83-32-9	Acenaphthene	**0.8**		ug/L	0.5
86-73-7	Fluorene	**1.2**		ug/L	0.5
85-01-8	Phenanthrene	**1.0**		ug/L	0.5
120-12-7	Anthracene	BRL		ug/L	0.5
206-44-0	Fluoranthene	BRL		ug/L	0.5
129-00-0	Pyrene	BRL		ug/L	0.5
56-55-3	Benzo[a]anthracene	BRL		ug/L	0.1
218-01-9	Chrysene	BRL		ug/L	0.1
205-99-2	Benzo[b]fluoranthene	BRL		ug/L	0.1
207-08-9	Benzo[k]fluoranthene	BRL		ug/L	0.1
50-32-8	Benzo[a]pyrene	BRL		ug/L	0.1
193-39-5	Indeno[1,2,3-c,d]pyrene	BRL		ug/L	0.1
53-70-3	Dibenzo[a,h]anthracene	BRL		ug/L	0.1
191-24-2	Benzo[g,h,i]perylene	BRL		ug/L	0.1

QC Surrogate Compound	Recovery	QC Limits
ortho-Terphenyl	74 %	40 - 140 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996). Analyte list as specified by the target analytes of the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons. Method modified by use of selected ion monitoring (SIM) in accordance with Section 7.5.5 of the method. Method protocol modified to include acidification and the surrogate compound in accordance with the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

ee Analyte response exceeded calibration range. Analyte result was quantified on the basis of a separate analytical run with the mass spectrometer operating in the full scan mode.

GROUNDWATER ANALYTICAL

EPA Method 8270C (Modified)
MA DEP EPH Polynuclear Aromatic Hydrocarbons by GC/MS-SIM

Field ID:	**RAM-ORC-4**	Laboratory ID:	**38683-32**
Project:	**Buzzard's Bay/101.20.3**	QC Batch ID:	**EP-0793-F**
Client:	**RAM Environmental**	Sampled:	**01-24-01**
Container:	**1 L Amber Glass**	Received:	**01-24-01**
Preservation:	**H2SO4 / Cool**	Extracted:	**01-26-01**
Matrix:	**Aqueous**	Analyzed:	**01-26-01**
		Dilution Factor:	**1**

CAS Number	Analyte	Concentration		Units	Reporting Limit
91-20-3	Naphthalene	**66**	ee	ug/L	10
91-57-6	2-Methylnaphthalene	**35**	ee	ug/L	10
208-96-8	Acenaphthylene	BRL		ug/L	0.5
83-32-9	Acenaphthene	BRL		ug/L	0.5
86-73-7	Fluorene	**0.5**		ug/L	0.5
85-01-8	Phenanthrene	BRL		ug/L	0.5
120-12-7	Anthracene	BRL		ug/L	0.5
206-44-0	Fluoranthene	BRL		ug/L	0.5
129-00-0	Pyrene	BRL		ug/L	0.5
56-55-3	Benzo[a]anthracene	BRL		ug/L	0.1
218-01-9	Chrysene	BRL		ug/L	0.1
205-99-2	Benzo[b]fluoranthene	BRL		ug/L	0.1
207-08-9	Benzo[k]fluoranthene	BRL		ug/L	0.1
50-32-8	Benzo[a]pyrene	BRL		ug/L	0.1
193-39-5	Indeno[1,2,3-c,d]pyrene	BRL		ug/L	0.1
53-70-3	Dibenzo[a,h]anthracene	BRL		ug/L	0.1
191-24-2	Benzo[g,h,i]perylene	BRL		ug/L	0.1

QC Surrogate Compound	Recovery	QC Limits
ortho-Terphenyl	79 %	40 - 140 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996). Analyte list as specified by the target analytes of the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons. Method modified by use of selected ion monitoring (SIM) in accordance with Section 7.5.5 of the method. Method protocol modified to include acidification and the surrogate compound in accordance with the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

ee Analyte response exceeded calibration range. Analyte result was quantified on the basis of a separate analytical run with the mass spectrometer operating in the full scan mode.

GROUNDWATER ANALYTICAL

EPA Method 8270C (Modified)
MA DEP EPH Polynuclear Aromatic Hydrocarbons by GC/MS-SIM

Field ID:	**RAM-SW-1**	Laboratory ID:	**38683-33**
Project:	**Buzzard's Bay/101.20.3**	QC Batch ID:	**EP-0793-F**
Client:	**RAM Environmental**	Sampled:	**01-24-01**
Container:	**1 L Amber Glass**	Received:	**01-24-01**
Preservation:	**H2SO4 / Cool**	Extracted:	**01-26-01**
Matrix:	**Aqueous**	Analyzed:	**01-26-01**
		Dilution Factor:	**1**

CAS Number	Analyte	Concentration	Units	Reporting Limit
91-20-3	Naphthalene	BRL	ug/L	0.5
91-57-6	2-Methylnaphthalene	BRL	ug/L	0.5
208-96-8	Acenaphthylene	BRL	ug/L	0.5
83-32-9	Acenaphthene	BRL	ug/L	0.5
86-73-7	Fluorene	BRL	ug/L	0.5
85-01-8	Phenanthrene	BRL	ug/L	0.5
120-12-7	Anthracene	BRL	ug/L	0.5
206-44-0	Fluoranthene	BRL	ug/L	0.5
129-00-0	Pyrene	BRL	ug/L	0.5
56-55-3	Benzo[a]anthracene	BRL	ug/L	0.1
218-01-9	Chrysene	0.2	ug/L	0.1
205-99-2	Benzo[b]fluoranthene	0.3	ug/L	0.1
207-08-9	Benzo[k]fluoranthene	BRL	ug/L	0.1
50-32-8	Benzo[a]pyrene	0.2	ug/L	0.1
193-39-5	Indeno[1,2,3-c,d]pyrene	0.1	ug/L	0.1
53-70-3	Dibenzo[a,h]anthracene	BRL	ug/L	0.1
191-24-2	Benzo[g,h,i]perylene	0.1	ug/L	0.1

QC Surrogate Compound	Recovery	QC Limits
ortho-Terphenyl	94 %	40 - 140 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996). Analyte list as specified by the target analytes of the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons. Method modified by use of selected ion monitoring (SIM) in accordance with Section 7.5.5 of the method. Method protocol modified to include acidification and the surrogate compound in accordance with the MA DEP Method for the Determination of Extractable Petroleum Hydrocarbons.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Quality Control Report
Matrix Spike and Matrix Spike Duplicate

Field ID:	**RAM-QA/QC-700/701**	Category:	**MA DEP EPH**
Project:	**Buzzard's Bay/101.20.3**	QC Batch ID:	**EP-0793-F**
Client	**Ram Environmental**	Sampled:	**01-24-01**
Matrix:	**Aqueous**	Received:	**01-24-01**
Units:	**ug/L**		

Matrix Spike - Lab ID 38683-29

CAS Number	Analyte	Spiked	Sample Concentration	Measured	Recovery	QC Limits
111-84-2	*n*-Nonane (C_9)	50	BRL	**25**	**49%**	40 - 140 %
629-59-4	*n*-Tetradecane (C_{14})	50	BRL	**25**	**50%**	40 - 140 %
629-92-5	*n*-Nonadecane (C_{19})	50	BRL	**36**	**72%**	40 - 140 %
112-95-8	*n*-Eicosane (C_{20})	50	BRL	**38**	**75%**	40 - 140 %
630-02-4	*n*-Octacosane (C_{28})	50	BRL	**38**	**76%**	40 - 140 %
91-20-3	Naphthalene	50	110	**111**	**s**	40 - 140 %
83-32-9	Acenaphthene	50	BRL	**28**	**56%**	40 - 140 %
120-12-7	Anthracene	50	BRL	**35**	**69%**	40 - 140 %
129-00-0	Pyrene	50	BRL	**32**	**65%**	40 - 140 %
218-01-9	Chrysene	50	BRL	**34**	**68%**	40 - 140 %

QC Surrogate Compounds		Recovery	QC Limits
Fractionation:	2-Fluorobiphenyl	**75 %**	40 - 140 %
	2-Bromonaphthalene	**71 %**	40 - 140 %
Extraction:	Chloro-octadecane	**68 %**	40 - 140 %
	ortho-Terphenyl	**65 %**	40 - 140 %

Matrix Spike Duplicate - Lab ID 38683-30

CAS Number	Analyte	Spiked	Measured	Recovery	RPD		QC Limits
111-84-2	*n*-Nonane (C_9)	50	20	**40%**	**2%**	50	40 - 140 %
629-59-4	*n*-Tetradecane (C_{14})	50	25	**49%**	**1%**	50	40 - 140 %
629-92-5	*n*-Nonadecane (C_{19})	50	33	**66%**	**8%**	50	40 - 140 %
112-95-8	*n*-Eicosane (C_{20})	50	35	**70%**	**8%**	50	40 - 140 %
630-02-4	*n*-Octacosane (C_{28})	50	34	**68%**	**11%**	50	40 - 140 %
91-20-3	Naphthalene	50	146	**68%**	**200% s**	50	40 - 140 %
83-32-9	Acenaphthene	50	36	**72%**	**26%**	50	40 - 140 %
120-12-7	Anthracene	50	45	**89%**	**25%**	50	40 - 140 %
129-00-0	Pyrene	50	42	**83%**	**25%**	50	40 - 140 %
218-01-9	Chrysene	50	43	**86%**	**24%**	50	40 - 140 %

QC Surrogate Compounds		Recovery	QC Limits
Fractionation:	2-Fluorobiphenyl	**95 %**	40 - 140 %
	2-Bromonaphthalene	**79 %**	40 - 140 %
Extraction:	Chloro-octadecane	**71 %**	40 - 140 %
	ortho-Terphenyl	**86 %**	40 - 140 %

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (1998).

Report Notations: All calculations performed prior to rounding. Quality Control Limits are defined by the methodology, or alternatively based upon the historical average recovery plus or minus three standard deviation units.

s Matrix spike recovery outside recommended limits due to high concentration of spike analyte native to the sample.

GROUNDWATER ANALYTICAL

Project Narrative

Project: **Buzzard's Bay/101.20.3**
Client: **RAM Environmental**

Lab ID: **38683**
Received: **01-24-01**

A. Physical Condition of Sample(s)

This project was received by the laboratory in satisfactory condition. The sample(s) were received undamaged in appropriate containers with the correct preservation.

B. Project Documentation

This project was accompanied by satisfactory Chain of Custody documentation, with the following amendment(s) or correction(s):

1. A Matrix Spike and Matrix Spike Duplicate were not performed on samples identified as "RAM-QA/QC-700" and "RAM-QA/QC-701" for BOD and Nitrate analysis, as discussed with Brian LaPierre, 01-31-01.

C. Analysis of Sample(s)

No analytical anomalies or non-conformances were noted by the laboratory during the processing of these sample(s). All data contained within this report are released without qualification.

GROUNDWATER ANALYTICAL

228 Main Street, P.O. Box 1200
Buzzards Bay, MA 02532
Telephone (508) 759-4441
FAX (508) 759-4475

CHAIN-OF-CUSTODY RECORD AND WORK ORDER

№ 047525

Project Name: ~~PA~~ Buzzards Bay
Firm: RAM Environmental LLC
Project Number: 101,20.3
Address: Ore Roberts Rd
Sampler Name: Brian LaPierre
City / State / Zip: Plymouth MA 02360
Project Manager: Timothy Conden
Telephone: 508-747-7900

INSTRUCTIONS: Use separate line for each container (except replicates).

TURNAROUND

- ☐ STANDARD (10 Business Days)
- ☒ PRIORITY (5 Business Days)
- ☐ RUSH (RAN-________)
(Rush requires Rush Authorization Number)

Please FAX ☒ YES ☐ NO
FAX Number: 508-747-3655

BILLING

Purchase Order No.: 101,20.3
GWA Reference No.:

ANALYSIS REQUEST

Metals — Specify: Dissolved Iron / Manganese

Date	Time	Sample Identification	Matrix: Water	Type: Grab	Number	40mL VOA Vial	1L/32oz Amber Glass	250mL/8oz Plastic	HCl	HNO₃	Ice	Laboratory Number (Lab Use Only) 38683	Metals (Dissolved Fe/Mn)	MA DEP EPH	MA DEP VPH	Nitrate/Chloride/Sulfate	BOD/TSS/TS
1/24/01	~~8:48~~ 8:48	RAM-MW-1	3	X	3	3			3		X	1			X		
	~~8:58~~ 8:58	RAM-MW-2	3	X	3	3			3		X	2			X		
	9:26	RAM-MW-3	3	X	3	3			3		X	3			X		
	9:40	RAM-MW-4	3	X	3	3			3		X	4			X		
	10:31	RAM-MW-5	3	X	3	3			3		X	5			X		
	12:30	RAM-ORC-1	8	X	8	3	3	2	3	2	X	6 13 18 23 28	X	X	X	X	X
	12:35	RAM-QA/QC-700	8	X	8	3	3	2	3	2	X	7 14 19 24 29	X	X	X	X	X
	12:35	RAM-QA/QC-701	8	X	8	3	3	2	3	2	X	8 15 20 25 30	X	X	X	X	X
	12:05	RAM-ORC-2	8	X	8	3	3	2	3	2	X	9 16 21 26 31	X	X	X	X	X
	12:30	RAM-ORC-4	8	X	8	3	3	2	3	2	X	10 17 22 27 32	X	X	X	X	X
	12:00	RAM-SW-1	5	X	5	3			3	2	X	11 33		X	X		
		RAM-QA/QC-100	2	X	2	2					X	12			X		

REMARKS / SPECIAL INSTRUCTIONS

Pc 1681

DATA QUALITY OBJECTIVES

Regulatory Program

- ☐ Safe Drinking Water Act
  - ☐ MA DEP Form
- ☐ NPDES/Clean Water Act Specify State: ____
- ☐ RCRA/Haz. Waste Char.
- ☒ MA MCP (310 CMR 40) Reportable Concentrations
  - ☒ RCGW - 1 ☐ RCS - 1
  - ☐ RCGW - 2 ☐ RCS - 2
- ☐ MA Dredge Disposal
- ☐ NH ☐ RI ☐ CT ☐ ME Specify Category: ____

Project Specific QC

Many regulatory programs and EPA methods require project specific QC. Project specific QC includes Sample Duplicates, Matrix Spikes, and/or Matrix Spike Duplicates. Laboratory QC is not project specific unless prearranged. Project specific QC samples are charged on a per sample basis. For water samples, each MS, MSD and Sample Duplicate requires an additional sample aliquot.

Project Specific QC Required
- ☐ Sample Duplicate
- ☒ Matrix Spike
- ☒ Matrix Spike Duplicate

Selection of QC Sample
- ☐ Selected by laboratory
- ☐ Please use sample: RAM-QA/QC-700, RAM-QA/QC-701 } ORC-1

CHAIN-OF-CUSTODY RECORD

NOTE: All samples submitted subject to Standard Terms and Conditions on reverse hereof.

Relinquished by Sampler:	Date	Time	Received by:	Receipt Temperature:
[signature]			[signature] 1/24/01 1:50pm	9.0
Relinquished by:	Date	Time	Received by:	Shipping/Airbill Number:
Relinquished by:	Date	Time	Received by Laboratory:	Custody Seal/Cooler Serial Number:

Method of Shipment: ☐ GWA Courier ☐ Express Mail ☐ Federal Express ☐ UPS ☐ Hand ☐ ____

GROUNDWATER ANALYTICAL

Quality Assurance/Quality Control

A. Program Overview

Groundwater Analytical conducts an active Quality Assurance program to ensure the production of high quality, valid data. This program closely follows the guidance provided by *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans*, US EPA QAMS-005/80 (1980), and *Test Methods for Evaluating Solid Waste*, US EPA, SW-846, Update III (1996).

Quality Control protocols include written Standard Operating Procedures (SOPs) developed for each analytical method. SOPs are derived from US EPA methodologies and other established references. Standards are prepared from commercially obtained reference materials of certified purity, and documented for traceability.

Quality Assessment protocols for most organic analyses include a minimum of one laboratory control sample, one method blank, one matrix spike sample, and one sample duplicate for each sample preparation batch. All samples, standards, blanks, laboratory control samples, matrix spikes and sample duplicates are spiked with internal standards and surrogate compounds. All instrument sequences begin with an initial calibration verification standard and a blank; and excepting GC/MS sequences, all sequences close with a continuing calibration standard. GC/MS systems are tuned to appropriate ion abundance criteria daily, or for each 12 hour operating period, whichever is more frequent.

Quality Assessment protocols for most inorganic analyses include a minimum of one laboratory control sample, one method blank, one matrix spike sample, and one sample duplicate for each sample preparation batch. Standard curves are derived from one reagent blank and four concentration levels. Curve validity is verified by standard recoveries within plus or minus ten percent of the curve.

B. Definitions

Batches are used as the basic unit for Quality Assessment. A Batch is defined as twenty or fewer samples of the same matrix which are prepared together for the same analysis, using the same lots of reagents and the same techniques or manipulations, all within the same continuum of time, up to but not exceeding 24 hours.

Laboratory Control Samples are used to assess the accuracy of the analytical method. A Laboratory Control Sample consists of reagent water or sodium sulfate spiked with a group of target analytes representative of the method analytes. Accuracy is defined as the degree of agreement of the measured value with the true or expected value. Percent Recoveries for the Laboratory Control Samples are calculated to assess accuracy.

Method Blanks are used to assess the level of contamination present in the analytical system. Method Blanks consist of reagent water or an aliquot of sodium sulfate. Method Blanks are taken through all the appropriate steps of an analytical method. Sample data reported is not corrected for blank contamination.

Surrogate Compounds are used to assess the effectiveness of an analytical method in dealing with each sample matrix. Surrogate Compounds are organic compounds which are similar to the target analytes of interest in chemical behavior, but which are not normally found in environmental samples. Percent Recoveries are calculated for each Surrogate Compound.

GROUNDWATER ANALYTICAL

Quality Control Report
Laboratory Control Sample

Category: **MA DEP EPH Method**
QC Batch ID: **EP-0793-F**
Matrix: **Water**
Units: **ug/L**

CAS Number	Analyte	Spiked	Measured	Recovery	QC Limits
111-84-2	n-Nonane (C9)	50	24	**47 %**	40 - 140 %
629-59-4	n-Tetradecane (C14)	50	24	**49 %**	40 - 140 %
629-92-5	n-Nonadecane (C19)	50	38	**76 %**	40 - 140 %
112-95-8	n-Eicosane (C20)	50	40	**80 %**	40 - 140 %
630-02-4	n-Octacosane (C28)	50	41	**81 %**	40 - 140 %
91-20-3	Naphthalene	50	26	**51 %**	40 - 140 %
83-32-9	Acenaphthene	50	29	**59 %**	40 - 140 %
120-12-7	Anthracene	50	43	**86 %**	40 - 140 %
129-00-0	Pyrene	50	41	**82 %**	40 - 140 %
218-01-9	Chrysene	50	47	**93 %**	40 - 140 %

QC Surrogate Compounds		Recovery	QC Limits
Fractionation:	2-Fluorobiphenyl	**75 %**	40 - 140 %
	2-Bromonaphthalene	**75 %**	40 - 140 %
Extraction:	Chloro-octadecane	**79 %**	40 - 140 %
	ortho-Terphenyl	**76 %**	40 - 140 %

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (1998).

Report Notations: All calculations performed prior to rounding. Quality Control Limits are defined by the methodology, or alternatively based upon the historical average recovery plus or minus three standard deviation units.

GROUNDWATER ANALYTICAL

Quality Control Report
Method Blank

Category: **MA DEP EPH Method**
QC Batch ID: **EP-0793-F**
Matrix: **Water**

EPH Ranges	Concentration	Units	Reporting Limit
n-C9 to n-C18 Aliphatic Hydrocarbons †	BRL	ug/L	500
n-C19 to n-C36 Aliphatic Hydrocarbons †	BRL	ug/L	500
n-C11 to n-C22 Aromatic Hydrocarbons †◊	BRL	ug/L	200
Unadjusted n-C11 to n-C22 Aromatic Hydrocarbons †	BRL	ug/L	200

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
91-20-3	Naphthalene	BRL	ug/L	10
91-57-6	2-Methylnaphthalene	BRL	ug/L	5
85-01-8	Phenanthrene	BRL	ug/L	10
83-32-9	Acenaphthene	BRL	ug/L	10
208-96-8	Acenaphthylene	BRL	ug/L	10
86-73-7	Fluorene	BRL	ug/L	10
120-12-7	Anthracene	BRL	ug/L	10
206-44-0	Fluoranthene	BRL	ug/L	10
129-00-0	Pyrene	BRL	ug/L	10
56-55-3	Benzo[a]anthracene	BRL	ug/L	10
218-01-9	Chrysene	BRL	ug/L	10
205-99-2	Benzo[b]fluoranthene	BRL	ug/L	10
207-08-9	Benzo[k]fluoranthene	BRL	ug/L	10
50-32-8	Benzo[a]pyrene	BRL	ug/L	10
193-39-5	Indeno[1,2,3-c,d]pyrene	BRL	ug/L	10
53-70-3	Dibenzo[a,h]anthracene	BRL	ug/L	10
191-24-2	Benzo[g,h,i]perylene	BRL	ug/L	10

QC Surrogate Compounds		Recovery	QC Limits
Fractionation:	2-Fluorobiphenyl	90 %	40 - 140 %
	2-Bromonaphthalene	91 %	40 - 140 %
Extraction:	Chloro-octadecane	80 %	40 - 140 %
	ortho-Terphenyl	92 %	40 - 140 %

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (1998).

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C11 to n-C22 Aromatic Hydrocarbons range data excludes the method target analyte concentrations.

GROUNDWATER ANALYTICAL

Quality Control Report
Laboratory Control Sample

Category: **Metals**
Matrix: **Aqueous**

CAS Number	Analyte	Method	QC Batch	Units	Spiked	Measured	Recovery	QC Limits
7439-89-6	Iron	6010B	MM-1238-WL	mg/L	1.00	0.94	**94 %**	80 - 120 %
7439-96-5	Manganese	6010B	MM-1238-WL	mg/L	1.00	0.96	**96 %**	80 - 120 %

Method References: Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Update III (1996).

Report Notations: All calculations performed prior to rounding. Quality Control Limits are defined by the methodology, or alternatively based upon the historical average recovery plus or minus three standard deviation units.

GROUNDWATER ANALYTICAL

Quality Control Report
Method Blank

Category: Metals
Matrix: Aqueous

CAS Number	Analyte	Result	Units	Reporting Limit	QC Batch	Method
7439-89-6	Iron	BRL	mg/L	0.05	MM-1238-WB	6010B
7439-96-5	Manganese	BRL	mg/L	0.05	MM-1238-WB	6010B

Method References: Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Update III (1996).

Report Notations: BRL Indicates result, if any, is below reporting limit for analyte. Reporting limit is the lowest value that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Quality Control Report
Laboratory Control Sample

Category: **Inorganic Chemistry**
Matrix: **Aqueous**

Analyte	Method	QC Batch	Units	Spiked	Measured	Recovery	QC Limits
Biochemical Oxygen Demand	EPA 405.1	BOD-0856-W	mg/L	200	226	**114 %**	80 - 120 %
Nitrate (as Nitrogen)	EPA 353.2	NI-1018-W	mg/L	0.50	0.55	**109 %**	80 - 120 %
Sulfate	EPA 375.2	SU-462-W	mg/L	50	48	**97 %**	80 - 120 %

Method References: Methods for Chemical Analysis of Water and Wastes, US EPA, EPA-600/4-790-020, Revised (1983), and Methods for the Determination of Inorganic Substances in Environmental Samples, US EPA, EPA/600/R-93/100, (1993), and Standard Methods for the Examination of Water and Wastewater, APHA, Eighteenth Edition (1992).

Report Notations: All calculations performed prior to rounding. Quality Control Limits are defined by the methodology, or alternatively based upon the historical average recovery plus or minus three standard deviation units.

GROUNDWATER ANALYTICAL

Quality Control Report
Method Blank

Category: **Inorganic Chemistry**
Matrix: **Aqueous**

Analyte	Result	Units	Reporting Limit	QC Batch	Method
Biochemical Oxygen Demand	BRL	mg/L	2	BOD-0856-W	EPA 405.1
Nitrate (as Nitrogen)	BRL	mg/L	0.02	NI-1018-W	EPA 353.2
Sulfate	BRL	mg/L	5	SU-0462-W	EPA 375.2

Method References: Methods for Chemical Analysis of Water and Wastes, US EPA, EPA-600/4-790-020, Revised (1983), and Methods for the Determination of Inorganic Substances in Environmental Samples, US EPA, EPA/600/R-93/100, (1993), and Standard Methods for the Examination of Water and Wastewater, APHA, Eighteenth Edition (1992).

Report Notations: BRL Indicates result, if any, is below reporting limit for analyte. Reporting limit is the lowest value that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

GROUNDWATER ANALYTICAL

Quality Control Report
Laboratory Control Sample

Category: **MA DEP VPH Method**
QC Batch ID: **VG3-1342-W**
Matrix: **Aqueous**
Units: **ug/L**

CAS Number	Analyte	Spiked	Measured	Recovery	QC Limits
1634-04-4	Methyl *tert*-butyl Ether	50	38	77%	70 - 130 %
71-43-2	Benzene	50	37	73%	70 - 130 %
108-88-3	Toluene	50	38	76%	70 - 130 %
100-41-4	Ethylbenzene	50	35	70%	70 - 130 %
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene	100	77	77%	70 - 130 %
95-47-6	*ortho*- Xylene	50	38	75%	70 - 130 %
91-20-3	Naphthalene	50	36	73%	70 - 130 %

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	86 %	70 - 130 %
2,5-Dibromotoluene (FID)	85 %	70 - 130 %

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations: All calculations performed prior to rounding. Quality Control Limits are defined by the methodology, or alternatively based upon the historical average recovery plus or minus three standard deviation units.

GROUNDWATER ANALYTICAL

Quality Control Report
Method Blank

Category: **MA DEP VPH Method**
QC Batch ID: **VG3-1342-W**
Matrix: **Aqueous**

VPH Ranges	Concentration	Units	Reporting Limit
n-C5 to n-C8 Aliphatic Hydrocarbons †◊	BRL	ug/L	20
n-C9 to n-C12 Aliphatic Hydrocarbons †⊗	BRL	ug/L	20
n-C9 to n-C10 Aromatic Hydrocarbons †	BRL	ug/L	20
Unadjusted n-C5 to n-C8 Aliphatic Hydrocarbons †	BRL	ug/L	20
Unadjusted n-C9 to n-C12 Aliphatic Hydrocarbons †	BRL	ug/L	20

CAS Number	Target Analytes	Concentration	Units	Reporting Limit
1634-04-4	Methyl *tert*-butyl Ether ¤	BRL	ug/L	5
71-43-2	Benzene ¤	BRL	ug/L	1
108-88-3	Toluene ¤	BRL	ug/L	5
100-41-4	Ethylbenzene ‡	BRL	ug/L	5
108-38-3 and 106-42-3	*meta*- Xylene and *para*-Xylene ‡	BRL	ug/L	5
95-47-6	*ortho*- Xylene ‡	BRL	ug/L	5
91-20-3	Naphthalene	BRL	ug/L	5

QC Surrogate Compounds	Recovery	QC Limits
2,5-Dibromotoluene (PID)	99 %	70 - 130 %
2,5-Dibromotoluene (FID)	98 %	70 - 130 %

Method Reference: Method for the Determination of Volatile Petroleum Hydrocarbons, MA DEP (1998).

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample dilution and sample size.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C5 to n-C8 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations.

⊗ n-C9 to n-C12 Aliphatic Hydrocarbons range data excludes the method target analyte concentrations and the concentration for the n-C9 to n-C10 Aromatic Hydrocarbons range.

¤ Analyte elutes in the n-C5 to n-C8 Aliphatic Hydrocarbons range.

‡ Analyte elutes in the n-C9 to n-C12 Aliphatic Hydrocarbons range.

GROUNDWATER ANALYTICAL

Certifications and Approvals

CONNECTICUT, Department of Health Services, PH-0586

Potable Water, Wastewater/Trade Waste, Sewage/Effluent, and Soil

pH, Conductivity, Acidity, Alkalinity, Hardness, Chloride, Fluoride, Ammonia, Kjeldahl Nitrogen, Nitrate, Nitrite, Orthophosphate, Total Dissolved Solids, Cyanide, Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Total Chromium, Hexavalent Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Tin, Titanium, Vanadium, Zinc, Purgeable Halocarbons, Purgeable Aromatics, Pesticides, PCBs, PCBs in Oil, Ethylene Dibromide, Phenols, Oil and Grease.

MAINE, Department of Human Services, MA103

Drinking Water

Reciprocal certification in accordance with Massachusetts certification for drinking water analytes.

Waste Water

Reciprocal certification in accordance with Massachusetts certification for waste water analytes.

MASSACHUSETTS, Department of Environmental Protection, M-MA-103

Potable Water

Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Thallium, Nitrate-N, Nitrite-N, Fluoride, Sodium, Sulfate, Cyanide, Turbidity, Residual Free Chlorine, Calcium, Total Alkalinity, Total Dissolved Solids, pH, Trihalomethanes, Volatile Organic Compounds, 1,2-Dibromoethane, 1,2-Dibromo-3-chloropropane, Total Coliform, Fecal Coliform, Heterotrophic Plate Count, E-Coli

Non-Potable Water

Aluminum, Antimony, Arsenic, Beryllium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Strontium, Thallium, Titanium, Vanadium, Zinc, pH, Specific Conductance, Total Dissolved Solids, Total Hardness, Calcium, Magnesium, Sodium, Potassium, Total Alkalinity, Chloride, Fluoride, Sulfate, Ammonia-N, Nitrate-N, Kjeldahl-N, Orthophosphate, Total Phosphorus, Chemical Oxygen Demand, Biochemical Oxygen Demand, Total Cyanide, Non-Filterable Residue, Total Residual Chlorine, Oil and Grease, Total Phenolics, Volatile Halocarbons, Volatile Aromatics, Chlordane, Aldrin, Dieldrin, DDD, DDE, DDT, Heptachlor, Heptachlor Epoxide, Polychlorinated Biphenyls (water), Polychlorinated Biphenyls (oil).

MICHIGAN, Department of Environmental Quality

Drinking Water

Trihalomethanes, Regulated and Unregulated Volatile Organic Compounds by EPA Method 524.2; 1,2-Dibromoethane, 1,2-Dibromo-3-chloropropane by EPA Method 504.1

NEW HAMPSHIRE, Department of Environmental Services, 202798

Drinking Water

Metals by Graphite Furnace, Metals by ICP, Mercury, Nitrite-N, Orthophosphate, Residual Free Chlorine, Turbidity, Total Filterable Residue, Calcium Hardness, pH, Alkalinity, Sodium, Sulfate, Total Cyanide, Insecticides, Herbicides, Base/Neutrals, Trihalomethanes, Volatile Organics, Vinyl Chloride, DBCP, EDB, Nitrate-N.

Wastewater

Metals by Graphite Furnace, Metals by ICP, Mercury, pH, Specific Conductivity, TDS, Total Hardness, Calcium, Magnesium, Sodium, Potassium, Total Alkalinity, Chloride, Fluoride, Sulfate, Ammonia-N, Nitrate-N, Orthophosphate, TKN, Total Phosphorus, COD, BOD, Non-Filterable Residue, Oil & Grease, Total Phenolics, Total Residual Chlorine, PCBs in Water, PCBs in Oil, Pesticides, Volatile Organics, Total Cyanide.

RHODE ISLAND, Department of Health, 54

Surface Water, Air, Wastewater, Potable Water, Sewage

Chemistry: Organic and Inorganic

APPENDIX E

TABLES

Table 3-1
Bioinoculation Groundwater Analytical Results
Buzzards Bay Mobil
Buzzards Bay, Massachusetts
(mg/L)

Sample ID	Date Collected	BOD	Nitrate	Sulfate	Dissolved Iron	Dissolved Manganese
RAM-ORC1	2/4/00	> 40	0.31	14	3.5	0.73
	4/28/00	60	0.09	26	0.96	0.72
	8/1/00	30	0.08	9	6.40	1.80
	11/1/00	10	0.07	7	5.40	0.85
	1/24/01	103	0.92	BRL<5	1.80	1.00
RAM-ORC2	2/4/00	> 37	0.06	14	11	1.4
	4/28/00	32	0.11	23	0.11	0.47
	8/1/00	23	0.21	14	6.30	2.10
	11/1/00	BRL<20	0.10	8	11.00	1.20
	1/24/01	84	0.04	7	1.70	1.40
RAM-ORC4	2/4/00	> 40	0.05	13	3.1	0.80
	4/28/00	< 20	1.10	14	2.4	0.61
	8/1/00	32	0.23	9	3.9	1.70
	11/1/00	BRL<20	0.24	9	19.0	1.50
	1/24/01	58	0.79	22	0.1	0.15
RAM-QAQC-501	2/4/00	> 38	0.04	8	9.0	1.3
	4/28/00	23	0.13	21	0.2	0.5
	8/1/00	25	0.35	12	9.3	2.4
	11/1/00	BRL<20	0.04	7	8.4	1.2

RAM-QA/QC-501 is a duplicate of RAM-ORC2
BOD = Biochemical Oxygen Demand
BRL<0.05 indicates concentration, if any, is below reporting limit for analyte.

S:\RAM\101.20\101_20_3\99DOCS\[0204GW.XLS]Sheet1

TABLE 6-1
SOIL VAPOR EXTRACTION OFF-GAS VAPOR PHASE CONCENTRATIONS
Buzzards Bay Mobil Station
246 Main Street, Buzzards Bay, Massachusetts
RAM Ref. No. 101.20.1

Operational Days	CurrDate	CurrTime	PrevDate	PrevTime	Operational Status	Elapsed Time	Influent Conc.	Midpoint Conc.	Effluent Conc.	Total Air Speed	Total Air Flow	Removal Rate (range)	Removal period	Cumulative Removal	DRE
				(mins)		(days)	(ppmv)	(ppmv)	(ppmv)	(fpm)	(cfm)	(lbs/day)	pounds	Total lbs	%
0	10/1/98	12:00 PM	10/1/98	12:00 PM	on	0	202	0.8	0	4300	842.8	56.18	0.00	0.00	
4	10/5/98	12:00 PM	10/1/98	12:00 PM	on	4.00	196	202	136	4000	784	50.71	202.84	202.84	30.61%
5	10/6/98	12:00 PM	10/5/98	12:00 PM	off	2.00	196	202	136	0	0	0.00	0.00	202.84	N/A
7	10/8/98	12:00 PM	10/7/98	12:00 PM	on	1.00	180	1	0	4400	862.4	51.23	51.23	254.06	100.00%
8	10/9/98	12:00 PM	10/8/98	12:00 PM	on	1.00	74	28	0.8	4300	842.8	20.58	20.58	274.64	98.92%
15	10/16/98	12:00 PM	10/9/98	12:00 PM	on	7.00	64.4	62.7	36.3	4200	823.2	17.49	122.46	397.11	43.63%
18	10/19/98	12:00 PM	10/16/98	2:00 PM	off	3.00	64.4	62.7	36.3	0	0	0.00	0.00	397.11	N/A
20	10/21/98	12:00 PM	10/19/98	12:00 PM	on	2.00	50	0	0	3800	744.8	12.29	24.58	421.69	100.00%
29	10/30/98	12:00 PM	10/21/98	12:00 PM	on	9.00	52	30.5	0.9	3800	744.8	12.78	115.03	536.71	98.27%
42	11/12/98	12:00 PM	10/30/98	12:00 PM	on	13.00	107	32.2	19.1	3800	744.8	26.30	341.89	878.60	82.15%
46	11/16/98	12:00 PM	11/12/98	12:00 PM	off	4.00	107	32.2	9.1	0	0	0.00	0.00	878.60	N/A
49	11/19/98	12:00 PM	11/16/98	12:00 PM	on	3.00	122	0.2	0	3950	774.2	31.17	93.51	972.11	100.00%
55	11/25/98	12:00 PM	11/19/98	12:00 PM	on	6.00	103	61.7	2.6	4000	784	26.65	159.89	1131.99	97.48%
78	12/18/98	12:00 PM	11/25/98	12:00 PM	on	23.00	40.2	28.1	19.4	4000	784	10.40	239.21	1371.21	51.74%
82	12/22/98	12:00 PM	12/18/98	2:00 PM	off	4.00	40.2	28.1	19.4	0	0	0.00	0.00	1371.21	N/A
96	1/5/99	12:00 PM	12/22/98	12:00 PM	on	14.00	25	1	0	4200	823.2	6.79	95.08	1466.29	100.00%
110	1/19/99	12:00 PM	1/5/99	12:00 PM	on	14.00	25	1	0	4000	784	6.47	90.55	1556.84	100.00%
111	1/20/99	12:00 PM	1/19/99	12:00 PM	off	1.00	25	24.5	9.4	0	0	0.00	0.00	1556.84	N/A
141	2/19/99	3:00 PM	1/20/99	12:00 PM	on	30.13	18.4	11.5	0	4100	803.6	4.88	146.99	1703.83	100.00%
154	3/4/99	2:30 PM	2/19/99	3:00 PM	on	12.98	18.7	15.4	4.5	4000	784	4.84	62.79	1766.63	75.94%
166	3/16/99	12:00 PM	3/4/99	2:30 PM	off	11.90	18.7	15.4	4.5	0	0	0.00	0.00	1766.63	N/A
166	3/16/99	2:00 PM	3/16/99	12:00 PM	on	0.08	5.6	0.3	0	4000	784	1.45	0.12	1766.75	100.00%
172	3/22/99	2:30 PM	3/16/99	2:00 PM	on	6.02	9.6	0	0	4000	784	2.48	14.95	1781.70	100.00%
180	3/30/99	4:30 PM	3/22/99	2:30 PM	on	8.08	16.2	0.6	0	4000	784	4.19	33.88	1815.58	100.00%
194	4/13/99	12:30 PM	3/30/99	4:30 PM	on	13.83	23	11	0.8	4000	784	5.95	82.32	1897.90	96.52%
204	4/23/99	2:00 PM	4/13/99	12:30 PM	on	10.06	51.6	38.2	17.4	4000	784	13.35	134.33	2032.23	66.28%
209	4/28/99	2:00 PM	4/23/99	2:00 PM	off	5.00	51.6	38.2	17.4	0	0	0.00	0.00	2032.23	N/A
210	4/29/99	5:00 PM	4/28/99	2:00 PM	on	1.13	20.8	0	0	4100	803.6	5.52	6.21	2038.44	100.00%
222	5/11/99	2:30 PM	4/29/99	5:00 PM	on	11.90	31.3	18.3	1	4000	784	8.10	96.33	2134.77	96.81%
243	6/1/99	10:30 AM	5/11/99	2:30 PM	on	20.83	52.8	41.2	26.8	4200	823.2	14.34	298.82	2433.59	49.24%
244	6/2/99	12:10 PM	6/1/99	10:30 AM	off	1.07	52.8	41.2	26.8	0	0	0.00	0.00	2433.59	N/A
250	6/8/99	12:00 PM	6/2/99	12:10 PM	on	5.99	75	26	0	4200	823.2	20.37	122.10	2555.69	100.00%
263	6/21/99	11:30 AM	6/8/99	12:00 PM	on	12.98	40.2	37.4	22	4200	823.2	10.92	141.74	2697.43	45.27%
264	6/22/99	10:00 AM	6/21/99	11:30 AM	off	0.94	40.2	37.4	22	0	0	0.00	0.00	2697.43	N/A
280	7/8/99	10:30 AM	6/22/99	10:00 AM	on	16.02	26.7	23.4	17.4	4200	823.2	7.25	116.20	2813.64	34.83%
281	7/9/99	12:00 PM	7/8/99	10:30 AM	off	1.06	26.7	23.4	17.4	0	0	0.00	0.00	2813.64	N/A
284	7/12/99	2:20 PM	7/9/99	12:00 PM	on	3.10	78.2	13	0	4100	803.6	20.74	64.23	2877.86	100.00%
292	7/20/99	9:20 AM	7/12/99	2:20 PM	on	7.79	60.2	20	3	4,100	803.6	15.96	124.39	3002.25	95.02%
308	8/5/99	2:30 PM	7/20/99	9:20 AM	on	16.22	88	75	60	4,100	803.6	23.34	378.41	3380.66	31.82%
312	8/9/99	12:00 PM	8/5/99	2:30 PM	off	3.90	88	75	60	0	0	0.00	0.00	3380.66	N/A
312	8/9/99	3:30 PM	8/9/99	12:00 PM	on	0.15	44	0	0	4,100	803.6	11.67	1.70	3382.36	100.00%
322	8/19/99	9:30 AM	8/9/99	3:30 PM	on	9.75	56.4	22.4	2.5	4,100	803.6	14.96	145.83	3528.19	95.57%
328	8/25/99	12:40 PM	8/19/99	9:30 AM	on	6.13	258	112	93.5	4,100	803.6	68.42	419.54	3947.73	63.76%
329	8/26/99	3:00 PM	8/25/99	12:40 PM	off	1.10	258	112	93.5	0	0	0.00	0.00	3947.73	N/A
334	8/31/99	1:00 PM	8/26/99	3:00 PM	on	4.92	260	84	12.5	4,100	803.6	68.95	339.00	4286.73	95.19%
351	9/17/99	10:30 AM	8/31/99	1:00 PM	on	16.90	140	60	30	4,100	803.6	37.13	627.28	4914.01	78.57%
351	9/17/99	5:00 PM	9/17/99	10:30 AM	off	0.27	140	60	30	0	0	0.00	0.00	4914.01	N/A
364	9/30/99	3:30 PM	9/17/99	5:00 PM	on	12.94	56	20	8	4,100	803.6	14.85	192.13	5106.14	85.71%
368	10/4/99	12:00 PM	9/30/99	3:30 PM	off	3.85	56	20	8	0	0	0.00	0.00	5106.14	N/A
378	10/14/99	12:20 PM	10/4/99	12:00 PM	on	10.01	30.2	0.4	0	4,100	803.6	8.01	80.20	5186.33	100.00%
392	10/28/99	9:10 AM	10/14/99	12:20 PM	on	13.87	12.1	6.1	0	4,100	803.6	3.21	44.50	5230.83	100.00%
405	11/10/99	2:30 PM	10/28/99	9:10 AM	on	13.22	6.4	1.8	0	4,100	803.6	1.70	22.44	5253.27	100.00%
426	12/1/99	8:30 AM	11/10/99	2:30 PM	on	20.75	4.2	0	0	4,100	803.6	1.11	23.11	5276.39	100.00%
438	12/13/99	3:00 PM	12/1/99	8:30 AM	on	12.27	4.8	3.6	2	4,100	803.6	1.27	15.62	5292.01	58.33%
440	12/15/99	11:00 AM	12/13/99	3:00 PM	off	1.83	4.8	3.6	2	0	0	0.00	0.00	5292.01	N/A
454	12/29/99	1:30 PM	12/15/99	11:00 AM	on	14.10	3.8	0	0	4,100	803.6	1.01	14.21	5306.22	100.00%
466	1/10/00	12:55 PM	12/29/99	1:30 PM	on	11.98	8.1	0	0	4,100	803.6	2.15	25.72	5331.94	100.00%
474	1/18/00	9:30 AM	1/10/00	12:55 PM	on	7.86	130	2.3	0	4,000	784	33.63	264.28	5596.22	100.00%
477	1/21/00	12:05 PM	1/18/00	9:30 AM	on	3.11	75	NA	0	1,800	352.8	8.73	27.14	5623.36	100.00%
484	1/28/00	12:00 PM	1/21/00	12:05 PM	on	7.00	72	NA	0	1,800	352.8	8.38	58.65	5682.01	100.00%
491	2/4/00	11:00 AM	1/28/00	12:00 PM	on	6.96	45	NA	0	1,800	352.8	5.24	36.46	5718.46	100.00%
505	2/18/00	11:00 AM	2/4/00	11:00 AM	on	14.00	64	NA	0	1,800	352.8	7.45	104.32	5822.78	100.00%
517	3/1/00	11:00 AM	2/18/00	11:00 AM	on	12.00	32.5	NA	0	1,800	352.8	3.78	45.41	5868.18	100.00%
539	3/23/00	11:00 AM	3/1/00	11:00 AM	on	22.00	16.5	NA	0	2,200	431.2	2.35	51.65	5919.84	100.00%
550	4/3/00	11:30 AM	3/23/00	11:00 AM	on	11.02	17	NA	0	2,200	431.2	2.42	26.66	5946.50	100.00%
552	4/5/00	11:00 AM	4/3/00	11:30 AM	off	1.98	17	NA	5	0	0	0.00	0.00	5946.50	N/A
567	4/20/00	11:00 AM	4/5/00	11:00 AM	on	15.00	25.7	NA	1	2,200	431.2	3.66	54.86	6001.35	96.11%
575	4/28/00	11:00 AM	4/20/00	11:00 AM	on	8.00	3.7	NA	0	2,200	431.2	0.53	4.21	6005.56	100.00%
581	5/4/00	12:00 PM	4/28/00	11:00 AM	on	6.04	7.5	NA	0	1,800	352.8	0.87	5.28	6010.84	100.00%
586	5/9/00	12:40 PM	5/4/00	12:00 PM	on	5.03	11.5	NA	0	1,800	352.8	1.34	6.73	6017.57	100.00%
594	5/17/00	11:30 AM	5/9/00	12:40 PM	on	7.95	7.4	NA	0.2	2,000	392	0.96	7.61	6025.18	97.30%
616	6/8/00	12:22 PM	5/17/00	11:30 AM	on	22.04	18.5	NA	0	2,000	392	2.39	52.74	6077.92	100.00%
620	6/12/00	1:30 PM	6/8/00	2:22 PM	off	4.05	18.5	NA	0	0	0	0.00	0.00	6077.92	N/A
634	6/26/00	11:00 AM	6/12/00	1:30 PM	on	13.90	20.6	NA	0	2,000	392	2.66	37.03	6114.95	100.00%

TABLE 6-1
SOIL VAPOR EXTRACTION OFF-GAS VAPOR PHASE CONCENTRATIONS
Buzzards Bay Mobil Station
246 Main Street, Buzzards Bay, Massachusetts
RAM Ref. No. 101.20.1

Operational Days	CurrDate	CurrTime	PrevDate	PrevTime	Operational Status	Elapsed Time	Influent Conc.	Midpoint Conc.	Effluent Conc.	Total Air Speed	Total Air Flow	Removal Rate (range)	Removal period	Cumulative Removal	DRE
				(mins)		(days)	(ppmv)	(ppmv)	(ppmv)	(fpm)	(cfm)	(lbs/day)	pounds	Total lbs	%
662	7/24/00	11:45 AM	6/26/00	11:00 AM	on	28.03	34	NA	0	2,000	392	4.40	123.29	6238.24	100.00%
686	8/17/00	3:35 PM	7/24/00	11:45 AM	on	24.16	17.3	NA	0	1,800	352.8	2.01	48.66	6286.90	100.00%
691	8/22/00	1:10 PM	8/17/00	3:35 PM	on	4.90	13.7	NA	0	2,000	392	1.77	8.68	6295.58	100.00%
712	9/12/00	1:00 PM	8/22/00	1:10 PM	on	20.99	13.7	NA	0	2,000	392	1.77	37.20	6332.78	100.00%
733	10/3/00	2:54 PM	9/12/00	1:00 PM	on	21.08	47.2	NA	0	2,000	392	6.11	128.71	6461.49	100.00%
736	10/6/00	9:55 AM	10/3/00	2:54 PM	on	2.79	31.2	NA	0	2,000	392	4.04	11.27	6472.76	100.00%
741	10/11/00	2:30 PM	10/6/00	9:55 AM	on	5.19	21	NA	0	2,000	392	2.72	14.10	6486.86	100.00%
775	11/14/00	12:25 PM	10/11/00	2:30 PM	on	33.91	12.9	NA	0	2,000	392	1.67	56.59	6543.45	100.00%
777	11/16/00	11:15 AM	11/14/00	12:25 PM	on	1.95	12.9	NA	0	1,500	294	1.25	2.44	6545.90	100.00%
781	11/20/00	12:12 PM	11/16/00	11:15 AM	off	4.04	9.9	NA	0	0	0	0.00	0.00	6545.90	N/A
783	11/22/00	12:48 PM	11/20/00	12:12 PM	on	2.03	9.9	NA	0	1,700	333.2	1.09	2.20	6548.10	100.00%
796	12/5/00	10:20 AM	11/22/00	12:48 PM	on	12.90	7.9	NA	0	1,800	352.8	0.92	11.86	6559.96	100.00%
846	1/24/01	9:15 AM	12/5/00	10:20 AM	on	49.95	7.8	NA	0	1,500	294	0.76	37.80	6597.77	100.00%
874	2/21/01	10:00 AM	1/24/01	9:15 AM	on	28.03	7.2	NA	0	1,500	294	0.70	19.58	6617.35	100.00%
882	3/1/01	4:40 PM	2/21/01	10:00 AM	on	8.28	9.1	NA	0	1,500	294	0.88	7.31	6624.66	100.00%
893	3/12/01	12:50 PM	3/1/01	4:40 PM	on	10.84	3.1	NA	0	1,400	274.4	0.28	3.04	6627.70	100.00%

Vapor phase removal rate per day estimated as FLOW (cfm) x CONCENTRATION (ppmv) x 0.00003 (lbs./day/cfm) for gasoline.
NA - Not applicable
Highlighted area indicates system was off for a period.
A catalytic oxidizer was activated on January 21, 2000.