DRAFT REPORT

DRAFT SUMMER 2010 ENVIRONMENTAL MONITORING REPORT

PSC Resources Superfund
Palmer, MA

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Draft Summer 2010 Environmental Monitoring Report

Palmer, Massachusetts

Prepared for:
PSC Resources Superfund

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ACRONYMS

BEHP	Bis(2-ethylhexyl)phthalate
COCs	Constituents of Concern
EMWP	Environmental Monitoring Work Plan
FSP	Field Sampling Plan
MassDEP	Massachusetts Department of Environmental Protection
O&M	Operation and Maintenance
POP	Project Operations Plan
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds

DISCLAIMER

This document is a DRAFT document prepared by the Performing Settling Defendants under a government Consent Decree. This document has not undergone formal review by the United States Environmental Protection Agency (USEPA) and the Massachusetts Department of Environmental Protection (MassDEP). The opinions, findings, and conclusions expressed are those of the author and not those of the USEPA and MassDEP.

1 INTRODUCTION

1.1 PURPOSE AND OBJECTIVES

In accordance with Section 2 of the Field Sampling Plan (FSP) of the modified Operation and Maintenance (O&M) Plan, Environmental Monitoring Work Plan (EMWP), and Project Operations Plan (POP) for PSC Resources Superfund Site (Site), this report presents the results of the summer 2010 environmental monitoring event. A modified sampling approach for the environmental monitoring activities performed during and subsequent to the summer 2008 environmental monitoring event was proposed in a technical memorandum dated February 20, 2008. After discussions with USEPA and MassDEP, the proposed modifications pertaining to the future groundwater monitoring portion of the environmental monitoring activities were revised and submitted to the agencies in a letter dated May 21, 2008. In a letter from USEPA dated June 18, 2008, USEPA, following consultation with MassDEP, approved the proposed modified environmental monitoring activities. Copies of each memorandum or letter are included in Appendix A.

This report also provides a narrative discussion of methods used, approved deviations (if any), and field results from the environmental monitoring event. Additionally, the report summarizes historical analytical results and other pertinent findings for the past twelve complete years of environmental monitoring at the Site.

The results of the environmental monitoring events are used to demonstrate conformance and compliance with the Performance Standards listed in Paragraph 15 of the Consent Decree and in accordance with the requirements of 40 CFR 264.97. The objective of this monitoring event is to evaluate the concentrations of constituents of concern (COCs) in the groundwater to assess the effectiveness of natural attenuation in achieving the established Performance Standards.

2 FIELD ACTIVITIES

The summer 2010 environmental monitoring event was performed at the Site on June 21, 2010. The environmental monitoring event was performed in accordance with the approved June 1998 O&M Plan, EMWP, and POP, as amended by correspondence dated January 31, 2001 and June 12, 2001, and as further amended by letters/memoranda to the agencies dated June 16, 2004, May 26, 2005, May 11, 2006, June 12, 2007, February 20, 2008 and May 21, 2008, and a letter from USEPA dated June 18, 2008 (the approved O&M Plan, EMWP, and POP; O'Brien & Gere 1998a, 2001, 2001b, 2004a, 2005a, 2006a, 2007a, 2008a, 2008b, 2008c). A copy of each letter and memorandum is included in Appendix A. A summary of modifications to the EMWP and a description of the field activities performed during the summer 2010 environmental monitoring event are provided below.

In accordance with Section 4.3.1.1 of the approved O&M Plan, EMWP, and POP, collection of groundwater elevation data is no longer required.

In accordance with the June 16, 2004 letter to the agencies, the following monitoring activities were discontinued following the summer 2003 monitoring event:

- Quaboag River and wetland surface water sampling
- Volatile organic compound (VOC) and Bis(2-ethylhexyl)phthalate (BEHP) sample collection/analyses in river sediment
- Total PAHs, total PCBs, arsenic, and lead sample collection/analyses in wetland sediment

In accordance with conclusions presented in the Summer 2004 Environmental Monitoring Report and approval from the agencies, as memorialized in the May 26, 2005 letter to the agencies, the following monitoring activities were discontinued following the summer 2004 monitoring event:

- Quaboag River sediment samples at RSED-05
- Wetland sediment samples at locations WL-SED-02 and WL-SED-03

In accordance with conclusions presented in the Summer 2005 Environmental Monitoring Report and approval from the agencies, as memorialized in the May 11, 2006 letter to the agencies, the following monitoring activities were discontinued following the summer 2005 monitoring event:

- Wetland sediment sample at location WL-SED-01

In accordance with the June 12, 2007 technical memorandum to the agencies, which contained revisions requested by the agencies in their June 8, 2007 approval by electronic mail of the original technical memorandum dated April 11, 2007, the following monitoring activities were discontinued following the summer 2006 monitoring event:

- Quaboag River sediment samples at RSED-01 and RSED-06

A February 20, 2008 technical memorandum is included in Appendix A. The memorandum addresses (among other things) a proposed modification to wetland sediment monitoring and groundwater monitoring. USEPA's approval of the proposed modification to wetland sediment monitoring and groundwater monitoring is documented in a letter dated June 18, 2008 (included in Appendix A). The following monitoring activity was discontinued following the summer 2007 monitoring event:

- Wetland sediment sample at WL-SED-04

The following monitoring activities were discontinued following the summer 2008 monitoring event:

- Groundwater samples at MW-102B, MW-103C and MW-104C

Based on the modifications to the EMWP stated above, groundwater is the only medium that now requires monitoring.

2.1 GROUNDWATER SAMPLING

Groundwater samples were collected June 1, 2010 from four monitoring wells (MW-101C (upgradient well), MW-104B, MW-105B and PSC-112S) in accordance with USEPA's approval letter dated June 18, 2008. Field tests (including turbidity, temperature, specific conductance, pH, dissolved oxygen, and oxidation/reduction potential) were conducted in accordance with Appendix C of the FSP. The field test results for the summer 2010 environmental monitoring event are included in Appendix B of this report.

The groundwater samples were shipped under chain-of custody to Life Science Laboratories, Inc. in Syracuse, New York. Samples were analyzed for the following eleven VOC COCs by USEPA Method 8260B: 1,1,1-Trichloroethane, 1,1-Dichloroethane, 2-Butanone, Acetone, Benzene, Methylene chloride, Tetrachloroethene, Trichloroethene, Vinyl chloride, cis-1,2-Dichloroethene, and trans-1,2-Dichloroethene. The validated analytical results for groundwater for the summer 2010 environmental monitoring event are presented and compared with cleanup levels in Table 1 of this report and discussed in Section 3.1.1. below. Historic groundwater analytical results are presented and compared with cleanup levels in Table 2 and discussed in Section 3.1.2. below.

2.2 HEALTH AND SAFETY MONITORING

Health and safety monitoring during the sampling event was conducted in accordance with Section 9 of the Health and Safety Plan included as Appendix 5-3 of the O&M Plan, EMWP, and POP.

3 RESULTS OF FIELD ACTIVITIES

3.1 GROUNDWATER ANALYTICAL DATA SUMMARY

3.1.1 Summer 2010 Environmental Monitoring Analytical Results

Four monitoring wells were sampled and analyzed for the eleven VOCs specified above. The validated analytical results and cleanup levels are presented in Table 1. Monitoring well locations are shown on Figures 1 and 2. The Data Validation Report for the summer 2010 environmental monitoring event is included in Appendix C of this report.

Monitoring well MW-101C is located upgradient of the cap. No VOCs were detected in this monitoring well during the summer 2010 environmental monitoring event.

Low VOC concentrations were detected in overburden wells MW-104B, MW-105B, and PSC-112S. Detected constituents were below the interim cleanup levels with one exception. Benzene was detected at 6.76 ug/L at MW-104B. The interim cleanup level is 5 ug/L.

3.1.2 Historic Groundwater Data Comparison

A summary of the historic groundwater analytical results (for constituents that have a cleanup level) and the corresponding cleanup levels is presented in Table 2. This table includes analytical data collected since 1998. The constituents (with interim cleanup levels) detected during the summer 2010 environmental monitoring event are summarized on Figure 2.

Concentrations of all VOCs detected during the summer 2010 monitoring event continue to be significantly less than those detected in the initial environmental monitoring events in 1998 and 1999. Concentrations of VOCs show a generally decreasing trend. During the summer 2009 monitoring event all VOCs were below the interim cleanup levels. Currently, VOCs are below the interim cleanup levels in the groundwater at all locations except for MW-104B. The detected concentration of benzene (6.76 ug/L) was slightly above the interim cleanup level of 5 ug/L.

CONCLUSIONS

The results of the summer 2010 environmental monitoring event show that the VOC concentrations in groundwater continue to remain low and are significantly less than historical levels. In accordance with USEPA's June 18, 2008 letter, the next environmental monitoring event will be performed in June 2014.

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Table 1
PSC Resources Superfund Site
Palmer, MA
2010 Ground Water Analytical Results and Cleanup Levels

			EM-MW-101C Overburden Well 6/01/2010	EM-MW-104B Overburden Well 6/01/2010	EM-MW-105B Overburden Well 6/01/2010	EM-PSC-112S Monitoring Well 6/01/2010
Ground Water Screened Interval (1)			6 - 16	25 - 30	8 - 18	1 - 11
	Interim Cleanup					
Chemical Name	Levels	Units				
1,1,1-Trichloroethane	200	ug/l	0.5 U	0.5 U	0.55	0.5 U
1,1-Dichloroethane	3600	ug/l	0.5 U	0.58 J	31.4	6.69
2-Butanone (MEK)	350	ug/l	10 U	1.67 J	1.70 J	10 U
Acetone	3500	ug/l	10 U	10 U	10 U	10 U
Benzene	5	ug/l	0.5 U	**6.76***	4.27	0.69
Methylene chloride	5	ug/l	2 U	2 U	0.20 J	2 U
Tetrachloroethene	5	ug/l	0.5 U	0.89	0.57	0.5 U
Trichloroethene (TCE)	5	ug/l	0.5 U	0.36 J	0.85	0.5 U
Vinyl Chloride	2	ug/l	1 U	1 U	1.23	0.34 J
cis-1,2-Dichloroethene	70	ug/l	0.5 U	0.5 U	3.10	0.20 J
trans-1,2-Dichloroethene	100	ug/l	0.5 U	0.5 U	0.15 J	0.5 U

Note:
(1) Measured in feet below grade
(2) * = Exceeds Interim Cleanup Level

Table 2
PSC Resources Superfund Site
Palmer, MA
Historic Ground Water Analytical Results and Cleanup Levels
MW-101C - Overburden Monitoring Well

		1998		1999				2000			2001		2002		2003	2004	2005	2006	2007	2008	2009	2010
Chemical	ICLs	9/30	12/14	3/16	6/14	9/20	12/13	3/13	6/12	12/19	6/4	12/10	6/17	12/3	6/17	6/21	6/23	6/20	6/25	6/26	6/22	6/01
Metals (mg/L)																						
Lead	0.015	0.005 U	0.005 U	0.005 U	0.003 J	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.0013 J	0.005 U	0.005 U	0.005 U	0.01 U	0.01 U	NA	NA
SVOCs (ug/L)																						
BEHP	6	5.3 U	5.3 U	5.2 U	5.1 U	5.2 U	6.7 U	5.1 U	1.0 J	5.3 U	5.0 U	5.2 U	5.0 U	5 U	5.1 U	5.1 U	1.1 J	5.1 U	5.2 U	5.2 U	NA	NA
VOCs (ug/L)																						
1,1,1-TCA	200	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-DCA	3600	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.5 U	0.5 U	0.5 U
MEK	350	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ	10 U	10. UJ	10 U	10. U	10. U	10 U	10.0 U	10 U	10 U	10 U	10 U
Acetone	3500	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	1.3 J	10 UJ	10 U	10. UJ	10 UJ	1.8 J	10 UJ	10 U	10.0 U	10 U	10 U	10 U	10 U
Benzene	5	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.5 U	0.5 U	0.5 U
Meth chlor	5	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2 U	2.0 U	2 U	2.0 U	2.0 U	2.0 U	2.00 U	2 U	2 U	2 U	2 U
PCE	5	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.5 U	0.5 U	0.5 U
TCE	5	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.5 U	0.5 U	0.5 U
VC	2	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1.0 U	1.0 U	1.00 U	1 U	1 U	1 U	1 U
cis-1,2-DCE	70	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.5 U	0.5 U	0.5 U
t-1,2-DCE	100	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.5 U	0.5 U	0.5 U

Notes:

Only parameters with cleanup levels are reported
U = Not detected
* = exceeds cleanup level
NA = Not Analyzed
D = result from diluted analysis
ICLs = Interim Cleanup Levels
J = Estimated

Parameters:

BEHP = bis(2-Ethylhexyl)phthalate
1,1,1-TCA = 1,1,1-Trichloroethane
1,1-DCA = 1,1-Dichloroethane
MEK = 2-Butanone
PCE = Tetrachloroethene
TCE = Trichloroethene
Meth Chlor = Methylene Chloride
t-1,2-DCE = trans-1,2-Dichloroethene
cis-1,2-DCE = cis-1,2-Dichloroethene
VC = Vinyl chloride

Table 2
PSC Resources Superfund Site
Palmer, MA
Historic Ground Water Analytical Results and Cleanup Levels
MW-104B - Overburden Monitoring Well

		1998		1999				2000			2001		2002		2003	2004	2005	2006	2007	2008	2009	2010
Chemical	ICLs	10/9	12/15	3/17	6/15	9/20	12/13	3/13	6/13	12/21	6/6	12/12	6/18	12/5	6/17	6/23	6/24	6/21	6/27	6/27	6/23	6/01
Metals (mg/L)																						
Lead	0.015	0.005 U	0.01	0.002 J	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.01 U	0.01 U	NA	NA
SVOCs (ug/L)																						
BEHP	6	5.7	5.2 UJ	5.1 U	5.3 U	5.1 U	6.7 U	5.1 U	5.2 U	2.0 J	2.4 J	5.1 UJ	5.0 U	5 U	5.0 U	5.2 U	3400 *	5.2 U	5.2 U	1.2 J	NA	NA
VOCs (ug/L)																						
1,1,1-TCA	200	0.50 U	50 UD	5.0 U	0.50 U	5.0 U	2.5 U	0.50 U	1.0 U	0.50 U	0.50 U	1 U	1.2 U	0.5 U	1.3 U	0.50 U	0.50 U	0.50 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-DCA	3600	12	20 D	7.0	5.8	17 J	11	6.0	5.3	12	6.5	5.1	2.6	2.4	4.3	5.5	3.4	1.6	1.5	1.27	0.47 J	0.58 J
MEK	350	10 U	1000 UD*	100 U	10 U	100 U	50 U	10 U	20 U	10 UJ	10 U	20 U	25. UJ	10 U	25 U	10 U	10 U	10 U	10 U	10 U	10 U	1.67 J
Acetone	3500	10 U	250 UD*	100 U	10 U	90 J	50 U	10 U	20 U	79 J	11 U	20 U	25. UJ	10 UJ	25 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U
Benzene	5	91 *	2700 D *	110 *	130 *	310 J *	120 *	58 *	47 *	82 *	67 *	51 *	68 *	70 *	30 *	26 *	19 *	5.8 *	6.37 *	7.57 *	2.55	6.76*
Meth chlor	5	1.1 U	50 UD*	5.0 U	0.65 U	2.5 U	10 U*	0.37 J	4.0 U	2.0 U	2.0 U	0.53 J	5.0 U	0.43 J	5.0 U	0.41 J	2.0 U	0.31 J	2 U	2 U	2 U	2 U
PCE	5	0.50 U	12 UD*	5.0 U	0.50 U	5.0 U	2.5 U	0.50 U	1.0 U	0.50 U	0.50 U	1.0 U	1.2 U	0.5 U	1.3 U	0.50 U	0.50 U	0.50 U	0.5 U	0.5 U	1.10	0.89
TCE	5	0.50 U	50 UD*	5.0 U	0.11 J	5.0 U	2.5 U	0.50 U	1.0 U	0.50 U	0.50 U	1.0 U	1.2 U	0.5 U	1.3 U	0.50 U	0.50 U	0.50 U	0.5 U	0.5 U	0.28 J	0.36 J
VC	2	1.0 U	100 UD*	10 U	1.0 U	10 U*	5.0 U*	1.0 U	2.0 U	1.0 U	1.0 U	2.0 U	2.5 U*	1.0 U	2.5 U*	1.0 U	1.0 U	1.0 U	1 U	1 U	1 U	1 U
cis-1,2-DCE	70	0.25 J	32 D	5.0 U	0.50 U	5.0 U	2.5 U	0.50 U	1.0 U	0.50 U	0.50 U	1.0 U	1.2 U	0.5 U	1.3 U	0.50 U	0.50 U	0.50 U	0.5 U	0.5 U	0.5 U	0.5 U
t-1,2-DCE	100	0.90	12 UD	5.0 U	0.22 J	5.0 U	2.5 U	0.15 J	1.0 U	0.33 J	0.18 J	1.0 U	1.2 U	0.18 J	1.3 U	0.50 U	0.50 U	0.50 U	0.5 U	0.5 U	0.5 U	0.5 U

Notes:

Only parameters with cleanup levels are reported
U = Not detected
* = exceeds cleanup level
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D = result from diluted analysis
ICLs = Interim Cleanup Levels
J = Estimated

Parameters:

BEHP = bis(2-Ethylhexyl)phthalate
1,1,1-TCA = 1,1,1-Trichloroethane
1,1-DCA = 1,1-Dichloroethane
MEK = 2-Butanone
PCE = Tetrachloroethene
TCE = Trichloroethene
Meth Chlor = Methylene Chloride
t-1,2-DCE = trans-1,2-Dichloroethene
cis-1,2-DCE = cis-1,2-Dichloroethene
VC = Vinyl chloride

Table 2
PSC Resources Superfund Site
Palmer, MA
Historic Ground Water Analytical Results and Cleanup Levels
MW-105B - Overburden Monitoring Well

		1998		1999				2000			2001		2002		2003	2004	2005	2006	2007	2008	2009	2010
Chemical	ICLs	9/29	12/15	3/17	6/15	9/23	12/14	3/14	6/13	12/20	6/6	12/12	6/18	12/5	6/17	6/23	6/23	6/21	6/26	6/26	6/23	6/01
Metals (mg/L)																						
Lead	0.015	0.002 J	0.003 J	0.005 U	0.003 J	0.006	0.004 J	0.002 J	0.001 J	0.002 J	0.005 U	0.0025 J	0.004 J	0.003 J	0.0014 J	0.00088 J	0.005 U	0.00084 J	0.01 U	0.01 U	NA	NA
SVOCs (ug/L)																						
BEHP	6	5.3 UJ	5.1 UJ	5.1 U	5.2 U	5.0 UJ	5.4 U	5.7 U	43 *	5.1 U	4.6 J	5.1 U	5.0 U	5 U	5.0 U	5.1 U	2.2 J	5.0 U	5.1 U	5 U	NA	NA
VOCs (ug/L)																						
1,1,1-TCA	200	51	81 D	49	60	130	69	28	53	17	20	18	20.	7.9	5.2	4.2	2.1	2.00	1.42	0.96	0.28 J	0.55
1,1-DCA	3600	160	170 D	150	150	88	100	110	99	150	110	96	72.	50	68.	66.	55	67.0	43.1	26.1	26.8	31.4
MEK	350	100 U	100 UD	100 U	28 J	50 UJ	50 U	100 U	20 U	50	50 U	50 U	50. UJ	100 U	50. U	20. U	20 U	1.90 J	20 U	10 U	10 U	1.70 J
Acetone	3500	190	250 D	130	140	50 UJ	50 U	100 U	160	180 J	83 U	50 U	21. J	100 UJ	6.4 J	20 UJ	20 U	10.0 U	20 U	10 U	2.23 J	10 U
Benzene	5	14 *	15 D *	12 *	13 *	1.4 J	3.8	6.9 *	5.8 *	12 *	9.1 *	6.9 *	3.2	2.4 J	4.9	4.3	3.4	3.6	3.4	2.2	2.90	4.27
Meth chlor	5	5.0 U	1.3 JD	5.0 U	2.5 U	2.5 U	10 U*	20 U*	4.0 U	0.52 J	10 U*	10 U*	10 U*	20 U*	10. U*	4.0 U	0.26 J	2.0 U	4 U	2 U	2 U	0.20 J
PCE	5	5.0 U	5.0 UD	5.0 U	0.65 J	1.4 J	0.90 J	5.0 U	0.68 J	0.58 J	0.51 J	2.5 U	0.97 J	5 U	0.93 J	0.29 J	0.40 J	0.42 J	0.36 J	0.41 J	0.29 J	0.57
TCE	5	3.0 J	4.1 JD	2.8 J	3.1	1.6 J	1.8 J	5.0 U	2.2	2.6	1.6 J	1.1 J	2.3 J	5 U	1.2 J	0.99 J	0.82 J	0.81	0.82 J	0.55	0.37 J	0.85
VC	2	3.5 J *	5.9 JD *	13 *	5.2 *	5.0 U*	5.0 U*	6.9 J *	4.6 *	14 *	5.4 *	3.8 J *	3.7 J *	10 U*	5.1 *	4.1 *	4.1 *	5.5 *	2.9 J *	1.85	1.97	1.23
cis-1,2-DCE	70	61	59 D	44	44	12	30	16	22	36	20	21	16.	6.2	10.	11.	6.9	7.7	5.56	2.07	2.11	3.10
t-1,2-DCE	100	1.3 J	1.4 JD	1.2 J	1.2 J	2.5 U	2.5 U	5.0 U	0.72 J	1.8	0.97 J	2.5 U	2.5 U	5 U	0.61 J	0.45 J	0.34 J	0.34 J	0.28 J	0.5 U	0.14 J	0.15 J

Notes:

Only parameters with cleanup levels are reported
U = Not detected
* = exceeds cleanup level
NA = Not Analyzed
D = result from diluted analysis
ICLs = Interim Cleanup Levels
J = Estimated

Parameters:

BEHP = bis(2-Ethylhexyl)phthalate
1,1,1-TCA = 1,1,1-Trichloroethane
1,1-DCA = 1,1-Dichloroethane
MEK = 2-Butanone
PCE = Tetrachloroethene
TCE = Trichloroethene
Meth Chlor = Methylene Chloride
t-1,2-DCE = trans-1,2-Dichloroethene
cis-1,2-DCE = cis-1,2-Dichloroethene
VC = Vinyl chloride

Table 2
PSC Resources Superfund Site
Palmer, MA
Historic Ground Water Analytical Results and Cleanup Levels
PSC112S - Overburden Monitoring Well

		1998		1999				2000			2001		2002		2003	2004	2005	2006	2007	2008	2009	2010
Chemical	ICLs	10/9	12/14	3/17	6/14	9/20	12/13	3/13	6/12	12/20	6/6	12/11	6/17	12/4	6/17	6/22	6/23	6/21	6/26	6/26	6/23	6/01
Metals (mg/L)																						
Lead	0.015	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.01 U	0.01 U	NA	NA
SVOCs (ug/L)																						
BEHP	6	5.3 U	5.3 U	5.0 U	5.1 U	5.1 U	5.6 U	5.2 U	5.1 U	5.0 U	2.6 J	5.1 U	5.0 U	5 U	5.0 U	5.3 U	7.9 *	1.2 J	5.1 U	5.2 U	NA	NA
VOCs (ug/L)																						
1,1,1-TCA	200	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-DCA	3600	9.1	12	3.6	5.7	2.6 J	4.6	1.7	4.6	7.0	8.6	8.6	2.2	3.6	5.5	7.2	8.7	9.00	11.3	5.78	4.23	6.69
MEK	350	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	1.3 J	10 U	10. UJ	10 U	10. U	10. U	10 U	10.0 U	10 U	10 U	10 U	10 U
Acetone	3500	9.4 J	10 U	10 U	10 U	2.1 J	10 U	10 U	7.2 J	10 UJ	10 U	10 U	10. UJ	10 UJ	10. U	10 UJ	10 U	1.80 J	10 U	10 U	10 U	10 U
Benzene	5	0.79	3.0	0.64	2.0	0.47 J	0.97	0.39 J	0.78	0.70	1.2	0.96	0.18 J	0.42 J	0.44 J	0.58	0.61	0.49 J	0.71	0.3J	0.26 J	0.69
Meth chlor	5	0.5 U	0.50 U	0.50 U	0.50 U	0.5 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2 U	2.0 U	2 U	2.0 U	2.0 U	2.0 U	2.00 U	2 U	2 U	2 U	2 U
PCE	5	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.5 U	0.5 U	0.5 U
TCE	5	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.5 U	0.5 U	0.5 U
VC	2	0.20 J	0.28 J	0.48 J	1.0 U	1.0 U	0.11 J	1.0 U	1.0 U	1.0 U	1.0 U	0.24 J	1.0 U	1 U	0.20 J	0.13 J	0.24 J	0.30 J	0.69 J	1U	0.50 J	0.34 J
cis-1,2-DCE	70	0.18 J	0.14 J	0.50 U	0.50 U	0.50 U	2.3	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.13 J	0.50 U	0.10 J	0.26 J	0.41 J	0.18J	0.12 J	0.20 J
t-1,2-DCE	100	0.14 J	0.28 J	0.50 U	0.13 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.5 U	0.5 U	0.5 U

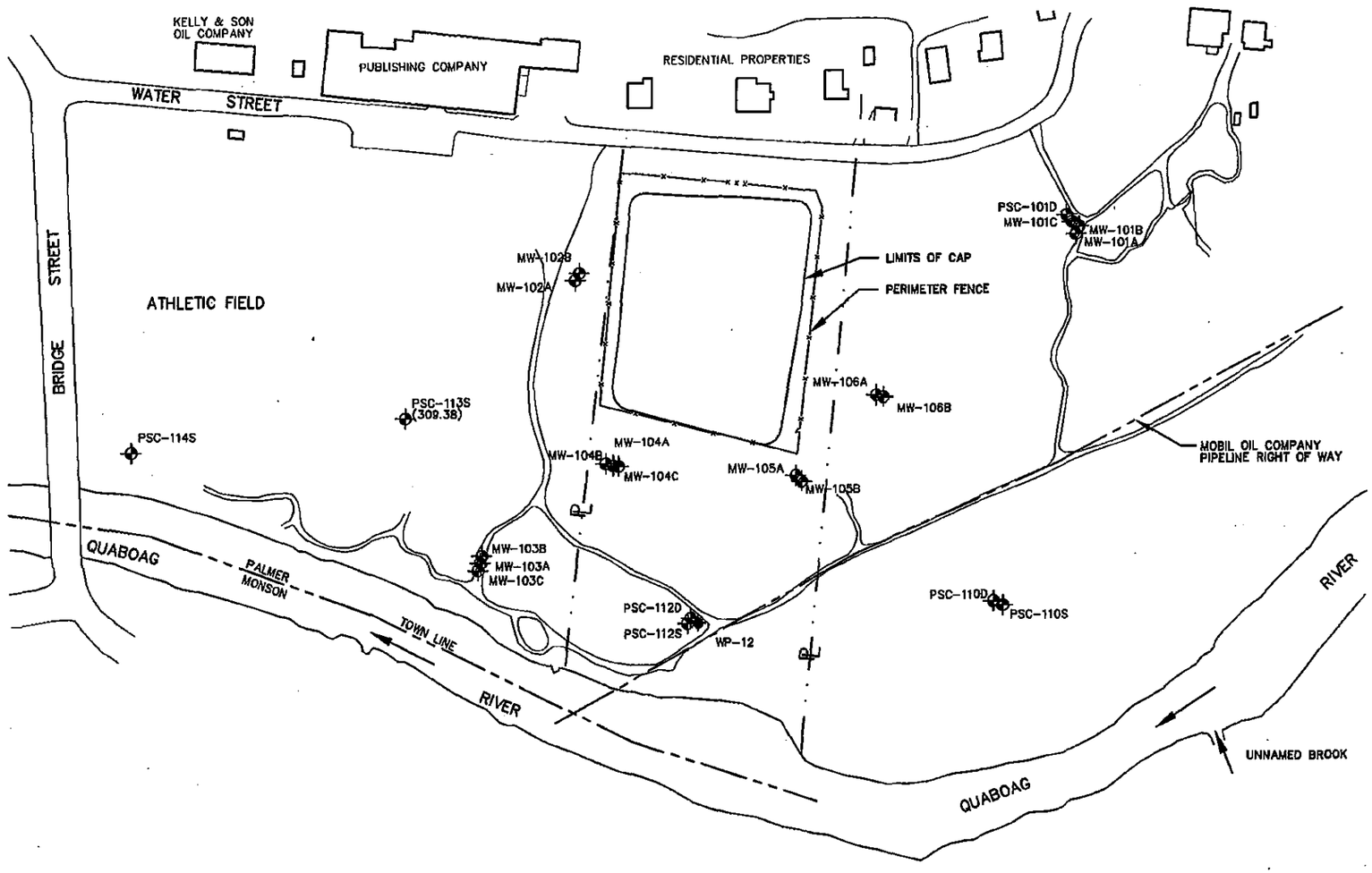
Notes:

Only parameters with cleanup levels are reported
U = Not detected
* = exceeds cleanup level
NA = Not Analyzed
D = result from diluted analysis
ICLs = Interim Cleanup Levels
J = Estimated

Parameters:

BEHP = bis(2-Ethylhexyl)phthalate
1,1,1-TCA = 1,1,1-Trichloroethane
1,1-DCA = 1,1-Dichloroethane
MEK = 2-Butanone
PCE = Tetrachloroethene
TCE = Trichloroethene
Meth Chlor = Methylene Chloride
t-1,2-DCE = trans-1,2-Dichloroethene
cis-1,2-DCE = cis-1,2-Dichloroethene
VC = Vinyl chloride

FIGURE 1



LEGEND

- MW-104B — MONITORING WELL
- WP-12 — PIEZOMETER
- APPROX. FENCELINE LOCATION
- PSC RESOURCES PROPERTY BOUNDARY

NOTE:
ELEVATIONS RELATIVE TO MEAN SEA LEVEL

PSC RESOURCES
SUPERFUND SITE
PALMER, MASSACHUSETTS

SITE PLAN

0 150 300
APPROX. SCALE IN FEET

AUGUST 2008
FILE NO. 5819.005.031

O'BRIEN & GERE ENGINEERS INC.

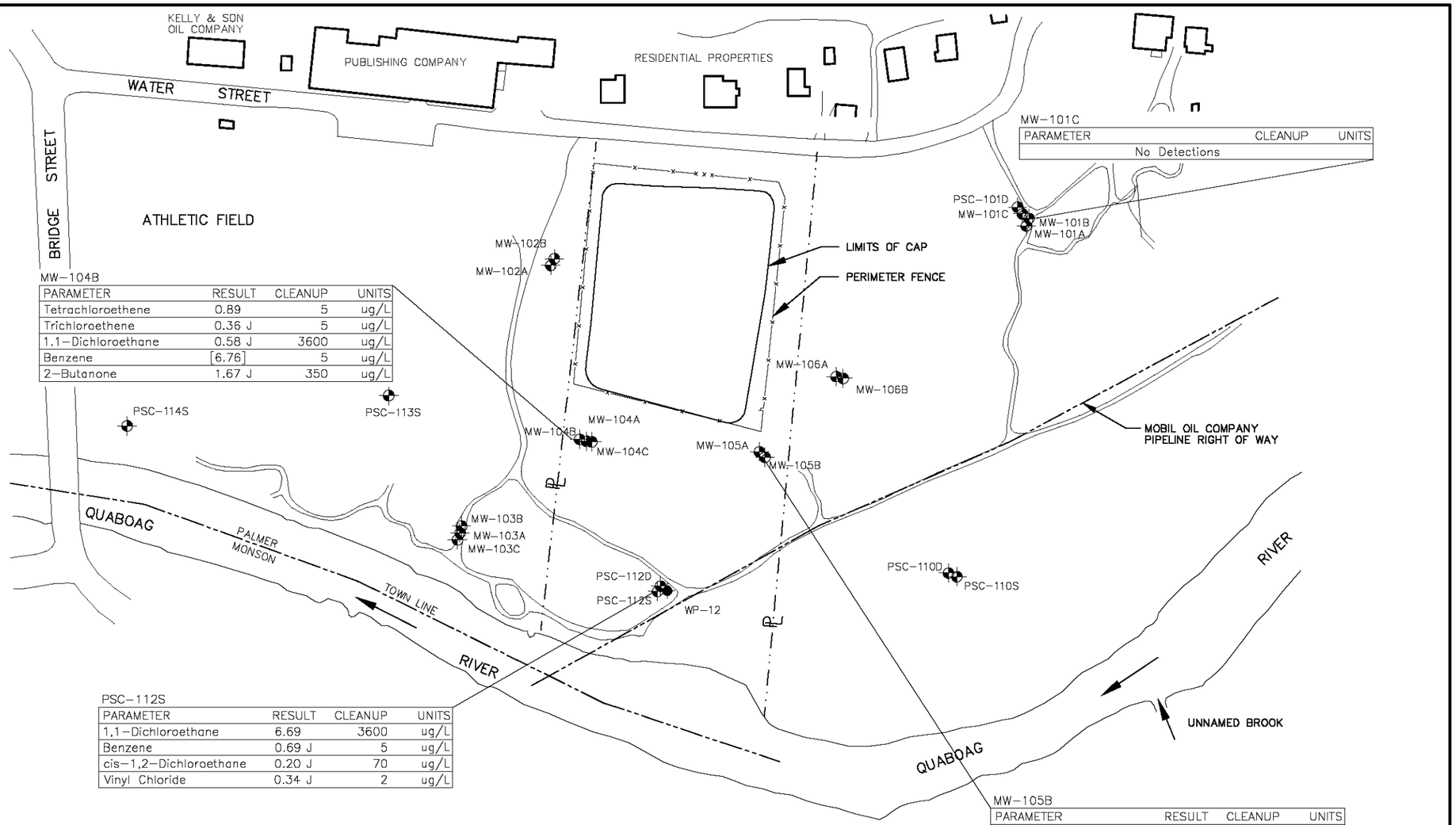
GENERAL NOTES:

1. FIGURE PLANS AND PRESENTATION MAP'S WERE PREPARED BASED UPON INFORMATION WITHIN THE "SARSS II" REMEDIAL INVESTIGATION, VOLUME I OF IV, SECTIONS 1 THROUGH 8, DATED JANUARY 1992, PREPARED BY HMM ASSOCIATES, INC.

REV DATE: 9/17/99

Sep 15, 2008 - 1:22pm

I:\DW71\Projects\5819005\DWG\71\031-Fig1.dwg



MW-104B

PARAMETER	RESULT	CLEANUP	UNITS
Tetrachloroethene	0.89	5	ug/L
Trichloroethene	0.36 J	5	ug/L
1.1-Dichloroethane	0.58 J	3600	ug/L
Benzene	[6.76]	5	ug/L
2-Butanone	1.67 J	350	ug/L

MW-101C

PARAMETER	CLEANUP	UNITS
No Detections		

PSC-112S

PARAMETER	RESULT	CLEANUP	UNITS
1,1-Dichloroethane	6.69	3600	ug/L
Benzene	0.69 J	5	ug/L
cis-1,2-Dichloroethane	0.20 J	70	ug/L
Vinyl Chloride	0.34 J	2	ug/L

MW-105B

PARAMETER	RESULT	CLEANUP	UNITS
1,1-Dichloroethane	31.4	3600	ug/L
1,1,1-Trichloroethane	0.55	200	ug/L
Benzene	4.27	5	ug/L
Tetrachloroethene	0.57	5	ug/L
Trichloroethene	0.85	5	ug/L
Vinyl Choride	1.23	2	ug/L
cis-1,2-Dichloroethene	3.10	70	ug/L
Trans-1,2-Dichloroethene	0.15 J	100	ug/L
2-Butanone	1.70 J	350	ug/L
Methylene Chloride	0.20 J	5	ug/L

FIGURE 2

LEGEND

MW-104B — MONITORING WELL

WP-12 — PIEZOMETER

APPROX. FENCELINE LOCATION

PSC RESOURCES PROPERTY BOUNDARY

FIGURE NOTES:

1. DETECTED CONSTITUENTS WHICH HAVE CLEANUP LEVELS ARE SHOWN.
2. DATA IS PRESENTED FOR SUMMER 2010 ENVIRONMENTAL SAMPLING EVENT.

PSC RESOURCES
SUPERFUND SITE
PALMER, MASSACHUSETTS

GROUND WATER DATA PRESENTATION MAP JUNE 1, 2010

0 150 300
APPROX. SCALE IN FEET

OCTOBER 2010
FILE NO. 5819.44344-001

O'BRIEN & GERE ENGINEERS INC.

Oct 04, 2010 - 10:04am

I:\Psc-Resources.5819\44344.Psc-Resources-S\Docs\DWG\Sheets\44344-001-FIG2.dwg

June 16, 2004

May 26, 2005

May 11, 2006

June 12, 2007

February 20, 2008

May 21, 2008

June 18, 2008

Correspondence

O'BRIEN & GERE

June 16, 2004

Mr. Donald McElroy
Remedial Project Manager
USEPA - Region 1
1 Congress Street, Suite 1100
M.C. HBT
Boston, Massachusetts 02114-2023

Ms. Evelina Vaughn
MADEP
Bureau of Waste Site Cleanup
One Winter Street
Boston, Massachusetts 02108

Re: PSC Resources Superfund Site
Palmer Massachusetts
File: [illegible]

Dear Mr. McElroy and Ms. Vaughn:

This letter serves three purposes. First, pursuant to Paragraph 26 of the Consent Decree for the PSC Resources Superfund Site, this provides notification that the fifteenth environmental monitoring sampling event will be performed during the week of June 21, 2004. This letter also provides a modified sampling approach for this monitoring event based on our Technical Memorandum dated December 5, 2003 (the Memorandum). Finally, the letter presents bioavailability evaluation criteria to be used for certain metals.

June 2004 Modified Sampling Approach

Per Mr. McElroy's telephone discussions with Judith Rank of O'Brien & Gere Engineers, Inc. on June 8 and June 10, 2004, the June 2004 monitoring event will be performed as follows:

- Ground water samples will be obtained in accordance with Section 4 of the modified Operation and Maintenance (O&M) Plan, Environmental Monitoring Work Plan (EMWP), and Project Operations Plan (POP).
- Quaboag River sediment samples will be collected and analyzed for Simultaneously Extracted Metals/Acid Volatile Sulfides (SEM/AVS) for lead at sample locations where concentrations of lead have exceeded the site-specific cleanup level during previous monitoring events (RSED-05 and RSED-06).
- Wetland sediment samples will be collected and analyzed for SEM/AVS for zinc at sample locations where concentrations of zinc have exceeded the site-specific cleanup level during previous monitoring events (WL-SED-01 and WL-SED-04).
- River sediment samples will be collected for lead at each sample location (RSED-01, RSED-05, and RSED-06). Wetland sediment samples will be collected for zinc at each sample location (WL-SED-01, WL-SED-02, WL-SED-03, and WL-SED-04). These samples will be held in the laboratory

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cooler until SEM/AVS results have been received and evaluated, and will not be analyzed unless SEM/AVS results indicate that lead and zinc are bioavailable.

Per the same telephone discussions between Mr. McElroy and Ms. Rank:

- As described in Sections 3.1 and 3.3 of the Memorandum, there are no concentrations above site-specific cleanup levels in Quaboag River and wetland surface water. Therefore, Quaboag River and wetland surface water samples will no longer be collected.
- As described in Sections 3.2.1 and 3.2.2 of the Memorandum, VOC and BEHP concentrations detected in Quaboag River sediment at the upstream sampling location (RSED-01) are statistically equivalent to VOC and BEHP concentrations detected in the Quaboag River sediment at the downstream sampling locations (RSED-05 and RSED-06). Based on these statistics, VOCs and BEHP in Quaboag River sediment are not present at concentrations above site-specific cleanup levels. Therefore, VOC and BEHP samples in river sediment will no longer be collected.
- As described in Section 3.4.1 of the Memorandum, and based on the telephone discussion on June 8, 2004, total PAHs have been consistently below the cleanup levels for the last four years (March 2000 - June 2003). Therefore, wetland sediment samples for total PAHs will no longer be collected.
- As described in Sections 3.4.2 and 3.4.3 of the Memorandum, total PCBs, arsenic, and lead have not been detected at concentrations above the site-specific cleanup level in wetland sediment. Therefore, wetland sediment samples for total PCBs, arsenic, and lead will no longer be collected.

Bioavailability Evaluation Criteria

As stated in Section 4.3.2 of the O&M Plan, EMWP, and POP, Quaboag River and wetland sediment may be analyzed to document the molar concentration ratios of SEM/AVS if constituents are found to exceed their respective site-specific cleanup levels. As stated above, sediment samples will be collected and analyzed for SEM/AVS at Northeast Analytical in Schenectady, New York. The SEM/AVS results will be used to evaluate the bioavailability of lead in Quaboag River sediment and zinc in wetland sediment.

The toxicity of divalent cationic metals like lead and zinc in sediments can be reduced through binding to acid-volatile sulfide (AVS). Such metals are not biologically available when bound to AVS. When the molar concentration of AVS exceeds that of the simultaneously extracted metals (SEM), they exist predominantly as insoluble metal sulfides, which are presumably not biologically available. Thus, if the molar concentration of AVS in sediments is higher than the sum of the molar concentrations of divalent cationic metals in a 1 Normal hydrochloric acid extract, all of the metals are in nonbioavailable forms in the sediments. This relationship can be summarized in the following manner:

SEM:AVS > 1 = metals are present in bioavailable forms

SEM:AVS < 1 = metals are not likely to be bioavailable

Based on this relationship and oral approval from Mr. McElroy on June 15, 2004, SEM/AVS results obtained during the June 2004 monitoring event will be evaluated as follows:

- If AVS exceeds SEM in a sediment sample, then metal concentrations detected in that sample will be considered ecologically insignificant because the metals are not considered to be bioavailable.

- If SEM exceeds AVS in a sediment sample, then these data will be used to calculate an "adjusted concentration" which accounts for the bioavailability of metals. The adjusted concentration will then be compared to site-specific cleanup levels.

In the latter case, the following equation will be implemented for each divalent cationic metal in this order: copper, lead, cadmium, zinc, and nickel. This order represents the presumed order of preferential binding. In doing so for each successive metal, the remaining (decreasing) molar concentration of AVS can be applied to the molar concentration of specific metals. When the concentration of AVS is zero, all remaining metals are assumed to be bioavailable. Following this calculation, the adjusted concentration of lead and zinc will be compared to site-specific cleanup levels.

$$Metal_b = (Metal_{SEM} - AVS)*(MW_{Metal})$$

where,

$Metal_b$	= concentration of metal that is bioavailable (mg/kg),
$Metal_{SEM}$	= molar concentration of metal as determined by simultaneous extraction (moles/kg),
AVS	= molar concentration of AVS (moles/kg), and
MW_{Metal}	= molecular weight of metal (mg/moles).

If the adjusted concentrations are below site-specific cleanup levels, it will be assumed that ecological impacts at that sample location are not significant.

If the SEM/AVS results indicate that metals of concern are not bioavailable, or if they are not bioavailable above the site-specific cleanup levels, further sediment monitoring in the Quaboag River and/or the wetland will be terminated.

Please feel free to call me if you should have any questions.

Very truly yours,

O'BRIEN & GERE ENGINEERS, INC.

James R. Heckathorne, P.E.
Project Coordinator

G:\SYRACUSE\DIV71\Projects\5819005\2_CORRES\AGENCY\notification 15&revised sampling approach.doc

cc: G. Gill-Austern, Esq. – Nutter, McClennen & Fish, LLP
M. Connell - Parker-Hannifin Corporation
J. Hunt – *de maximis, inc.*
J. Shanahan, P.E. – O'Brien & Gere Engineers, Inc.
J. Rank – O'Brien & Gere Engineers, Inc.

JR

O'BRIEN & GERE

May 26, 2005

Mr. Donald McElroy
Remedial Project Manager
USEPA - Region 1
1 Congress Street, Suite 1100
M.C. HBT
Boston, Massachusetts 02114-2023

Mr. Paul Craffey
MADEP
Bureau of Waste Site Cleanup
One Winter Street, 7th Floor
Boston, Massachusetts 02108

Re: PSC Resources Superfund Site
Palmer Massachusetts
File: 5819.005 #2

Dear Mr. McElroy and Mr. Craffey:

This letter serves two purposes. First, pursuant to Paragraph 26 of the Consent Decree for the PSC Resources Superfund Site, it provides notification that the sixteenth environmental monitoring sampling event will be performed during the week of June 13, 2005. The samples will be obtained in accordance with Section 4 of the modified Operation and Maintenance (O&M) Plan, Environmental Monitoring Work Plan (EMWP), and Project Operations Plan (POP), as changed by the modified sampling approach memorialized in our June 16, 2004 letter to EPA and DEP (copy attached).

Second, this letter provides, based on our Summer 2004 Environmental Monitoring Report dated November 22, 2004, a further modified sampling approach for the upcoming monitoring event, which Mr. McElroy orally approved during a telephone discussion with Judith Rank of O'Brien & Gere Engineers, Inc. on May 16, 2005.

June 2005 Modified Sampling Approach
The June 2005 monitoring event will consist of the following:

- Ground water samples will be obtained in accordance with Section 4 of the modified O&M Plan, EMWP, and POP.
- River sediment samples will be collected for lead at sample locations RSED-01 and RSED-06, but no longer at sample location RSED-05.
- Wetland sediment samples will be collected for zinc at sample locations WL-SED-01 and WL-SED-04, but no longer at sample locations WL-SED-02 and WL-SED-03.

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. . . and offices in major U.S. cities

Please feel free to call me if you should have any questions.

Very truly yours,

O'BRIEN & GERE ENGINEERS, INC.

James R. Heckathorne, P.E.
Project Coordinator

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cc: G. Gill-Austern, Esq. – Nutter, McClennen & Fish, LLP
M. Connell - Parker-Hannifin Corporation
J. Hunt – *de maximis*, inc.
J. Shanahan, P.E. – O'Brien & Gere Engineers, Inc.
J. Rank – O'Brien & Gere Engineers, Inc.

O'BRIEN & GERE

May 11, 2006

Mr. Donald McElroy
Remedial Project Manager
USEPA – Region 1
1 Congress Street, Suite 1100
M.C. HBT
Boston, Massachusetts 02114-2023

Mr. Paul Craffey
MADEP
Bureau of Waste Site Cleanup
One Winter Street, 7th Floor
Boston, Massachusetts 02108

Re: PSC Resources Superfund Site
Palmer Massachusetts
File: 5819.005 #2

Dear Mr. McElroy and Mr. Craffey:

This letter serves two purposes. First, pursuant to Paragraph 26 of the Consent Decree for the PSC Resources Superfund Site, it provides notification that the seventeenth environmental monitoring sampling event will be performed during the week of June 19, 2006. The samples will be obtained in accordance with Section 4 of the modified Operation and Maintenance (O&M) Plan, Environmental Monitoring Work Plan (EMWP), and Project Operations Plan (POP), as changed by the modified sampling approaches memorialized in our June 16, 2004 and May 26, 2005 letters to EPA and DEP (copies attached).

Second, this letter provides, based on our Summer 2005 Environmental Monitoring Report that was submitted to the agencies on October 26, 2005, a further modified sampling approach for the upcoming monitoring event, which Mr. McElroy approved via electronic mail to Judy Shanahan of O'Brien & Gere Engineers, Inc. on May 8, 2006.

June 2006 Modified Sampling Approach
The June 2006 monitoring event will consist of the following:

- Ground water samples will be obtained in accordance with Section 4 of the modified O&M Plan, EMWP, and POP.
- River sediment samples will be collected for lead at sample locations RSED-01 and RSED-06, but no longer at sample location RSED-05.
- A wetland sediment sample will be collected for zinc at sample location WL-SED-04, but no longer at sample locations WL-SED-01, WL-SED-02 and WL-SED-03.

Please feel free to call me if you should have any questions.

Very truly yours,

O'BRIEN & GERE ENGINEERS, INC.

James R. Heckathorne, P.E.
Project Coordinator

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cc: G. Gill-Austern, Esq. – Nutter, McClennen & Fish, LLP
M. Connell - Parker-Hannifin Corporation
J. Hunt – *de maximis*, inc.
J. Shanahan, P.E. – O'Brien & Gere Engineers, Inc.
J. Rank – O'Brien & Gere Engineers, Inc.

O'BRIEN & GERE

June 12, 2007

Mr. Donald McElroy
Remedial Project Manager
USEPA – Region 1
1 Congress Street, Suite 1100
M.C. HBT
Boston, Massachusetts 02114-2023

Mr. Paul Craffey
MassDEP
Bureau of Waste Site Cleanup
One Winter Street, 7th Floor
Boston, Massachusetts 02108

Re: PSC Resources Superfund Site
Palmer Massachusetts
File: 5819.005 #2

Dear Mr. McElroy and Mr. Craffey:

On June 8, 2007, O'Brien & Gere received electronic mail messages from MassDEP and USEPA approving the proposal to terminate further monitoring of Quaboag River sediments advanced in O'Brien & Gere's April 11, 2007 technical memorandum.

USEPA also included a comment regarding Section 5.2 in its June 8, 2007 electronic mail message, which has been addressed in the attached revision of the technical memorandum.

Very truly yours,

O'BRIEN & GERE ENGINEERS, INC.

James R. Heckathorne, P.E.
Project Coordinator

I:\DIV71\Projects\5819005\2_CORRES\AGENCY\Riversedimentmemotransmittalrevised.doc

cc: G. Gill-Austern, Esq. – Nutter, McClennen & Fish, LLP
M. Connell – Parker-Hannifin Corporation
J. Hunt – *de maximis, inc.*
J. Shanahan, P.E. – O'Brien & Gere Engineers, Inc.
J. Rank – O'Brien & Gere Engineers, Inc.

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To:	Don McElroy, USEPA Paul Craffey, MassDEP	*cc:*	G.L. Gill-Austern, Esq. – NMF M. Connell – Parker-Hannifin
From:	William Schew, Ph.D., Sr. Technical Director		J.R. Heckathorne, P.E. – O'Brien & Gere
Re:	Quaboag River Sediment Evaluation – Revised		J.M. Rank – O'Brien & Gere
File:	5819.005 #3		J.A. Shanahan, P.E. – O'Brien & Gere
Date:	June 12, 2007		

1.0. Introduction

In accordance with Section 4.2 of the draft Summer 2006 Environmental Monitoring Report, this technical memorandum documents an evaluation to assess whether Quaboag River sediment monitoring at the PSC Resources Superfund Site (Site) in Palmer, Massachusetts should be terminated. It reaches the conclusion that sediment monitoring should be terminated.

As described below, the following four factors are evaluated: 1) whether levels of lead in Site ground water that discharges into Quaboag River are at levels expected to cause lead concentrations in river sediment to exceed published ecological standards; 2) whether observed mean concentrations of lead in river sediments are within the range of published ecological screening levels; 3) whether there is a difference between observed concentrations of lead in river sediments in pre- and post-remediation conditions; and 4) whether there is evidence of a decreasing trend in recent downstream lead concentrations. The overall evaluation incorporates all 16 rounds of post-closure sediment sampling at the Site for the period September 1998 through June 2006.

2.0. Background

When environmental monitoring began in September 1998, sediment from the Quaboag River was collected from three locations: RSED-01, RSED-05 and RSED-06 (Figure 1). RSED-01 is the upstream sample location used as the standard in each sampling event. Sample location RSED-05 is downstream of RSED-01 and upstream of RSED-06. Sediment sample collection at RSED-05 was terminated in June of 2004, in accordance with Section 4.5.4 of the modified Environmental Monitoring Plan (O'Brien & Gere 1998), after an acid volatile sulfides/simultaneously extracted metals analysis demonstrated that the lead at this sample location was largely unavailable to ecological receptors. Termination of sampling at RSED-05 was memorialized in a May 26, 2005 letter to the agencies.

With respect to the downstream sample location (RSED-06), lead concentrations decreased after 2002, and were within the range of acceptable sediment background concentrations (4-17 mg/kg; International Joint Commission Sediment Subcommittee 1988) during the June 2004 and June 2005 environmental monitoring events. Lead concentrations at the upstream sample location (RSED-01) were within the range of acceptable background concentrations from 1998 through 2005. During the June 2006 environmental monitoring event, however, the concentrations of lead in both the upstream (RSED-01) and downstream (RSED-06) samples were above the range of acceptable sediment background concentrations according to the above-referenced International Joint Commission Sediment Subcommittee's standards. The lead concentration in the June 2006 upstream sample (RSED-01) was the highest detected since the monitoring program began in the fall of 1998. At the same time, the lead concentration in the June 2006 downstream sample (RSED-06) was consistent with historic data (Figure 2). Because the June 2006 data was anomalistic, the question was raised as to whether, using different criteria, i.e., criteria not explicitly provided for in Site-related documents, Quaboag River sediment monitoring should be terminated.

3.0. Conceptual Site Model

Use of a conceptual site model (CSM) is central to this evaluation. A CSM identifies constituent sources (source of contamination), affected media (e.g., ground water, sediment), transport mechanisms (e.g., erosion, ground water intrusion into surface water), exposure media (e.g., surface water, sediment) and receptors (e.g., benthic invertebrates [also referred to as sediment-dwelling organisms]). Unacceptable ecological risk may only be possible when each of these is found.

The historic land use of the Site entailed petroleum or solvent-related industry since approximately 1900. From at least 1974 until operations ceased in 1978, activities at the Site included waste oil and solvent recovery and disposal. In the course of these operations, spills may have occurred causing contamination of soils, sediments, and groundwater. The Remedial Action at the Site included buildings/structures decontamination and demolition, collection and treatment of surface water previously contained in lagoons, ex situ stabilization of impacted lagoon sediments and soils, and containment within a low-permeability cap system. Wetland areas on the Site were restored. With the exception of zinc at one wetland sediment sample location (WL-SED-04) and lead at one river sediment sample location (RSED-06), cleanup levels in wetland and Quaboag River surface water and sediment have been attained.

Once the Remedial Action was complete, only two potential sources for the continuing presence of lead in river sediment were possible: upstream sources, and Site ground water. With respect to the relevant potential receptors, sediment-dwelling organisms, exposure to ground water constituents from the Site could only be through ground water discharge to surface water.

A CSM for the Quaboag River sediments is shown in Figure 3.

4.0. Evaluation

As presented in Section 1.0, four factors are used to evaluate whether available data supports terminating future Quaboag River sediment monitoring events:

1. Would the discharge of ground water from the Site into the Quaboag River be expected to cause sediment lead concentrations that exceed published ecological standards?
2. Are the mean concentrations of lead in the river sediments greater than published ecological screening values?
3. Is there a difference between pre- and post-remediation sediment samples with respect to mean lead concentrations?
4. Is there a decreasing trend in recent downstream lead concentrations?

Each of these factors is evaluated below.

4.1. Would the discharge of ground water from the Site into the Quaboag River be expected to cause sediment lead concentrations that exceed published ecological standards?

The discharge of affected ground water from the Site to the sediment of the Quaboag River is a possible mechanism that could expose off-site receptors to Site constituents. As ground water discharges to the river, site-related constituents present in the ground water may partition to sediment from the dissolved phase. This pathway was evaluated using the equilibrium partitioning model as follows:

$$C_s = C_d \times K_d \times f_{oc}$$

Where:
C_s = estimated sediment concentration
C_d = ground water concentration (0.0056 mg/L)
K_d = soil/water partitioning coefficient (900 L/kg for lead, RAIS, 2006)
f_{oc} = organic carbon fraction (set as default 2.5%)

There are several conservative assumptions used in this calculation, however, that could result in sediment lead concentrations being overestimated:

- The maximum detected lead concentration (0.0056 mg/L) in June 2006 was used as the ground water concentration.
- No attenuation of constituent concentrations occurs between the Site monitoring wells and the discharge point into the Quaboag River.
- The affected ground water does not mix with (and become diluted by) the Quaboag River prior to coming in contact with river sediment.
- The screening ecological benchmarks used in this assessment are analogous to threshold effects level (TEL) standards. These TELs represent the concentration below which adverse effects are expected to occur only rarely.

Even with these very conservative assumptions, the estimated sediment concentration of lead that would result from the discharge of ground water from the Site into the Quaboag River is 0.13 mg/kg (Table 1). This value is over 250 times less than the TEL of 35 mg/kg (Smith, et al. 1996). Thus, this line of evidence shows that the discharge of ground water from the Site to river sediments is not expected to result in adverse impacts to sediment-dwelling organisms.

4.2. Are observed concentrations of lead in river sediments greater than published ecological screening levels?

Numerical sediment quality guidelines (SQGs) have been developed by various federal and state agencies for freshwater ecosystems. These SQGs have been used to identify constituents of concern in aquatic systems and to assess the quality of sediments following remediation. Various approaches have been used to develop SQGs against which affected sediments can be compared. These approaches depend on the administrative jurisdiction, the applicable receptors (e.g., sediment-dwelling organisms, wildlife), the degree of protection desired, and the intended use of the SQG (e.g., screening tool, cleanup objective, and bioaccumulation assessment).

Observed concentrations of lead in Quaboag River sediments downstream of the Site (RSED-05 and RSED-06), the locations which presumably have the greatest potential to be influenced by the Site, have ranged from 82 mg/kg to 2.6 g/kg, with an average of 25.1 mg/kg since 1998.

These sediment concentrations are consistent with expected levels of impact ranging from "no adverse effects" to "adverse effects being only rarely observed." For example, the minimal effects threshold (MET) of 42 mg/kg (EC and MENVIQ 1992) is a level at which sediments are "considered to be clean to marginally polluted" (MacDonald, et al. 2000). Likewise, the TEL of 35 mg/kg (Smith et al. 1996) represents concentrations below which adverse effects are expected to occur only rarely, and the low effects level (LEL) of 31 mg/kg (Persaud, et al. 1993) represents a concentration at which no effects on 95% of sediment-dwelling organisms are expected.

In determining whether the current levels of lead in Quaboag River sediments are protective of the environment, two main points should be addressed: 1) the assessment endpoint being considered; and 2) the potential for the sediments to impact the assessment endpoint. The assessment endpoint is an explicit expression of the environmental value that is to be protected. In the case of Quaboag River sediment, the Record of Decision (ROD) for the Site summarized the Ecological Risk Assessment (ERA) performed during the Remedial Investigation which found that benthic invertebrates were such an assessment endpoint. The ROD also reports that the ERA concluded that "The potential risk to benthic invertebrates from contaminated ground water discharging to river sediment is low" (ROD, 30).

In addressing the potential impact to sediment-dwelling organisms, it is important to consider how impact is being determined and what such impact actually means. By comparing measured sediment concentrations to sediment quality benchmarks, we can reach conclusions about the likelihood of adverse impacts to sediment-dwelling organisms. Since 1998, the majority of lead concentrations in RSED-05 and RSED-06 were at or below the MET of 42 mg/kg (23 of 30 samples), 20 of 30 were at or below the TEL of 35 mg/kg, and 18 of 30 were at or below the LEL of 31 mg/kg. Consequently, the majority of the sample results indicate no adverse impacts or only potentially rare adverse impacts to sediment-dwelling organisms. To put these sediment results in context, all samples were significantly below the severe effects level (SEL) of 250 mg/kg (Persaud, et al. 1993) and the effects range-median (ERM) of 110 mg/kg (Long and Morgan 1990). The SEL represents a concentration at which adverse impacts are expected on the majority of sediment-dwelling organisms and the ERM represents a concentration above which adverse effects would frequently occur.

4.3. Is there a difference between pre- and post-remediation sediment samples with respect to mean lead concentrations?

A comparison of the pre-remediation sediment concentrations of lead (n=5) to all of the downstream post-remediation concentrations (n=30) was conducted using a one-way analysis of variance (ANOVA) (Table 2). The ANOVA indicates no significant difference between the pre-remediation sediment samples and the post-remediation samples with respect to mean lead concentrations (35.7 mg/kg vs. 25.1 mg/kg).

4.4. Is there a decreasing trend in recent downstream lead concentrations?

The Mann-Kendall test was used to determine if there are any trends in more recent data from the RSED-06 sample location, i.e., data collected from December 2002 through June 2006 (Table 3). The results of this test show there is no trend in the data at the 95% confidence level. However, sample location RSED-06 data does appear to be decreasing over time, as the probability from this test is 0.117. This neutral (trending negative) trend observed in the data supports a conclusion that lead levels are not increasing.

5.0. Summary and Conclusion

The results of the evaluation with respect to each of the four factors are:

5.1. Would the discharge of ground water from the Site into the Quaboag River be expected to cause sediment lead concentrations that exceed published ecological standards?

Section 4.1 shows that it is very unlikely that the lead in ground water from the Site would increase sediment lead concentrations upon discharge into the Quaboag River. In spite of the conservative assumptions used in this analysis, the estimated sediment lead concentration (0.13 mg/kg) is over 250 times less than the TEL (35 mg/kg). Moreover, using the TEL to evaluate river sediment adds another level of conservatism as it represents the concentration below which adverse effects are expected to occur only rarely. Therefore, discharge of ground

water from the Site to river sediments is not expected to result in adverse impacts to sediment-dwelling organisms.

5.2. Are the mean concentrations of lead in the river sediments greater than published ecological screening values?
Section 4.2 compared downstream sediment samples collected since 1998 to published ecological screening values. This evaluation shows that the majority of the sample results indicate no adverse impacts or only potentially rare adverse impacts to sediment-dwelling organisms.

5.3. Is there a difference between pre- and post-remediation sediment samples with respect to mean lead concentrations?
Section 4.3 shows that there is no statistical difference between the pre- and post-remedial samples for mean lead concentration.

5.4. Is there a decreasing trend in recent downstream lead concentrations?
Section 4.4 shows that the recent lead concentrations have leveled off and are trending toward decline.

5.5. Conclusion
The evidence presented above supports termination of future sediment monitoring in the Quaboag River.

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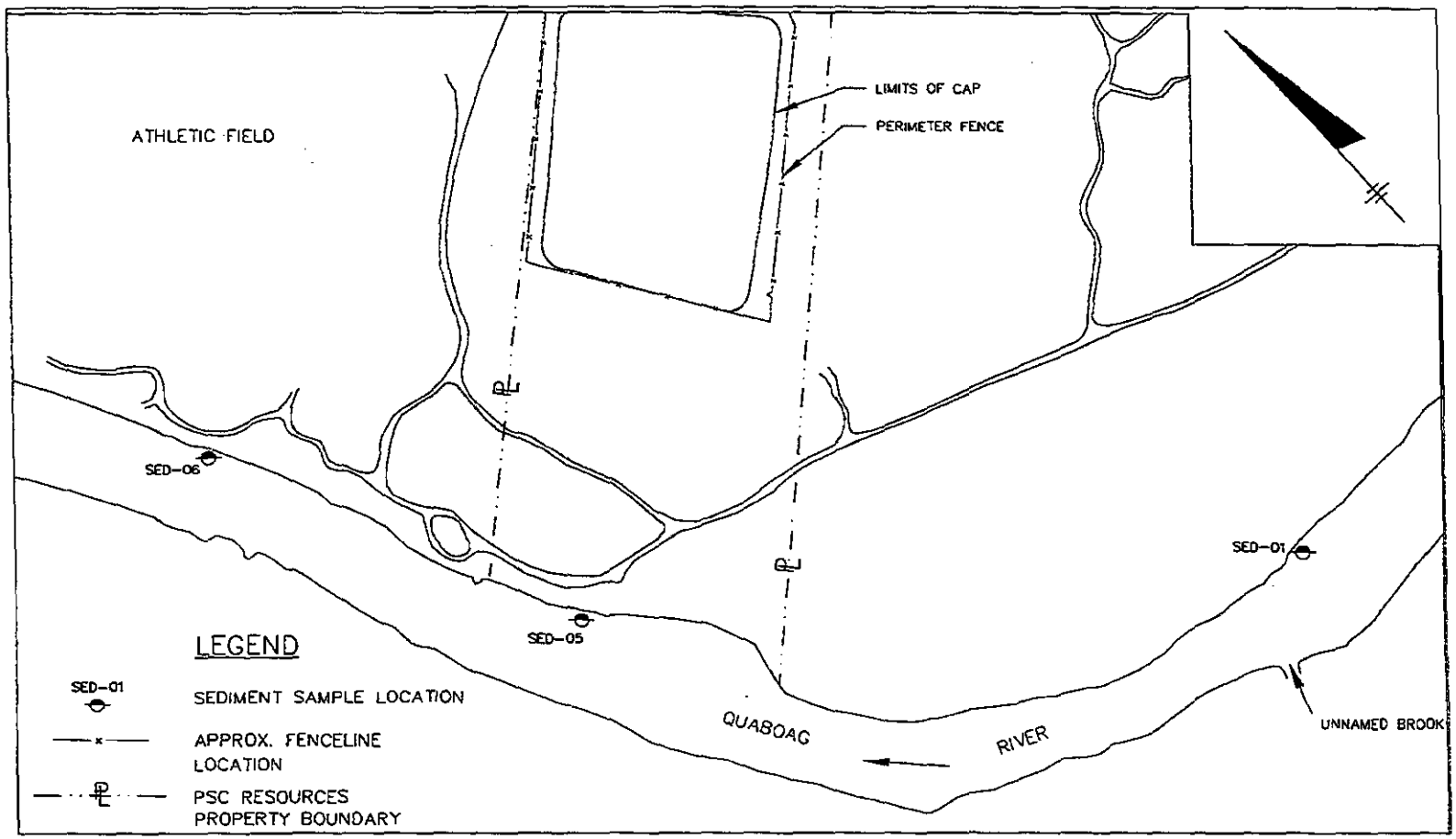

PSC RESOURCES SUPERFUND SITE
PALMER, MASSACHUSETTS

QUABOAG RIVER SEDIMENT SAMPLE LOCATIONS

0 150 300
SCALE IN FEET

FIGURE 1

O'BRIEN & GERE

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Figure 2
PSC Resources Superfund Site
Palmer, Massachusetts
Quaboag River Sediment

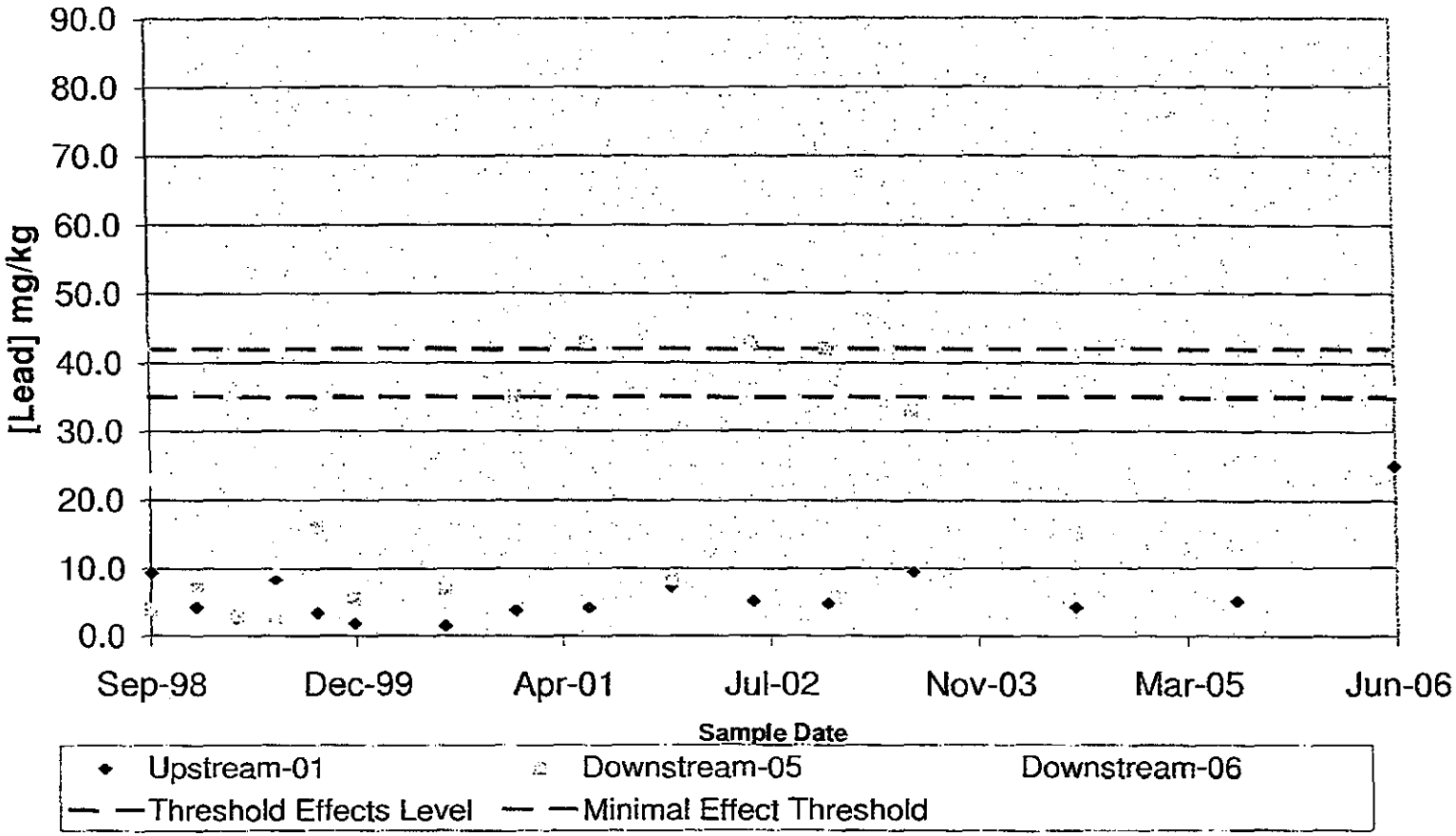

Figure 3
PSC Resources Superfund Site
Palmer, Massachusetts
Conceptual Site Model for the Quaboag River Sediment Evaluation

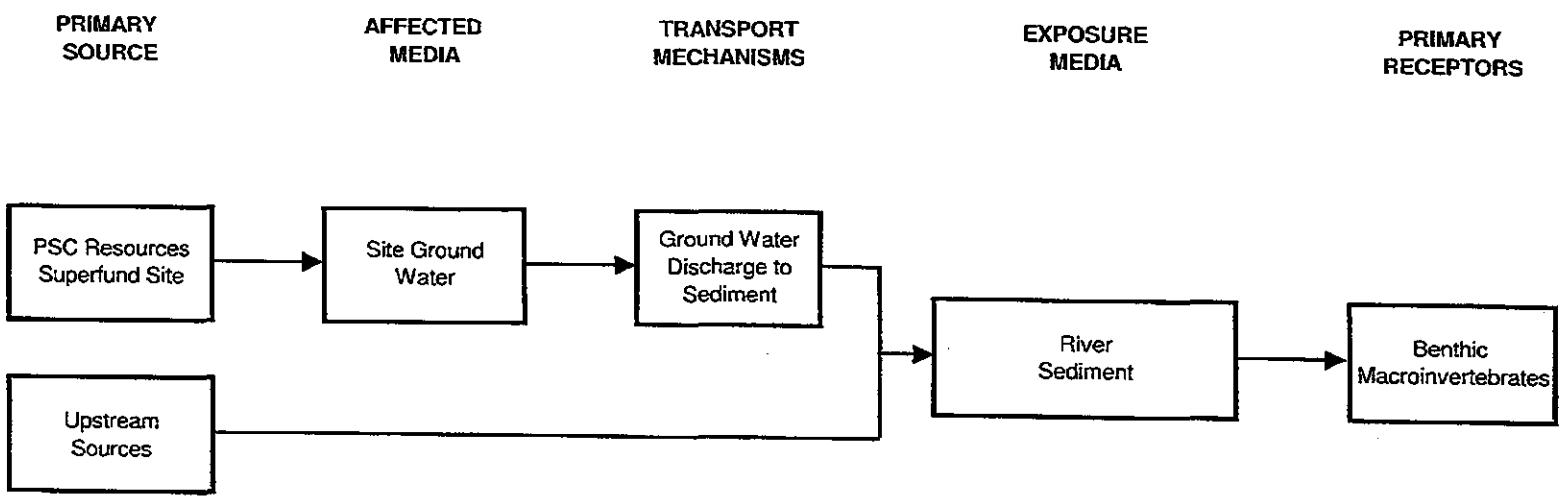

Table 1

PSC Resources Superfund Site
Palmer, Massachusetts
Quaboag River Sediment Evaluation - Lead
Estimated Sediment Concentrations from Hypothetical Ground Water to Surface Water Discharge

Constituent	GW/Pore-water Concentration - C_d[1] (mg/L)	K_d[2] (L/kg)	Sediment Concentration - C_s[3] (mg/kg)	Threshold Effects Level[4] (mg/kg)
Lead	0.0056	900	0.13	35

NOTES:

1 Since the majority of the ground water samples (wells 101C, 102B, 103C, 104B, 104C, 105B and 112C from 9/98 to 6/06) were not detected at a reporting limit of 0.005 mg/L, one-half this reporting limit (0.0025 mg/L) was used as the ground water concentration.

2 soil/water partioning coefficient taken from the Risk Assessment Information System (http://rais.ornl.gov/)

3 Sediment concentration was calculated using the equilibrium partitioning equation as follows: $C_s = C_d * K_d * f_{oc}$, where C_s = sediment concentration, C_d = ground water/pore water concentration, K_d = soil/water partitioning coefficient, and foc = organic carbon fraction (set at default of 2.5%) after EPA 822-D-94-002, 1994.

4 Threshold effects level from Feb 2004 version of NOAA Screening Level Reference Table (SQUIRT)

Table 2

PSC Resources Superfund Site
Palmer, Massachusetts
Quaboag River Sediment Evaluation - Lead
Analysis of Variance

Description: a one-way ANOVA comparing the mean lead concentrations from the remedial samples to all downstream samples (stations 05 and 06 combined)

	RI Lead Data (9/20/1990) (mg/kg)	All Downstream Lead Data for Sediment (stations 05 & 06 combined) (mg/kg)					
	23.1	3.9	5.3	43.0	8.9	7.7	82.0
	4.5	7.4	6.8	42.0	36.0	52.0	57.0
	3.7	3.0	35.0	33.0	10.0	52.0	12.2
	56	2.6	43.0	15.1	21.0	22.0	13.0
	91.2	16.0	8.2	23.0	13.0	43.0	36.0
Mean =	35.7	25.1					

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	5	178.5	35.7	1412.135
Column 2	30	753.1	25.103333	399.42516

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	481.2400476	1	481.24005	0.9216018	0.3440363	4.1392525
Within Groups	17231.86967	33	522.17787			
Total	17713.10971	34				

Results: ANOVA indicates that there is no difference between the mean RI lead concentration and all the downstream samples (stations 05 & 06 combined)

Table 3

PSC Resources Superfund Site
Palmer, Massachusetts
Quaboag River Sediment Evaluation - Lead
Mann-Kendall test for trend - Downstream 06 data (post 12/02)

	1	2	3	4	5	No. of	No. of
	82.0	57.0	12.2	13.0	33.0	+ signs	- signs
82.0	---	-	-	-	-	0	4
57.0		---	-	-	-	0	3
12.2			---	+	-	1	1
13.0				---	+	1	0
33.0					---		
					Total	2	8

S = -6

Since the absolute value of S (6) is less than the critical value (8) the null hypothesis is not rejected: there is no trend in the data

the p- value for S=6 and n=5 is 0.117 for a one-tailed test [from USEPA (2006) Table A-12b)

Mann-Kendall test for trend after USEPA/240/B-06/003, Feb 2006, Data Quality Assessment: Statistical Methods for Practitioners and Gilbert (1987)

To: Don McElroy, EPA
Paul Craffey, MassDEP

From: Judy Shanahan

Re: PSC Resources Superfund Site
Proposed Monitoring Modifications

File: 5819.005 #3

Date: February 20, 2008

cc: M. Connell – Parker-Hannifin
B.R. Thompson, *de maximis, inc.*
G.L. Gill-Austern – NMF, LLP
B. McDonald – NMF, LLP
J.R. Heckathorne - O'Brien & Gere
J.M. Rank - O'Brien & Gere

1.0 Introduction

During a meeting at USEPA Region 1 on November 20, 2007, representatives of USEPA, MassDEP, the Performing Settling Defendants (Group) and O'Brien & Gere Engineers, Inc. (Supervising Contractor) discussed, among other things, modifying the environmental monitoring program and ending the use of an Independent Quality Assurance Team (IQAT) at the PSC Resources Superfund Site (Site) in Palmer, Massachusetts. This technical memorandum proposes and provides the reasons to:

- reduce the frequency of the ground water monitoring program; and
- cease all wetland sediment monitoring.

A proposal to cease IQAT services and reduce the frequency of progress reporting is addressed in a separate correspondence from the Group's project manager.

2.0 Ground Water Monitoring

The Record of Decision (ROD) selected a Source Control remedy as well as a Management of Migration remedy for ground water. As contemplated by the Management of Migration remedy and as described in the Remedial Design/Remedial Action Statement of Work (SOW), long-term monitoring of ground water has been performed for various contaminants of concern (COCs). The SOW requires the Group to continue the ground water monitoring program until Performance Standards are met and maintained for three years.

Since 1998, ground water has been monitored at seven monitoring wells (MW-101C, MW-102B, MW-103C, MW-104B, MW-104C, MW-105B and PSC-112S) in accordance with the modified Operation and Maintenance (O&M) Plan, Environmental Monitoring Work Plan (EMWP), and Project Operations Plan (POP). Since 2004, monitoring has been performed on an annual basis.

Since 1998, ground water has been sampled 17 times, creating a sufficient body of data to evaluate the success of natural attenuation, the selected Management of Migration remedy. See Table 1 for the historical analytical data. To date, the Performance Standards (or cleanup levels) have been attained for all COCs at five of the seven ground water monitoring wells. The two monitoring wells with minimal Performance Standard exceedances, each for one COC, are MW-104B and MW-105B. During the most recent monitoring event in June 2007, MW-104B contained benzene at 6.37 ug/L (Performance Standard is 5 ug/L), and MW-105B contained vinyl chloride at 2.9 ug/L (Performance Standard is 2 ug/L).

The ROD estimated that it would take 7 to 11 years following completion of the Source Control remedy for ground water cleanup levels to be attained by natural attenuation. Through the first eight years,

cleanup levels have been achieved at all but two wells, and at those wells the concentrations are approaching the cleanup levels. The concentration of benzene in MW-104B has decreased significantly since the first year of sampling when levels of 90-130 ug/L were detected. The concentration of vinyl chloride in MW-105B has been consistently low since 2001, and is only minimally above the Performance Standard.

The Group recognizes that while the remedy objective of complete restoration of the ground water aquifer is not yet realized, the Group proposes to modify the frequency and extent of the ground water monitoring program. The remaining ground water COCs above Performance Standards do not present a current risk to human health or the environment. The human exposure pathway to ground water is not complete and migration of ground water contaminants to other environmental media has been demonstrated to be below all Performance Standards based on past wetland and Quaboag River sampling. The continued, albeit less frequent, monitoring proposed by the Group will ensure the ongoing evaluation of aquifer restoration.

Based on the above, the Group proposes to modify the frequency and extent of ground water monitoring as follows:

1. Ground water monitoring will be performed in June 2008 and June 2009; thereafter, once every five years (2014, 2019, etc.). Ground water samples will be obtained from three monitoring wells (MW-101C (upgradient well), MW-104B and MW-105B), and analyzed for VOCs. An environmental monitoring report similar to the current format will be submitted to the agencies. This schedule ensures that ground water monitoring will be performed one year before each five-year review performed by USEPA in accordance with CERCLA § 121(c). (The next five-year review is scheduled for 2010.)

2. If the Performance Standards for benzene and vinyl chloride are attained during a monitoring event, the Group will vary the above-stated schedule, and will conduct monitoring during the following two succeeding years.

3. If the Performance Standards for vinyl chloride and benzene are not attained for three consecutive years, following the non-attainment monitoring event, the Group will next conduct monitoring during the first year that ends with a 4 or a 9. (For example, if the Performance Standards are met in 2009, sampling will occur in 2010 and 2011. If Performance Standards are not met, however, in 2010 or 2011, the next sampling would occur in 2014.); thereafter in accordance with 1. above.

4. Once the Performance Standards have been achieved for three consecutive years, a round of ground water samples will be obtained from the seven original ground water monitoring wells, and analyzed in accordance with the modified O&M Plan, EMWP, and POP. This data will be utilized in a risk assessment performed in accordance with IV.A.1. of the SOW. In accordance with section X.B.C.2. of the ROD, monitoring can be terminated if the regulatory agencies determine that the remaining COCs do not present a significant risk to human health and/or the environment.

3.0 Wetland Sediment Monitoring

The Record of Decision (ROD) selected a Source Control remedy to address contamination present in wetland sediments at the Site. As documented in the ROD, an ecological risk assessment identified wetland sediments as posing a probable environmental risk. The ROD also noted that the COCs contributing to the ecological risk were total PAHs, lead and zinc and that the three contaminants tended to follow a co-occurrence pattern in the affected wetland sediments.

Following completion of the Source Control remedy, and as part of the environmental monitoring program at the Site, since September 1998 wetland sediment samples have been collected from four locations and analyzed in accordance with the modified O&M Plan, EMWP and POP. Three locations were in areas addressed by the Source Control remedy, the fourth sample location (WL-SED-04) was to serve as a background sample location. The Performance Standards set forth in the SOW have been attained at sample locations in the remediated wetland areas and monitoring at those locations has been discontinued. The historical analytical data for these sample locations are included in Table 2.

Currently, a single COC, zinc, at the background wetland sediment sample location (WL-SED-04) exceeds the applicable Performance Standard as shown on Table 2. The level of zinc was below the Performance Standard for 13 of 18 monitoring events. Zinc was consistently well below the Performance Standard of 550 mg/kg from September 1998 until June 2001 when it reached a high of 720 mg/kg. The levels of zinc have fluctuated between 270 mg/kg and 720 mg/kg over the last ten monitoring events, and have exceeded the 550 mg/kg Performance Standard on five of those occasions.

Based on the following, the Group proposes to cease wetland sediment monitoring in its entirety:

(a) The nature of zinc at the sample location is anomalous and is not indicative of zinc concentrations in remediated wetland areas.

(b) The elevated level of zinc is likely caused by a source unrelated to the Site. The presence of zinc at WL-SED-04 does not correlate to the presence of other Site COCs, as observed at sediment monitoring locations related to the Site. The sample location is in an "uncontrolled area" east of the PSC Resources Property that is owned by a third party.

(c) The location of the sediment sample is side-gradient to the PSC Resources Property and is located outside the remediated wetland area. The WL-SED-04 sample location was chosen to serve as a background sample location to compare with wetland sediment data from the remediated wetland areas.

(d) Continued sampling activities are intrusive to wetlands, and potentially enable the physical destruction of flora and fauna.

The Group believes that the wetland sediment performed to date is adequate to evaluate the success of the Source Control remedy and to determine that the ARARs have been met at the Site.

Table 1A
PSC Resources Superfund Site
Palmer, MA
Historic Ground Water Analytical Results and Cleanup Levels
MW-101C - Overburden Monitoring Well

		1998		1999				2000			2001		2002		2003	2004	2005	2006	2007
Chemical	ICLs	9/30	12/14	3/16	6/14	9/20	12/13	3/13	6/12	12/19	6/4	12/10	6/17	12/3	6/17	6/21	6/23	6/20	6/25
Metals (mg/L)																			
Lead	0.015	0.005 U	0.005 U	0.005 U	0.003 J	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.0013 J	0.005 U	0.005 U	0.005 U	0.01 U
SVOCs (ug/L)																			
BEHP	6	5.3 U	5.3 U	5.2 U	5.1 U	5.2 U	6.7 U	5.1 U	1.0 J	5.3 U	5.0 U	5.2 U	5.0 U	5 U	5.1 U	5.1 U	1.1 J	5.1 U	5.2 U
VOCs (ug/L)																			
1,1,1-TCA	200	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U
1,1-DCA	3600	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U
MEK	350	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ	10 U	10. UJ	10 U	10. U	10. U	10 U	10.0 U	10 U
Acetone	3500	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	1.3 J	10 UJ	10 U	10. UJ	10 UJ	1.8 J	10 UJ	10 U	10.0 U	10 U
Benzene	5	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U
Meth chlor	5	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2 U	2.0 U	2 U	2.0 U	2.0 U	2.0 U	2.00 U	2 U
PCE	5	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U
TCE	5	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U
Vinyl Chloride	2	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1.0 U	1.0 U	1.00 U	1 U
cis-1,2-DCE	70	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U
trans-1,2-DCE	100	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U

Notes:

Only parameters with cleanup levels are reported
U = Not detected
* = exceeds cleanup level
D = result from diluted analysis
ICLs = Interim Cleanup Levels
J = Estimated

Parameters:

BEHP = bis(2-Ethylhexyl)phthalate
1,1,1-TCA = 1,1,1-Trichloroethane
1,1-DCA = 1,1-Dichloroethane
MEK = 2-Butanone
PCE = Tetrachloroethene
TCE = Trichloroethene
Meth Chlor = Methylene Chloride
trans-1,2-DCE = trans-1,2-Dichloroethene
cis-1,2-DCE = cis-1,2-Dichloroethene

Table 1B
PSC Resources Superfund Site
Palmer, MA
Historic Ground Water Analytical Results and Cleanup Levels
MW-102B - Overburden Monitoring Well

		1998		1999				2000			2001		2002		2003	2004	2005	2006	2007
Chemical	ICLs	9/29	12/14	3/16	6/14	9/20	12/13	3/13	6/12	12/19	6/5	12/11	6/17	12/3	6/17	6/22	6/23	6/20	6/26
Metals (mg/L)																			
Lead	0.015	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.01 U
SVOCs (ug/L)																			
BEHP	6	5.1 U	5.2 UJ	5.0 U	5.1 U	5.3 U	5.1 U	5.2 U	5.0 U	5.0 U	1.7 J	5.1 U	5.0 U	5 U	5.0 U	5.1 U	1.9 J	5.1 U	5.1 U
VOCs (ug/L)																			
1,1,1-TCA	200	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U
1,1-DCA	3600	0.66	0.50	0.50 U	0.50	0.45 J	0.33 J	0.25 J	0.21 J	0.24 J	0.13 J	0.25 J	0.50 U	0.11 J	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U
MEK	350	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 UJ	10 U	10. UJ	10 U	10. U	10. U	10 U	10.0 U	10 U
Acetone	3500	10 U	10 U	10 U	10 U	2.3 J	10 U	10 U	10 U	10 UJ	10 UJ	10 U	1.2 J	10 UJ	4.7 J	10 UJ	1.9 J	10.0 U	10 U
Benzene	5	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U
Meth chlor	5	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2 U	2.0 U	2 U	2.0 U	2.0 U	2.0 U	2.00 U	2 U
PCE	5	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U
TCE	5	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.23 J	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U
Vinyl Chloride	2	0.43 J	1.0 U	1.0 U	0.35 J	0.27 J	0.27 J	1.0 U	1.0 U	1.0 U	1.0 U	1 U	1.0 U	1 U	1.0 U	1.0 U	1.0 U	1.00 U	1 U
cis-1,2-DCE	70	0.82	0.67	0.29 J	0.62	0.52	1.2	0.33 J	0.28 J	0.44 J	0.21 J	0.38 J	0.14 J	0.15 J	0.50 U	0.21 J	0.50 U	0.50 U	0.5 U
trans-1,2-DCE	100	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U

Notes:

Only parameters with cleanup levels are reported
U = Not detected
* = exceeds cleanup level
D = result from diluted analysis
ICLs = Interim Cleanup Levels
J = Estimated

Parameters:

BEHP = bis(2-Ethylhexyl)phthalate
1,1,1-TCA = 1,1,1-Trichloroethane
1,1-DCA = 1,1-Dichloroethane
MEK = 2-Butanone
PCE = Tetrachloroethene
TCE = Trichloroethene
Meth Chlor = Methylene Chloride
trans-1,2-DCE = trans-1,2-Dichloroethene
cis-1,2-DCE = cis-1,2-Dichloroethene

Table 1C
PSC Resources Superfund Site
Palmer, MA
Historic Ground Water Analytical Results and Cleanup Levels
MW-103C - Bedrock Monitoring Well

		1999		1999				2000		2001		2002		2003	2004	2005	2006	2007
Chemical	ICLs	9/29	12/15	3/17	6/15	9/23	12/14	7/11	12/20	6/6	12/11	6/18	12/4	6/17	6/22	6/23	6/21	6/26
Metals (mg/L)																		
Lead	0.015	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.001 J	0.002 J	0.005 U	0.005 U	0.005 U	0.005 U	0.0011 J	0.00089 J	0.005 U	0.005 U	0.01 U
SVOCs (ug/L)																		
BEHP	6	5.3 U	5.0 U	5.1 U	5.1 U	5.2 UJ	5.2 U	5.1 U	5.0 U	5.1 U	1.3 J	5.0 U	5 U	5.0 U	5.0 U	5.2 U	5.2 U	5.2 U
VOCs (ug/L)																		
1,1,1-TCA	200	0.50 U	2.5 UD	5.0 U	0.50 U	2.5 U	0.50 U	0.50 U	0.50 U	0.50 UJ	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U
1,1-DCA	3600	6.3	5.8 D	4.4 J	3.5	2.7	2.6	4.0	4.0	1.9	2.2	0.96	3.8	2.5	1.8	1.4	0.46 J	0.7
MEK	350	10 U	50 UD	100 U	10 U	50 UJ	10 U	10 U	10 U	10 U	10 U	1.3 J	10 U	10. U	10. U	10 U	10.0 U	10 U
Acetone	3500	10 U	50 UD	100 U	10 U	50 UJ	10 U	10 U	51 J	10 U	10 U	6.0 J	10 UJ	0.98 J	10 UJ	10 U	10.0 U	10 U
Benzene	5	46 *	130 D *	100 *	130 *	130 *	100 *	18 *	33 *	26 *	13 *	14 *	45 *	18 *	1.9	1.5	0.57	0.67
Meth chlor	5	0.51 U	1.6 JD	5.0 U	1.2 U	2.5 U	2.0 J	2 U	0.54 J	2.0 U	0.32 J	2.0 U	1.1 J	2.0 U	2.0 U	2.0 U	2.00 U	2 U
PCE	5	0.50 U	2.5 UD	5.0 U	0.50 U	2.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.16 J	0.71	0.26 J	2.35
TCE	5	0.50 U	2.5 UD	5.0 U	0.50 U	2.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.17 J	0.50 U	0.12 J	0.50 U	0.50 U	0.30 J	0.25 J	1.38
Vinyl Chloride	2	12 *	5.8 D *	6.6 J *	0.49 J	5.0 U	1.0 U	1.0 U	1.4	0.11 J	1 U	1.0 U	1 U	0.14 J	1.0 U	1.0 U	1.00 U	1 U
cis-1,2-DCE	70	4.7	2.1 JD	5.0 U	0.29 J	2.5 U	0.10 J	0.50 U	0.15 J	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.27 J
trans-1,2-DCE	100	0.50 U	2.5 UD	5.0 U	0.88	2.5 U	0.50 U	0.14 J	0.17 J	0.12 J	0.5 U	0.12 J	0.43 J	0.19 J	0.50 U	0.50 U	0.50 U	0.5 U

Notes:

Only parameters with cleanup levels are reported
U = Not detected
* = exceeds cleanup level
D = result from diluted analysis
ICLs = Interim Cleanup Levels
J = Estimated

Parameters:

BEHP = bis(2-Ethylhexyl)phthalate
1,1,1-TCA = 1,1,1-Trichloroethane
1,1-DCA = 1,1-Dichloroethane
MEK = 2-Butanone
PCE = Tetrachloroethene
TCE = Trichloroethene
Meth Chlor = Methylene Chloride
trans-1,2-DCE = trans-1,2-Dichloroethene
cis-1,2-DCE = cis-1,2-Dichloroethene

Table 1D
PSC Resources Superfund Site
Palmer, MA
Historic Ground Water Analytical Results and Cleanup Levels
MW-104B - Overburden Monitoring Well

		1998		1999				2000			2001		2002		2003	2004	2005	2006	2007
Chemical	ICLs	10/9	12/15	3/17	6/15	9/20	12/13	3/13	6/13	12/21	6/6	12/12	6/18	12/5	6/17	6/23	6/24	6/21	6/27
Metals (mg/L)																			
Lead	0.015	0.005 U	0.01	0.002 J	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.01 U
SVOCs (ug/L)																			
BEHP	6	5.7	5.2 UJ	5.1 U	5.3 U	5.1 U	6.7 U	5.1 U	5.2 U	2.0 J	2.4 J	5.1 UJ	5.0 U	5 U	5.0 U	5.2 U	3400 *	5.2 U	5.2 U
VOCs (ug/L)																			
1,1,1-TCA	200	0.50 U	50 UD	5.0 U	0.50 U	5.0 U	2.5 U	0.50 U	1.0 U	0.50 U	0.50 U	1 U	1.2 U	0.5 U	1.3 U	0.50 U	0.50 U	0.50 U	0.5 U
1,1-DCA	3600	12	20 D	7.0	5.8	17 J	11	6.0	5.3	12	6.5	5.1	2.6	2.4	4.3	5.5	3.4	1.6	1.5
MEK	350	10 U	1000 UD*	100 U	10 U	100 U	50 U	10 U	20 U	10 UJ	10 U	20 U	25. UJ	10 U	25 U	10 U	10 U	10 U	10 U
Acetone	3500	10 U	250 UD*	100 U	10 U	90 J	50 U	10 U	20 U	79 J	11 U	20 U	25. UJ	10 UJ	25 U	10 UJ	10 U	10 U	10 U
Benzene	5	91 *	2700 D *	110 *	130 *	310 J *	120 *	58 *	47 *	82 *	67 *	51 *	68 *	70 *	30 *	26 *	19 *	5.8 *	6.37 *
Meth chlor	5	1.1 U	50 UD*	5.0 U	0.65 U	2.5 U	10 U*	0.37 J	4.0 U	2.0 U	2.0 U	0.53 J	5.0 U	0.43 J	5.0 U	0.41 J	2.0 U	0.31 J	2 U
PCE	5	0.50 U	12 UD*	5.0 U	0.50 U	5.0 U	2.5 U	0.50 U	1.0 U	0.50 U	0.50 U	1.0 U	1.2 U	0.5 U	1.3 U	0.50 U	0.50 U	0.50 U	0.5 U
TCE	5	0.50 U	50 UD*	5.0 U	0.11 J	5.0 U	2.5 U	0.50 U	1.0 U	0.50 U	0.50 U	1.0 U	1.2 U	0.5 U	1.3 U	0.50 U	0.50 U	0.50 U	0.5 U
Vinyl Chloride	2	1.0 U	100 UD*	10 U	1.0 U	10 U*	5.0 U*	1.0 U	2.0 U	1.0 U	1.0 U	2.0 U	2.5 U*	1.0 U	2.5 U*	1.0 U	1.0 U	1.0 U	1 U
cis-1,2-DCE	70	0.25 J	32 D	5.0 U	0.50 U	5.0 U	2.5 U	0.50 U	1.0 U	0.50 U	0.50 U	1.0 U	1.2 U	0.5 U	1.3 U	0.50 U	0.50 U	0.50 U	0.5 U
trans-1,2-DCE	100	0.90	12 UD	5.0 U	0.22 J	5.0 U	2.5 U	0.15 J	1.0 U	0.33 J	0.18 J	1.0 U	1.2 U	0.18 J	1.3 U	0.50 U	0.50 U	0.50 U	0.5 U

Notes:

Only parameters with cleanup levels are reported
U = Not detected
* = exceeds cleanup level
D = result from diluted analysis
ICLs = Interim Cleanup Levels
J = Estimated

Parameters:

BEHP = bis(2-Ethylhexyl)phthalate
1,1,1-TCA = 1,1,1-Trichloroethane
1,1-DCA = 1,1-Dichloroethane
MEK = 2-Butanone
PCE = Tetrachloroethene
TCE = Trichloroethene
Meth Chlor = Methylene Chloride
trans-1,2-DCE = trans-1,2-Dichloroethene
cis-1,2-DCE = cis-1,2-Dichloroethene

Table 1E
PSC Resources Superfund Site
Palmer, MA
Historic Ground Water Analytical Results and Cleanup Levels
MW-104C - Overburden Monitoring Well

		1998		1999				2000			2001		2002		2003	2004	2005	2006	2007
Chemical	ICLs	9/29	12/15	3/18	6/15	9/23	12/14	3/14	6/13	12/20	6/6	12/12	6/18	12/5	6/17	6/23	6/24	6/21	6/26
Metals (mg/L)																			
Lead	0.015	0.004 J	0.005 U	0.005 J	0.004 J	0.017 *	0.007	0.003 J	0.004 J	0.003 J	0.004 J	0.0045 J	0.006	0.007	0.0095	0.0072	0.0025 J	0.0056	0.0063 J
SVOCs (ug/L)																			
BEHP	6	5.2 UJ	5.3 U	5.1 U	5.1 U	5.1 UJ	5.1 U	5.3 U	1.3 J	3.6 J	2.6 J	5.1 UJ	5.2 U	5.2 U	5.0 U	2.6 J	1.5 J	5.3 U	5.1 U
VOCs (ug/L)																			
1,1,1-TCA	200	5.0 U	2.5 UD	50 U	0.50 U	10 U	0.30 J	0.50 U	0.50 U	0.50 U	0.50 U	1 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U
1,1-DCA	3600	100	11 D	50 U	31	3.0 J	4.9	0.82	0.96	0.41 J	0.72	4.4	0.16 J	0.11 J	0.12 J	0.82	0.21 J	0.17 J	0.38 J
MEK	350	100 U	50 UD	1000 UJ*	10 U	200 UJ	10 U	10 U	10 U	10 UJ	10 U	20 U	10. UJ	10 U	10. U	10. U	10 U	10.0 U	10 U
Acetone	3500	100 U	50 UD	1000 UJ*	10 U	200 UJ	10 U	10 U	10 U	10 UJ	10 U	20 U	2.8 J	10 UJ	10. U	10 UJ	10 U	1.20 J	10 U
Benzene	5	860 *	120 D *	2300 *	4900 *	530 *	190 *	39 *	40 *	8.3 *	72 *	120 J *	7.7 *	11 *	7.9 *	7.1 *	2.3	3.0	1.54
Meth chlor	5	5.0 U	1.2 JD	50 U*	0.50 U	10 U*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	4 U	2.0 U	2 U	2.0 U	2.0 U	2.0 U	2.0 U	2 U
PCE	5	5.0 U	2.5 UD	50 U*	0.37 J	10 U*	0.55	0.29 J	0.24 J	0.52	0.20 J	1 U	0.39 J	0.4 J	0.12 J	0.50 U	0.50 U	0.50 U	0.5 U
TCE	5	2.6 J	2.5 UD	15 J *	5.5 *	10 U*	0.29 J	0.14 J	0.75	0.12 J	0.20 J	0.42 J	0.50 U	0.11 J	0.50 U	0.13 J	0.50 U	0.50 U	0.5 U
Vinyl Chloride	2	5.9 J *	5.0 UD*	100 U*	1.9	20 U*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2 U	1.0 U	1 U	1.0 U	0.11 J	1.0 U	1.00 U	1 UJ
cis-1,2-DCE	70	110 *	2.5 UD	50 U	78 *	7.4 J	5.8	0.88	1.2	0.16 J	0.75	3.6	0.20 J	0.17 J	0.20 J	0.63	0.18 J	0.17 J	0.23 J
trans-1,2-DCE	100	2.1 J	2.5 UD	50 U	1.0	10 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	1 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U

Notes:

Only parameters with cleanup levels are reported
U = Not detected
* = exceeds cleanup level
D = result from diluted analysis
ICLs = Interim Cleanup Levels
J = Estimated

Parameters:

BEHP = bis(2-Ethylhexyl)phthalate
1,1,1-TCA = 1,1,1-Trichloroethane
1,1-DCA = 1,1-Dichloroethane
MEK = 2-Butanone
PCE = Tetrachloroethene
TCE = Trichloroethene
Meth Chlor = Methylene Chloride
trans-1,2-DCE = trans-1,2-Dichloroethene
cis-1,2-DCE = cis-1,2-Dichloroethene

Table 1F
PSC Resources Superfund Site
Palmer, MA
Historic Ground Water Analytical Results and Cleanup Levels
MW-105B - Overburden Monitoring Well

		1998		1999				2000			2001		2002		2003	2004	2005	2006	2007
Chemical	ICLs	9/29	12/15	3/17	6/15	9/23	12/14	3/14	6/13	12/20	6/6	12/12	6/18	12/5	6/17	6/23	6/23	6/21	6/26
Metals (mg/L)																			
Lead	0.015	0.002 J	0.003 J	0.005 U	0.003 J	0.006	0.004 J	0.002 J	0.001 J	0.002 J	0.005 U	0.0025 J	0.004 J	0.003 J	0.0014 J	0.00088 J	0.005 U	0.00084 J	0.01 U
SVOCs (ug/L)																			
BEHP	6	5.3 UJ	5.1 UJ	5.1 U	5.2 U	5.0 UJ	5.4 U	5.7 U	43 *	5.1 U	4.6 J	5.1 U	5.0 U	5 U	5.0 U	5.1 U	2.2 J	5.0 U	5.1 U
VOCs (ug/L)																			
1,1,1-TCA	200	51	81 D	49	60	130	69	28	53	17	20	18	20.	7.9	5.2	4.2	2.1	2.00	1.42
1,1-DCA	3600	160	170 D	150	150	88	100	110	99	150	110	96	72.	50	68.	66.	55	67.0	43.1
MEK	350	100 U	100 UD	100 U	28 J	50 UJ	50 U	100 U	20 U	50	50 U	50 U	50. UJ	100 U	50. U	20. U	20 U	1.90 J	20 U
Acetone	3500	190	250 D	130	140	50 UJ	50 U	100 U	160	180 J	83 U	50 U	21. J	100 UJ	6.4 J	20 UJ	20 U	10.0 U	20 U
Benzene	5	14 *	15 D *	12 *	13 *	1.4 J	3.8	6.9 *	5.8 *	12 *	9.1 *	6.9 *	3.2	2.4 J	4.9	4.3	3.4	3.6	3.4
Meth chlor	5	5.0 U	1.3 JD	5.0 U	2.5 U	2.5 U	10 U*	20 U*	4.0 U	0.52 J	10 U*	10 U*	10 U*	20 U*	10. U*	4.0 U	0.26 J	2.0 U	4 U
PCE	5	5.0 U	5.0 UD	5.0 U	0.65 J	1.4 J	0.90 J	5.0 U	0.68 J	0.58 J	0.51 J	2.5 U	0.97 J	5 U	0.93 J	0.29 J	0.40 J	0.42 J	0.36 J
TCE	5	3.0 J	4.1 JD	2.8 J	3.1	1.6 J	1.8 J	5.0 U	2.2	2.6	1.6 J	1.1 J	2.3 J	5 U	1.2 J	0.99 J	0.82 J	0.81	0.82 J
Vinyl Chloride	2	3.5 J *	5.9 JD *	13 *	5.2 *	5.0 U*	5.0 U*	6.9 J *	4.6 *	14 *	5.4 *	3.8 J *	3.7 J *	10 U*	5.1 *	4.1 *	4.1 *	5.5 *	2.9 J *
cis-1,2-DCE	70	61	59 D	44	44	12	30	16	22	36	20	21	16.	6.2	10.	11.	6.9	7.7	5.56
trans-1,2-DCE	100	1.3 J	1.4 JD	1.2 J	1.2 J	2.5 U	2.5 U	5.0 U	0.72 J	1.8	0.97 J	2.5 U	2.5 U	5 U	0.61 J	0.45 J	0.34 J	0.34 J	0.28 J

Notes:

Only parameters with cleanup levels are reported
U = Not detected
* = exceeds cleanup level
D = result from diluted analysis
ICLs = Interim Cleanup Levels
J = Estimated

Parameters:

BEHP = bis(2-Ethylhexyl)phthalate
1,1,1-TCA = 1,1,1-Trichloroethane
1,1-DCA = 1,1-Dichloroethane
MEK = 2-Butanone
PCE = Tetrachloroethene
TCE = Trichloroethene
Meth Chlor = Methylene Chloride
trans-1,2-DCE = trans-1,2-Dichloroethene
cis-1,2-DCE = cis-1,2-Dichloroethene

Table 1G
PSC Resources Superfund Site
Palmer, MA
Historic Ground Water Analytical Results and Cleanup Levels
PSC112S - Overburden Monitoring Well

		1998		1999				2000			2001		2002		2003	2004	2005	2006	2007
Chemical	ICLs	10/9	12/14	3/17	6/14	9/20	12/13	3/13	6/12	12/20	6/6	12/11	6/17	12/4	6/17	6/22	6/23	6/21	6/26
Metals (mg/L)																			
Lead	0.015	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.01 U
SVOCs (ug/L)																			
BEHP	6	5.3 U	5.3 U	5.0 U	5.1 U	5.1 U	5.6 U	5.2 U	5.1 U	5.0 U	2.6 J	5.1 U	5.0 U	5 U	5.0 U	5.3 U	7.9 *	1.2 J	5.1 U
VOCs (ug/L)																			
1,1,1-TCA	200	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U
1,1-DCA	3600	9.1	12	3.6	5.7	2.6 J	4.6	1.7	4.6	7.0	8.6	8.6	2.2	3.6	5.5	7.2	8.7	9.00	11.3
MEK	350	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	1.3 J	10 U	10. UJ	10 U	10. U	10. U	10 U	10.0 U	10 U
Acetone	3500	9.4 J	10 U	10 U	10 U	2.1 J	10 U	10 U	7.2 J	10 UJ	10 U	10 U	10. UJ	10 UJ	10. U	10 UJ	10 U	1.80 J	10 U
Benzene	5	0.79	3.0	0.64	2.0	0.47 J	0.97	0.39 J	0.78	0.70	1.2	0.96	0.18 J	0.42 J	0.44 J	0.58	0.61	0.49 J	0.71
Meth chlor	5	0.5 U	0.50 U	0.50 U	0.50 U	0.5 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2 U	2.0 U	2 U	2.0 U	2.0 U	2.0 U	2.00 U	2 U
PCE	5	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U
TCE	5	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U
Vinyl Chloride	2	0.20 J	0.28 J	0.48 J	1.0 U	1.0 U	0.11 J	1.0 U	1.0 U	1.0 U	1.0 U	0.24 J	1.0 U	1 U	0.20 J	0.13 J	0.24 J	0.30 J	0.69 J
cis-1,2-DCE	70	0.18 J	0.14 J	0.50 U	0.50 U	0.50 U	2.3	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.13 J	0.50 U	0.10 J	0.26 J	0.41 J
trans-1,2-DCE	100	0.14 J	0.28 J	0.50 U	0.13 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U

Notes:

Only parameters with cleanup levels are reported
U = Not detected
* = exceeds cleanup level
D = result from diluted analysis
ICLs = Interim Cleanup Levels
J = Estimated

Parameters:

BEHP = bis(2-Ethylhexyl)phthalate
1,1,1-TCA = 1,1,1-Trichloroethane
1,1-DCA = 1,1-Dichloroethane
MEK = 2-Butanone
PCE = Tetrachloroethene
TCE = Trichloroethene
Meth Chlor = Methylene Chloride
trans-1,2-DCE = trans-1,2-Dichloroethene
cis-1,2-DCE = cis-1,2-Dichloroethene

Table 2
PSC Resources Superfund Site
Palmer, MA
Historic Wetland Sediment Analytical Results and Cleanup Levels (mg/kg)

Constituent:		Arsenic	Lead	Zinc	Constituent:		Arsenic	Lead	Zinc
Performance Standards:		0.012	375	550	Performance Standards:		0.012	375	550
Location	Sample Date				Location	Sample Date			
EM-WL-SED-01	9/23/1998	8 *	220	550 *	EM-WL-SED-02	9/23/1998	5.3 *	58	72
	12/17/1998	7.9 *	270	470		12/17/1998	5.0 *	59	71
	3/19/1999	3.8 J *	110	300 J		3/19/1999	6.3 J *	20	51 J
	6/16/1999	4.0 *	140	360		6/16/1999	5.7 *	63	70
	9/22/1999	4.1 *	88	510		9/22/1999	6.5 *	59	57
	12/14/1999	5.8 *	170	390		12/14/1999	4.7 *	13	42
	3/14/2000	4.8 *	150	400		3/14/2000	4.8 *	25	58
	6/14/2000	3.9 *	110	220		6/14/2000	6.4 *	51	66
	12/22/2000	7.0 *	150	480		12/22/2000	4.6 *	55	72
	6/5/2001	10 *	150	590 *		6/5/2001	5.4 *	56	80
	12/12/2001	8.6 *	130	510		12/12/2001	6.6 *	61	81
	6/19/2002	8.9 *	94	460		6/19/2002	6.0 *	75	81
	12/4/2002	9.0 *	99	290		12/4/2002	6.1 *	65	71
	6/18/2003	10 *	140	500		6/18/2003	5.6 *	59	77
	6/23/2004	na	94J	324		6/23/2004	na	na	74
	6/24/2005	na	na	520					

Constituent:		Arsenic	Lead	Zinc	Constituent:		Arsenic	Lead	Zinc
Performance Standards:		0.012	375	550	Performance Standards:		0.012	375	550
Location	Sample Date				Location	Sample Date			
EM-WL-SED-03	9/23/1998	0.9U	5.9	23	EM-WL-SED-04	9/23/1998	3.1 *	33	44
	12/17/1998	1.1 *	15	22		12/17/1998	4.2 *	32	37
	3/19/1999	1.9 J *	15	40 J		3/19/1999	3.1 J *	30	53 J
	6/16/1999	1.6 *	12	33		6/16/1999	1.7 *	11	26
	9/22/1999	1.3 *	10	13		9/22/1999	3.6 *	30	37
	12/14/1999	3.7 *	11	74		12/14/1999	1.4 *	4.3	27
	3/14/2000	2.8 *	9	150		3/14/2000	1.6 *	8.0	46
	6/14/2000	4.4 *	38	100		6/14/2000	1.6 *	4.3	38
	12/22/2000	4.2 *	40	98		12/22/2000	8.1 *	110	270
	6/5/2001	5.8 *	54	150		6/5/2001	10 *	360	720 *
	12/12/2001	5.9 *	39	120		12/12/2001	6.7 *	150	270
	6/19/2002	2.7 *	19	39		6/19/2002	12 *	100	590 *
	12/4/2002	7.6 *	55	64		12/4/2002	6.8 *	73	540
	6/18/2003	6.8 *	52	91		6/18/2003	8.8 *	95	360
	6/23/2004	na	na	14		6/23/2004	na	86 J	440
						6/24/2005	na	na	600 *
						6/20/2006	na	na	700 *
						6/27/2007	na	na	630 *

NOTES: (1) U - not detected, J - estimated, * - exceeds cleanup level, na - not analyzed

O'BRIEN & GERE

May 21, 2008

Mr. Donald McElroy
Remedial Project Manager
USEPA – Region 1
1 Congress Street, Suite 1100
M.C. HBT
Boston, Massachusetts 02114-2023

Mr. Paul Craffey
MassDEP
Bureau of Waste Site Cleanup
One Winter Street
Boston, Massachusetts 02108

Re: PSC Resources Superfund Site

File: 5819.005 #2

Dear Mr. McElroy and Mr. Craffey:

This letter summarizes proposed modifications to the frequency and extent of ground water monitoring at the PSC Resources Superfund Site in Palmer, Massachusetts. The modifications presented below are based upon a technical memorandum submitted to the agencies on February 20, 2008, and revised as a result of telephone discussions with the agencies on April 15, 2008 and May 8, 2008.

As proposed, the below modifications are to take effect following completion of the June 2008 ground water monitoring event and submission of the Summer 2008 Environmental Monitoring Report. The modifications are as follows:

1. Ground water monitoring will be performed in June 2009; thereafter, once every five years (2014, 2019, etc.). Ground water samples will be obtained from four monitoring wells (MW-101C (upgradient well), MW-104B, MW-105B and PSC-112S), and analyzed for VOCs. An environmental monitoring report similar to the current format will be submitted to the agencies. This schedule ensures that ground water monitoring will be performed one year before each five-year review performed by USEPA in accordance with CERCLA § 121(c). (The next five-year review is scheduled for 2010.)

2. If the Performance Standards for benzene and vinyl chloride are attained during a monitoring event, the Group will vary the above-stated schedule, and will conduct monitoring during the following two succeeding years.

5000 Brittonfield Parkway / East Syracuse, New York 13057
(315) 437-6100 / FAX (315) 463-7554 ▪ http://www.obg.com

...with offices in 25 major metropolitan areas and growing.

3. If the Performance Standards for vinyl chloride and benzene are not attained for three consecutive years, following the non-attainment monitoring event, the Group will next conduct monitoring during the first year that ends with a 4 or a 9. (For example, if the Performance Standards are met in 2009, sampling will occur in 2010 and 2011. If Performance Standards are not met, however, in 2010 or 2011, the next sampling would occur in 2014; thereafter, in accordance with 1. above.)

4. Once the Performance Standards have been achieved for three consecutive years, a round of ground water samples will be obtained from the seven original ground water monitoring wells, and analyzed in accordance with the modified Operation and Maintenance Plan, Environmental Monitoring Work Plan, and Project Operations Plan. This data will be utilized in a risk assessment performed in accordance with section IV.A.1. of the Remedial Design/Remedial Action Statement of Work. In accordance with section X.B.C.2. of the Record of Decision, monitoring can be terminated if the regulatory agencies determine that the remaining contaminants of concern do not present a significant risk to human health and/or the environment.

Please confirm the agencies' agreement with the modifications stated above.

Very truly yours,

O'BRIEN & GERE ENGINEERS, INC.

Judy Shanahan

Judy A. Shanahan, P.E.
Senior Project Engineer

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cc: G.L. Gill-Austern, Esq. - Nutter, McClennen & Fish, LLP
B.M. McDonald, Esq. – Nutter, McClennen & Fish, LLP
M. Connell - Parker-Hannifin
B. Thompson - *de maximis, inc.*
T. Majer – *de maximis, inc.*
J.R. Heckathorne, P.E. - O'Brien & Gere Engineers, Inc.
J.M. Rank - O'Brien & Gere Engineers, Inc.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
ONE CONGRESS STREET SUITE 1100
BOSTON, MASSACHUSETTS 02114-2023

June 18, 2008

Jim Heckathorne
O'Brien & Gere Engineers, Inc.
5000 Brittonfield Parkway
East Syracuse, NY 13057

RE: PSC Resources Superfund Site, Proposed Monitoring Modifications

Dear Jim:

EPA received a technical memorandum dated February 20, 2008 prepared by O'Brien & Gere Engineers, Inc. ("O'Brien & Gere"), the Supervising Contractor for the Performing Settling Defendants under the Consent Decree entered on January 31, 1995 for the PSC Resources Superfund Site (the "Site"). The technical memorandum outlined proposed modifications to the monitoring of wetland sediment and groundwater at the Site. Following discussions with EPA and MassDEP, the Performing Settling Defendants revised their proposed modifications with regard to groundwater monitoring in a letter prepared by O'Brien & Gere dated May 21, 2008.

Wetland Sediment Monitoring

With regard to wetland sediment monitoring, EPA, after consultation with the Massachusetts Department of Environmental Protection ("MassDEP"), agrees that performance standards in the Record of Decision for the Site dated September 15, 1992 ("ROD") have been achieved in remediated wetland areas. In the February 20, 2008 memorandum, O'Brien & Gere proposed that the Performing Settling Defendants cease wetland sediment monitoring in its entirety. The Performing Settling Defendants may suspend wetland sediment monitoring at this time. Upon request by EPA, the Performing Settling Defendants shall resume monitoring of wetland sediments at this and/or other sampling locations identified in the Environmental Monitoring Work Plan.

Groundwater Monitoring

The proposed modification with regard to groundwater monitoring detailed in the May 21, 2008 letter from O'Brien & Gere is as follows:

> *1. Ground water monitoring will be performed in June 2009; thereafter, once every five years (2014, 2019, etc.). Ground water samples will be obtained from four*

monitoring wells (MW-101C (upgradient well), MW-104B, MW-105B and PSC-112S), and analyzed for VOCs. An environmental monitoring report similar to the current format will be submitted to the agencies. This schedule ensures that ground water monitoring will be performed one year before each five-year review performed by USEPA in accordance with CERCLA § 121(c). (The next five-year review is scheduled for 2010.)

2. If the Performance Standards for benzene and vinyl chloride are attained during a monitoring event, the Group will vary the above-stated schedule, and will conduct monitoring during the following two succeeding years.

3. If the Performance Standards for vinyl chloride and benzene are not attained for three consecutive years, following the non-attainment monitoring event, the Group will next conduct monitoring during the first year that ends with a 4 or a 9. (For example, if the Performance Standards are met in 2009, sampling will occur in 2010 and 2011. If Performance Standards are not met, however, in 2010 or 2011, the next sampling would occur in 2014; thereafter, in accordance with 1. above.)

4. Once the Performance Standards have been achieved for three consecutive years, a round of ground water samples will be obtained from the seven original ground water monitoring wells, and analyzed in accordance with the modified Operation and Maintenance Plan, Environmental Monitoring Work Plan, and Project Operations Plan. This data will be utilized in a risk assessment performed in accordance with section IV.A.1. of the Remedial Design/Remedial Action Statement of Work. In accordance with section X.B.C.2. of the Record of Decision, monitoring can be terminated if the regulatory agencies determine that the remaining contaminants of concern do not present a significant risk to human health and/or the environment.

EPA, after consultation with MassDEP, approves the proposed groundwater monitoring modifications described above in item numbers 1, 2, 3, and 4. These modifications shall take effect following the Performing Settling Defendant's completion of the June 2008 groundwater monitoring event and submission of the Summer 2008 Environmental Monitoring Report. EPA reserves the right to require more frequent monitoring of groundwater and to require monitoring in additional wells and/or for additional contaminants of concern. Nothing in this letter is intended to be, or should be construed as, a waiver of EPA's or the Commonwealth of Massachusetts' authority to take any enforcement or response action authorized by law.

EPA notes that the process outlined in Section IV.A.1 of the SOW and Section X.A of the ROD relates to establishing final cleanup levels for groundwater at the site for the Management of Migration component of the remedy. Performing Settling Defendants are obligated to continue groundwater monitoring as part of the Source Control component of the remedy in compliance with Massachusetts post-closure requirements and in order to permit EPA to conduct reviews at least every five years as required by Section 121(c) of CERCLA.

Please feel free to contact me if you have any questions.

Sincerely,

Don McElroy
Remedial Project Manager

cc: Martha Connell, Parker-Hannifin
Bruce Thompson, de maximis, inc.
Gary Gil-Austern, Nutter, McClennen & Fish
Brent McDonald, Nutter, McClennen & Fish
Susan Scott, EPA
David Bragg, MassDEP
Paul Craffey, MassDEP
Keith Tashima, DOJ
Judy Shanahan, OB&G

Field Observations and Notes

on _____ Date 6/1/10

t / Client PSC Resources 2010

ampling event

Prep equipment ; load rental

PLD MJD leave for site

Pick up N_2 tanks @ Airgas

On site perform cap inspect.

Mob to MW-101C and set up for GW sampling

Begin purging MW-101C

Collect sample @ MW-101C : MS/MSD

Mob to MW-104B, begin Purging

Collect sample @ MW-104B

Offsite

@ Hotel

PLD

Location _____ Date 6/2/10

Project / Client PSC Resources 2010

Sampling Event

0730 Calibrate equipment

YSI ; pH, cond, ORP

LaMotte ; turbidity 1 : 10

PID

0810 leave for site

0830 On site

0910 Mob to PSC-112S

0940 Collect sample PSC-112S

1000 Mob to MW-105B - purging @ 1000

1020 Collect Sample : X-1 @ MW-105B

O'BRIEN & GERE

Low Flow Ground Water Sampling Log

Date	6/1/10	Personnel	PLD, MJD	Weather	70f Overcast
Site Name	PSC Resources	Pump/Controller ID#	Peri Pump	Well #	MW-101C
Site Location	Palmer, MA	Sampling Method	Peri Pump	Project #	44344.001.100

Monitoring Equip. Used (include ID#): PID 110-013597

Well information:

Depth of Well * — ft.

Depth to Water * 8.28 ft.

Length of Water Column — ft.

* Measurements taken from

X	Top of Well Casing
	Top of Protective Casing
	(Other, Specify)

Start Purge Time: 1355

indicate units

Elapsed Time	Depth To Water (ft bmp)	Temperature (Celsius)	pH (SU)	Specific Conductivity (uS/cm)	Eh (mV)	Dissolved Oxygen (mg/l)	Turbidity (NTU)	Flow Rate (ml/min)
0	9.80	9.86	6.52	38	134	8.43	28	~500
5	NM ~~10.54~~	10.54	5.70	42	167	8.07	14	~500
10	NM	10.99	5.61	47	176	7.96	13	~500
15	NM	11.39	5.70	55	176	8.20	22	~500
20	NM	10.46	5.73	59	180	8.70	16	~500
25	NM	10.84	5.69	63	187	8.84	10	~500
30	NM	11.14	5.73	64	187	8.46	10	~500
35	NM	11.38	5.72	64	190	8.04	6	~500

End Purge Time: 1450

PID Reading: 1.1 ppm

Water sample:

Time collected: 1440

Total volume of purged water removed: ~4 gal

Physical appearance at start

Color: Clear

Odor: None

Sheen/Free Product: NA

Physical appearance at sampling

Color: Clear

Odor: None

Sheen/Free Product: NA

Analytical Parameters:

	Container Size	Container Type	# Collected	Field Filtered	Preservative	Lab
	VOC	Glass	3	No	HCL	LSL
MS/MSD	VOC	Glass	6	No	HCl	LSL

Note: WL meter not reading.

O'BRIEN & GERE

Low Flow Ground Water Sampling Log

Date	6/1/10	Personnel	PLD, MJD	Weather	70t Rain
Site Name	PSC Resources	Pump/Controller ID#	Peri Pump	Well #	MW-104B
Site Locatior	Palmer, MA	Sampling Method	Peri Pump	Project #	44344.001.100

Monitoring Equip. Used (include ID#): PID

Well information:

Depth of Well * — ft.

Depth to Water * 6.06 ft.

Length of Water Column — ft.

* Measurements taken from

X	Top of Well Casing
	Top of Protective Casing
	(Other, Specify)

Start Purge Time: 1530

indicate units

Elapsed Time	Depth To Water (ft bmp)	Temperature (Celsius)	pH (SU)	Specific Conductivity (uS/cm)	Eh (mV)	Dissolved Oxygen (mg/l)	Turbidity (NTU)	Flow Rate (ml/min)
0	6.13	11.60	6.74	276	-49	7.18	14.5	~500
5	6.11	12.32	7.04	283	-97	3.49	52	~500
10	6.11	12.01	7.03	261	-101	2.36	59	~500
15	6.09	12.33	7.03	259	-101	1.88	65	~500
20	6.10	12.45	7.04	260	-103	1.60	44	~500
25	6.41	10.60	7.07	254	-106	1.50	59	~500
30	6.42	10.58	7.03	255	-92	1.48	40	~500
35	6.44	10.51	7.08	259	-104	0.82	45	~500
40	6.42	10.52	7.10	260	-110	0.61	47	~500
45	6.98	10.58	7.10	262	-113	0.53	50	~500

End Purge Time: 1620

PID Reading: 0.1 ppm

Water sample:

Time collected: 1615

Total volume of purged water removed: ~4 gal

Physical appearance at start

Color: Clear

Odor: None

Sheen/Free Product: NA

Physical appearance at sampling

Color: Clear

Odor: None

Sheen/Free Product: NA

Analytical Parameters:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Lab
VOC	Glass	3	No	HCL	LSL

O'BRIEN & GERE

Low Flow Ground Water Sampling Log

Date	6/2/10	Personnel	PLD, MJD	Weather	80± Clear
Site Name	PSC Resources	Pump/Controller ID#	Peri Pump	Well #	PSC-1128
Site Locatior	Palmer, MA	Sampling Method	Peri Pump	Project #	44344.001.100

Monitoring Equip. Used (include ID#): PID 110-013597

Well information:

Depth of Well * / ft.

Depth to Water * 4.81 ft.

Length of Water Column / ft.

* Measurements taken from

X	Top of Well Casing
	Top of Protective Casing
	(Other, Specify)

Start Purge Time: 0915

indicate units

Elapsed Time	Depth To Water (ft bmp)	Temperature (Celsius)	pH (SU)	Specific Conductivity (mS/cm)	Eh (mV)	Dissolved Oxygen (mg/l)	Turbidity (NTU)	Flow Rate (ml/min)
0	4.92	10.43	7.34	222	-55	9.81	260	~500
5	4.93	9.74	6.73	227	-37	1.47	320	~500
10	4.96	9.67	6.68	227	-35	0.02	29	~500
15	4.89	9.68	6.66	227	-35	0.00	17	~500
20	4.90	9.73	6.66	227	-36	0.00	14	~500
25	4.91	9.69	6.67	227	-36	0.00	10	500

End Purge Time: 0948

PID Reading: 0.0 ppm

Water sample:

Time collected: 0940

Total volume of purged water removed: ~3 gal

Physical appearance at start

Color: Clear

Odor: Light Sulfur

Sheen/Free Product: NA

Physical appearance at sampling

Color: Clear

Odor: Light Sulfur

Sheen/Free Product: NA

Analytical Parameters:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Lab
VOC	Glass	3	No	HCL	LSL

O'BRIEN & GERE

Low Flow Ground Water Sampling Log

Date	6/2/10	Personnel	PLD, MJD	Weather	80± Clear
Site Name	PSC Resources	Pump/Controller ID#	Peri Pump	Well #	MW-105B
Site Locatior	Palmer, MA	Sampling Method	Peri Pump	Project #	44344.001.100

Monitoring Equip. Used (include ID#): PID 110-013597

Well information:

Depth of Well * / ft.

Depth to Water * 6.11 ft.

Length of Water Column / ft.

* Measurements taken from

X	Top of Well Casing
	Top of Protective Casing
	(Other, Specify)

Start Purge Time: 1000

indicate units

Elapsed Time	Depth To Water (ft bmp)	Temperature (Celsius)	pH (SU)	Specific Conductivity (mS/cm)	Eh (mV)	Dissolved Oxygen (mg/l)	Turbidity (NTU)	Flow Rate (ml/min)
0	6.11	9.71	6.42	207	-4.2	0.00	6	~500
5	6.22	9.47	6.20	202	-4.3	0.00	3	~500
10	6.36	9.61	6.17	206	-6.5	0.00	2	~500
15	6.20	9.48	6.11	209	-5.1	0.00	2	~500
20	6.23	9.50	6.04	213	-3.1	0.00	2.5	~500

End Purge Time: 1030

PID Reading: 0.5 ppm

Water sample:

Time collected: 1020

Total volume of purged water removed: ~4 gal

Physical appearance at start

Color: Clear

Odor: Light Sulfur

Sheen/Free Product: NA

Physical appearance at sampling

Color: Clear

Odor: Light Sulfur

Sheen/Free Product: NA

Analytical Parameters:

Container Size	Container Type	# Collected	Field Filtered	Preservative	Lab
VOC	Glass	3	No	HCL	LSL
VOC	Glass	3	No	HCl	LSL

X-1

Life Science Laboratories, Inc.
Central Lab

5854 Butternut Drive
East Syracuse, New York 13057
(315) 445-1105

Chain of Custody

Client: O'Brien & Gere

Project: PSC Resources

Sampled by: Paul D'Annibale Matt Dupay

Client Contact: Judy Bank Phone # 315-437-6100

Sample Description

Sample Location	Date Collected	Time Collected	Sample Matrix	Comp. or Grab	No. of Containers	Analysis/Method: VOCs by 8260							Comments
MW-101C-060110	6/1/10	1440	GW	G	3	X							
MW-104B-060110	6/1/10	1615	↓	↓	3	X							
PSC-112S-060210	6/2/10	0940	↓	↓	3	X							
MW-105B-060210	6/2/10	1020	↓	↓	3	X							
MW-101C-060110 MS/MSD	6/1/10	1440	↓	↓	6	X							
X-1-060210 (MW-105B)	6/2/10	—	↓	↓	3	X							
Trip Blank	—	—	—	—	2	X							

Relinquished by:		Date:	Time:	Received by:	Date:	Time:
Relinquished by:	Paul D'Annibale of OBG	Date: 6/2/10	Time: 1500	Received by: Fed Ex	Date: 6/2/10	Time: 1500
Relinquished by:		Date:	Time:	Received by Lab:	Date:	Time:
Shipment Method:	Fed Ex			Airbill Number:		

Turnaround Time Required:
Routine 20 BD
Rush _____

Comments:

Cooler Temperature: _____

Original - Laboratory
Copy - Client

Validation Report for Summer 2010 Environmental Monitoring Event

REPORT

DRAFT DATA VALIDATION REPORT FOR SUMMER 2010 ENVIRONMENTAL MONITORING EVENT

PSC Resources Superfund
Palmer, MA

October 2010

O'BRIEN & GERE
www.obg.com

5819 | 44344

Draft Data Validation Report for Summer 2010 Environmental Monitoring Report

Palmer, Massachusetts

Prepared for:
PSC Resources Superfund

JAMES R. HECKATHORNE, P.E., VP
O'Brien & Gere Engineers, Inc.

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1 INTRODUCTION

Data validation was performed for the groundwater samples collected from the PSC Resources Superfund Site in Palmer, Massachusetts. The samples were collected on June 1, 2010 by O'Brien & Gere Engineers, Inc. Groundwater samples were analyzed by Life Science Laboratories, Inc. for selected volatile organic compounds (VOCs) in accordance with Section 9 of the Quality Assurance Project Plan (QAPP), presented as Appendix 5-2 of the approved modified *Operation and Maintenance Plan, Environmental Monitoring Work Plan and Project Operations Plan* (O'Brien & Gere Engineers, June 1998).

1.1 GENERAL CONSIDERATIONS

Validation is a process of determining the suitability of a measurement system for providing useful analytical data. Although the term is frequently used in discussing analytical methods, it applies to all aspects of the process and especially to the samples, their measurement, and the actual data generated. Accordingly, this report outlines excursions from the applicable quality control outlined in the following documents:

- Operation and Maintenance Plan, Environmental Monitoring Work Plan and Project Operations Plan as amended by correspondence dated 1/31/01 and 6/12/01, Appendix 5-2: Quality Assurance Project Plan (QAPP), (O'Brien & Gere Engineers, June 1998).
- Test Methods for Evaluating Solid Wastes: Physical and Chemical Methods, SW-846, Final Update III, (USEPA, December 1996).
- Region I USEPA-New England (NE) Data Validation Functional Guidelines for Evaluating Environmental Analyses, Part II, Volatile/Semivolatile Data Validation Functional Guidelines (USEPA Region I, December 1996).
- USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A), 540/1-89/002 (USEPA, revised 1992).

The following sections of this document address distinct aspects of the validation process. Section 2 lists the analytical methodology employed in sample analysis. Section 3 lists the data quality assurance/quality control (QA/QC) protocols used to validate the sample data. Specific QA/QC excursions and qualifications performed on the sample data are discussed in Section 4. Data usability with respect to the intended purposes of the data is discussed in Section 5.

2 ANALYTICAL METHODS

Groundwater samples were analyzed by Life Science Laboratories, Inc. for selected VOCs by USEPA Method 8260B (Test Methods for Evaluating Solid Wastes: Physical and Chemical Methods, SW-846, Final Update III. USEPA, December 1996). VOC target compounds analyzed included: 1,1,1-Trichloroethane, 1,1-Dichloroethane, 2-Butanone, Acetone, Benzene, Methylene chloride, Tetrachloroethene, Trichloroethene, Vinyl chloride, cis-1,2-Dichloroethene, and trans-1,2-Dichloroethene.

Analytical results for these analyses are presented in the tables presented in the Draft Summer 2010 Environmental Monitoring Report. The letters found immediately to the right of individual sample results serve to qualify the sample data. When the data validation process identified more than one quality control deficiency, the qualifier added to the sample result represents the cumulative effect of the individual QC excursions. Consistent with the listed guidance document, the following qualifiers may be used during the data validation:

U Indicates that the compound was analyzed for, but was not detected. The practical quantitation limit (PQL) is presented and adjusted for dilution. This qualifier is also used when the quantitation limit is raised due to presence of blank contamination.

J Indicates that the detected sample result should be considered approximate. This qualifier is used when the data validation process identifies a deficiency in the data generation process. Additionally, this qualifier is used when analytes or compounds are detected at concentrations above the method

detection limit (MDL) but below the laboratory practical quantitation limit (PQL). Results below the PQL should be considered approximate since method accuracy and precision are not defined for these concentration levels.

UJ Indicates that the detection limit for the analyte in this sample should be considered approximate. This qualifier is used when the data validation process identifies a deficiency in the data generation process.

R Indicates that the previously reported detection limit or sample result was rejected due to a major deficiency in the data generation procedure. The data should not be used for qualitative or quantitative purposes.

3. DATA VALIDATION PROTOCOLS

Quality control data were evaluated based on accuracy and precision criteria specified in Table 3A of the QAPP. The following are method specific QA/QC parameters used in the validation of sample data generated for this investigation:

Volatile Analyses

- Holding times and sample preservation
- GC/MS tuning criteria
- Initial and continuing calibration
- Blank analysis
- Surrogate recovery
- Internal standard performance
- Matrix spike/matrix spike duplicate (MS/MSD) analysis
- Field duplicate analysis
- Laboratory control sample (LCS) analysis
- System performance
- Target compound identification, quantitation, and reporting limits
- Documentation completeness
- Overall data assessment

In accordance with the QAPP, laboratory control limits were used to assess MS/MSD, LCS, surrogate, and field duplicate data. Based on guidance provided in EPA Region I's validation guidelines (USEPA Region I, December 1996), analytical data were qualified in the following manner when laboratory control limits were not met:

- If percent recoveries were less than laboratory control limits but greater than ten percent, non-detected and detected results were approximated (UJ, J).
- If percent recoveries were greater than laboratory control limits detected results were approximated (J).
- If percent recoveries were less than ten percent, detected results were approximated (J) and non-detected results were rejected (R).
- If relative percent differences (RPDs) for MSDs, laboratory duplicates, and field duplicates were outside of laboratory control limits or the duplicate limits specified in the POP, detected results greater than the PQL were approximated.

It should be noted that qualification of data for MS/MSD analyses was performed only when both MS and MSD percent recoveries were outside of laboratory control limits. Qualification of data was not performed if MS/MSD or surrogate recoveries were outside of laboratory control limits due to sample dilution.

4 DATA QUALITY EVALUATION

This section summarizes the QA/QC parameters which met validation criteria and describes qualifications performed on sample data when QA/QC criteria were not met. Samples that required qualification are identified in the following sections by the sample location documented on the field chain-of-custody record.

Field duplicate (BD), MS/MSD, equipment blank (EQBLK), and trip blanks (TB) were collected at the frequency specified in Section 4.3 of the QAPP. Table 4-1 is a summary of environmental and QC samples collected.

Table 4-1 Field QC Sample Collection

Environ-mental Samples	Date Collected	Analyses Performed	Field Duplicate ID	MS/MSD ID	Field Blanks
Ground-water	6/1/2010	Selected VOC	X-1-060210=MW-105B-060210	MW-101C-060110	Trip Blank

Source: O'Brien & Gere

4.1 VOLATILE ANALYSES

The following QA/QC parameters met validation criteria or did not result in qualification of data:

- Holding times and sample preservation
- GC/MS tuning criteria
- Initial and continuing calibration
- Surrogate recovery
- Internal standard performance
- MS/MSD analysis
- Field duplicate analysis
- LCS analysis
- System performance
- Target compound identification, quantitation, and reporting limits
- Documentation completeness
- Overall data assessment

Blank analysis. Acetone was detected at 1.09 ug/L in the trip blank. The detected result for acetone in sample MW-104B-060110 was replaced with the laboratory reporting limit and qualified as not detected (U) since the concentration was less than both the laboratory reporting limit and trip blank concentration.

Overall data assessment. The laboratory performed volatile organic analyses and QA/QC procedures in accordance with the QAPP. Volatile data are useable for qualitative and quantitative purposes. The detected result for acetone was replaced with the laboratory reporting limit and qualified as not detected in one sample based on the concentration for this compound in the trip blank. Results that were detected at concentrations

above MDLs but below PQLs were approximated (J) in the samples, since method accuracy and precision data are not defined below the PQL.

5. DATA USABILITY

Analytical data were validated for samples collected from the PSC Resources Superfund Site in Palmer, Massachusetts based on accuracy and precision criteria specified in the QAPP. When excursions were observed from QA/QC requirements, the analytical data were qualified based on guidance provided in the USEPA Region I validation guidelines (USEPA Region I, December 1996).

Minor deficiencies in the data generation process which would result in approximation of sample data were not observed. Detected samples results greater than laboratory MDL but less than the reporting limit (RL) were qualified as approximate. Approximation of a data point indicates uncertainty in the reported concentration of the analyte, but not its assigned identity. The conservative assumptions used in the development of conclusions based on the analytical data verify that approximated analytical data adheres to the project data quality objectives. This approach to the use of analytical data is consistent with the guidance presented in the *USEPA Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A), 540/1-89/002* (USEPA, December 1992).

This section summarizes the adherence of the analytical data to the data quality objectives (DQOs) established in the QAPP for precision, accuracy, representativeness, comparability, completeness, and sensitivity. A detailed discussion of the analytes and samples which were qualified is presented in Section 4. Summary tables of validated sample results with data validation qualifiers have been provided in the Draft Summer 2010 Environmental Monitoring Report.

Data quality objectives were evaluated using percent usability defined as the percentage of sample results that are usable for qualitative and quantitative purposes.

Precision was assessed from laboratory duplicate and field duplicate analyses. Data usability with respect to precision was calculated as 100%.

Accuracy was assessed from GC/MS tuning, calibration, surrogate recovery, internal standard performance, interference check sample analysis, MS/MSD, and LCS data. Data usability with respect to accuracy was calculated as 100%.

Representativeness was assessed from holding times, sample preservation, blank analysis, target compound identification and quantitation, sampling and analytical methodologies used. Data usability with respect to representativeness was 100%. The detected results for acetone in sample MW-104B-060110 was replaced with the laboratory reporting limit and qualified as not detected (U) based on concentration observed in the trip blank.

Comparability is a qualitative measure; therefore, usability calculations were not performed. Comparability requirements were met since standard analytical methods, reporting units, reference materials, and data deliverables were utilized by the laboratory.

Sensitivity requirements were met. Detected results reported at concentrations less than the PQL were approximated since method accuracy and precision data are not defined below the PQL.

Data completeness was calculated as 100%, exceeding the 95% requirement established in the QAPP.