

# COKE OVEN AREA INTERIM MEASURES PROGRESS REPORT

(December 2012)

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*Prepared for*

Sparrows Point, LLC



January 31, 2013



**ENVIRONMENTAL  
ENGINEERING & CONTRACTING, INC.**  
200 Harry S. Truman Parkway, Suite 300  
Annapolis, MD 21401 | 401 | 263-2234

# Coke Oven Area Interim Remedial Measures Progress Report

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## Introduction

In accordance with the United States Environmental Protection Agency's (US EPA)'s September 2, 2010 letter, this document is the monthly progress report for December 2012 for the US EPA approved interim measures (IMs) that have been developed to address identified environmental conditions at the Coke Oven Area (COA) Special Study Area at the Sparrows Point LLC facility located in Sparrows Point, Maryland. This progress report summarizes IM progress for December 2012.

The following designations are applied in this document to the operating IM "Cells" (**Figure 1**) at the COA:

- Cell 1: Prototype Air Sparge/Soil Vapor Extraction (AS/SVE) System in the Former Benzol Processing Area,
- Cell 3: AS/SVE System in "Cove" Area,
- Cell 4: In-Situ Anaerobic Bio-treatment Area,
- Cell 6: Light Non-Aqueous Phase Liquid (LNAPL) Recovery at the Former Benzol Processing Area.

As of December 2012, Cells 1, 3, 4 and 6 continue to be operational. Soil gas sampling to assess current conditions was performed during December 2012. The results of these sampling events including trending graphs from IM startup are detailed in this report.

# Coke Oven Area Interim Remedial Measures Progress Report

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## Cell 1: Prototype AS/SVE System in the Former Benzol Processing Area

Cell 1 consists of a prototype IM, which includes AS/SVE coupled with vapor destruction via an electric catalytic oxidation (CATOX) unit. **Figure 2** shows the system layout of Cell 1 and locations of the major design components including the air sparging wells and vapor collection trenches.

### December 2012 Operational Performance

Operational performance of Cell 1 during this reporting period is summarized in **Table 1**. In summary, the CATOX unit operated for 741.6 hours (99.7 %) during this reporting period. Operations were in conformance with the manufacturer's specifications at all times that soil gases were collected in accordance with the May 20, 2011 modified permit-to-construct conditions.

The hydrocarbon removal rate was calculated to be approximately 0.001 pounds per operating hour (estimated monthly total of 0.8 pounds). **Table 1** also includes a cumulative summary of operational performance since system startup on August 3, 2010. In total, Cell 1 has destroyed approximately 9,579 pounds of recovered hydrocarbons. **Figure 3** presents a graph of the cumulative estimated monthly hydrocarbon recovery in Cell 1 since the startup of the IM system.

Soil gas samples were collected for laboratory analysis to monitor CATOX unit performance. One (1) untreated soil gas sample was collected in a Tedlar® bag and submitted to TestAmerica Laboratories, Inc. in Knoxville, Tennessee (TestAmerica) for analysis by US EPA Method TO-15. The influent soil gas hydrocarbon concentration collected on December 31, 2012 was less than one (1) part per million by volume (ppmv).

Hydrocarbon removal calculations were based entirely on the analytical results and the average daily field-measured influent flow rates. The mass removal calculations assume that the sample collected on December 31, 2012 is representative of hydrocarbon concentrations for the entire

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month of December. This assumption is based on the fact that the same air sparge wells (AS-1 thru AS-8) and extraction wells (V-1 thru V-6) were online when the system was operational.

A loose fitting for the influent SVE piping was identified during a field operation and maintenance inspection in January. This loose fitting has been determined to be the reason for the significant decrease in hydrocarbon concentration in the soil gas sample collected on December 31, 2012 from previous results. The fitting has been repaired.

Soil gas concentrations recovered from this treatment area have decreased in recent months notwithstanding the loose fitting that has been repaired. Modified operating practices, including pulsing the system, will be implemented in future operating months to determine if improvements can be made in operating protocol to increase recovery of hydrocarbons from the subsurface. This effort will also evaluate the system for possible concentration rebounding.

## December 2012 Groundwater Monitoring Results

Groundwater sampling will be conducted on a quarterly basis to monitor ongoing operations. The next scheduled event is February 2013. The data from the groundwater monitoring for Cell 1 is shown in **Figure 4**.

## Cell 3: AS/SVE System in the “Cove” Area

Cell 3 consists of an AS/SVE system coupled with vapor destruction via an electric CATOX unit. **Figure 1** shows the location of the Cell 3 AS/SVE treatment area at the COA. The major design components are described in the Cell 3 final design report (*Coke Oven Area Interim Measures Cell 3 “Cove” Area Air Sparge/Soil Vapor Extraction System Design*), submitted to US EPA on March 1, 2011.

## December 2012 Operational Performance

Operational performance of Cell 3 during this reporting period is summarized in **Table 2**. In summary, the CATOX unit operated for 744 hours (100 %) during December. Operations were in conformance with the manufacturer’s specifications at all times that soil gases were collected in accordance with the May 20, 2011 modified permit-to-construct conditions.

## Coke Oven Area Interim Remedial Measures Progress Report

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The hydrocarbon removal rate was calculated to be approximately 0.02 pounds per operating hour (estimated monthly total of 14.9 pounds). **Table 2** also includes a cumulative summary of operational performance since system startup on June 24, 2011. In total, Cell 3 has destroyed approximately 623 pounds of recovered hydrocarbons. **Figure 3** presents a graph of the cumulative estimated monthly hydrocarbon recovery in Cell 3 since the startup of the IM system.

Soil gas samples were collected for laboratory and/or field instrument (e.g., PID) analysis to monitor CATOX unit performance. One (1) untreated soil gas sample was collected in a Tedlar® bag and submitted to TestAmerica. The influent soil gas hydrocarbon concentration collected on December 31, 2012 was 3.5 ppmv.

Hydrocarbon removal calculations were based entirely on the analytical results and the average daily field-measured influent flow rates. The mass removal calculations assume that the sample collected on December 31, 2012 is representative of hydrocarbon concentrations for the entire month of December. This assumption is based on the fact that the same air sparge wells (AS-2 thru AS-12) and extraction wells (V-2 thru V-4) were online when the system was operational.

Soil gas concentrations recovered from this treatment area have also decreased in recent months. Modified operating practices similar to Cell 1, including pulsing the system, will be implemented in future operating months to determine if improvements can be made in operating protocol to increase recovery of hydrocarbons from the subsurface. This effort will also evaluate the system for possible concentration rebounding.

### December 2012 Cell 3 Groundwater Monitoring

Groundwater sampling will be conducted on a quarterly basis to monitor ongoing operations. The next scheduled event is February 2013. The data from the groundwater monitoring for Cell 3 is shown in **Figure 5**.

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## Cell 4: In-Situ Anaerobic Bio-treatment Area

Cell 4 consists of an in-situ anaerobic bio-treatment system including extraction and mixing of groundwater in an above ground storage tank containing a nutrient amendment solution and reinjection of groundwater. A schematic layout of the Cell 4 system is shown on **Figure 6**. The major design components are described in the Cell 4 final design report (*Coke Oven Area Interim Measures Cell 4 In-Situ Anaerobic Bio-Treatment System Design*), submitted to US EPA on March 31, 2011.

### December 2012 Operations

A review of historical data and hydrocarbon removal effectiveness is currently underway for this interim measure system. Findings and operational plan for ongoing operation will be presented in the January 2013 Progress Report.

### December 2012 Groundwater Monitoring Results

Groundwater sampling will be conducted on a quarterly basis to monitor ongoing operations. The next scheduled event is February 2013. The data from the groundwater monitoring for Cell 4 is shown in Figure 8.

## Cell 6: LNAPL Extraction at the Former Benzol Processing Area

The Cell 6 LNAPL monitoring and recovery system was monitored weekly during December 2012). **Table 3** summarizes LNAPL occurrence and recovery observed during the reporting period, the start date of extraction from recovery wells and cumulative LNAPL recovered since the beginning of the interim measure. **Figure 9** illustrates the well locations. An estimated 212 gallons (1,554 pounds) of LNAPL were recovered during December, bringing the total recovered LNAPL to 8,375 gallons (61,360 pounds) as of December 31, 2012. **Figure 3** presents a graph of the cumulative estimated monthly hydrocarbon recovery in Cell 6 since the startup of the IM system.

# Coke Oven Area Interim Remedial Measures Progress Report

The LNAPL was recovered from the following wells:

Well	LNAPL Recovery (gal/lbs)		Notes
	During December 2012	Total thru December 31, 2012	
BP-MW-05	152/1,114	6,630/48,577	c
RW-04	30/220	1,046/7,666	c
BP-MW-08	30/220	670/4,903	c
BP-MW-11	0/0	8/57	a
RW-03	0/0	19/141	d
RW-01	0/0	1/10	b
RW-02	0/0	0.8/5.9	b

(a) Recovery system moved from BP-MW-11 to BP-MW-08 on September 8, 2010

(b) Manual bailing

(c) Cumulative totals included estimated recovery from 12/28/11 to 1/18/12 as well as 5/24 to 6/22/12

(d) Began pumping RW-03 with a skimmer pump on August 6, 2012

The wells are presented in **Table 4**. LNAPL thicknesses during the reporting period are summarized below (wells are not listed if LNAPL was not present):

- RW-04 (1.86 ft),
- BP-MW-05 (0.92 ft),
- BP-MW-08 (0.85 ft),
- BP-MW-11 (0.68 ft),
- BP-MW-10 (0.18 ft),
- RW-02 (0.16 ft),
- RW-03 (0.46 ft)
- RW-01 (0.06 ft), and
- BP-MW-07 (0.26 ft).

## Coke Oven Area Interim Remedial Measures Progress Report

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No LNAPL was observed in wells RW-05, BP-MW-06, BP-MW-09, or CO19-PZM004. For all wells in which LNAPL accumulated, **Table 4** provides well-specific details concerning the measured depths to LNAPL, the water table, and calculated LNAPL thicknesses.



# TABLES

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**Table 1**

**Summary of Operation Conditions  
 Cell 1: Prototype AS/SVE System for Former Benzol Processing Area  
 Former Coke Oven Area Interim Remedial Measures  
 Sparrows Point, LLC**

**Cell 1 December 2012 Estimated Hydrocarbon Recovery**

Parameter	Units	Quantity
Total CATOX Operating Time (December 1 - December 31, 2012)	hours	741.6
Overall CATOX Operational Time	%	99.7%
Estimated Total Hydrocarbons Destroyed	pounds	0.8
Estimated Hydrocarbon Removal Rate	pounds/hour	0.001

**Cell 1 Cumulative Summary of Estimated Hydrocarbon Recovery**

Parameter	Units	Quantity
Total ICE/CATOX Operating Time (August 3, 2010 - December 31, 2012)	hours	17,255
Overall CATOX Operational Time	%	75.1%
Estimated Total Hydrocarbons Destroyed	pounds	9,579
Estimated Hydrocarbon Removal Rate	pounds/hour	0.6

**Table 2**  
**Summary of Operation Conditions**  
**Cell 3: AS/SVE System in the "Cove" Area**  
**Former Coke Oven Area Interim Remedial Measures**  
**Sparrows Point, LLC**

**Cell 3 December 2012 Estimated Hydrocarbon Recovery**

Parameter	Units	Quantity
Total CATOX Operating Time (December 1 - December 31, 2012)	hours	744
Overall CATOX Operational Time	%	100.0%
Estimated Total Hydrocarbons Destroyed	pounds	14.9
Estimated Hydrocarbon Removal Rate	pounds/hour	0.02

**Cell 3 Cumulative Summary of Estimated Hydrocarbon Recovery**

Parameter	Units	Quantity
Total ICE/CATOX Operating Time (August 3, 2010 - December 31, 2012)	hours	11,976
Overall CATOX Operational Time	%	86.0%
Estimated Total Hydrocarbons Destroyed	pounds	623.4
Estimated Hydrocarbon Removal Rate	pounds/hour	0.05

Table 3

**LNAPL Occurrence and Recovery**  
**Cell 6: LNAPL Recovery System in Former Benzol Processing Area**  
**Former Coke Oven Area Interim Remedial Measures**  
**Sparrows Point, LLC**

Well	LNAPL Occurrence During December 2012 (ft)	Total LNAPL Recovery Period		Cumulative Total LNAPL Recovered		Estimate LNAPL Recovered During December 2012	
		Begin	End	(gal)	(lbs) (a)	(gal)	(lbs) (a)
RW-04	1.86	23-Jul-10	On-going (b)	1,046	7,666	30	220
BP-MW-05	0.92	28-Jan-10	On-going (b)	6,630	48,577	152	1,114
BP-MW-08	0.85	8-Sep-10	On-going (b)	670	4,903	30	220
BP-MW-11	0.68	23-Jul-10	9/8/2010	7.8	57	0	0
RW-02	0.16	28-Jan-11	On-going (c)	0.8	5.9	0	0
RW-03	0.46	24-Nov-10	On-going (c)	19.3	141	0	0
RW-01	0.06	28-Oct-11	On-going (c)	1.3	10	0	0
BP-MW-10	0.18	na	na	0	0	0	0
BP-MW-07	0.68	na	na	0	0	0	0
BP-MW-06	none	na	na	0	0	0	0
RW-05	none	na	na	0	0	0	0
BP-MW-09	none	na	na	0	0	0	0
CO19-PZM004	none	na	na	0	0	0	0
<b>Total Recovery:</b>				<b>8,375</b>	<b>61,360</b>	<b>212</b>	<b>1,554</b>

**Notes:**

- (a) Weight is calculated based on average BP-MW-05 and BP-MW-08 oil density of 0.878 grams per cubic centimeter, measured by EA (2009) by ASTM Method D1481  
(b) Skimmer  
(c) Bailing  
(d) Cumulative recovery volumes are calculated using an estimated recovery from 12/28/11 to 1/18/12 as well as 5/24/12 to 6/22/12.

Table 4  
 Depths (feet) to Water and LNAPL  
 Cell 6: LNAPL Recovery System in Former Benzol Processing Area  
 Former Coke Oven Area Interim Remedial Measures  
 Sparrows Point, LLC





Date	RW-01			RW-02			RW-03		
	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness
12/31/2012	10.59	10.65	0.06	10.29	10.45	0.16	8.64	9.1	0.46
Date	RW-04			BP-MW-05			BP-MW-07		
	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness
12/31/2012	9.6	11.46	1.86	11.1	12.02	0.92	10.23	10.49	0.26
Date	BP-MW-08			BP-MW-10			BP-MW-11		
	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness
12/31/2012	12.06	12.91	0.85	8.95	9.13	0.18	11.03	11.71	0.68

All measurement are presented in feet

# FIGURES

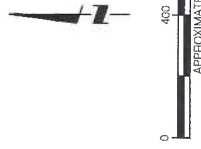
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**LEGEND**

-  New Monitoring Well
-  Existing Monitoring Well
-  AS/SVE Treatment Area
-  Special Study Area

**INTERIM MEASURES TREATMENT CELLS**

- "Cell 1": Prototype AS/SVE System in Benzol Area
- "Cell 2": AS/SVE and Dual Phase GW Treatment/Injection System in the Former Coal Storage Area
- "Cell 3": AS/SVE System in the "Core" Area
- "Cell 4": In-Situ Anaerobic Bio-treatment System in the Coal Tar Area
- "Cell 5": Groundwater Extraction/Treatment/Injection at the Turning Basin Area
- "Cell 6": LNAPL Recovery at the Former Benzol Processing Area



Project  
Sparrows Point, LLC  
Baltimore, Maryland

**INTERIM MEASURES TREATMENT AREAS**

Project Number	E-2439-01
File Number	E2439-2012-12-01
Date	January 30, 2013
Figure	1
REVISION	MZ DB SS

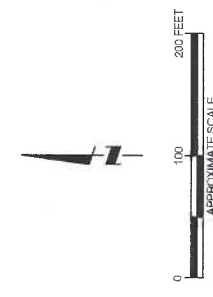


Image source: World Imagery, ESRI, GeoEye, 2009

1:250 CAD (REV1) Sparrows Point Remediation Project (Revised) (Drawing) 2/23/2012 12:01:01 (2/23/2012)

**LEGEND**

- V-1 TRENCH VAPOR EXTRACTION RISER
- EXT-1 SVE PILOT TEST EXTRACTION WELL
- OBS-1 SVE PILOT TEST OBSERVATION WELL
- 0018-PZM006 EXISTING MONITORING WELL
- AS-2 AIR SPARGE WELL
- VAPOR COLLECTION TRENCHES
- - - FORMER STRUCTURES (DEMOLISHED)



Project  
Sparrows Point, LLC  
Baltimore, Maryland

**AS-BUILT LAYOUT PLAN CELL  
1 FORMER BENZOL  
PROCESSING AREA**

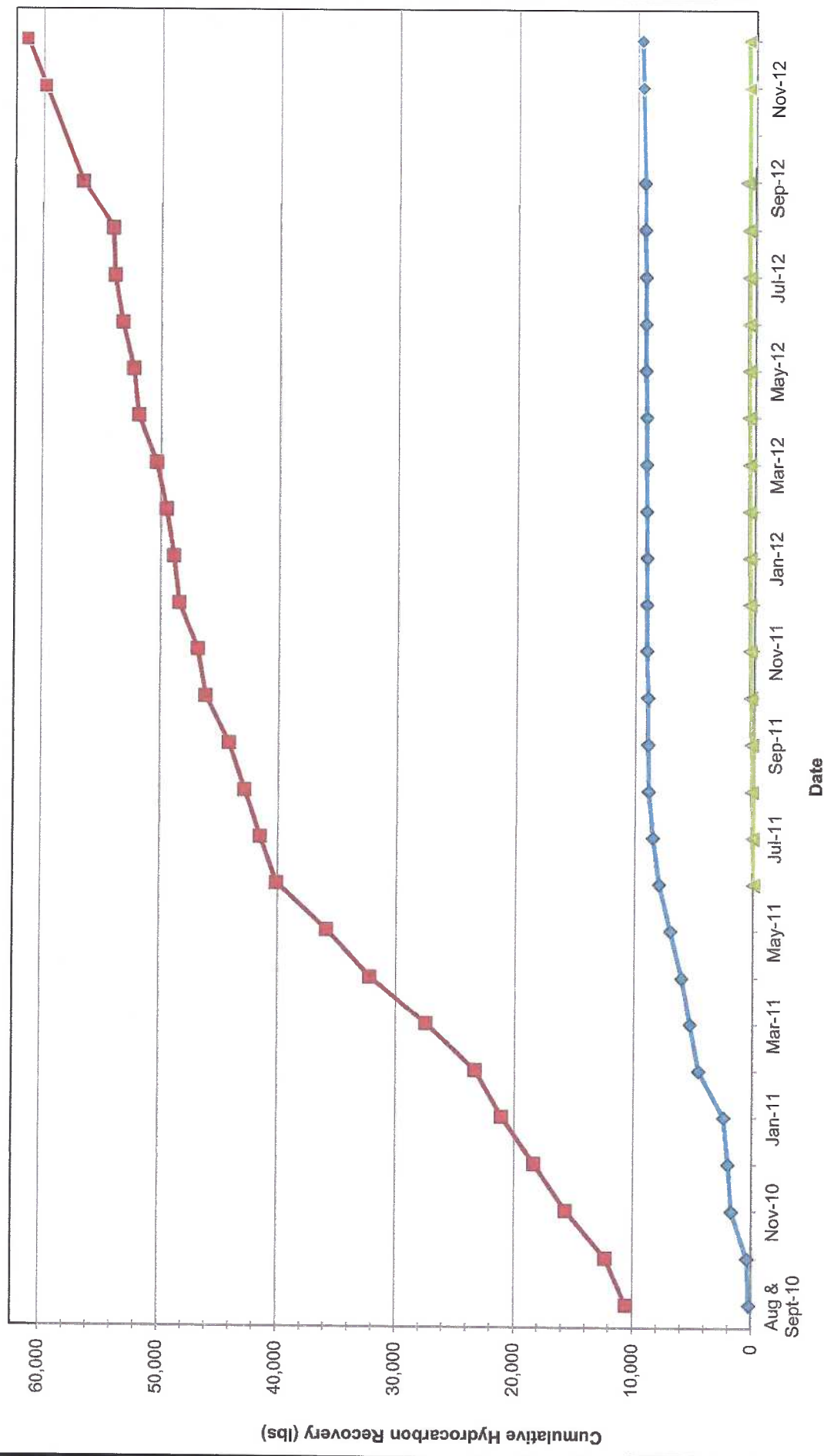
Project Number E-2439.01  
File Number E2439-2012-12-02

Date	January 30, 2013	Figure	2
PEPG	MZ	DB	SS



1. ERI CAD DRAFT SparrowsPoint.kwd Project Location: Sparrows Point, Baltimore, MD 21144 Date: 01/30/2013





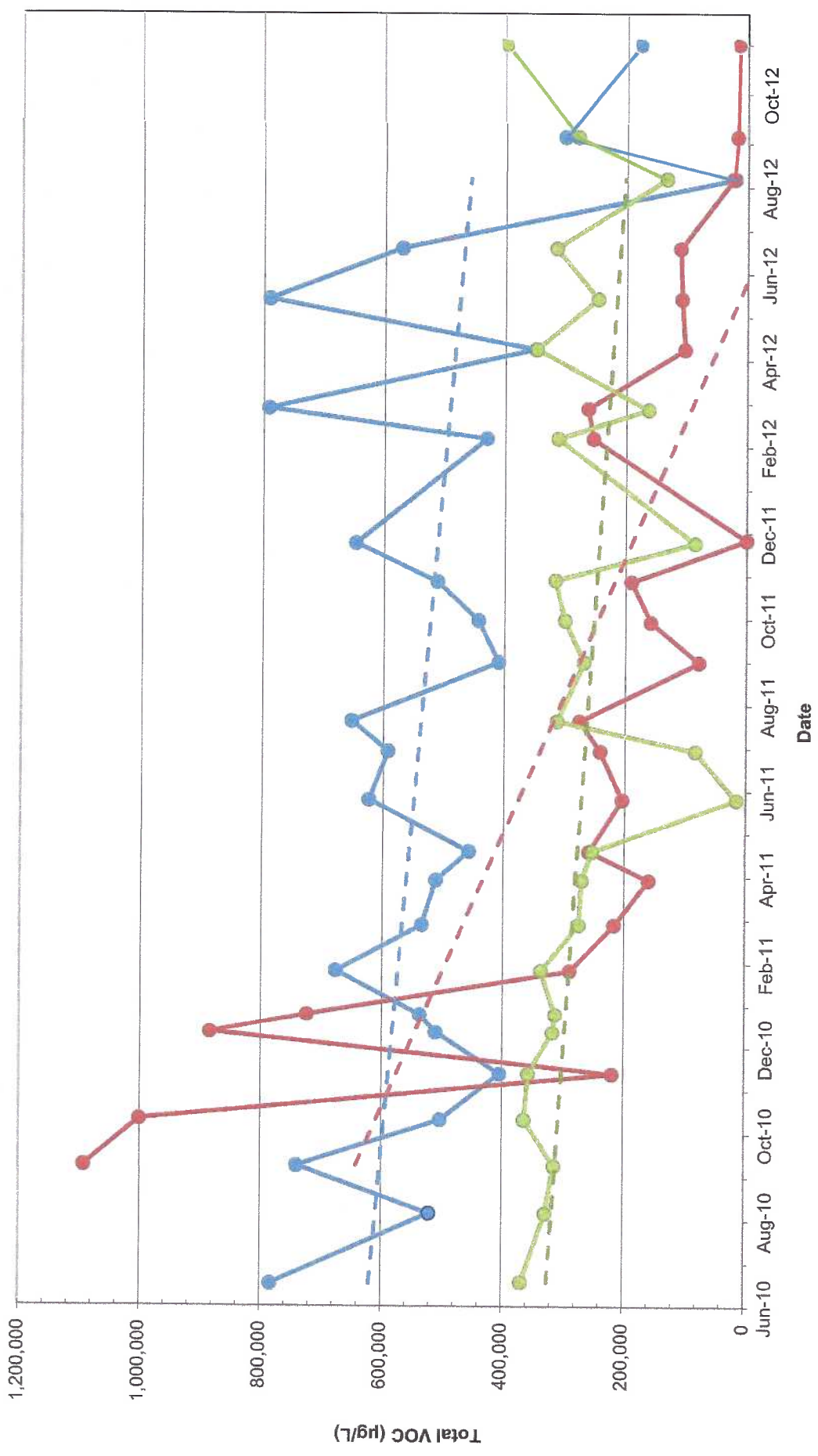
**CUMULATIVE SUMMARY OF ESTIMATED HYDROCARBON RECOVERY**  
 Sparrows Point, LLC  
 Baltimore, Maryland  
 Project Number: E-2439.01  
 Project Manager: DB  
 File: E2439-2012-12-03  
 Figure: **3**

**Cumulative Summary of Estimated Hydrocarbon Recovery**  
 Former Coke Oven Area Interim Remedial Measures  
 Sparrows Point, LLC

Legend:  
 Cell 1 (Red Square)  
 Cell 6 (Blue Diamond)  
 Cell 3 (Green Triangle)

ENVIRONMENTAL ENGINEERING & CONTRACTING, INC.

Date: January 30, 2013  
 Drafter: SS



**MEASURED GROUNDWATER VOC CONCENTRATION BY MONTH**  
 Sparrows Point, LLC  
 Baltimore, Maryland

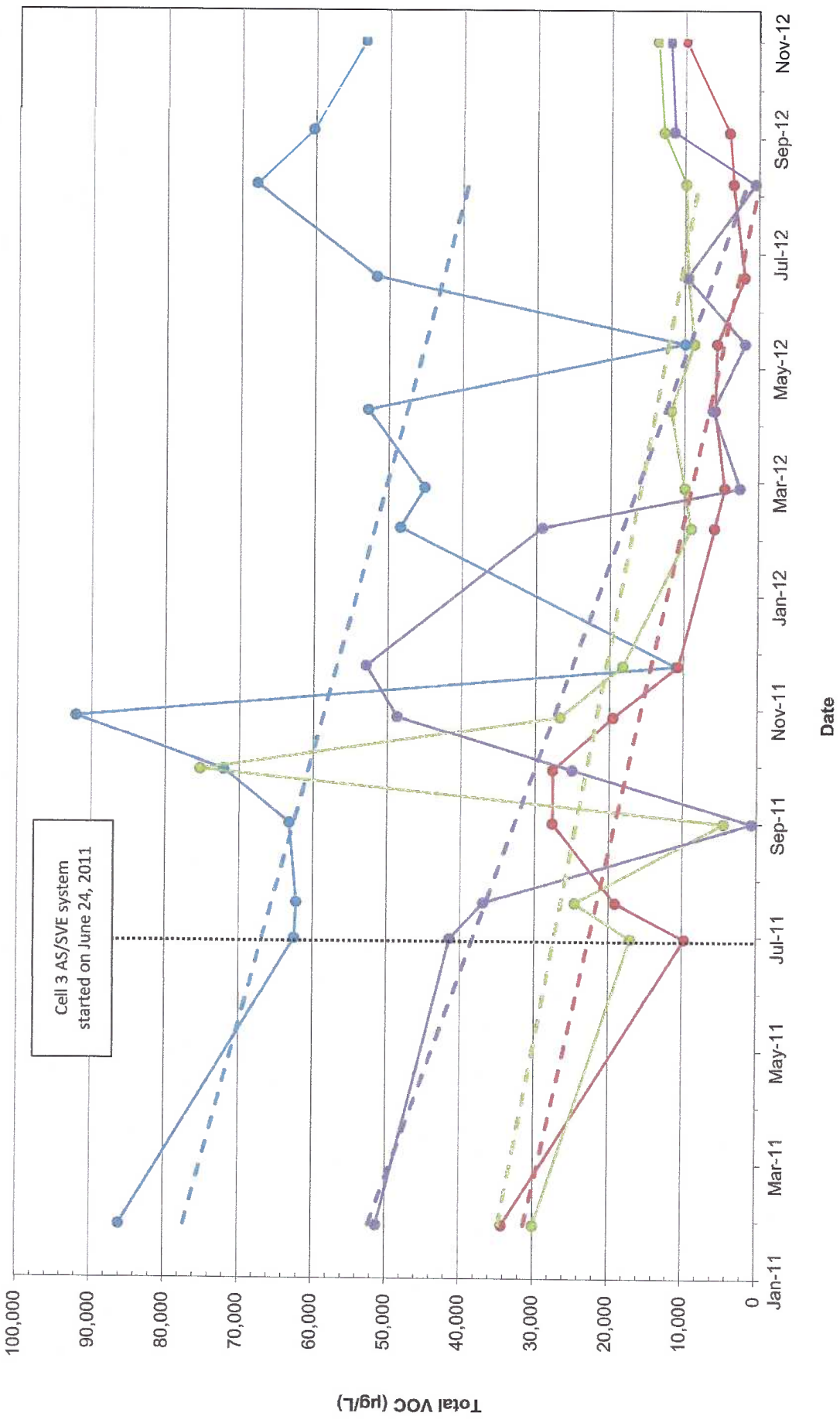
PE/PG	MZ	Project Number	E-2439.01
Project Manager	DB	File	E2439-2012-12-04

Figure **4**

**Measured Groundwater VOC Concentration by Month**  
 Cell 1: Prototype AS/SVE System in the "Cove" Area  
 Sparrows Point, LLC

CO02-PZM006	CO18-PZM006	BP-MW-09
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Date: January 30, 2013  
 Drafter: SS



**MEASURED GROUNDWATER VOC CONCENTRATION BY MONTH**  
 Sparrows Point, LLC  
 Baltimore, Maryland  
 PER/G: MZ  
 Project Number: E-2439.01  
 Project Manager: DB  
 File: E2439-2012-12-05  
 Figure: **5**

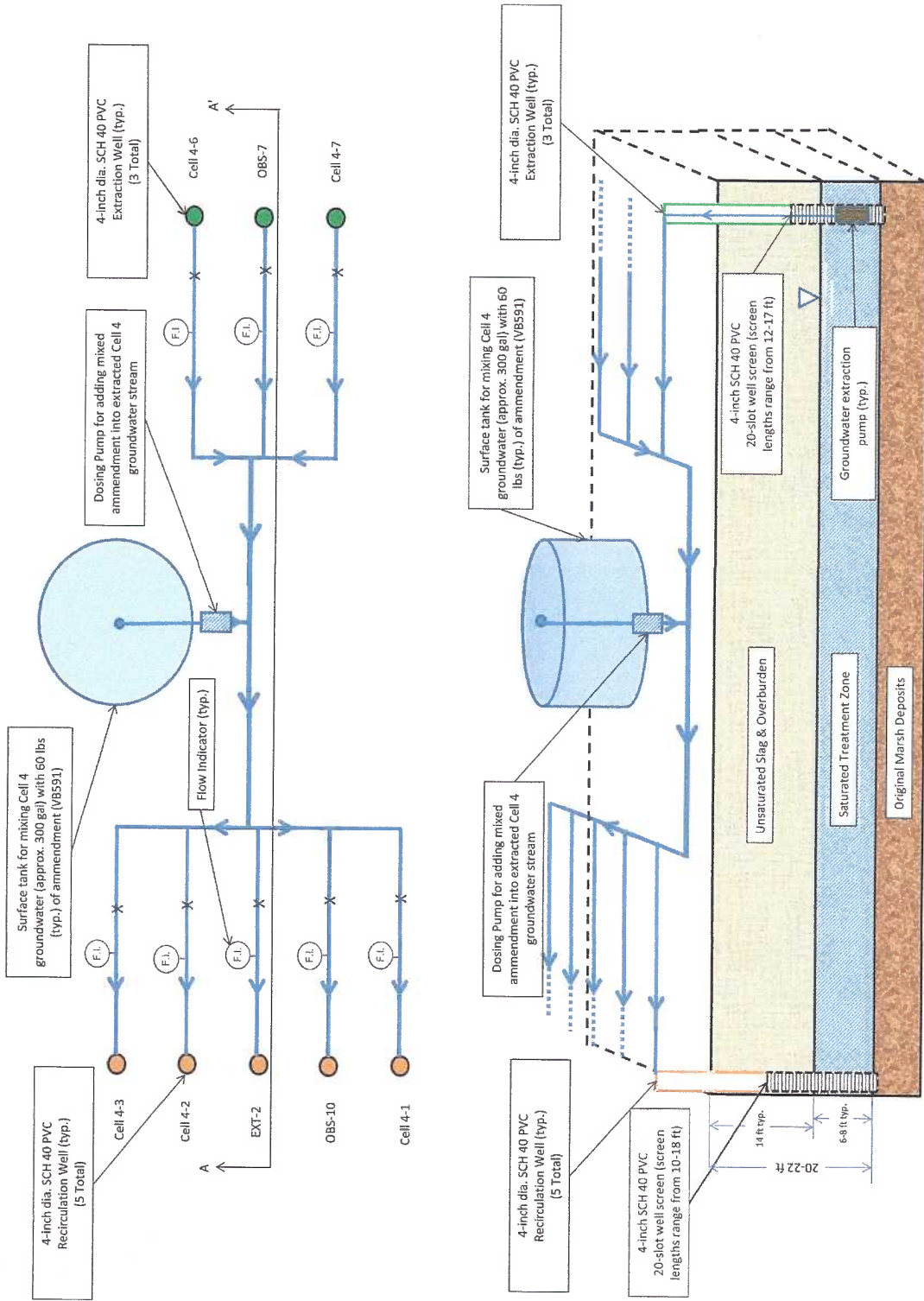
**Measured Groundwater VOC Concentration by Month**  
 Cell 3: Prototype AS/SVE System in the "Cove" Area  
 Sparrows Point, LLC

—●— CO30-PZM015   
 —●— MW-CELL 3-1   
 - - -●- - - MW-CELL 3-2   
 —●— MW-CELL 3-3

Date: January 30, 2013

Drafter: SS

**Schematic Layout and Sections  
Cell 4 In-Situ Anaerobic Bio-Treatment System  
Former Coke Oven Area Interim Remedial Measures  
Sparrows Point, LLC**



Project: Sparrows Point, LLC  
Baltimore, Maryland

**SCHEMATIC LAYOUT AND SECTIONS**

Project Number	E-2439.01	File Number	E2439-2012-12-06
Date	January 30, 2013	Figure	6
PE/PG	MZ	DB	SS

7:05 PM 01/30/2013 E:\Projects\2012\12-06\12-06-01\12-06-01.dwg

# Cell 4

## In-Situ Anaerobic Bio-System

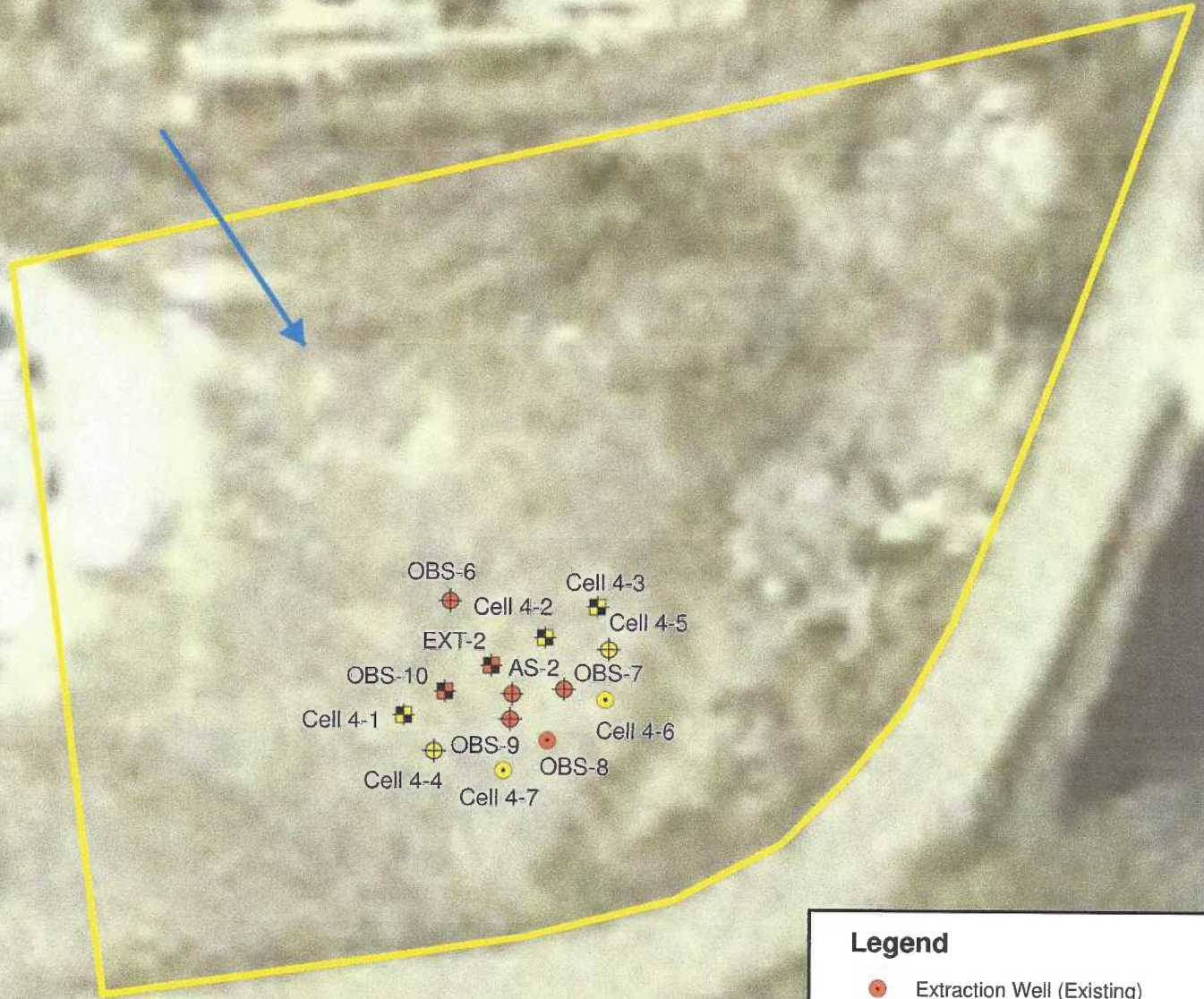


Image source: World Imagery, ESRI, GeoEye, 2009.

### Legend

- Extraction Well (Existing)
- Extraction Well (New)
- Recirculation Well (Existing)
- Recirculation Well (New)
- Monitoring Well (Existing)
- Monitoring Well (New)
- Groundwater Flow Direction



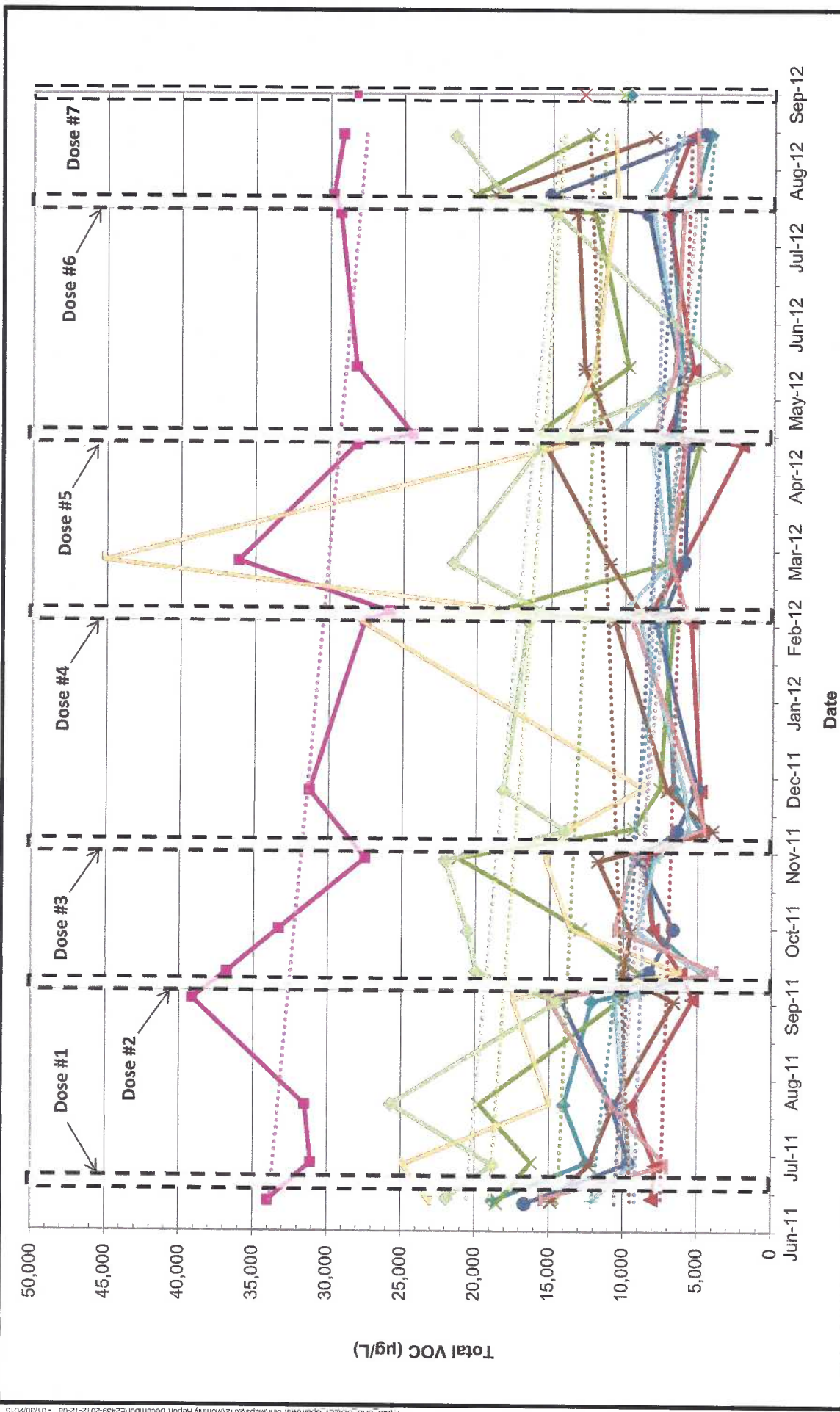
Date: January 30, 2013  
 Drafter: SS



### CELL 4 WELLS

Sparrows Point, LLC  
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 Baltimore, Maryland

PE/PG	Project Number	Figure
MZ	E-2439.01	<b>7</b>
Project Manager	File	
DB	E2439-2012-12-07	



**MEASURED GROUNDWATER VOC CONCENTRATION BY MONTH**  
 Sparrows Point, LLC  
 Baltimore, Maryland  
 Project Number: E-2439.01  
 Project Manager: DB  
 Figure: 8

**Measured Groundwater VOC Concentration by Month**  
 Cell 4: In-Situ Anaerobic Bio-Treatment Area  
 Sparrows Point, LLC

- AS-2
- EXT-2
- Cell 4-3
- Cell 4-4
- Cell 4-5
- Cell 4-6
- Cell 4-7
- OBS-3
- OBS-6
- Cell 4-1

ENVIRONMENTAL ENGINEERING & CONTRACTING, INC.  
 Date: January 30, 2013  
 Drafter: SS

Y:\GIS\_CAD\_BR\LT\_SparrowsPoint\Mapa2012\Monthly Report December\E2439-2012-12-08 - 01/30/2013