

COKE OVEN AREA INTERIM MEASURES PROGRESS REPORT

(First Quarter 2014)

Prepared for

Sparrows Point, LLC



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Prepared by



Environmental Engineers

Coke Oven Area Interim Remedial Measures Progress Report

Introduction

This document presents operational data and monitoring information collected in the 1st quarter of 2014 for interim measures (IMs) that have been installed to address identified environmental conditions at the Coke Oven Area (COA) Special Study Area at the Sparrows Point LLC site located in Sparrows Point, Maryland. This progress report also summarizes IM performance including data from the first quarter of 2014 and is submitted in accordance with reporting requirements outlined in correspondence received from US EPA on March 26, 2013. The following designations are applied in this document to the operating IM “Cells” (**Figure 1**) at the COA:

- Cell 1: 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 the end of the first quarter 2014, Cells 1, 3, and 6 continue to be operational. Groundwater and soil gas sampling were conducted during the first quarter of 2014 to assess current conditions and removal efficiencies of the operating IM systems. The results of these sampling events, including trending graphs from IM startup, are detailed in this report. LNAPL removal continued at Cell 6 without interruption.

Design work has been completed on the IM remediation systems for Cell 2 and Cell 5 and final approval for both systems was received from EPA on September 10, 2013. As part of this approval, the bio-treatment process at Cell 4 has been discontinued and a combined Cell4/Cell5 remediation design has been approved. As of March 31, 2013, installation of the IM remediation systems at both Cells 2 and 4/5 is ongoing.

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

Cell 1 consists of an AS/SVE system 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.

1st Quarter 2014 Operational Performance

Operational performance of Cell 1 during this reporting period is summarized in **Table 1**. In summary, the CATOX unit operated for 576 hours (26.4 %) during this reporting period. The system at Cell 1 continues to operate on a pulsing schedule; where the system is in recovery or on mode for one day and then turned off to let the area rebound for two or three days. This practice was implemented during the first quarter 2013 to improve recovery of hydrocarbons from the subsurface. Operations continue to be 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 0.25 pounds per operating hour (estimated quarterly total of 141.2 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 12,044 pounds of recovered hydrocarbons.

Soil gas samples were collected for laboratory analysis to monitor CATOX unit performance. Three (3) untreated soil gas sample were collected in Suma Canisters and submitted to Pace Analytical Services, Inc. in Minneapolis, Minnesota for analysis by US EPA Method TO-15. The average influent soil gas hydrocarbon concentration of the three samples taken throughout the fourth quarter was 186,989 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) as summarized in **Table 2**.

Hydrocarbon removal calculations were based on the analytical results and the average daily field-measured influent flow rates. The mass removal calculations assume that the samples collected throughout the first quarter are representative of hydrocarbon concentrations for the entire quarter. 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. The pulsing operational method continues to show improved recovery concentrations in the influent soil gases and will be maintained in the future.

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1st Quarter 2014 Groundwater Monitoring Results

Groundwater samples were collected on March 19, 2014 from the following wells:

- BP-MW-09 (upgradient of Cell 1),
- CO18-PZM006 (upgradient of Cell 1 at edge of berm), and
- CO02-PZM006 (downgradient of Cell 1).

The groundwater samples were submitted to Pace Analytical Services, Inc., located in Greensburg, Pennsylvania for the analyses shown in **Table 3**. These data indicate benzene is the most prevalent volatile organic compound (VOC) constituent. Since system startup in August 2010, a decreasing total VOC concentration trend is documented at the wells monitored for system performance. The identified trend for these monitoring wells will continue to be monitored and assessed during system operation in future months.

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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.

1st Quarter 2014 Operational Performance

Operational performance of Cell 3 during this reporting period is summarized in **Table 4**. In summary, the CATOX unit operated for 576 hours (26.4%) during the first quarter of 2014. The system at Cell 3 continues to operate on a pulsing schedule; where the system is in recovery or on mode for one day and then turned off to let the area rebound for two or three days. This practice was implemented to improve recovery of hydrocarbons from the subsurface. Operations continue to be 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 0.0750 pounds per operating hour (estimated quarterly total of 43.2 pounds). **Table 4** also includes a cumulative summary of operational performance since system startup on June 24, 2011. In total, Cell 3 has destroyed approximately 1,395.6 pounds of recovered hydrocarbons.

Soil gas samples were collected for laboratory analysis to monitor CATOX unit performance. Three (3) untreated soil gas sample were collected in Suma Canisters and submitted to Pace Analytical Services. The average influent soil gas hydrocarbon concentration of the three samples taken throughout the first quarter was 57,249 ug/m³ as summarized in **Table 5**.

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 samples collected throughout the third quarter are representative of hydrocarbon concentrations for the entire first quarter of 2014. 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. Operations at this Cell will continue to be evaluated in the future to improve system recovery rates.

Coke Oven Area Interim Remedial Measures Progress Report

1st Quarter 2014 Groundwater Monitoring

Groundwater samples were collected on March 19, 2014 from the following wells (**Figure 1**):

- MW-CELL3-1 (downgradient of Cell 3),
- MW-CELL3-2 (upgradient of Cell 3),
- MW-CELL3-3 (upgradient of Cell 3), and
- CO30-PZM015 (downgradient of Cell 3).

The groundwater samples were submitted to Pace Analytical for the analyses shown in **Table 6**. These data indicate that benzene is the most prevalent VOC constituent. Since system startup on June 24, 2011, a generally decreasing VOC concentration trend is documented for some of the sampled wells. The trends for these monitoring wells will continue to be monitored and assessed during system operation in future months.

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Cell 4: In-Situ Anaerobic Bio-treatment Area

The in-situ anaerobic bio-treatment system at Cell 4 has been discontinued as of the end of third quarter 2013. The treatment area at Cell 4 has been incorporated into the design of Cell 5, which will be installed in the first quarter 2014.

1st Quarter 2014 Groundwater Monitoring Results

Groundwater samples were collected on March 19, 2014. Groundwater samples were collected from the following wells (**Figure 7**):

- OBS-6 MW-CELL 4-3
- EXT-2 MW-CELL 4-5 (**NS**)
- AS-2 MW-CELL 4-6
- MW-CELL 4-1 (**NS**)
- MW-CELL 4-5
- MW-CELL 4-7

The groundwater samples were submitted to Pace Analytical for the analyses shown in **Table 7**. The data in Table 7 indicate naphthalene is the most prevalent VOC constituent. Figure 8 presents a graph of the total VOC concentrations in Cell 4 groundwater and indicates when each dosing event occurred. VOC trends for these monitoring wells will continue to be monitored and assessed in future months.

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Cell 6: LNAPL Extraction at the Former Benzol Processing Area

The Cell 6 LNAPL monitoring and recovery system was monitored weekly during the first quarter of 2014. **Table 8** summarizes; 1) LNAPL occurrence and recovery observed in monitoring wells for this Cell during the reporting period, 2) the start date of extraction from recovery wells and 3) cumulative LNAPL recovered since the beginning of the interim measure. **Figure 9** illustrates the well locations. An estimated 110 gallons (806 pounds) of LNAPL were recovered during the first quarter 2014, bringing the total recovered LNAPL to 10,456 gallons (76,608 pounds) as of March 31, 2014. The LNAPL was recovered from the following wells:

Well	LNAPL Recovery (gal/lbs)	
	1 st Qtr 2014	Total thru 1 st Qtr 2014
BP-MW-05	83/608	8,272/60,610
RW-04	0/0	1,116/8,178
BP-MW-08	27/198	1,039/7,606
BP-MW-11	0/0	8/57
RW-03	0/0	19/141
RW-01	0/0	1/10
RW-02	0/0	0.8/5.9

LNAPL thicknesses during the reporting period are summarized below (wells are not listed if LNAPL was not present):

- RW-04 (2.61 ft),
- BP-MW-05 (0.93 ft),
- BP-MW-08 (2.59 ft),
- BP-MW-11 (5.88 ft),
- BP-MW-10 (0.06 ft),
- RW-03 (6.48 ft)
- RW-01 (0.21 ft), and
- BP-MW-07 (0.06 ft).

No LNAPL was observed in wells RW-02, RW-05, BP-MW-06, BP-MW-09, or CO19-PZM004. For all wells in which LNAPL accumulated, **Table 9** provides well-specific details concerning the measured depths to LNAPL, the water table, and calculated LNAPL thicknesses.

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The skimmer pump at Well RW-04 has been sent to the manufacturer for repair. Pumping is scheduled to resume at well RW-04 the week of May 5, 2014. Plans are in place to start pumping recoverable product from wells BP-MW-11 and RW-3 which will be implemented in the second quarter of 2014..

TABLES

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

Cell 1 First Quarter 2014 Estimated Hydrocarbon Recovery

Parameter	Units	Quantity
Total CATOX Operating Time (January 1 - March 31, 2014)	hours	576
Overall CATOX Operational Time	%	26.4%
Estimated Total Hydrocarbons Destroyed	pounds	141.2
Estimated Hydrocarbon Removal Rate	pounds/hour	0.25

Cell 1 Cumulative Summary of Estimated Hydrocarbon Recovery

Parameter	Units	Quantity
Total ICE/CATOX Operating Time (August 3, 2010 - March 31, 2014)	hours	19,944
Overall CATOX Operational Time	%	76.1%
Estimated Total Hydrocarbons Destroyed	pounds	12,044
Estimated Hydrocarbon Removal Rate	pounds/hour	0.6

Table 2
Summary of Soil Gas Analytical Results (First Quarter 2014)
Cell 1: Prototype AS/SVE System in Former Benzol Processing Area
Former Coke Oven Area Interim Remedial Measures
Sparrows Point, LLC

Analyte	Sample ID Date Time Dilution Factor Units	CATOX Influent Q1 2014
TO-15 Volatile Organics		
trans-1,3-Dichloropropene	ug/m ³	ND
Acetone	ug/m ³	ND
Ethylbenzene	ug/m ³	116
2-Hexanone	ug/m ³	ND
Methylene Chloride	ug/m ³	13
Benzene	ug/m ³	176,497
1,1,2,2-Tetrachloroethane	ug/m ³	ND
Tetrachloroethene	ug/m ³	307
Toluene	ug/m ³	7,967
1,1,1-Trichloroethane	ug/m ³	ND
1,1,2-Trichloroethane	ug/m ³	ND
Trichloroethene	ug/m ³	ND
Vinyl Chloride	ug/m ³	ND
o-Xylene	ug/m ³	447
m-Xylene & p-Xylene	ug/m ³	1,643
2-Butanone (MEK)	ug/m ³	ND
4-Methyl-2-pentanone (MIBK)	ug/m ³	ND
Bromoform	ug/m ³	ND
Carbon Disulfide	ug/m ³	ND
Carbon tetrachloride	ug/m ³	ND
Chlorobenzene	ug/m ³	ND
Chloroethane	ug/m ³	ND
Chloroform	ug/m ³	ND
1,1-Dichloroethane	ug/m ³	ND
1,2-Dichloroethane	ug/m ³	ND
1,1-Dichloroethene	ug/m ³	ND
trans-1,2-Dichloroethene	ug/m ³	ND
1,2-Dichloropropane	ug/m ³	ND
cis-1,3-Dichloropropene	ug/m ³	ND
Total Volatile Organics	ug/m ³	186,990

Notes:

VOC concentrations are averages derived from the 3 monthly influent air samples taken during the quarter (one sample taken each month of the quarter)

BOLD = Analyte detected

ug/m³ = micro grams per cubic meter

ND = Analyte not detected above laboratory reporting limit

Table 3
Summary of Groundwater Analytical Results (First Quarter 2014)
Cell 1: Prototype AS/SVE System in Former Benzol Processing Area
Former Coke Oven Area Interim Remedial Measures
Sparrows Point, LLC

Analyte	Sample ID	CO02-PZM006	CO18-PZM006	BP-MW-09
	Date	3/19/2014	3/19/2014	3/19/2014
	Units			
Volatile Organics				
Vinyl Chloride	µg/L	ND	ND	ND
Chloroethane	µg/L	ND	ND	ND
1,1-Dichloroethene	µg/L	ND	ND	ND
Acetone	µg/L	ND	36.4	29.6
Carbon Disulfide	µg/L	ND	ND	14.8
Methylene Chloride	µg/L	9.8	6.1	ND
trans-1,2-Dichloroethene	µg/L	ND	ND	ND
1,1-Dichloroethane	µg/L	ND	ND	ND
2-Butanone (MEK)	µg/L	ND	ND	ND
Chloroform	µg/L	ND	ND	ND
1,1,1-Trichloroethane	µg/L	ND	ND	ND
Carbon Tetrachloride	µg/L	ND	ND	ND
Benzene	µg/L	218,000	361,000	250,000
1,2-Dichloroethane	µg/L	ND	ND	ND
Trichloroethene	µg/L	ND	ND	ND
1,2-Dichloropropane	µg/L	ND	ND	ND
Methyl Isobutyl Ketone (MIBK)	µg/L	ND	ND	ND
cis-1,3-Dichloropropene	µg/L	ND	ND	ND
Toluene	µg/L	5,350	6,550	52,200
trans-1,3-Dichloropropene	µg/L	ND	ND	ND
1,1,2-Trichloroethane	µg/L	ND	ND	ND
2-Hexanone (MBK)	µg/L	ND	ND	ND
Tetrachloroethene	µg/L	ND	ND	ND
Chlorobenzene	µg/L	ND	ND	ND
1,1,1,2-Tetrachloroethane	µg/L	ND	ND	ND
Ethylbenzene	µg/L	573	78.3	3,000
Styrene	µg/L	87.6	ND	1,910
Bromoform	µg/L	ND	ND	ND
1,1,2,2-Tetrachloroethane	µg/L	ND	ND	ND
1,3,5-Trimethylbenzene	µg/L	ND	ND	ND
1,2,4-Trimethylbenzene	µg/L	ND	ND	ND
Total Xylenes	µg/L	3,330	2,990	40,500
Total Volatile Organics	µg/L	227,350	370,661	347,654

Notes:

Bold = Analyte Detected

ND = Analyte not detected above laboratory reporting limit

µg/L = Micrograms per liter

Table 4
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 First Quarter 2014 Estimated Hydrocarbon Recovery

Parameter	Units	Quantity
Total CATOX Operating Time (January 1 - March 31, 2014)	hours	576
Overall CATOX Operational Time	%	26.4%
Estimated Total Hydrocarbons Destroyed	pounds	43.2
Estimated Hydrocarbon Removal Rate	pounds/hour	0.0750

Cell 3 Cumulative Summary of Estimated Hydrocarbon Recovery

Parameter	Units	Quantity
Total ICE/CATOX Operating Time (August 3, 2010 - March 31, 2014)	hours	14,663
Overall CATOX Operational Time	%	77.2%
Estimated Total Hydrocarbons Destroyed	pounds	1,395.6
Estimated Hydrocarbon Removal Rate	pounds/hour	0.10

Table 5
Summary of Soil Gas Analytical Results (First Quarter 2014)
Cell 3: AS/SVE System in the "Cove" Area
Former Coke Oven Area Interim Remedial Measures
Sparrows Point, LLC

Analyte	Sample ID Date Time Dilution Factor Units	CATOX Influent Q1 2014
TO-15 Volatile Organics		
trans-1,3-Dichloropropene	ug/m ³	ND
Acetone	ug/m ³	12,900
Ethylbenzene	ug/m ³	310
2-Hexanone	ug/m ³	ND
Methylene Chloride	ug/m ³	17
Benzene	ug/m ³	14,967
1,1,1,2-Tetrachloroethane	ug/m ³	ND
Tetrachloroethene	ug/m ³	ND
Toluene	ug/m ³	21,850
1,1,1-Trichloroethane	ug/m ³	ND
1,1,2-Trichloroethane	ug/m ³	ND
Trichloroethene	ug/m ³	ND
Vinyl Chloride	ug/m ³	ND
o-Xylene	ug/m ³	1,727
m-Xylene & p-Xylene	ug/m ³	5,479
2-Butanone (MEK)	ug/m ³	ND
4-Methyl-2-pentanone (MIBK)	ug/m ³	ND
Bromoform	ug/m ³	ND
Carbon Disulfide	ug/m ³	ND
Carbon tetrachloride	ug/m ³	ND
Chlorobenzene	ug/m ³	ND
Chloroethane	ug/m ³	ND
Chloroform	ug/m ³	ND
1,1-Dichloroethane	ug/m ³	ND
1,2-Dichloroethane	ug/m ³	ND
1,1-Dichloroethene	ug/m ³	ND
trans-1,2-Dichloroethene	ug/m ³	ND
1,2-Dichloropropane	ug/m ³	ND
cis-1,3-Dichloropropene	ug/m ³	ND
Total Volatile Organics	ug/m ³	57,250

Notes:

VOC concentrations are averages derived from the 3 monthly influent air samples taken during the quarter (one sample taken each month of the quarter)

BOLD = Analyte detected

ug/m³ = micro grams per cubic meter

ND = Analyte not detected above laboratory reporting limit

Table 6
Summary of Groundwater Analytical Results (First Quarter 2014)
Cell 3: Prototype AS/SVE System in the "Cove" Area
Former Coke Oven Area Interim Remedial Measures
Sparrows Point, LLC

Analyte	Sample ID Date Units	CO30-PZM015	MW-CELL 3-1	MW-CELL 3-2	MW-CELL 3-3
		3/19/2014	3/19/2014	3/19/2014	3/19/2014
Volatile Organics					
Vinyl Chloride	µg/L	ND	ND	ND	ND
Chloroethane	µg/L	ND	ND	ND	ND
1,1-Dichloroethene	µg/L	ND	ND	ND	ND
Acetone	µg/L	28.3	ND	ND	46.9
Carbon Disulfide	µg/L	ND	ND	ND	ND
Methylene Chloride	µg/L	6.1	9.8	8.5	8.5
trans-1,2-Dichloroethene	µg/L	ND	ND	ND	ND
1,1-Dichloroethane	µg/L	ND	ND	ND	ND
2-Butanone (MEK)	µg/L	ND	ND	ND	ND
Chloroform	µg/L	ND	ND	ND	ND
1,1,1-Trichloroethane	µg/L	ND	ND	ND	ND
Carbon Tetrachloride	µg/L	ND	ND	ND	ND
Benzene	µg/L	73,700	23,500	21,800	67,300
1,2-Dichloroethane	µg/L	ND	ND	ND	ND
Trichloroethene	µg/L	ND	ND	ND	ND
1,2-Dichloropropane	µg/L	ND	ND	ND	ND
Methyl Isobutyl Ketone (MIBK)	µg/L	ND	ND	ND	ND
cis-1,3-Dichloropropene	µg/L	ND	ND	ND	ND
Toluene	µg/L	4,910	1,660	1,560	6,240
trans-1,3-Dichloropropene	µg/L	ND	ND	ND	ND
trans-1,4-Dichloro-2-butene	µg/L	ND	ND	ND	ND
1,1,2-Trichloroethane	µg/L	ND	ND	ND	ND
2-Hexanone (MBK)	µg/L	ND	ND	ND	ND
Tetrachloroethene	µg/L	ND	ND	ND	ND
Chlorobenzene	µg/L	ND	ND	ND	ND
1,1,1,2-Tetrachloroethane	µg/L	ND	ND	ND	ND
Ethylbenzene	µg/L	81.5	21.8	22.8	90.4
Styrene	µg/L	30.6	10	10.9	33.8
Bromoform	µg/L	ND	ND	ND	ND
1,1,1,2,2-Tetrachloroethane	µg/L	ND	ND	ND	ND
1,3,5-Trimethylbenzene	µg/L	ND	ND	ND	ND
1,2,4-Trimethylbenzene	µg/L	ND	ND	ND	ND
Total Xylenes	µg/L	1,230	259	260	1,520
Total Volatile Organics	µg/L	79,987	25,461	23,662	75,240

Notes:

Bold = Analyte Detected

ND = Analyte not detected above laboratory reporting limit

µg/L = Micrograms per liter

Table 7
Summary of Groundwater Analytical Results (First Quarter 2014)
Cell 4: In-Situ Anaerobic Bio-Treatment Area
Former Coke Oven Area Interim Remedial Measures
Sparrows Point, LLC

Sample ID	4-1	4-5	4-7	AS-2	EXT-2	OBS-6	
	Date	3/19/2014	3/19/2014	3/19/2014		3/19/2014	
Time							
Analyte	Units						
Volatile Organics							
Vinyl Chloride	µg/L	NS	ND	ND	ND	NS	ND
Chloroethane	µg/L	NS	ND	ND	ND	NS	ND
1,1-Dichloroethene	µg/L	NS	ND	ND	ND	NS	ND
Acetone	µg/L	NS	ND	ND	41.6	NS	28.4
Carbon Disulfide	µg/L	NS	ND	ND	ND	NS	ND
Methylene Chloride	µg/L	NS	5.9	ND	12	NS	5.8
trans-1,2-Dichloroethane	µg/L	NS	ND	ND	ND	NS	ND
1,1-Dichloroethane	µg/L	NS	ND	ND	ND	NS	ND
2-Butanone (MEK)	µg/L	NS	ND	ND	ND	NS	ND
Chloroform	µg/L	NS	ND	ND	ND	NS	ND
1,1,1-Trichloroethane	µg/L	NS	ND	ND	ND	NS	ND
Carbon Tetrachloride	µg/L	NS	ND	ND	ND	NS	ND
Benzene	µg/L	NS	2,310	1,750	6,790	NS	1,500
1,2-Dichloroethane	µg/L	NS	ND	ND	ND	NS	ND
Trichloroethene	µg/L	NS	ND	ND	ND	NS	ND
1,2-Dichloropropane	µg/L	NS	ND	ND	ND	NS	ND
Methyl Isobutyl Ketone (MIBK)	µg/L	NS	ND	ND	ND	NS	ND
cis-1,3-Dichloropropene	µg/L	NS	ND	ND	ND	NS	ND
Toluene	µg/L	NS	2,060	1,270	5,350	NS	951
trans-1,3-Dichloropropene	µg/L	NS	ND	ND	ND	NS	ND
1,1,2-Trichloroethane	µg/L	NS	ND	ND	ND	NS	ND
2-Hexanone (MBK)	µg/L	NS	ND	ND	ND	NS	ND
Tetrachloroethene	µg/L	NS	ND	ND	ND	NS	ND
Chlorobenzene	µg/L	NS	ND	1	ND	NS	ND
1,1,1,2-Tetrachloroethane	µg/L	NS	ND	ND	ND	NS	ND
Ethylbenzene	µg/L	NS	52.6	61.9	81.1	NS	35.6
Styrene	µg/L	NS	516	379	1,220	NS	222
Bromoform	µg/L	NS	ND	ND	ND	NS	ND
1,1,2,2-Tetrachloroethane	µg/L	NS	ND	ND	ND	NS	ND
1,3,5-Trimethylbenzene	µg/L	NS	ND	ND	ND	NS	ND
1,2,4-Trimethylbenzene	µg/L	NS	ND	ND	ND	NS	ND
Xylenes, Total	µg/L	NS	1,390	1,460	2,350	NS	836
Semi-Volatiles							
Naphthalene	µg/L	NS	33,200	13,000	50,300	NS	20,500
Total Volatile Organics	µg/L	0	39,535	17,922	66,145	0	24,079

Notes:

- Bold = Analyte Detected
- ND = Analyte not detected above laboratory reporting limit
- µg/L = Micrograms per liter
- NS = Not Sampled

Table 8
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 Fourth Quarter 2013 (ft)	Total LNAPL Recovery Period		Cumulative Total LNAPL Recovered		Estimate LNAPL Recovered During Fourth Quarter 2013	
		Begin	End	(gal)	(lbs) (a)	(gal)	(lbs) (a)
RW-04	2.61	23-Jul-10	On-going (b)	1,116	8,178	0	0
BP-MW-05	0.93	28-Jan-10	On-going (b)	8,272	60,610	83	608
BP-MW-08	2.59	8-Sep-10	On-going (b)	1,039	7,606	27	198
BP-MW-11	5.88	23-Jul-10	9/8/2010	7.8	57	0	0
RW-02	0.01	28-Jan-11	On-going (c)	0.8	5.9	0	0
RW-03	6.48	24-Nov-10	On-going (c)	19.3	141	0	0
RW-01	0.21	28-Oct-11	On-going (c)	1.3	10	0	0
BP-MW-10	0.06	na	na	0	0	0	0
BP-MW-07	0.06	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
Total Recovery:				10,456	76,608	110	806

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 9
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
3/31/2013	11.31	11.52	0.21	11.38	11.39	0.01	9.2	15.68	6.48
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
3/31/2013	9.26	11.87	2.61	11.1	12.03	0.93	11.1	11.16	0.06
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
3/31/2013	11.91	14.5	2.59	7.79	7.85	0.06	11	16.88	5.88

All measurement are presented in feet

FIGURES

Y:\gis_cad_db\let_sparrowspoint\maps\2013\monthlyreport_feb\map\IE2439-2013-02-01 - 04/30/2013



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 "Cove" 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

APPROXIMATE SCALE



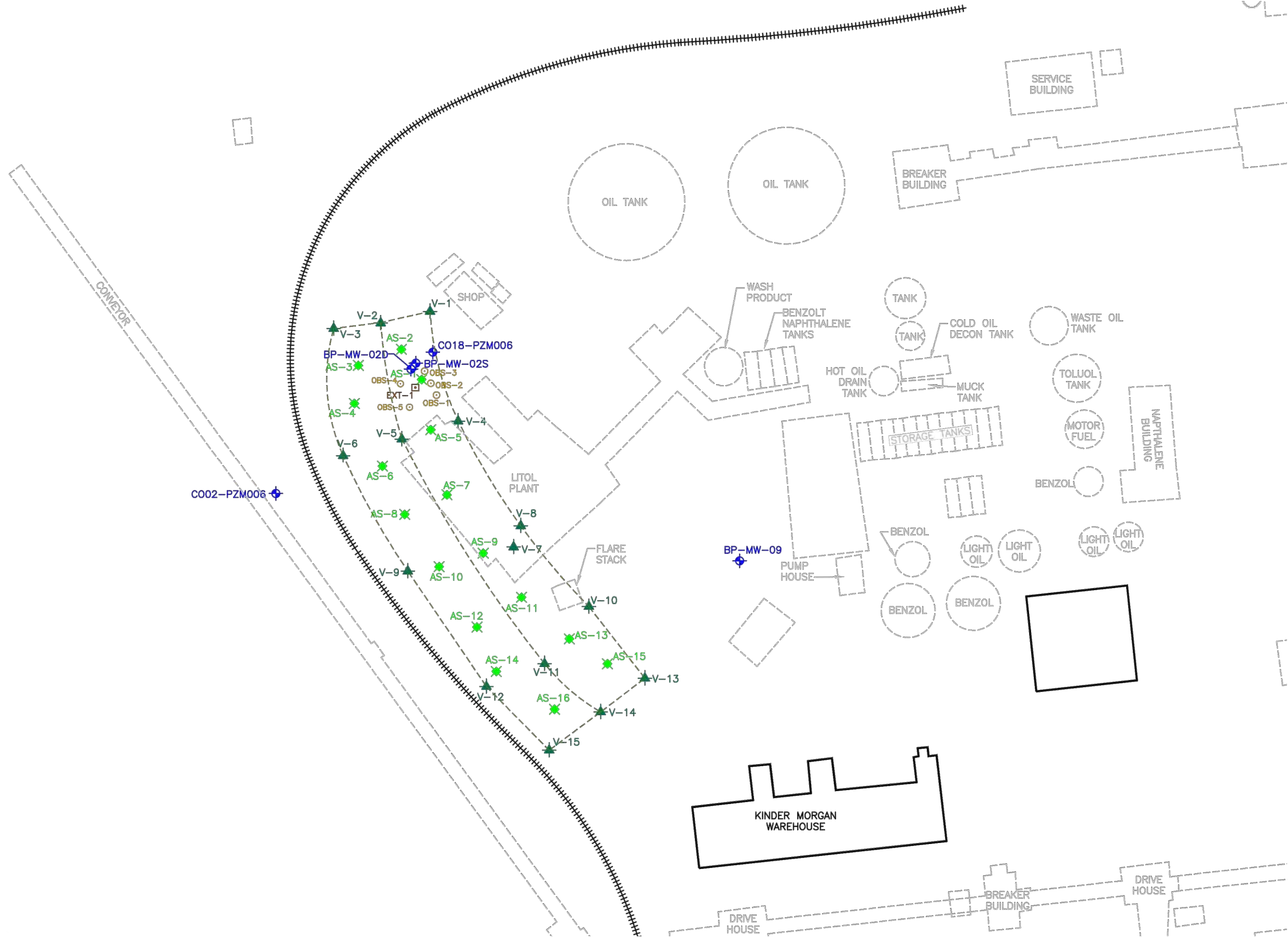
Project
Sparrows Point, LLC
Baltimore, Maryland

INTERIM MEASURES TREATMENT AREAS

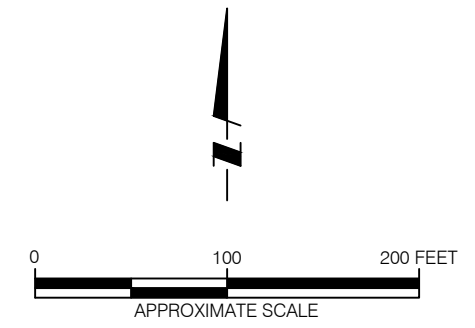
Project Number		File Number	
Date	April 30, 2013	Figure	
PE/PG	PM	Drafter	1

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

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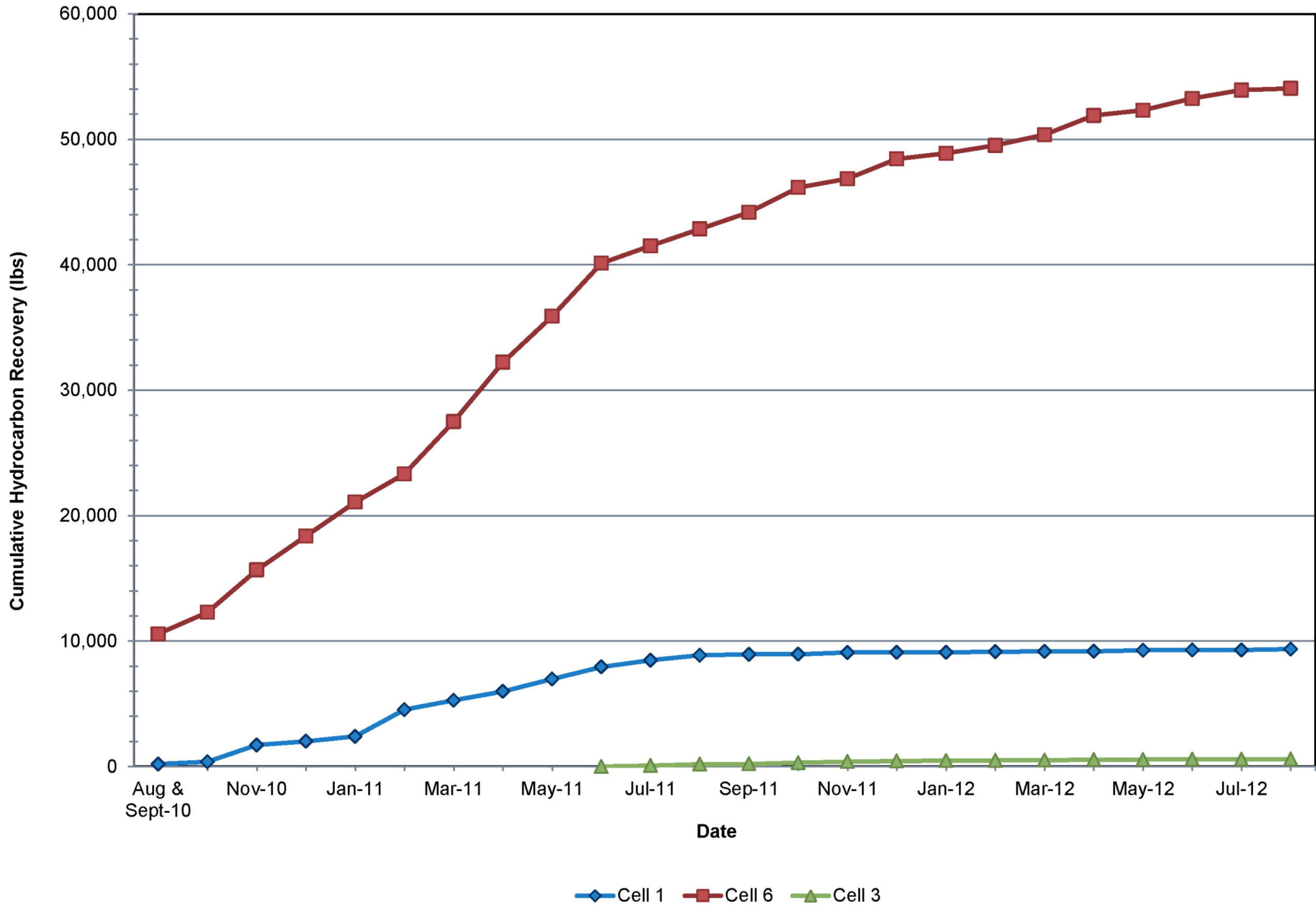
- LEGEND**
- V-1 TRENCH VAPOR EXTRACTION RISER
 - EXT-1 SVE PILOT TEST EXTRACTION WELL
 - OBS-1 SVE PILOT TEST OBSERVATION WELL
 - CO18-PZM006 EXISTING MONITORING WELL
 - AS-2 AIR SPARGE WELL
 - - - VAPOR COLLECTION TRENCHES
 - - - FORMER STRUCTURES (DEMOLISHED)



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AS-BUILT LAYOUT PLAN

Project Number		File Number	
Date	April 30, 2013		Figure
PE/PG	PM	Drafter	2



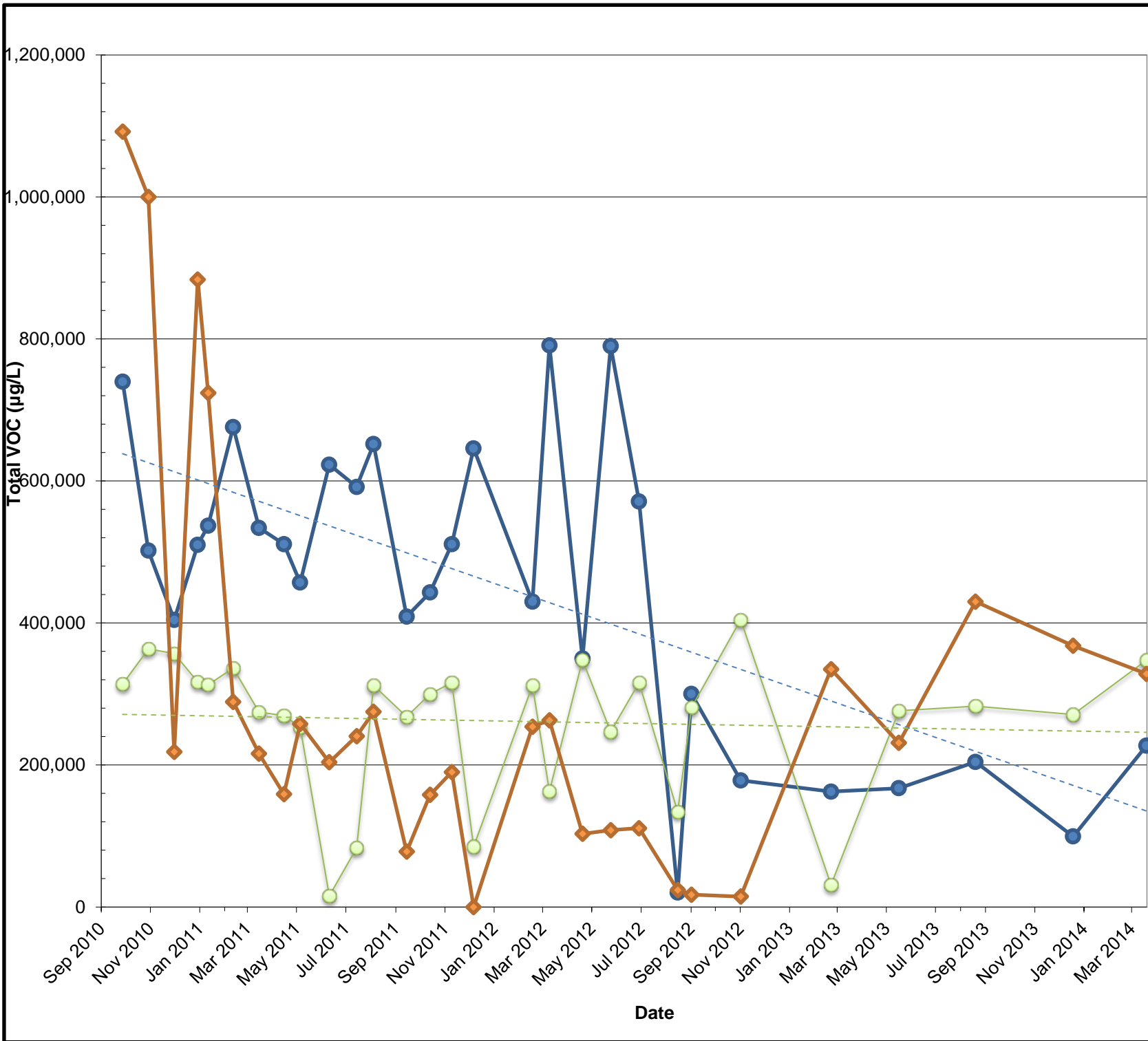
Project
Sparrows Point, LLC
Baltimore, Maryland

**CUMULATIVE SUMMARY OF ESTIMATED
HYDROCARBON RECOVERY
FORMER COKE OVEN AREA INTERIM
REMEDIAL MEASURES
AUGUST 2010 – AUGUST 2012**

Project Number _____ File Number _____

Date: April 30, 2013 Figure: **3**

PE/RG	PM	DR
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LEGEND

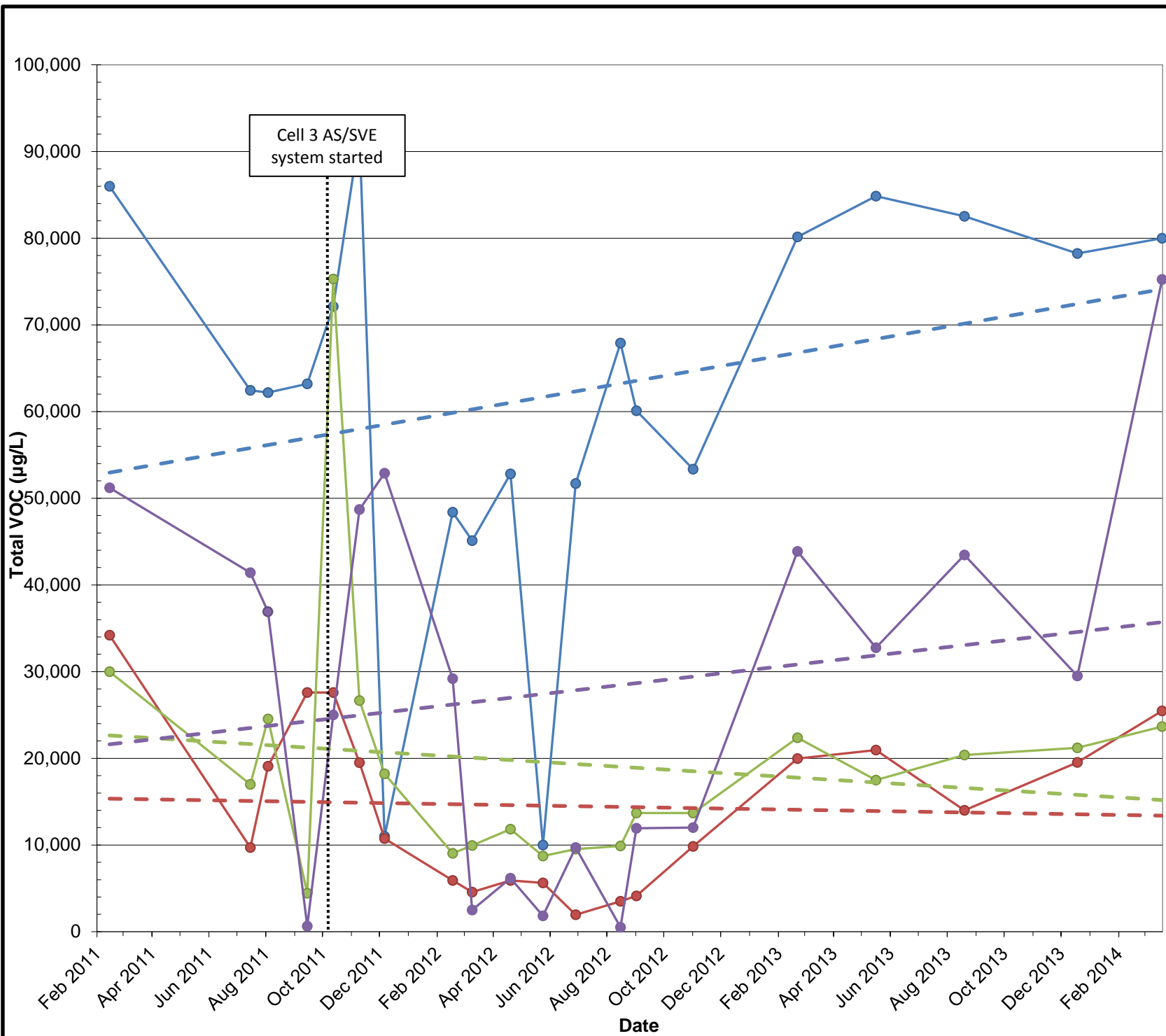
- CO2-PZM006
- BP-MW-09
- CO18-PZM006



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MEASURED GROUNDWATER VOC
CONCENTRATION BY MONTH
CELL 1: PROTOTYPE AS/SVE
SYSTEM IN THE "COVE" AREA

Date	Figure
Mar. 31, 2014	4
E/RG PM DR	



- LEGEND**
- CO30-PZM015
 - MW-CELL 3-1
 - MW-CELL 3-2
 - MW-CELL 3-3



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MEASURED GROUNDWATER VOC
CONCENTRATION BY MONTH
CELL 3: PROTOTYPE AS/SVE
SYSTEM IN THE COVE AREA

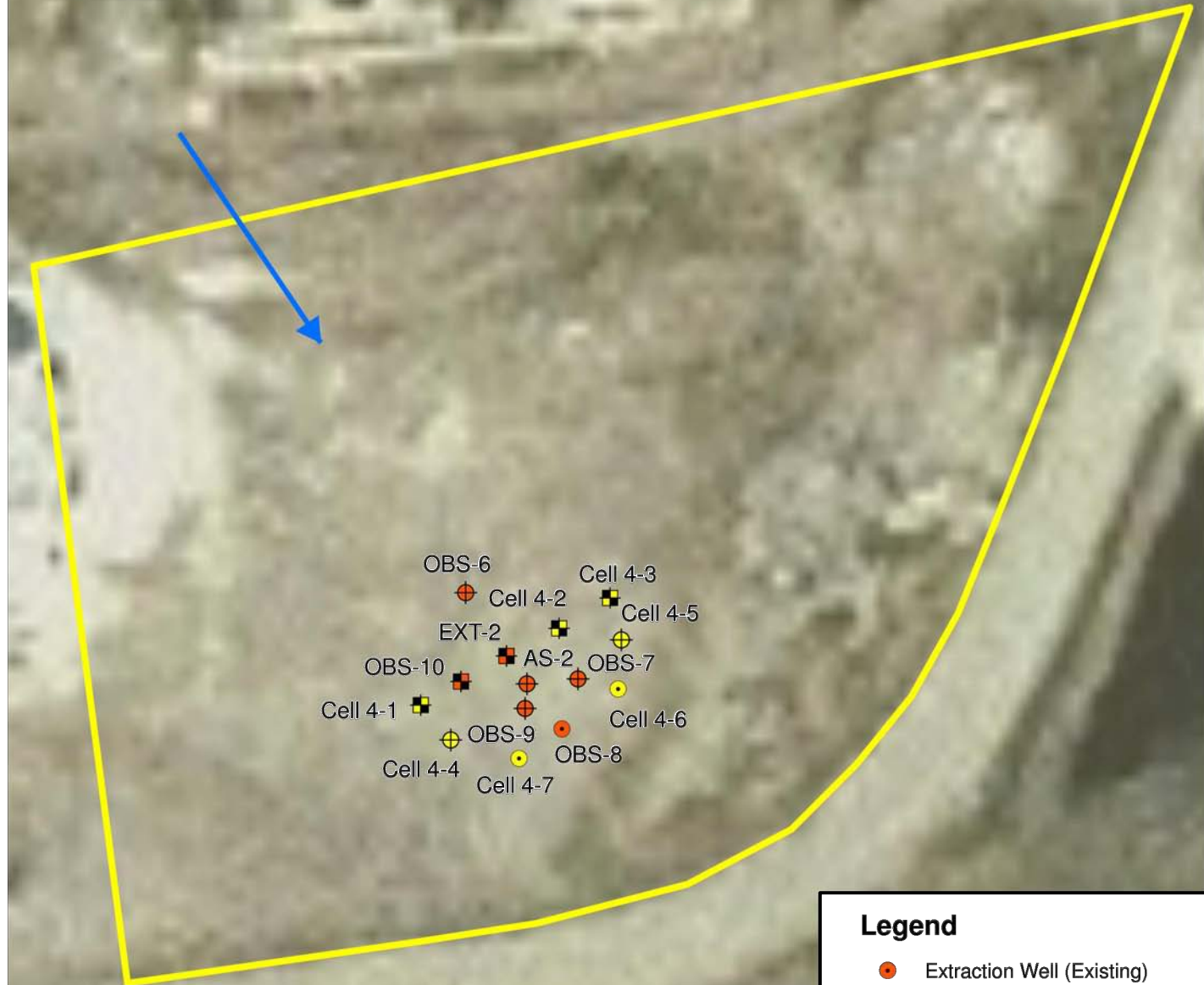
Date
Mar. 31, 2014

Figure
5

E/RG PM DR

Cell 4

In-Situ Anaerobic Bio-System



OBS-6
 Cell 4-2
 Cell 4-3
 Cell 4-5
 EXT-2
 AS-2
 OBS-7
 OBS-10
 Cell 4-1
 Cell 4-6
 OBS-9
 Cell 4-4
 Cell 4-7
 OBS-8



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



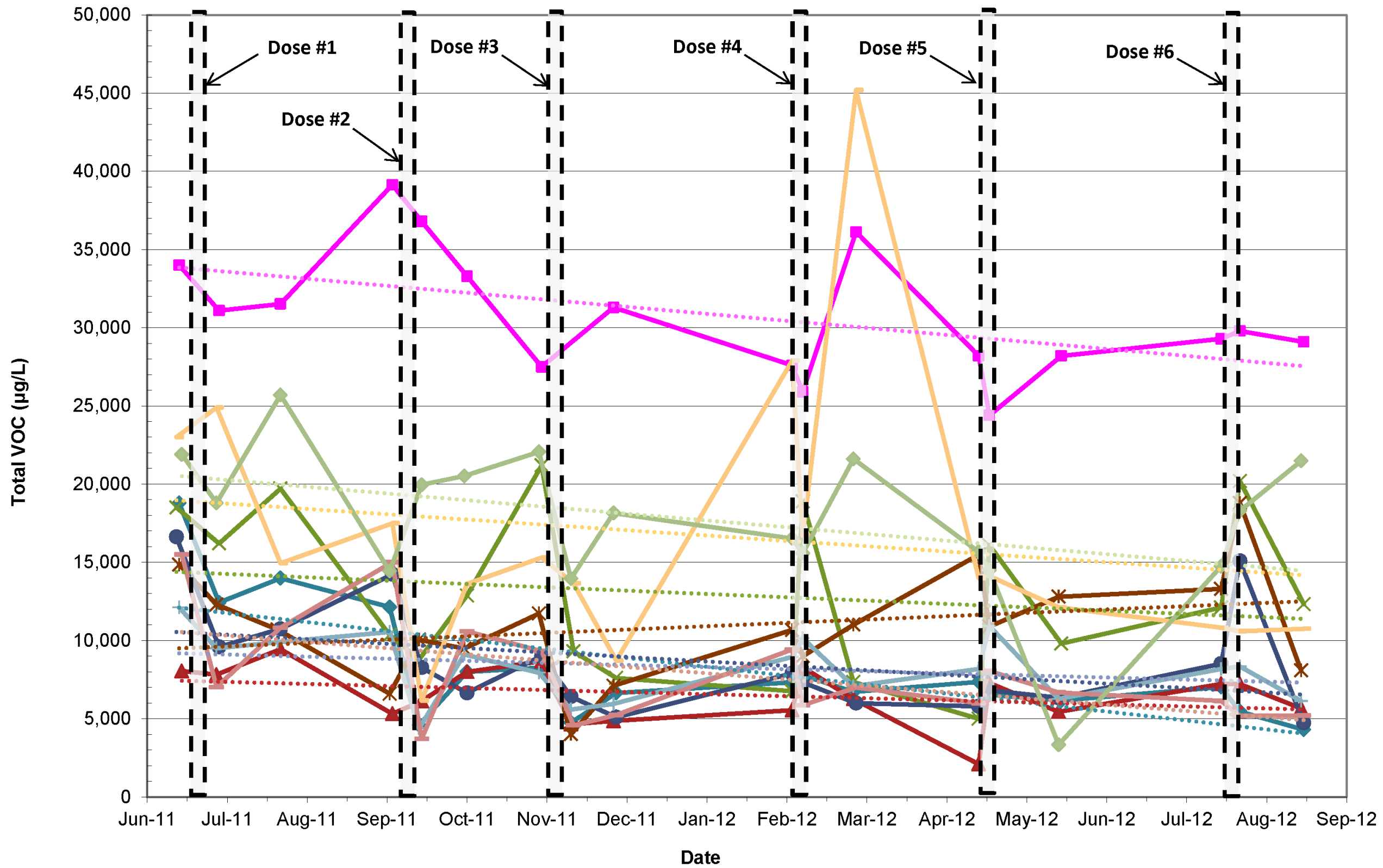
CELL 4 WELLS

Sparrows Point, LLC
 Baltimore, Maryland



Date	Drafter
April 30, 2013	

PE/PG	Project Number	Figure 7
Project Manager	File	



AS-2 EXT-2 OBS-6 OBS-8 Cell 4-1 Cell 4-3 Cell 4-4 Cell 4-5 Cell 4-6 Cell 4-7



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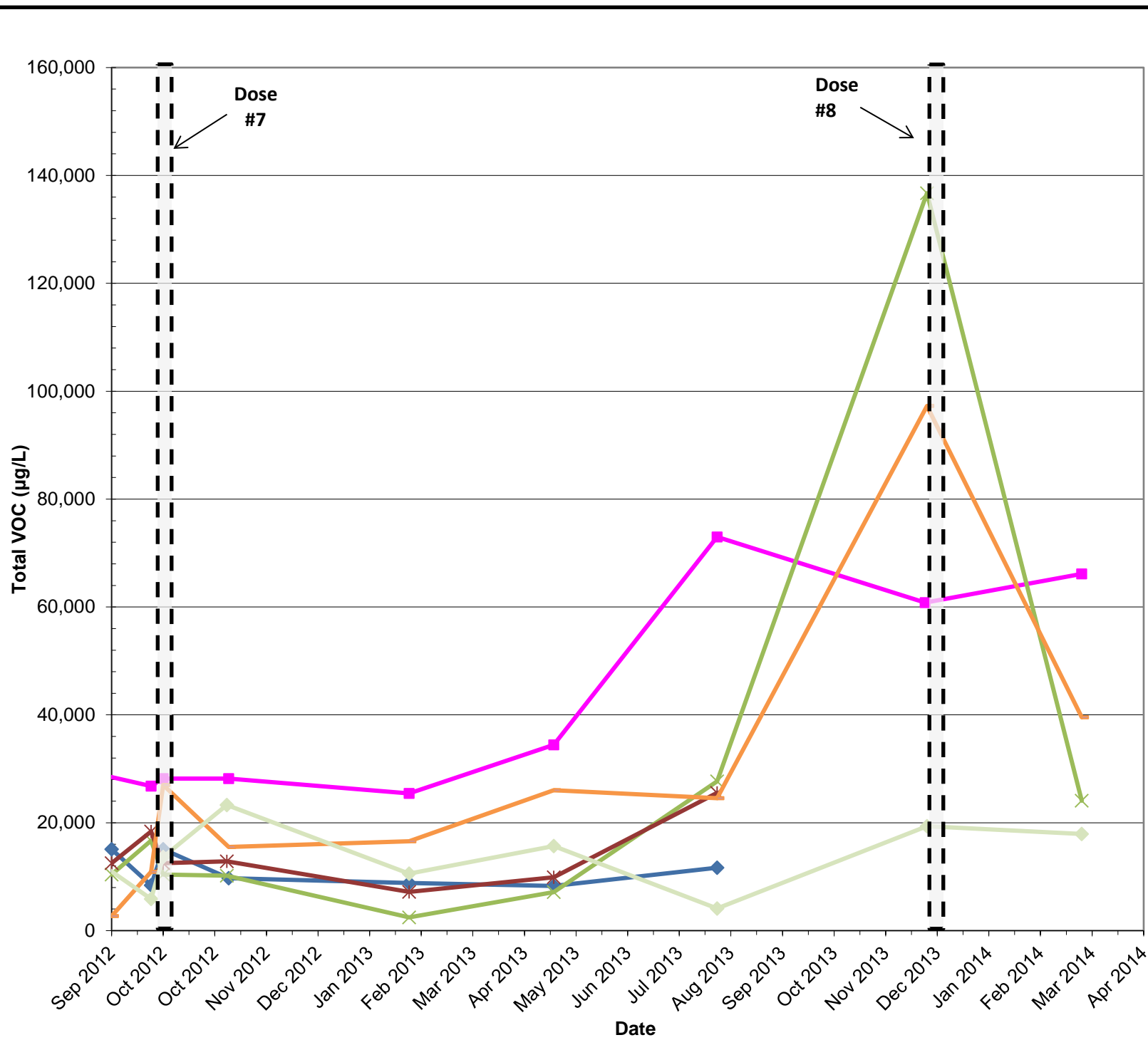
**MEASURED GROUNDWATER VOC
CONCENTRATION BY MONTH
CELL 4: IN-SITU ANAEROBIC BIO-
TREATMENT AREA
JUNE 2011 – AUGUST 2012**

Project Number File Number

Date
April 30, 2013 Figure

PE/RG PM DR

8



LEGEND

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

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MEASURED GROUNDWATER VOC CONCENTRATION BY MONTH
CELL 4: IN-SITU ANAEROBIC BIO-TREATMENT AREA
SEPTEMBER 2012 AND BEYOND

Date	figure
Mar. 31, 2014	8A
E/RG PM DR	