



May 1, 2015

Mr. Andrew Fan, PE  
US EPA Region III, 3LC20  
1650 Arch Street  
Philadelphia, PA 19103-2029

Ms. Barbara Brown  
Project Coordinator  
Maryland Department of the Environment  
1800 Washington Blvd.  
Baltimore, MD 21230

**Re: COKE OVEN AREA INTERIM MEASURES PROGRESS REPORT 1<sup>ST</sup> QUARTER 2015**

Dear Mr. Fan and Ms. Brown:

On behalf of Sparrows Point Terminal, LLC and Sparrows Point, LLC, enclosed please find the Coke Oven Area Interim Measures Progress Report for the first quarter of 2015 completed for the Sparrows Point Terminal site. This report was distributed electronically on May 1, 2015 in accordance with the reporting requirements outlined in the US EPA Interim Measures Progress Report frequency letter dated March 26, 2013. Please advise if paper copies are required for your use and we will distribute accordingly.

The report summarizes implementation progress for the interim measures (IMs) that have been developed to address identified environmental conditions at the Coke Oven Area through March 31, 2015. Please contact me at (314) 620-3056 should questions arise during your review of the enclosed progress report.

Sincerely,

A handwritten signature in black ink that reads "James Calenda". The signature is written in a cursive, flowing style.

James Calenda  
Project Manager

Enclosure

# FORMER COKE OVEN AREA INTERIM MEASURES PROGRESS REPORT

(First Quarter 2015)

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*Prepared for*

**SPARROWS POINT TERMINAL, LLC AND  
SPARROWS POINT LLC  
1600 SPARROWS POINT BOULEVARD  
SPARROWS POINT MD 21219**

**April 30, 2015**



## Introduction

This document presents operational data and monitoring information collected in the 1<sup>st</sup> quarter of 2015 for Interim Measures (IMs) that have been installed to address identified environmental conditions at the former Coke Oven Area (COA) Special Study Area at the Sparrows Point Terminal site located in Sparrows Point, Maryland. This progress report summarizes IM performance including data collected from the 1<sup>st</sup> quarter of 2015 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 identify 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 2: Air Sparge/Soil Vapor Extraction (AS/SVE) System in the shallow groundwater zone, groundwater pump and treat (GW P&T) system in the intermediate zone, Former Coal Basin Area,
- Cell 3: AS/SVE System in “Cove” Area,
- Cell 5: Dual Phase Extraction (DPE) system for the shallow zone, “Turning Basin” side of former Coke Oven Area,
- Cell 6: Light Non-Aqueous Phase Liquid (LNAPL) Recovery at the Former Benzol Processing Area.

As of the end of the first quarter 2015, Cells 1, 2, 3, 5 and 6 are operational. Groundwater and soil gas sampling were conducted during the first quarter of 2015 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. Additional detail on the design, operation and groundwater monitoring for these systems is provided in this progress report.

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

Cell 1 consists of an AS/SVE system installed to remove volatile hydrocarbons that is 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, vapor collection trenches and groundwater monitoring wells.

### 1st Quarter 2015 Operational Performance

Operational performance of Cell 1 during this reporting period is summarized in **Table 1**. In summary, the CATOX unit operated for 408 hours (18.5 %) 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 as reflected in the Permit to Operate issued to Sparrows Point LLC on December 8, 2014.

The hydrocarbon removal rate was calculated to be approximately 0.009 pounds per operating hour (estimated quarterly total of 3.86 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 12,449 pounds of recovered hydrocarbons as shown graphically in **Figure 3**.

Soil gas samples were collected for laboratory analysis to monitor CATOX unit performance. One untreated soil gas sample was collected in a Suma Canister 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 third quarter was 37,712 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 third 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. Recovery concentrations in the influent soil gases were lower this quarter and this trend will be monitored in future quarters.

### 1<sup>st</sup> Quarter 2015 Groundwater Monitoring Results

Groundwater samples were collected on March 16, 2015 from the following wells; the location of the wells are shown on Figure 2:

- New well designation (former 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 as illustrated in **Figure 4**. The identified trend for these monitoring wells will continue to be monitored and assessed during system operation in future months.

## Cell 2: Air Sparge/Soil Vapor Extraction (AS/SVE) System in the Shallow Groundwater Zone, Groundwater Pump and Treat (GW P&T) System in the Intermediate Groundwater Zone, Former Coal Basin Area

Cell 2 consists of an AS/SVE system coupled with vapor destruction via an electric catalytic oxidation (CATOX) unit for volatile hydrocarbon groundwater treatment in the shallow zone and a pump and treat system for recovery of groundwater and volatile hydrocarbon treatment from the intermediate zone. The system design plans were approved by US EPA in correspondence received on September 10, 2013 and began full scale operation in October 2014. **Figure 5** shows the system layout of Cell 2 and locations of the major design components including the air sparging wells, vapor collection trenches, intermediate groundwater recovery wells, groundwater injection wells and groundwater monitoring well locations.

### AS/SVE System

The delivery and recovery systems for the shallow AS/SVE system include the use of air sparge points and a horizontal vapor extraction trench. Eight (8) air sparge points along a 500 feet long stretch were installed near the shore line of Cell 2. Details of the air sparge zone and recovery trench include the following:

- Air sparge zone: 8 – 2-inch diameter AS points @ approximately 56 ft spacing, center to center (C-C)
  - Installed to 15 ft -17 ft bgs (bottom of slag fill)
  - Bottom 2 ft of each point to be screened with 20-slot screen
- Recovery trench
  - 500 ft of horizontal, 4-inch diameter perforated pipe (or 20-slot screen) installed to a total depth (TD) of 5 ft
  - 5 vertical 4-inch risers spaced every 100 ft, C-C
  - Top 2 ft is a clay cap
  - Geotextile fabric @ 2 ft bgs (under clay)
  - Granular screened slag backfill from 2 ft -5 ft
  - Horizontal recover piping located approximately 3 ft bgs (above water table)

### GW P&T System

The pump and treat groundwater system includes a low profile air stripper that then utilizes an oxidizer to destroy all VOC vapors generated prior to exhausting to the atmosphere. The design groundwater flow is for a maximum of 40 gallons per minute (gpm). The oxidizer is sized to handle up to a 600 cubic feet per minute air flow. The recovery and re-injection systems include the use

of six groundwater recovery wells and six groundwater injection wells. The six recovery wells are installed along a 500 feet long stretch near the shore line of Cell 2.

- 6 – 4-inch diameter GW RWs @ approximately 83 ft spacing, C-C
  - Installed to 40-45 ft bgs (intermediate sand zone)
  - Bottom 15 ft of each RW screened with 20-slot screen
  - An electric pump in each RW, resting approximately 7-10 ft above the bottom of the well
  
- Recovered GW Treatment
  - Enters low profile air stripper
  - Off-gas sent to Electric Oxidizer for destruction
  - Treated groundwater pumped to six-6 inch diameter re-injection wells screened from 5 to 15 feet in depth for recirculation in shallow GW zone

## 1<sup>st</sup> Quarter 2015 Operational Performance

### AS/SVE System

Operational performance of the AS/SVE System at Cell 2 during this reporting period is summarized in **Table 4**. In summary, the CATOX unit operated for 1584 hours (71.7%) during this reporting period. The system at Cell 2 is operated on a continuous schedule during this reporting quarter to determine the initial performance of the system. Operations were in conformance with the manufacturer's specifications at all times that soil gases were collected in accordance with the March 24, 2014 permit-to-construct conditions as reflected in the Permit to Operate issued to Sparrows Point LLC on December 8, 2014.

The hydrocarbon removal rate was calculated to be approximately 0.032 pounds per operating hour (estimated quarterly total of 50.4 pounds). **Table 4** also includes a cumulative summary of operational performance since system startup in October 2014. In total, the AS/SVE system at Cell 2 has destroyed approximately 219.5 pounds of recovered hydrocarbons as shown graphically in **Figure 3**.

Soil gas samples were collected for laboratory analysis to monitor CATOX unit performance. One untreated soil gas sample was collected in a Suma Canister 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 was 56,634 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) as summarized in **Table 5**.

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 fourth quarter are representative of hydrocarbon concentrations for

the entire quarter. This assumption is based on the fact that the same air sparge wells and extraction wells were online when the system was operational.

### GW P&T System Evaluation

The Cell 2 groundwater pump and treat system was evaluated with regard to: 1) the water levels measured in the various water bearing zones, and 2) the effectiveness of this system with respect to the mass of volatile hydrocarbons removed from groundwater.

### Groundwater Level Monitoring

Groundwater-level measurements were manually measured in March 2015 for fourteen (14) groundwater wells that have been installed to evaluate the Cell 2 system. A summary of the installation specifications of the wells has been included as **Table 6**; water level measurements (depth to water and water elevation) are presented in **Table 7**. The locations of the monitoring wells are shown on **Figure 5**.

The groundwater elevation data are graphically presented as groundwater elevation contour maps in **Figures 6** and **7**. **Figures 6** and **7** represent the fourth quarter 2014 data for the shallow and intermediate water bearing zones. The intermediate water bearing zone is pumped and is therefore also referred to as the intermediate pumping zone. The shallow water bearing zone (water table) includes piezometers screened to depths of approximately 15-feet below ground surface; the intermediate water bearing zone includes piezometers screened from approximately 30- to 50-foot depths. The water level results for each of these zones are discussed below.

#### Shallow Water Table Zone

**Figure 6** presents the groundwater elevation contour map for the shallow water table zone, corresponding to the March 2015 time period when the underlying zone (intermediate pumping zone) was being pumped and groundwater was being re-injected into the shallow zone through the six injection wells. The data for the shallow groundwater zone exhibit the possible influence of the reinjection zone as higher groundwater elevations are noticed in this area. This area is also higher in elevation so data from additional time periods will be required to confirm this feature.

## Intermediate Pumping Zone

**Figure 7** presents groundwater elevations within the intermediate pumping zone during the March 2015 time period. The data indicates significant drawdown surrounding the six pumping wells (CO43- CO48) that comprise the groundwater recovery system. This system is maintaining a broad zone of influence extending from the pumping wells.

### Evaluation of Pump and Treat System Effectiveness

A total of 770,235 gallons of water were extracted from the Cell 2 Area pumping wells and treated during the first quarter of 2015. The average pumping rate for the pump and treat system was 10,767 gpd, or 8 gpm. Cell 2 experienced a significant decrease of 5,000 gpd less than the previous quarter due to shutdowns to protect the system during extremely cold temperatures, most notably during the month of February.

Operations were in conformance with the manufacturer’s specifications at all times that stripped hydrocarbons were discharged through the CaTOX unit to the atmosphere in accordance with the March 24, 2014 permit-to-construct conditions as reflected in the Permit to Operate issued to Sparrows Point LLC on December 8, 2014. In addition, treated groundwater discharges were in compliance with discharge permit conditions outlined in Discharge Permit 11-DP-3746 issued to Sparrows Point LLC on May 6, 2013. These pumping rates appear to effectively capture the most impacted groundwater beneath Cell 2, as revealed by **Figure 9** discussed in the following section.

A total of 1,541 lbs of benzene, toluene and xylene compounds (btx) and 12 lbs of naphthalene were removed and treated during the first quarter of 2015. This total is shown graphically in **Figure 3**. The following table presents data for influent and effluent (treated) groundwater.

Field_ID	Analysis	Units	14-Jan	20 Jan	12-Feb	25-Feb	23-Mar	24-Mar	Quarter Average
GWPT Cell 2 INFLUENT	Benzene	ug/L	360,000	180,000	99,000	280,000	190,000	190,000	<b>216,500</b>
GWPT Cell 2 INFLUENT	Toluene	ug/L	19,000	14,000	8,400	21,000	22,000	21,000	<b>17,566</b>
GWPT Cell 2 INFLUENT	Total Xylenes	ug/L	3,400	2,400	1,400	3,900	5,700	5,500	<b>3,716</b>
GWPT Cell 2 INFLUENT	Naphth	ug/L	2,000	1,800	1,100	1,900	2,400	3,000	<b>2,033</b>
GWPT Cell 2 EFFLUENT	Benzene	ug/L	100	24	140	280	140	0	<b>114</b>
GWPT Cell 2 EFFLUENT	Toluene	ug/L	0	0	16	31	0	0	<b>7.8</b>

GWPT Cell 2 EFFLUENT	Total Xylenes	ug/L	0	0	0	0	0	0	0
GWPT Cell 2 EFFLUENT	Naphth	ug/L	120	74	23	250	170	130	<b>128</b>

The pump and treat system is removing significant amounts of volatile hydrocarbons from groundwater within the intermediate water bearing zone at the current pumping rates, and it is controlling groundwater flow and associated migration within the intermediate water bearing zone.

### 1<sup>st</sup> Quarter 2015 Groundwater Monitoring Results

Groundwater samples were collected in March 2015 from the following wells; the well locations are shown on **Figure 5**. Exception(s) to the wells sampled in March are noted for wells CO37-PZM003. CO37-PZM003 was not sampled due to the presence of free product first identified in November 2014 that is discussed further below.

- CO27- PZM012 – shallow zone
- CO27-PZM046 - intermediate zone
- CO36-PZM008 – shallow zone
- CO36-PZM043 – intermediate zone
- CO37-PZM003 – shallow zone
- CO37-PZM038 – intermediate zone
- CO38-PZM006 – shallow zone
- CO38-PZM043– intermediate zone
- CO39-PZM007– shallow zone
- CO39-PZM042– intermediate zone
- CO40-PZM008– shallow zone
- CO41-PZM 001– shallow zone
- CO41-PZM 036– intermediate zone
- CO42-PZM004 – shallow zone

The groundwater samples were submitted to Pace Analytical Services, Inc., located in Greensburg, Pennsylvania for the analyses shown in **Table 8**. These data indicate benzene is the most prevalent volatile organic compound (VOC) constituent. The VOC concentrations for the 2015 sampling events are shown for the groundwater wells monitored for system performance in **Figure 8A** and **8B**. These wells will continue to be monitored to assess possible trends associated with operation of the interim measure. **Figure 9** presents a plan view of the concentration of benzene in the intermediate zone from analytical results from the March 2015 monitoring event.

Light non-aqueous product (LNAPL) was encountered in well CO37-PZM003 in the shallow groundwater zone in November 2014. This well was bailed on a weekly basis throughout the first quarter of 2015 and over 5 gallons of product was recovered. The well will continue to be monitored on a weekly basis going forward to determine the extent of continued presence of LNAPL.

### 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.

#### 1<sup>st</sup> Quarter 2015 Operational Performance

Operational performance of Cell 3 during this reporting period is summarized in **Table 9**. In summary, the CATOX unit operated for 384 hours (26.4%) during the first quarter of 2015. 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 0.049 pounds per operating hour (estimated quarterly total of 18.8 pounds). **Table 9** also includes a cumulative summary of operational performance since system startup on June 24, 2011. In total, Cell 3 has destroyed approximately 1463.8 pounds of recovered hydrocarbons as shown graphically in **Figure 3**.

Soil gas samples were collected for laboratory analysis to monitor CATOX unit performance. One untreated soil gas sample was collected in a Suma Canister and submitted to Pace Analytical Services. The average influent soil gas hydrocarbon concentration of the three samples taken throughout the third quarter was 93,564 ug/m<sup>3</sup> as summarized in **Table 10**.

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 2015. 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.

## 1<sup>st</sup> Quarter 2015 Groundwater Monitoring

Groundwater samples were collected in March 2015 from the following wells (Figure 10):

- 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 11**. These data indicate that benzene is the most prevalent VOC constituent. Since system startup on June 24, 2011, a generally inconclusive VOC concentration trend is documented, as illustrated in **Figure 11**. The VOC concentrations at MW-CELL3-3 (CO103-PZM) showed similar results from the previous quarter. The analysis conducted in the 3<sup>rd</sup> quarter of 2014 showed an unusually high concentration for this well. November 2014 and March 2015 results continue to more closely reflect the historical concentrations for MW-Cell3-3. This result and associated trends for these monitoring wells will continue to be monitored and assessed during system operation in future months.

## Cell 5: Dual Phase Extraction (DPE) System for the Shallow Zone, “Turning Basin” side of Former Coke Oven Area

Cell 5 consists of a dual phase (vapor and water) system (DPE) with a low profile air stripper followed by vapor phase granular activated carbon (VGAC) for removal and treatment of vapor and dissolved volatile hydrocarbons in the shallow groundwater zone. The system design plans were approved by US EPA in correspondence received on September 10, 2013 and began full scale operation in October 2014. **Figure 12** shows the system layout of Cell 5 and locations of the major design components including the dual phase recovery points, treatment system, groundwater injection wells and groundwater monitoring well locations.

The recovery and re-injection systems include the use of dual phase (soil vapor and groundwater) recovery wells and six groundwater re-injection wells. Twelve (12) recovery wells were installed along an approximate 500 feet long stretch downgradient of the most recent 10,000 ug/L isocontour line for naphthalene (between the naphthalene source area and the eastern shore line along the Turning Basin).

- 12 – 1.5-inch diameter DPE RWs @ approximately 42 ft spacing, C-C
  - Installed to 15-17 ft bgs (to bottom of shallow slag)
  - Bottom 2 ft of each RW screened with 20-slot screen
  - Vapor recovery perforations located between 10-12 ft bgs
  
- Recovered GW and vapor Treatment
  - Enters MS knockout tank to separate air and water phases
  - Water sent to low profile air stripper
  - Off-gas sent to VGAC for capture
  - Treated groundwater pumped to six-6 inch diameter re-injection wells screened from 5 to 15 feet in depth for recirculation in shallow GW zone

### 1<sup>st</sup> Quarter 2015 Operational Performance

The Cell 5 DPE system was evaluated with regard to: 1) the water levels measured in the various water bearing zones, and 2) the effectiveness of this system with respect to the mass of volatile hydrocarbons removed from groundwater.

### Groundwater Level Monitoring

Groundwater-level measurements were manually measured in March 2015 for nine (9) groundwater wells that have been installed in the shallow groundwater zone to evaluate the Cell 5 system. A summary of the installation specifications of the wells has been included as

**Table 6;** water level measurements (depth to water and water elevation) are presented in **Table 12.** The locations of the monitoring wells are shown on **Figure 12.**

The groundwater elevation data are graphically presented as groundwater elevation contour maps in **Figure 13.** The shallow water bearing zone (water table) includes piezometers screened to depths of approximately 15-feet below ground surface. The data from March 2014 for the shallow groundwater zone are inconclusive as to the influence of the groundwater recovery points on the capture and movement of groundwater. Data from additional time periods will be required to confirm the presence of a capture zone for the shallow groundwater from this system. Some slight mounding may be present in the re-injection zone although additional data and monitoring appears to be required at this location as well.

### **Evaluation of Pump and Treat System Effectiveness**

A total of 907,782 gallons of water were extracted from the Cell 5 Area dual phase extraction wells and treated during the first quarter of 2015. The average recovery rate for the DPE system was around 13,824 gpd. This system experienced some icing within some of the extraction lines during the quarter and was non-operational for several days. Improvements have since been put into place to prevent freezing issues.

Operations were in conformance with the manufacturer's specifications at all times that stripped hydrocarbons were discharged to the atmosphere in accordance with the March 24, 2014 permit-to-construct conditions as reflected in the Permit to Operate issued to Sparrows Point LLC on December 8, 2014.

A total of 50.8 pounds (lbs) of benzene, toluene and xylene compounds (btex) and naphthalene were removed and treated during the first quarter of 2015. This total is shown graphically in **Figure 3**. The following table presents data for influent and effluent (treated) groundwater.

Field_ID	Analysis	Units	14-Jan	20-Jan	25-Feb	28-Feb	12-Mar	24-Mar	Quarter Average
GWPT Cell 5 INFLUENT	Benzene	ug/L	400	600	360	490	460	440	<b>458</b>
GWPT Cell 5 INFLUENT	Toluene	ug/L	210	650	220	290	290	280	<b>323</b>
GWPT Cell 5 INFLUENT	Total Xylenes	ug/L	190	280	180	250	330	330	<b>260</b>
GWPT Cell 5 INFLUENT	Naphth	ug/L	5700	8200	6300	2900	6400	6300	<b>5967</b>
GWPT Cell 5 EFFLUENT	Benzene	ug/L	0	0	0	0	0	0	<b>0</b>
GWPT Cell 5 EFFLUENT	Toluene	ug/L	0	0	0	0	0	0	<b>0</b>
GWPT Cell 5 EFFLUENT	Total Xylenes	ug/L	0	0	0	0	0	0	<b>0</b>
GWPT Cell 5 EFFLUENT	Naphth	ug/L	230	320	580	85	470	500	<b>364</b>

The DPE system is removing volatile hydrocarbons from groundwater within the shallow water bearing zone at the current recovery rates. Improved performance is expected in the future as the system improves in operation.

### 1<sup>st</sup> Quarter 2015 Groundwater Monitoring Results

Groundwater samples were collected in March 2015 from the following shallow zone monitoring wells; the well locations are shown on **Figure 12**.

- CO23- PZM008
- CO24-PZM007
- CO26-PZM007
- CO55-PZM000
- CO56-PZP001
- CO57-PZP002
- CO58-PZM001
- CO59-PZP002
- CO60-PZP001

The groundwater samples were submitted to Pace Analytical Services, Inc., located in Greensburg, Pennsylvania for the analyses shown in **Table 13**. These data indicate naphthalene is the most prevalent hydrocarbon constituent. The naphthalene concentrations for the 2014-

2015 sampling events are shown for the groundwater wells monitored for system performance as illustrated in **Figure 14A** and **14B**. **Figure 14A** presents shallow groundwater naphthalene concentration trends for wells presumed to be upgradient of the treatment system, **Figure 14B** presents shallow groundwater naphthalene concentrations for downgradient wells between the treatment system and the shoreline. **Figure 15** presents a plan view of the concentration of naphthalene in the shallow zone from analytical results from the March 2015 monitoring event. These wells will continue to be monitored to assess possible trends associated with operation of the interim measure in future quarters.

## 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 2015. **Table 14** 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 16** illustrates the well locations. An estimated 212 gallons (1,550 pounds) of LNAPL were recovered during the first quarter 2015, bringing the total recovered LNAPL to 12,311 gallons (90,198 pounds) as of March 31, 2015. Additional skimmer pump systems were installed in wells BP-MW-10, BP-MW-11 and RW-3 in October 2014. Well BP-MW-10 did not produce measurable amounts of LNAPL. LNAPL was recovered from wells in the Cell 6 area as shown below.

The LNAPL was recovered from the following wells:

Well	Previous Well Identifier	LNAPL Recovery (gal/lbs)	
		1 <sup>st</sup> Qtr 2015	Total thru 1 <sup>st</sup> Qtr 2015
CO99-PZMxxx	RW-04	26 / 191	1,274/9336
CO89-PZMxxx	BP-MW-05	110/806	8,998/65,930
CO92-PZMxxx	BP-MW-08	26/191	1,326/9,710
CO95-PZMxxx	BP-MW-11	22/161	655/4,798
CO97-PZMxxx	RW-02	0/0	0.8/6
CO98-PZMxxx	RW-03	27.5/202	55.8/409
CO96-PZMxxx	RW-01	0/0	1.3/10
	<b>TOTAL</b>		

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

- RW-04 (2.11 ft),
- BP-MW-05 (1.3 ft),
- BP-MW-08 (3.7 ft),
- BP-MW-11 (4.15 ft),
- RW-03 (1.3 ft),
- RW-01 (0.15 ft),
- RW-02 (0.07 ft),

No LNAPL was observed in wells RW-05, BP-MW-06, BP-MW-07, BP-MW-09, BP-MW-10 or CO19-PZM004. For all wells in which LNAPL accumulated, **Table 15** 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 in Former Benzol Processing Area**  
**Former Coke Oven Area Interim Remedial Measures**  
**Sparrows Point, LLC**

**Cell 1 First Quarter 2015 Estimated Hydrocarbon Recovery**

Parameter	Units	Quantity
Total CATOX Operating Time (January 1 - March 31, 2015)	hours	408
Overall CATOX Operational Time	%	18.5%
Estimated Total Hydrocarbons Destroyed	pounds	3.866
Estimated Hydrocarbon Removal Rate	pounds/hour	0.00947

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

Parameter	Units	Quantity
Total ICE/CATOX Operating Time (August 3, 2010 - March 31, 2015)	hours	21,888
Overall CATOX Operational Time	%	62.7%
Estimated Total Hydrocarbons Destroyed	pounds	12,449
Estimated Hydrocarbon Removal Rate	pounds/hour	0.57

**Table 2**  
**Summary of Soil Gas Analytical Results (First Quarter 2015)**  
**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 2015
<b>TO-15 Volatile Organics</b>		
Acetone	ug/m <sup>3</sup>	<b>12</b>
Benzene	ug/m <sup>3</sup>	<b>29,700</b>
Bromoform	ug/m <sup>3</sup>	0
2-Butanone (MEK)	ug/m <sup>3</sup>	<b>3</b>
Carbon disulfide	ug/m <sup>3</sup>	0
Carbon tetrachloride	ug/m <sup>3</sup>	0
Chlorobenzene	ug/m <sup>3</sup>	0
Chloroethane	ug/m <sup>3</sup>	0
Chloroform	ug/m <sup>3</sup>	0
1,1-Dichloroethane	ug/m <sup>3</sup>	0
1,2-Dichloroethane	ug/m <sup>3</sup>	0
1,1-Dichloroethene	ug/m <sup>3</sup>	0
trans-1,2-Dichloroethene	ug/m <sup>3</sup>	0
1,2-Dichloropropane	ug/m <sup>3</sup>	0
cis-1,3-Dichloropropene	ug/m <sup>3</sup>	0
trans-1,3-Dichloropropene	ug/m <sup>3</sup>	0
Ethylbenzene	ug/m <sup>3</sup>	<b>28</b>
2-Hexanone	ug/m <sup>3</sup>	0
Methylene Chloride	ug/m <sup>3</sup>	0
4-Methyl-2-pentanone (MIBK)	ug/m <sup>3</sup>	0
1,1,2,2-Tetrachloroethane	ug/m <sup>3</sup>	0
Tetrachloroethene	ug/m <sup>3</sup>	0
Toluene	ug/m <sup>3</sup>	<b>1,635</b>
1,1,1-Trichloroethane	ug/m <sup>3</sup>	0
1,1,2-Trichloroethane	ug/m <sup>3</sup>	0
Trichloroethene	ug/m <sup>3</sup>	0
Vinyl chloride	ug/m <sup>3</sup>	0
m&p-Xylene	ug/m <sup>3</sup>	<b>975</b>
o-Xylene	ug/m <sup>3</sup>	<b>360</b>
<b>Total Volatile Organics</b>	ug/m <sup>3</sup>	<b>32,712</b>

**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/m<sup>3</sup> = micro grams per cubic meter

ND = Analyte not detected above laboratory reporting limit

**Table 3**  
**Summary of Groundwater Analytical Results (First Quarter 2015)**  
**Cell 1: Prototype AS/SVE System in Former Benzol Processing Area**  
**Former Coke Oven Area Interim Remedial Measures**  
**Sparrows Point, LLC**

New Sample ID		CO02-PZM006	CO18-PZM006	CO93-PZMxxx
Former Sample ID		CO02-PZM006	CO18-PZM006	BP-MW-09
Date		3/25/2015	3/25/2015	3/25/2015
Analyte	Units			
<b>Volatile Organics</b>				
1,1,1,2-Tetrachloroethane	µg/L	ND	ND	ND
1,1,1-Trichloroethane	µg/L	ND	ND	ND
1,1,2,2-Tetrachloroethane	µg/L	ND	ND	ND
1,1,2-Trichloroethane	µg/L	ND	ND	ND
1,1-Dichloroethane	µg/L	ND	ND	ND
1,1-Dichloroethene	µg/L	ND	ND	ND
1,2,3-Trichloropropane	µg/L	ND	ND	ND
1,2-Dibromo-3-chloropropane	µg/L	ND	ND	ND
1,2-Dibromoethane (EDB)	µg/L	ND	ND	ND
1,2-Dichlorobenzene	µg/L	ND	ND	ND
1,2-Dichloroethane	µg/L	ND	ND	ND
1,2-Dichloropropane	µg/L	ND	ND	ND
1,4-Dichlorobenzene	µg/L	ND	ND	ND
2-Butanone (MEK)	µg/L	ND	ND	ND
2-Hexanone	µg/L	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	µg/L	ND	ND	ND
Acetone	µg/L	ND	<b>74.5</b>	ND
Acrylonitrile	µg/L	ND	ND	ND
Benzene	µg/L	<b>170000</b>	<b>38300</b>	<b>236000</b>
Bromochloromethane	µg/L	ND	ND	ND
Bromodichloromethane	µg/L	ND	ND	ND
Bromoform	µg/L	ND	ND	ND
Bromomethane	µg/L	ND	ND	ND
Carbon disulfide	µg/L	ND	ND	<b>9.5</b>
Carbon tetrachloride	µg/L	ND	ND	ND
Chlorobenzene	µg/L	ND	ND	<b>16.2</b>
Chloroethane	µg/L	ND	ND	ND
Chloroform	µg/L	ND	ND	ND
Chloromethane	µg/L	ND	ND	ND
Dibromochloromethane	µg/L	ND	ND	ND
Dibromomethane	µg/L	ND	ND	ND
Ethylbenzene	µg/L	<b>394</b>	<b>10.6</b>	<b>2690</b>
Iodomethane	µg/L	ND	ND	ND
Methyl-tert-butyl ether	µg/L	ND	ND	ND
Methylene Chloride	µg/L	ND	ND	ND
Styrene	µg/L	<b>22.8</b>	ND	<b>1930</b>
Tetrachloroethene	µg/L	ND	ND	ND
Toluene	µg/L	<b>1540</b>	<b>560</b>	<b>49100</b>
Trichloroethene	µg/L	ND	ND	ND
Trichlorofluoromethane	µg/L	ND	ND	ND
Vinyl acetate	µg/L	ND	ND	ND
Vinyl chloride	µg/L	ND	ND	ND
Xylene (Total)	µg/L	<b>1840</b>	<b>592</b>	<b>34600</b>
cis-1,2-Dichloroethene	µg/L	ND	ND	ND
cis-1,3-Dichloropropene	µg/L	ND	ND	ND
trans-1,2-Dichloroethene	µg/L	ND	ND	ND
trans-1,3-Dichloropropene	µg/L	ND	ND	ND
trans-1,4-Dichloro-2-butene	µg/L	ND	ND	ND
<b>Total Volatile Organics</b>	µg/L	<b>173,797</b>	<b>39,537</b>	<b>324,346</b>
<b>Semi-Volatiles</b>				
Naphthalene	µg/L	<b>599</b>	<b>78.4</b>	<b>5740</b>

Notes:

Bold = Analyte Detected

ND = Analyte not detected above laboratory reporting limit

µg/L = Micrograms per liter

**Table 4**  
**Summary of Operation Conditions**  
**Cell 2 AS/SVE System**  
**Former Coke Oven Area Interim Remedial Measures**  
**Sparrows Point, LLC**

**Cell 2 Fourth Quarter 2014 Estimated Hydrocarbon Recovery**

Parameter	Units	Quantity
Total CATOX Operating Time (January 1 - March 31, 2015)	hours	1,584
Overall CATOX Operational Time	%	71.7%
Estimated Total Hydrocarbons Destroyed	pounds	50.40
Estimated Hydrocarbon Removal Rate	pounds/hour	0.032

**Cell 2 Cumulative Summary of Estimated Hydrocarbon Recovery**

Parameter	Units	Quantity
Total ICE/CATOX Operating Time (October 1, 2014 - March 31, 2015)	hours	3,432
Overall CATOX Operational Time	%	78.6%
Estimated Total Hydrocarbons Destroyed	pounds	219.50
Estimated Hydrocarbon Removal Rate	pounds/hour	0.032

**Table 5**  
**Summary of Soil Gas Analytical Results (First Quarter 2015)**  
**Cell 2 AS/SVE System**  
**Former Coke Oven Area Interim Remedial Measures**  
**Sparrows Point, LLC**

Analyte	Sample ID Date Time Dilution Factor Units	CATOX Influent Q1 2015
<b>TO-15 Volatile Organics</b>		
Acetone	ug/m <sup>3</sup>	<b>4</b>
Benzene	ug/m <sup>3</sup>	<b>40,863</b>
Bromoform	ug/m <sup>3</sup>	0
2-Butanone (MEK)	ug/m <sup>3</sup>	0
Carbon disulfide	ug/m <sup>3</sup>	<b>7</b>
Carbon tetrachloride	ug/m <sup>3</sup>	0
Chlorobenzene	ug/m <sup>3</sup>	0
Chloroethane	ug/m <sup>3</sup>	0
Chloroform	ug/m <sup>3</sup>	0
1,1-Dichloroethane	ug/m <sup>3</sup>	0
1,2-Dichloroethane	ug/m <sup>3</sup>	0
1,1-Dichloroethene	ug/m <sup>3</sup>	0
trans-1,2-Dichloroethene	ug/m <sup>3</sup>	0
1,2-Dichloropropane	ug/m <sup>3</sup>	0
cis-1,3-Dichloropropene	ug/m <sup>3</sup>	0
trans-1,3-Dichloropropene	ug/m <sup>3</sup>	0
Ethylbenzene	ug/m <sup>3</sup>	<b>626</b>
2-Hexanone	ug/m <sup>3</sup>	<b>1</b>
Methylene Chloride	ug/m <sup>3</sup>	<b>2</b>
4-Methyl-2-pentanone (MIBK)	ug/m <sup>3</sup>	0
1,1,2,2-Tetrachloroethane	ug/m <sup>3</sup>	<b>2</b>
Tetrachloroethene	ug/m <sup>3</sup>	0
Toluene	ug/m <sup>3</sup>	<b>10,553</b>
1,1,1-Trichloroethane	ug/m <sup>3</sup>	0
1,1,2-Trichloroethane	ug/m <sup>3</sup>	0
Trichloroethene	ug/m <sup>3</sup>	0
Vinyl chloride	ug/m <sup>3</sup>	0
m&p-Xylene	ug/m <sup>3</sup>	<b>3,280</b>
o-Xylene	ug/m <sup>3</sup>	<b>1,295</b>
<b>Total Volatile Organics</b>	ug/m <sup>3</sup>	<b>56,634</b>

**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/m<sup>3</sup> = micro grams per cubic meter

ND = Analyte not detected above laboratory reporting limit

**Table 6**  
**Cell 2 and Cell 5 Monitoring Well Data**

Location Designation	Monitoring Well Designation	Monitoring Well Temporary Identification	Installation Method	Date Installed	Well Use	Northing	Eastings	Top of Casing Elevation	Protective Cover Type	Well Total Depth	Riser Length	Screen Length	Filter Pack Interval	Seal Interval	Grout Interval
CO36	CO36-PZM008	Cell 2 - MW1 (S)	Hollow Stem Auger	3/2014 - 5/2014	Monitoring Well	563212.31	1454571.76	6.94	Steel Riser	15.00	5.00	10.00	3-15	2-3	0-2
	CO36-PZM043	Cell 2 - MW8 (I)	Hollow Stem Auger	3/2014 - 5/2014	Monitoring Well	563214.49	1454578.37	6.92	Steel Riser	50.00	30.00	20.00	28-50	27-28	0-27
CO37	CO37-PZM003	Cell 2 - MW2 (S)	Hollow Stem Auger	3/2014 - 5/2014	Monitoring Well	563268.52	1455158.69	12.34	Steel Riser	15.00	5.00	10.00	3-15	2-3	0-2
	CO37-PZM038	Cell 2 - MW9 (I)	Hollow Stem Auger	3/2014 - 5/2014	Monitoring Well	563268.50	1455154.68	12.12	Steel Riser	50.00	30.00	20.00	28-50	27-28	0-27
CO38	CO38-PZM006	Cell 2 - MW3 (S)	Hollow Stem Auger	3/2014 - 5/2014	Monitoring Well	563078.80	1454743.79	6.75	Steel Riser	13.00	3.00	10.00	2-13	1-2	0-1
	CO38-PZM043	Cell 2 - MW10 (I)	Hollow Stem Auger	3/2014 - 5/2014	Monitoring Well	563078.33	1454737.75	6.65	Steel Riser	50.00	30.00	20.00	28-50	27-28	0-27
CO39	CO39-PZM007	Cell 2 - MW4 (S)	Hollow Stem Auger	3/2014 - 5/2014	Monitoring Well	563141.66	1455095.70	7.75	Steel Riser	15.00	5.00	10.00	3-15	2-3	0-2
	CO39-PZM042	Cell 2 - MW11 (I)	Hollow Stem Auger	3/2014 - 5/2014	Monitoring Well	563140.07	1455089.80	7.91	Steel Riser	50.00	30.00	20.00	28-50	27-28	0-27
CO40	CO40-PZM008	Cell 2 - MW5 (S)	Hollow Stem Auger	3/2014 - 5/2014	Monitoring Well	563039.41	1455081.70	7.47	Steel Riser	15.00	5.00	10.00	3-15	2-3	0-2
CO41	CO41-PZM001	Cell 2 - MW6 (S)	Hollow Stem Auger	3/2014 - 5/2014	Monitoring Well	562873.18	1454953.00	13.57	Steel Riser	15.00	5.00	10.00	3-15	2-3	0-2
	CO41-PZM036	Cell 2 - MW12 (I)	Hollow Stem Auger	3/2014 - 5/2014	Monitoring Well	562865.34	1454950.75	13.6	Steel Riser	50.00	30.00	20.00	28-50	27-28	0-27
CO42	CO42-PZM004	Cell 2 - MW7 (S)	Hollow Stem Auger	3/2014 - 5/2014	Monitoring Well	563177.72	1455458.51	10.83	Steel Riser	15.00	5.00	10.00	3-15	2-3	0-2
CO43	CO43-PZM048	Cell 2 - GW Extraction Well 1	Hollow Stem Auger	3/2014 - 5/2014	Groundwater Extraction	563202.59	1454621.23	1.96	Steel Riser	50.00	35.00	15.00	33-50	32-33	0-32
CO44	CO44-PZM048	Cell 2 - GW Extraction Well 2	Hollow Stem Auger	3/2014 - 5/2014	Groundwater Extraction	563206.63	1454719.44	1.73	Steel Riser	50.00	35.00	15.00	33-50	32-33	0-32
CO45	CO45-PZM047	Cell 2 - GW Extraction Well 3	Hollow Stem Auger	3/2014 - 5/2014	Groundwater Extraction	563218.62	1454818.73	2.68	Steel Riser	50.00	35.00	15.00	33-50	32-33	0-32
CO46	CO46-PZM047	Cell 2 - GW Extraction Well 4	Hollow Stem Auger	3/2014 - 5/2014	Groundwater Extraction	563226.70	1454918.44	3.08	Steel Riser	50.00	35.00	15.00	33-50	32-33	0-32
CO47	CO47-PZM046	Cell 2 - GW Extraction Well 5	Hollow Stem Auger	3/2014 - 5/2014	Groundwater Extraction	563234.85	1455018.95	3.85	Steel Riser	50.00	35.00	15.00	33-50	32-33	0-32
CO48	CO48-PZM044	Cell 2 - GW Extraction Well 6	Hollow Stem Auger	3/2014 - 5/2014	Groundwater Extraction	563243.86	1455117.45	5.55	Steel Riser	50.00	35.00	15.00	33-50	32-33	0-32
CO49	CO49-PZM	Cell 2 - RIW 1	Hollow Stem Auger	3/2014 - 5/2014	Reinjection Well	563045.26	1455174.13	6.52	Steel Riser						
CO50	CO50-PZM	Cell 2 - RIW 2	Hollow Stem Auger	3/2014 - 5/2014	Reinjection Well	563049.45	1455224.48	7.71	Steel Riser						
CO51	CO51-PZM	Cell 2 - RIW 3	Hollow Stem Auger	3/2014 - 5/2014	Reinjection Well	563056.05	1455281.11	7.58	Steel Riser						
CO52	CO52-PZM	Cell 2 - RIW 4	Hollow Stem Auger	3/2014 - 5/2014	Reinjection Well	563066.70	1455325.29	7.92	Steel Riser						
CO53	CO53-PZM	Cell 2 - RIW 5	Hollow Stem Auger	3/2014 - 5/2014	Reinjection Well	563078.31	1455365.17	7.77	Steel Riser						
CO54	CO54-PZM	Cell 2 - RIW 6	Hollow Stem Auger	3/2014 - 5/2014	Reinjection Well	563103.41	1455423.30	7.84	Steel Riser						
CO55	CO55-PZM000	Cell 5 - MW1 (S)	Hollow Stem Auger	3/2014 - 5/2014	Monitoring Well	561434.42	1457585.90	15.1	Steel Riser	15.00	5.00	10.00	3-15	2-3	0-2
CO56	CO56-PZP001	Cell 5 - MW2 (S)	Hollow Stem Auger	3/2014 - 5/2014	Monitoring Well	561668.41	1457790.05	15.92	Steel Riser	15.00	5.00	10.00	3-15	2-3	0-2
CO57	CO57-PZP002	Cell 5 - MW3 (S)	Hollow Stem Auger	3/2014 - 5/2014	Monitoring Well	561122.52	1457530.00	16.59	Steel Riser	15.00	5.00	10.00	3-15	2-3	0-2
CO58	CO58-PZM001	Cell 5 - MW4 (S)	Hollow Stem Auger	3/2014 - 5/2014	Monitoring Well	561331.31	1457989.13	14.31	Steel Riser	15.00	5.00	10.00	3-15	2-3	0-2
CO59	CO59-PZP002	Cell 5 - MW5 (S)	Hollow Stem Auger	3/2014 - 5/2014	Monitoring Well	561446.98	1457308.79	16.75	Steel Riser	15.00	5.00	10.00	3-15	2-3	0-2
CO60	CO60-PZP001	Cell 5 - MW6 (S)	Hollow Stem Auger	3/2014 - 5/2014	Monitoring Well	561872.55	1457913.36	15.83	Steel Riser	15.00	5.00	10.00	3-15	2-3	0-2
CO61	CO61-PZM007	Cell 5 - DPE Well 1	Hollow Stem Auger	3/2014 - 5/2014	Groundwater and Vapor Extractio	561330.96	1457592.28	10.26	Steel Riser	17.00	15.00	2.00	13-17	12-13	4-12
CO62	CO62-PZM007	Cell 5 - DPE Well 2	Hollow Stem Auger	3/2014 - 5/2014	Groundwater and Vapor Extractio	561357.45	1457625.28	9.66	Steel Riser	17.00	15.00	2.00	13-17	12-13	4-12
CO63	CO63-PZM007	Cell 5 - DPE Well 3	Hollow Stem Auger	3/2014 - 5/2014	Groundwater and Vapor Extractio	561382.08	1457657.57	10.29	Steel Riser	17.00	15.00	2.00	13-17	12-13	4-12
CO64	CO64-PZM006	Cell 5 - DPE Well 4	Hollow Stem Auger	3/2014 - 5/2014	Groundwater and Vapor Extractio	561407.02	1457691.78	11.16	Steel Riser	17.00	15.00	2.00	13-17	12-13	4-12
CO65	CO65-PZM005	Cell 5 - DPE Well 5	Hollow Stem Auger	3/2014 - 5/2014	Groundwater and Vapor Extractio	561431.95	1457724.23	11.6	Steel Riser	17.00	15.00	2.00	13-17	12-13	4-12
CO66	CO66-PZM005	Cell 5 - DPE Well 6	Hollow Stem Auger	3/2014 - 5/2014	Groundwater and Vapor Extractio	561458.25	1457755.59	11.57	Steel Riser	17.00	15.00	2.00	13-17	12-13	4-12
CO67	CO67-PZM006	Cell 5 - DPE Well 7	Hollow Stem Auger	3/2014 - 5/2014	Groundwater and Vapor Extractio	561503.24	1457809.88	11.2	Steel Riser	17.00	15.00	2.00	13-17	12-13	4-12
CO68	CO68-PZM005	Cell 5 - DPE Well 8	Hollow Stem Auger	3/2014 - 5/2014	Groundwater and Vapor Extractio	561537.61	1457830.32	12.03	Steel Riser	17.00	15.00	2.00	13-17	12-13	4-12
CO69	CO69-PZM005	Cell 5 - DPE Well 9	Hollow Stem Auger	3/2014 - 5/2014	Groundwater and Vapor Extractio	561579.10	1457852.16	11.92	Steel Riser	17.00	15.00	2.00	13-17	12-13	4-12
CO70	CO70-PZM005	Cell 5 - DPE Well 10	Hollow Stem Auger	3/2014 - 5/2014	Groundwater and Vapor Extractio	561618.53	1457867.42	12.28	Steel Riser	17.00	15.00	2.00	13-17	12-13	4-12
CO71	CO71-PZM006	Cell 5 - DPE Well 11	Hollow Stem Auger	3/2014 - 5/2014	Groundwater and Vapor Extractio	561654.51	1457886.12	11.33	Steel Riser	17.00	15.00	2.00	13-17	12-13	4-12
CO72	CO72-PZM005	Cell 5 - DPE Well 12	Hollow Stem Auger	3/2014 - 5/2014	Groundwater and Vapor Extractio	561694.20	1457904.22	11.96	Steel Riser	17.00	15.00	2.00	13-17	12-13	4-12
CO73	CO73-PZM007	Cell 5 - RIW 1	Hollow Stem Auger	3/2014 - 5/2014	Reinjection Well	561813.02	1457253.88	11.03	Steel Riser	18.00	3.00	15.00	2-18	1-2	0-1
CO74	CO74-PZM007	Cell 5 - RIW 2	Hollow Stem Auger	3/2014 - 5/2014	Reinjection Well	561830.95	1457262.00	10.84	Steel Riser	18.00	3.00	15.00	2-18	1-2	0-1
CO75	CO75-PZM006	Cell 5 - RIW 3	Hollow Stem Auger	3/2014 - 5/2014	Reinjection Well	561831.95	1457277.07	10.07	Steel Riser	16.00	6.00	10.00	5-16	4-5	0-4
CO76	CO76-PZM006	Cell 5 - RIW 4	Hollow Stem Auger	3/2014 - 5/2014	Reinjection Well	561838.34	1457290.97	10.09	Steel Riser	16.00	6.00	10.00	5-16	4-5	0-4
CO77	CO77-PZM006	Cell 5 - RIW 5	Hollow Stem Auger	3/2014 - 5/2014	Reinjection Well	561840.78	1457353.41	10.39	Steel Riser	16.00	6.00	10.00	5-16	4-5	0-4
CO78	CO78-PZM006	Cell 5 - RIW 6	Hollow Stem Auger	3/2014 - 5/2014	Reinjection Well	561835.90	1457409.46	9.89	Steel Riser	16.00	6.00	10.00	5-16	4-5	0-4

**Table 7**  
**Cell 2**  
**Monitoring Well Groundwater Elevations**

Well ID	Temporary Well ID	Top of PVC Elevation (ft)	Aquifer	Well Depth from Ground Surface (ft)	3/12/2015	
					Depth to Groundwater (ft)	Groundwater Elevation (ft)
CO27-PZM012		5.12	S	17.00	4.85	0.27
CO27-PZM046		5.17	I	51.00	8.25	-3.08
CO36-PZM008	Cell 2 - MW1 (S)	6.94	S	15.00	7.21	-0.27
CO36-PZM043	Cell 2 - MW8 (I)	6.92	I	50.00	8.21	-1.29
CO37-PZM003	Cell 2 - MW2 (S)	12.34	S	15.00		NM
CO37-PZM038	Cell 2 - MW9 (I)	12.12	I	50.00	12.51	-0.39
CO38-PZM006	Cell 2 - MW3 (S)	6.75	S	13.00	6.55	0.20
CO38-PZM043	Cell 2 - MW10 (I)	6.65	I	50.00	7.65	-1.00
CO39-PZM007	Cell 2 - MW4 (S)	7.75	S	15.00	5.58	2.17
CO39-PZM042	Cell 2 - MW11 (I)	7.91	I	50.00	8.94	-1.03
CO40-PZM008	Cell 2 - MW5 (S)	7.47	S	15.00	6.38	1.09
CO41-PZM001	Cell 2 - MW6 (S)	13.57	S	15.00	12.56	1.01
CO41-PZM036	Cell 2 - MW12 (I)	13.6	I	50.00	14.22	-0.62
CO42-PZM004	Cell 2 - MW7 (S)	10.83	S	15.00	6.53	4.30
CO43-PZM048	Cell 2 - GW Extraction Well 1	1.96	I	50.00	NM	NM
CO44-PZM048	Cell 2 - GW Extraction Well 2	1.73	I	50.00	NM	NM
CO45-PZM047	Cell 2 - GW Extraction Well 3	2.68	I	50.00	NM	NM
CO46-PZM047	Cell 2 - GW Extraction Well 4	3.08	I	50.00	NM	NM
CO47-PZM046	Cell 2 - GW Extraction Well 5	3.85	I	50.00	NM	NM
CO48-PZM044	Cell 2 - GW Extraction Well 6	5.55	I	50.00	NM	NM

**Notes**

I = Intermediate depth wells S = Water table well

NA = No survey available

NM = Not Measured

**Table 8**  
**Summary of Groundwater Analytical Results (First Quarter 2015)**  
**Cell 2**  
**Former Coke Oven Area Interim Remedial Measures**  
**Sparrows Point, LLC**

New Sample ID		CO27-PZM012	CO27-PZM046	CO36-PZM008	CO36-PZM043	CO37-PZM038	CO37-PZM003	CO38-PZM043	CO38-PZM006	CO39-PZM007	CO39-PZM042	CO40-PZM008	CO41-PZM001	CO41-PZM036	CO42-PZM004
Former Sample ID		CO27-PZM012	CO27-PZM046	Cell 2-MW1 (S)	Cell2-MW8 (I)	Cell2-MW9 (I)	Cell2-MW2 (S)	Cell2-MW10 (I)	Cell2-MW3 (S)	Cell2-MW4 (S)	Cell2-MW11 (I)	Cell2-MW5 (S)	Cell2-MW6 (S)	Cell2-MW12 (I)	Cell2-MW7 (S)
Date		3/12/2015	3/12/2015	3/12/2015	3/12/2015	3/12/2015	NS	3/12/2015	3/12/2015	3/13/2015	3/13/2015	3/13/2015	3/13/2015	3/13/2015	3/13/2015
Analyte	Units														
<b>Volatile Organics</b>															
1,1,1,2-Tetrachloroethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane (EDB)	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Acrylonitrile	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	µg/L	<b>8280</b>	<b>403000</b>	<b>30200</b>	<b>41500</b>	<b>32800</b>	NS	<b>10.3</b>	<b>16500</b>	<b>424</b>	<b>41700</b>	<b>8910</b>	<b>98600</b>	<b>428000</b>	<b>1390</b>
Bromochloromethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Dibromomethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	µg/L	<b>73.2</b>	<b>853</b>	<b>72.1</b>	<b>104</b>	<b>346</b>	NS	<b>8.2</b>	<b>123</b>	<b>2.7</b>	<b>340</b>	<b>87.7</b>	<b>1010</b>	<b>1210</b>	<b>218</b>
Iodomethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Methyl-tert-butyl ether	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	µg/L	<b>47.4</b>	<b>216</b>	<b>14.2</b>	<b>20.6</b>	<b>585</b>	NS	ND	<b>126</b>	<b>1.2</b>	<b>552</b>	<b>128</b>	<b>95.5</b>	<b>328</b>	<b>201</b>
Tetrachloroethene	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	µg/L	<b>1920</b>	<b>56800</b>	<b>5960</b>	<b>7950</b>	<b>15000</b>	NS	<b>2.2</b>	<b>3610</b>	<b>38.6</b>	<b>15700</b>	<b>2930</b>	<b>45700</b>	<b>141000</b>	<b>3020</b>
Trichloroethene	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl acetate	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
Xylene (Total)	µg/L	<b>661</b>	<b>13400</b>	<b>1460</b>	<b>1770</b>	<b>2880</b>	NS	<b>3</b>	<b>961</b>	<b>18.4</b>	<b>2820</b>	<b>901</b>	<b>16400</b>	<b>27700</b>	<b>2160</b>
cis-1,2-Dichloroethene	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,4-Dichloro-2-butene	µg/L	ND	ND	ND	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND
<b>Total Volatile Organics</b>	µg/L	<b>10982</b>	<b>474269</b>	<b>37706</b>	<b>51345</b>	<b>51611</b>	<b>0</b>	<b>24</b>	<b>21320</b>	<b>485</b>	<b>61112</b>	<b>12957</b>	<b>161806</b>	<b>598238</b>	<b>6989</b>
<b>Semi-Volatiles</b>															
Naphthalene	µg/L	<b>596</b>	<b>20800</b>	<b>584</b>	<b>996</b>	<b>5300</b>	NS	<b>4</b>	<b>819</b>	<b>378</b>	<b>1840</b>	<b>13600</b>	<b>677</b>	<b>339</b>	<b>860</b>

Notes:

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

**Table 9**  
**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 2015 Estimated Hydrocarbon Recovery**

Parameter	Units	Quantity
Total CATOX Operating Time (January 1 - March 31, 2015)	hours	384
Overall CATOX Operational Time	%	17.8%
Estimated Total Hydrocarbons Destroyed	pounds	18.839
Estimated Hydrocarbon Removal Rate	pounds/hour	0.049060

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

Parameter	Units	Quantity
Total ICE/CATOX Operating Time (August 3, 2010 - March, 2015)	hours	16,415
Overall CATOX Operational Time	%	70.3%
Estimated Total Hydrocarbons Destroyed	pounds	1,463.8
Estimated Hydrocarbon Removal Rate	pounds/hour	0.09

**Table 10**  
**Summary of Soil Gas Analytical Results (First Quarter 2015)**  
**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 2015
<b>TO-15 Volatile Organics</b>		
Acetone	ug/m <sup>3</sup>	<b>34</b>
Benzene	ug/m <sup>3</sup>	<b>79,750</b>
Bromoform	ug/m <sup>3</sup>	0
2-Butanone (MEK)	ug/m <sup>3</sup>	<b>5</b>
Carbon disulfide	ug/m <sup>3</sup>	<b>7</b>
Carbon tetrachloride	ug/m <sup>3</sup>	0
Chlorobenzene	ug/m <sup>3</sup>	0
Chloroethane	ug/m <sup>3</sup>	0
Chloroform	ug/m <sup>3</sup>	0
1,1-Dichloroethane	ug/m <sup>3</sup>	0
1,2-Dichloroethane	ug/m <sup>3</sup>	0
1,1-Dichloroethene	ug/m <sup>3</sup>	0
trans-1,2-Dichloroethene	ug/m <sup>3</sup>	0
1,2-Dichloropropane	ug/m <sup>3</sup>	0
cis-1,3-Dichloropropene	ug/m <sup>3</sup>	0
trans-1,3-Dichloropropene	ug/m <sup>3</sup>	0
Ethylbenzene	ug/m <sup>3</sup>	<b>86</b>
2-Hexanone	ug/m <sup>3</sup>	0
Methylene Chloride	ug/m <sup>3</sup>	0
4-Methyl-2-pentanone (MIBK)	ug/m <sup>3</sup>	0
1,1,2,2-Tetrachloroethane	ug/m <sup>3</sup>	0
Tetrachloroethene	ug/m <sup>3</sup>	0
Toluene	ug/m <sup>3</sup>	<b>11,030</b>
1,1,1-Trichloroethane	ug/m <sup>3</sup>	0
1,1,2-Trichloroethane	ug/m <sup>3</sup>	0
Trichloroethene	ug/m <sup>3</sup>	0
Vinyl chloride	ug/m <sup>3</sup>	0
m&p-Xylene	ug/m <sup>3</sup>	<b>1,790</b>
o-Xylene	ug/m <sup>3</sup>	<b>863</b>
<b>Total Volatile Organics</b>	ug/m <sup>3</sup>	<b>93,564</b>

**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/m<sup>3</sup> = micro grams per cubic meter

ND = Analyte not detected above laboratory reporting limit

**Table 11**  
**Summary of Groundwater Analytical Results (First Quarter 2015)**  
**Cell 3: Prototype AS/SVE System in the "Cove" Area**  
**Former Coke Oven Area Interim Remedial Measures**  
**Sparrows Point, LLC**

New Sample ID		CO30-PZM015	CO30-PZM060	CO101-PZM	CO102-PZM	CO103-PZM	CO104-PZM
Former Sample ID		CO30-PZM015	CO30-PZM060	MW-CELL 3-1	MW-CELL 3-2	MW-CELL 3-3	MW-CELL 3-4
Date		3/16/2015	3/16/2015	3/16/2015	3/16/2015	3/16/2015	3/16/2015
Analyte	Units						
<b>Volatile Organics</b>							
1,1,1,2-Tetrachloroethane	µg/L	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	µg/L	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	µg/L	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	µg/L	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	µg/L	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	µg/L	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	µg/L	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane	µg/L	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane (EDB)	µg/L	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	µg/L	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	µg/L	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	µg/L	ND	ND	ND	ND	ND	ND
2-Hexanone	µg/L	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	µg/L	ND	ND	ND	ND	ND	ND
Acetone	µg/L	ND	ND	ND	ND	ND	ND
Acrylonitrile	µg/L	ND	ND	ND	ND	ND	ND
Benzene	µg/L	<b>79500</b>	<b>10.8</b>	<b>2240</b>	<b>17200</b>	<b>47300</b>	<b>55.1</b>
Bromochloromethane	µg/L	ND	ND	ND	ND	ND	ND
Bromodichloromethane	µg/L	ND	ND	ND	ND	ND	ND
Bromoform	µg/L	ND	ND	ND	ND	ND	ND
Bromomethane	µg/L	ND	ND	ND	ND	ND	ND
Carbon disulfide	µg/L	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	µg/L	ND	ND	ND	ND	ND	ND
Chlorobenzene	µg/L	ND	ND	ND	ND	ND	ND
Chloroethane	µg/L	ND	ND	ND	ND	ND	ND
Chloroform	µg/L	ND	ND	ND	ND	ND	ND
Chloromethane	µg/L	ND	ND	ND	ND	ND	ND
Dibromochloromethane	µg/L	ND	ND	ND	ND	ND	ND
Dibromomethane	µg/L	ND	ND	ND	ND	ND	ND
Ethylbenzene	µg/L	<b>96.8</b>	ND	<b>18.6</b>	<b>22.5</b>	<b>80</b>	ND
Iodomethane	µg/L	ND	ND	ND	ND	ND	ND
Methyl-tert-butyl ether	µg/L	ND	ND	ND	ND	ND	ND
Methylene Chloride	µg/L	<b>ND</b>	ND	ND	ND	ND	ND
Styrene	µg/L	<b>24.4</b>	ND	<b>6.3</b>	<b>5.7</b>	<b>14.6</b>	ND
Tetrachloroethene	µg/L	ND	ND	ND	ND	ND	ND
Toluene	µg/L	<b>5650</b>	<b>1.7</b>	<b>500</b>	<b>1100</b>	<b>3710</b>	<b>6.3</b>
Trichloroethene	µg/L	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	µg/L	ND	ND	ND	ND	ND	ND
Vinyl acetate	µg/L	ND	ND	ND	ND	ND	ND
Vinyl chloride	µg/L	ND	ND	ND	ND	ND	ND
Xylene (Total)	µg/L	<b>1420</b>	<b>ND</b>	<b>233</b>	<b>253</b>	<b>1340</b>	<b>3.3</b>
cis-1,2-Dichloroethene	µg/L	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	µg/L	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	µg/L	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	µg/L	ND	ND	ND	ND	ND	ND
trans-1,4-Dichloro-2-butene	µg/L	ND	ND	ND	ND	ND	ND
<b>Total Volatile Organics</b>	µg/L	<b>86,691</b>	<b>13</b>	<b>2,998</b>	<b>18,581</b>	<b>52,445</b>	<b>65</b>
<b>Semi-Volatiles</b>							
Naphthalene	µg/L	<b>7,050</b>	<b>5</b>	<b>4,680</b>	<b>1,370</b>	<b>11,000</b>	<b>43</b>

Notes:

Bold = Analyte Detected

ND = Analyte not detected above laboratory reporting limit

µg/L = Micrograms per liter

**Table 12**  
**Cell 5**  
**Monitoring Well Groundwater Elevations**

Well ID	Temporary Well ID	Top of PVC Elevation (ft)	Aquifer	Well Depth from PVC (ft)	12/22/2014		1/16/2014		3/17/2014	
					Depth to Groundwater (ft)	Groundwater Elevation (ft)	Depth to Groundwater (ft)	Groundwater Elevation (ft)	Depth to Groundwater (ft)	Groundwater Elevation (ft)
CO23-PZM008		15.76	S	19.00	15.05	0.71	15.41	0.35	15	0.76
CO24-PZM007		15.95	S	19.00	15.12	0.83	15.47	0.48	15.51	0.44
CO26-PZM007		14.89	S	20.00	15.26	-0.37	15.39	-0.5	14.87	0.02
CO55-PZM000	Cell 5 - MW1 (S)	15.1	S	15.00	14.55	0.55	14.95	0.15	14.53	0.57
CO56-PZP001	Cell 5 - MW2 (S)	15.92	S	15.00	15.40	0.52	15.75	0.17	15.30	0.62
CO57-PZP002	Cell 5 - MW3 (S)	16.59	S	15.00	15.42	1.17	15.33	1.26	14.65	1.94
CO58-PZM001	Cell 5 - MW4 (S)	14.31	S	15.00	13.90	0.41	14.20	0.11	13.72	0.59
CO59-PZP002	Cell 5 - MW5 (S)	16.75	S	15.00	16.15	0.60	16.54	0.21	16.07	0.68
CO60-PZP001	Cell 5 - MW6 (S)	15.83	S	15.00	15.33	0.50	15.68	0.15	15.22	0.61

**Notes**

I = Intermediate depth wells S = Water table well

NA = No survey available

NM = Not Measured

**Table 13**  
**Summary of Groundwater Analytical Results (First Quarter 2015)**  
**Cell 5 DPE Groundwater Pump and Treat System**  
**Former Coke Oven Area Interim Remedial Measures**  
**Sparrows Point, LLC**

New Sample ID	CO23-PZM008	CO24-PZM007	CO26-PZM007	CO55-PZM000	CO56-PZP001	CO57-PZP002	CO58-PZM001	CO59-PZP002	CO60-PZP001	
Former Sample ID	CO23-PZM008	CO24-PZM007	CO26-PZM007	Cell5-MW1 (S)	Cell5-MW2 (S)	Cell5-MW3 (S)	Cell5-MW4 (S)	Cell5-MW5 (S)	Cell5-MW6 (S)	
Date	3/17/2015	3/17/2015	3/17/2015	3/17/2015	3/17/2015	3/17/2015	3/17/2015	3/17/2015	3/17/2015	
Time	16:03	10:52	15:05	12:00	14:25	13:19	13:46	15:06	14:25	
Analyte	Units									
<b>Volatile Organics</b>										
1,1,1,2-Tetrachloroethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane (EDB)	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acrylonitrile	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	µg/L	<b>2900</b>	<b>4.9</b>	ND	<b>18.1</b>	<b>549</b>	ND	<b>220</b>	<b>106</b>	<b>500</b>
Bromochloromethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromomethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	µg/L	ND	7	ND	ND	<b>20.4</b>	ND	<b>11.1</b>	<b>5.8</b>	<b>11.5</b>
Iodomethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl-tert-butyl ether	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	µg/L	ND	ND	ND	ND	<b>81.8</b>	ND	<b>21.6</b>	<b>4.3</b>	<b>74.2</b>
Tetrachloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	µg/L	<b>1100</b>	<b>4.4</b>	ND	<b>10.1</b>	<b>345</b>	<b>1.1</b>	<b>68.2</b>	<b>62.7</b>	<b>202</b>
Trichloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl acetate	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylene (Total)	µg/L	<b>950</b>	<b>16.6</b>	ND	<b>7.4</b>	<b>401</b>	ND	<b>190</b>	<b>92.4</b>	<b>270</b>
cis-1,2-Dichloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,4-Dichloro-2-butene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
<b>Semi-Volatiles</b>										
Naphthalene	µg/L	<b>6,300</b>	<b>3,090</b>	<b>3.8</b>	<b>78</b>	<b>8,140</b>	ND	<b>1,750</b>	<b>451</b>	<b>7,640</b>
<b>Total Volatile Organics</b>	µg/L	<b>11,250</b>	<b>3,123</b>	<b>3.8</b>	<b>113</b>	<b>9,537</b>	<b>1</b>	<b>2,261</b>	<b>722</b>	<b>8,698</b>

Notes:

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

**Table 14**  
**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 ID	Former Well ID	LNAPL Occurrence During First Quarter 2015 (ft)	Total LNAPL Recovery Period		Cumulative Total LNAPL Recovered		Estimate LNAPL Recovered During First Quarter 2015	
			Begin	End	(gal)	(lbs) (a)	(gal)	(lbs) (a)
CO99-PZMxxx	RW-04	2.11	23-Jul-10	On-going (b)	1,274	9,336	26	191
CO89-PZMxxx	BP-MW-05	1.3	28-Jan-10	On-going (b)	8,998	65,930	110	806
CO92-PZMxxx	BP-MW-08	3.7	8-Sep-10	On-going (b)	1,326	9,710	26	191
CO95-PZMxxx	BP-MW-11	4.15	23-Jul-10	On-going (b)	655	4,798	22	161
CO97-PZMxxx	RW-02	0.07	28-Jan-11	On-going (c)	0.8	6	0	0
CO98-PZMxxx	RW-03	1.3	24-Nov-10	On-going (c)	55.8	409	27.5	202
CO96-PZMxxx	RW-01	0.15	28-Oct-11	On-going (c)	1.3	10	0	0
CO94-PZMxxx	BP-MW-10	0	na	na	0	0	0	0
CO91-PZMxxx	BP-MW-07	0	na	na	0	0	0	0
CO90-PZMxxx	BP-MW-06	none	na	na	0	0	0	0
CO100-PZMxxx	RW-05	none	na	na	0	0	0	0
CO93-PZMxxx	BP-MW-09	none	na	na	0	0	0	0
CO19-PZM004	CO19-PZM004	none	na	na	0	0	0	0
<b>Total Recovery:</b>					<b>12,311</b>	<b>90,198</b>	<b>212</b>	<b>1,550</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 15**  
**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	CO89-PZM			CO90-PZM			CO91-PZM		
	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness
3/11/2015	10.40	11.85	1.45	9.01	9.01	0	10.30	10.30	0
Date	CO92-PZM			CO93-PZM			CO94-PZM		
	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness
3/11/2015	11.05	14.75	3.7	10.13	10.13	0	7.15	7.15	0
Date	CO95-PZM			CO96-PZM			CO97-PZM		
	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness
3/11/2015	10.2	14.35	4.15	10.65	10.80	0.15	8.15	8.22	0.07
Date	CO98-PZM			CO99-PZM			CO100-PZM		
	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness	Depth to LNAPL	Depth to Water	LNAPL Thickness
3/11/2015	8.75	10.05	1.3	8.60	10.71	2.11	8.4	8.4	0
Date	CO19-PZM004								
	Depth to LNAPL	Depth to Water	LNAPL Thickness						
3/11/2015	9.25	9.25	0						

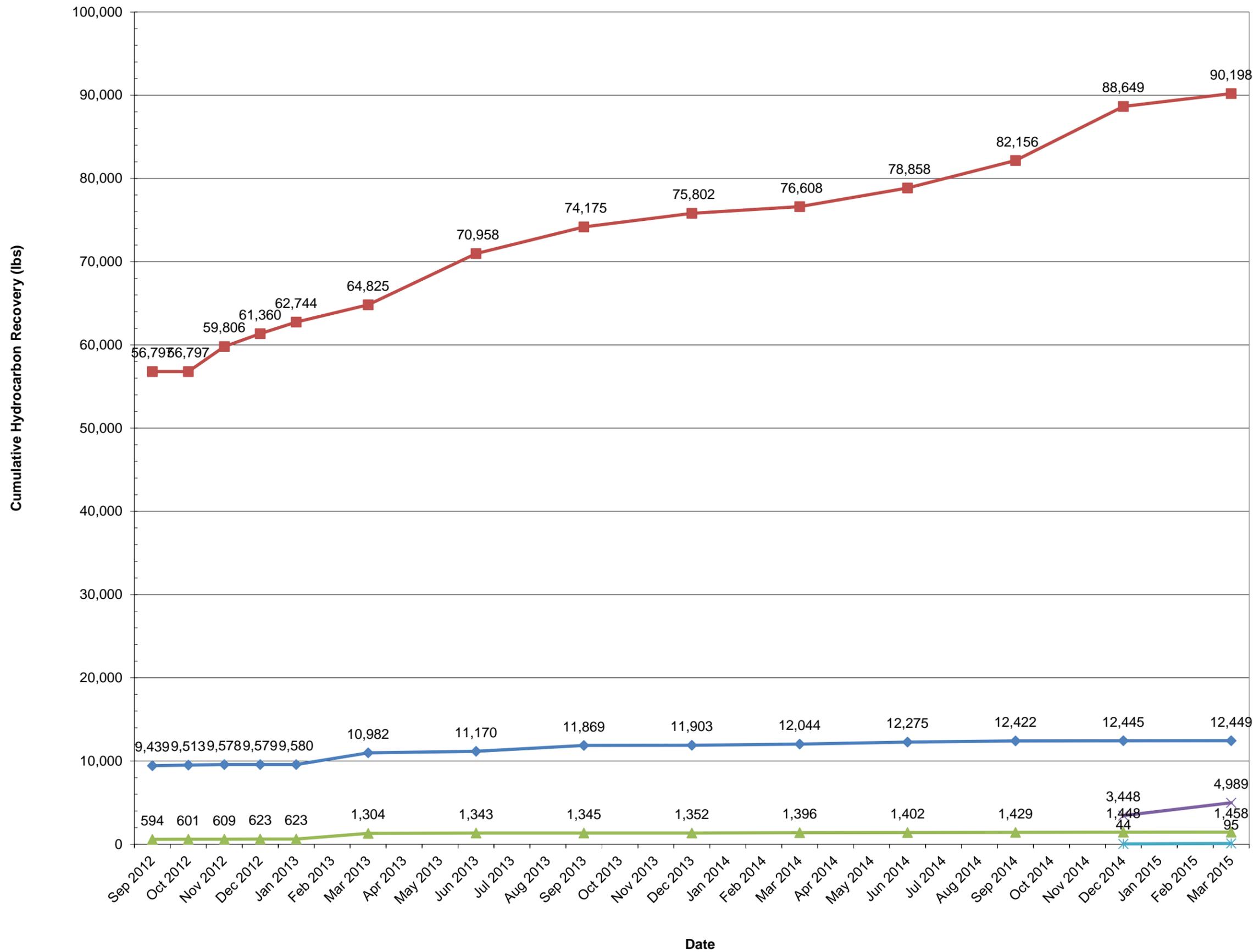
# FIGURES

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## Former Coke Oven Area Cell 1 System Layout



**LEGEND**

- Cell 1
- Cell 2
- Cell 3
- Cell 5
- Cell 6



Environmental Engineers

Project  
Sparrow Point Terminal, LLC  
Baltimore, Maryland

CUMULATIVE SUMMARY OF ESTIMATED  
HYDROCARBON RECOVERY  
FORMER COKE OVEN AREA  
INTERIM REMEDIAL MEASURES

Project Number

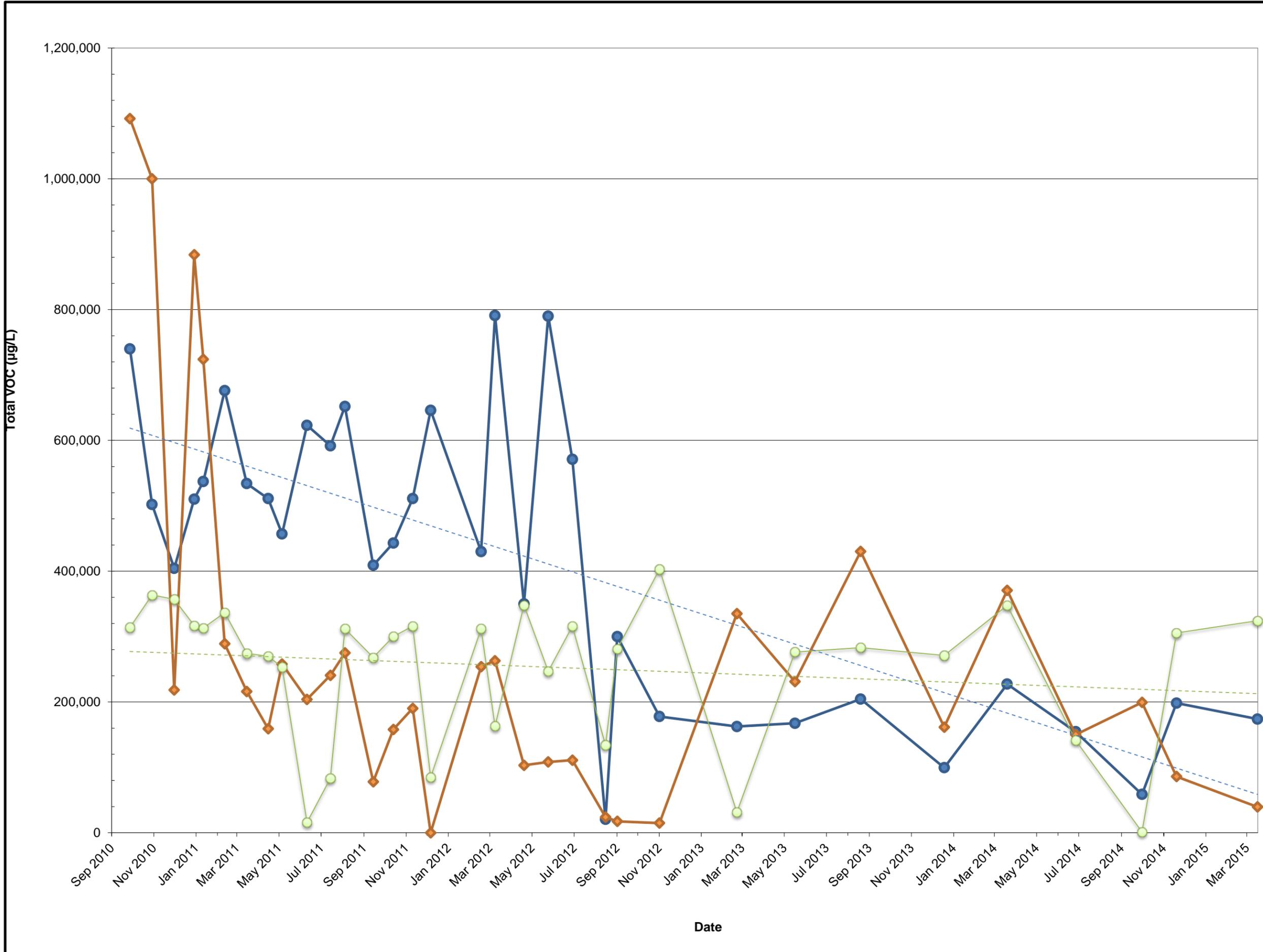
File Number

Date  
March 31, 2015

Figure

PE/RG PM DR

3



**LEGEND**

- CO02-PZM006
- ◆ CO18-PZM006
- CO93-PZMxxx

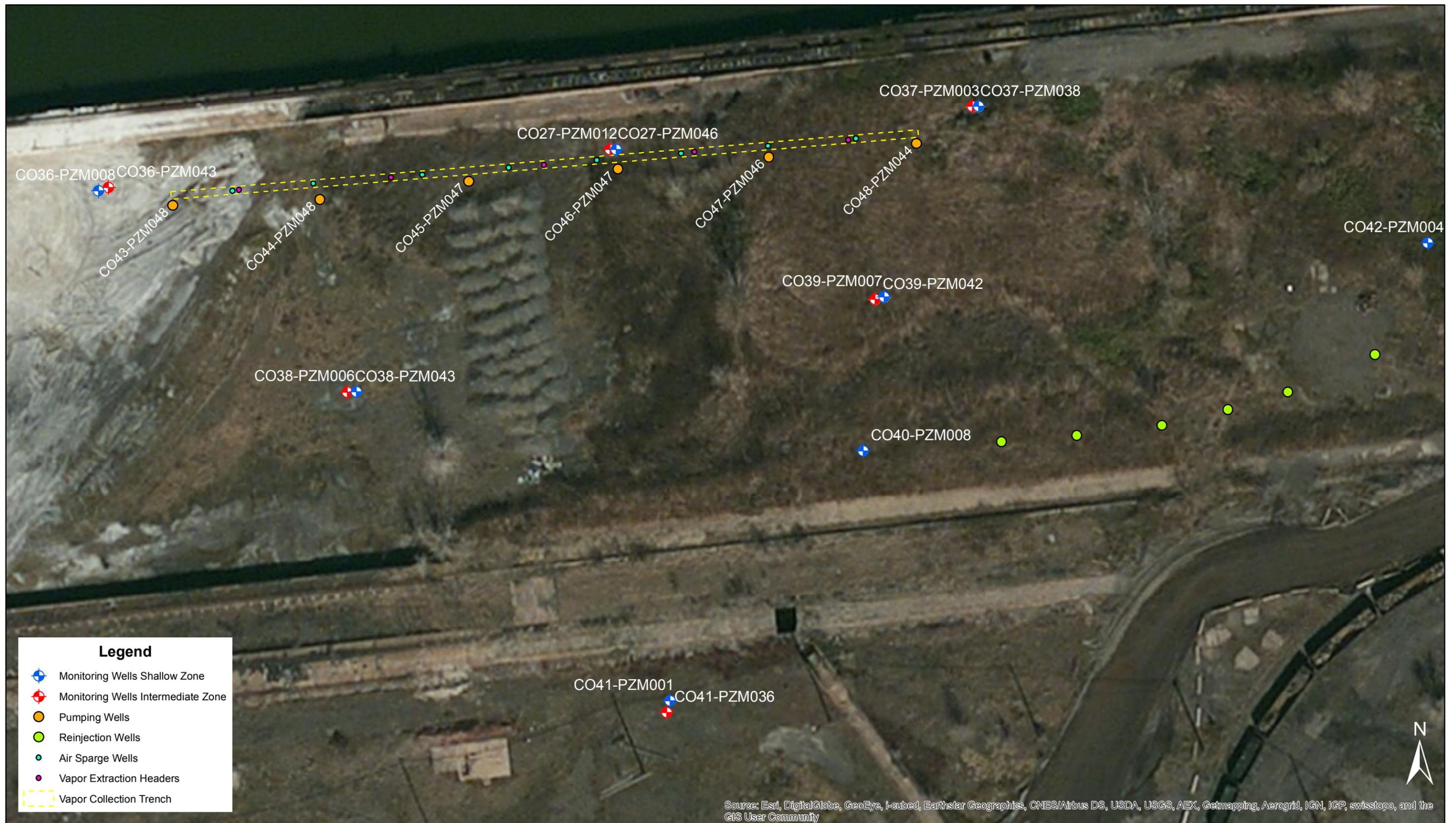


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Baltimore, Maryland

MEASURED GROUNDWATER VOC  
CONCENTRATION BY MONTH  
CELL 1: PROTOTYPE AS/SVE SYSTEM  
IN THE FORMER BENZOL PROCESSING AREA

Date		Figure	
March. 31, 2015		4	
PE/RG	PM	DR	





## Former Coke Oven Area Cell 2 Groundwater Elevation Contours Shallow Zone

Water Levels Recorded 3/12/2015



**Figure 6**



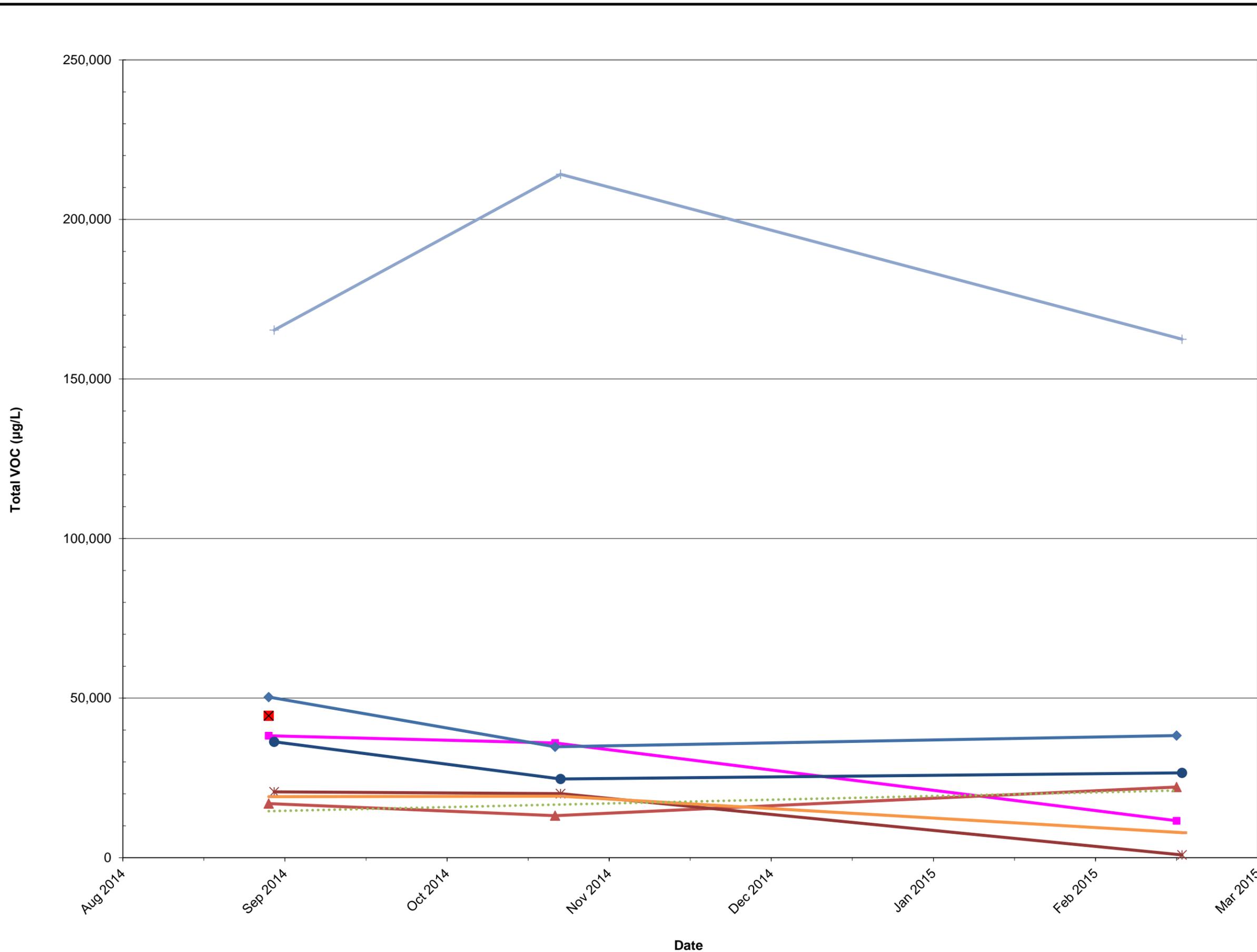
## Former Coke Oven Area

### Cell 2 Groundwater Elevation Contours Intermediate Zone

Water Levels Recorded 3/12/2015



**Figure 7**



**LEGEND**

- CO27-PZM012
- CO36-PZM008
- CO37-PZM003
- CO38-PZM006
- CO39-PZM007
- CO40-PZM008
- CO41-PZM001
- CO42-PZM004
- Linear (CO38-PZM006)

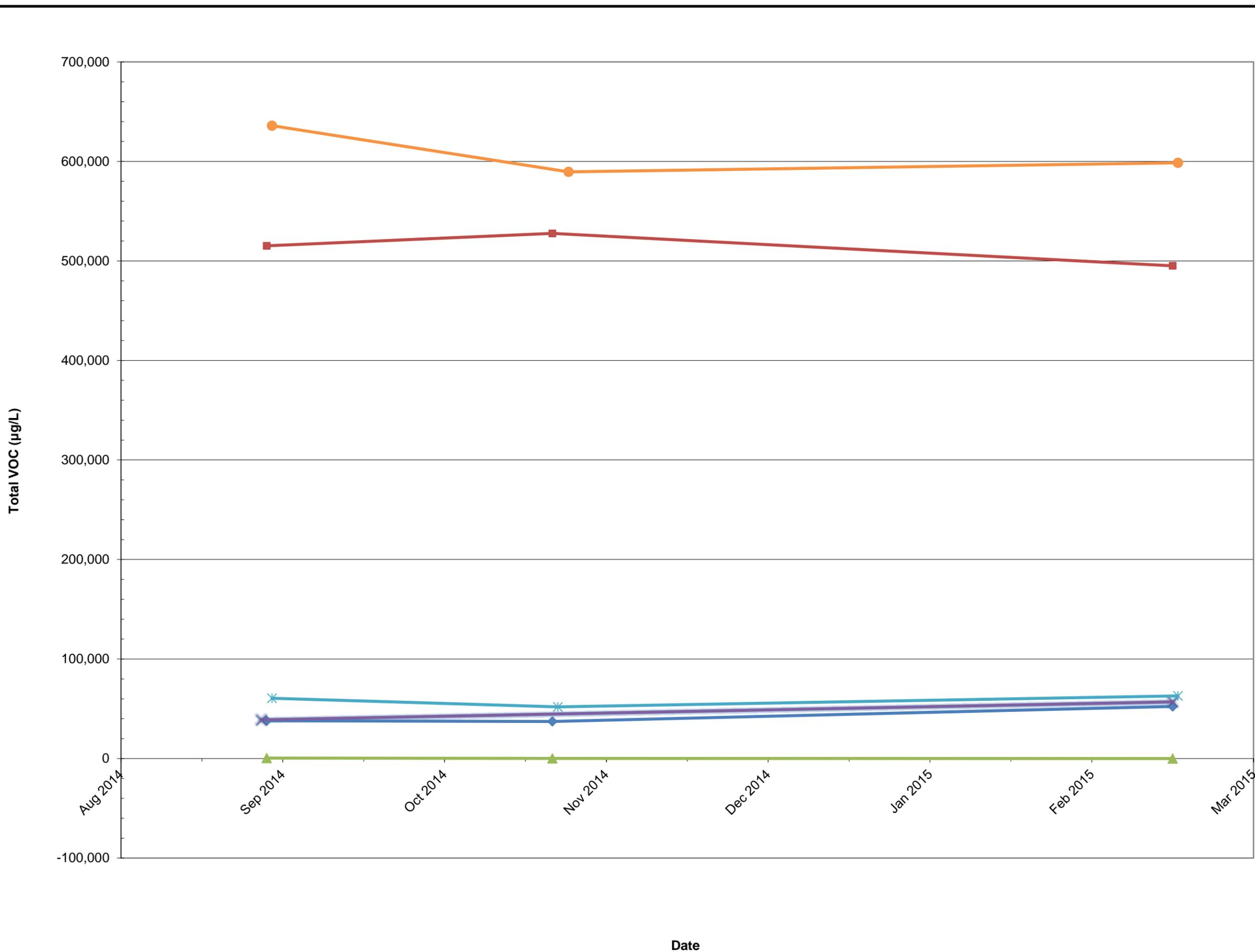


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MEASURED GROUNDWATER VOC  
CONCENTRATION BY MONTH  
CELL 2: GROUNDWATER PUMP AND TREAT SYSTEM  
SHALLOW ZONE

Date		Figure	
March 31 2015		8A	
PE/RG	PM	DR	



**LEGEND**

- CO27-PZM046
- CO36-PZM043
- CO37-PZM038
- CO38-PZM043
- CO39-PZM042
- CO41-PZM036
- Linear (CO38-PZM043)



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MEASURED GROUNDWATER VOC  
CONCENTRATION BY MONTH  
CELL 2: GROUNDWATER PUMP AND TREAT SYSTEM  
INTERMEDIATE ZONE

Date  
March. 31, 2015

Figure  
8B

PE/RG	PM	DR
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## Former Coke Oven Area Cell 2 Benzene Concentrations Intermediate Zone

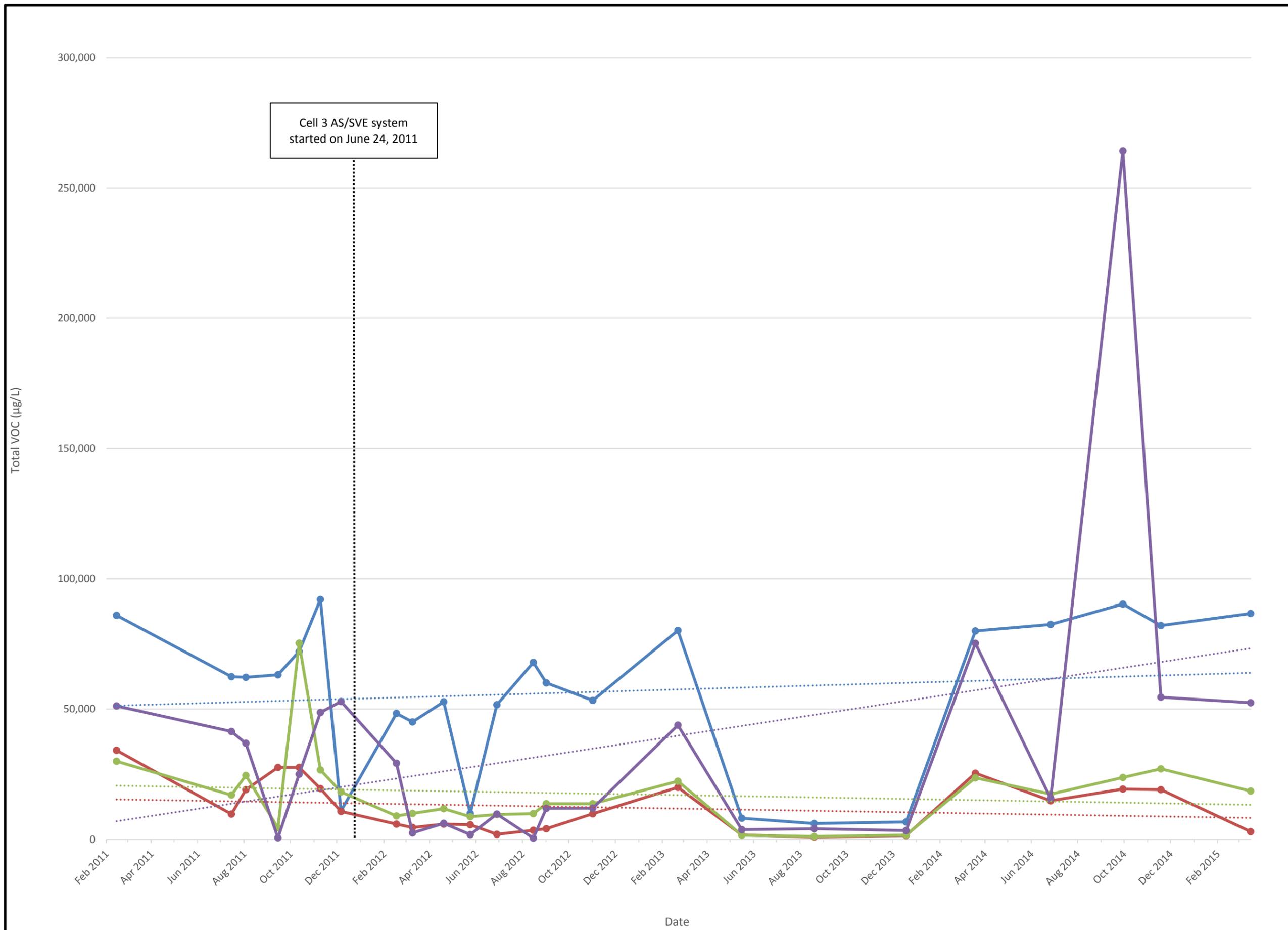
Monitoring Wells Sampled 3/12/2015 - 3/13/2015



**Figure 9**



## Former Coke Oven Area Cell 3 System Layout



**LEGEND**

- CO30-PZM015
- CO101-PZMxxx
- CO102-PZMxxx
- CO103-PZMxxx
- Linear (CO30-PZM015)
- Linear (CO101-PZMxxx)
- Linear (CO102-PZMxxx)
- Linear (CO103-PZMxxx)



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 Baltimore, Maryland

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

Date		Figure	
March. 31, 2015		11	
PE/RG	PM	DR	

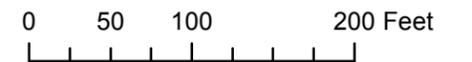




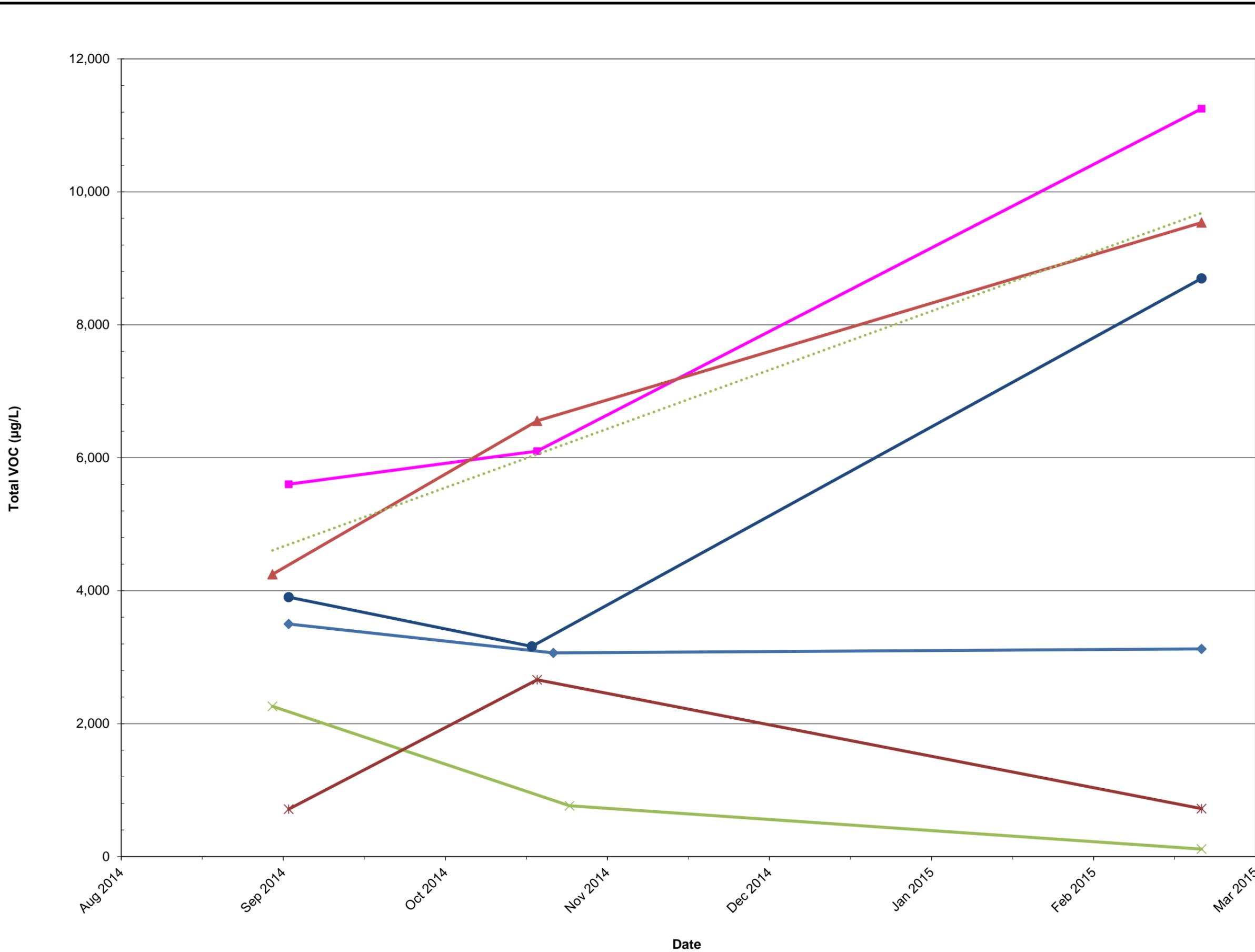
## Former Coke Oven Area

### Cell 5 Groundwater Elevation Contours Shallow Zone

Water Levels Recorded 3/17/2015



**Figure 13**



**LEGEND**

- CO23-PZM008
- CO24-PZM007
- CO55-PZM000
- CO56-PZP001
- CO59-PZP002
- CO60PZP001
- Linear (CO56-PZP001)



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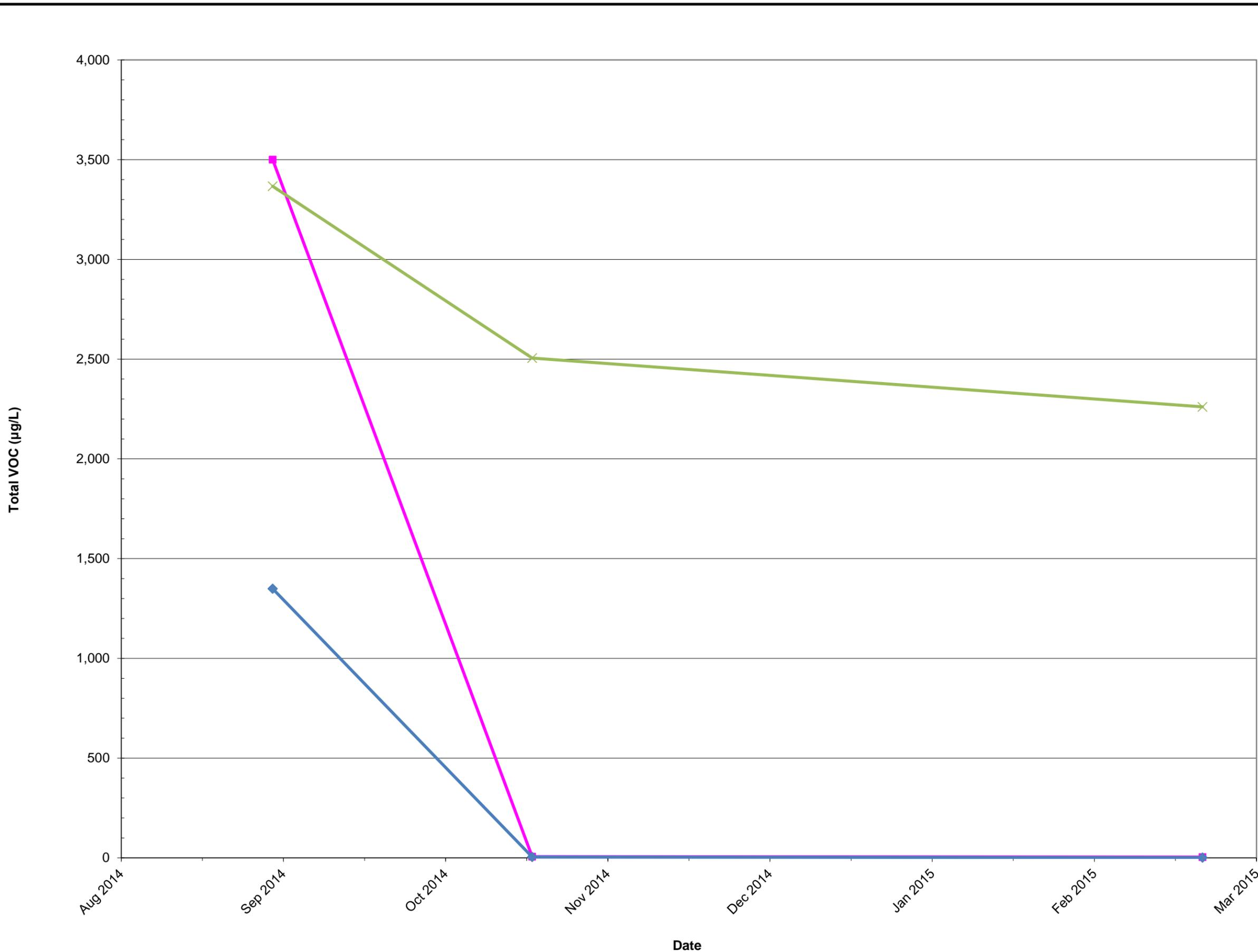
MEASURED GROUNDWATER VOC  
CONCENTRATION BY MONTH  
CELL 5: DPE GROUNDWATER PUMP  
AND TREAT SYSTEM

Date  
March. 31, 2015

Figure

PE/RG PM DR

14A



**LEGEND**

- CO26-PZM007
- CO57-PZP002
- CO58-PZM001



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MEASURED GROUNDWATER VOC  
CONCENTRATION BY MONTH  
CELL 5: DPE GROUNDWATER PUMP  
AND TREAT SYSTEM

Date  
March. 31, 2015

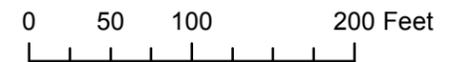
Figure  
14B

PE/RG PM DR



## Former Coke Oven Area Cell 5 Naphthalene Concentrations Shallow Zone

Monitoring Wells Sampled 3/17/2015



**Figure 15**



Former Coke Oven Area  
Cell 6 Well Locations

0 25 50 100 Feet