

COKE OVEN AREA INTERIM MEASURES PROGRESS REPORT (NOVEMBER 2010)

Prepared for

Severstal-Sparrows Point, LLC
Sparrows Point, Maryland



December 30, 2010

URS

URS Corporation
200 Orchard Ridge Drive, Suite 101
Gaithersburg, MD 20878
Project no. 15302307

Coke Oven Area Interim Remedial Measures Progress Report

Introduction

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

For mutual ease of understanding, and as agreed during the June 3, 2010 teleconference with US EPA, the following designations are applied in this document to the six (6) IM "Cells" (**Figure 1**) at the COA:

- Cell 1: Prototype Air Sparge/Soil Vapor Extraction (AS/SVE) System in the Former Benzol Processing Area,
- Cell 2: AS/SVE and Dual Phase Groundwater Extraction System in Former Coal Storage Area,
- Cell 3: AS/SVE System in "Cove" Area,
- Cell 4: In-Situ Anaerobic Bio-treatment Area in Coal Tar Area,
- Cell 5: Groundwater Extraction at the Turning Basin Area, and
- Cell 6: LNAPL Recovery at the Former Benzol Processing Area.

As of November 30, 2010, Cell 1 and Cell 6 continue to be operational and the planned evaluation and design of the in-situ enhanced anaerobic bioremediation system at Cell 4 is continuing. All three Cells are addressed in this progress report. The other Cells are in various stages of evaluation, design, and under permitting considerations by Maryland Department of the Environment (MDE).

Coke Oven Area Interim Remedial Measures Progress Report

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

US EPA's March 2, 2010 letter approved the air sparge/soil vapor extraction (AS/SVE) interim measure for Cell 1, as originally proposed by Severstal. This cell consists of a prototype IM, which includes AS/SVE coupled with vapor destruction via an internal combustion engine (ICE). Design of this system includes air sparging groundwater wells and vapor collection trenches as shown schematically on **Figure 2**.

Figure 3 shows the system layout of Cell 1, which consists of the following major components:

- Three (3) generally parallel and interconnected vapor collection trenches approximately 500 feet long and 60 feet apart, fitted with perforated 4-inch DR-17 high-density polyethylene (HDPE) pipe. Fifteen (15) vertical extraction risers are connected to a common suction header,
- Sixteen (16) air sparge wells located between the trenches,
- At-grade, 4-inch DR-17 HDPE sparge and suction headers fitted with control valves for 2-inch DR-17 HDPE sparge and suction laterals,
- One (1) ICE unit for extraction vacuum and vapor destruction, which is equipped with an integral Becker KDT series air compressor for sparge air, and
- Perimeter slag berm for system demarcation and protection from vehicular traffic.

Operational performance of Cell 1 during this reporting period is summarized in **Table 1**. In summary, the ICE operated almost 73% during this reporting period. Hydrocarbon removal rates averaged approximately 2.56 pounds per hour (ranging from 56 to 61 pounds per operating day for a total of 1,341 pounds) during this period. The data and methodology used to compute hydrocarbon removal rates is summarized in **Attachment 1**. Severstal is continuing to evaluate possible methods for enhancing benzene recovery. The ICE catalytic converter destruction efficiency averaged around 93%.

Soil gas and ICE exhaust gas samples were collected to evaluate system performance. Calibrated field instruments (e.g., photoionization detector [PID]) and ICE system-calculated vapor concentrations were also used to evaluate system performance. The untreated soil gas samples were collected in Tedlar[®] bags and the ICE exhaust sample collected in a 6-liter SUMMA can. All gas samples were submitted to TestAmerica Laboratories, Inc. Knoxville,

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Tennessee laboratory for analysis by US EPA Method TO-15. These data are summarized in **Table 2**.

From **Table 2**, influent soil gas hydrocarbon concentrations, collected on November 9, 18, and 30, 2010, were 3,900, 5,900, and 4,200 parts per million by volume (ppmv), respectively. As indicated above, Severstal is evaluating measures to maximize benzene concentration in the extracted soil gas in order to maximize benzene recovery and destruction.

Groundwater samples were collected on November 30, 2010 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 Microbac Laboratories, Inc. of Baltimore, Maryland for the analyses summarized in **Table 3**. These data indicate benzene is the most prevalent volatile organic compound (VOC) constituent. The November groundwater hydrocarbon concentrations shown in **Table 3** reflect an increase in all three wells, as compared to previously reported values. Severstal is continuing to monitor the groundwater hydrocarbon concentrations to assess any potentially significant trends.

Overall, Severstal is continuing to operate the prototype system and is evaluating measures to maximize hydrocarbon concentration in the extracted soil gas in order to maximize hydrocarbon recovery and destruction. These measures include:

- Planning to install measures to prevent condensate water from freezing in the SVE and air sparging piping, and
- Evaluating various technologies for vapor extraction and destruction.

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Cell 4: In-Situ Anaerobic Bio-treatment Area in Coal Tar Area

US EPA's March 2, 2010 letter approved the in-situ bio-treatment concept for Cell 4 (**Figure 4**), as originally proposed by Severstal. As discussed in September's progress report, baseline groundwater data and a microbial conditions evaluation using Bio-Trap[®] Samplers (Bio-Traps) were performed in July 2010 as the first step to developing a preliminary conceptual design.

Severstal is continuing efforts toward designing, installing and operating the planned in-situ enhanced anaerobic bioremediation system at Cell 4. These activities include:

1. Design and install a groundwater re-circulation system to deliver bionutrients to the subsurface.
2. Supplement the depleted nutrients that are necessary to support general microbial activities, including nitrate and phosphorous. Commercially available bionutrients (such as VB591 from BioNutra Tech) are being evaluated.

Severstal is expecting to begin installation and construction activities the first quarter of 2011.

Cell 6: LNAPL Extraction at the Former Benzol Processing Area

The Cell 6 LNAPL monitoring and recovery system was monitored approximately weekly during November (four site visits). **Table 4** summarizes LNAPL occurrence and recovery observed during the reporting period and **Figure 5** illustrates the well locations.

During November, approximately 462 gallons (3,381 pounds) of LNAPL was recovered, bringing the total recovered LNAPL to 2,249 gallons (16,481 pounds) as of November 24. The LNAPL was recovered from the following wells:

Well	LNAPL Recovery (gal / lbs)		Notes
	During November	Total thru November 24	
BP-MW-05	360 / 2,638	1,910 / 13,995	
RW-04	87 / 637	217 / 1,590	
BP-MW-08	14 / 103	114 / 835	
BP-MW-11	0 / 0	7.8 / 57	(a)
RW-1	0.3 / 2	0.3 / 2	(b)
RW-3	0.2 / 1	0.2 / 1	(b)

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

(b) Manual bailing.

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The wells are presented in **Table 4** in the order of decreasing LNAPL occurrence/recovery. During the reporting period, the range of LNAPL thicknesses has varied as summarized below (wells are not listed if LNAPL was not present):

- BP-MW-05 (2.08 to 2.30 ft),
- BP-MW-08 (0.52 to 0.92 ft),
- BP-MW-11 (0.09 to 0.19 ft),
- BP-MW-10 (0.07 to 0.09 ft),
- RW-1 (0.17 to 0.25 ft),
- RW-2 (0.04 to 0.04 ft),
- RW-3 (0.30 to 0.34 ft), and
- RW-4 (0.29 to 0.54 ft).

LNAPL was not observed in wells RW-5, BP-MW-07, BP-MW-06, BP-MW-09, or CO19-PZM004.

For all wells in which LNAPL accumulated, **Table 5** provides well-specific details concerning the measured depths to LNAPL, the water table, and calculated LNAPL thicknesses.

Tables

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

Parameter	Units	Quantity
Total ICE Operating Time (November 1 - November 30, 2010)	hours	524
Overall ICE Operational Time	%	72.8
Estimated Total Hydrocarbons Destroyed	pounds	1,341
Estimated Hydrocarbon Removal Rate	pounds/hour	2.56

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

Sample ID	ICE Influent	ICE Influent	ICE Exhaust	ICE Influent	ICE Exhaust
Date	11/9/2010	11/18/2010	11/18/2010	11/30/2010	11/30/2010
Time	9:18	12:10	12:15	11:55	12:03
Dilution Factor	225319.04	169521.45	24034.78	197001.27	19550.99
Analyte	Units				
TO-15 Volatile Organics					
trans-1,3-Dichloropropene	ppb	< 45,000 U	< 34,000 U	< 4,800 U	< 3,900 U
Acetone	ppb	< 1,100,000 U	< 850,000 U	< 120,000 U	< 98,000 U
Ethylbenzene	ppb	< 45,000 U	< 34,000 U	< 4,800 U	< 3,900 U
2-Hexanone	ppb	< 110,000 U	< 85,000 U	< 12,000 U	< 9,800 U
Methylene Chloride	ppb	< 110,000 U	< 85,000 U	< 12,000 U	< 9,800 U
Benzene	ppb	3,900,000	5,900,000	400,000	4,200,000
1,1,2,2-Tetrachloroethane	ppb	< 45,000 U	< 34,000 U	< 4,800 U	< 3,900 U
Tetrachloroethene	ppb	< 45,000 U	< 34,000 U	< 4,800 U	< 3,900 U
Toluene	ppb	760,000	1,100,000	38,000	1,100,000
1,1,1-Trichloroethane	ppb	< 45,000 U	< 34,000 U	< 4,800 U	< 3,900 U
1,1,2-Trichloroethane	ppb	< 45,000 U	< 34,000 U	< 4,800 U	< 3,900 U
Trichloroethene	ppb	< 45,000 U	< 34,000 U	< 4,800 U	< 3,900 U
Vinyl Chloride	ppb	< 45,000 U	< 34,000 U	< 4,800 U	< 3,900 U
o-Xylene	ppb	< 45,000 U	40,000	< 4,800 U	64,000
m-Xylene & p-Xylene	ppb	130,000	150,000	< 4,800 U	230,000
2-Butanone (MEK)	ppb	< 230,000 U	< 170,000 U	< 24,000 U	< 20,000 U
4-Methyl-2-pentanone (MIBK)	ppb	< 110,000 U	< 85,000 U	< 12,000 U	< 9,800 U
Bromoform	ppb	< 45,000 U	< 34,000 U	< 4,800 U	< 3,900 U
Carbon Disulfide	ppb	< 110,000 U	< 85,000 U	< 12,000 U	< 9,800 U
Carbon tetrachloride	ppb	< 45,000 U	< 34,000 U	< 4,800 U	< 3,900 U
Chlorobenzene	ppb	< 45,000 U	< 34,000 U	< 4,800 U	< 3,900 U
Chloroethane	ppb	< 45,000 U	< 34,000 U	< 4,800 U	< 3,900 U
Chloroform	ppb	< 45,000 U	< 34,000 U	< 4,800 U	< 3,900 U
1,1-Dichloroethane	ppb	< 45,000 U	< 34,000 U	< 4,800 U	< 3,900 U
1,2-Dichloroethane	ppb	< 45,000 U	< 34,000 U	< 4,800 U	< 3,900 U
1,1-Dichloroethene	ppb	< 45,000 U	< 34,000 U	< 4,800 U	< 3,900 U
trans-1,2-Dichloroethene	ppb	< 45,000 U	< 34,000 U	< 4,800 U	< 3,900 U
1,2-Dichloropropane	ppb	< 45,000 U	< 34,000 U	< 4,800 U	< 3,900 U
cis-1,3-Dichloropropene	ppb	< 45,000 U	< 34,000 U	< 4,800 U	< 3,900 U
Total Volatile Organics	ppb	4,790,000	7,190,000	438,000	5,594,000
Hydrocarbons					
Methane	%	< 0.18 U	< 0.20 U		< 0.24 U

Notes:
<Blank> = Not measured
BOLD = Analyte detected
ppb = parts per billion
</U = Analyte not detected above corresponding Reporting Limit
% = Percent

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

	Sample ID	CO02-PZM006	CO18-PZM006	BP-MW-09
Analyte	Date	11/30/2010	11/30/2010	11/30/2010
	Units			
Water Quality Parameters				
Temperature	deg C	19.50	24.00	17.93
pH	std units	7.90	8.01	11.68
ORP	mV	--	--	--
Conductivity	mS/cm	1.620	2.040	2.520
Turbidity	NTU	0.0	11.2	1.2
DO	mg/L	0.34	5.67	0.76
Volatile Organics				
Acetone	µg/L	< 500 U	< 500 U	< 500 U
Benzene	µg/L	3,600,000	1,900,000	2,500,000
Bromoform	µg/L	< 100 U	< 100 U	< 100 U
2-Butanone	µg/L	< 500 U	< 500 U	< 500 U
Carbon Disulfide	µg/L	< 100 U	< 100 U	< 100 U
Carbon Tetrachloride	µg/L	< 100 U	< 100 U	< 100 U
Chlorobenzene	µg/L	< 100 U	< 100 U	< 100 U
Chloroethane	µg/L	< 100 U	< 100 U	< 100 U
Chloroform	µg/L	< 100 U	< 100 U	< 100 U
1,1-Dichloroethane	µg/L	< 100 U	< 100 U	< 100 U
1,2-Dichloroethane	µg/L	< 100 U	< 100 U	< 100 U
1,1-Dichloroethene	µg/L	< 100 U	< 100 U	< 100 U
trans-1,2-Dichloroethene	µg/L	< 100 U	< 100 U	< 100 U
1,2-Dichloropropane	µg/L	< 100 U	< 100 U	< 100 U
cis-1,3-Dichloropropene	µg/L	< 100 U	< 100 U	< 100 U
trans-1,3-Dichloropropene	µg/L	< 100 U	< 100 U	< 100 U
Ethylbenzene	µg/L	1,100	240 U	4,000
2-Hexanone	µg/L	< 500 U	< 500 U	< 500 U
4-Methyl-2-Pentanone (MIBK)	µg/L	< 500 U	< 500 U	< 500 U
Methylene Chloride	µg/L	< 100 U	< 100 U	< 100 U
1,1,1,2-Tetrachloroethane	µg/L	< 100 U	< 100 U	< 100 U
1,1,1,2,2-Tetrachloroethane	µg/L	< 100 U	< 100 U	< 100 U
Tetrachloroethene	µg/L	< 100 U	< 100 U	< 100 U
Toluene	µg/L	330,000	220,000	670,000
Xylenes, Total	µg/L	10,000	6,300	360,000
1,1,1-Trichloroethane	µg/L	< 100 U	< 100 U	< 100 U
1,1,2-Trichloroethane	µg/L	< 100 U	< 100 U	< 100 U
Trichloroethene	µg/L	< 100 U	< 100 U	< 100 U
Vinyl Chloride	µg/L	< 100 U	< 100 U	< 100 U
Total Volatile Organics	µg/L	3,941,100	2,126,540	3,534,000

Notes:

<Blank> = Not measured
Bold = Analyte Detected
deg C = Degree Celcius
mg/L = milligrams per liter
mS/cm = Microsiemens per Centimeter
mV = Millivolts
NA = Standard not available or not currently established
NTU = Nephelometric Turbidity Units
ORP = Oxidation Reduction Potential
std units = Standard units
<U = Analyte not detected above corresponding Reporting Limit
µg/L = micrograms per liter

Table 4
LNAPL Occurrence and Recovery
Cell 6: LNAPL Recovery System in Former Benzol Processing Area
Former Coke Oven Area Interim Remedial Measures
Severstal Sparrows Point, LLC

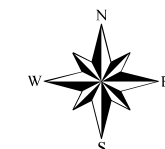
Well	LNAPL Occurrence During November (ft)	Total LNAPL Recovery Period		Total LNAPL Recovered thru November 24, 2010		LNAPL Recovered during November 2010	
		Begin	End	(gal)	(lbs) (a)	(gal)	(lbs) (a)
BP-MW-05	2.08 to 2.30	28-Jan	On-going (b)	1,910	13,995	360	2,638
RW-4	0.29 to 0.54	23-Jul	On-going (b)	217	1,590	87	637
BP-MW-08	0.52 to 0.92	8-Sep	On-going (b)	114	835	14	103
BP-MW-11	0.09 to 0.19	23-Jul	8-Sep	7.8	57	0	0
BP-MW-10	0.07 to 0.09	na	na	0	0	0	0
RW-1	0.17 to 0.25	28-Oct	On-going (c)	0.3	2	0.3	2
RW-2	0.04 to 0.04	na	na	0	0	0	0
RW-3	0.30 to 0.34	na	On-going (c)	0.2	1	0.2	1
RW-5	none	na	na	0	0	0	0
BP-MW-07	none	na	na	0	0	0	0
BP-MW-06	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

Table 5
Depths to Water and LNAPL Thickness
Cell 6: LNAPL Recovery System in Former Benzol Processing Area
Former Coke Oven Area Interim Remedial Measures
Severstal Sparrows Point, LLC

Date	RW-1			RW-2			RW-3		
	Depth product	Depth to Water	Product Thickness	Depth product	Depth to Water	Product Thickness	Depth product	Depth to Water	Product Thickness
11/5/2010	10.86	11.03	0.17	11.25	11.29	0.04	8.92	9.22	0.30
11/11/2010	11.05	11.28	0.23	11.46	11.50	0.04	9.15	9.45	0.30
11/17/2010	11.21	11.41	0.20	--	--	--	9.30	9.65	0.35
11/24/2010	11.38	11.63	0.25	11.80	11.84	0.04	9.49	9.83	0.34
Date	RW-4			BP-MW-05			BP-MW-08		
	Depth product	Depth to Water	Product Thickness	Depth product	Depth to Water	Product Thickness	Depth product	Depth to Water	Product Thickness
11/5/2010	9.07	9.50	0.43	10.88	12.97	2.09	11.65	12.18	0.53
11/11/2010	9.28	9.82	0.54	10.70	13.00	2.30	11.85	12.20	0.35
11/17/2010	9.60	9.89	0.29	10.86	12.94	2.08	11.59	12.51	0.92
11/24/2010	9.63	10.15	0.52	11.05	13.21	2.16	12.20	12.72	0.52
Date	BP-MW-10			BP-MW-11					
	Depth product	Depth to Water	Product Thickness	Depth product	Depth to Water	Product Thickness			
11/5/2010	9.38	9.46	0.08	10.70	10.89	0.19			
11/11/2010	9.58	9.65	0.07	10.90	11.00	0.10			
11/17/2010	9.91	10.00	0.09	11.88	12.02	0.14			
11/24/2010	10.11	10.19	0.08	11.33	11.42	0.09			

Note: All depth and thickness data are reported in feet.

Figures



Legend

◆ Existing Monitoring Well

INTERIM MEASURES TREATMENT CELLS

"Cell 1": Prototype AS/SVE System in Benzol Area

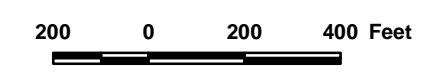
"Cell 2": AS/SVE and Dual Phase GW Treatment/Injection System in the Former Coal Storage Area

"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




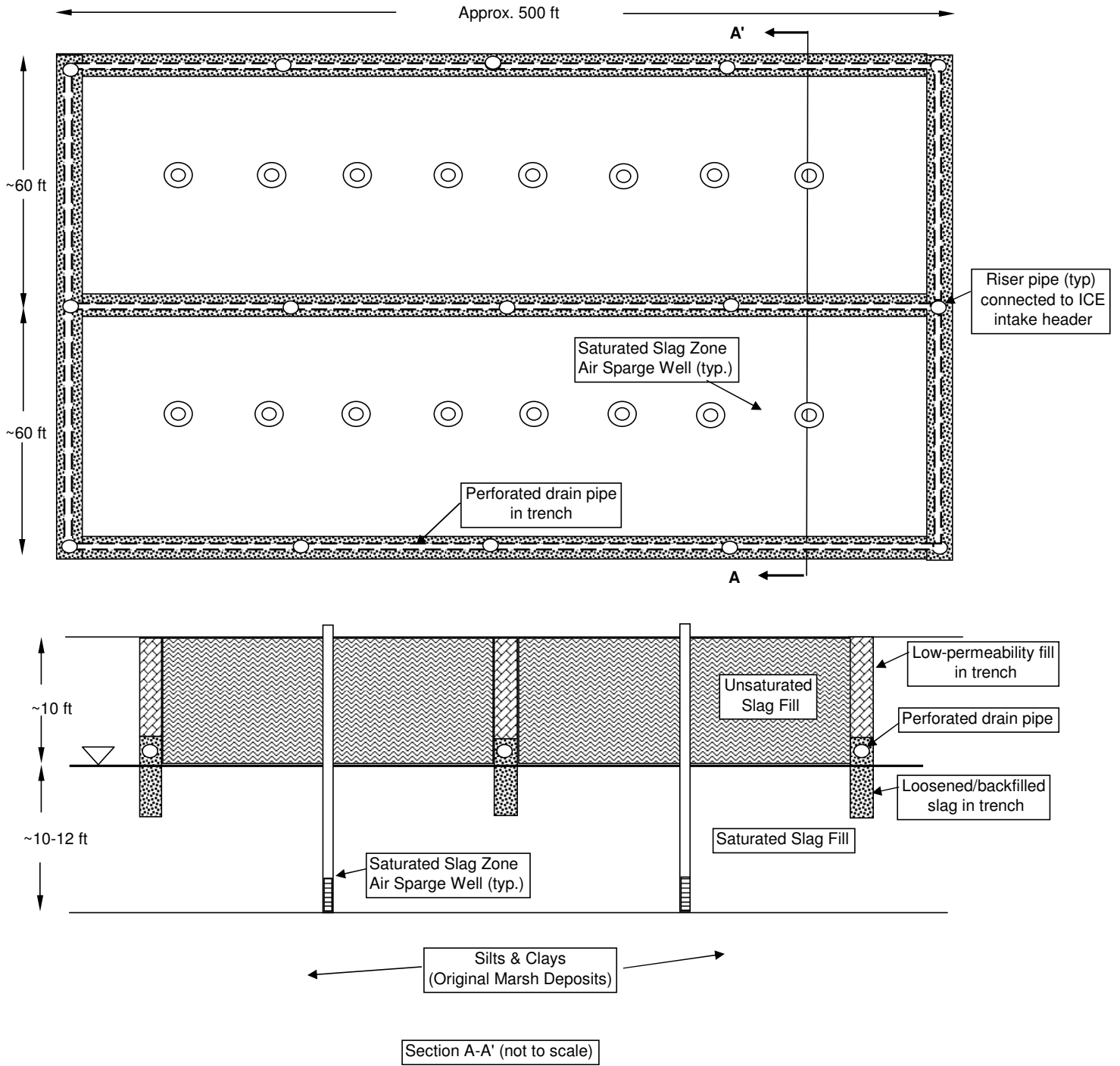
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DATE: 06/11/10	FILE: G:\Projects\SparrowsPoint\Projects\2010\CokeOven-and-CokePoint-6Prototype Cells_rev1.mxd
 200 Orchard Ridge Drive Gaithersburg, MD 20878	








Figure 1
Interim Measures Treatment Areas

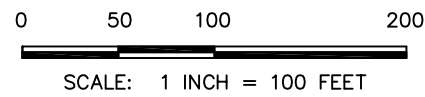
Image source: World Imagery, ESRI, GeoEye, 2009.

Figure 2
Schematic Diagram
Cell 1: Prototype AS/SVE System in Former Benzol Processing Area
Former Coke Oven Area Interim Remedial Measures
Severstal Sparrows Point, LLC



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)



URS
 335 COMMERCE DRIVE, SUITE 300
 FORT WASHINGTON, PA 19034
 PHONE: (215) 367-2500 FAX: (215) 367-1000

Job:	15302307.11001
Prepared by:	JES
Checked by:	JH
Date:	10/27/10

AS-BUILT LAYOUT PLAN
 CELL 1: FORMER BENZOL PROCESSING AREA
 SEVERSTAL SPARROWS POINT, LLC FACILITY
 BALTIMORE, MARYLAND

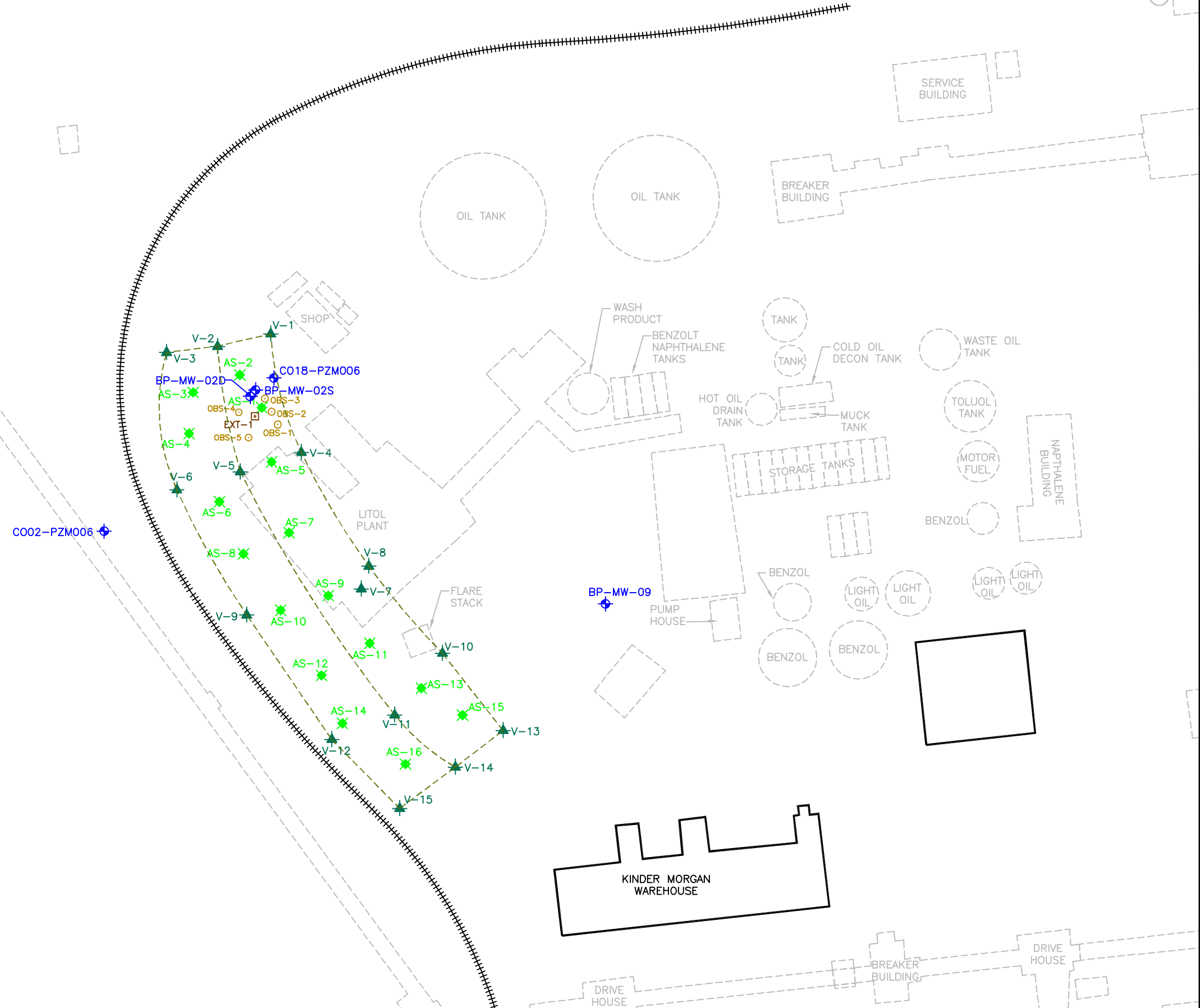




Image source: World Imagery, ESRI, GeoEye, 2009.


CLIENT	Sparrows Point		
LOCATION	Baltimore, MD		
 200 Orchard Ridge Drive Gaithersburg, MD 20878	GIS BY	JK	10/13/10
	CHK BY	BE	10/14/10
	PM	BE	10/14/10



Figure 4
Existing Cell 4 Wells

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LEGEND

- Recent Recovery Well
- ⊕ Maryland Port Admin. Monitoring Well
- ⊕ Severstal Sitewide Assessment Monitoring Well
- - - LNAPL Boundary Estimated by EASTI (2009)

CLIENT Sparrows Point

LOCATION Baltimore, MD

URS
 200 Orchard Ridge Drive
 Gaithersburg, MD 20878

GIS BY	JK	10/13/10
CHK BY	BE	10/14/10
PM	BE	10/14/10



Figure 5
LNAPL Monitoring and Recovery Wells

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Attachment 1