COKE OVEN AREA SPECIAL STUDY AREA INTERIM MEASURES WORK PLAN PHASE 1

SEVERSTAL SPARROWS POINT, LLC

SPARROWS POINT, MARYLAND

Prepared for:

Severstal Sparrows Point, LLC
Sparrows Point, Maryland

In accordance with:

United States of America and State of Maryland Department of the Environment v. Bethlehem Steel Corporation; Docket No. JFM-97-558 & JFM-97-559

April 2009

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1.0 INTRODUCTION

This document is the work plan to implement Phase 1 (P1) of interim measures (IM) intended to address contamination in groundwater and the vadose zone at the Coke Oven Area (COA) of the Severstal Sparrows Point Facility (Severstal). This P1 IM WP describes the planned procedures to implement a pilot scale Soil Vapor Extraction/Air Sparging (SVE/AS) system at the COA, intended to recover COA groundwater and vadose zone contamination and provide design information for a potential larger scale SVE/AS system. Figure 1 illustrates the location of the COA.

This P1 IM WP is intended to comply with the requirement specified in the United States Environmental Protection Agency (USEPA) letter (dated February 19, 2009) requesting Severstal to submit to USEPA a work plan to implement interim measures to recover hydrocarbon product in the COA, under the authorization of United States of America and State of Maryland Department of the Environment v. Bethlehem Steel Corporation; Docket No. JFM-97-558 & JFM-97-559. The USEPA letter cites elevated levels of benzene and naphthalene, both which are addressed in this P1 IM WP.

1.1 OBJECTIVES

The overall objective of this P1 IM WP is to collect further site-specific information pertaining to technologies that have the potential to protect human health and the environment and, to the extent practicable, do so in a manner consistent with any additional Interim Measures or potential long-term corrective action. Specifically, this P1 IM WP describes a Pilot Test that is intended to:

1. Evaluate the potential effectiveness of SVE/AS technologies for removing and destroying benzene and naphthalene mass from the unsaturated zone and shallow groundwater, and

2. Develop criteria for possible expanded-scale IM application if the P1 IM SVE/AS Pilot Test demonstrates potential effectiveness.

1.2 DESCRIPTION OF SITE AND P1 IM SVE/AS PILOT TEST AREA

The COA is located at the southwestern portion of the Sparrows Point peninsula. The site is made land comprised of slag placed over the natural materials comprised of: 1) recent fluvial sediments deposited by Bear Creek/Patapsco River, and 2) underlying clay, silt and sand layers of moderate density associated with the Talbot Formation.

The Slag-Fill unit is the uppermost hydrostratigraphic unit at the COA. The shallow water table occurs within the Slag-Fill Unit at a depth on the order of 10 feet below ground surface. Slag-Fill Unit groundwater is unconfined. In some COA areas, the Slag-Fill Unit is directly underlain by and connected to the coarser grained beds or lenses within the Talbot Formation. In these areas, the Slag-Fill and natural permeable materials form a single groundwater flow system. Throughout much of the COA, the Slag-Fill unit is underlain by finer-grained silts and clays of the Talbot Formation. In these areas, groundwater flow in the Slag-Fill Unit is separated from groundwater flow in any underlying coarse-grained beds or lenses. Shallow groundwater movement at the COA generally is radial toward surrounding surface water bodies.

COA groundwater analytical results indicate that VOCs and SVOCs (predominately benzene and naphthalene) have impacted groundwater. The areal extent of the VOCs and SVOC is confined to the southwestern fill portion of the Sparrows Point peninsula and has not migrated to the area north of the COA. The maximum VOC concentrations (predominately benzene) are located at the northwest portion of the COA. Groundwater with elevated VOCs has migrated toward the southwest and northwest of the Coke Oven SSA and is present at the shoreline. The SVOC concentrations (predominately naphthalene) are more evenly distributed, and the maximum concentrations are located on the eastern half of the Coke Oven SSA. VOC and SVOC concentrations decrease to below their respective reporting limits or exhibit a significant decreasing trend toward the laboratory reporting limits in all samples collected from the lower groundwater zone piezometers.

Figure 2 shows the general planned location of the P1 SVE/AS Pilot System test area within the COA. This location was selected because, as shown on Figure 3**,** shallow groundwater benzene and naphthalene concentrations are elevated here (i.e., 1,300 mg/L benzene and 0.19 mg/l naphthalene in well CO18). These data suggest that the P1 SVE/AS pilot system could recover benzene and naphthalene vapor mass from the unsaturated zone and provide design information for a future larger scale system.

2.0 P1 IM SVE/AS PILOT TEST INVESTIGATION PROGRAM

This section describes activities to collect and evaluate further site-specific information pertaining to the P1 IM SVE/AS Pilot Test technologies.

2.1 Preliminary Considerations

Preliminary considerations for development of the P1 IM SVE/AS Pilot Test focus on benzene because the benzene concentrations greatly exceed the naphthalene concentrations. However, the technology and associated considerations also apply to naphthalene.

Based on the 1,300 mg/L groundwater benzene concentration at well CO18 (Figure 3), an equilibrium soil gas benzene vapor concentration of 8.9% (89,000 ppmv) is estimated. Percentage concentrations of benzene in soil gas are unsafe to treat with granular activated carbon (GAC) prior to discharge to atmosphere because of excessive heat generated during the exothermic GAC adsorption reactions. Several methods for extracting and treating the benzene-laden soil gas were considered:

1. Thermal oxidizer (propane-fired) with integral regenerative blower for soil gas extraction,
2. Catalytic oxidizer (either electrically heated or propane-fired) with integral regenerative blower for soil gas extraction, or
3. Specially equipped, propane-fueled internal combustion engine (ICE) equipped with catalytic converter.

Of these methods, the ICE applies best to the Site-specific conditions because:

- No electric power is required, as it is for both thermal and catalytic oxidizers (methods 1 and 2 above).
- The ICE system utilizes engine intake vacuum (up to 20 inches Hg) to extract soil gas from the well, whereas the oxidizers are normally equipped with regenerative blowers that can typically develop less than 10 inches Hg vacuum pressure. The higher vacuum pressure developed by the ICE allows for vapor extraction from "tighter" formations.
- The benzene concentrations anticipated may be too great for catalytic oxidizers to treat without excessive dilution air to prevent overheating (typical maximum operating temperature around 600° C).

Therefore, a propane-fueled ICE specifically designed for such applications and equipped with an exhaust catalytic converter will be used for off-gas treatment.

The static water level (SWL) is approximately 2 ft above msl (i.e., 10 ft below grade) in the Phase 1 IM Pilot Test area. Based on well CO18 construction information, approximately 2 ft of screen in well CO18 is open above the SWL; suggesting well CO18 (2-in. diameter) would best be used as a vacuum pressure observation well during the Phase 1 IM Pilot Test.

URS will submit a letter of determination request to the Maryland Department of the Environment (MDE) to request an exemption for an air discharge permit for the Phase 1 IM Pilot Test using an ICE system.

2.2 Preparations for Phase 1 IM Pilot Test

Preparation for the P1 IM SVE/AS Pilot Test includes installing additional test wells and mobilizing the necessary equipment to perform the Pilot Test.

Additional SVE test wells are necessary to evaluate SVE effectiveness and at least one AS well is necessary to evaluate the AS technology. Seven test wells (one SVE extraction well, five SVE observation wells, and one AS well) will be installed in the area of existing well CO18 generally configured as shown on Figure 4. Well CO18 will be utilized as an observation well for measuring vacuum pressure/AS response from extraction at proposed well EXT-1 and /or AS-1 (Figure 4).

After installation of EXT-1, AS-1, and OBS-1 through OBS-5 the following shallow COA wells will by evaluated for the presence of LNAPL and DNAPL, and will undergo sampling and analysis for benzene and naphthalene to evaluate the current shallow groundwater benzene and naphthalene plumes:

- EXT-1
- AS-1
- TS wells 5, 6, and 8
- SW wells 13, 14, and 17
- CO wells 2 through 13, and 15 through 31, and 31A

Although free LNAPL has generally not been observed in Former Coke Oven Area monitoring wells, the groundwater benzene concentrations suggest its possible presence. Possible NAPL may occur as non-recoverable free benzene bound within the formation matrix. In order to evaluate whether NAPL is present in the formation materials, the following additional actions are planned:

- Perform continuous split-spoon sampling during installation of AS-1, EXT-1 and OBS-1 through OBS-5, resulting in these samples:
    - Twelve from AS-1
    - Two from each of EXT-1 and OBS-1 through OBS-5,
- Submit each of the above 24 soil sample for analysis to a qualified laboratory for benzene and naphthalene by Method SW846-8260 and free organic liquid.

Soil (slag) cuttings resulting from test well installation will be managed as appropriate and either left at the well location or, if significantly visually contaminated, removed and disposed of properly. Similarly, any water produced by the drilling operations, AS well development, and any condensate resulting from the SVE system operation will be containerized and sampled/characterized for disposal.

The additional test wells will be installed using drilling techniques appropriate for the slag fill material present in the Pilot Test area. SVE test wells will be installed with screened intervals located just above the water table (i.e., typically less than 10 ft total depth bgs). The AS test well will be installed within the saturated slag fill zone and equipped with a short (i.e., 2-ft) screen interval approximately 25 ft bgs. Figure 5 depicts a schematic sectional diagram of the Phase 1 IM Pilot Test well and equipment layout.

Equipment mobilized to the Site for implementing the Phase 1 IM Pilot Test will include:

- Trailer-mounted ICE unit (see Appendix A for typical specifications),
- Portable gasoline or diesel-powered air compressor to supply sparge air,
- Propane tank for ICE supplemental fuel, and
- Various ancillary equipment necessary to support the Phase 1 IM Pilot Test, including soil gas sampling equipment, field instruments (PID, FID, water level meter, etc.), PPE necessary for compliance with project health and safety plan (Appendix B) requirements, and other miscellaneous equipment.

2.3 Phase 1 IM Pilot Test Procedures

P1 IM SVE/AS Pilot Test procedures are described in the following paragraphs. Field conditions may dictate variations in these anticipated procedures, but in general, these procedures will be followed:

- Field-check all equipment for proper operation including the ICE unit, AS air compressor, field instruments for measuring total volatile organic constituents (VOCs) in air, and communication connections, as appropriate,

- Connect the trailer-mounted ICE unit to extract soil gas from one well (proposed well EXT-1: Figure 4) for a period of up to four days, operating the ICE 24-hours per day. While the ICE unit is equipped with automatic data logging of critical operating parameters, selected readings (e.g., soil gas flow rate, inlet vacuum pressure, etc.) will be recorded manually in the project log book,
- Measure vacuum pressure in the extraction well and in all six observation wells at intervals frequent enough to establish a vacuum pressure radius of influence (ROI),
- Collect samples of untreated soil gas (up to six plus one ICE exhaust gas samples for laboratory analysis by EPA method TO-15 + methane (SUMMA) to evaluate soil gas composition and confirm ICE/catalyst benzene destruction performance,
- Measure soil gas flow rate through the ICE, which will be used to calculate benzene (plus other constituents) removal rate (expressed in pounds per day).
- The SVE system will be operated in a manner to minimize or eliminate extraction of groundwater. Condensate production during SVE operation will depend on ambient temperature conditions at the time the test is performed; the colder the air temperature, the more condensate may be produced,
- Depending on field-measured responses to vacuum pressures, soil gas concentrations, and other performance factors, a decision will be made to initiate the AS component of the Pilot Test,
- Connect the air compressor to well AS-1 (Figure 4) and operate as necessary to provide the desired subsurface response for the AS component of the Pilot Test. Compressed air flow rates and pressures will be increased slowly until the "breakout" pressure and flow is achieved (that at which flow is initiated into the formation) and will be increased gradually until a maximum practical flow is achieved,
- Measure and record sparge air injection pressure and flow rate at the AS well and observe vacuum pressure responses in the SVE wells and total VOC concentrations in the extracted soil gas (via field instruments and ICE response to possible changes in VOC concentrations) while continuously operating the SVE unit.

- Collect samples as necessary for characterization of Pilot Test waste materials (soil and water) and ship the samples to the appropriate laboratories for analysis,
- Upon completion of the AS Pilot Test component, demobilize all equipment and secure the Pilot Test wells by installing caps/plugs,

2.4 Data Evaluation and Reporting

Data collected from the Phase 1 IM SVE/AS Pilot Test will be evaluated using commonly accepted procedures in the industry. A written report summarizing the SVE/AS Pilot Test results will be prepared that will contain sufficient text, tables, and figures to:

- Describe the Phase 1 IM SVE/AS Pilot Test procedures and results,
- Estimate a radius of influence (ROI) for both the SVE and AS components,
- Estimate the benzene (and other VOC constituents) removal rate, expressed in pounds per 24-hour day,
- If warranted by the SVE/AS Pilot Test results, provide a conceptual design to expand and operate a larger SVE/AS system as part of an expanded IM effort.

3.0 PROJECT SCHEDULE

The Phase 1 IM SVE/AS Pilot Test project implementation schedule is summarized as follows:

Receive Work Plan Approval:	
Contractor Selection and award	4-6 weeks
Phase 1 Work Plan Field Work	4 weeks
Evaluate Data and Prepare Report	10 weeks

The implementation schedule will depend on Severstal scheduling requirements, driller availability for well installation, and determination of air permitting requirements.

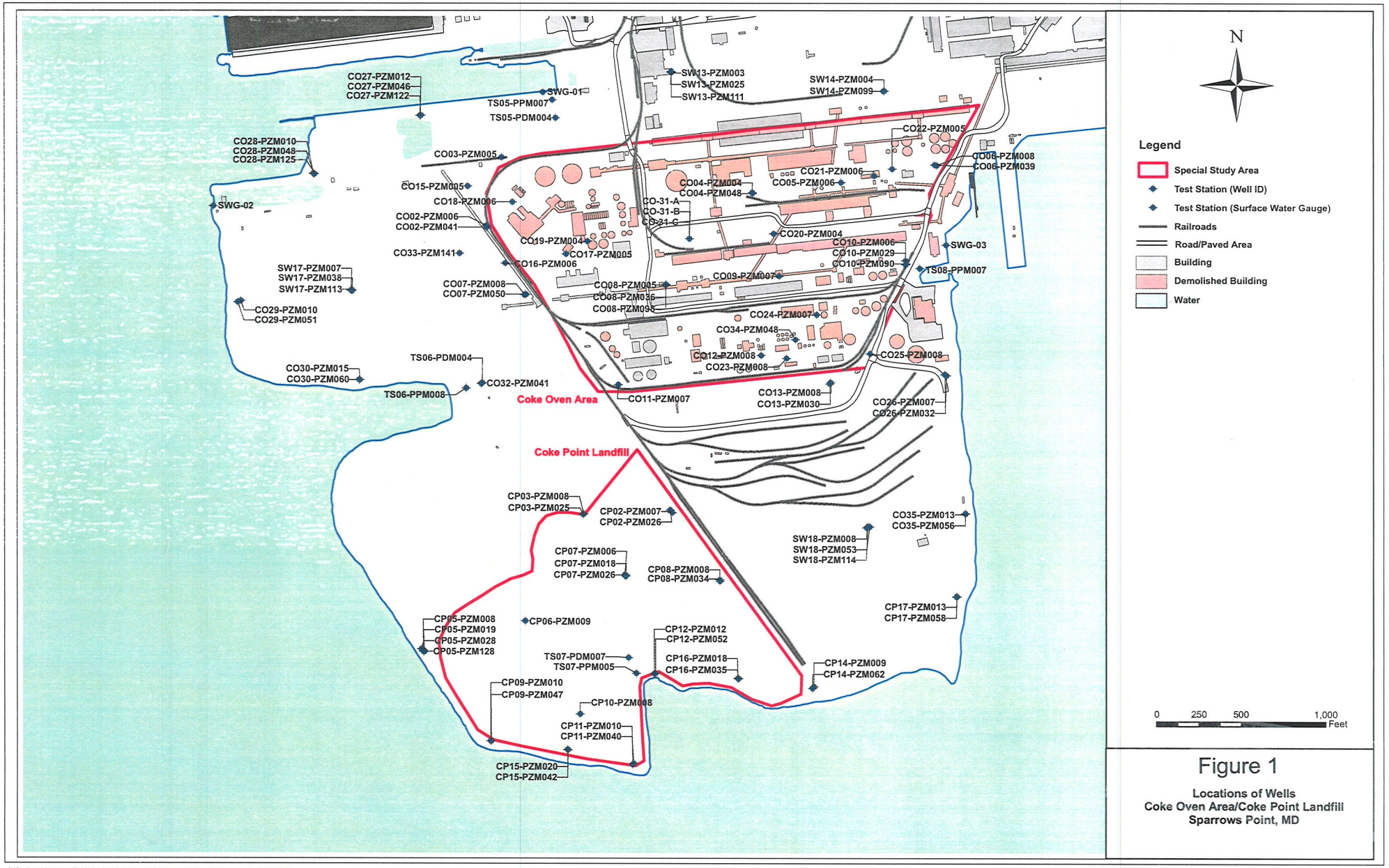

Figure 1

Locations of Wells
Coke Oven Area/Coke Point Landfill
Sparrows Point, MD

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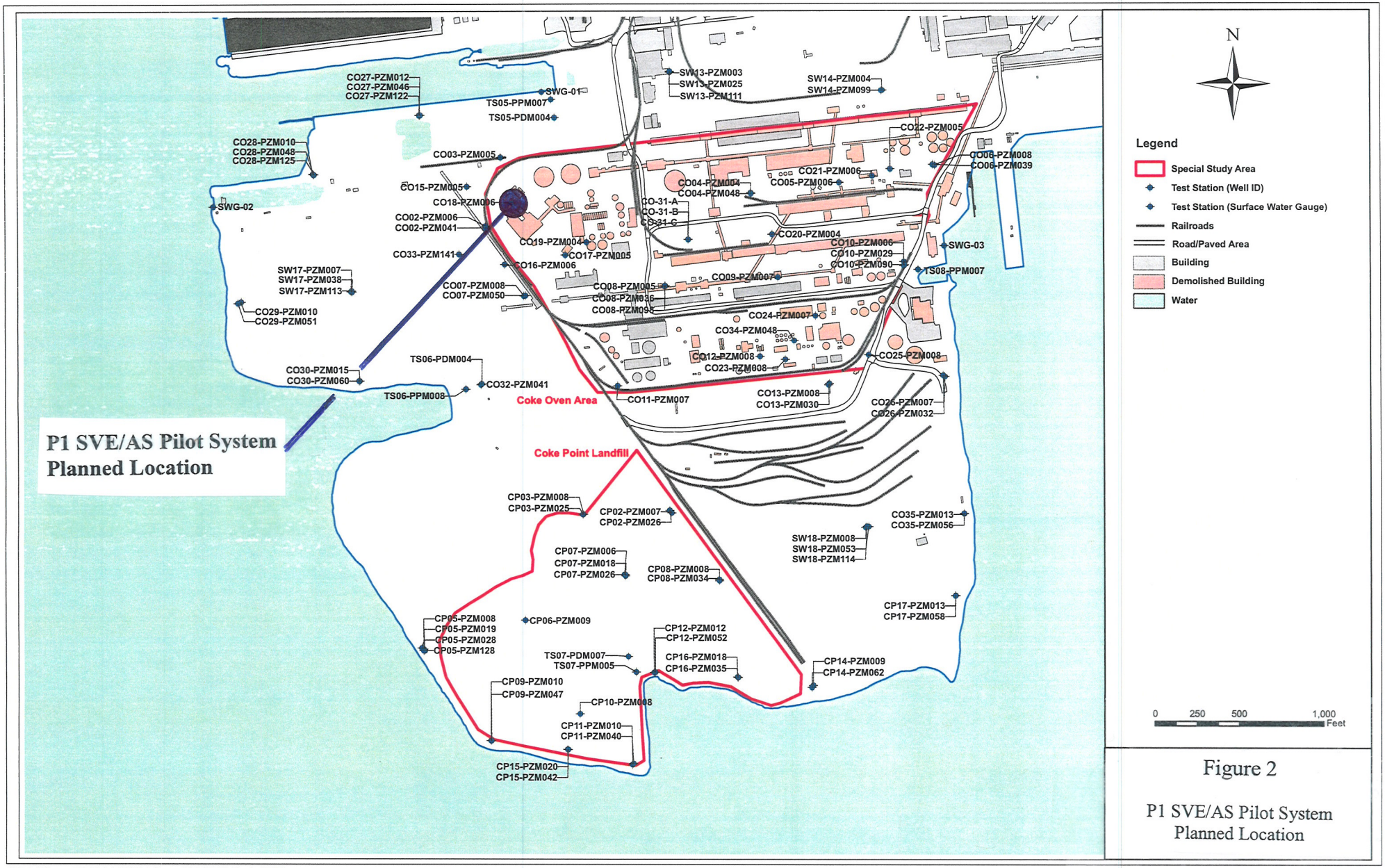

Figure 2

P1 SVE/AS Pilot System
Planned Location

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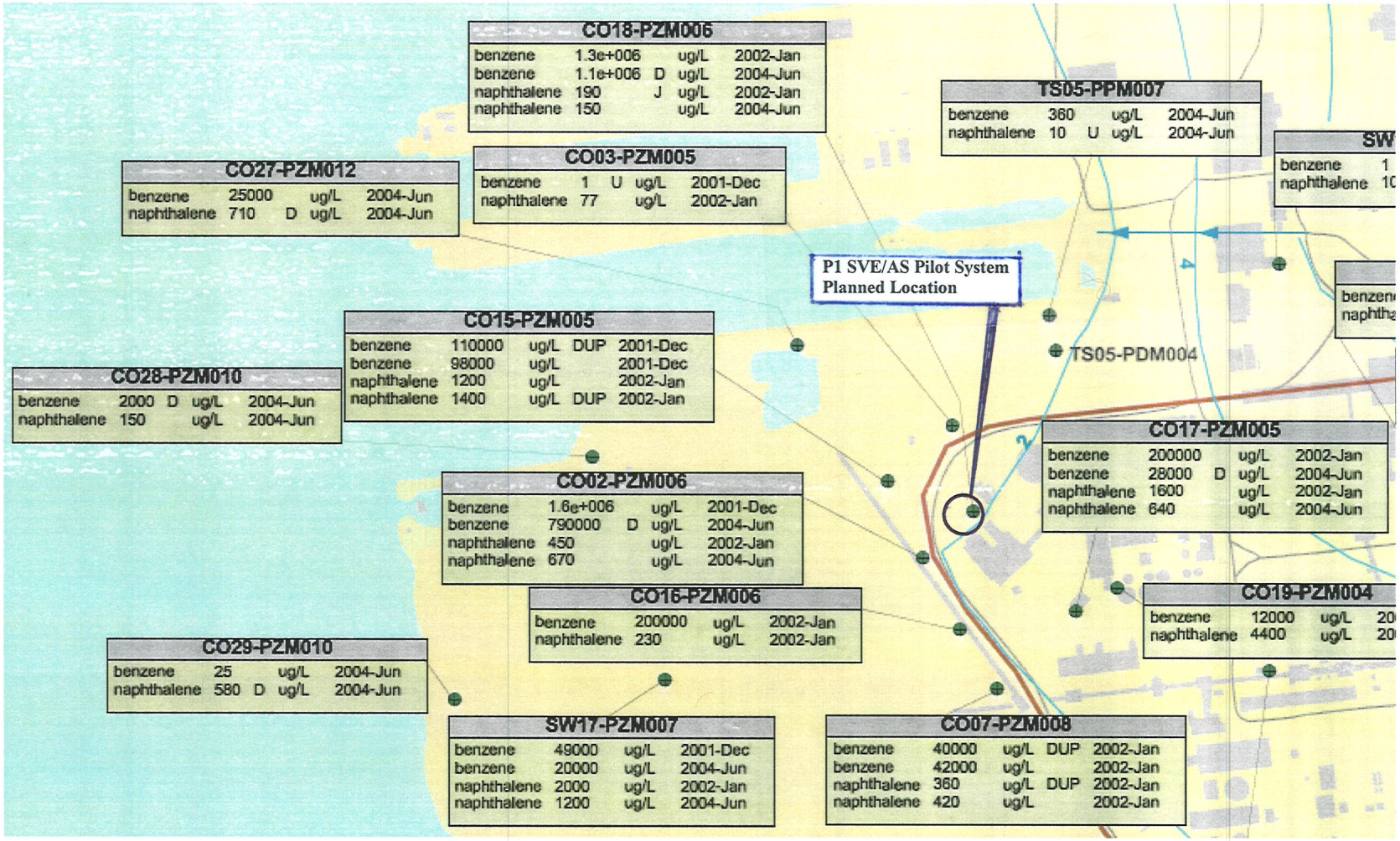
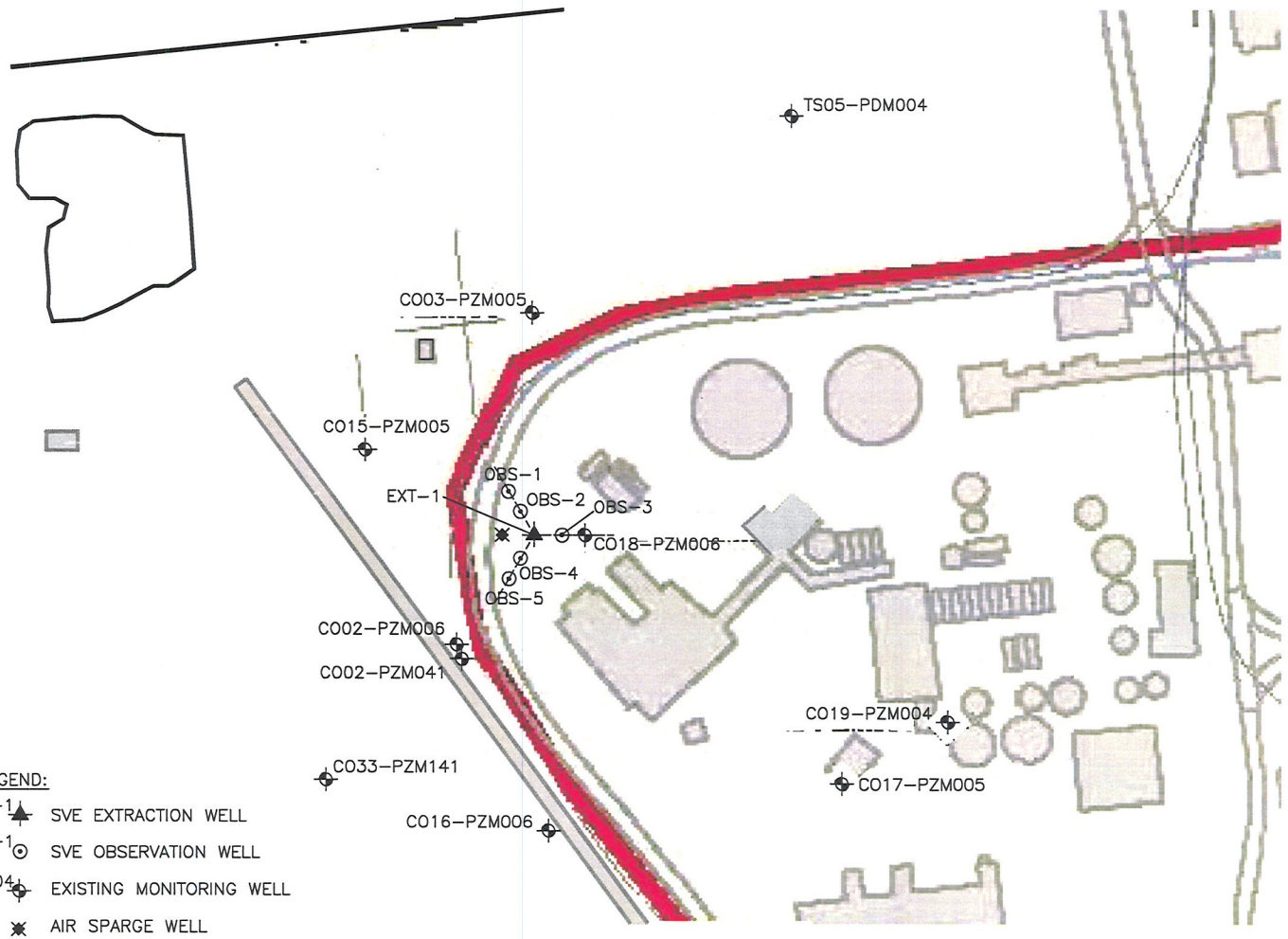
Figure 3
Target Constituent Concentrations in General Location of P1 IM SVE/AS Pilot Test
Sparrows Point Former Coke Oven Area





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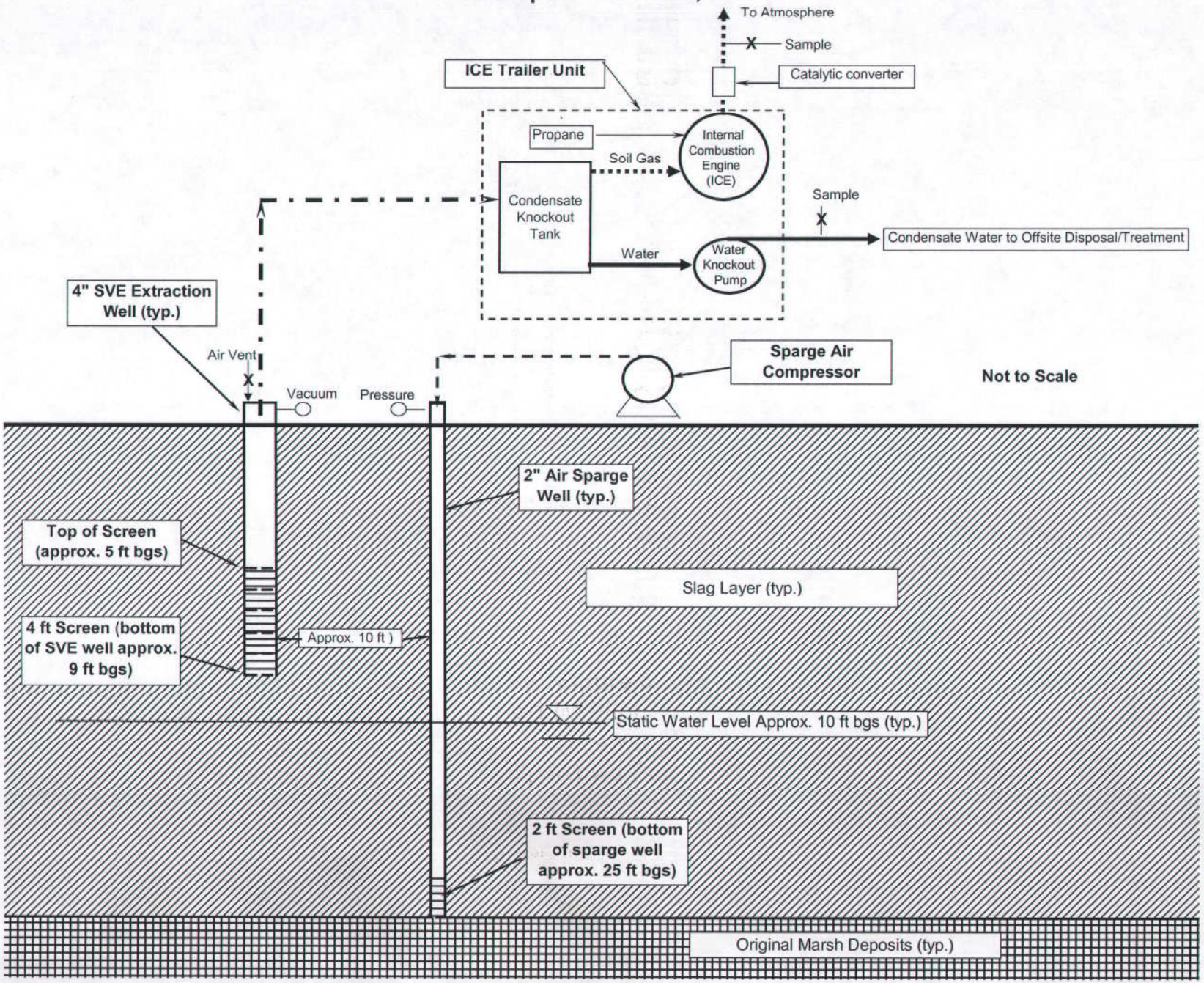
Prepared by: TFP	
Checked by:	
Date: 10/17/2008	

CONCEPTUAL SVE PILOT TEST WELL LAYOUT
COKE OVEN AREA
SEVERSTAL SPARROWS POINT, LLC

Figure 4

Figure 5
Schematic of Phase 1 IM Pilot SVE/Air Sparge System
Former Coke Works Area
ISG Sparrows Point, Inc.



APPENDIX A

RSI Model V3 Base Unit

REMEDIATION SERVICE, INT'L
"Technology in Support of the Envrionment"

Remediation Service, Int'l (RSI)
4835 Colt. St., Unit D · Ventura, CA 93003 · USA
Tel +1 805 644 8382 · Fax +1 805 644 8378
E-mail: info@rsi-save.com Web: http://www.rsi-save.com

Model V3 Base Unit

Model V3 Base Unit

System Specifications

- Up to 30 lbs/hr hydrocarbon destruction rate
- Engine - power source/compressive thermal oxidizer
- Catalytic converter
- Miscellaneous engine gauges with safety shutdown
- Moisture knockout tank with air particulate filter (one gallon capacity)
- Oil reservoir system
- Automatic Fire Suppression System
- Hot Air Ducts/additional noise reduction
- Natural gas control solenoid valve and propane regulator
- Noise abatement housing/cabinetery
- Single or dual Axle Trailer Optional

APPENDIX B

Health & Safety Plan
(presented as a separate document)

COKE OVEN AREA SPECIAL STUDY AREA INTERIM MEASURES WORK PLAN

HEALTH AND SAFETY PLAN

SEVERSTAL SPARROWS POINT, LLC

SPARROWS POINT, MARYLAND

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