

PCB Mass Loading
Diamond State Foundry-Pullman Car Works
SIRB ID: DE-1144
Wilmington, Delaware



BrightFields, Inc.

Appendix 9

DIAMOND STATE FOUNDRY- PULLMAN CAR WORKS WILMINGTON, DELAWARE

SIRB ID: DE-1144

GENERAL SITE INFORMATION

Site Name: Diamond State Foundry-Pullman Car Works

SIRB ID Number: DE-1144

Site Location and Description: The Diamond State Foundry-Pullman Car Works is located across from the Gander Hill correctional institution on 12th Street in Wilmington, Delaware. A portion of the property is located north of Railroad Avenue and is bounded by the Brandywine Creek on the west and 11th Street to the east. The remainder of the property is just south of Railroad Avenue and is bounded by 12th Street to the northeast and the Brandywine Creek to the south and west. The site is located in the northeast section of the city of Wilmington and is approximately 34 acres in size. As of July 2009 this site is in the process of being spilt into multiple sites, which may include the delegation of different site names to different properties. The data discussed in this Appendix will likely be assigned DE-1222 or DE-1300.

Previous Site Uses: The area west of the rail line was the historic location of the Delaware Iron Foundry and the Delaware Terracotta works. Most recently this area was the location of fishing shacks and a marina. Currently this portion of the study area is heavily wooded, with several abandoned boats and various buildings/trailers.

Site Regulatory Status: This section briefly summarizes previous investigations performed on the site through the SIRB program. A current SIRB regulatory status is also included.

Brownfield Preliminary Assessment II (BPA II) of the Diamond State Foundry Study Area (DNREC 200)

DNREC collected a total of 71 soil (shallow and deep) and sediment samples during the BPA II. Soil and sediment sampling took place the week of June 14, 1999. One groundwater well was installed on June 21, 1999 and was then sampled on July 7, 1999. Soil and sediment samples were all screened for the presence of volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and metals. As a result 19 samples were submitted for confirmatory analysis.

Elevated levels of metals and PAHs were reported in the shallow soil south and east of the railroad line. DNREC recommended that Diamond State Foundry-Pullman Car Works enter into a Voluntary Clean-up Program (VCP) with the state.



Current Regulatory Status:

In 2001 the Brandywine Industrial Complex entered into a VCP agreement for the site. On April 11, 2002 Gilmore Associates, Inc. submitted a work plan for additional sampling activities at the Brandywine Industrial Complex parcel. As of December 2008 no work associated with this work plan has been completed.

SUMMARY OF SITE PCB INFORMATION

Site Investigation PCB Findings:

PCBs were detected in two soil samples collected from this assessment area. One sample was collected from surface soil (GP-5S) and the other was collected from the subsurface saturated soil (TP-9D).

Due to the very limited amount of distinct detections in the surface soil, BrightFields used the maximum concentration detected for the overland flow loading calculations and groundwater partitioning calculations. The quantitative numbers used in these calculations were based on the qualitative screening values assigned to each of these samples.

Concentrations of PCBs on Site			
Sample Matrix	Corresponding Figure	Analytical Methods	Range of Total PCBs
Surface Soil	Figure 2	Immunoassay	Not detected to >1 < 2 mg/kg
Subsurface Soil (unsaturated)	Figure 3	Immunoassay and Method 8082	Not detected
Subsurface Soil (saturated)	Figure 4	Immunoassay and Method 8082	Not detected to >1 < 5 mg/kg
Groundwater	Figure 5	Method 8082	Not detected

A summary of all samples collected for PCBs are presented in the attached Tables 1 through 3.

Acreage where PCBs detected:

Total area associated with surface soils impacted by PCBs is 1.88 acres of which only 0.65 acres may be contributing to overland flow loading. The other 1.23 acres was determined to be under an impervious surface through the site cover evaluation. The subsurface unsaturated soil area impacted by PCBs is approximately 1.91 acres. The subsurface saturated soil area impacted by PCBs is approximately 0.53 acres.

PCB Remediation Status:

No remedial activities have occurred on the site as of December 2008.

PCB MASS LOADING SUMMARY

The PCB mass loading rate to surface water via overland flow and via groundwater transport were estimated for the Diamond State Foundry-Pullman Car Works site. A summary of the results is included below and the details of the calculations are included as attachments to this Appendix.

OVERLAND FLOW:

Overland flow has been determined on this site by using the Revised Universal Soil Loss Equation (RUSLE). The RUSLE predicts the long term average annual rate of erosion on an area based on rainfall patterns, soil type, topography, cover/canopy factors, and support management practices. These specific factors are site specific and rely on local information of the site. A breakdown of the individual factors is presented below with a brief explanation of their choice.

Ground Cover and Canopy:

A site inspection was performed on November 7, 2008 to estimate the current site ground cover and canopy. The cover/management factor (C) assigned to the site and associated flow path is 0.011, which corresponds to areas that have a vegetative cover consisting of 75% groundcover, with the cover at the surface being grass, grass-like plants, decaying compacted duff, or litter at least 2 inches deep. Photographs of the site ground cover and canopy are attached.

Site Sediment and Erosion Control Practices:

There are no current erosion and sediment controls in place at the Diamond State Foundry-Pullman Car Works site.

Input Factors and Results:

A breakdown of the individual factors is presented below with a brief explanation of their choice.



Diamond State Foundry-Pullman Car Works

RUSLE Factors	Values Provided	Explanation of Selection
E = rainfall/erodibility index (10 ² m-tonne-cm/ha-hr)	170	An appropriate value for R for the site was determined from plots of Rainfall patterns for the Eastern U.S. (Wischmeier and Smith, 1978).
K = soil erodibility (0.01 tonf acre hr/acre ft-ton in)	0.28	The soil erodibility factor was inferred based on the information provided by the boring log represented for TP-9 in the BPA II for the Diamond State Foundry Study Area (DNREC 2000).
ls = topographic factor (dimensionless)	1.1	The slope length was estimated to be 51.8 feet, which is the distance between the site and creek along the overland flow path. The assumed slope (9.66 %) and slope length were used to calculate a topographic factor of 1.1 from the USGS windows based application.
C = cover/management factor (dimensionless)	0.011	The cover/management factor C assigned to the site by the USGS windows based application was 0.011, which corresponds to approximately a 75% cover with the cover being grass or grass like at the surface or litter at least 2 inches deep.
P = support practice factor (dimensionless)	1.0	There are no current support practices implemented.

The average annual erosion rate is based on the windows based RUSLE2 program (RUSLE2 License, version 2006-Jul-24).

The total PCB loading via overland flow for the Diamond State Foundry-Pullman Car Works is 0.5 grams per year. Please see attached table for specific variables.

Uncertainty Analysis Associated with Overland Flow:

Specific Areas and Degree of Uncertainty for the Diamond State Foundry-Pullman Car Works site

	Samples Per Acre (site)	Chemical Data Quality*	Topography	Soil Type	Site Coverage	Map Quality	Distance to Discharge Points
Site Specific Information	1.73	Immunoassay kits	Estimated using topography	Logs from borings located on-site	Based on a site assessment	Scaled Map	51.7 feet
Degree of Uncertainty	Moderate to High	High	Moderate	Moderate	Moderate	Moderate	Low to Moderate

* Primary analysis used in the historical samples

Areas of uncertainty concerning the Diamond State Foundry-Pullman Car Works site include the following: the concentrations for both overland flow and groundwater calculations were inferred from qualitative immunoassay concentrations for total PCBs. In these instances BrightFields assumes that the quantitative concentration for that sample is half the upper limit. The chemical data quality for this site has a high uncertainty factor because the majority of the samples collected only analyzed using immunoassay screening analysis. The sample locations for this site were geo-referenced based on a paper copy of scaled figures, which could lead to sample locations varying slightly from their original location. Based on these findings the overall uncertainty associated with the PCB mass loading via overland flow from the Diamond State Foundry-Pullman Car Works site is **moderate to high**.

GROUNDWATER DISCHARGE ANALYSIS

Groundwater discharge is based on the hydraulic conductivity of the soil, the groundwater gradient, and the cross-sectional area of the aquifer. A breakdown of the individual factors used in the Darcy equation is presented below.

Because PCBs were detected in saturated soil, but not in groundwater, the calculated concentration of PCBs in pore water, based on partitioning, was used to calculate the mass loading. The calculated PCB concentration in the pore water ranges from 0.55 to 2.7 µg/L. The calculations are presented in Table B in the groundwater transport calculations attachment.

Input Factors:

A breakdown of the individual factors is presented below with a brief explanation of their choice.

Groundwater Transport Factors	Value Used		Justification/Derivation of Value Used
	min	max	
K = Hydraulic Conductivity (ft/day)	0.0028	0.028	Test pit logs from the BPAII were used to evaluate the lithology beneath the site. An examination of the logs shows that the groundwater unit monitored is within a fine-grained clayey silt fill unit above marsh deposits or sometimes weathered bedrock surface. The hydraulic conductivity for a fine clayey silt ranges from approximately 1×10^{-6} to 1×10^{-5} cm/sec (Cernica, 1995).
I = Horizontal Groundwater Gradient	0.023	0.026	Because only one groundwater well was installed at the site, the horizontal hydraulic gradient could not be directly calculated. However, because the groundwater surface frequently mimics topography, an estimate of the gradient can be made based on surface slope. Based on measurements, the ground surface elevation decreases approximately 2.5 to 2.8 feet over the course of approximately 95 to 120 feet.



Groundwater Transport Factors	Value Used		Justification/Derivation of Value Used
	min	max	
Saturated Thickness (ft)	2	3	Based on the test pit logs, the saturated thickness ranged from approximately 2 to 3 feet.
Lateral Discharge Distance (ft)	325	325	The lateral discharge distance was estimated to be 325 feet.
A= Cross-Sectional Area (ft ²)	650	975	Calculated from the saturated thickness and lateral discharge distance.
Groundwater PCB Concentration (µg/L)	0.55	2.7	The maximum concentration observed in the saturated subsurface soil (2.5 mg/kg) was used to determine the estimated concentration in groundwater.
Distance to Discharge point (ft)	Directly adjacent		Approximate distance from property boundary to closest surface water location.

Mass Loading Via Groundwater Transport Result:

The groundwater discharge is 1.0 to 32 L/day (attached Table A). The maximum detected PCB concentration (2.5 mg/kg) was used to calculate the groundwater concentrations for the loading estimate. The estimated minimum and maximum contaminant mass loading contributions are shown in the Table C in the groundwater transport calculations attachment, assuming that there are no contaminant losses due to degradation, dispersion, sorption, volatilization, etc.

The total PCB loading via groundwater discharge is between 0.001 to 0.02 grams per year (attached Table C).

Uncertainty Analysis Associated with Groundwater Transport:

**Specific Areas and Degree of Uncertainty for the
 Diamond State Foundry-Pullman Car Works**

	Groundwater PCB Concentration	Hydraulic Conductivity	Horizontal Groundwater Gradient	Saturated Thickness	Lateral Discharge Distance	Distance to Discharge point
Site Specific Information	Partitioning based on maximum concentration observed in saturated soil (screening value)	Conductivity based on limited quality logs	Gradient based on low quality surface topography	No or limited quality boring logs	Poor sample control/ quality, poor ground-water flow data	Directly adjacent
Degree of Uncertainty	High	Moderate	High	High	High	Low



Based on this evaluation the overall uncertainty associated with PCB loading via groundwater transport from the Diamond State Foundry-Pullman Car Works is **moderate to high.**

PCB Mass Loading
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Site References:

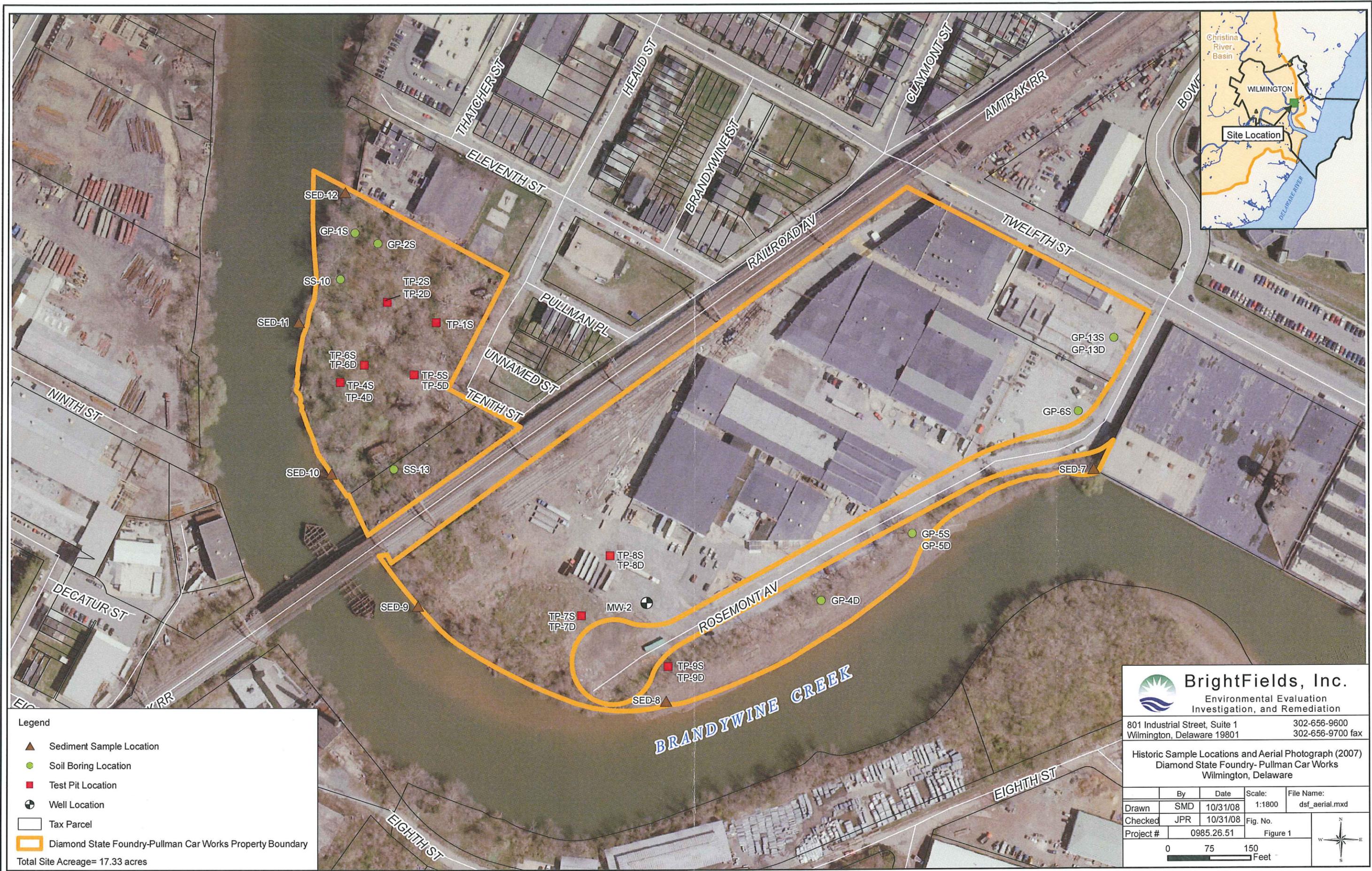
Department of Natural Resources and Environmental Control (DNREC 2000), Brownfield Preliminary Assessment II of the Diamond State Foundry Study Area. September 2000.

PCB Mass Loading
Diamond State Foundry-Pullman Car Works
SIRB ID: DE-1144
Wilmington, Delaware



BrightFields, Inc.

Figures



Legend

- ▲ Sediment Sample Location
- Soil Boring Location
- Test Pit Location
- ⊕ Well Location
- Tax Parcel
- ▭ Diamond State Foundry-Pullman Car Works Property Boundary

Total Site Acreage= 17.33 acres

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 Investigation, and Remediation

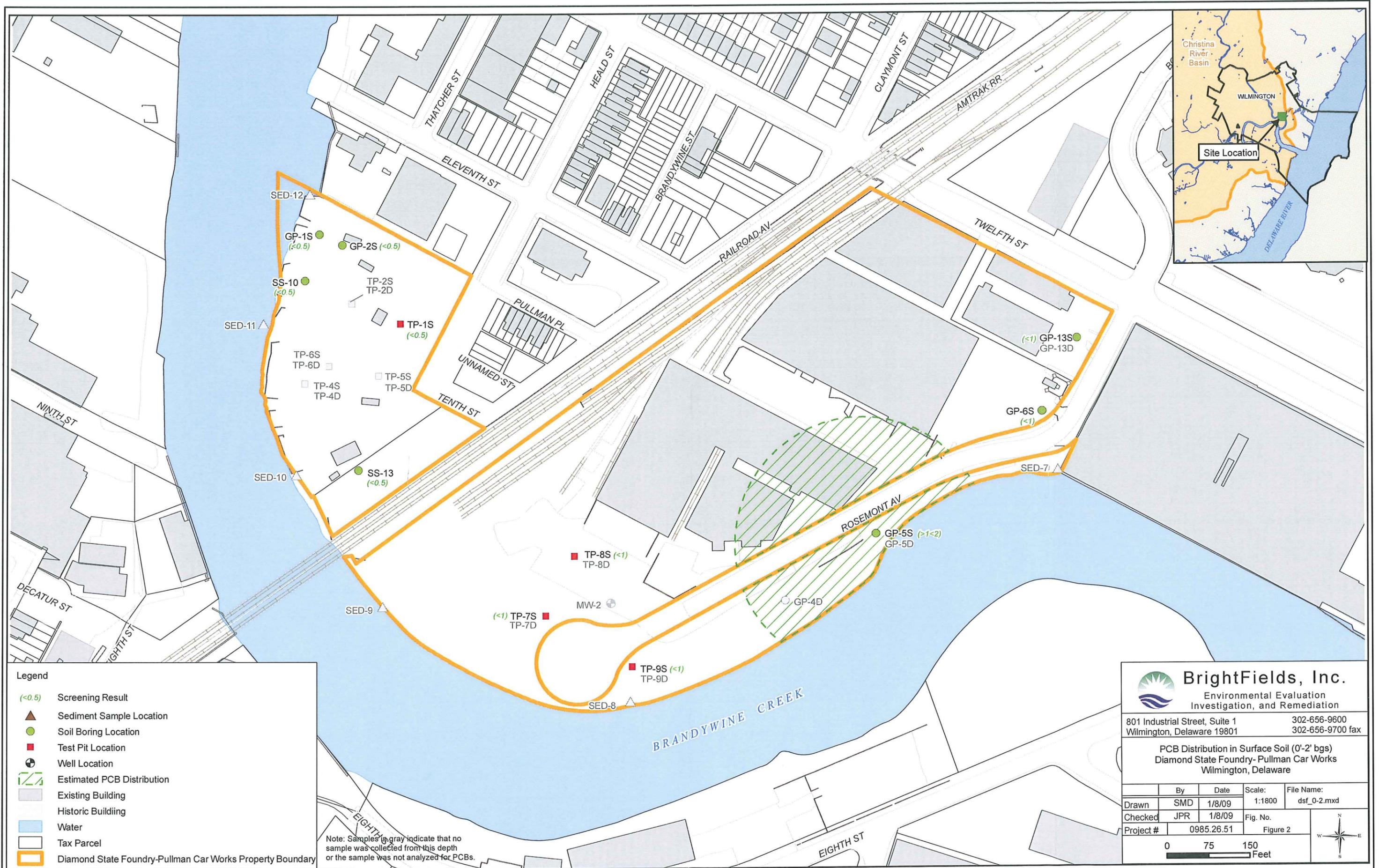
801 Industrial Street, Suite 1
 Wilmington, Delaware 19801

302-656-9600
 302-656-9700 fax

Historic Sample Locations and Aerial Photograph (2007)
 Diamond State Foundry- Pullman Car Works
 Wilmington, Delaware

	By	Date	Scale:	File Name:
Drawn	SMD	10/31/08	1:1800	dsf_aerial.mxd
Checked	JPR	10/31/08	Fig. No.	
Project #	0985.26.51		Figure 1	

0 75 150 Feet



Legend

- (<0.5) Screening Result
- ▲ Sediment Sample Location
- Soil Boring Location
- Test Pit Location
- ⊕ Well Location
- ▨ Estimated PCB Distribution
- ▒ Existing Building
- ░ Historic Building
- Water
- Tax Parcel
- ▭ Diamond State Foundry-Pullman Car Works Property Boundary

Note: Samples in gray indicate that no sample was collected from this depth or the sample was not analyzed for PCBs.

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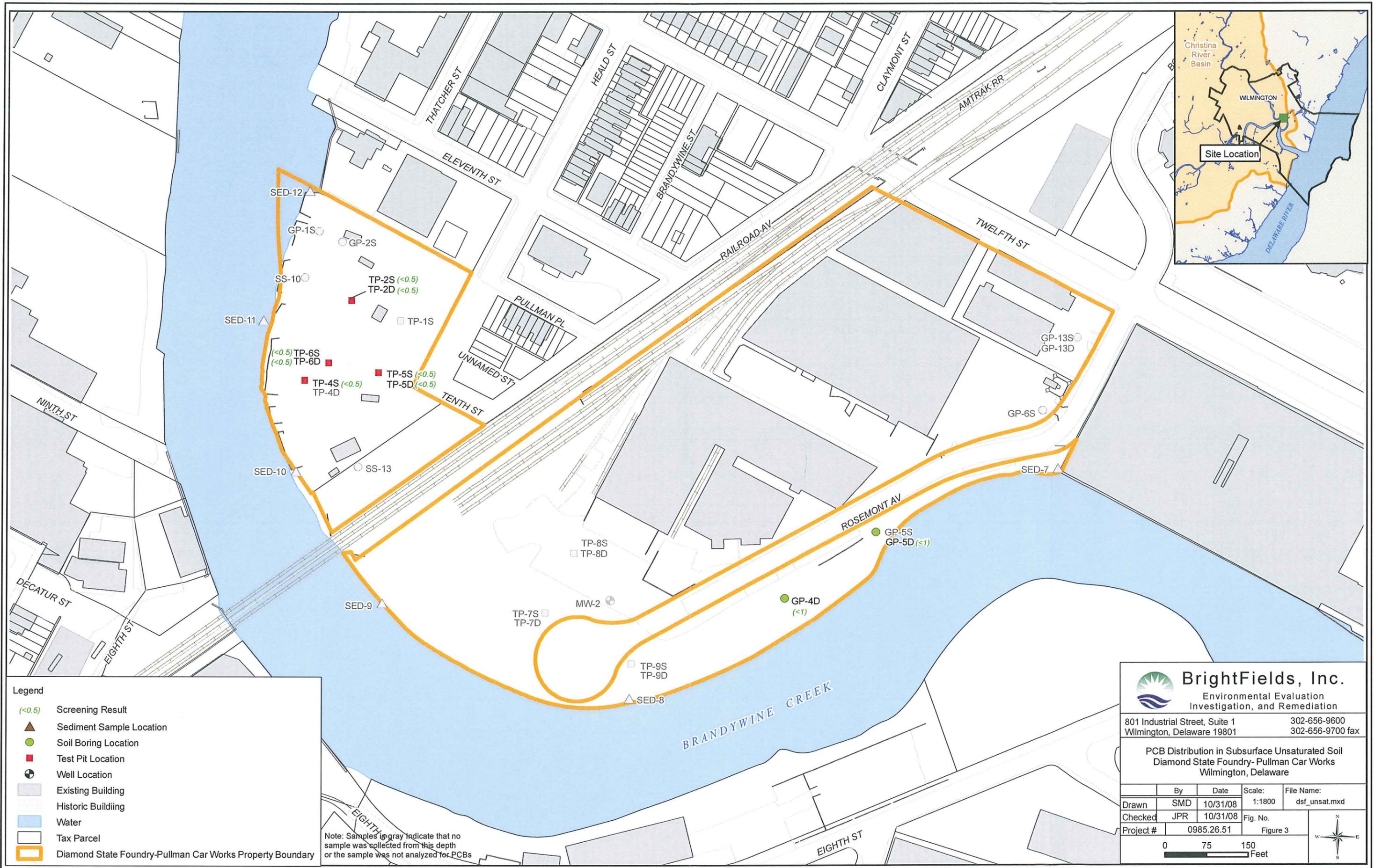
801 Industrial Street, Suite 1
 Wilmington, Delaware 19801

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PCB Distribution in Surface Soil (0'-2' bgs)
 Diamond State Foundry- Pullman Car Works
 Wilmington, Delaware

	By	Date	Scale:	File Name:
Drawn	SMD	1/8/09	1:1800	dsf_0-2.mxd
Checked	JPR	1/8/09	Fig. No.	
Project #	0985.26.51		Figure 2	

0 75 150 Feet



Legend

- (<0.5) Screening Result
- ▲ Sediment Sample Location
- Soil Boring Location
- Test Pit Location
- ⊕ Well Location
- Existing Building
- Historic Building
- Water
- Tax Parcel
- Diamond State Foundry-Pullman Car Works Property Boundary

Note: Samples in gray indicate that no sample was collected from this depth or the sample was not analyzed for PCBs

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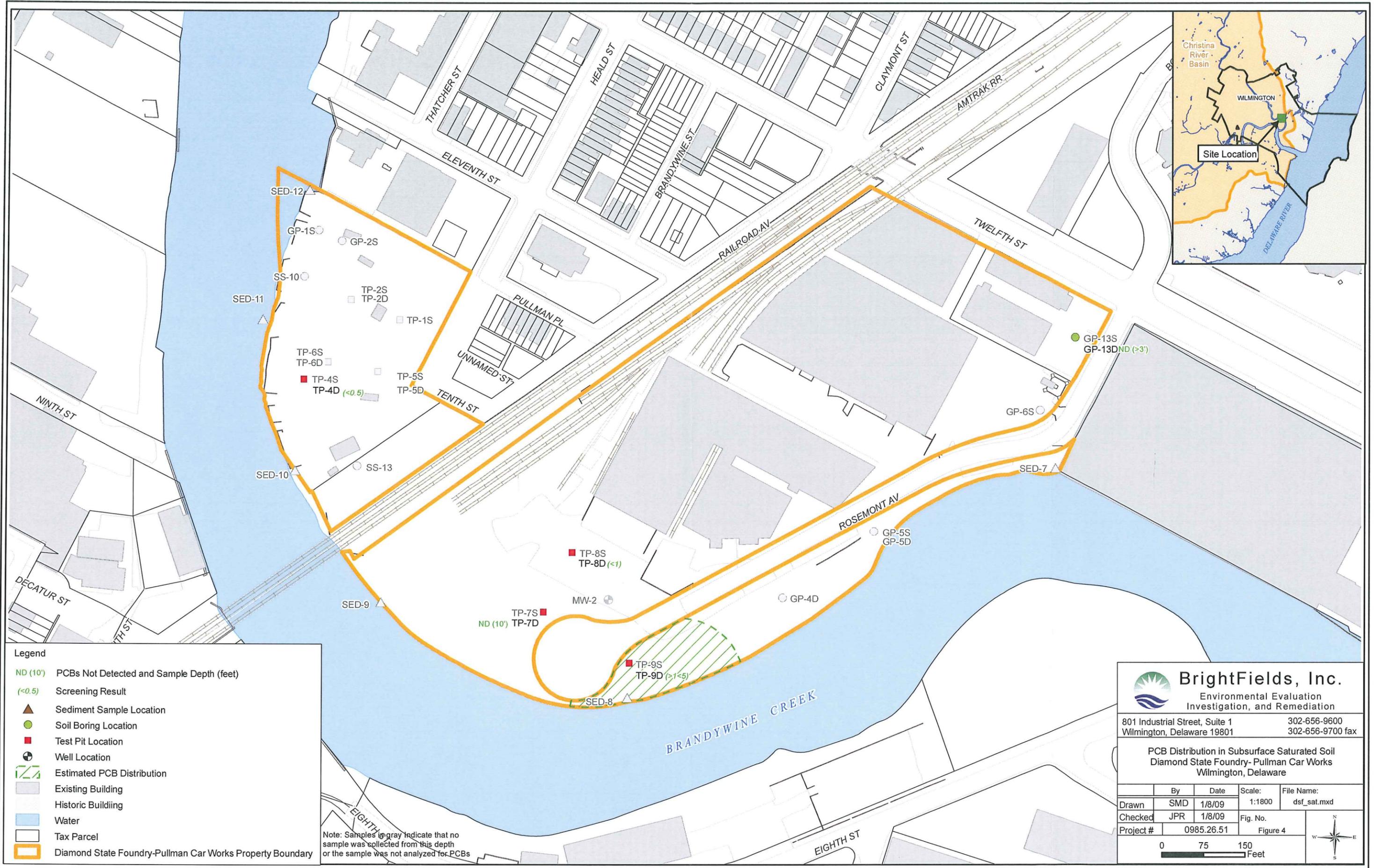
801 Industrial Street, Suite 1
 Wilmington, Delaware 19801

302-656-9600
 302-656-9700 fax

PCB Distribution in Subsurface Unsaturated Soil
 Diamond State Foundry- Pullman Car Works
 Wilmington, Delaware

	By	Date	Scale:	File Name:
Drawn	SMD	10/31/08	1:1800	dsf_unsat.mxd
Checked	JPR	10/31/08	Fig. No.	
Project #	0985.26.51		Figure 3	

0 75 150 Feet



Legend

- ND (10') PCBs Not Detected and Sample Depth (feet)
- <0.5 Screening Result
- ▲ Sediment Sample Location
- Soil Boring Location
- Test Pit Location
- ⊕ Well Location
- ▨ Estimated PCB Distribution
- ▭ Existing Building
- ▭ Historic Building
- ▭ Water
- ▭ Tax Parcel
- ▭ Diamond State Foundry-Pullman Car Works Property Boundary

Note: Samples in gray indicate that no sample was collected from this depth or the sample was not analyzed for PCBs

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 Environmental Evaluation
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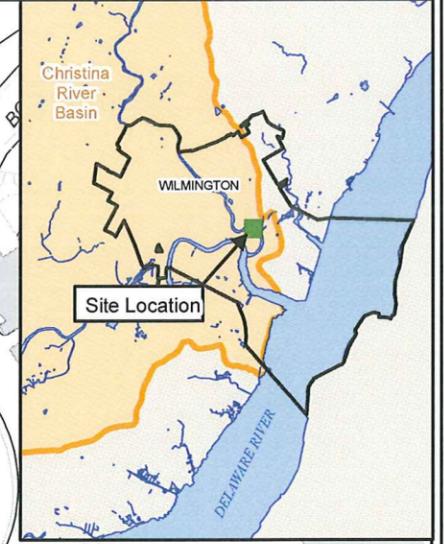
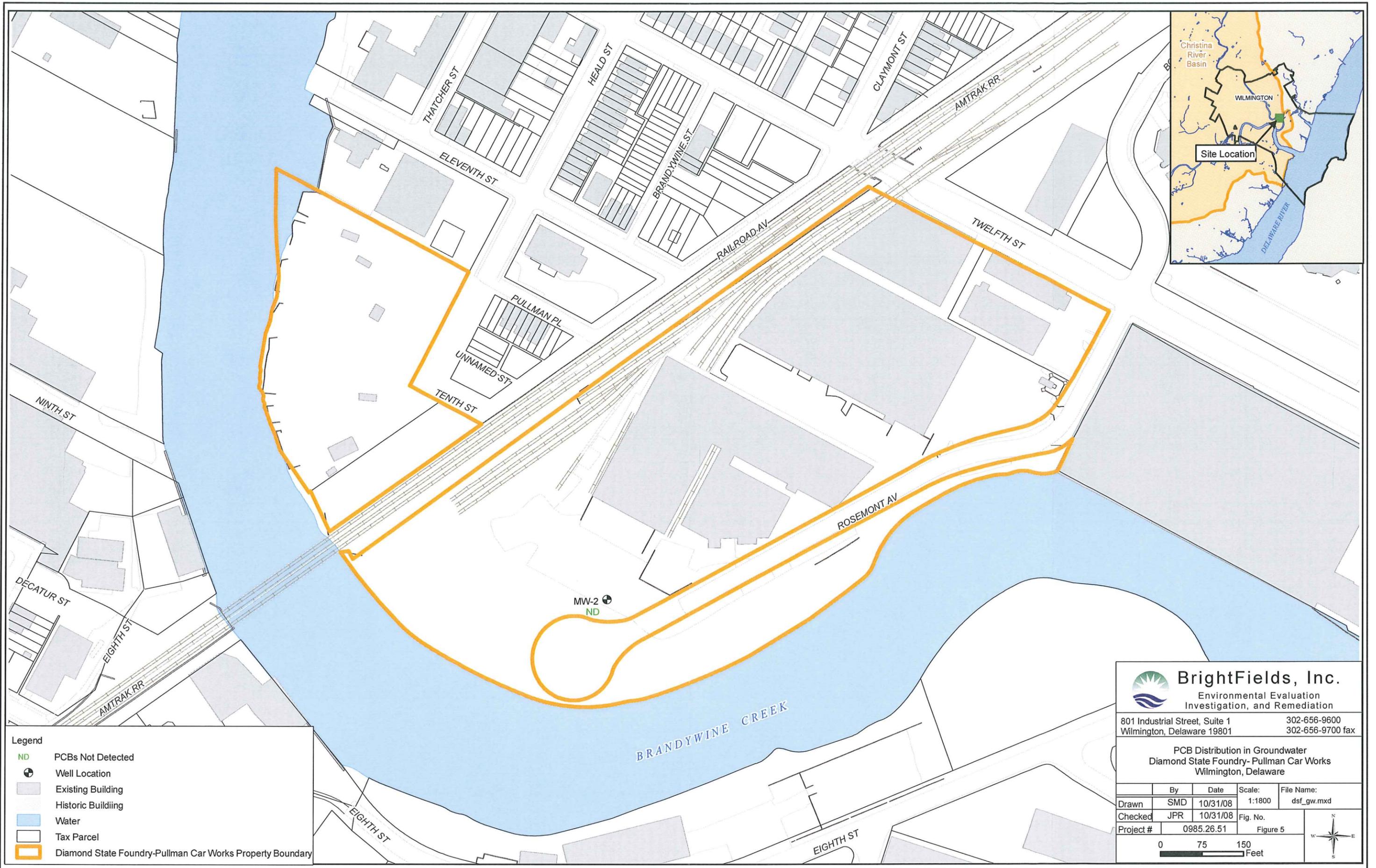
801 Industrial Street, Suite 1
 Wilmington, Delaware 19801

302-656-9600
 302-656-9700 fax

PCB Distribution in Subsurface Saturated Soil
 Diamond State Foundry- Pullman Car Works
 Wilmington, Delaware

By	Date	Scale:	File Name:
SMD	1/8/09	1:1800	dsf_sat.mxd
Checked	JPR	1/8/09	Fig. No.
Project #	0985.26.51	Figure 4	

0 75 150 Feet



Legend

ND	PCBs Not Detected
⊕	Well Location
▒	Existing Building
░	Historic Building
■	Water
□	Tax Parcel
▭	Diamond State Foundry-Pullman Car Works Property Boundary

BrightFields, Inc.
 Environmental Evaluation
 Investigation, and Remediation

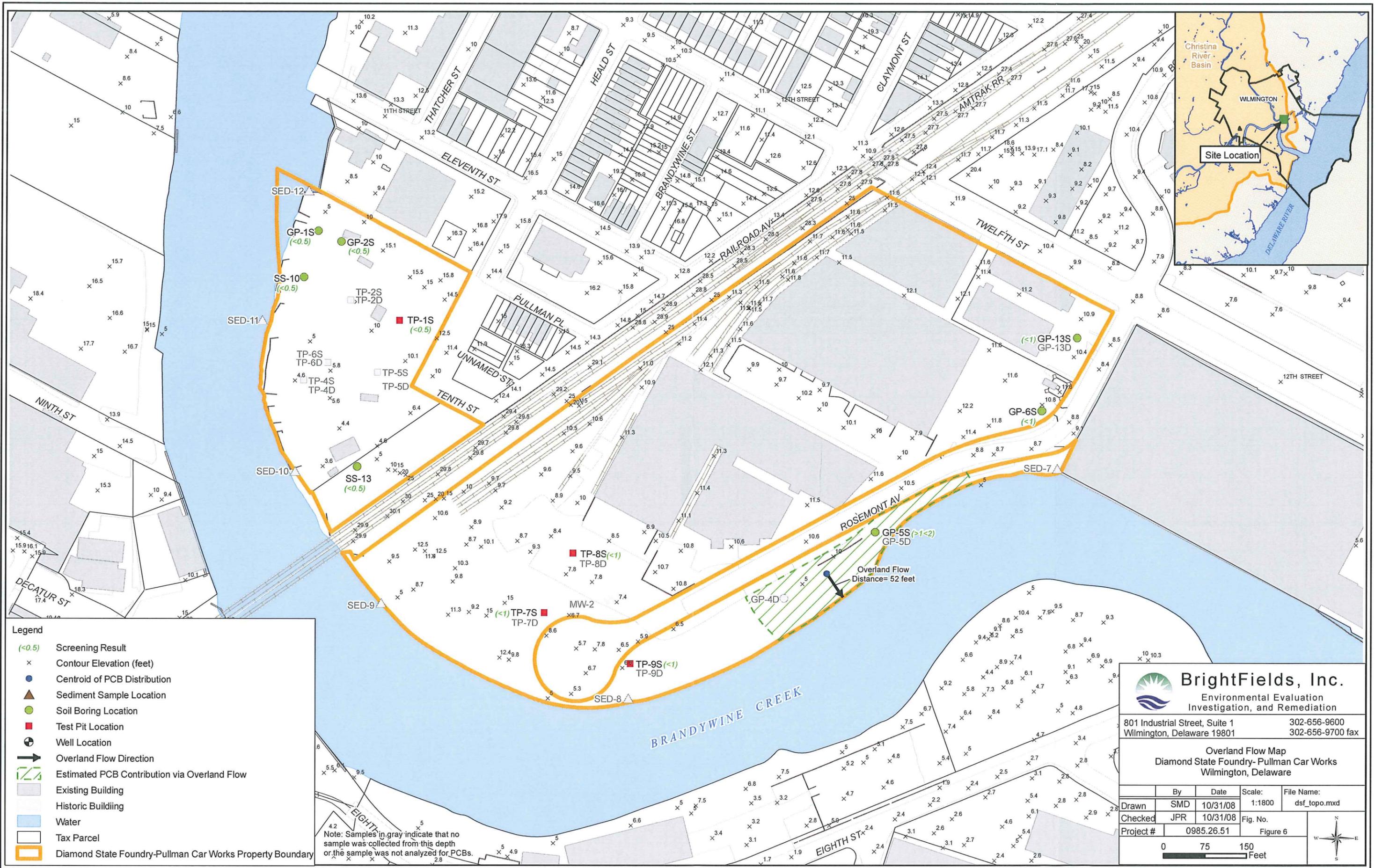
801 Industrial Street, Suite 1
 Wilmington, Delaware 19801

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PCB Distribution in Groundwater
 Diamond State Foundry- Pullman Car Works
 Wilmington, Delaware

	By	Date	Scale:	File Name:
Drawn	SMD	10/31/08	1:1800	dsf_gw.mxd
Checked	JPR	10/31/08	Fig. No.	
Project #	0985.26.51		Figure 5	

0 75 150 Feet



Legend

- (<0.5) Screening Result
- x Contour Elevation (feet)
- Centroid of PCB Distribution
- ▲ Sediment Sample Location
- Soil Boring Location
- Test Pit Location
- ⊕ Well Location
- ➔ Overland Flow Direction
- ➔ Estimated PCB Contribution via Overland Flow
- Existing Building
- Historic Building
- Water
- Tax Parcel
- Diamond State Foundry-Pullman Car Works Property Boundary

Note: Samples in gray indicate that no sample was collected from this depth or the sample was not analyzed for PCBs.

BrightFields, Inc.
 Environmental Evaluation
 Investigation, and Remediation

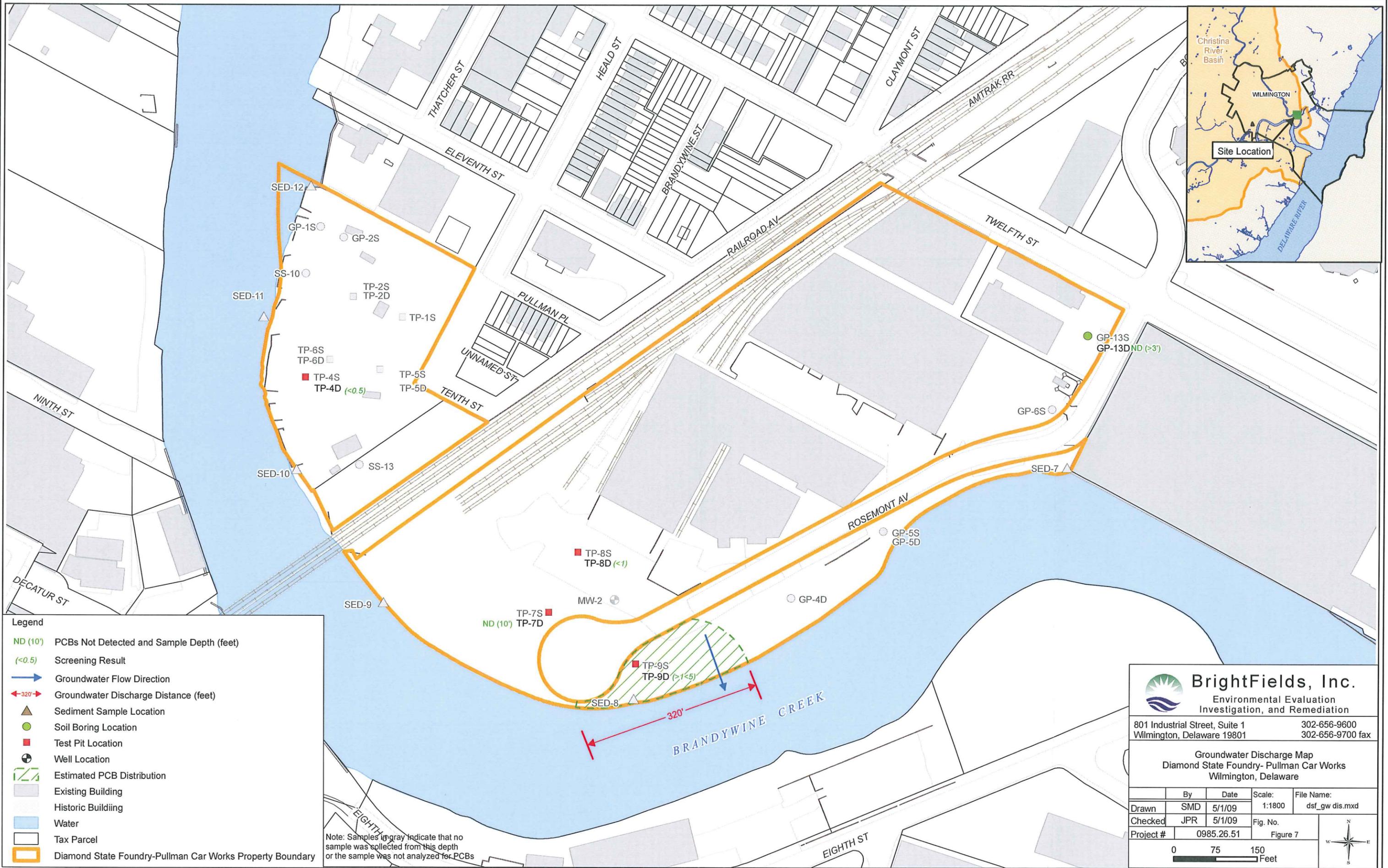
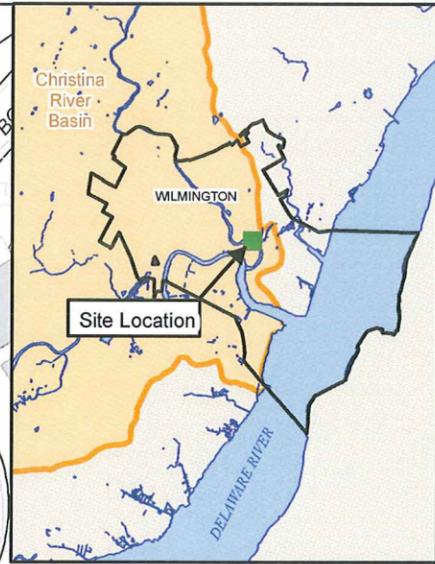
801 Industrial Street, Suite 1
 Wilmington, Delaware 19801

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 302-656-9700 fax

Overland Flow Map
 Diamond State Foundry- Pullman Car Works
 Wilmington, Delaware

By	Date	Scale:	File Name:
SMD	10/31/08	1:1800	dsf_topo.mxd
Checked	JPR	10/31/08	Fig. No.
Project #	0985.26.51		Figure 6

0 75 150 Feet



Legend

- ND (10') PCBs Not Detected and Sample Depth (feet)
- <0.5> Screening Result
- Groundwater Flow Direction
- ←320→ Groundwater Discharge Distance (feet)
- ▲ Sediment Sample Location
- Soil Boring Location
- Test Pit Location
- ⊕ Well Location
- ▨ Estimated PCB Distribution
- ▒ Existing Building
- ░ Historic Building
- Water
- Tax Parcel
- ▭ Diamond State Foundry-Pullman Car Works Property Boundary

Note: Samples in gray indicate that no sample was collected from this depth or the sample was not analyzed for PCBs

BrightFields, Inc.
 Environmental Evaluation
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Groundwater Discharge Map
 Diamond State Foundry- Pullman Car Works
 Wilmington, Delaware

	By	Date	Scale:	File Name:
Drawn	SMD	5/1/09	1:1800	dsf_gw_dis.mxd
Checked	JPR	5/1/09	Fig. No.	
Project #	0985.26.51		Figure 7	

0 75 150 Feet

PCB Mass Loading
Diamond State Foundry-Pullman Car Works
SIRB ID: DE-1144
Wilmington, Delaware



BrightFields, Inc.

Tables

Table 1
 PCB Laboratory Analytical Results For Soil
 Diamond State Foundry-Pullman Car Works
 Wilmington, DE
 SIRB ID: DE-1144

Sample ID Sampling Depth (feet bgs) Sampling Date Units Report Issued	DNREC URS for Protection of Human Health Non-critical Water Resource Area mg/Kg		GP-13D >3' 6/14/99 mg/Kg DNREC (2000)	TP-7D 10' 6/14/99 mg/Kg DNREC (2000)
	Unrestricted Use	Restricted Use		
	PCBs			
Aroclor-1016	5	82	0.044 U	0.041 U
Aroclor-1221	0.3	3	0.089 U	0.082 U
Aroclor-1232	0.3	3	0.044 U	0.041 U
Aroclor-1242	0.3	3	0.044 U	0.041 U
Aroclor-1248	0.3	3	0.044 U	0.041 U
Aroclor-1254	0.3	3	0.044 U	0.041 U
Aroclor-1260	0.3	3	0.044 U	0.041 U

DNREC (2000) - Brownfield Preliminary Assessment II for Diamond State Foundry Study Area (September 2000)

Qualifiers

- U - The compound was not detected above the indicated laboratory detection limit
- NR - Not analyzed
- nca - no criteria available
- bold - concentration is above DNREC URS unrestricted use criteria
- shaded - concentration is above DNREC URS restricted use criteria

Table 2
 DNREC PCB Screening Data
 Diamond State Foundry-Pullman Car Works
 Wilmington, DE
 SIRB ID: DE-1144

Sample ID	Sample Depth	Investigation Report	Sample Date	DNREC URS for Protection of Human Health (Non-critical Water Resource Area) Unrestricted Use (mg/kg)	Total PCBs (mg/kg)
GP-2S	0'-2'	DNREC (2000)	6/14-16/99	1	<0.5
GP-1S	0'-2'	DNREC (2000)	6/14-16/99	1	<0.5
TP-2S	2'-3'	DNREC (2000)	6/14-16/99	1	<0.5
TP-1S	2'	DNREC (2000)	6/14-16/99	1	<0.5
TP-5S	2.5'	DNREC (2000)	6/14-16/99	1	<0.5
TP-6S	2.5'	DNREC (2000)	6/14-16/99	1	<0.5
TP-4S	2.5'	DNREC (2000)	6/14-16/99	1	<0.5
TP-8S	1.5'	DNREC (2000)	6/14-16/99	1	<1
TP-7S	2'	DNREC (2000)	6/14-16/99	1	<1
TP-9S	0'-2'	DNREC (2000)	6/14-16/99	1	<1
GP-4D	>3'	DNREC (2000)	6/14-16/99	1	<1
GP-5D	>3'	DNREC (2000)	6/14-16/99	1	<1
GP-6S	0'-2'	DNREC (2000)	6/14-16/99	1	<1
TP-13S	1'	DNREC (2000)	6/14-16/99	1	<1
TP-12S	1'	DNREC (2000)	6/14-16/99	1	<1
GP-12D	>3'	DNREC (2000)	6/14-16/99	1	<1
GP-11D	>3'	DNREC (2000)	6/14-16/99	1	<1
GP-13S	0'-2'	DNREC (2000)	6/14-16/99	1	<1
TP-8D	6'	DNREC (2000)	6/14-16/99	1	<1
TP-2D	nca	DNREC (2000)	6/14-16/99	1	<0.5
TP-4D	7'	DNREC (2000)	6/14-16/99	1	<0.5
TP-5D	6.5'-7.5'	DNREC (2000)	6/14-16/99	1	<0.5
TP-6D	5'	DNREC (2000)	6/14-16/99	1	<0.5
TP-9D	8'	DNREC (2000)	6/14-16/99	1	>1<5
GP-5S	0'-2'	DNREC (2000)	6/14-16/99	1	>1<2
GP-11S	0'-2'	DNREC (2000)	6/14-16/99	1	<1
GP-12S	0'-2'	DNREC (2000)	6/14-16/99	1	<1
SS-10	6"	DNREC (2000)	6/14-16/99	1	<0.5
SS-13	6"	DNREC (2000)	6/14-16/99	1	<0.5

DNREC (2000) - Brownfield Preliminary Assessment II for Diamond State Foundry-Pullman Car Works (September 2000)

Qualifiers:

- ND - compound was not detected
- Bold - concentration exceeds URS
- nca - no criteria available

Table 3
PCB Laboratory Analytical Results For Groundwater
Diamond State Foundry-Pullman Car Works
Wilmington, DE
SIRB ID: DE-1144

Sample ID Sampling Date Units Report Issued	DNREC URS for Protection of Human Health ug/L	MW02 7/7/99 ug/L DNREC (2000)
PCBs		
Aroclor-1016	0.1	0.001 U
Aroclor-1221	0.03	0.002 U
Aroclor-1232	0.03	0.001 U
Aroclor-1242	0.03	0.001 U
Aroclor-1248	0.03	0.001 U
Aroclor-1254	0.03	0.001 U
Aroclor-1260	0.03	0.001 U

DNREC (2000) - Brownfield Preliminary Assessment II for Diamond State Foundry-Pullman Car Works
(September 2000)

Qualifiers

U - The compound was not detected above the indicated laboratory detection limit

NR - Not analyzed

nca - no criteria available

bold - concentration is above DNREC URS unrestricted use criteria

shaded - concentration is above DNREC URS restricted use criteria

PCB Mass Loading
Diamond State Foundry-Pullman Car Works
SIRB ID: DE-1144
Wilmington, Delaware



BrightFields, Inc.

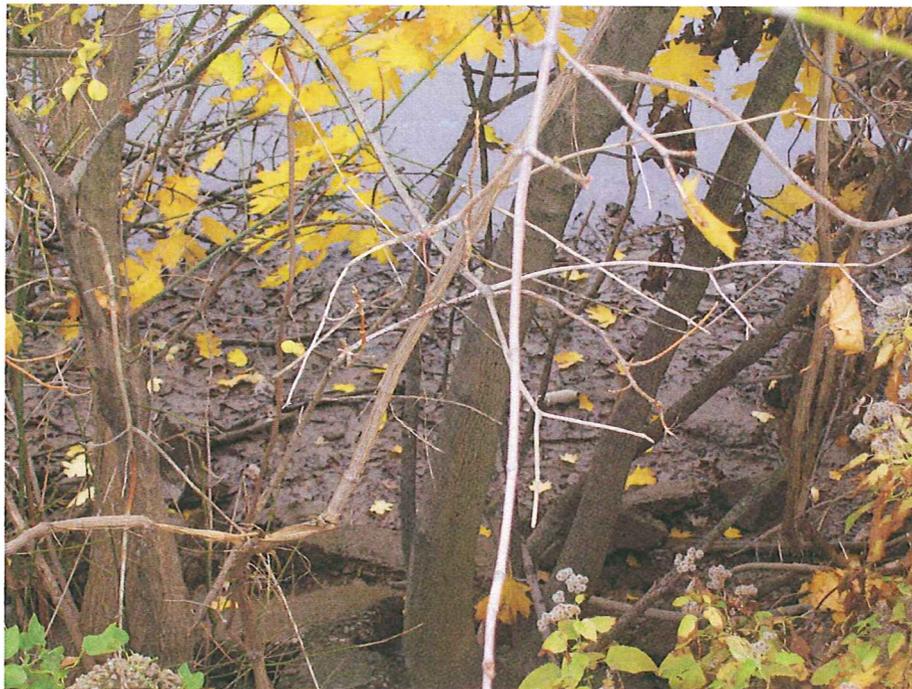
Site Photographs



**PCB Mass Loading Evaluation
Diamond State Foundry/Pullman Car Works**



Site surface cover associated with the identified area of concern.



River bank elevation change and sediments associated with river.

**PCB Mass Loading Evaluation
Diamond State Foundry/Pullman Car Works**



Vegetative buffer zone in the overland flow pathway.



Trash and debris associated with river bank.

PCB Mass Loading
Diamond State Foundry-Pullman Car Works
SIRB ID: DE-1144
Wilmington, Delaware



BrightFields, Inc.

Overland Flow Calculations

**PCB Loading Calculations from the Universal Soil Loss Equation
Diamond State Foundry-Pullman Car Works Site
Wilmington, DE
DE-1144**

Surface PCB Concentration 1.5 mg/kg

Symbol	Factor	Value	Units
R	Rainfall/Runoff Erosivity Index	170	10 ² ft-ton in/acre hr
K	Soil Erodibility	0.28	0.01 ton acre hr/ac ft-ton in
	Estimated Slope Length	51.78	Feet
	Estimated Elevation Difference	5	Feet
	Slope	9.66	Percent (ft/ft)
	Erodeable Area	0.65	Acres
LS	Topographic Factor	1.100	Dimensionless
C	Cover and Management Factor	0.011	Dimensionless
P	Support Practice Factor	1	Dimensionless
	Average Annual Soil Loss	0.55	ton/ac/yr

PCB Loading via Overland Flow 0.486 grams/year - PCBs

Diamond State Foundry/Pullman Car Works

Location: USA\Delaware\New Castle County

Net C factor: 0.011
 Net LS factor: 1.1
 Net K factor: 0.28
 Net contour factor: 1.0
 Net ridge factor: 1.0
 Net ponding factor: 1.0

Rock cover, %: 0
 Adjust rock cover: open
 General yield level: Set by user
 Surf. res. cov. values: Surf. cover
 Adjust res. burial level: Normal res. burial

Soil conditioning index: open

Energy use for entire simulation, BTU/ac: 0.0050

Equiv. diesel use for entire simulation, gal/ac: 0.000036
 Fuel cost for entire simulation, US\$/ac: 0.000108

Manage Soil Topo

Add break | Erase break

Avg. slope steepness, %: 9.6
 Slope length (horiz), ft: 52
 Crit. slope length, ft: 0.55
 Soil loss erod. portion, t/ac/yr: 0.546
 Detachment on slope, t/ac/yr: 3.0
 Sediment delivery, t/ac/yr: 0.55
 T value, t/ac/yr: 0.546

Fuel type for entire run: (none)

Align of oper on segments | General composite segment info | Biomass by layer | Biomass summary | C subfactor by day | C subfactor by period | C subfactor by operation
 Ridges_contour by day | Erosion by day | Erosion by period | Erosion by operation | Erosion by year | Extra C.L. crit. length values | Hydrology | Management output by day
 Management output by period | Residue values | Roughness | STRIPS_AND_BARRIERS | MANAGEMENT_STRIP_BUILDER | Runoff / Sediment overall results
 Runoff / Sediment results by day | Sediment results by flow path | Sediment by segment | Sediment by segment by day | Soil output by day | Yield values | Visuals | Info

Soil: MISC_CALCULATIONS1 | Topography | Management | Strips / Barriers | Irrigation / Subsurface drainage | Diversion/terrace, sediment basin

Slope Soils

Segment	Soil	Seg length (horiz), ft	Soil loss, t/ac/yr	Sed. del., t/ac/yr	Consolidation time, yr
1	Generic Soils\sandy loam (m OM, slo perm)	52	0.55	0.55	7

PCB Mass Loading
Diamond State Foundry-Pullman Car Works
SIRB ID: DE-1144
Wilmington, Delaware



BrightFields, Inc.

Groundwater Transport Calculations

**PCB Loading Calculations - Groundwater Discharge to Surface Water
Diamond State Foundry - Pullman Car Works
Wilmington, DE
DE-1144**

**TABLE A
Groundwater Discharge Calculations**

Location	Hydraulic Conductivity (K) (ft/day)	Horizontal Gradient (i) (ft/ft)	Cross-sectional Area (A) (ft ²)	Groundwater Discharge*	
				Liters/day	Gallons/day
TP11-TP13					
Minimum	2.80E-03	0.02	640	1.0	0.27
Maximum	2.80E-02	0.02	960	15	4

* - Groundwater Discharge (Q) = KiA

**TABLE B
Potential Groundwater PCB Concentration Calculation**

Location	Maximum Soil PCB (µg/kg)	f _{oc} (fraction of organic carbon)		Pore Water PCB (µg/L)	
				Minimum	Maximum
TP11-TP13	2,500	0.01	0.05	0.55	2.7

**TABLE C
Estimated Mass Loadings of PCBs in Groundwater to Surface Water**

Location	Subsurface Soil Concentration/ Converted to Pore Water Concentration (µg/L)	Estimated PCB Mass Loading (g/yr)	
		Minimum	Maximum
TP11-TP13	2.7	0.001	0.015