THIRD FIVE-YEAR REVIEW REPORT FOR PAOLI RAIL YARD SUPERFUND SITE CHESTER COUNTY, PENNSYLVANIA

Prepared by

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APR 28 2016

Date

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LIST OF ABBREVIATIONS & ACRONYMS

Amtrak	National Railroad Passenger Corporation
APU	American Premier Underwriters, Inc.
ARAR	Applicable or Relevant and Appropriate Requirement
BTEX	Benzene, toluene, ethylbenzene and xylene
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Conrail	Consolidated Rail Corporation
COC	Contaminant of Concern
DRO	Diesel-Range Organics
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FS	Feasibility Study
GRO	Gasoline-Range Organics
GPRA	Government Performance and Results Act
HRS	Hazard Ranking System
IC	Institutional Control
MCL	Maximum Contaminant Level
µg/L	micrograms per liter
mg/kg	milligram per kilogram
mg/L	milligram per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PADEP	Pennsylvania Department of Environmental Protection
PCBs	Polychlorinated Biphenyls
PCE	Tetrachloroethylene
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
RSL	Regional Screening Level
SWRAU	Site-Wide Ready for Anticipated Use
SEPTA	Southeastern Pennsylvania Transportation Authority
SVOCs	Semi-volatile Organic Compounds
SPL	Separate Phase Liquid
TBC	To-Be-Considered
Vanguard	Vanguard Group, Inc
VOCs	Volatile Organic Compounds

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Paoil Rail Yard Superfund Site		
EPA ID: PAD980692594		
Region: 3	**State:** PA	**City/County:** Paoli/Chester County

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA
Author name (Federal or State Project Manager): Christopher Sklaney
Author affiliation: EPA Region 3
Review period: September 2015 through May 2016
Date of site inspection: 9/29/2015
Type of review: Statutory
Review number: 3
Triggering action date: 5/5/2011
Due date: 5/5/2016

I. INTRODUCTION

The purpose of a Five-Year Review is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five-year review reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this Five-Year Review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP) (40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the third Five-Year Review for the Paoli Rail Yard Superfund Site. The triggering action for this statutory review is the signature date of the previous Five-Year Review Report. This Five-Year Review Report has been prepared due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure.

The Site consists of two operable units (OUs). OU1 is about 400 acres of residential, commercial and stream areas outside the rail yard property. OU2 is the 28-acre rail yard property and includes rail yard soils and ground water contamination beneath, and migrating from, the rail yard. This five-year review report addresses both OUs.

EPA conducted this five-year review from September 2015 to May 2016. The Five-Year Review was led by Christopher Sklaney, EPA Region 3 Remedial Project Manager (RPM), with contractor support from Skeo Solutions. Participants included Mindi Snoparksy (EPA Region 3 Hydrogeologist), Dawn Ioven (EPA Region 3 Toxicologist), Bruce Pluta (EPA Region 3 Biologist), Kathy Patnode (U.S. Fish and Wildlife Service), Gina Soscia (EPA Region 3 Community Involvement Coordinator), and Thomas Cinti (EPA Region 3 Attorney). The Pennsylvania Department of Environmental Protection (PADEP), as the support agency representing the Commonwealth of Pennsylvania, has reviewed all supporting documentation and provided input to EPA during the review process. The potentially responsible parties (PRPs) performing the work, American Premier Underwriters, Inc. (APU) (formerly Consolidated Rail Corporation, or Conrail) at OU1, and Southeastern Pennsylvania Transportation Authority (SEPTA) and National Railroad Passenger Corporation (Amtrak) at OU2, referenced collectively in site documents as the Rail Companies, were notified of the initiation of the Five-Year Review and participated in the five-year review site inspection.

Site Background

The Site is in a residential and commercial area of Paoli, Chester County, Pennsylvania (Figure 1, Appendix B). Portions of the Site are located in Willistown and Tredyffrin Townships. The Site consists of the 28-acre former Paoli rail yard facility, ground water under the rail yard, and site-related contamination in the 400-acre watershed north of the rail yard. The rail yard is bordered to the north by Central Avenue and residential properties, North Valley Road to the east, commercial properties to the west, and the Harrisburg Rail Line to the south. Lancaster Avenue (U.S. Route 30), south of the rail yard, is the main street of Paoli. Primary features of the rail yard property include a containment cell that stores stabilized polychlorinated biphenyl (PCB)-contaminated soils and sediment, four storm water management basins, an asphalt cover below which PCBs in soil greater than 25 milligrams per kilogram (mg/kg) remain in place, a garage building, a trailer that serves as a field office, a rail tie pile and several open gravel areas (west, central and east yards). The containment cell appears as a grass-covered hill on the western portion of the rail yard. These features are presented on Figure 2.

The rail yard property is located on the northern edge of a prominent regional ridge underlain by metamorphic rocks (schist) of the Wissahickon Formation. Chester Valley, which is underlain by carbonate and fine-grained clastic rocks, is located to the north. The relief between the ridge on which the rail yard property is located and Chester Valley is about 350 feet, and the topography between contains numerous deeply incised, high-gradient streams. Natural drainage from the Site is toward the north to Little Valley Creek through one of three tributaries: Cedar Hollow, Hollow Road, or North Valley. Cedar Hollow and Hollow Road tributaries flow together for

about 1,000 feet before the confluence with Little Valley Creek, which subsequently flows into Valley Creek and the Schuylkill River. Drainage patterns from the Site have been modified by the remedy and are now controlled through a storm water management system, the outfall of which flows through two storm water detention basins and into the Cedar Hollow and Hollow Road tributaries. All precipitation that falls on the rail yard property is directed to the tributaries through the storm water detention basins.

Ground water at the rail yard property is not used for any purpose. A ground water divide is located approximately on the southern side of the rail yard, with sources of contamination located on the north side. The surrounding area is serviced by public water, although four residences on Hollow Road, approximately 1,200 feet east-northeast of the asphalt cover area on the rail yard, use private domestic supply wells as a potable water source. Site-related hazardous substances have never been detected in the wells. The approximate location of the wells is presented on Figure 2.

Land use around the rail yard property is residential and commercial. Future land use in the Site area is anticipated to remain consistent with current land use. The prior five-year review noted that solar panels had been proposed for installation at the Site; however, the project was not implemented. No immediate plans for initiating redevelopment at the Site are known to exist.

In the early 1900s, the rail yard was established as a location for storage and maintenance of passenger rail cars pulled by steam engines. After conversion from steam to electric engines, mineral oil was used to insultate electronic components within transformers. In the 1950s, PCBs replaced mineral oil as an insultating fluid. The primary maintenance area was a car shop located on the north-central portion of the rail yard property. In 1979, EPA banned the manufacture of PCBs and began to phase out their use. A program by SEPTA to replace PCBs in transformers was completed by 1986.

In the late 1970s, both EPA and the Pennsylvania Department of Environmental Resources (now PADEP) inspected the rail yard and identified several areas of potential contamination. PCBs found in the soils and sediments at the Site were likely released during servicing and operation of the rail cars. The Rail Companies, a collective comprised of SEPTA, Amtrak and Conrail were required to determine the extent of contamination and to correct any problem areas. Sampling conducted by the Rail Companies from 1980 through 1984 indicated that PCBs were prevalent in soils at the rail yard.

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

In December 1985, a removal site evaluation conducted by EPA identified high concentrations of PCBs in surface soils at the rail yard and nearby residential properties, at concentrations up to 39,600 mg/kg and 1,900 mg/kg, respectively. PCBs are listed as hazardous substances under CERCLA. Sampling conducted in Valley Creek by Amtrak and SEPTA found PCBs in fish tissue as high as 5 mg/kg. The rail yard contained no off-site migration controls and access to the rail yard was unrestricted to the public. Based on these factors, EPA determined an imminent and substantial endangerment to human health and the environment existed and initiated response actions.

Response Actions

The first response action conducted at the Site was a time-critical removal action conducted from February 1986 through June 1988 that included the removal of 700 tons of soil containing high concentrations of PCBs on portions of the adjacent residential properties and the construction of erosion control and surface water detention structures to prevent future off-property migration of PCBs. Early in 1986, while the time-critical removal action was underway, EPA began evaluation of the releases pursuant to the Hazard Ranking System (HRS) to determine whether remedial response actions were appropriate. EPA proposed the Site to the National Priorities List (NPL) on January 22, 1987, and formally added the Site to the NPL on August 30, 1990.

In May 1987, the PRPs agreed to begin a Remedial Investigation (RI) and Feasibility Study (FS), or RI/FS, to characterize contaminants of potential concern, determine the extent of site-related contamination, assess risk to human health and the environment, and evaluate cleanup alternatives. During the RI, a fuel oil recovery system comprised of several extraction wells, an oil-water separator, and an infiltration gallery was installed and began operation after No. 2 fuel oil was observed in ground water monitoring wells drilled in the vicinity of the former car shop.

Based on the findings of the RI/FS, EPA selected the remedial response action, or remedy, in a July 21, 1992 Record of Decision (ROD). The ROD established the following remedial action objectives (RAOs) for the site:

- Source control of rail yard soil contaminated with PCB concentrations above 25 mg/kg to prevent exposure through direct contact,
- Decontamination of buildings and structures on the rail yard property to minimize exposure of persons working on the Site,
- Excavation of residential soils contaminated with PCBs to prevent exposure through direct contact,
- Recovery of fuel oil and entrained PCBs from the ground water in the vicinity of the rail yard car shop building and treatment of ground water, and
- Excavation of sediments in streams and tributaries to provide adequate protection of human health and the environment, while minimizing the destruction, loss, and degradation of natural habitat in stream channels and riparian zones.

The components of the remedy selected in the ROD are described as follows:

- Excavation of rail yard soils with PCB concentrations exceeding 25 mg/kg,
- On-site stabilization and solidification of excavated rail yard soils and placement in a lined containment cell with an impermeable cap located on the rail yard,
- Installation of erosion and sedimentation controls on the rail yard property,
- Deed restrictions on the rail yard property to protect the integrity of the remedy, prohibit residential and agricultural use and prohibit use of on-site ground water for domestic purposes,
- Decontamination of buildings and structures on the rail yard property with PCB concentrations above 10 micrograms/100 square centimeters and continuation of a worker protection program,
- Excavation and treatment of PCB-contaminated soils on residential properties to achieve an average PCB concentration of 2 mg/kg for each individual property; placement of treated soils in the rail yard property containment cell,
- Extraction and treatment of ground water contaminated with fuel oil; discharge of the treated ground water on site through a subsurface infiltration gallery and off-site disposal of recovered fuel at an approved facility,
- Excavation and treatment of stream sediments along North Valley Creek, Hollow Creek, Cedar Hollow Creek, and Little Valley Creek and Valley Creek with PCB concentrations exceeding 1 mg/kg, with placement of treated sediments in the rail yard property containment cell, and
- Long-term ground water monitoring.

EPA issued Explanations of Significant Differences (ESDs) in April 1997, September 2004, and March 2005 to modify certain remedy components in the following manner:

- Required demolition of rail yard buildings no longer in use and discontinued a worker protection stipulation (1997 ESD),
- Permitted off-site disposal of PCB-contaminated soils and sediment at an approved facility, as necessary (2004 ESD),
- Permitted an existing rail tie pile to remain in place (2004 ESD),

- Revised the performance standard for benzene in ground water to be based solely on the Maximum Contaminant Level (MCL) of 5 micrograms per liter (µg/L), eliminating the requirement to restore the aquifer to background (2005 ESD), and
- Modified the ground water monitoring program requirements to allow flexibility in the analytical parameters (2005 ESD).

The contaminants of concern (COCs) selected in the ROD based upon their toxicity, mobility, and persistence in the environment and potential health risks were PCBs in soil and sediment and benzene in ground water. Performance standards selected in the ROD and ESDs are presented in Table 1.

Table 1. Performance Standards

Operable Unit	Media/Area	Contaminant	Performance Standard	Basis for Performance Standard
OU1	Residential surface soils	PCBs	2 mg/kg (average concentration per individual property)	a
	Stream sediments	PCBs	1 mg/kg	a, b
OU2	Rail yard soils	PCBs	25 mg/kg	a
	Ground water	Benzene	5 µg/L	c
	Ground water in former car shop area	Fuel oil	Remove to maximum possible extent	d

Notes:

a) EPA's cleanup recommendations for PCBs in soil at Superfund sites provided in "A Guide on Remedial Actions at Superfund Sites with PCB Contamination," Directive 9355 4-01 FS, August 1990.

b) EPA's cleanup goals for stream sediments in accordance with recommendations of the U.S. Department of the Interior, the Pennsylvania Fish and Boat Commission, and a compilation of technical documents published by the U.S. Department of Commerce, Ocean Assessments Division, entitled "A Discussion of PCB Target Levels in Aquatic Sediments."

c) MCL, promulgated under the Safe Drinking Water Act at 40 CFR. §§ 141 11-.12 & 141 61-.62.

d) As required in the 1992 ROD.

PCBs were not selected as a COC in ground water. During the RI, PCBs were found at high concentrations in fuel oil, but were not detected in ground water samples collected from the wells where fuel oil was present. PCBs were detected in ground water samples collected from only two monitoring wells on the rail yard property at concentrations above the MCL, and were not detected in those two wells during two subsequent sampling events.

Status of Implementation

The remedial design for the OU1 portion of the remedy began in 1996 and was completed in 2001. The remedial action for OU1, during which an estimated 10,200 cubic yards of stream sediments and residential soils containing PCBs above performance standards were removed, was conducted between 2001 and 2004 and is complete (several residential properties adjacent to the rail yard were addressed through the time-critical removal action in the late 1980s). The remedial action for the stream sediment portion of OU1 focused on targeted removal of in-channel and flood plain sediments containing PCBs greater than 10 mg/kg, and included the construction of a depositional basin in the Cedar Hollow tributary. The basin is located 200 feet upstream of the confluence with Little Valley Creek, and serves as an area where residual contaminated sediments accumulate through natural fluvial processes.

The design for the OU2 portion of the remedy began in 1997 and was completed in 2000. The remedial action for OU2 began in 2000 and was completed in 2004, and included construction of the containment cell and on-going operation of the fuel oil recovery system. Construction of both OU remedies was completed on July 12, 2005 with the signature of the Preliminary Closeout Report.

Institutional controls (ICs) were placed on the rail yard property to prohibit use for residential and agricultural purposes and to prohibit the use of ground water at the rail yard for domestic purposes. The controls are being implemented and enforced pursuant to a settlement embodied in a Consent Decree between and among the United States and the Rail Companies [United States v. SEPTA. Civil Action No. 86-1094 (E.D.Pa)]. The controls were placed on the property on May 19, 1999 following entry of the Consent Decree. The controls apply only to the rail yard property and are intended to protect the remedy without preventing re-use of the property in a manner that is compatible with the remedy. No institutional controls exist for residential or stream sediment portions of the remedy. ICs required by the remedy are summarized in Table 2. Parcel locations are presented on Figure 4.

Table 2. Summary of Institutional Controls

Media, engineered controls, and areas that do not support Unlimited Use/Unrestricted Exposure based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Affected Parcels	IC Objective	IC Implementation
Ground Water and Soil on Rail Yard Property	Yes	Yes	43-9L-202-E 54-1-14-E 54-1-8-E	Protect the integrity of the remedy, prohibit use of the property for residential or agricultural purposes and prohibit the use of on-site ground water for domestic purposes	OU-2 Consent Decree requires the PRPs to implement the remedy at the rail yard in accordance with the approved O&M Plan.

Systems Operations/Operation & Maintenance

Operations and maintenance (O&M) continues to be conducted for the stream sediment portion of OU1 and for OU2. The remedial action for the residential soil portion of OU1 is complete, and O&M is not required. The residential properties are suitable for unrestricted use.

O&M at OU1 currently includes:

- Monitoring and maintenance of remediated in-stream and floodplain depositional areas,
- Annual sediment sampling for PCBs,
- Quarterly sediment removal via vacuum extraction at one critical depositional area,
- Annual vegetative monitoring,
- Control and replacement of vegetation in remediated riparian and floodplain areas
- Monitoring of erosion controls, and
- Bi-annual fish tissue monitoring for PCBs in Little Valley and Valley Creeks during odd-numbered years.

The scope of O&M at OU1 has changed little in the past five years. Beginning in June 2014, portions of the Cedar Hollow and Hollow Road tributaries were not monitored or inspected. The lapse in monitoring occurred due to the expiration and renegotiation of right-of-access agreements between APU and the owner of the property, the Vanguard Group, Inc. (Vanguard). A new right-of-access agreement between APU and Vanguard was signed in September 2015, and these areas will be monitored and inspected during future events.

O&M at OU2 currently includes:

- Semi-annual inspection of the containment cell, storm water detention and conveyance system, erosion controls, asphalt cover area, retaining walls, site security fence and signs, and monitoring wells,

- Semi-annual to annual sampling of 13 monitoring wells within or adjacent to the asphalt cover area for PCBs, diesel-range organics (DRO), gasoline-range organics (GRO), and BTEX compounds (benzene, toluene, and ethyl benzene; xylenes are not part of the monitoring program), and inspection for separate-phase liquids (SPLs)/fuel oil, and
- Annual sampling of four containment cell monitoring wells for PCBs and VOCs.

The scope of O&M at OU2 has remained generally consistent for the past five years. In 2012, EPA approved a change in the frequency of monitoring for asphalt cover area wells from quarterly to semi-annually due to decreased concentrations of benzene and the long-term absence of fuel oil in ground water monitoring wells, although the Rail Companies continued to monitor several wells on a quarterly basis through 2014. The performance standard for benzene, which required that concentrations in all wells remain less than 5 µg/L at least 12 consecutive quarterly monitoring events, was achieved in 2014. The in-situ chemical oxidation and aerobic enhancement pilot study initiated in monitoring well MW-22 in 2007 was discontinued in 2014. Since the pilot study effectively reduced benzene concentrations, full-scale studies are not planned or necessary.

O&M at OU2 previously included annual sampling of three private domestic supply wells located along the east side of Hollow Road. These wells, located approximately 1,200 feet east-northeast of the rail yard, were removed from the monitoring program in 2006. The wells had been sampled on an annual basis for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and PCBs between 2001 and 2006, and periodically between 1986 and 2000. No Site-related contaminants had ever been detected above performance standards or MCLs in samples collected from the supply wells or in monitoring wells located up gradient of the supply wells.

III. PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations and statements from the **last** five-year review as well as the recommendations from the **last** five-year review and the current status of those recommendations.

Table 3: Protectiveness Determination/Statement from the 2011 Five-Year Review

OU	Protectiveness Determination	Protectiveness Statement
Site-wide	Short-term Protective	The remedy is protective of human health and the environment. Monitoring data indicate that the remedy is functioning as intended. Cleanup goals have been achieved on the rail yard property and at residential properties. The majority of PCB-contaminated sediments have been removed from impacted stream areas, and ongoing sediment removal activities continue to restrict the migration of PCBs. In the past two years, elevated PCB concentrations have been consistently observed at sediment monitoring location CHFP16. If the results from the autumn 2011 annual monitoring event are elevated at this location, steps will be taken to identify the source of the contamination. Engineering controls constructed as part of the remedy, including the containment cell, storm water management system, asphalt cover, retaining walls, and security fencing, are operating as designed and prevent direct contact with contaminated soils that remain at the rail yard property. The recovery and treatment system has effectively removed fuel oil, reduced benzene concentrations, and prevented the off-site migration of contaminated ground water. Benzene concentrations have been further reduced through in-situ chemical oxidation and aerobic bioremediation conducted as part of an on-going pilot study. All institutional controls are in place and functioning as anticipated.

Table 4: Status of Recommendations from the 2011 Five-Year Review

OU	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date
01	Elevated PCB concentrations at sediment monitoring location CHFP16.	Evaluate the analytical results of the next annual sediment monitoring event, scheduled for autumn 2011. If the results are elevated, take steps to identify the source of PCB contamination at sediment monitoring location CHFP16.	Completed	PCB concentrations noted in 2011 reduced to 2.07 mg/kg and have not been above the 1 mg/kg cleanup standard in subsequent monitoring events. No further action other than continued regular monitoring and O&M has been necessary.	3/15/2013

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

In December 2015, the public was notified through an advertisement posted in the Chester County *Daily Local News* newspaper that EPA was conducting the five-year review. The public was advised of the purpose of the review, invited to contact EPA with questions or information, and notified of the anticipated release date. The results of the review and the report are available at the Site information repository located at the Paoli Library, 18 Darby Road in Paoli, or can be obtained electronically on the internet (http://epa.gov/5yr).

During the five-year review process, interviews were conducted to document any perceived problems or successes with the remedy that has been implemented to date**.** By way of electronic mail or personal correspondence, EPA informed the Rail Companies, APU, Tredyffrin and Willistown Township, and PADEP of the upcoming conduct of the second Five-Year Review. Representatives of Tredyffrin Township inquired about the current status of the remedy at the rail yard. Township officials did not express any concerns regarding the Site or the Five-Year Review. No other issues were identified during the correspondence.

In addition, EPA receives one to three requests per year for data related to the residential portion of the remedy. Typically, these requests are made from current owners or prospective purchasers. One current owner contacted the RPM during preparation of the five-year review in 2015 requesting soil sampling data from her property. The property owner noted that at a recent Willistown Township meeting, a resident inquired about the status of the remedy with Township officials. The resident suggested that EPA attend a future Township meeting to update the community on the current status of the Site. The RPM was unable to reach the resident to obtain permission to use her name. EPA intends to attend future Willistown and Tredyffrin Township meetings to update the community.

Data Review

This data review incorporates OU1 sediment and fish monitoring data and OU2 ground water monitoring data, as originally presented in the 2011 through 2015 performance monitoring reports. PCBs in all media were evaluated as Aroclors[1]. Key findings from this review regarding data trends are provided below:

[1] PCBs are mixtures of up to 209 individual chlorinated compounds called congeners. Many commercial PCB mixtures are known in the United States by the trade name Aroclor.

- PCBs in sediment declined in concentration and occurrence,
- PCBs in fish tissue in Valley Creek and Little Valley Creek remained consistent,
- No PCBs or Site-related COCs were detected in containment cell monitoring wells,
- Benzene was not detected in ground water above the 5 µg/L performance standard in the last five years, and
- PCBs were detected sporadically in ground water above the MCL (0.5 µg/L) at six wells, including one off-rail yard property well (MW-23).

OU1

S*ediment Monitoring*

PCB concentrations in the stream and tributary sediments have continued to exhibit an overall decline in the past five years. In 2011, the first annual monitoring event of this five-year review period, PCBs were present above the 1 mg/kg performance standard at 20 locations, with a maximum concentration of 6.4 mg/kg. In 2012, PCBs exceeded the standard at six locations and were present at concentrations lower than in 2011 at all but one location. In 2013 and 2014, PCBs were not present above the performance standard at any monitoring location (13 locations were not accessible on the Vanguard property in 2014 due to right-of-access issues). PCBs were detected at five locations slightly above the performance standard during annual monitoring in 2015, although at concentrations no higher than 1.8 mg/kg. Sediment sampling locations and a summary of results from 2015 monitoring are presented on Figure 5 and Figure 6.

Fish Tissue Monitoring

Harvest of fish for sampling for PCBs occurs at four locations: Little Valley Creek upstream and downstream of the confluence with the tributaries, and in Valley Creek upstream and downstream of the confluence with Little Valley Creek. At each of the four locations, samples are collected from mature brown trout fillets, whole mature brown trout, whole juvenile trout, and whole white suckers. No Site-specific performance standards have been established for PCBs in fish. PCBs in mature brown trout filets (those that would be the most likely to be harvested and consumed by people) increased slightly in upstream and downstream locations in both creeks since the last five-year review, with a maximum observed concentration of 0.73 mg/kg in the 2013 sample collected from Little Valley Creek downstream of the confluence with the tributaries. The PCB concentrations remained within the range of concentrations that is classified as Group 3 in the *Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory* (the protocol utilized by the Pennsylvania Fish and Boat Commission). The Group 3 advisory recommends consumption of no more than one-half pound of trout per week for a 150-pound person, while 2016 Pennsylvania Fish and Boat Commission regulations recommend consumption of no more than one-half pound of brown trout per month.

OU2

Ground water monitoring occurs on a semi-annual or annual schedule, depending on the analytical parameter and well location. Four monitoring wells evaluating the effectiveness of the containment cell are monitored annually for PCBs and VOCs (CC-series wells). Thirteen monitoring wells in the vicinity of the asphalt cover area are sampled on a semi-annual or annual basis (MW- and RW-series wells). The analytical parameters and frequency of sampling are described in Table 5.

Table 5. Sampling and Monitoring Schedule, Rail Yard Property (as of October 2015)

Monitoring Well ID	Number of Sampling/Monitoring Events Per Year				
	VOCs	BTEX only	PCBs	DRO/GRO	SPLs
CC-MW-1, CC-MW-2, CC-MW-3, CC-MW-4	1	--	1	--	--
RW-10, RW-14, RW-16, RW-20	--	1	2	1	2
MW-WA-R, MW-1, MW-2, MW-8, MW-17, MW-21	--	1	1	1	--
MW-22	--	2	1	1	2
MW-23	--	2	1	1	2
MW-11	--	--	1	--	--

Notes:

1) Monitored natural attenuation parameters are also analyzed on a semi-annual or annual schedule, and include dissolved oxygen, oxygen-reduction potential, pH, specific conductance, turbidity, temperature, alkalinity, ferrous iron, methane, nitrate, and sulfate.
2) DRO and GRO are mixtures of total petroleum hydrocarbons which contain boiling point ranges that roughly correspond to those of diesel fuel and gasoline, respectively.

Containment Cell Ground Water Monitoring

Analytical results from containment cell wells indicate that PCBs are not being released or migrating from the cell. PCBs were not detected above laboratory reporting limits in any ground water samples collected from the containment cell wells during this five-year review evaluation period (through October 2014). Results from containment cell wells identified tetrachloroethylene (PCE) in MW-CC-4, with levels no greater than 1.4 µg/L. Detected PCE concentrations are below the current MCL (5 µg/L); no site-specific cleanup standard exists for PCE. It is believed that PCE in MW-CC-4 is unrelated to the Site because MW-CC-4 is down gradient of the adjacent property, where a release of chlorinated VOCs has been documented. No chlorinated VOCs were known or suspected to have been used, stored, or disposed of on the rail yard property in this area.

Asphalt Cover Area Ground Water Monitoring

Monitoring wells that monitor the impact to ground water from the contaminated soils left in place beneath the asphalt cover area are sampled for PCBs and on an annual basis for BTEX compounds (benzene, toluene and ethyl benzene; xylene is not part of the analytical program), DRO, and GRO. Samples from wells near and including MW-22 were also collected on a quarterly basis until 2013, when sampling frequency was reduced to semi-annual. The wells are also inspected semi-annually for SPLs. No SPLs were observed in any well during the five-year review period. Asphalt cover area monitoring wells are presented on Figure 7.

Benzene has not been detected in any well above the performance standard of 5 µg/L since November 2011. Benzene levels in site wells were below 5 µg/L for 28 of the last 30 sampling events. The performance standard for benzene has been achieved.

Concentrations of DRO and GRO have been relatively stable or decreasing in most wells in the last five years. DRO were detected in MW-8, MW-22, MW-23, RW-10, RW-14, and RW-16, and were not present above 2.1 milligrams per liter (mg/L) in any well other than RW-16. Concentrations of DROs in RW-16 generally ranged from 1.6 to 6.9 mg/L, with an anomalously high concentration of 100 mg/L in November 2012. GRO were detected only in MW-8, RW-14, and RW-16. Concentrations of GRO in MW-8 were as high as 390 µg/L in 2012, but were not detected in either 2011 or 2015. Concentrations of GRO in RW-14 ranged from non-detect in 2011 to 850 µg/L in 2014. In RW-16, GRO was present above detection limits on only one occasion (380 µg/L in 2012).

Historically, occurrences of PCBs in ground water have been rare. On-going ground water monitoring during this five-year review period has also identified increasing concentrations of PCBs in six monitoring wells in, adjacent to, or down gradient of the asphalt cover area. Wells RW-10 and MW-22 are located in the western portion of the area, and RW-14 and RW-16 are located in the eastern portion. MW-17 and MW-23 are located down gradient of the western area and MW-20 is located down gradient of the eastern portion. No Site-specific performance standard was established by the remedy for PCBs in ground water because historically, PCBs had not been detected in ground water and were not considered a COC. For purposes of comparison in this five-year review, data were compared to the current MCL for total PCBs (0.5 µg/L) by adding the results for Aroclor-1254 and Aroclor-1260. PCBs consistently exceeded the MCL in RW-10 and MW-22, although only once in down gradient monitoring wells MW-17 and MW-23. PCBs exceeded the MCL in RW-16 for six consecutive monitoring events in 2011 and 2012, but only once from 2013 through 2015. No PCB results above the MCL occurred in RW-14, down gradient monitoring well MW-20, or in samples collected from any other monitoring wells at the Site in the last five years. Table 6 provides a summary of PCB results over the five-year review period in these asphalt cover area monitoring wells.

Table 6: Total PCBs in Select Asphalt Cover Area Monitoring Wells, 2011-2015

Sampling Date (Month-Year)	Western Asphalt Cover Area				Eastern Asphalt Cover Area		
	RW-10	MW-22	MW-23	MW-17	RW-14	RW-16	MW-20
Feb-11	0.32	--	--	--	ND	ND	ND
Jun-11	0.39	--	--	--	ND	**0.57**	ND
Aug-11	**0.5**	--	--	--	0.26	**0.76**	ND
Nov-11	0.41	**4.6**	ND	ND	0.25	**1.3**	ND
Feb-12	0.25	--	--	--	0.31	**1.2**	0.26
May-12	0.21	--	--	--	ND	**4.8**	ND
Nov-12	**1.7**	**6.5**	ND	ND	ND	**12**	ND
May-13	0.37	--	--	--	0.21	0.21	ND
Nov-13	**0.54**	**1**	ND	ND	ND	ND	ND
Jun-14	**0.87**	--	--	--	ND	**0.61**	ND
Oct-14	0.48	**7.6**	**0.64**	ND	ND	ND	ND
Apr-15	**0.74**	--	ND	--	ND	0.25	ND
Oct-15	**0.91**	**8.9**	0.21	ND	0.4	0.43	0.30

Notes:

1) All results in micrograms per liter (µg/L, equivalent to parts per billion, or ppb).
2) "--" indicates samples were not collected or analyzed.
3) Values derived by adding Aroclor-1254 and Aroclor-1260 results from a specific monitoring event.
4) Values in **BOLD** indicate results that exceed the MCL.
5) Monitoring wells RW-10, RW-14, and RW-16 are located below the asphalt cover. Monitoring well MW-22 is located on the rail yard adjacent to the asphalt cover. Monitoring wells MW-17, MW-20, and MW-23 are located on properties adjacent to the rail yard and down gradient of the asphalt cover.
6) The source of the data is the 2nd (July through December) 2015 Semi-Annual/Annual Report, Paoli Rail Yard Superfund Site, dated January 2016.

Site Inspection

EPA performed the five-year review site inspection on September 29, 2015. The purpose of the inspections was to assess the protectiveness of the remedy. In attendance were Christopher Sklaney, EPA RPM; Gina Soscia, EPA Community Involvement Coordinator; and Amanda Goyne and Jill Billus, Skeo Solutions. Mike O'Connor, APU and Mike Persico, Unicorn Management Consultants, LLC, as consultant for APU, accompanied the inspection team for the OU1 portion of the inspection. Lena Harper, PADEP; Craig Caldwell, Amtrak; and Paul Stratman, Advanced GeoServices, as consultant for Amtrak, joined the inspection team for the OU2 rail yard portion of the inspection.

Site inspection participants for the OU1 portion of the inspection observed sediment deposition area CHSD01 and revegetated areas near monitoring station CHFP01TR3 Plot #3, which had been affected by the Tredyffrin

Township Public Works Department during pipeline work. Grasses were well established and woody growth was beginning to return. The various components of the stream remedy were found to be in good condition. A minor item requiring maintenance was a fallen tree near the sediment collection area that could obstruct flow.

Site inspection participants then drove to the former rail yard property and accessed the Site from Central Avenue. Mr. Craig Caldwell, Amtrak, and Mr. Paul Stratman, Advanced GeoServices, provided the group with a brief summary of historical activities at the property. The site inspection team then walked the property to observe the various remedy components.

Site inspection participants toured the containment cell and observed the cap is in good condition and is well vegetated with grasses. Monitoring wells near the containment cell are in good condition, locked and labeled. Retaining walls and various surface water controls, including the retention basins, were in good condition. The asphalt cover over the former car shop area was in good condition with no subsidence or major cracks. Minor separation at several joints was observed. Mr. Caldwell indicated that contractors would soon be sealing any minor cracks in the cover to maintain its integrity.

The property is completely surrounded by chain-link fencing, which was in good condition overall. Participants observed no trespassing signs located periodically along the fenced perimeter. A fallen tree was observed on the fence near the rail tie pile in the northwestern portion of the property. Mr. Caldwell indicated that there have not been any major problems with trespassing. The minor issues at both OUs have since been corrected.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

Question A Summary:
Yes, the review of recent monitoring reports, applicable or relevant and appropriate requirements (ARARs), decision documents and the results of the site inspection indicate that the physical components of the remedy are functioning as intended by decision documents. Performance standards for PCB-contaminated soils were met on the rail yard property and at residential properties where soil excavations were conducted.

OU1 data show that most PCB-contaminated sediments have been removed from the stream areas that were affected by the migration of PCBs from the rail yard. Sediment removal activities at the CHSD01 deposition area occur quarterly and continue to restrict the migration of PCBs downstream.

For OU2, the capped containment cell prevents direct exposure to contaminated soil and sediment. Regular O&M ensures that the integrity of the cap, storm water controls, asphalt cover area and other remedy features are maintained. Ground water results from containment cell wells indicate that contaminants are not being released or migrating from the cell. The containment cell is operating as intended by decision documents.

Analytical results from asphalt cover area ground water monitoring show that oxidant injections at the rail yard property were successful at reducing benzene concentrations to below the performance standard. Benzene has not been detected in any well since June 2011 and has achieved its performance standard.

PCBs were detected above the MCL in a few wells in and adjacent to the asphalt cover area, and on one occasion in one monitoring well located down gradient of the asphalt cover area. The ROD stated that if ground water monitoring indicated the presence of PCBs for two consecutive quarters (or since the monitoring schedule as been subsequently changed, consecutive monitoring events), EPA should consider appropriate responses.

Institutional controls are in place at the rail yard parcels that protect the integrity of the remedy, prohibit use of the rail yard for residential or agricultural purposes, and prohibit the use of ground water underlying the rail yard for

domestic purposes. If on-going ground water monitoring identifies a plume of PCBs that extends beyond the rail yard, the addition of a ground water use restriction for impacted properties should be considered.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

Question B Summary:
Yes, the exposure assumptions, toxicity data, cleanup levels and RAOs are still valid.

Changes in Standards and To-Be-Considered (TBC) Values
The soil performance standards for total PCBs remain consistent with EPA's cleanup recommendations for PCBs in soil at Superfund sites ["A Guide on Remedial Actions at Superfund Sites with PCB Contamination," Directive 9355.4-01 FS, August 1990]. This guidance recommends remediation goals of 1 mg/kg (as a starting point) for residential areas and 10 to 25 mg/kg at industrial sites. To evaluate whether any toxicity value changes since the ROD could affect the cleanup levels, the rail yard soil cleanup goal for total PCBs was compared to EPA's Regional Screening Levels (RSLs) based on industrial land use. The residential soil cleanup goal was compared to EPA's RSL based on residential land use. All ROD soil cleanup goals for total PCBs remain valid because they are equivalent to a cancer risk level within or below EPA's risk management range of 1E-06 to 1E-04.

The ground water performance standard for benzene was derived in accordance with the requirement that remedial actions "at least" attain ARARs, including MCLs, and be protective of human health and the environment. The ground water performance standard for benzene meets the current federal and Pennsylvania state cleanup goal or MCL. Benzene has been below laboratory detection limits (0.5 or 1.0 µg/L) for 12 consecutive monitoring events and below the Site-specific cleanup standard of 5 µg/L for 29 of the past 31 monitoring events. Benzene has not been detected in ground water at the Site since September 2011.

The performance standard for PCBs in sediment (1 mg/kg) was based on recommendations of the United States Department of the Interior, the Pennsylvania Fish and Boat Commission and a compilation of technical documents published by the United States Department of Commerce, Ocean Assessments Division, entitled "A Discussion of PCB Target Levels in Aquatic Sediments." The performance standard for PCBs in sediment remains valid.

Changes in Exposure Pathways
Land use has not changed since the previous five-year review. No permanent workers are present at the rail yard.

Decision documents did not establish ground water action levels protective of the vapor intrusion pathway. Due to the presence of volatile chemicals in ground water at the Site, this five-year review evaluated the vapor intrusion exposure pathway using EPA's 2015 Vapor Intrusion Screening Level calculator to identify if any of the volatile ground water COCs at the Site require further vapor intrusion evaluation. Maximum detected concentrations of volatile chemicals from monitoring wells on and off the rail yard property from the October 2014 and April 2015 sampling events were used in the calculations. Individual cancer risk levels were within EPA's risk management range of 1E-06 to 1E-04. None of the chemicals resulted in a non-cancer hazard index exceeding 1 for a commercial scenario. In addition, there are no current vapor intrusion exposure pathways at the rail property, as the property is vacant with no occupied structures.

A separate assessment was conducted using data from off-property wells to assess a residential vapor intrusion exposure scenario. Maximum detection concentrations of organic compounds from the off-property well MW-23 were used in the calculations. Aroclor-1260 was the only organic compound detected during sampling in MW-23 in the past five years. The Aroclor-1260 detection resulted in an individual cancer risk of 1.8E-06. Results of this evaluation suggest vapor intrusion is not a concern at this time. The pathway should be re-evaluated using site-specific data if VOC concentrations increase.

There are no newly identified contaminants, contaminant sources or unanticipated toxic byproducts of the remedy, and physical site conditions have not changed in a way that could affect the protectiveness of the remedy.

Changes in Toxicity and Other Contaminant Characteristics
Changes in toxicity factors were included above, as part of the "Changes in Standards and TBC Values" discussion.

Changes in Risk Assessment Methods
There have been significant changes in EPA's risk assessment guidance since the original risk assessment was performed. These include changes in basic methodology, dermal guidance, inhalation methodologies and exposure factors. Risks were estimated using current methodology; those risks estimated are discussed above.

Expected Progress toward Meeting RAOs
RAOs identified in the ROD and ESDs have been met. However, the frequency of PCBs detected in ground water above the MCL has increased since late 2010 or early 2011. The ROD indicated that in the event "ground water monitoring indicates the presence of PCBs for two consecutive quarters [or monitoring events], EPA will consider appropriate responses." Within the past five years, PCBs have been detected during consecutive events in all four monitoring wells located within or immediately adjacent to the asphalt cover area (MW-22, RW-10, RW-14, RW-16). Based upon the findings of additional investigations conducted based on the recommendation in this five-year review, the RAOs may need to be revised.

QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?

Question C Summary:
No other information has come to light that could call into question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
01

Issues and Recommendations Identified in the Five-Year Review:					
OU: 02	**Issue Category:** Remedy Performance				
	Issue: The ROD states that EPA should consider additional response actions if detections of PCBs in two consecutive monitoring events occur. The frequency of PCB detections above the MCL in several wells on the rail yard property in, adjacent to, and down gradient of the asphalt cover area has increased in the last five years.				
	Recommendation: Increase the frequency of monitoring in the asphalt cover area wells. Evaluate data to determine if a plume of PCBs exists and whether additional response actions are necessary.				
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**	
No	Yes	PRP	EPA	5/5/2019	

Other Findings

No other findings that actually or potentially impact protectiveness of the remedy were identified.

VII. PROTECTIVENESS STATEMENT

OU1 Protectiveness Statement	
Protectiveness Determination: Short-term Protective	*Planned Addendum Completion Date:* N/A
Protectiveness Statement: The remedy for OU1 currently protects human health and the environment. Soil cleanup goals have been achieved at residential properties. High concentrations of PCBs in sediments have been removed from affected stream areas, and ongoing sediment removal activities limit migration of residual PCBs. PCB concentrations in fish tissue continue to decline.	

OU2 Protectiveness Statement	
Protectiveness Determination: Short-term Protective	*Planned Addendum Completion Date:* N/A
Protectiveness Statement: The remedy for OU2 currently protects human health and the environment. Engineering controls constructed as part of the remedy, including the containment cell, storm water management system, asphalt cover, retaining walls and security fencing, are operating as designed and prevent direct contact with contaminated soils on the rail yard property. Institutional controls prevent use of ground water on the rail yard property for domestic and agricultural purposes. Properties adjacent to the rail yard property use public water not obtained from the local aquifer as a source of potable water. The remedial performance standard for benzene in ground water has been achieved. Additional monitoring will be conducted to determine the nature and extent of PCBs in ground water.	

Sitewide Protectiveness Statement	
Protectiveness Determination: Short-term Protective	*Planned Addendum Completion Date:* N/A
Protectiveness Statement: Because the remedial actions at both OUs are protective in the short term, the remedy is currently protective of human health and the environment. The remedy will be protective in the long term when all cleanup and performance standards have been achieved.	

VIII. GOVERNMENT PERFORMANCE AND RESULTS ACT MEASURES

As part of this five-year review, the Government Performance and Results Act (GPRA) Measures have also been reviewed. The GPRA Measures and their status are provided as follows:

Environmental Indicators
Human Health: Human Exposure Controlled and Protective Remedy in Place
Ground Water Migration: Ground Water Migration Under Control

Sitewide Ready for Anticipated Use (SWRAU)
The Site achieved the SWRAU measure on March 18, 2011.

IX. NEXT REVIEW

The next five-year review report for the Site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

1st (January through June) 2012 Semi-Annual Report, Paoli Rail Yard Superfund Site, Paoli, Pennsylvania. Prepared by Advanced GeoServices. July 31, 2012.

1st (January through June) 2014 Semi-Annual Report, Paoli Rail Yard Superfund Site, Paoli, Pennsylvania. Prepared by Advanced GeoServices. July 30, 2015.

2nd (July through December) 2015 Semi-Annual Report, Paoli Rail Yard Superfund Site, Paoli, Pennsylvania. Prepared by Advanced GeoServices. January 29, 2016.

2nd (July through December) 2013 Semi-Annual Report, Paoli Rail Yard Superfund Site, Paoli, Pennsylvania. Prepared by Advanced GeoServices. June 13, 2014.

2012 Annual Report and 2nd (July through December) 2012 Semi-Annual Report, Paoli Rail Yard Superfund Site, Paoli, Pennsylvania. Prepared by Advanced GeoServices. January 31, 2013.

Explanation of Significant Differences, Paoli Rail Yard Superfund Site, Paoli, Chester County, Pennsylvania. Prepared by USEPA. April 2, 1997.

Explanation of Significant Differences, Paoli Rail Yard Superfund Site, Paoli, Pennsylvania. Prepared by USEPA. April 1, 2005.

Explanation of Significant Differences, Paoli Rail Yard Superfund Site, Paoli, Pennsylvania. Prepared by USEPA. September 14, 2004.

Five-Year Review Report, Paoli Rail Yard Superfund Site, Chester County, Pennsylvania. Prepared by USEPA Region 3. May 5, 2006.

Ninth Annual Monitoring Report (2013), Non-Rail Yard Site Property (Stream Sediment Portion of the Remedy), Paoli Rail Yard Superfund Site. Prepared by Unicorn Management Consultants, LLC. March 2014.

Second Five-Year Review Report for Paoli Rail Yard, Chester County, Pennsylvania. Prepared by USEPA Region 3. May 5, 2011.

Tenth Annual Monitoring Report (2014), Non-Rail Yard Site Property (Stream Sediment Portion of the Remedy), Paoli Rail Yard Superfund Site. Prepared by Unicorn Management Consultants, LLC. March 4, 2015.

Eleventh Annual Monitoring Report (2015), Non-Rail Yard Site Property (Stream Sediment Portion of the Remedy), Paoli Rail Yard Superfund Site. Prepared by Unicorn Management Consultants, LLC. March 11, 2016.

Action Memorandum, Paoli Rail Yard, Paoli, Pennsylvania. Prepared by USEPA Region 3. February 21, 1986.

Federal On-Scene Coordinator's Report, Paoli Railcar Facility. Prepared by USEPA Region 3. June 16, 1988.

Record of Decision, Paoli Rail Yard, Paoli, Pennsylvania. Prepared by USEPA Region 3. July 21, 1992.

Fish Consumption Advisory, 2016 Pennsylvania Summary of Fishing Regulations and Laws. Issued by Commonwealth of Pennsylvania Fish and Boat Commission, pp. 30-31.

APPENDIX B - FIGURES

Figure 1: Site Location Map

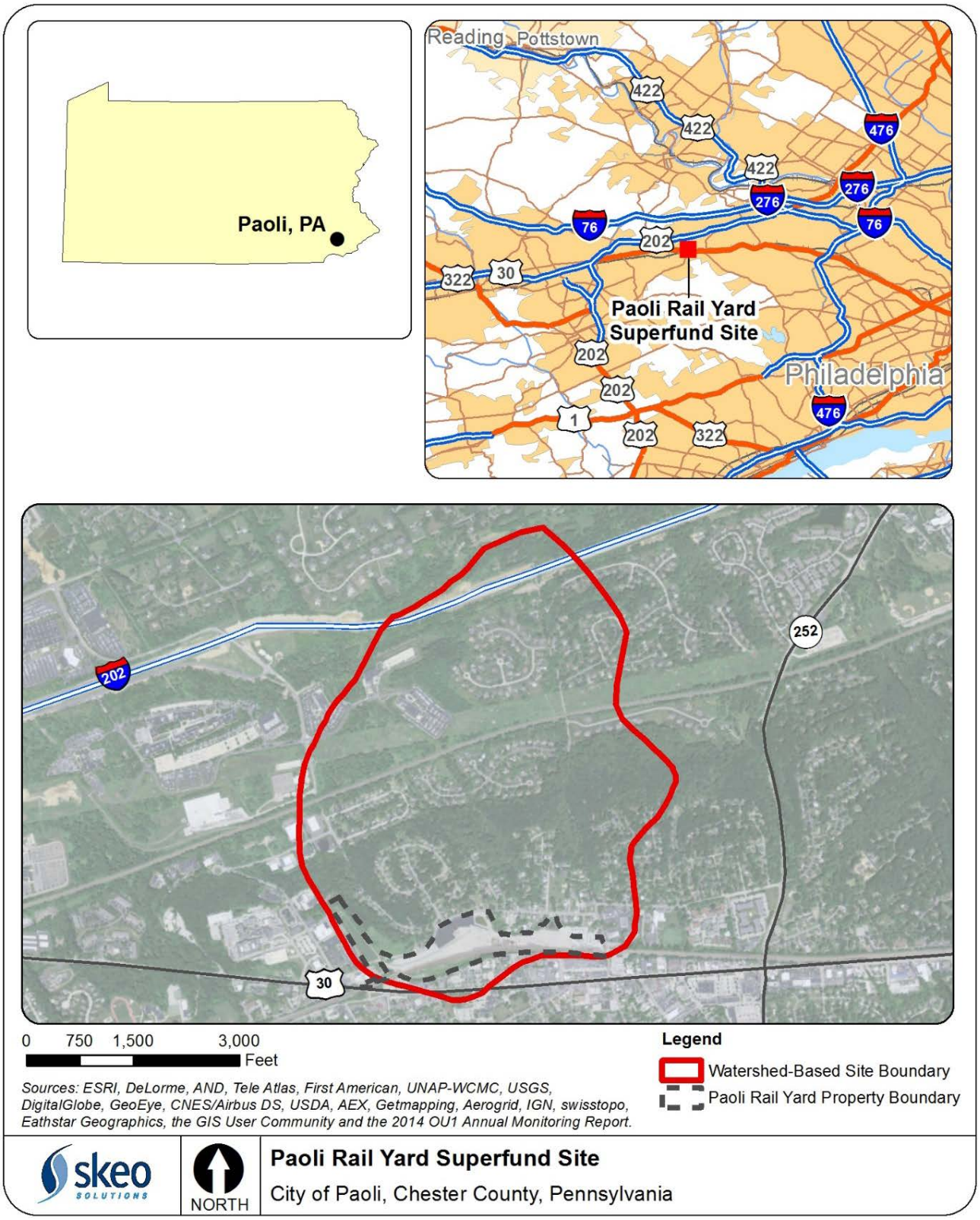

Figure 2: Detailed Site Map – OU2

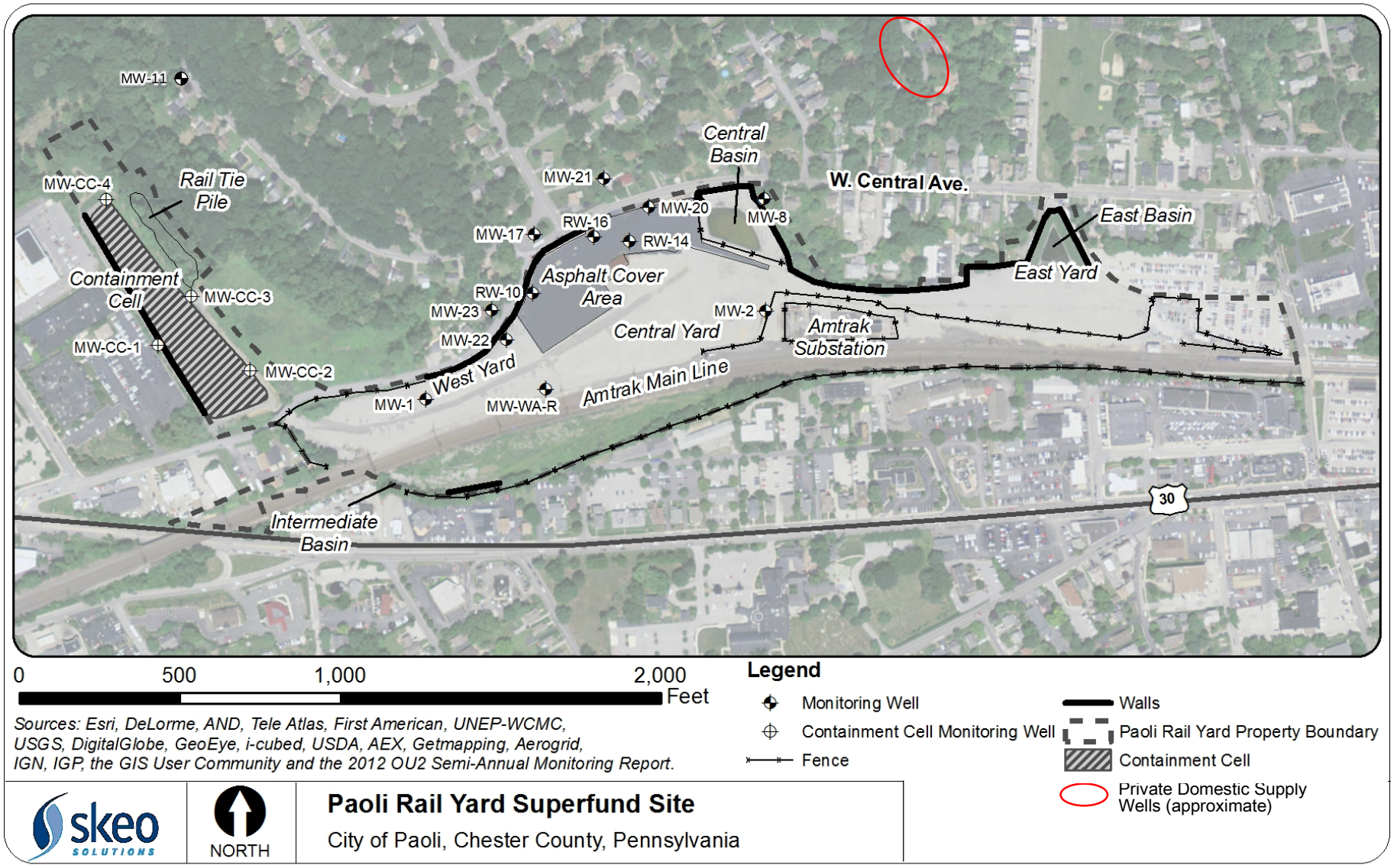

Figure 3: Detailed Site Map – OU1

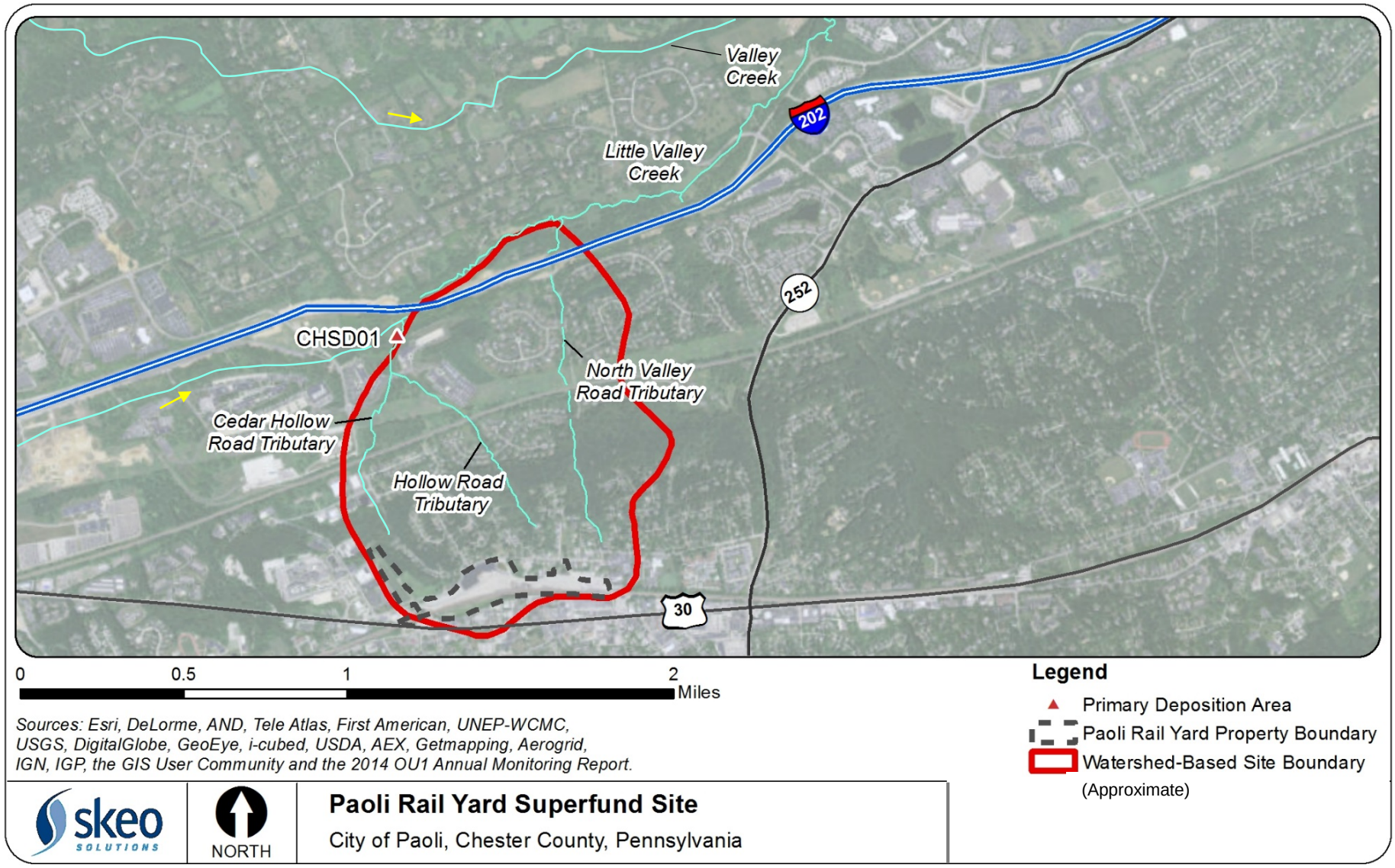

Figure 4: Institutional Control Base Map

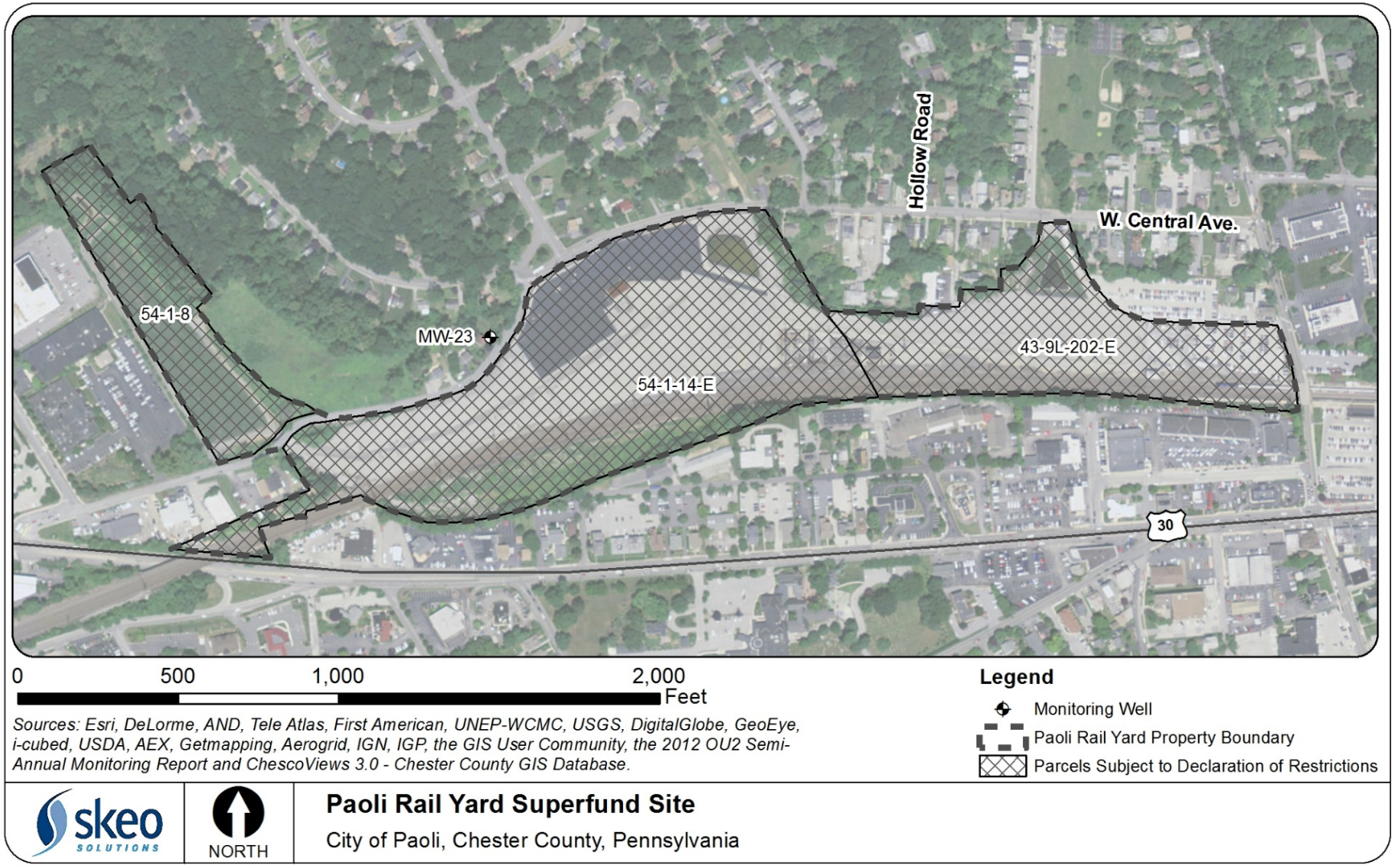

Figure 5: Stream Sediment Monitoring Location Map, Upper Basin

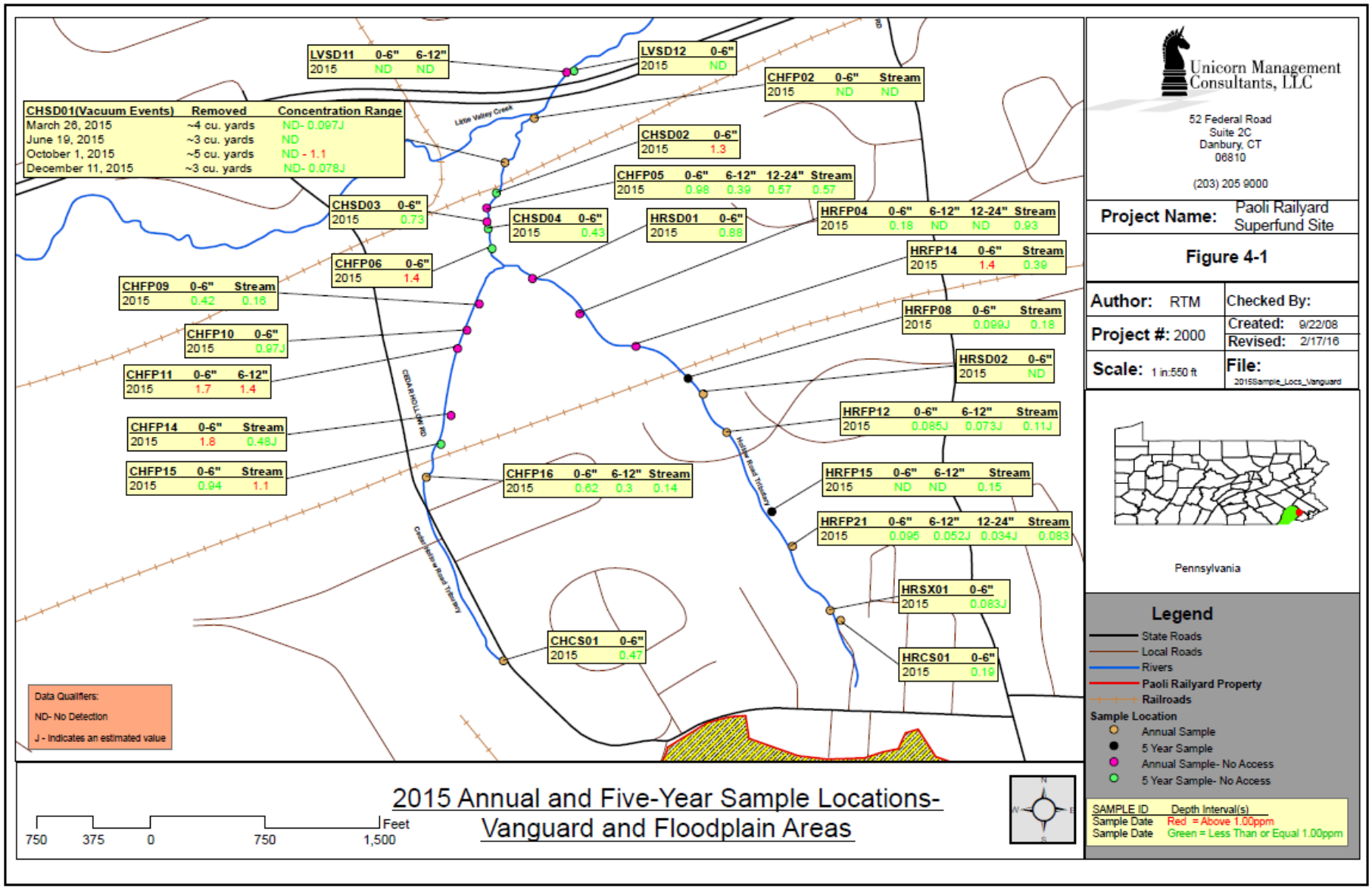

Figure 6: Stream Sediment Monitoring Location Map, Lower Basin

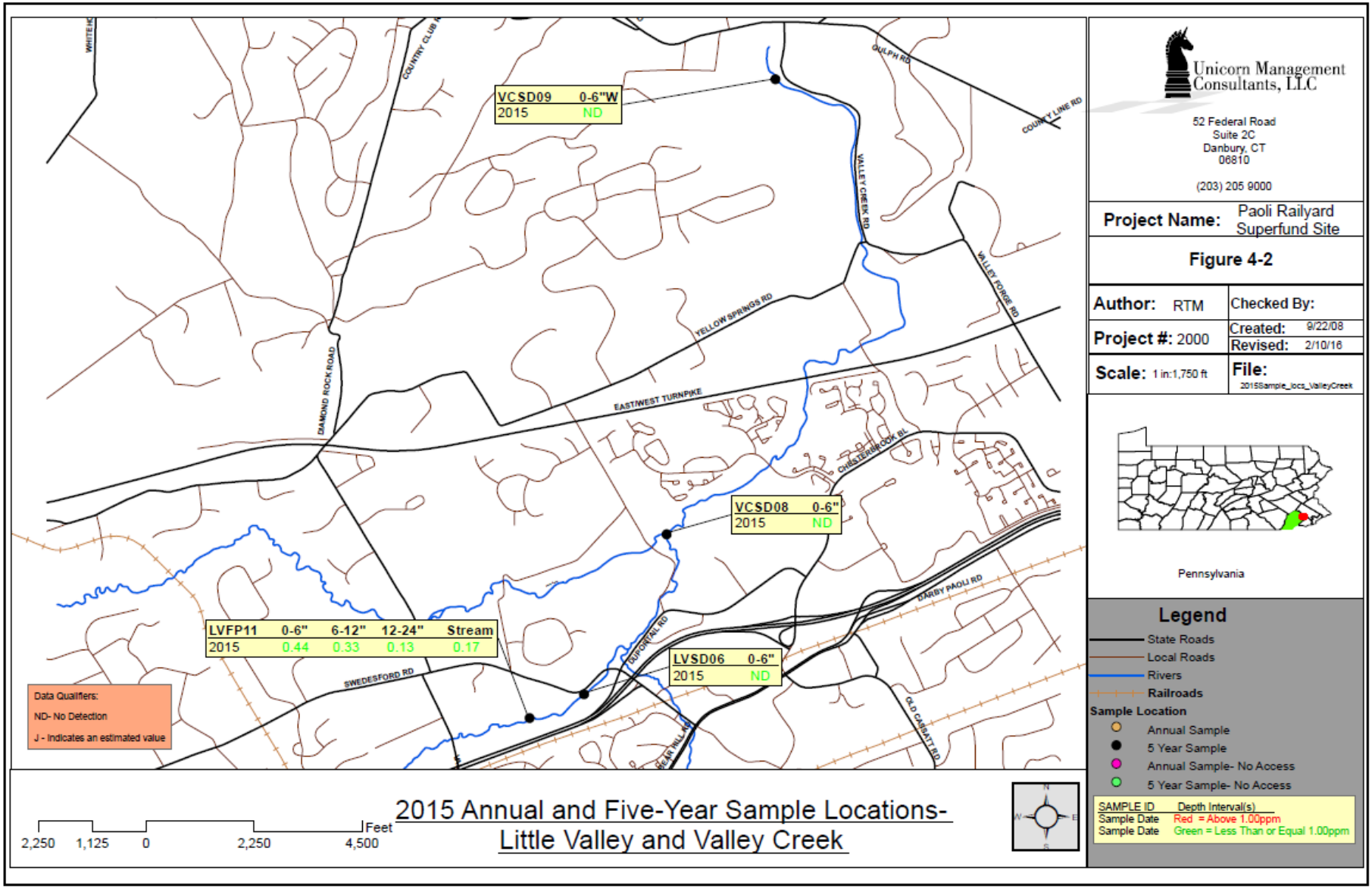

Figure 7: Rail Yard Asphalt Cover Monitoring Well Location Map