PCB Mass Loading
Amtrak Maintenance Facility
SIRB ID: DE-0170
Wilmington, Delaware

BrightFields, Inc.

Historic Data

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July 28, 2008

Mr. Wilmer Reyes
Department of Natural Resources and Environmental Control
Division of Air and Waste Management
391 Lukens Drive
New Castle, DE 19720-2774

Subject: **Draft RI/FFS Work Plan**
AMTRAK Maintenance Facility (DE 0170), Wilmington, Delaware

Dear Mr. Reyes:

Enclosed are two hard copies and one CD-ROM of the Draft Remedial Investigation (RI)/Focused Feasibility Study (FFS) Work Plan for the AMTRAK Maintenance Facility, Wilmington, Delaware (DE-0170).

Should you have any questions or comments associated with the enclosed Work Plan, please call me at (484) 875-3075.

Sincerely,
SECOR International Incorporated

Steve Baggett, PG
Principal Hydrogeologist

cc: Craig Caldwell, Andrew Enzman, Michael Stern, Esq., Ben Stonelake, Esq., Paul Yaniga, Kerry Hanlon, Frank Aceto, Project File

DRAFT REMEDIAL INVESTIGATION AND FOCUSED FEASIBILITY STUDY WORK PLAN

AMTRAK WILMINGTON MAINTENANCE FACILITY
DE- 0170

4001 Vandever Avenue
WILMINGTON, DE

July 28, 2008

Prepared for:

National Railroad Passenger Corporation (AMTRAK)
and
American Premier Underwriters, Inc.

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1.0 INTRODUCTION

SECOR International (SECOR) has been contracted by National Railroad Passenger Corporation (AMTRAK) and American Premier Underwriters, Inc. (APU) to develop this work plan for a Remedial Investigation (RI) and Focused Feasibility Study (FFS) for the Maintenance Facility portion of the AMTRAK Wilmington Maintenance Yard located along Vandever Avenue in Wilmington, Delaware (**Figure 1-1**). The AMTRAK Wilmington Maintenance Yard consists of the Former Fueling Facility and the Maintenance Facility. The Former Fueling Facility has been investigated under the Delaware Voluntary Cleanup Program (VCP) enacted under 7 Del. C Chapter 91: Delaware Hazardous Substance Cleanup Act (HSCA). *Draft Phase II Remedial Investigation and Focused Feasibility Study Report, AMTRAK Former Fueling Facility, Wilmington, Delaware (DE-266)* (Draft Phase II RI/FFS Report), prepared by SECOR, was submitted to the Delaware Department of Natural Resources and Environmental Control (DNREC) on July 30, 2007.

For the purposes of this Work Plan, the Maintenance Facility will be considered the AMTRAK property north of the area investigated during the Former Fueling Facility remedial investigation. The area of this investigation extends from the north of the former roundhouse area to Shellpot Creek (refer to **Figure 1-2**). This remedial investigation will also be performed under the Delaware VCP. As such, methods and procedures included in this Work Plan were developed in accordance with the Delaware Department of Natural Resources and Environmental Control (DNREC) guidance's *Hazardous Substance Cleanup Act Guidance Manual*, dated October 1994, to the extent appropriate, as well as *Standard Operating Procedures for Chemical Analytical Programs*, revised September 2006 (SOPCAP).

In a March 16, 2007 letter to SECOR, DNREC requested a proposal to address potential contamination remaining in the Maintenance Facility portion of the property. Also in that letter, DNREC requested an RI/FFS Work Plan for Maintenance Facility portion of the AMTRAK Wilmington Yard be prepared. This request was attributed, in part, to the results of sampling performed in the drainage ditch north of the Eastern Drainage Ditch during the Former Fueling Facility remedial investigation.

In a letter to DNREC dated June 29, 2007, on behalf of AMTRAK and APU, SECOR proposed to develop a Work Plan for the Maintenance Facility that is consistent with the Pollutant Minimization Plan for PCBs (PMP) approach adopted by the Delaware River Basin Commission (DRBC) to reduce future PCB discharges to the Delaware River Estuary. In response, in their July 19, 2007 letter to SECOR, DNREC indicated that they did not disagree with the proposed approach, but stated that the Work Plan also needs to be in compliance with the State of Delaware HSCA regulations. The general scope of work included in this Work Plan was discussed in a meeting on October 4, 2007 with AMTRAK, APU, SECOR and DNREC.

1.1 Purpose

This Work Plan describes the strategy and scope of remedial investigation and focused feasibility study activities for the Maintenance Facility as requested by DNREC in their letters dated March 16, 2007 and July 19, 2007. Remedial investigation activities are focused on the characterization of site surface and subsurface soils, groundwater, and sediments in drainage features associated with the Maintenance Facility. As will be described in this Work Plan, previous investigations and soil removal activities have been performed in the Maintenance Facility. AMTRAK has monitored two storm water outfalls (Outfall 002 and 007) in the Maintenance Facility in accordance with NPDES permits for the facility. AMTRAK also made a good faith commitment to reducing discharges of polychlorinated biphenyls (PCBs) from the AMTRAK Maintenance Yard to the Delaware Estuary through the PMP process in accordance with the Delaware River Basin Commission (DRBC) PMP Rule 4.30.9. The PMP was prepared by SECOR, on behalf of AMTRAK, and was submitted to DRBC on September 29, 2005. The Notice of Completeness of the Pollutant Minimization Plan from DRBC to AMTRAK was dated January 18, 2006.

Activities performed in accordance with the PMP, as well as NPDES monitoring, and previous investigations are summarized in this Work Plan and were used to scope the proposed remedial investigations. Annual reports dated March 2007 and March 2008 prepared in accordance with the PMP program were submitted to DRBC and DNREC.

This Work Plan also describes proposed focused feasibility activities and includes components of a presumptive remedy to reduce PCB loading in surface water from the Maintenance Facility using best management practices (BMPs). The BMPs would be consistent with those implemented in the Outfall 004 drainage improvement and sediment reduction project, which achieved a 94% reduction in PCB concentrations in surface water at Outfall 004. The additional Work Plan components requested by DNREC in their July 19, 2007 letter are also included in this Work Plan. Although a presumptive remedy for site soils is currently envisioned to include BMPs similar to those implemented in the Outfall 004 drainage area, the site remedy will be based on the findings of the investigation, as requested by DNREC.

The human health risk assessment will focus on site soils using realistic exposure scenarios but will also consider groundwater (via the indoor air pathway). The risk assessment will focus on on-site industrial worker and on-site construction worker exposure scenarios. The evaluation will include dermal contact and ingestion exposures.

1.2 Site Description

The Amtrak Wilmington Maintenance Yard is located in Wilmington, New Castle County, Delaware (refer to **Figure 1-1**). The site is situated in an industrial area of southeast Wilmington. The Site is zoned General Industrial (M-2) by the City of Wilmington. The Wilmington Maintenance Yard was constructed in 1903. Since the original construction, the operations have consisted primarily of the maintenance, service and overhaul of locomotives, rail cars, and rail road equipment. As mentioned, the Wilmington Maintenance Yard consists of the Maintenance Facility and the Former Fueling

Facility. A Draft Phase II RI/FFS Report has been submitted for the Former Fueling Facility. This investigation focuses on the Maintenance Facility (refer to **Figure 1-2**).

The Maintenance Facility is located north of the Former Fueling Facility. The Maintenance Facility is bounded to the east by the former Conrail Edgemor Yards (now owned and operated by Norfolk Southern), to the north by Shellpot Creek, and to the west by active mainline AMTRAK track (**Figure 1-3** presents the site vicinity). As indicated in **Figure 1-2** and mentioned previously, for the purposes of this investigation, the Maintenance Facility is considered the Amtrak property north of the former roundhouse (the former roundhouse area was evaluated as part of the Former Fueling Facility remedial investigation). The Maintenance Facility area of investigation encompasses approximately 53 acres; of which approximately 30.5 acres is paved or under building roof and 22.5 acres is unpaved.

1.3 Work Plan Organization

This Work Plan has been developed in accordance with the HSCA guidelines and is divided into the following primary sections. These sections are described as follows:

Section 1.0 – Provides general introductory and background information on the site and the purpose for the remedial investigation and focused feasibility study.

Section 2.0 – Summarizes the site operational history, previous site investigations and soil removal activities, the hydrogeologic setting, hydrologic setting, and area water usage. Also included is a discussion of the Pollutant Minimization Plan for PCBs which has been implemented at the site.

Section 3.0 – Provides a discussion of the regional environmental setting. The discussion is focused on PCB occurrence in the Shellpot Creek drainage basin.

Section 4.0 – Presents the current understanding of the site conceptual model that was considered in the development of this Work Plan.

Section 5.0 – Describes the scope of the proposed investigation activities. These activities include a site survey, surface and subsurface soil sampling, monitoring well installation, groundwater sampling, surface water, sediment sampling and building sewer drain inspection/sampling.

Section 6.0 – Describes the scope of the human health risk assessment and ecological investigations.

Section 7.0 – Provides the Work Plan for the Focused Feasibility Study.

Section 8.0 – Describes project plans including a project management plan, health and safety plan, sampling and analysis plan, waste management plan and community relations plan.

Section 9.0 – Discusses a proposed schedule for completing project activities.

Section 10.0 – Provides a list of the references cited in this Work Plan.

2.0 SITE CHARACTERIZATION

This section provides a characterization of the current understanding of site conditions which was used to develop the scope of investigative activities. Included below are descriptions of the facility operational history, previous site investigations, hydrogeologic setting, hydrologic setting, and area water usage. Also included is a discussion of the Pollutant Minimization Plan for PCBs which has been implemented at the site.

2.1 Operational History

As previously mentioned, the Wilmington Maintenance Yard was constructed in 1903. Since the original construction, the operations have consisted primarily of the maintenance, service and overhaul of locomotives, rail cars, and rail road equipment. Ownership and operation of the facility was conveyed by Penn Central Transportation Company, debtor, to Consolidated Rail Corporation (CONRAIL), effective April 1, 1976. CONRAIL then conveyed ownership and operation of the facility to AMTRAK, effective April 1, 1976.

The Maintenance Facility is an active rail yard used primarily for the maintenance of locomotives, and rail road equipment. The main maintenance activities are performed in Car Shop 1, Car Shop 2, the Locomotive Shop, Electric Shop and the Wheel Shop (refer to **Figure 2-1**). Other activities include the fabrication of concrete forms and track panels. In 1995, fueling operations were moved from the Former Fueling Facility to the Maintenance Facility. A new fueling area with a 10,000 gallon above ground storage tank (AST) was installed.

As will be described, during previous site investigations, PCBs were detected in soils and surface water as well as in sediment samples collected in the facility storm sewers. The use of PCB equipment at the facility was primarily associated with oils in electric transformers in some locomotives and (self-propelled) passenger cars (as will be described equipment containing PCBs is no longer used at the facility). Several stationary transformers containing PCB dielectric fluids were also in operation at the facility. These stationary transformers were removed by AMTRAK by 1983.

PCBs historically were contained in dielectric fluids in the transformers in some locomotives and passenger cars. The maintenance of locomotives was primarily performed in the Locomotive Shop; Car Shop 1 and Car Shop 2 were used primarily for the servicing of passenger cars.

Beginning in the late 1970's and continuing into the 1980's, transformers on locomotives and self-propelled passenger cars were retrofilled to reduce the PCB concentrations in transformer fluids. The PCB fluids were flushed from the transformers and replaced with new dielectric fluids. The flushing involved the use of trichlorobenzene to reduce the PCB concentrations in the transformers. The trichlorobenzene was reclaimed using a distillation process and reused (this operation ceased in 1987). According to AMTRAK personnel, as of July 1987, all remaining locomotives had been retrofilled.

Currently, the fleet of locomotives serviced at the facility includes electric locomotives (equipped with non-PCB silicon dielectric fluid filled transformers) and diesel locomotives. No equipment containing PCBs, including retrofilled equipment, is in service.

A summary of PCB minimization activities is provided below for operations and equipment managed by AMTRAK and based on available records and discussion with AMTRAK personnel.

- Stationary transformers containing PCB fluids were removed by AMTRAK by 1983. These fluids were incinerated at an USEPA-approved facility.
- Transformer dielectric fluid retrofilling activities were performed in the 1970's and 1980's.
- No equipment containing PCBs is currently in service. Equipment that had been retrofilled has been removed from service.
- The Maintenance Facility sewer systems were reconfigured in the 1980's (refer to Section 2.4). Work pits below cars and locomotives were sealed in the 1980's and connected to the industrial sewer system.
- Asphalt or concrete paving was placed on road surfaces and parking area reducing the area of uncovered soils.
- AMTRAK has performed several soil excavation (and off-site disposal) activities in the Maintenance Facility. These activities are included in the discussion below.

2.2 Previous Investigations and Soil Removal Activities

There have been several environmental investigations performed at the facility. A summary of the available information for investigations in the Maintenance Facility is provided below.

Three large-scale site investigations were performed between 1980 and 1984 to assess site conditions. As will be described below, these investigations were used to identify areas for soil removal activities which were performed in 1984 and 1985. A 1994 investigation performed by DNREC documented sediment sample collection in the drainage ditch on the Eastern perimeter of the facility. From 1995 to present, several localized investigations were performed which were prompted by proposed construction of new buildings or expansions to existing structures. A summary of each investigation based on available information for the Maintenance Facility is provided below. Available documentation for the investigations identified below are provided on a compact disk (CD) included in **Appendix A**. **Figure 2-2** presents the extent of previous excavation activities (based on available excavation plans) and proposed excavation areas.

Assessment of PCBs at the Wilmington Maintenance Facility was prepared by Woodward-Clyde Consultants and dated January 30, 1981. In June and July, 1980, Woodward-Clyde collected twenty-eight (28) soil samples for PCB analyses from soils along roadways and mainline tracks, and in marshes and puddles throughout the Maintenance Facility. Sixteen (16) additional soil samples were collected from six boring locations in the Maintenance Facility. Two (2) sediment samples and three (3) surface water samples were collected along the drainage ditch north of the Eastern Drainage Ditch. Groundwater samples were also collected from eight (8) observation well locations in the

Maintenance Facility. Data from the analyses of PCB in surface soils (to a depth of one foot), subsurface soils, surface water, sediment, and groundwater was reported. With the exception of a sample from a former drum storage area (894 mg/kg; formerly located between Buildings #23 and #27), the soil sample results for total PCBs ranged from below detection limits to 26 mg/kg. The surface water samples from the drainage ditch north of the Eastern Drainage Ditch ranged from below detection limits (the detection limit was not reported) to 0.0020 mg/l for PCBs. Sediment samples collected from the drainage ditch north of the Eastern Drainage Ditch ranged from 0.0116 mg/kg to 24 mg/kg total PCBs. Groundwater sample results for total PCBs ranged from 0.000077 mg/l to 0.0109 mg/l during the July 1980 sampling event (believed to be unfiltered samples) and below detection limits to 0.000750 mg/l during the August 1980 sampling event (filtered samples).

In a letter to USEPA accompanying the Woodward-Clyde report described above and dated January 30, 1981, AMTRAK proposed the following activities as a result of the investigations:

- Excavate the portion of the drum storage area which exceeds 50 ppm (PCBs). Pave the balance of the drum storage area;
- Pave roadways and parking lots,
- Separate storm, industrial, and sanitary sewers, and
- Abandon existing sewer trunk lines.

Analyses of Soil Samples from AMTRAK was prepared by Radiation Management Corporation and dated July 1982. A total of 64 soil samples were collected in 12 general locations across the Former Fueling Facility and the Maintenance Facility. In the Maintenance Facility five (5) samples were collected in the swampy area between the current location of Outfall 002 and Shellpot Creek (Sampling Area 1); four (4) samples were collected in a track area to the west of the Wheel Shop (Sampling Area 11), and six (6) samples were collected between Buildings 23 and 27 (Sampling Area 12). Oil and grease concentrations ranged from 611 mg/kg to 140,884 mg/kg. PCB concentrations generally ranged from 12 mg/kg to 477 mg/kg (with the exception of one sample near the Wheel Shop which reported a PCB concentration of 1,475 mg/kg). Based on the results of this investigation, three areas were identified for soil removal (refer to **Figure 2-2**).

Radiation Management also conducted soil sampling in 1983 and 1984. Two hundred seventy four (274) samples were collected at depths ranging from six to 24 inches below ground surface along the perimeter of the AMTRAK Wilmington Yard, in the Maintenance Facility, and around the Locomotive Shop. Available documentation from this sampling event consists of drawings with sample locations and tabulated analytical data (refer to **Appendix A**). Samples were collected during three sampling events designated A, B and C. PCB concentrations ranged from less than 1 mg/kg to 5,770 mg/kg. The highest concentrations were reported in the transfer table, the northern perimeter of the study area, in the vicinity of the former drum storage area, and track areas (refer to **Appendix A**).

During 1984 and 1985, approximately 10,000 cubic yards of PCB impacted soils were removed from areas in and around the Maintenance Facility. Areas where previous sampling identified "hot spots" of PCBs were reported to have been removed. The soil removal was coordinated with the USEPA and state agencies. The cleanup area included: in and around the locomotive shop; oil and drum staging area (between Buildings 23 and 27); the mainline track area; and the track area south of the

locomotive shop (NUS, 1989). The proposed excavation areas are included on **Figure 2-2**, although a plan confirming excavated areas is not available. **Figure 2-2** also indicates proposed soil removal in the transfer table area. Roadways and parking lots were also paved to prevent soil erosion.

In 1986, approximately 2,000 yards of soils were reportedly removed from the vicinity of the current location of the Wheel Shop (refer to **Figure 2-2**).

A 1989 Preliminary Assessment Report prepared by NUS Corporation provides details of an August 16, 1988 site visit by FIT, EPA, DNREC and Amtrak. No samples were collected and EPA concluded that "the extensive sampling and cleanup of PCB-contaminated areas, as well as the discontinuation of the use of PCB transformers, has minimized concerns for exposure to the environment and for population."

During April 1991, a 5,000 gallon kerosene underground storage tank (UST) was removed from an area south of Building Number 27. The removal of this UST (as well as two USTs from the Former Fueling Facility) was documented in Tank Closure Record Wilmington Maintenance Facility, Vandever Avenue, Wilmington, Delaware (UST Closure Report) prepared by Joseph T. Hardy and Son, Inc., dated May 20, 1991. The UST Closure Report indicates a product sheen was detected on the water table in the UST excavation and approximately four tons of soil was removed from the excavation. Post excavation soil samples reported 559 mg/kg and 36.4 mg/kg total petroleum hydrocarbons.

In December 1994, *Inspection Report on the AMTRAK Wilmington Refueling Facility* was prepared by DNREC (DNREC, 1994). Sampling was conducted on November 30, 1993 and January 13, 1994 to evaluate potential human health and environmental risks, identify potential target populations/resources, determine potential pathways, and to conclude whether additional investigation was deemed necessary in the Former Fueling Facility. One surface water sample and one sediment sample were collected from the drainage ditch north of the Eastern Drainage Ditch. One sediment and one surface water sample were collected from this drainage ditch as background/upgradient samples relative to the Former Fueling Facility. The only organic compounds reported in the water sample was chloroform and chlorobenzene, both at estimated concentrations of 1 ug/l. The total PCB concentration in the sediment sample was 1.5 mg/kg.

During 1995, AMTRAK performed soil sampling along the track area to the north of Car Shop 1. The sampling was performed in advance of the track replacement/ maintenance project in the area. Soil samples were collected on a grid pattern. Areas reporting PCB concentrations greater than 25 mg/kg were targeted for soil excavation.

Following the sampling mentioned above, AMTRAK contracted with Clean Harbors Environmental Services, Inc. (Clean Harbors) to remove soils from the track area north of Car Shop 1. Between April 8 and May 15, 1996, Clean Harbors excavated and removed soil, ballast, and rail ties in the area. The analytical results from this activity were documented in Analytical Summary Report PCB Soil/Ballast Excavation Project Amtrak Maintenance Shops Wilmington, Delaware (prepared by Clean and Harbors and dated May 1996). A total of 3,777 tons of material was shipped to Chemical Waste Management's Model City Landfill in Model City, NY (a TSCA facility). Areas having PCB

concentrations equal to or greater than 25 ppm were targeted for excavation. If groundwater was encountered, no further excavation took place in that area. Areas where soil PCB concentrations were greater than 25 ppm after the initial soil removal, as identified from the initial sampling rounds (sampling events 1, 2, and 3), were targeted for re-excavation (refer to **Appendix A**).

During 1997, Amtrak excavated approximately 2,400 cubic yards of material (soil and construction debris) during the construction of an addition to the Wheel Shop. The soils were transported to the Former Fueling Facility and stockpiled within the bermed area at the former location of the 250,000 gallon above ground storage tank that was historically used for fueling locomotives. Approximately 15 soil samples were collected from the pile between 1997 and 2000 for the analyses of PCBs. The results of the PCB analyses ranged from 6.4 mg/kg to 64 mg/kg. The pile was subsequently covered with impermeable rubber membrane to prevent water run off. These soils were removed from the facility during 2005 by Phillips Service Corporation.

Summary Report of Soil Removal Activities, Proposed Warehouse Building Area was prepared by SECOR in December 2005 (refer to **Appendix A**). This report detailed characterization soil borings and excavation activities performed in September/October 2005 at the location of a proposed new warehouse building to be located north of Building 33 and adjacent to Building 39 (refer to **Figure 2-2**). A total of 98 soil samples were collected from 26 boring locations. Based on the results, Amtrak determined that soils from two areas were to be excavated. The two proposed excavation areas measured approximately 60 feet by 60 feet (R-105 excavation areas) and 20 feet by 20 feet (SB-104 excavation area) based on soil characterization data. Soils greater than 500 mg/kg total PCBs were targeted for excavation. Based on the results of initial post-excavation sampling, additional soils were excavated from the southern portion of the R-105 excavation and soils were excavated to a depth of eight feet four inches in the center of excavation at which depth groundwater was encountered. The SB-104 excavation was completed to a depth of 3.5 feet. A total of 1,137 tons of material was disposed at a TSCA approved landfill. The proposed warehouse building was not constructed.

Another proposed building prompted soil characterization to the northeast of Car Shop 1 (Building 1) in September of 2006 (refer to **Figure 2-2**). SECOR conducted soil characterization and post-excavation soil sampling for PCBs for use by Amtrak and their construction contractors. A total of 48 samples were collected from 12 boring locations with PCB results ranging from ND to 1,900 mg/kg. An area of approximately 130 feet by 180 feet varying in depth from 0.5 feet to 3.0 feet was excavated. Post-excavation samples were also collected (the report of findings is included in **Appendix A**).

In July and August 2007, a subsurface investigation was conducted by SECOR in the Locomotive/Wheel Shop area. Ten (10) one-inch diameter peizometers were installed to a depth of approximately 10 feet bgs to evaluate the potential occurrence of light nonaqueous phase liquids (LNAPL) on the water table. LNAPL was detected in four of the peizometers with a maximum apparent thickness of 1.56 feet. PCB aroclor analyses were performed on two of the LNAPL samples. Total PCB aroclor concentrations in the two LNAPL samples were 42 mg/kg and 30.6 mg/kg. *Locomotive/Wheel Shop Areas Subsurface Investigations Report of Findings* dated September 20, 2007 is included in **Appendix A**. LNAPL accumulating in the peizometers is removed (by bailing) on a monthly basis. Additional investigations are planned for the vicinity of the

Locomotive and Wheel Shops including the further delineation of LNAPL on the water table surface and the video inspection of storm sewer piping as part of the PMP activities.

2.3 Hydrogeologic Setting

The site is located within the Atlantic Coastal Plain Physiographic Province and mapped as being underlain by unconsolidated sediments of the Columbia Formation (Quaternary Age). These fluvial sediments generally consist of gravelly, coarse-to medium-grained sands with interbedded silts and clays (Woodruff and Thompson, 1975). The thickness of the Columbia Formation is generally less than 10 feet in the vicinity of the site. The Columbia Formation represents the water table aquifer in the site vicinity.

The Columbia Formation is underlain by the Potomac Formation (Cretaceous Age) which consists of variegated red, gray, purple, yellow, and white silts and clays containing interbedded sand and some gravel (Woodruff and Thompson, 1975). Because of the proximity of the site to the Fall Line, the Potomac Formation at the site is expected to be thin and it pinches out along the northwestern portion of the AMTRAK Wilmington Maintenance Yard.

The Wilmington Complex (Precambrian Age) subcrops beneath Columbia Formation along the northwestern portion of the site. The Wilmington Complex represents the crystalline basement rocks of the northern Delaware area and consists of norite, hypersthene-quartz-andesine gneiss, and noritic anorthosite in the vicinity of the site (Woodruff and Thompson, 1975). The upper portions of these basement rocks are commonly weathered resulting in a zone of regolith which is reported to be from 20 to 50 feet thick just north of the study area (Christopher and Woodruff, 1982).

The Columbia Formation represents the water table aquifer but is thin in the vicinity of the site. Groundwater is transmitted through the Wilmington Complex through secondary permeability features (fractures and joints) and is capable of sustaining relatively low yields. Neither the Columbia Formation nor the Wilmington Complex are used as a water source in the vicinity of the site (refer to Section 2.5).

Eleven monitoring wells were installed during 1980 in the current Maintenance Facility area of investigation by Woodward-Clyde Consultants (1981). Woodward Clyde reported that the stratigraphy in three deep wells (well depths ranging from 31 to 35 feet bgs), located in the Former Fueling Facility, the southern portion of the Maintenance Facility, and the northern portion of the Maintenance Facility, was similar. Fine to medium grained sand with gravel was encountered at a depth of 25 to 30 feet below ground surface. This sand unit was overlain by 15 to 20 feet of clayey slit or silty clay with traces of sand and some peat (first encountered at a depth of approximately 10 feet in the two wells in the Maintenance Facility). A layer of peat was identified above the clayey silt/silty clay unit in some wells. The peat when present was overlain by fill. The other wells in the Maintenance Facility were shallow wells installed to a depth of 15 feet or less. Gray clay was also encountered at depths ranging from 3 to 10 feet in the drainage ditch north of the Eastern Drainage Ditch during sediment sampling performed as part of the Former Fueling Facility remedial investigation.

Woodward Clyde Consultants (1981) interpreted that the lower silt sand with some gravel is probably alluvial sediment that may be channels sands of the Delaware River. The clayey silts or silty clays above the channels were interpreted to be over-bank (flood plain) deposits on which marsh vegetation grew over part of the area. Fill was interpreted to have been placed on the marsh deposits in order to provide usable land.

Water table contour maps were prepared by Woodward Clyde Consultants (1981) for data collected on July 29, 1980 and August 27, 1980. These maps indicate that the direction of groundwater flow from the Maintenance Facility is from the AMTRAK mainline tracks towards the drainage ditch north of the Eastern Drainage Ditch with components of flow towards Shellpot Creek and Eastern Drainage Ditch in the northern and south portions of the facility, respectively. It was also reported that water level measurements from shallow/deep well pairs indicated an upward head potential through the silt/clay unit.

2.4 Hydrologic Setting

The ground surface in the Maintenance Facility is generally flat and approximately 30 acres of the 53 acre study area is paved or covered with buildings. Nearly all storm water flow is conveyed through the facility storm water sewer system (refer to Section 2.4.1). Two storm water outfalls (Outfall 002 and 007) are located in the Maintenance Facility and are monitored in accordance with the NPDES permit for the facility (refer to Section 2.4.2). Shellpot Creek flows to the east along the northern boundary of the Maintenance Facility and empties into the Delaware River downstream of the site (refer to Section 2.4.3). Direct surface runoff to the Shellpot Creek occurs along the northern portion of the facility.

A drainage ditch to the east of the Maintenance Facility separates the AMTRAK rail yard from the Norfolk Southern rail yard. In the Former Fueling Facility Phase II RI/FFS, this drainage ditch was referred to as the drainage ditch north of the Eastern Drainage Ditch or "NED" (this ditch also receives storm water runoff from the adjacent Norfolk Southern rail yard). The northern portion of this drainage ditch flows in a generally northerly direction to the Shellpot Creek while the southern portion flows in a southerly direction to the Eastern Drainage Ditch (which eventually flows through two sediment control dams and to Brandywine Creek). The general location of the drainage divide in this ditch is depicted on **Figure 1-2**. The location of the drainage divide may vary as a result of tidal conditions in Shellpot Creek. This ditch also receives runoff from the adjacent Norfolk Southern rail yard and a tank car cleaning operation located to the east of AMTRAK property.

2.4.1 Maintenance Facility Sewer Systems

Storm water flow in the Maintenance Facility is routed to Outfall 002 (which flows to the Shellpot Creek) and to Outfall 007 (which flows to the Eastern Drainage Ditch). Outfall locations and approximate on-site drainage areas are presented on **Figure 2-3.** Overland flow occurs in the immediate vicinity of the Shellpot Creek in the northern portion of the facility and adjacent to the drainage ditch north of the Eastern Drainage Ditch in the eastern portion of the facility.

In addition to the storm sewer system, the water management piping in the Maintenance Facility consists of industrial waste sewers and sanitary sewers (**Figure 2-4**). Flow to the industrial waste sewer are routed to the industrial waste treatment building for treatment prior to discharge to the City of Wilmington Wastewater Treatment Plant under an industrial waste discharge permit issued by the City of Wilmington (City of Wilmington Department of Public Works Wastewater Discharge Permit #W-85-04). The permit requires semi-annual monitoring for PCB congeners (EPA's Draft Test Method 1668A) and other parameters. The sanitary sewers, which connect to rest room and locker room facilities, also discharge to the City of Wilmington Wastewater Treatment Plant.

2.4.2 NPDES Monitoring Program

There are seven outfall locations identified in the NPDES permit for the Wilmington Shops (Outfalls 001, 002, 003, 004, 005, 006, and 007). As noted above, Outfalls 002 and 007 receive drainage from the Maintenance Facility portion of the site. All of the site outfall locations other than Outfalls 002 and 007 are located within or adjacent to the Former Fueling Facility portion of the site. As indicated on **Figure 2-3,** Outfall 002 flows into a drainage swale that drains to Shellpot Creek. Outfall 007 flows into a drainage swale that drains into the Eastern Drainage Ditch and is upgradient of Outfalls 001 (Dam B) and 003 located in the Eastern Drainage Ditch, and Outfall 006 (12th Street Dam) which receives flow from the Eastern and Western Drainage Ditches.

The current NPDES permit (DE0050962) became effective May 1, 2006. The monitoring requirements of the NPDES permit vary by outfall locations and are included in **Appendix B**. Parameters for analysis under the permit include oil and grease, pH, TCE, surfactants, PCB congeners, total nitrogen, total phosphorus, and enterococci. The permit requires annual PCB congener analyses from Outfall 006 (Former Fueling Facility) and Outfall 002, and biannual analyses at Outfall 007. Historical NPDES monitoring data for Outfalls 002 and 007 (the outfalls adjacent to the Maintenance Facility) is included in **Appendix B**.

2.4.3 Shellpot Creek Watershed

As mentioned, Outfall 002 drains to the Shellpot Creek and Shellpot Creek bounds the northern portion of the facility. The Shellpot Creek Watershed consists of approximately 6,300 acres of primarily residential and commercial land, situated in northeastern New Castle County, Delaware (refer to **Figure 2-5**). Shellpot Creek headwaters originate at elevation 400 feet and flows approximately seven miles before entering the Delaware River between Cherry Island and Edgemor, Delaware.

Approximately the lower mile of Shellpot Creek is influenced by diurnal tides from the Delaware River. Due to the relatively flat topographic profile of the Shellpot Creek bed, this area functions as a relative "sink" for receiving debris, sediments and water from surrounding areas. Diurnal tidal flow into the creek is attenuated, although not stopped, by a tide gate located approximately 0.25 mile upstream of the confluence with the Delaware River. The attenuation in tidal flow caused by the tide gates has fostered the deposition of sediment and organic detritus in the lower tidal reach of Shellpot Creek. Oxygen demand from decaying organic matter, upgradient nutrient loads and reduced tidal exchange, results in depressed dissolved oxygen concentrations within this portion of the creek during the

summer months.

Vegetation within the tidal portion of Shellpot Creek is typified by bands of emergent wetland vegetation on intertidal flats of varying width, grading into large upgradient stands of common reed (*Phragmites australis*). A large area of emergent marsh, with a diverse plant community, is located off of the mainstream creek approximately 0.6 miles above the confluence with the Delaware River.

The bed of the tidal Shellpot Creek consists primarily of silt and mud, with an increasing proportion of sand in the upper tidal reach. Land use adjacent to the tidal portion of Shellpot Creek is primarily industrial with dredge spoils and plant process waste solids stored in filled marsh areas on the south bank of the Shellpot Creek.

A transition area between the tidal and non-tidal portions of the creek is located between the downstream-most Norfolk Southern railroad bridge and the AMTRAK main line bridge. This area has a generally non-tidal character, with a moderately incised channel, some riffle/pool segmentation, and a broad mixed deciduous forested floodplain.

The approximate limit of the tide is located immediately upstream of the AMTRAK main line bridge. The lower half mile or so of the non-tidal Shellpot Creek is relatively low gradient, with a predominantly sand and gravel substrate. Land use adjacent to this portion of the creek is primarily commercial.

Most of the non-tidal Shellpot Creek has a moderately to deeply incised channel and a moderately steep gradient. The width of the channel narrows with progression upstream. The creek bed substrate reflects the gradient and local geology, and consists primarily of cobble and boulders, with bedrock outcrops and ledges in some areas. The aquatic habitat consists of series of pools, runs, and riffles. The banks of the creek are typically lined by mixed deciduous trees and shrubs. Vegetated riparian buffer areas of varying widths adjoin most of the non-tidal creek. The creek flows through several New Castle County parks, some of which include relatively large wooded tracts.

In a number of locations, sanitary sewer lines occur beneath or adjacent to the bed of the non-tidal Shellpot Creek. Evidence of sewer overflow was observed at a sewer manhole adjacent to the creek immediately downstream of Market Street during a field reconnaissance in October 2005.

Land use adjacent to the non-tidal portion of Shellpot Creek is primarily residential and commercial with increasing residential use in the headwaters areas. Potential sources of PCBs in the Shellpot Creek Watershed are discussed in Section 4.0.

2.5 Area Water Usage

A survey of water usage in the vicinity of the site was preformed by DNREC and documented in *Site Inspection Report - AMTRAK Wilmington Refueling Facility* dated December, 1994. This survey included a search of Delaware Water Use Data System (DWUDS) for the identification of water well data within a four mile radius of the site. The results of this survey are summarized below.

The site and surrounding area is supplied with potable water from the City of Wilmington. The City uses two intakes from the Brandywine. These intakes are at least two miles upstream from the confluence of the site tributary and the Brandywine. Two other public water purveyors were identified within four miles of the site, Wilmington Suburban Water Company (WSWC) and the Artesian Water Company (AWC). WSWC uses surface water from streams more than four miles from the site and the nearest AWC well is approximately four miles south of the site.

Approximately 24 domestic wells were identified within the search area with nearest wells located approximately two miles from the site. These wells are north and west of the site and penetrate the Wilmington Complex. Because of the distance from the site and the aquifer penetrated, the wells identified have no hydraulic connection to the site.

2.6 Pollutant Minimization Plan for PCBs

The Delaware River Basin Commission (DRBC) approved Resolution No. 2005-9 to amend the *Water Quality Regulations* and *Comprehensive Plans* on May 18, 2005. Under this Resolution, DRBC desires to achieve a 50 percent reduction on the aggregate loads of total PCBs to the Delaware estuary within five years. The Delaware River Estuary has been classified by EPA, and the states of Delaware, New Jersey, and Pennsylvania as impaired because it exceeds water quality standards for many parameters. As a result, EPA and DNREC are establishing total maximum daily loads (TMDLs) for several parameters. DNREC has developed TMDLs for Shellpot Creek for total nitrogen, total phosphorous and bacteria EPA established a TMDL for PCBs based on attaining water quality criteria for Zones 2 (from Trenton, NJ to approximately Philadelphia, PA) through Zone 6 (Delaware Bay). DRBC established regulations to require PMPs to reduce PCB loading from facilities located within the Delaware River Estuary.

As previously mentioned, AMTRAK made a good faith commitment to reducing discharges of polychlorinated biphenyls (PCBs) from the Amtrak Maintenance Yard to the Delaware Estuary through the PMP process. The PMP for the facility was prepared by SECOR on behalf of Amtrak and was submitted to DRBC on September 29, 2005. The Notice of Completeness of the PMP from DRBC to Amtrak was dated January 18, 2006. The Notice was received by Amtrak on approximately January 25, 2006.

One forerunner of these PMP requirements was an award-winning (Water Resources Association of the Delaware River Basin, Business and Industry Award, 2005) sediment reduction and erosion control program implemented in the Outfall 004 drainage area. As described in the Draft Phase II RI/FFS Report for the Former Fueling Facility, these measures resulted in a 94% reduction in PCB concentrations in surface water from Outfall 004. Sediment reduction and erosion control measures included bioretention covers, stone/geotextile filter berms, placement of stone/geotextile on unpaved areas, check dams and stone lined drainage swales.

Minimization efforts documented in the PMP Annual Report for 2006 (dated March 2007) included the cleanout of the Outfall 002 storm sewer system. The storm water piping to Outfall 002 was cleaned during the period of August 23 through November 18, 2006. The storm sewer was cleaned to remove sediments which had collected in the sewer. Lines were cleaned in segments using high pressure

water while recovering the cleaning water at a downstream location. The storm sewer consisted of 12 to 42 inch diameter concrete pipe. The total length of storm sewer cleaned was approximately 7,000 feet.

Minimization efforts documented in the PMP Annual Report for 2007 (dated March 2008) included erosion and sediment reduction controls in the immediate vicinity of Outfall 002. The controls included a combination of stone/filter berms and stone gravel/fabric covering of existing exposed soil/gravel surfaces (refer to **Figure 2-6**). Filter fabric was placed on the ground surface (approximately 2,000 sq. ft.) and covered with stone (filter fabric with 2"-stone placed 6" deep, minimum size and depth). A perimeter stone/filter berm was placed around the perimeter of the work area, totaling approximately 170 linear feet. A second stone/filter berm was placed adjacent to the Outfall 002 headwall structure, approximately 30 linear feet long. These are the same general controls that were included in the Outfall 004 sediment reduction project that reduced PCB concentration in storm water by approximately 94%.

In the northeastern portion of the facility, curbing along the eastern perimeter of a parking area is being upgraded to better control storm water movement (this work is currently in progress). The curbing is being upgraded to minimize erosion.

The PMP Annual Report for 2007 documented an overall 73.5% reduction in PCB loading from baseline conditions at Wilmington Maintenance Yard (based on measurements from Outfalls 002, 004, and 007 and the industrial waste sewer; a baseline loading from Outfall 006 was not included due to the tidal conditions and regional PCB sources). As noted above, implementation of erosion and sediment reduction controls reduced the reduced PCB concentration in storm water by approximately 94% in the Outfall 004 drainage area. The PMP Annual Report for 2007 also documented the results of track-back sediment sampling investigations in the Outfall 002 storm sewer, track-back storm water sampling investigations in the Outfall 007 storm sewer, track-back liquids sampling investigations in the industrial waste sewer, and the results of storm water monitoring for PCB congener analyses. The activities are summarized below. Summarized data and sample location maps from the PMP Annual Report for 2007 are located in **Appendix C**.

As a result of the track-back investigations, additional sampling and minimization measures will be performed as part of the PMP program as discussed below. Sampling activities and minimization measures completed during 2008 will be documented in the PMP Annual Report for 2008. These activities will also be included in the RI/FFS Report for the Maintenance Facility.

2.6.1 Outfall 002 Storm Sewer Sediment Track-Back Investigation

As described in the PMP Annual Report for 2006 and mentioned above, the storm water piping to Outfall 002 was cleaned during the period of August 23 through November 18, 2006. Storm water samples were collected from Outfall 002 on December 11 and 12, 2006 (refer to the Annual Report dated March 22, 2007) and on July 11 and 12, 2007 for the analyses of PCB congener using EPA Draft Test Method 1668A. These samples reported 0.89388546 ug/l and 0.80737520 ug/l total PCB congeners, respectively (refer to **Appendix C**). As a result, sediment samples were collected in the storm sewer system that drains to Outfall 002 and from surface soils in the transfer table (a

rectangular unpaved area that is used for moving railcars into maintenance facilities) which has a storm water drain connected to the Outfall 002 storm sewer system.

On November 8, 2007, seven grab sediment samples were collected from the Outfall 002 storm water sewer system and one sediment sample (Steam Bay) was collected from the Industrial Waste Sewer System for the analyses of PCB aroclors by method 8082. Since runoff from surface soils is a potential source of PCB loading, six surface soil samples were also collected from the transfer table area.

Sediment and surface soil sample results are summarized on **Table C-1** (**Appendix C**). Sample collection locations are displayed on **Figure C-1** (**Appendix C**). The highest sediment sample concentration was 139 mg/kg total PCB aroclors in the steam bay. The steam bay is a trough used to collect wash water from the cleaning of maintenance equipment before maintenance activities are performed on the equipment. The steam bay is connected to the industrial waste sewer but was sampled as part of the Outfall 002 track down investigations to evaluate potential impact if the steam bay overflowed during a rain event. The highest sediment sample concentration in the Outfall 002 storm sewer system was 54.9 mg/kg total PCB aroclors in manhole MH-7A (refer to **Figure C-1**). As indicated on **Table C-1**, the remaining sediment sample concentrations ranged from 1.99 mg/kg (in the drain from the transfer table) to 19.9 mg/kg (MH-9) total PCB aroclors.

Six surface samples were collected from the transfer table (refer to **Figure C-1**). The surface soil concentrations in the transfer table ranged from 3.7 mg/kg (TTS-4) to 30.9 mg/kg (TTS-6) total PCB aroclors. As mentioned above, the sediment sample from the storm water drain in the transfer table reported only 1.99 mg/kg total PCB aroclors.

Based on the results of the November 7, 2007 sampling event, additional sediment and surface soil samples were collected further upgradient in the Outfall 002 storm water sewer system. On January 30, 2008, six sediment samples and four surface soil samples were collected for PCB aroclor analyses using Method 8082. Sediment and surface soil results for the January 30, 2008 event are summarized on **Table C-2** (**Appendix C**). Sampling locations are displayed on **Figure C-2** (**Appendix C**).

As indicated on **Table C-2**, the highest concentration in sediment samples was detected in a storm sewer drain adjacent to the location of a transformer (all facility stationary transformers containing PCB fluids were removed by Amtrak in 1983; refer to the Annual Report dated March 22, 2007). Sample location TD-A reported 79 mg/kg total PCB aroclors. Total PCB aroclor concentrations in the five other sediment samples ranged from 0.640 mg/kg (MH-H) to 3.0 mg/kg (MH-B).

Three surface soil samples (SS-A, SS-B, and SS-C) were collected in an unpaved area in the southwest portion of the Maintenance Facility adjacent to a storm water drain. Total PCB aroclor concentrations in these samples were 160 mg/kg (SS-A), 110 mg/kg (SS-B) and 14 mg/kg (SS-C). A surface soil sample (SS-D) was collected from an unpaved area near Building 23. Sample SS-D reported 1.80 mg/kg total PCBs.

In the long-term, it is envisioned that the Outfall 002 storm water sewers will be cleaned a second time and that the Outfall 007 storm sewer will be cleaned. However, before cleaning these storm sewers, inputs of PCBs to storm sewers will be identified and addressed.

In the Outfall 002 storm sewer, sediments containing PCBs were detected after the storm sewer was cleaned. Additional surface soils samples will be collected in select unpaved areas drain to the Outfall 002 storm sewer. Activities such as soil removal or erosion and sedimentation controls may be implemented based on the results of surface soil sampling. Erosion and sedimentation control measures will be implemented in the transfer table.

2.6.2 Outfall 007 Storm Water Track-back Investigation

On September 11, 2007, storm water track-back investigations were performed in the Outfall 007 storm water system. Samples were collected from five manholes/catch basins locations (refer to **Figure C-3**, **Appendix C**). At each location, four grab samples were collected and composited on a flow-weighted basis for the analyses of 64 congeners using Method 8082 and total suspended solids (TSS). A 24 hour time-weighted composite sample was also collected at Outfall 007 for the analyses of PCB congeners using EPA Draft Test Method 1668A. The total precipitation on September 11, 2007 (as recorded at the New Castle County Airport) was 0.23 inches. The surface water analytical results are summarized on **Table C-3**, **Appendix C**).

As indicated on **Table C-3**, the total 64 PCB congener concentrations in unfiltered samples reported in the manholes/catch basins were 5.84 ug/l and 6.82 ug/l in MH-14 and the Track Area MH, respectively. The total 64 PCB congener concentrations in unfiltered samples MH-4, MH-6, and C-11 were 1.12 ug/l, 1.17 ug/l, and 1.11 ug/l, respectively. The total 209 PCB congener concentration in the Outfall 007 sample was 1.01 ug/l (1,009,122.96 pg/l). Samples MH-14 and Track Area MH also reported the highest TSS concentrations (34 and 81 mg/l, respectively).

As a result of visual observations of an oil sheen in manhole MH-14 (sorbent booms were deployed in MH-14), an investigation of the occurrence of the light nonaqueous phase liquids (LNAPL) was performed in the vicinity of Locomotive and Wheel Shops. Ten one-inch diameter monitoring wells were installed. LNAPL was detected in four wells at apparent product thickness up to 1.56 feet. PCB aroclor analyses was performed on two of the LNAPL samples. Total PCB aroclor concentrations in the two LNAPL samples were 42 mg/kg and 30.6 mg/kg. *Locomotive/Wheel Shop Areas Subsurface Investigations Report of Findings* dated September 20, 2007 is included in **Appendix A**.

Additional investigations are planned for the vicinity of the Locomotive and Wheel Shops including the further delineation of LNAPL on the water table surface and the video inspection of storm sewer piping.

In the vicinity of the Track Area Manhole, a broken section of pipe in the industrial waste sewer was observed. The elevated PCB concentrations at sample location Track Area MH are believed to be associated with the broken piping. The broken industrial waste sewer pipe has been repaired by Amtrak.

2.6.3 Industrial Waste Sewer Track-back Investigations

On October 15, 2007, liquid samples were collected from five locations within the industrial waste sewer system. Sampling locations are presented on **Figure C-4** (**Appendix C**). Upon receipt of the samples at the laboratory, water and oil fractions were observed in all but one of the samples (an oil fraction was not noticed in the sample designated Track Area MH). As a result, water fractions were analyzed for PCB aroclors using Method 8082 (samples for PCB analyses were filtered because of the oil content) and suspended solids. The oil fraction was also analyzed for PCB aroclors. Sample results are presented on **Table C-4** (**Appendix C**).

As indicated on **Table C-4**, the highest total PCB aroclor concentrations reported in water were 21.5 ug/l in the Steam Bay Manhole and 4.98 ug/l in MH-1. As indicated on **Figure C-4**, MH-1 is located in the industrial sewer system downgradient of the steam bay. The total PCB aroclor concentration in the other water samples ranged from below detection (MH-3 and the deep well which is a pre-treatment concrete lined stilling basin; detection limit of 2 ug/l) and 0.473 ug/l (Track Area MH).

The highest total PCB concentration in the oil fraction samples was 162.7 mg/kg in MH-1. The total PCB aroclor concentrations in the other oil fraction samples were 17.62 mg/kg (Steam Bay MH), 10.99 mg/kg (Deep Well), and below the detection limit of 10 mg/kg (MH-3). Note that the Deep Well is actually a concrete lined holding structure prior to the Dissolved Air Flotation (DAF) industrial waste sewer treatment building. Oil on the surface of water in the industrial waste sewer is removed by a belt skimmer in an equalization vessel after the deep well.

A sample of the effluent from the DAF Building was collected on October 16, 2007 and analyzed for PCB congeners by EPA Draft Test Method 1668A in accordance with the City of Wilmington Permit. This sample reported a total PCB congener concentration of 3.13 ug/l.

In order to address the industrial waste sewer, the steam bay will be cleaned. Sediments and liquids in the steam bay trough will be removed. Additional sediment samples will be collected from the steam bay and it will be visually inspected after the cleaning.

2.6.4 Storm Water Monitoring

During 2007, storm water samples were collected from Outfalls 002, 006, and 007 during a sampling event performed on July 11 and 12, 2007. Samples collected at Outfalls 002 and 007 were time-weighted 24 hour composite samples collected using an automated sampler. The sample collected from Outfall 006 was a grab sample collected on an outgoing tide as a result of the tidal conditions described in the PMP. The total rainfall during the sampling event was 0.23 inches (recorded at the New Castle County Airport). The storm water samples were analyzed for PCB congeners by Test America (formerly STL) located in Knoxville, Tennessee. These sampling results, as well as the results of other sampling events performed as part of the PMP program, are presented on **Table C-5** (**Appendix C**). Storm water samples from outfalls 002, 006, and 007 reported 0.807375 pg/l, 0.109385 pg/l, and 0.161433 ug/l total PCB congeners, respectively.

A 24 hour composite storm water sample was also collected from Outfall 007 on September 11-12, 2007 for analyses of PCB congeners. This sample was to be collected as the third baseline sample in accordance with the PMP. The total rainfall for this sampling event was 0.19 inches (recorded at the New Castle County Airport). The total PCB concentration in this sample from Outfall 007 was 0.1009123 ug/l.

3.0 REGIONAL ENVIRONMENTAL SETTING

As previously described, the AMTRAK Maintenance Facility is bounded to the north by Shellpot Creek and Outfall 002 drains to Shellpot Creek. This discussion of the regional environmental setting focuses on potential sources to Shellpot Creek based on a previous investigation performed by SECOR which was provided to DNREC on November 20, 2006. Since flow from Outfall 007 drains to the Eastern Drainage Ditch, through two sediment control dams, under 12th Street to Brandywine Creek; a discussion of potential PCB sources along the tidal portion of the Brandywine Creek was provided in the Draft Phase II RI/FFS Report for the Former Fueling Facility.

SECOR was retained by American Premier Underwriters (APU), AMTRAK and DuPont to gather information about environmental conditions of the Shellpot Creek and its watershed located near Wilmington, Delaware. Information was collected from readily accessible documents available to the public and site reconnaissance conducted in October 2005. This summary provides an overview of the information collected. A compendium of information, including maps, site files, data and field observations, was prepared in the format of an interactive set of four CD's (Shellpot Creek Collaboration Project, November 2006). Information referenced in the summary provided below is described in detail within the report. The physical characterization of the Shellpot Creek watershed was presented in Section 2.4.3.

The Shellpot Creek Watershed has undergone decades of urbanization resulting in a variety of environmental conditions influencing the Shellpot Creek, including flooding, combined sewer over flows, some chemical or industrial impacts and disposal of trash, other "unknown" wastes and debris. The Shellpot Creek is identified by regulatory agencies as an impaired waterway due to nutrient levels and low dissolved oxygen from non-point source surface water flows. Sewers servicing the City of Wilmington and New Castle County have been documented with combined sewer overflows to surface waters within the watershed.

A fish advisory against consuming fish from the Shellpot Creek was issued in 2002. In the study leading to the advisory, Polychlorinated Biphenyls (PCBs), pesticides, dioxins/furans and mercury were detected/identified in fish tissue. DNREC has developed TMDLs for total nitrogen, total phosphorous and bacteria. All of these substances have been identified as contaminants of concern (COCs) for this watershed.

An inventory of regulated, environmental sites was prepared by SECOR by researching available files and data of related regulatory agencies. This inventory produced over 337 sites (many were above and underground tank sites). An evaluation of the project files from these sites shows overall very limited data was collected and reported on COCs for this watershed. However, some sites located in the Lower Shellpot were inventoried as having detected PCBs from historical environmental sampling.

DNREC identified known or potential sources related to the fish advisory issued in 2002. These were described as follows:

- Creek sediments

- Railroad
- Power Plant/Substation
- Landfills(s)
- WWTP
- Delaware River
- Commercial/Residential areas above Route 13

Environmental regulatory "drivers" were identified based upon water quality testing and fish tissue sampling. In 2005, a Total Maximum Daily Load (TMDL) was established in response to the Shellpot Creek being identified as an impaired waterway because of elevated nutrient levels and low dissolved oxygen concentrations. (Total Maximum Daily Loads (TMDLs) Analysis for Shellpot Creek, DNREC, 2005). The TMDL analysis identified non-point sources (rather than point sources) as the source of nutrients and other oxygen consuming pollutants into the Shellpot Creek Watershed. Pollution loading from the City of Wilmington combined sewer overflow (CSO) at outfall CSO #31 was also identified as a significant source. CSO #31 is located off Bowers Street, southeast of Northeast Elementary School and discharges into an unnamed tributary of the Shellpot Creek. Chemicals, such as PCBs, have historically been detected in the City of Wilmington combined sewer overflow, however no specific data was available for CSO #31(Study of the Loadings of PCBs from Tributaries and Point Sources Discharging to the Tidal Delaware River, DRBC, June 1998).

DNREC and the Department of Public Health issued a state fish advisory against consuming fish from the Shellpot Creek in 2002. The advisory was prompted by levels of PCBs in fish collected by DNREC in 1999 at two locations, Hay Road, a tidal portion of Shellpot Creek, and Route 13, a non-tidal portion. In addition, pesticides, dioxins/furans and mercury detected in the fish tissue were also included in the fish advisory risk characterization by DNREC. (Fish Contamination in the Shellpot Creek and Risks to Anglers Who Consume Their Catch, undated presentation, R. Greene, DNREC).

Known sites with limited sample data were reviewed and inventoried based upon geographic location within the Shellpot Creek Watershed. FOIA requests were submitted to various regulatory agencies in an effort to compile regulatory site locations, data files and reports. An inventory of sites identified by the FOIA process is summarized below:

- 13 DNREC SIRB sites
- 45 Hazardous and Solid Waste sites
- 21 sites from DNREC programs (Recycling, Wastewater, Salvage)
- 137 UST sites
- 119 LUST sites
- 2 AST sites

In addition, two other areas, CSO #31 and the New Castle County Sewer System were identified as potential contributors. Attempts were made to gather further information from these areas. However, such information was not readily accessible for the preparation of this document.

Overall, these site files reflect a limited data base that only has limited value for identifying or quantifying the sources of contamination in the Shellpot Creek Watershed. Limited to nonexistent

information was available for the compounds associated with the fish advisory. However, some sites were identified with the presence of PCBs.

A search of the accessible database and site inventory information was performed to screen sites where the presence of PCBs were reported within the Shellpot Creek Watershed. The database search included DNREC, NPDES, DRBC TMDL and other sites categorized by DNREC or USEPA. Additional sites may exist, however such information was not readily accessible for the preparation of this document. In addition, PCBs and other regulated chemicals have been detected in Delaware River sediment/water. Tidal backflushing in part, occurs through the partial functioning of existing tide gates. The influence of this backflushing occurs roughly in the lower 1 mile stretch of the Shellpot Creek. The Delaware River is a potential source for PCBs in the Shellpot Creek. PCBs were also detected at several sites in the Shellpot Creek Watershed. A description of the limited PCB data collected is described below.

As authorized by the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) permit program regulates sources that discharge into waters of the United States. NPDES databases were searched and information was supplied by DNREC. In addition to the AMTRAK Wilmington Facility, other sites may exist, however such information was not readily accessible.

The USEPA Regions II and III established Stage 1 Total Maximum Daily Loads for PCBs for Zones 2 through 5 of the Delaware Estuary on December 15, 2003. At the request of USEPA Regions II and III and the States of New Jersey, Delaware and Pennsylvania, the Delaware River Basin Commission is developing Stage 2 TMDLs. A focused search of the TMDL Database was conducted. While many potential sources of PCBs were identified in the general south Wilmington, Delaware area, the search only focused upon locations where sample monitoring data existed and the location of the sample point was within the Shellpot Creek Watershed. Both the AMTRAK Wilmington Facility and the Conectiv Edgemor Power Plant collected surface water and detected the presence of PCBs by analysis of PCB congeners using USEPA's Draft Test Method 1668A. AMTRAK's outfall 002 and Conectiv's outfall 041 discharge to the Shellpot Creek.

Other PCB data for sites within the Shellpot Creek Watershed were obtained through reviewing files from DNREC or other sources. The results are described below on a site by site basis (these locations are identified on **Figure 3-1**).

- Amtrak Wilmington Facility PCBs have been detected in soil, surface water, sediment, groundwater, sewer sediment and sewer water at the site (refer to Section 2.0).

- Conectiv Salvage Yard Relocation Area I - The Salvage Yard Relocation Area I Site is currently owned by Conectiv. The site has been extensively filled. PCBs were detected in one soil sample as reported in "Toxicological Evaluation for the Proposed Salvage Yard Relocation Area I Site, Wilmington, Delaware", prepared by Delaware Department of Natural Resources and Environmental Control, November, 2000.

- DuPont Cherry Island (Hay Road facility) DuPont Edge Moor owns a parcel of land located along the banks of the Shellpot Creek in Edgemor, Delaware. This property is approximately

1 mile south of the main DuPont Edge Moor facility off of Hay Road. This parcel contains a former landfill and an area formerly used to stage Iron-Rich Material (IRM). The closed landfill received stabilized residual solids from the production of titanium dioxide from the DuPont Edge Moor Plant along with other solid waste from 1958 until approximately 1993. In 1993, landfill closure was initiated under DNREC permit SW-93/01. Closure was completed for the landfill portion of the parcel in 1996.

- Approximately 500,000 tons of IRM has been staged at the IRM staging area at Hay Road. The IRM staging area is managed under the DNREC VCP Program. As part of the DNREC VCP Program, 5 IRM samples were analyzed for select PCB congeners and PCB homologs. As reported in "Cherry Island Staging Area, Potential Historic Release Assessment", prepared by DuPont Engineering Technology, et. al., revised September 2002, PCBs were detected in samples analyzed.

- As part of the post-closure monitoring for Cherry Island Landfill (Hay Road Landfill), DuPont has collected sediment and storm water samples on a semi-annual basis from 1997 to the present. Sediment samples are collected from the adjacent Shellpot Creek at two locations (upstream and downstream of the site). Storm water samples are collected at four locations (Outfall 002 – north of Cell 2 on Shellpot Creek, Outfall 004 - Hay Road outfall on Shellpot Creek, D-002 - runoff from the IRM stockpile and D-001 (not usually collected due to insufficient water volume)). PCBs have been detected in both the sediment and storm water samples.

- Purina Tower Area A - Purina Tower Area A site is currently owned by A. R. Anthony & Son Inc. The Ralston Purina Co. manufactured domestic animal food at this location from approximately the early to mid 1940's through the early 1970's. Currently, the site is used as a bus storage and maintenance facility for the Brandywine School District. The Purina Tower Site (Area A and Area B) consists of four property parcels totaling approximately 6.2 acres - Area A Site consists of three parcels totaling 2.7 acres located within the City of Wilmington corporate limits. PCBs were detected in three of the four soil samples collected at this site, as reported in "Toxicological Evaluation for the Purina Area "A" Site, Wilmington, Delaware", prepared by Delaware Department of Natural Resources and Environmental Control, September, 2002.

- Purina Tower Area B - Purina Tower Area B Site is currently owned by A. R. Anthony & Son Inc. The Ralston Purina Co. also operated this site. Currently the site is used as a bus storage and maintenance facility for the Brandywine School District. PCBs were detected in two of the three soil samples collected at the Area B Site, as reported in "Purina Tower Area B, Brownfield Preliminary Assessment II, Wilmington, Delaware", prepared by Delaware Department of Natural Resources and Environmental Control, July, 2002.

- Pollution loading from the City of Wilmington Combined Sewer Outfall Outfalls (CSO) at CSO #31 (refer to **Figure 3-1**) was also identified as a potential source.

During May 2008, 900 to 1,000 gallons of oil in 1940s-era transformers was spilled by vandals (believed to be dismantling the transformers for their copper wire) at the Merchants Square Shopping Center (refer to **Figure 3-1**) according to an article in the Wilmington News Journal. Oils in 1940s-era transformers likely contained PCBs. The spill location is within the Shellpot Creek watershed. Sampling results related to this spill are currently not available.

4.0 CONCEPTUAL SITE MODEL

This conceptual site model is presented to characterize source conditions and to describe potential migration pathways related to the Maintenance Facility. This conceptual site model has been developed primarily from historical investigations and PMP related activities. The conceptual site model will be used to focus remedial investigations.

The following conditions and information summarize the occurrence and transport of constituents of interest throughout the Maintenance Facility.

1. The Maintenance Facility is located north of the Former Fueling Facility and south of Shellpot Creek.

2. The Maintenance Facility is bordered to the west by active AMTRAK mainline track and the east by a drainage ditch which separates the AMTRAK Yard from the Norfolk Southern Yard.

3. The study area encompasses approximately 53 acres; of which approximately 30 acres is paved or under building or roof.

4. The Maintenance Facility is an active rail yard used primarily for the maintenance of locomotives and railroad equipment. The main maintenance activities are performed in Car Shop 1, Car Shop 2, the Locomotive Shop, Electric Shop and the Wheel Shop.

5. According to AMTRAK, there is no current use of PCBs at the site. Stationary transformers containing PCB dielectric fluids were removed by AMTRAK by 1983. The facility now services locomotives currently serviced at the facility are equipped with silicon dielectric fluid filled transformers and diesel locomotives.

6. Subsurface materials reported during previous investigations include medium grained sands with gravel overlain by 15 to 20 feet of clayey silt or silty clay, above which is a thin layer of peat in some locations and fill.

7. Based on previous investigations, the direction of groundwater flow in the water table aquifer is believed to be in a southeasterly direction from the AMTRAK mainline tracks towards the drainage ditch north of the Eastern Drainage Ditch adjacent to the Norfolk Southern rail yard. Components of flow are also indicated towards Shellpot Creek and the Eastern Drainage Ditch in the northern and southern portions of the facility, respectively. An upward vertical gradient through the silty clay layer was reported. The depth to the water table was approximately 2.5 to 5.0 feet in the Locomotive/Wheel Shop during 2007. Groundwater is not used as potable water source in the site vicinity.

8. PCBs have been detected in soils, surface water, and sediments within the sewer and drainage ditches. PCB concentrations in groundwater have reportedly ranged from below detection limits to 0.0109 mg/l based on groundwater samples collected during 1980.

Potential sources of PCB loading from the site include storm water runoff from unpaved areas and infiltration into facility sewers.

9. Light nonaqueous phase liquids (LNAPL) was detected in four of the 10 wells installed (during 2007) in the Locomotive/Wheel Shop vicinity at apparent LNAPL thicknesses up to 1.56 feet. Two LNAPL samples were analyzed for PCBs, and reported total PCB aroclor concentrations of 42 mg/kg and 30.6 mg/kg. LNAPL is manually bailed on a monthly basis.

10. The ground surface is nearly flat. Nearly all storm water is conveyed through the facility storm water system.

11. The northern portion of the facility is bounded on the north by Shellpot Creek and bounded on the eastern portion of the facility by the drainage ditch north of the Eastern Drainage Ditch (the "NED"). Overland flow may occur immediately adjacent to the drainage features, although the majority of storm water enters the facility storm water sewer system.

12. Surface water discharges from the Maintenance Facility are regulated by an NPDES Permit issued by DNREC that establishes two monitoring points in the Maintenance Facility: (a) Outfall 002 is located in the northern portion of the Maintenance Facility and flows to Shellpot Creek and (b) Outfall 007 discharges to the Eastern Drainage Ditch upstream of two site sediment control dams.

13. A summary of NPDES monitoring data for Outfall 002 and 007 is presented in **Appendix B**. Total PCB concentrations (both aroclor and congener analyses have been performed) ranging from below detection limits (generally 0.5 ug/l for aroclor analyses) to 5.2 ug/l at Outfall 002; and from below detection limit to 1.0 ug/l at Outfall 007.

14. AMTRAK made a good faith commitment to reducing discharges of PCBs to Delaware Estuary through the DRBC PMP process. Storm water runoff from site soils are a potential source of PCBs to the storm sewers and adjacent drainage features. Planned PMP related activities include additional soil sampling in order to target, develop, and implement measures to control runoff from unpaved areas to the facility storm sewers.

5.0 REMEDIAL INVESTIGATIVE ACTIVITIES

This section describes the proposed scope of the remedial investigation activities proposed for the Maintenance Facility. The proposed scope of the investigation was developed based on facility operational history and previous investigations including sampling performed as part of the PMP program. It also considers DNREC's comments presented in their July 19, 2007 letter to DNREC. A summary of all laboratory methodology is presented in the Sampling and Analysis Plan in Section 8.0. **Table 8-1** summarizes all laboratory analyses for on-site samples and QA/QC requirements. The remedial investigations will be performed in accordance with HSCA protocols.

5.1 Investigative Approach

Remedial investigation activities will be focused on providing a data base sufficient for the development of a site remedy that is consistent with the Pollutant Minimization Plan for PCBs (PMP) approach adopted by the Delaware River Basin Commission (DRBC) to reduce future PCB discharges to the Delaware Estuary. As described in Section 2.0, the primary constituent of concern identified through previous investigations is PCBs. However, as requested by DNREC in their July 19, 2007 letter, the investigations will include the analyses of other parameters and the remedy selected will be consistent with the findings of the remedial investigation.

As will be discussed, remedial investigations will include the characterization of soils, groundwater, surface water, and sediments, as well as the occurrence of LNAPL in the Locomotive/Wheel Shop area. Since uncovered soil and fill are a potential source of PCBs (through storm water runoff), the frequency of soil sample collection will be greatest in those areas in order to evaluate potentially erodible soils. However, soil samples will also be collected in paved areas as requested by DNREC. Surface and subsurface samples will be collected. Soil samples will also be collected in select areas where past soil excavations were proposed (and soil removal documentation is not available) and which historically reported elevated PCB concentrations in soils. Surface soil samples collected as part of PMP related activities will also be considered in the Maintenance Facility RI/FFS.

Monitoring wells will be installed to evaluate groundwater chemistry along the upgradient portion of the property, within the area of current facility active operations, and along the downgradient portion of the property. As described in Section 2.3, based on previous site investigations, the direction of groundwater flow is believed to be from the mainline tracks in a general southeasterly direction across the site in the direction of the drainage ditch north of the Eastern Drainage Ditch, with components of flow towards Shellpot Creek and the Eastern Drainage Ditch in the northern and southern portions of the study area, respectively. Monitoring well installations will also be performed to evaluate the continuity of the silt clay/clayey silt layer across the site (refer to Section 2.3). As described in Section 2.6, further investigations are planned for the delineation of LNAPL in the vicinity of the Locomotive and Wheel Shops as part of the PMP. Data collected during the PMP investigations will be included in the remedial investigations.

Sediment samples will be collected in Maintenance Facility Drainage features. These drainage features include the drainage swale between Outfall 002 and Shellpot Creek, and the drainage ditch north of the Eastern Drainage Ditch. Sediment sample collection in the drainage ditch north of the

Eastern Drainage Ditch will be performed in the portion of the ditch that flows to Shellpot Creek. Sediment sample collection in portion of this ditch that flows to the Eastern Drainage Ditch was sampled during the Phase II remedial investigations for the Former Fueling Facility. Property access authorization will need to be obtained from Norfolk Southern for work in the drainage ditch north of the Eastern Drainage Ditch.

As described in Section 2.6, wet weather surface samples are collected from Outfalls 002 and 007 as part of the PMP. The results of these samples will be considered in the remedial investigation. In addition, surface water samples will be collected in portion of the drainage ditch north of the Eastern Drainage Ditch that flows to Shellpot Creek. These sampling locations account for nearly all storm water runoff from the Maintenance Facility. The potential for the runoff of PCBs via overland flow in areas immediately adjacent to the surface water drainage features will be assessed based on the results of the surface soil characterization. It is noted that surface water samples from the drainage ditch north of the Eastern Drainage Ditch will include contributions from the adjacent Norfolk Southern rail yard. Surface water samples will also be collected from water back flushing from Shellpot Creek into the Outfall 002 drainage ditch and the drainage ditch north of the Eastern Drainage Ditch.

Site reconnaissance will be performed to identify sewer drains within buildings that may represent potential sources. Identified drains will be mapped. Depending on accessibility for sample collection, either sewer water or sediment samples will be collected.

5.2 Site Survey

An aerial survey will be performed in order to provide a current aerial photograph and survey base map of the facility. The aerial photograph will be geo-referenced to Delaware state plane coordinate system (NAD 83). The site base map will be prepared to show current site features and will include topographic contours (one foot contour intervals). Site base maps used in the preparation of this Work Plan were obtained from Amtrak and may not be reflective of all current features.

5.3 Soil Investigations

As mentioned above, the focus of the soil sampling will be to characterize potentially erodible soil which may be a source of PCBs in storm water runoff from the site. Soil samples will also be collected from paved areas, from select areas where past soil excavations were proposed (and soil removal documentation is not available and from track areas). Soil sample collection is described below.

5.3.1 Surface Soils

Surface soil samples will be collected across the Maintenance Facility in order to evaluate potentially erodible soils. These samples will be collected from unpaved areas in order to characterize soils which may be washed into the site drainage ditches during precipitation events.

5.3.1.1 Unpaved Areas

Surface soil samples will be collected from unpaved areas at depth of 0 to 6 inches. All surface soil samples will be collected with a stainless steel hand auger or a stainless steel trowel. The approximate soil sample locations are presented on **Figure 5-1.** As indicated in **Figure 5-1**, surface soils will be collected from unpaved areas along the western and eastern perimeters of the facility and in smaller unpaved areas within the facility. Surface soils will also be collected on an approximately 100 feet by 100 foot grid system in the large unpaved areas in the northern and southern portions of the study area. Based on the extent of unpaved areas presented on **Figure 5-1**, it is estimated that approximately 163 surface soil samples will be collected (the actual number of samples to be collected may vary slightly based on the proposed site survey and current extent of paved areas). The proposed surface soils samples are summarized as follows:

- Western perimeter unpaved area (23 samples; at a 100 foot spacing)
- Eastern perimeter unpaved area (10 samples; at a 100 foot spacing)
- Local facility interior unpaved areas (17 samples),
- Northern perimeter unpaved area (approximately 40 samples; based on the estimated extent of the unpaved area and a 100 foot by 100 foot grid system), and
- Southern perimeter unpaved area (approximately 27 samples; based on the estimated extent of the unpaved area and a 100 foot by 100 foot grid system).

The proposed locations may be adjusted in the field based on site conditions and based on the proposed site survey (sample locations will reflect the extent of unpaved areas as determined by the proposed site survey). It is anticipated that the surface soil sampling in the eastern and western unpaved perimeter areas will be included in the PMP soil sampling activities.

All soil samples will be analyzed for PCB aroclors (USEPA Method 8082). Approximately 5% of the samples will also be analyzed for:

- Volatile organic compounds (VOCs) by EPA Method 8260B
- Semi-volatile organic compounds (SVOCs) by EPA Method 8270C
- Target analyte list (TAL) metals
- Petroleum hydrocarbons using Massachusetts EPH/VPH methodology, and
- PCB congeners using EPA Draft Test Method 1668A.

5.3.1.2 Rail Track Samples

Surface soil samples will also be collected within track areas to evaluate potential run-off of PCBs from track areas. Approximately one sample will be collected for each 200 linear feet of track. The samples will be collected between the rails from the track bedding material. This material consists of ballast as well as finer-grained particles within the ballast. Samples consisting of track ballast will be pulverized by the analyzing laboratory prior to analysis.

Assuming an estimated 20,000 linear feet of rail track, it is estimated that approximately 100 samples (one per 200 linear feet of track) will be collected within rail tracks. These samples will be analyzed for PCB aroclors (EPA Method 8082).

5.3.2 Soil Borings

Thirty-three (33) soil borings will be advanced in order to evaluate subsurface soil conditions. Soil borings will be advanced to the water table surface across paved and unpaved areas. Proposed soil boring locations are presented on **Figure 5-2** and are summarized as follows:

- SB-1 through SB-14 (at proposed monitoring well locations; refer to Section 5.4),
- SB-15 and SB-25 (areas previously reporting evaluated PCB concentrations; to confirm soil removal activities were previously performed), and
- SB-26 through SB-33 (other general areas of current or historic industrial operations).

Soil borings will be advanced using either direct push methods (Geoprobe) or spilt spoons driven by a hollow-stem auger drill rig. The hollow-stem auger drill rig will be used in areas where it is anticipated that Geoprobe refusal may be encountered before the depth of the water table (areas that may be underlain by coarse fill or ballast) and at proposed monitoring well locations. All soil borings will be backfilled with a cement/bentonite mixture to the ground surface.

Continuous soil samples will be inspected by the supervising geologist for lithology, field screened with a photoionization detector (PID) and visually inspected for the presence soil impact. At each soil boring location, a soil sample will be collected at each 2 foot depth interval of the analyses of PCB aroclors USEPA Method 8082. Approximately 5% of the samples collected from soil borings will also be analyzed for:

- volatile organic compounds (USEPA method 8260B),
- semivolatile organic compounds (USEPA method 8260C),
- TAL metals,
- petroleum hydrocarbons using Massachusetts EPH/VPH methodology,
- PCB congeners (EPA Draft Test Method 1668A).

5.4 Groundwater and LNAPL Investigations

Remedial investigations will be performed in order to characterize site groundwater and the occurrence of LNAPL in the Locomotive and Wheel Shops vicinity. Groundwater investigations include monitoring well installation, depth to liquids measurements, groundwater sampling and slug testing. LNAPL investigations included baildown tests and LNAPL sampling. These activities are described below.

5.4.1 Monitoring Well Installation

Fourteen (14) monitoring wells will be installed in order to evaluate ground water chemistry and the hydraulic gradient across the site. As will be discussed, two of the monitoring wells will be installed to

evaluate the recoverability of LNAPL in the Locomotive/Wheel Shop area (the extent of LNAPL in this area will be delineated by small diameter monitoring wells installed as part of PMP activities; refer to Section 2.6). Proposed monitoring well locations are depicted on **Figure 5-3**. The rationale for the selection of the proposed monitoring well locations is summarized below:

- MW-1, MW-2 and MW-3 are positioned along the upgradient (based on Woodward Clyde, 1981) property boundary,
- MW-4 through MW-9 are positioned in the area of the facility where the majority of the current and past facility operations are/were performed,
- MW-10, MW-11 and MW-12 are positioned along the downgradient (based on Woodward Clyde, 1981) boundary of the area of investigation, and
- MW-13 and MW-14 are positioned in the Locomotive/Wheel Shops area where LNAPL is anticipated. These wells will be located in the area of the greatest apparent LNAPL thickness (based on the data base at the time of well installation) in order to evaluate the recoverability of the LNAPL (refer to Section 2.6; the pre-existing wells in this area are small diameter).

At each monitoring well location, a soil boring will be extended to a depth of approximately 8 to 10 feet below the groundwater surface with a hollow-stem auger drill rig under the supervision of a SECOR geologist. If the gray silty clay/clayey silt unit is encountered, drilling will proceed no more than two feet into this unit. The borehole will be backfilled with a cement/bentonite mixture to the depth where the unit was first encountered and the well will be constructed above this unit. These procedures are proposed in order to prevent a potential drilling-induced vertical migration pathway.

The monitoring wells will be designed and constructed to permit the collection of liquid level and groundwater quality data. All monitoring wells will be constructed using 4-inch diameter PVC well casing and 4-inch diameter 0.01 slot PVC well screen. Because of the shallow depth to liquids and the importance of detecting potential LNAPL occurrence at the site, specific well completion specifications may vary between locations. The length of well screen placed will depend on the depth to liquids but it is intended that wells will be constructed with approximately 5 feet of well screen above the prevailing water table with at least 2 feet of bentonite seal above the sand pack to prevent surface infiltration through the annulus. This may be modified if extremely shallow groundwater is encountered so that potential LNAPL detection is not prevented. The borehole will be packed approximately one foot above the PVC screen with an appropriately sized sand pack.

Depending on well locations, the wells may be completed with stick-up casings or in manholes. The stick-up casings will be completed with steel protective outer casings with and expandable locking plug on the PVC inner casing and a locking steel outer casing. Wells to be completed in a water-tight manhole will have an expandable locking plug which will be installed on the top of the PVC.

Subsequent to installation, each monitoring well will be developed by surging and pumping to remove any sediments that may have settled within the wells during installation and to remove any fine sediments surrounding the wells to ensure proper communication with the aquifer.
All non-disposable drilling and sampling equipment will be decontaminated between wells to prevent equipment induced cross contamination. The drill cuttings will be examined by the supervising geologist and recorded on lithologic logs along with well completion details and PID screening results.

5.4.2 Well Survey and Liquid Level Measurements

The locations of the proposed monitoring wells will be surveyed by a Delaware licensed professional surveyor for vertical and horizontal control relative to NAVD 88 datum and state plan coordinates, respectively. The top of casings of the proposed wells will be surveyed to the nearest 0.01 feet to develop elevational control for static head measurements. The small diameter wells in the Locomotive/Wheel Shops areas will be included in this survey.

Depth to groundwater and LNAPL (if manifested) measurements will be recorded from site wells relative to the elevation of the top of the monitoring well casings to the nearest 0.01 feet. Two rounds of measurements will be collected from existing and proposed wells. These measurements and the well survey data will be used to generate a groundwater contour map for the site as well as to evaluate LNAPL occurrence.

5.4.3 Groundwater Sampling and Analyses

Groundwater samples will be collected from all proposed wells free of measurable LNAPL accumulations during two sampling events performed at least one month apart. Prior to collecting groundwater samples, the wells will be purged of at least three well volumes or bailed dry to ensure the collection of representative groundwater samples. Well purging and sampling equipment will be decontaminated between wells.

Groundwater samples will be collected and preserved appropriately and transported to the analyzing laboratory according to standard quality assurance procedures. A chain of custody form will be completed and conveyed with the samples throughout the shipping and analytical process. Quality assurance/quality control (QA/QC) samples will also be submitted for laboratory analyses in accordance with the requirements summarized in Section 8.3.

Following well purging, field measurement of specific conductance, oxidation/reduction potential (ORP), pH and dissolved oxygen will be recorded. Groundwater samples will be analyzed for the following parameters:

- volatile organic compounds (USEPA method 8260B),
- semivolatile organic compounds (USEPA method 8270C),
- TAL metals; on filtered samples; samples for metals analyses will be field filtered, and
- PCB aroclors using Method 8082 (on filtered and unfiltered samples; samples for PCB analyses will be filtered by the laboratory).

5.4.4 Aquifer Characterization

Slug tests will be conducted in order to evaluate the hydraulic conductivity of aquifer materials. Rising head slug tests will be performed utilizing proposed monitoring wells which are free of LNAPL. Prior to initiating each test, static water level measurements will be recorded. A "slug" (constructed of 2-inch diameter PVC and filled with sand) will then be inserted below the water table in each well to

be tested. Once the water level returns to static conditions, the slug will instantaneously be removed. Depth-to-water measurements will then be recorded at set time intervals as the water level recovers. Slug test data will be analyzed using the Bouwer and Rice (1976) method for determining the hydraulic conductivity of unconfined water-bearing zones.

5.4.5 Product Baildown Tests and Laboratory Analyses

Product baildown tests will be performed on proposed monitoring wells MW-13 and MW-14 or any other proposed monitoring well exhibiting significant apparent LNAPL accumulations (approximately 0.5 feet or greater) in order to evaluate the recoverability of the product and to provide a rough estimate of the volume of product in the formation. These tests will be performed by first removing the LNAPL only to the extent possible by bailing. Depth to liquids measurements will then be recorded as the liquid levels return to equilibrium. These measurements will then be plotted versus time in order to evaluate LNAPL recoverability and provide a rough estimate of volume of product in the subsurface.

Product samples from two wells will be collected for laboratory analyses for remediation considerations and PCB content. These samples will be analyzed for specific gravity, viscosity and gas chromatography fingerprint. The samples will also be analyzed for PCB aroclors in product.

5.5 Sediment Investigations

Sediment samples will be collected in Maintenance Facility drainage features. These drainage features include the drainage swale between Outfall 002 and Shellpot Creek, and the drainage ditch north of the Eastern Drainage Ditch. This data will be used to assess potential impact to site sediments from storm water runoff and remedial alternatives for the site ditches. Sediment sampling locations are depicted on **Figure 5-4**.

Sediment samples will be collected at approximately 15 locations in the drainage ditch north of the Eastern Drainage Ditch in the portion of the ditch that flows to Shellpot Creek. Sediment samples will be collected in the center of the ditch at locations spaced approximately 100 feet apart extending from the drainage divide (between the Eastern Drainage Ditch and Shellpot Creek) and the confluence with Shellpot Creek.

Sediment samples will also be collected from the drainage swale between Outfall 002 and Shellpot Creek. Sediment samples will be collected at five locations (at the top of each bank, near the bottom of each bank, and at center of the ditch) along two transects in this ditch.
The sediment sample collection procedures will be similar to those used in the Phase II remedial investigations in the Former Fueling Facility. At each sample location, samples will be collected for laboratory analyses to evaluate the vertical sediment profile. Representative samples will be retained for analyses from: (1) a depth 0 to 3 inches (designated the "A" interval on **Figure 5-4**); (2) a depth of 3 inches to the top of the underlying clay substrate; (designated the "B" on **Figure 5-4),** from the top the clay to one foot into the clay (designated the "C" interval on **Figure 5-4**). The "A" interval will be analyzed to represent the potentially bioavailable/erodible layer. The "B" interval sample will be analyzed to represent the bulk of sediment material at each location. Based on the thickness of the