# TSCA Risk-Based Disposal Application – August 2019

Site: Former McCandless Fuels Site
2231 Delsea Drive, Route 47
Franklinville, Gloucester County
New Jersey

Prepared for: Antea USA, Inc.
5910 Rice Creek Parkway, Suite 100
Shoreview, Minnesota 55126

Prepared by: Resource Control Consultants
10 Lippincott Lane, Unit 1
Mount Holly, New Jersey 08060

RCC
ENVIRONMENTAL PROFESSIONALS

**VOLUME I RISK-BASED DISPOSAL APPLICATION (RBDA)**

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# 1 INTRODUCTION

## 1.1 Project Overview

Resource Control Consultants (RCC), under contract to Antea USA, Inc. (Antea Group) has prepared this Toxic Substances Control Act (TSCA) Risk-Based Disposal Application (RBDA) for the Former McCandless Fuels (Site) located at 2231 Delsea Drive, in Franklin Township (Franklinville), Gloucester County, New Jersey. A site location map is included as **Figure 1.** The Site has been the subject of numerous investigations since the early 1990's which have fully delineated the extent of contamination in soil and groundwater media. The primary contaminants of concern (COCs) are Polychlorinated biphenyls (PCBs) entrained in petroleum hydrocarbons distributed in select surficial soil locations and across the water table interval.

Antea Group is under contract with Charles T. and Deborah M. Nevins (property owners) and the members of the McCandless Litigation Group[1] under an agreement entered into in 2008 to manage the remediation of the open environmental incident at the Site. Antea Group formerly known as Delta Environmental Consultants (Delta) was acquired by Oranjewoud in January 2008 and changed its name from Delta to Antea USA, Inc. on January 5, 2011 and operates under the name Antea Group.

In 2009, the extent of contamination at the Site was fully delineated and an innovative treatment approach was selected for the remediation of the primary contaminants of concern (COCs), specifically PCBs and Total Petroleum Hydrocarbons (TPHs). The cleanup goal for PCBs on-site was 1 mg/kg. Based on challenges presented by the distribution and magnitude of PCB contamination, an alternate destruction method was proposed under 761.60(e) of TSCA and a demonstration permit was granted by the US Environmental Protection Agency (EPA) in 2010 to destroy PCBs by ozone based In-Situ Chemical Oxidation (ISCO). A remediation system was fabricated, and an injection network was installed to inject ozone into a designated treatment area of the subsurface environment. The system operated successfully for a five-year period. At that point, it was determined that alternate methods would be required to achieve the Site regulatory closure within a timeframe acceptable to Antea Group and the McCandless Litigation Group. This application will articulate the remediation accomplished to date and propose new remedial actions to address residual impacted soil and groundwater at the Site and offsite areas and to mitigate any potential, future impacts to the public or the environment.

Proposed remedial actions for the on-site residual contamination will include the removal of contaminated soil above the TSCA Risk-Based Disposal Approval request to allow residual PCBs up to 500 mg/kg to remain below a protective clean soil buffer of at least two feet and cap that meets the design requirements under TCSA 760.61(a)7 and presumptive remedy for the New Jersey Department of Environmental Protection (NJDEP) Residential Direct Contact Soil Remediation Standards (RDCSRS). Evidence will be presented to confirm that the residual PCB concentrations will not exceed 500 mg/kg onsite and they remain immobile and do not adversely affect groundwater quality beyond the treatment area, which currently meets the New Jersey Department of Environmental Protection NJDEP Class II Groundwater Quality Standards. Future use of the Site will be restricted to non-residential redevelopment options. Engineering and institutional controls will be integral components of the final remedial action for on-site contamination.

The off-site property is currently zoned commercial; however, the proposed remedial actions for off-site residual contamination will allow residential usage, at least relative to the site-specific contaminants of

concern. Proposed remedial actions off-site will include the removal of contaminated soil to the New Jersey Department of Environmental Protection (NJDEP) Residential Direct Contact Soil Remediation Standards (RDCSRS) for PCBs at 0.2 mg/kg. Engineering and institutional controls off-site will not be required components of the final remedial action under these cleanup objectives.

This TSCA RBDA is organized in the following manner. **Volume I** include **Section 1 & Section 2** which provide a background description of the Site's historical operations and environmental setting. **Section 3** addresses the nature of contamination as revealed through a series of remedial investigations between 1991 and 2009. **Section 4** presents a Conceptual Site Model (CSM) based on the historical findings and a review and selection of a remedial action to address the CSM contamination. **Section 5** discusses the sampling procedures used to evaluate the performance of the initial remedial action (i.e. ozone based In-Situ Chemical Oxidation). **Section 6** reviews the extent of contamination in the designated treatment area (OU1) and off-site Operable Units (OU2 & OU3) prior to ISCO ozone-based treatment. **Section 7** reviews those conditions after ozone-based treatment. **Section 8** discusses the strategy and Remedial Action Workplan to accomplish the remedial goals, **Section 9** discusses a pathway analysis on the extent and magnitude of residual PCB contamination at the site and potential threats to the public health and the environment, **Section 10** includes the specifics of the TSCA risk-based disposal proposal, **Section 11, Section 12 & Section 13** discuss decontamination procedures, contingency plan and green cleanup initiatives in remedial activities, respectively. **Section 14** provides a schedule for remediation activities and **Section 15** describes the repository for all the data related to the site and where/how it may be accessed.

**Volume II** includes the analytical lab report backups to the data supporting the treatment and post-treatment conditions of the Site.

## 1.2 Background Information

The Site reportedly was operated as a fuel oil distribution facility since the 1940s. At various times, portions of the Site were also used for waste storage purposes. Fuel handling operations reportedly ceased at the Site in May 1989 and all aboveground storage tanks (ASTs) and most underground storage tanks (USTs) were removed by 1990. Demolition of onsite buildings and the removal of a remaining heating oil UST was completed in 2009. The potential for seepage, spillage and other discharges of petroleum products, chlorinated solvents, and PCB containing materials was high given the materials handled by the various tenants, the number of storage vessels and the related appurtenances.

## 1.3 Former Site Configuration

Based on historical aerial photographs, it appears that only half of the Site was developed. Known as the Operations Area, this eastern portion of the property housed four cinderblocks on grade slab buildings, an AST tank farm comprised of 12 ASTs, multiple elevated horizontal tanks and several USTs. A pump house and distribution rack for dispensing fuel to delivery trucks was centrally located among the tanks and buildings. The buildings housed administrative offices or maintenance/garage space. The western half of the property (Western Area) has appeared to be undeveloped since the 1930s. Refer to **Figure 2** for a perspective of the Site's historical configuration.

## 1.4 Site Operational Chronology

Following, is a brief chronology of the Site history:

| | |
|---|---|
| **1947-1973** | Community Oil Service is operational. |
| **1970-1972** | Rollins-Purle stores PCBs, chlorinated solvents, VOCs and No. 2 fuel oil in vertical ASTs at the Site. |
| **1974** | Progressive Fuel Oil Company takes title of the Site. |
| **1976-1978** | East Coast Pollution Control operates the Site as a hazardous waste and non-hazardous waste industrial handling facility for chlorinated compounds and tank bottoms. |
| **1978-1985** | Progressive Fuel Oil stored and transferred gasoline, No. 2 fuel oil, motor oil, kerosene, and hydraulic fluids at the Site. |
| **1985** | McCandless purchases the property and operates as a petroleum distribution facility. |
| **1989** | The operational area of the Site is closed. |
| **1990** | All AST and USTs are removed (except a 4,000-gallon UST for the heating system of the Administration Building). |
| **1990-2006** | Little or no operational activity occurs at the Site except for use of the office building in the eastern most portion of the property for administrative (non-industrial) purposes. |
| **2009** | Demolition of onsite buildings and removal of the remaining heating UST. |

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Footnote 1

Chicago Insurance Company
East Coast Pollution Control, Inc.
E.I. du Pont de Nemours and Company
General Electric Company
Lillian A. Grochowski
Estate of Joseph J. Grochowski
Progressive Fuel Oil Co.
Safety Clean Corporation, former subsidiary Safety Kleen Bridgeport, Inc. (formerly known as Rollins Environmental Services NJ, Inc.
Community Oil Service
Community Services Inc.
Community Inc.
J & L Laundries, Inc.
Community, Appliances, Inc.
McCandless Fuels, Inc.

# 2 SITE CHARACTERIZATION

The subject property (Site) address is 2231 Delsea Drive, Franklinville, New Jersey and the tax reference is Block 3507, Lot 2 (**Figure 3**). The Site consists of 4.416 acres of land. As mentioned above, the Site supported four buildings (approximately 20,000 SF of improvements) and associated parking areas and roadways in the central and eastern portions of the property.

The off-site impacted property is 2205 Delsea Drive, Franklinville, New Jersey and the tax reference is Block 3507, Lot 1 (**Figure 3**). The off-site property consists of 9.04 acres of land. The property supports one large, multi-tenant, retail commercial building, known as Community Commons. The Commons has associated parking areas to the east, along Delsea Drive frontage, and to the north separating the building from the McCandless site. The western portion of this property is landscaped (lawn) or undeveloped.

## 2.1 Site Description and Environmental Setting

The buildings on the McCandless site were razed in 2009 and the property is currently vacant. The McCandless site is bounded immediately to the north, north-east by a former electric substation and a residential property. To the east, directly across Delsea Drive is a used car dealership and a residential neighborhood. To the immediate south is the commercial retail building (Community Commons) and to the west is an active rail line. Beyond the rail line are two surface water bodies (Little Ease Run and a man-made lake) and commercial and residential properties (**Figure 4**).

## 2.2 Topography and Soils

Surface elevations of the McCandless site are relatively flat with a gentle slope to the west and southwest toward Little Ease Run and the man-made lake west and southwest of the Site, respectively. The Site, and these water features are separated by the active rail line, which interrupts the natural slope of the area. Little Ease Run is located approximately 200 feet west of the Site and flows generally to the south to Willow Grove Lake, which eventually discharges into the Maurice River. The man-made lake is approximately 200 feet southwest of the Site and was created following sand mining operations associated with a brick manufacturing operation formerly located on the southern side of this lake. Following completion of mining operations, the quarry reportedly filled with groundwater.

The characterization of the Community Commons topography and soils is identical.

## 2.3 Geology and Hydrogeology

According to the United States Department of Agriculture's Web Soil Survey website, the Site and the off-site properties are underlain by soils classified as Evesboro-Urban land complex, Fallsington loams and Manahawkin muck. The subsurface material consisted primarily of sand with varying amounts of silt and gravel along with occasional boulders, identified during drilling as a part of remedial investigation activities. These materials were encountered from the ground surface to approximately 45 to 50 feet below grade surface (bgs). Confining layers were not encountered on the McCandless site; although some silty-clay was observed at approximately 47' to 52' bgs during the installation of one of the offsite monitoring wells (MW-7D) and in all four of the onsite vertical delineation soil borings in the south-central portion of the property at approximately 15' to 25' bgs. Bedrock was not encountered during drilling activities to a depth of approximately 50' bgs.

The properties overlie the Cohansey Aquifer outcrop (the Cohansey is 250 feet thick), a major drinking water supply source. Groundwater flow is west-southwest, with a hydraulic gradient of 0.005. The average hydraulic conductivity is estimated to be 16 feet per day, based on historical slug test data compiled in 2001. Groundwater has varied between 5'-10' below grade surface (bgs), according to historical investigations. During the time period of ISCO treatment, since 2010, the water table

consistently fluctuated around seven feet below grade surface (7' bgs) and has a very slight gradient to the southwest.

# 3 NATURE OF CONTAMINANTS

Several site and remedial investigations were conducted at the McCandless site between 1991 and 2009 by at least eight different environmental consulting firms (see **Section 15**). The investigations evaluated the extent and magnitude of contamination across the site and adjoining properties. In summary, the contaminants historically found in soil and groundwater were divided into two categories:

- Primary Contaminants of Concern (COCs)
    - PCBs
    - TCE
    - Oil/TPH
- Secondary Contaminants of Concern
    - Polycyclic Aromatic Hydrocarbons (PAHs mostly as components of oils or waste oil)

Metals were also encountered but considered of low concern. Of the sixty-three soil samples collected during an initial phase of Site investigation, all were below action criteria for metals.

## 3.1 Historic Investigation Findings

### 3.1.1 *Soil Investigations*

In January 30, 1998, Environmental Strategies & Applications, Inc. (ESA) prepared a Remedial Investigation Report summarizing their investigations of the Site. The investigation identified PCB as the primary contaminants of concern, while volatile organics and petroleum hydrocarbons were present to a lesser degree.

In May 1991, soil sampling and analysis were conducted by Rhodes Engineering (Rhodes). The purpose of the Rhodes investigation was to determine if contamination was present at select Areas of Concern (AOCs), specifically the Spent Oil-Filter Area, the Loading Rack Area, the (former) Underground Storage Tank Area, and the Fuel Storage Area. In March 1992, additional investigations of the extent of surficial soil contamination was conducted by Rhodes. Later that year (October 1992), Trillium, Inc. (Trillium) also conducted investigations into the types and sources of contamination at the Site.

From October 1993 through December 1993, a preliminary groundwater investigation along with test pit excavations were conducted by ESA, in conjunction with Trillium, to identify the presence and sources of soil contamination at the site; identify the presence of groundwater contamination; determine the groundwater flow direction; and, determine if contamination from the site had migrated off-site.

In November 1994, ESA performed a round of groundwater sampling of a recently installed monitoring well (MW-1) and piezometers P1, P2, P3 and P5. In March 1995, ESA performed soil sampling in the area adjacent to the former electric substation to delineate observed levels of PCBs previously detected at this location by Rhodes. In June 1995, ESA performed soil sampling in the rear undeveloped portion of the site to investigate potential disposal areas identified in a review of aerial photographs.

A 4,000-gallon fuel oil UST was removed from the site on March 7, 1996. The tank reportedly exhibited no corrosion or holes. A sample of product from the tank was submitted for fingerprint analysis to Friedman & Bruya Inc. in Seattle, Washington, and identified the material as diesel/heating oil.

In June 1997 additional investigation of the site was conducted by ESA, in conjunction with Trillium, to evaluate additional areas of concern identified through a review of aerial photographs.

In August and September 2000, groundwater sampling was conducted by RT Environmental Services, Inc. (RT Environmental) in seven monitoring wells ((MW-1, MW-3, MW-6, and MW-11 through MW-14) and analyzed for PCBs and Volatile Organic Compounds and Tentatively Identified Compounds (VOCs + TICs).

April 2001, RT Environmental sampled six monitoring wells and performed a limited soil investigation of the marshy area located to the west of the Site to evaluate whether it constituted a sensitive receptor. Two soil samples (SS-1 and SS-2) were collected from seeps along the west side of the railroad bed and analyzed for PCBs and VOC+TICs.

In May 2003, Synergy Inc. (Synergy) performed site characterization activities including the installation of seven new monitoring wells (MW-1A and MW-15 through MW-20); installation of 11 piezometers (PZ-1 through PZ-11); excavation of four test pits (TP-1 through TP-4) in areas identified by a 1998 ground penetrating radar survey as possible fill areas; collected soil samples from soil borings, monitoring well borings, piezometer borings and test pits for laboratory analysis of VOCs + TICs, Diesel Range Organics (DROs) and PCBs, collected soil samples for laboratory analysis of geotechnical parameters (grain size, permeability, etc.), collected groundwater samples from 22 wells for VOC+TICS, Base/Neutrals/Acids (BNAs+TICs) and PCBs and performed slug tests in nine wells.

In August 2003, Synergy performed additional investigation activities that included the collection of surface soil samples from the area near the former recreational area for the former Faith Fellowship Center (Administrative Building along Delsea Drive frontage) for laboratory analysis of PCBs. Collection of groundwater samples from the McCandless supply well (located at the former Office Building), the former Faith Fellowship supply well and the Community Commons supply well for analysis of VOCs+TICs. Refer to **Section 3.1.3** for additional discussion on historical investigations of potable wells.

Based on the environmental investigations at the Site that commenced in 1991 and continued through 2004, it appeared that free-phase product was detected in certain wells when the water table was around 10’ bgs and a smear zone layer of impacted soils existed at this interval. It was suspected that in the past the water table was lower for a sustained period of time and a product layer/smear zone developed between 5 to 10’ bgs, corresponding to historic water table elevation fluctuations.

In preparation for a supplemental soil investigation in 2006 to close data gaps in the site characterization, Delta compiled the existing data from all previous investigations into a common database for evaluation. The database indicated that the PCBs detected around the Site were directly associated with areas containing oil residuals. Delta deployed a TRIAD based investigation approach using a downhole Fuel Fluorescence Detector (FFD) to further delineate oil impacts in the vadose and saturated zones. The Triad investigation confirmed that the extent of PCB impacts below five feet was essentially the extent of the hydrocarbon impact zone at the water table under the Operations Area.

In February 2008, Delta conducted remedial investigation activities to finalize the vertical and horizontal extents of the impacted soils at the site, which had been established in the historical remedial investigations and the 2006 TRIAD findings. In May 2009, Delta completed the remedial investigation work.

The culmination of all these investigations into the distribution of the primary COC in soil at the Site (i.e. PCBs) is summarized in a series of isopleth maps which were included in the 2009 Remedial Action Workplan submitted to and approved by the New Jersey Department of Environmental Protection (NJDEP). These maps are reproduced here as **Figures 5A-D**.

### 3.1.2 *Groundwater Investigations*

Between **1991 and 2009,** multiple investigations into the contamination of groundwater were conducted by the different consulting firms that worked on the Site. Some of the early groundwater investigations indicated that free-phase product (free phase is intended to refer to a separate fluid present on the water table surface as a light non-aqueous phase liquid or LNAPL) had been detected in certain wells when the water table was around ten feet below ground surface and a smear zone layer of impacted soils existed at this interval. [There has been no evidence of free phase product in any of the monitoring wells since 2009.] Antea Group suspected that in the past the water table was lower for a sustained period of time and product layer/smear zone developed between 5 to 10' bgs, corresponding to historic water table elevation fluctuations.

A review of the historical groundwater investigation findings confirms the general flow direction to the west anticipated by the topography and proximity to Little Ease Run, a gaining stream to the west of the railroad tracks. The historical data for groundwater is presented within various Site and Remedial Investigations that were submitted previously to the NJDEP and appended to the 2009 Remedial Action Workplan (RAW - **Section 15**). The reports depicted a chlorinated organic plume extending from the Operations Area to the southwest and onto the adjoining Community Commons property (**Figure 6**). There are potential sources for chlorinated solvents that exist upgradient along Delsea Drive and upgradient in Little Ease Run, as evidenced in groundwater data for the west of the railroad which was collected from temporary well points in 2008 (**Appendix A**).

In July 2009, Antea Group collected groundwater samples from 16 monitoring wells (MW-2 to MW-4, MW-6, MW-6D, MW-7B, MW-7D, MW-8, MW-8D, MW-10, MW-12, MW-13, MW-16, MW-21, MW-22, MW-24) in accordance with N.J.A.C. 7: 26E and NJDEP Field Sampling Procedure Manual, dated August 2005. The location of the monitoring wells is illustrated on **Figure 7.**

The groundwater samples were analyzed for organics (VOCs, SVOCs, PCBs), but only PCB results are discussed herein. [**Volume II** contains results for all compounds analyzed.] PCBs were not detected above NJDEP Ground Water Quality Standards (GWQS) for Class II waters. The summarized laboratory results are presented in **Table 1.** Groundwater elevation contours from this event are presented in **Figure 8A and 8B**. The analytical results for PCBs in groundwater prior to the implementation of the In-Situ Chemical Oxidation (ISCO) remedial action is plotted on **Figure 8C.** In 2009, there was no evidence of dissolved PCBs in groundwater represented by the permanent monitoring well network.

In order to examine the potential impacts of the site to ecological receptors, the Delta/Antea Group investigated the groundwater on the eastern side of Little Ease Run. Eight temporary shallow monitoring wells were installed at Little Ease Run to reflect upstream, midstream and downstream groundwater conditions between the site and both the stream and man-made lake. The potential groundwater transport was investigated and documented in the June 2008 Remedial Investigation Report (**Appendix A**). There were no detections of PCBs in the groundwater samples from these temporary wells.

### 3.1.3 *Potable Well Investigations*

On August 1, 2003, Synergy performed investigation activities that included the collection of aqueous samples from the on-site McCandless supply wells (located at the former Office Building) and the former Faith Fellowship supply well and the off-site Community Commons supply well. The samples were analyzed for VOCs. The samples from Faith Fellowship and Community Commons exhibited no VOCs above standard, however, the sample collected from the supply well exhibited a TCE concentration of 5.1 ug/l, which was above the GWQS of 1 mg/kg. This investigation was summarized in the Synergy October 2003 Remedial Investigation Report (**Section 15**) and in the response to the US EPA comments on the May 2017 RBDA (**Appendix A**).

On August 27, 2003, Synergy resampled the McCandless supply well and the Faith Fellowship supply well. The McCandless supply well also supplied water to the residence of the north of the site. The samples were analyzed for VOC+TICs, BNA+TICs and PCBs. The results were non-detect for VOCs, BNAs and PCBs in the McCandless supply well and residential well. The samples from the Faith Fellowship were non-detect for PCBs and BNAs, and while there were VOC detections, the concentrations did not exceed standards (**Appendix A**). The McCandless supply well and the Faith Fellowship supply well were abandoned with the razing of the buildings in 2009 and are no longer present. Well abandonment records for these wells are included in the 2014 RIR (**Section 15**).

In 2018, RCC performed a well search of the area and included the findings in the response to US EPA comments on the May 2017 RBDA (**Appendix A**). NJDEP was contacted for records or data on the Community Commons well (a Non-Community Potable Water Supply well). NJDEP indicated that no records were available; however, Antea was able to secure permission to sample this well. On November 6, 2018, Antea collected an aqueous sample from the Community Common well and had it analyzed for PCBs by Method 508. The analytical results were non-detect for PCBs. The analytical results for this sample are presented in **Table 2** and the lab report is available in **Volume II**.

It is important to note that no PCBs were detected in the on-site potable wells sampled and none have been detected in any of the off-site monitoring wells. As reflected in a recent well search, none of the potable wells identified in proximity to the Site lie within the 250'/500' area of concern for monitoring established by NJDEP regulations on receptor evaluation (See **Section 9**). Residential wells downgradient and to the west of the site lie outside the area of potential concern. In addition, the downgradient wells are separated from potential site impacts by a gaining stream (Little Ease Run) that lies between the residences and the Site.

## 3.2 Areas of Concern

Ten Areas of Concern (AOCs) were identified at the McCandless site from summarizing the work of previous investigations. The list of AOCs identified includes the following:

- AOC 1 – Pump House and Tank Area

- AOC 2 – Loading Rack Area
- AOC 3 – Gate Tank Area
- AOC 4 – Tank Farm Area
- AOC 5 – UST Area
- AOC 6 – West Tank Area
- AOC 7 – Western Area
- AOC 8 – Spent Oil Filter Area
- AOC 9 – Fence line Area
- AOC 10 – Office Area

The location of the AOCs referred within this report are provided on **Figure 9.**

To the north of the Operations Area lies a former PSE&G electric substation (**Figure 2**). In a December 8, 1997 report entitled "Report Concerning Contamination in McCandless" by Trillium there is a statement that "On November1, 1991, EMA Laboratories sampled soils on the Atlantic Electric transformer station on the northeastern corner of Lot 2 adjacent to the McCandless Petroleum, Inc. property (Lot 2A). The electric station was initially suspected as a potential source/contributor to PCBs on-site. No PCBs were detected with a detection limit reported at or less than 0.25 mg/kg. The EMA Laboratories report dated November 1991 demonstrates that the Atlantic Electric property was not the source of the PCB contamination found on the McCandless Petroleum facility." [Refer to **Section 15** for additional reference to these historical reports.]

In June 11, 2008, Antea installed three soil borings (DSB-111, DSB-112 and DSB-113) along the fence-line between the Site and the former transformer substation. A total of eleven (11) soil samples were collected from various depths within these borings, all of which were submitted for PCB analysis for vertical and horizontal delineation purposes. The analytical results for these samples showed that PCBs were detected in only one of these eleven samples. The reported concentration in this sample was below the NJDEP Residential Direct Contact Soil Remediation Standard (0.2 mg/kg) such that the lateral and vertical delineation in this area has been established and there was no evidence that PCBs on-site were migrating to or from the adjacent substation property. The pre-treatment site condition is reflected in **Figures 5A-5D**.

Investigations in 2008 into the distribution of contamination within the Western Area (AOC 7) possibly attributable to suspected historical dumping could only confirm three (3) areas of contamination. One of the areas (represented by sample location ID SW-1; **Figure 5-A**) was delineated to Residential and Non-residential Soil Remediation Standards in 2008. Two other areas within AOC 7 (represented by sample locations S2C2-62 and B15; **Figure 5-C**) were targeted for ISCO treatment under the 2009 RAW. Treatment by ISCO was also selected for resolving the non-PCB contamination present in the so called "Spent Oil Filter Area" (AOC 8).

Remaining AOCs 1, 2, 3, 4, 5, 6, and 10 were contiguous, within the property and contained the same COCs, hence they were addressed as one contaminated area within the 2009 RAW. For this TSCA Risk-based Disposal application, these AOCs will hereafter be referred to collectively as Operable Unit 1 (OU1).

The contaminant area associated with OU 1 extended offsite into the driveway between the McCandless site and the Community Commons building. This area of concern is henceforth referred as Operable Unit

2 (OU2). OU1 contamination also extended into a grass area behind Community Commons which is henceforth referred to as Operable Unit 3 (OU3). These Operable Units are represented by the extended areas of contamination shown in **Figures 5A, 5B & 5C.** The generalized areas of these Operable Units are also shown on by the cross hatched overlays in **Figure 9**.

# 4 Conceptual Site Model

The Conceptual Site Model (CSM) for the property is that petroleum hydrocarbons from decades of operating a fuel distribution facility, compounded by the storage and release of waste oils contaminated with chlorinated solvents and PCBs, has led to the contamination of soils and groundwater at the Site. Except for the building structures and the tank farm areas, the surface of the site was natural hard pack soils. Contamination migrated from release points at the surface through the unsaturated soils to the water table, where it tended to rise and fall over time with the water table resulting in an approximate five foot "smear zone" between 5-10' bgs that migrated horizontally out from the release points. Contaminant delineation has been determined to be consistent with the boundaries of the hydrocarbon mass in the unsaturated and saturated zones.

## 4.1 COCs and COC Distribution

Environmental investigations at the site commenced in 1991 and extended through 2009. These investigations identified the primary COCs as PCBs, TPH and select VOCs (specifically Trichloroethene - TCE) in soil and groundwater. The secondary COCs included non-chlorinated VOCs and BNAs in groundwater, the latter of which were mostly present as components of oils or waste oil. OU1 was the primary area of affected media (PCBs, TCE, oil). Historical data (pre-2009) indicated that total PCB concentrations in soil ranged from non-detectable (ND) to as high as 4,300 mg/kg and the depth of PCB impacts appeared to be limited to approximately 11' bgs. Prior to treatment, baseline results (2010) would indicate PCBs as high as 9,800 mg/kg (**Section 6**) and 14,000 mg/kg (**Appendix A**).

The Western Area (**Figure 2**) was suspected to have been subject to intermittent dumping. Review of historical aerials have confirmed that the Western Area was not part of the operational area of the site. Historical site investigations had indicated there were three isolated areas where dumping appeared to have occurred. In 2008, Delta/Antea installed five soil borings in the area around SW-1 (**Figure 5A**) to further delineate an isolated elevated PCB concentration previously identified by others. A total of nine soil samples DSB-108, DSB-109, DSB-110, DSB-110A, SW-1B were collected from various depths within these borings, all of which were submitted for PCB analysis. The analytical results for these samples are discussed in **Section 6.1.2**. Only one of the samples (DSB-108B) had PCB concentrations for two Aroclors slightly above the NJDEP RDCSCC but below the NJDEP NRDCSCC such that the lateral and vertical delineation of PCBs in this area has been established at or below 1 mg/kg. The other two areas represented by historical locations S2C2-62 and B-15 (**Figure 5C**) contained PCBs above the NJDEP NRDSRS of 1 mg/kg so they were treated with ozone and remediated to cleanup levels (< 1 PPM) as reflected in discussions in **Section 7.1.3**. Additional sampling in the Western Area was conducted at the request of US EPA Region II in 2019 to close some data gaps. Those results were also all below the NJDEP NRDCSRS and US EPA cleanup criteria of 1 mg/kg (see **Section 7.1.3**).

Investigations by Delta/Antea in 2006 and 2008 were unable to find evidence of LNAPL in the shallow groundwater system. The extent of PCB impacts below five feet is essentially the extent of the hydrocarbon impact zone at the water table under the Operations Area (**Figure 5C**).

In 2009, off-site impacts were confirmed to extend slightly at two locations at the southern property line (OU2 & OU3).

## 4.2 Remedial Action Selection

Various remedial technologies were considered for this Site including excavation, in-situ dual phase extraction, ISCO and bioremediation based on a variety of oxidants. Bench and pilot testing was performed to evaluate the site-specific application of an ISCO remedial action using ozone as the primary oxidant. In addition, other oxidants were evaluated during bench-scale testing, which clearly indicated that ozone could effectively degrade VOCs, BNAs and PCBs within the Site soil matrix. The final reports for Pilot Testing and the Bench Scale Studies were appended to the 2009 Remedial Action Workplan submittal and the 2009 Remedial Investigation Report (**Section 15**).

Per the proposed 2009 Remedial Action Workplan (RAW), the source and impact areas attributable to the former petroleum and chemical storage were to be addressed through implementation and operation of an active ozone injection system. In-situ remediation using ozone and oxygen gas injection, air sparging, and vapor extraction were the preferred remedial method. Bench scale testing and pilot studies documented the effectiveness of the approach and provided design information for the implementation of this remedial alternative. The proposed remediation system was designed to address the dissolved phase COC concentrations, any aqueous phase liquids present in the subsurface, and the adsorbed phase COC detected at the site.

## 4.3 Permitting the Remedial Action

Paramount to implementing the selected remedial action, a waiver to manage PCBs by methods other than incineration or chemical landfilling had to be secured from US EPA Headquarters. A demonstration permit to destroy PCBs by ozone based ISCO was approved on August 25, 2010. In addition, permits for discharges to groundwater and air were required from the NJDEP and permits for stormwater management and construction were required and obtained from the Township of Franklin (**Section 15**).

## 4.4 Remedial System

The initial remediation system proposed for the Site consisted of ozone injection into a series of injection points that were installed in specific vertical intervals of the impacted area. Soil vapor extraction wells were placed on the perimeter of the treatment area to influence the movement of treatment gases through the vadose zone and control possible fugitive emissions at the surface and horizontal boundaries. The entire treatment area of OU1 was capped with 4”- 6” of asphalt.

ISCO with ozone injection was the selected remedial technology for the McCandless site. Ozone based ISCO provides in-situ chemical oxidation with subsequent enhanced bioremediation. Ozone can either directly oxidize contaminants in-situ or can indirectly oxidize contaminants by reacting with water as it degrades to oxygen and forms free-radical ions. Un-reacted ozone will quickly degrade to oxygen, which can enhance biodegradation of aerobically degradable COCs. Refer to **Appendix B** for a more detailed description of the system and its operation.

As described in **Appendix B**, the network of injection wells of remedial treatment system did extend into the Western Area and to the off-site impacted areas (OU2 & OU3).

# 5 SAMPLING AND ANALYSIS PROCEDURES

The McCandless Fuels Site has been investigated by numerous consultants over a period of twenty-five years. Some of the data used to characterize the Site is not available beyond summary information; however, most conclusions have been reaffirmed by recent technology and supportive, available data. RCC and Antea Group have compiled a database of results to support the characterization of the Site. Within this database, the analytical results are qualified, as appropriate, to reflect their usability.

Characterization data is presented herein as historical, baseline pre-ISCO treatment or post-ISCO treatment. Most historical data are reflective of work completed between 1991 and 2004. The methodologies used in the sampling and analysis that generated this historical data is available in the Site Investigation and Remedial Investigation Reports prepared prior to 2006. These reports are available in the project data repository (**Section 15**). Delta assembled additional characterization data between 2006 and 2009 to address data gaps in the historical database. The methodologies used in those sampling and analytical efforts is available in the Remedial Investigation Reports prepared in 2006 and 2008 (**Section 15**). With the completion of the Remedial Investigation delineation and Remedial Action Workplan in 2009 (**Section 15**), Delta/Antea Group completed assembly of the historical site characterization.

With the initiation of the proposed remedial action (ozone based ISCO) and consistent with the requirements of the demonstration permit issued by the USEPA under 761.60(e), specific monitoring requirements were established for soils, groundwater and air. The following discussion summarizes those requirements.

In accordance with N.J.A.C. 7:26E-2.1(a)14, sampling methods, sample preservation requirements, sample holding times, decontamination procedure for field equipment, and frequency for field blanks, field duplicates and trip blanks were undertaken in conformance to applicable industry methods such as those specified in the NJDEP *Field Sampling Procedures Manual* originally issued in August 2005 and subsequently updated as recently as 2011. A Quality Assurance Project Plan (QAPP) was developed for the 2009 RAW. That QAPP is available in the project data repository (**Section 15**).

## 5.1 Sample Collection Locations

### 5.1.1 *Groundwater Monitoring Network*

A network of monitoring wells (MWs) and piezometers existed at the site prior to the implementation of the ISCO remedial action (**Figure 7**). The following MWs were designated for sampling during the remedial action:

- ***Upgradient*** – MW-15, MW-15D, MW-16
- ***Source Area*** – MW-17, MW-14, MW-13, MW-13D, MW-18, MW-19, MW-11, MW-3, MW-3D, MW-8, MW-8D
- ***Downgradient*** – MW-9, MW-7, MW-6, MW-6D, MW-10

Initially, the MWs were sampled quarterly and then semi-annually with the soil sampling events.

### 5.1.2 *Soil Performance Monitoring Points*

A series of performance monitoring points (PMPs) were selected to assess changes in the subsurface soil conditions because of the ozone based ISCO treatment. The distribution of PMPs (**Figure 10)** was biased accordingly with the pre-treatment characterization of contamination in the 2009 RAW (**Figures 5A-D)**. Vertically, sampling was planned to assess the following depth intervals:

- ***Vadose Shallow (VS)*** – 0.0-2.5' bgs
- ***Vadose Deep (VD)*** – 2.5-6.0' bgs
- ***Water Table (WT)*** – 6.0-8.5' bgs
- ***Saturated Intermediate (SI)*** – 8.5-16.0' bgs
- ***Saturated Deep (SD)*** – 16.0-24.0' bgs

At the baseline (initial) sampling event in July and September 2010, samples were collected from the centroid location and at all the various designated depth intervals. [Refer to **Section 5.2.2** for sample collection protocols deployed at the PMP locations.] Because soils cannot be collected from the same location/depth in subsequent events, a step-out scheme was proposed and approved. Each subsequent sampling event involved a one-foot set back from the centroid location, in a clockwise progression around the compass. Sample results for the same location are distinguished primarily by date differences; however, they may also have a directional designation (e.g. PMP-2-SE) in the lab reports to reflect the set-back orientation to the centroid. After the four primary step outs were achieved (i.e. N, E, S and W), the next event was collected from half the distance between any previous sample location (e.g. NE). None of the ten eventual sample locations were any further than one foot off the original centroid for each PMP location.

### 5.1.3 *Air Monitoring Stations*

To monitor potential emissions generated because of the ISCO injections, a series of perimeter monitors were established on each boundary of the treatment area. Ozone monitoring took place over the complete duration of the remediation system operation and utilized automated monitoring by multiple sensors placed around the Site and the adjoining Community Commons building. All sensors were connected to the remediation trailer and had the ability to shut down the system if 0.1 parts per million by volume (ppmv) ozone levels were reached. These locations, and other select locations about the network infrastructure, were also monitored with an ozone sensitive field instrument during the routine weekly Operations & Maintenance (O&M) visits.

VOCs were monitored within the SVE collection system at well head locations around the system and prior to and after the carbon filters at the end of the process stream. VOCs were monitored with a Photo-ionization detector (PID) field instrument during the routine weekly O&M visit.

## 5.2 Sample Collection Procedures

Sampling techniques employed were in accordance with the NJDEP *Field Sampling Procedures Manual*. Regardless of sampling technique, the following general procedures were followed.

### 5.2.1 *Groundwater Sampling*

Groundwater samples were collected in accordance with the Technical Rules, N.J.A.C. 7:26E-3.7; the NJDEP *Field Sampling Procedures Manual*; United States Environmental Protection Agency (U.S. EPA) *Low*

*Stress (Low Flow) Groundwater Purging and Sampling Procedures*; and the NJDEP approved 2009 RAW. Low flow sampling was used to minimize fine sediments in the groundwater samples.

A bladder pump equipped with a Teflon™ bladder and assembled with Teflon™ and stainless-steel fittings was used for the low-flow sampling. Dedicated Teflon™-lined polyethylene tubing was used to discharge groundwater from the bladder pump to a 5-gallon carbon bucket. If the saturated screened interval was five feet or greater, the bladder pump intake was positioned at the mid-point of the shallowest five-foot interval below the water table. If the saturated screened interval was less than five feet, the bladder pump intake was lowered to the middle of the saturated screened interval of the monitoring well.

During purging, a multi-function water quality meter equipped with an in-line flow through cell (Horiba U-52) was used to record field parameter measurements every five minutes. Field measurements were also collected before purging, after purging, and after sampling for dissolved oxygen, pH, ORP, temperature, and conductivity.

After purging, the dedicated Teflon™-lined polyethylene tubing was used to collect the groundwater samples to be analyzed for BNAs, PAHs, and PCBs. The samples were purged directly into dedicated laboratory-supplied Teflon™-capped glassware. After the BN, PAH, and PCB samples were collected, dedicated disposable Teflon™ bailers were used to collect the groundwater samples to be analyzed for VOCs. The samples to be analyzed for VOCs were poured from the bailers into dedicated laboratory-supplied Teflon™-capped glassware. The groundwater samples to be analyzed for VOCs were preserved with hydrochloric acid. All of the groundwater samples were placed into a cooler and maintained at a temperature of less than 4° Celsius for transportation to the laboratory.

Groundwater samples for VOC analysis were collected in 40 ml-glass vials that have lids fitted with a Teflon pad for sealing the cap. The groundwater samples were taken without air space or bubbles at the top of the vial.

Groundwater samples for BNA and PCB analysis were collected in 1-Liter (L) clean amber glass bottles provided by the laboratory. The number of bottles required for each analysis was determined by the laboratory.

The groundwater samples were forwarded under proper chain-of-custody procedures along with a trip blank and three field blanks (one field blank per day of sampling) to TestAmerica Inc. (TestAmerica) of Edison, NJ. TestAmerica is an NJDEP-certified laboratory (Certification Number 12028). The groundwater samples were analyzed for VOCs via U.S. EPA Method 624 plus VOC+10, BNAs via US EPA Method 625 plus BNA+10, PCBs via U.S. EPA Method 608, and PAHs via U.S. EPA Method 8270C using selective ion monitoring (SIM).

### 5.2.2 *Soil Sampling*

Soil borings were completed using direct-push technology manufactured by Geoprobe®. Soil boring depths were biased towards zones known to be impacted by PCBs and total petroleum hydrocarbons (TPH). Refer to **Section 5.1.2** for additional details on sample depth intervals. Soil boring (PMP) locations are shown on **Figure 10**. Within any targeted sample depth interval, sample collection was limited to a six (6) inch interval representing stained soils or elevated PID readings, consistent with the NJDEP Field Sampling Procedures Manual protocols.

Soil samples collected for VOC analysis were collected by use of EnCore™ samplers from the six-inch interval and submitted to the laboratory for extraction within 48 hours of sampling.

Soil samples collected for PCB, BN and TPH analysis were also collected from the same six inch interval as the VOCs and transferred from the sampling device (Macrocore™ sampler) using a decontaminated stainless steel or dedicated plastic disposable trowel and placed in clean glass bottles of varying capacities, as provided by the laboratory.

After collection, soil samples were immediately containerized in an appropriate manner for laboratory analysis. To minimize the possible cross-contamination, nitrile gloves were used and replaced between each sampling location. Soil samples were field screened and logged. Soil cores were characterized using the Unified Soil Classification System (USCS). Soil boring logs were prepared for all soil samples to document sub-surface conditions including but not necessarily limited to soil types, field instrument measurements (PID), observed depth to groundwater and if present, staining. Soil boring records (e.g. logs and photos) are part of the Remedial Action Progress Reporting in the project archives (**Section 15**) and will be included in the Final Remedial Action Report at the completion of the project.

Soil samples were submitted to TestAmerica Inc. (TestAmerica) of Edison, NJ. TestAmerica is an NJDEP-certified laboratory (Certification Number 12028). Samples were analyzed for VOCs+10 via US EPA Method 8260B, BNs+15 via US EPA Method 8270C, PCBs via US EPA Method 8082 and TPH via US EPA Method OQA-QAM-025, as per the approved 2009 RAW.

### 5.2.3 *Water-Level Measurements*

Water-level measurements were performed at all accessible wells in the sampling program. Measurements were made with an electronic water level probe. Depth-to-water was measured from the surveyed top of casing and recorded to the nearest 0.01 foot in the field log book. Additionally, headspace was measured from inside the well upon opening using a photoionization detector (PID). Subsequent to the completion of groundwater monitoring activities, water-level measurements were converted to groundwater elevations and used to develop groundwater elevation contour maps.

## 5.3 Soil Analysis Procedures

Soils were analyzed by the fixed-based laboratory for the following parameters:

| **Parameter** | **Analytical Method** |
|---|---|
| EPH | EPA Method 8015B |
| PCBs | EPA Method 8082 |
| VOCs | EPA Method 8260B plus forward library search |
| BNs | EPA Method 8270C plus forward library scan |

## 5.4 Groundwater Analysis Procedures

Groundwater samples were analyzed for the following parameters:

| **Parameter** | **Analytical Method** |
|---|---|

| | |
|---|---|
| PCBs | EPA Method 608 |
| VOCs | EPA Method 624 plus forward library scan |
| BNs | EPA Method 625 plus forward library scan |
| PAHs | EPA Method 8270 using selective ion (SIM) |

Refer to **Appendix C**, Site QAPP for additional details on sample containers, holding times and analytical methods deployed at the Site.

# 6 Pre-ISCO Baseline Conditions

## 6.1 Soils

Delta supplemented the historical characterization of the contamination areas onsite by performing a background soil sampling event prior to operating the remedial system. Most of the Soil Baseline sampling event was conducted in June and September 2010, with supplemental events for the Western Area conducted in 2011 and 2012. The soil samples were collected from soil boring locations, PMP 1 through PMP 34. The soil sampling locations are presented on **Figure 10.** Performance monitoring point sampling depths were labeled in accordance with the naming convention discussed above in **Section 5.1.1** for ease of locating sampled zones. Within any zone (depth interval), the actual soil sample was collected from a six inch interval, based on previous characterization work.

### 6.1.1 *Sample Collection*

Delta collected baseline soil samples in June 2, 2010. A total of thirty-six (36) soil samples were collected from eleven (11) soil boring locations. The collected soil samples were analyzed for VOC, Semi-volatile Organic Compounds (SVOCs), TPH and PCBs. Only the PCB results are presented in this report. The sample ID and depth intervals are presented below:

| **Sample ID** | **Depth Interval** | | | | |
|---|---|---|---|---|---|
| | **VS (0'-2.5 ')** | **VD (2.5'-7')** | **WT (7'-8.5')** | **SI (8.55'-16')** | **SD (16'-24')** |
| PMP 1 | | X | X | X | |
| PMP 2 | | X | X | X | |
| PMP 3 | | X | X | X | |
| PMP 5 | | X | X | X | |
| PMP 6 | | X | X | X | |
| PMP 7 | | X | X | X | |
| PMP 9 | | X | X | X | |
| PMP 10 | | X | X | X | X |
| PMP 13 | | X | X | X | X |
| PMP 15 | | X | X | X | X |
| PMP 16 | | X | X | X | |

Another baseline soil sample was implemented on June 3, 2010. A total of thirty (30) soil samples were collected from ten (10) soil boring locations. Soil samples were analyzed for PCBs. The sample ID and depth intervals are presented below:

| Sample ID | Depth Interval | | | | |
|---|---|---|---|---|---|
| | VS (0'-2.5 ') | VD (2.5'-7') | WT (7'-8.5') | SI (8.5'-16') | SD (16'-24') |
| PMP 17 | | X | X | X | |
| PMP 18 | | X | X | X | |
| PMP 19 | | X | X | X | |
| PMP 12 | X | X | X | | |
| PMP 14 | X | X | X | | |
| PMP 20 | | X | X | X | |
| PMP 4 | X | X | X | | |
| PMP 8 | X | X | X | | |
| PMP 11 | X | X | X | | |
| PMP 21 | | X | X | X | |

On September 22, 2010, Delta collected a total of twenty-two (22) soil samples from seven (7) soil boring locations from various depth intervals. The collected samples were analyzed for VOC, Semi-volatile Organic Compounds (SVOCs), TPH and PCBs. Only the PCB results are presented in this report. The sample ID and depth intervals are presented below:

| Sample ID | Depth Interval | | | | |
|---|---|---|---|---|---|
| | VS (0'-2.5 ') | VD (2.5'-7') | WT (7'-8.5') | SI (8.55'-16') | SD (16'-24') |
| PMP 24 | X | X | X | X | |
| PMP 22 | X | X | X | | |
| PMP 23 | X | X | X | | |
| PMP 25 | X | X | X | | |
| PMP 28 | | X | | X | X |
| PMP 26 | | X | X | X | |
| PMP 27 | | X | X | X | |

### AOC 7: Western Area

Four (4) ozone injection points were installed in the Western Area (AOC 7) to address the isolated PCB exceedances noted during the delineation work (**Figures 5C**). On March 16, 2011, three (3) baseline soil samples were collected from PMP 29. The samples were analyzed for PCBs. The sample ID and depth intervals are presented below:

| Sample ID | Depth Interval | | | | |
|---|---|---|---|---|---|
| | VS (0'-2.5 ') | VD (2.5'-7') | WT (7'-8.5') | SI (8.55'-16') | SD (16'-24') |
| PMP 29 | X | X | X | | |

On April 26, 2012, RCC installed two more Performance Monitoring Points (PMP-33 and PMP 34) in this AOC. A total of five (5) samples were collected from these two (2) soil boring locations at select depth intervals based on previous characterization work and analyzed for PCBs. The sample ID and depth intervals are presented below:

| Sample ID | Depth Interval | | | | |
|---|---|---|---|---|---|
| | VS (0'-2.5 ') | VD (2.5'-7') | WT (7'-8.5') | SI (8.55'-16') | SD (16'-24') |
| PMP 33 | | | X | X | |
| PMP 34 | | X | X | X | |

In March and September 2013, baseline samples were collected from PMP 31, PMP 32. A total of six (6) samples were collected from these two(2) soil borings . The samples were analyzed for PCBs. The sample ID and depth intervals are presented below:

| Sample ID | Depth Interval | | | | |
|---|---|---|---|---|---|
| | VS (0'-2.5 ') | VD (2.5'-7') | WT (7'-8.5') | SI (8.55'-16') | SD (16'-24') |
| PMP 31 | | X | X | X | |
| PMP 32 | X | X | X | | |

### 6.1.2 *Soil Investigation Findings*

The laboratory analytical results for the soil sampling events described above are provided in **Table 3** and are plotted on **Figure 11 (Series 11A, 11B ,11C, 11D and 11E).** The laboratory analytical data packages for these samples are presented in **Volume II**. Also included in **Table 3** and **Figure 11** are the historical sample locations and results which were utilized to delineate the extent and magnitude of PCB contamination at the Site. The laboratory analytical data packages for the historical results, if available, are referenced in the **Section 15** Data Repository.

In instances where 2010 data points were proximal to historical points, the new data replaced the historical data. In instances where data points reflected clean conditions, these data points were retained to help define the extents of the contamination to be treated. [Note: CAT II screening data with MDLs above 1 mg/kg included in **Table 3** were not plotted in **Figures 11A-E**] Collectively, the combination of historical (1991-2009) and 2010 results became the database for the pre-treatment condition of the Site.

The soil database results revealed that PCBs were either not detected or detected at or below the RDCSRS and IGWSSL (0.2 mg/kg) concentrations in two hundred and thirty-three (233) of the five hundred and twenty-eight (528) total soil samples representing the pre-treatment conditions at the Site. Two hundred and seventy-nine (279) soil samples exhibited PCB concentrations above the NRDCSRS (1 mg/kg). The highest PCB concentration was detected at 9800 mg/kg in PMP-24 (5.25' bgs).

As reflected in the iso-contour maps (**Figures 11A-E**), pre-treatment levels of PCBs in soil were elevated and distributed at the surface (0-2.5' bgs interval, **Figure 11A**) in proximity to the suspected release area

(former pump house, distribution rack and AST farm) of OU1 and extended off-site into OU2. Levels dropped with depth to the water table interval (2.5-6' bgs, **Figure 11B**), except around PMP-24. At the water table (6.5-8' bgs, **Figure 11C**), they appeared to become more widely distributed at elevated levels across a large footprint beneath OU1, progressing from the release area in the direction of groundwater flow. PCB concentrations were high below the release areas at saturated depth between 8.5-16' bgs (**Figure 11 D**) but appeared not to have migrated below 16' bgs (**Figure 11E**).

The pre-treatment baseline results confirmed evidence of off-site migration of PCBs into OU2 and OU3 at the surface (0-2.5' bgs) to saturated zones (6-10'bgs) zones (**Figures 11A-D**), but showed no deeper contamination (**Figure 11E**).

### AOC 7: Western Area

The analytical results for the baseline soil samples collected from AOC 7 (PMP 29 through PMP 34) indicated that the PCB concentrations were below the standard of NRDCSCC at all depth intervals except PMP-33 (2.6 mg/kg) at the depth interval of 7.5-8' bgs. Location PMP 33 at 7.5' bgs exceeded the NRDCSRS of 1 mg/kg, as did other proximal historical sample points (e.g. S2C2-60, S2C2-62, S2C2-54, and B-15) at similar depths (**Figure 5C**). The summarized baseline analytical results for PMP-31 through PMP-34 is shown below. These results are not plotted in **Figure 11A-E**, which primarily reflect data predating 2010**,** but may be found in the data plots included in the response to US EPA comments on the May 2017 RBDA (**Appendix A**).

| Location | Sample Depth (ft bgs) | Depth Intervals | RDCSRS | NRDCSRS | 4/6/2012 | 9/13/2013 |
|---|---|---|---|---|---|---|
| | | | | | PCB | PCB |
| PMP-31 | | VS | 0.2 | 1 | | 0.016U |
| PMP-31 | | VD | 0.2 | 1 | | 0.016U |
| PMP-31 | | WT | 0.2 | 1 | | 0.017U |
| PMP-32 | | VS | 0.2 | 1 | | 0.064J |
| PMP-32 | | VD | 0.2 | 1 | | 0.016U |
| PMP-32 | | WT | 0.2 | 1 | | 0.018U |
| PMP-33 | 7.5 | WT | 0.2 | 1 | **2.6** | |
| PRA-P33 | 7.75 | | 0.2 | 1 | | |
| PMP-33 | 9.5 | SI | 0.2 | 1 | 0.23 | |
| PMP-34 | 3.5 | VD | 0.2 | 1 | 0.29 | |
| PMP-34 | 7.5 | WT | 0.2 | 1 | 0.16 | |
| PMP-34 | 9.5 | SI | 0.2 | 1 | 0.013 | |

## 6.2 Groundwater

In preparation for the startup of the system, a Baseline Groundwater Sampling Event was also completed on June 6 – June 11, 2010.

### 6.2.1 *Groundwater Sample Collection*

Samples were collected from twenty-three (23) monitoring wells (MW-2, MW-3, MW-3D, MW-6D, MW-7B, MW-7D, MW-8, MW-8D, MW-9, MW-11, MW-12, MW-13, MW-13D, MW-14, MW-15, MW-15D, MW-16, MW-17, MW-18, MW-19, MW-21, MW-24, and MW-25). The collected samples were analyzed for VOC, Semi-volatile Organic Compounds (SVOCs), TPH and PCBs. Only the PCB results are presented in this report.

### 6.2.2 *Groundwater Investigation Findings*

The groundwater laboratory analytical results for this sampling event are provided in **Table 4**. The laboratory analytical results for baseline groundwater sampling events are plotted in **Figure 12**. The laboratory analytical data package for these results is presented in **Volume II**.

Laboratory analysis identified PCBs in excess of the applicable NJDEP GWQS in 14 of the 23 groundwater samples collected [MW-3, MW-3D, MW-8, MW-8D, MW-9, MW-11, MW-12, MW-13, MW-13D, MW-14, MW-17, MW-18, MW-19 and MW-24]. In addition to Aroclor 1242, Aroclor 1248 and 1269 was also detected at concentrations above the NJDEP GWQS. Aroclor 1248 was detected above the standard in 2 of the 23 samples collected [MW-3D (0.55 µg/L) and MW-24 (0.64 µg/L)]. Aroclor 1260 was detected above the standard in 2 of the 23 samples collected [MW-11 (31 µg/L) and MW-13 (3.5 J µg/L)].

Of note, more than 100 injection wells had been installed within the treatment area between the July 2009 groundwater sampling event (**Section 3.1.2**) and this June 2010 event. Although groundwater samples during this event were collected using low-flow protocols, none of the samples were filtered.

## 6.3 Performance Evaluation/Split Samples

As part of the permit monitoring program, the US EPA Headquarters office staff visited the Site on an annual basis to observe sampling techniques and obtain split (soil) samples from select PMP locations.

EPA selected three locations to represent low, moderate and high-level PCB contamination. On four separate occasions, the EPA obtained split samples by drawing their sample aliquot from a six-inch interval within one half of the Macrocore sleeve (Antea Group utilized the other half). EPA sent their samples off to a Battelle laboratory for analysis. Results of the US EPA sampling are included as **Table 5.** In general, after the baseline event, there was a same order of magnitude comparison between the Battelle and the project lab (Test America) results for the split samples.

The Battelle laboratory analytical data packages are presented in **Volume II**.

# 7 Post-ISCO Extent of Contamination

### 7.1.1 *Soils*

Following the completion of the ISCO remedial action activities at the site in 2015, several post-remedial soil sampling events were conducted to confirm compliance with the US EPA TSCA Demonstration Permit and the N.J.A.C 7:26D, Soil Remediation Standards.

### 7.1.2 *Soil Sample Collection*

Post injection (end point) soil samples were initially collected from 34 soil borings (PMP 1 – PMP 34) at various depths which corresponded to previous sample events. Endpoint samples represent the last date analysis were performed at a given location/depth to evaluate NRDCSRS attainment. In addition to the PMP locations, post remedial action (PRA-#) samples were collected to confirm conditions and update or supplement historical and performance monitoring data points. The collected samples were analyzed for VOC, Semi-volatile Organic Compounds (SVOCs), TPH and PCBs. Only the PCB results are presented in this report. Historical samples that were not replaced by current PMP or PRA points were retained as part of the final database reflecting the post-treatment conditions at the Site.

### 7.1.3 *Soil Sample Findings*

The analytical results for the post treatment site condition are presented in **Table 6** and plotted on **Figure 13 (Series 13A-E).** [Note: CAT II screening data with MDLs above 1 mg/kg included in **Table 6** were not plotted in **Figures 13A-E**.] A total of five hundred and twenty-four (524) samples, including historical and recent samples, characterize the post ozone treatment condition of the Site. Of the 524 total samples, one hundred and three (103) samples exceed the RDCSRS and IGWSSL of 0.2 mg/kg. Similarly, a total of one hundred and forty-eight (148) samples exceed the NRDCSRS of 1 mg/kg. The highest post-treatment PCB concentration was 1500 mg/kg detected in PMP-24 at 5.25' bgs. Only 3 of the 524 total samples exceeded 500 mg/kg at locations PMP-24/PRA-P24 (5.25' bgs), PMP-24D (6.5' bgs) and PMP-24D1 (6.5' bgs). The current PCB concentrations in soil are summarized below, by Operable Unit, and the laboratory analytical data packages are presented in **Volume II**.

<u>Operable Unit 1 (AOCs: 1, 2, 3, 4, 5, 6, 10)</u>

In Operable Unit 1, PCBs in excess of the applicable NJDEP Non-Residential Direct Contact Soil Remediation Standard (NRDCSRS) of 1 mg/kg were identified at the shallow depth interval of 0-2' bgs in 6 of the 22 soil samples collected as Post-ISCO or end point samples, [PMP-24B (55mg/Kg), PMP 24C1 (8.8 mg/kg), PMP-24C2 (9.3 mg/kg), PMP-24NW2V (360 mg/kg), PMP-24C (24mg/kg) and PMP-24D (8.8 mg/kg)]. Refer to **Figure 13A**.

In the Vadose Deep zone (2.5-6.0' bgs), laboratory analysis identified PCBs in excess of the applicable NJDEP NRDCSRS in 10 of the 38 soil samples [PRA-2NW (4.9 mg/kg), PRA-5SE (3.6 mg/kg), PRA-P24 (1500 mg/kg), PRA-24C1 (13 mg/kg), PMP-24D (9.8 mg/kg), PMP-24D1 (3.05 mg/kg), PRA-P7S (7.4 mg/kg), PMP-7 (6.8 mg/kg), PMP7 (14.1 mg/kg) and PMP 24B (69 mg/kg)]. Refer to **Figure 13B**.

In the Water Table zone (6.0' to 8.5' bgs), laboratory analysis identified 33 of total 44 samples exceeded the applicable NJDEP NRDCSRS of 1mg/kg. PCBs were identified exceeding the standard of 1mg/kg in PMP-24B, PMP-24, PMP-24C1, PMP-24A2, PMP-24A1, D1, PMP-2, PRA-B9, PMP-5, PMP-24D, PMP-24D1, PMP-6, PMP-24D2, PMP-7, PRA-B6, PRA-B7 PMP-10, PRA-B7, PRA-C116W, PMP-9, PMP-13, PRA-B5, PMP-16, E131, PMP-15, PMP-28, PMP-17,, PRA-B4, PMP-27, PMP-18, PMP-20,PMP-19 and PMP-26. Refer to **Figure 13C**.

Laboratory analysis identified PCBs in excess of the applicable NJDEP NRDCSRS at the depth interval of 8.5-16' bgs in 19 of the 40 soil samples collected as end point samples, [PMP-20NW2-S (26mg/Kg), PMP 9 (73 mg/Kg), PMP-24C (22 mg/Kg), PMP-5-NW2S (29.6 mg/Kg) and PMP-5-NW2 (14.6 mg/Kg), PRA-P24 (9.6D mg/Kg), PMP-2 (3.1D mg/Kg), PRA-E4 (28.3D mg/Kg), PMP-24A2 (19.7 mg/kg), PMP-24A1 (171

mg/Kg), PMP-24A (68 mg/Kg), PMP-24B1 (1.52 mg/Kg), PMP-24B (1.6 mg/Kg), PMP-24C1 (340 mg/Kg), PMP-24D1 (280 mg/Kg), PMP-24D2 (3.3 mg/Kg), PMP-6NW2-S (29 mg/Kg) and PMP-7 (99D mg/Kg)]. Refer to **Figure 13D**.

No PCB results exceeded the applicable NJDEP NRDCSRS at depths below 16' bgs in Operable Unit 1. Refer to **Figure 13E**.

Operable Unit 2 (Offsite; Driveway)

In Operable Unit 2, PCBs exceeded the applicable Residential Direct Contact Soil Remediation Standard (RDCSRS) of 0.2 mg/kg at the depth interval of 0-2.5' bgs in 3 of the 6 soil samples collected as end point samples, [PMP-22-SW (0.64mg/kg), PMP-4NW2V (1 mg/kg) and PMP-8 (13 mg/kg)]. Only 1 sample (PMP-8 at 13 mg/kg) exceeded the US EPA cleanup standard of 1 mg/kg. Refer to **Figure 13A** for an illustration of the extents remaining off-site in the Vadose Shallow interval (0-2.5' bgs).

In the Vadose Deep zone of OU2 (depth interval 2.5-6' bgs), no soil samples exceeded the applicable RDCSRS (**Figure 13B**).

In the Water Table depth interval (6-8.5' bgs), no PCB results were identified in excess of the applicable RDCSRS in the soil sample locations (**Figure 13C**).

Based on previous delineation sample results indicating no contamination below 8.5' bgs (**Figure 13D**), no post treatment samples were collected in Operable Unit 2 in the Saturated Interval (8.5-16' bgs) or the depth interval of Saturated Deep Zone (>16' bgs) for the post ISCO sample events.

Operable Unit 3 (Offsite; Lawn)

In Operable Unit 3, PCBs exceeded the applicable NJDEP RDCSRS of 0.2 mg/kg at the depth interval of 0-2.5' bgs in one sample PRA-25E (0.472 mg/Kg). Note, no samples exceeded the EPA standard of 1 mg/kg in the shallow depth (0-2'bgs) of this off-site location (**Figure 13A**).

In the depth interval of 2.5-3.75' bgs, laboratory results indicated PCBs in excess of the applicable NJDEP RDCSRS of 0.2 mg/kg in two PMP samples, PRA-P25E2 (0.85 mg/Kg) at 3.75'bgs and PRA-25E (3.68 mg/kg) at 3.75' bgs (**Figure 13B**). At this location, PRA-25E did exceed the US EPA standard of 1 mg/kg.

In the depth interval of 6-8.5' bgs, PCBs were identified in excess of the applicable NJDEP RDCSRS of 0.2 mg/kg and the US EPA standard of 1 mg/kg at PRA-P-25E1 (1.54 mg/Kg) and PRA-P-25E3 (3.31 mg/Kg) [**Figure 13C**].

No PCB results exceeded the applicable US EPA or NJDEP RDCSRS at the depth interval of 8.5-16' bgs in Operable Unit 3 (**Figure 13D**) or the depth interval of the Saturated Deep Zone, >16' bgs (**Figure 13E**).

For additional data on the reduction of PCB concentrations during the progression of treatment over the five year treatment period (2010-2015), please refer to the response to US EPA comments on the May 2017 RBDA (**Appendix A**).

AOC 7: Western Area

Since PCBs exceeded the NRDCSRS at PMP-33 during the first sampling event in April 2012 (**Section 6.1.2**), a second sample (PRA-P-33) was collected in August 2016. The concentration of PCBs (0.16mg/kg) did not exceed the applicable US EPA or NJDEP NRDCSRS of 1 mg/kg.

The summarized laboratory results of historical soil samples collected from the Western Area (AOC 7) is presented in **Section 6.1.2** and the recent representative data is presented in **Table 6**. The locations of these soil borings are depicted on **Figure 13A-E.**

In 2019, at the request of the US EPA, additional locations (PRA-B1, PRA-B2, and PRA-B3) were sampled in the Western Area to close potential data gaps (**Figures 13A-E**). All the soil samples collected indicated PCB concentrations were below the US EPA and NJDEP NRDCSRS of 1 mg/kg. The results for samples in these locations is presented in **Table 6**. The laboratory analytical data packages are presented in **Volume II**.

AOC 8: Spent Oil Filter Area

In June 2010, soil samples were collected at various depth intervals at PMP-12 (**Figure 10**). The samples were analyzed for TPH and PCBs. The laboratory results indicated that the concentration of contaminants in soil samples were below the NRDSCC standard of 10,000 mg/kg for TPH and 1 mg/kg for PCBs. Subsequent sampling in March and September 2011 confirmed that none of the soil samples exceeded the NRDCSRS standard for PCBs or TPH. The laboratory results for PCBs in the soil samples is presented in **Table 6.** The laboratory analytical data packages are presented in **Volume II**.

## 7.2 Groundwater

A post-remedial groundwater sampling event was conducted in September 2016 and June 2017 in order to confirm compliance with NJDEP 2008 Ground Water Quality Standards (GWQS).

### 7.2.1 *Groundwater Sample Collection*

In September 2016, samples were collected from 18 monitoring wells (MW-3, MW-3D, MW-6, MW-7B, MW-7D, MW-8, MW-8D, MW-9, MW-10, MW-13, MW-13D, MW-14, MW-15, MW-15D, MW-18, MW-20, MW-21 and MW-22). The collected groundwater samples were analyzed for VOC, SVOCs, TPH and PCBs. In June 2017, samples were collected from 24 monitoring wells (MW-3/3D, MW-4, MW-6/6D, MW-7B/7D, MW-8/8D, MW-9, MW-10, MW-11, MW-12, MW-13/13D, MW-14, MW-15/15D, MW-16, MW-18, MW-19, MW-20, MW-21 and MW-22). The collected groundwater samples were analyzed for VOC, SVOCs, TPH and PCBs. Here, only the PCB results are discussed, but all the data is provided in **Volume II**.

### 7.2.2 *Groundwater Investigation Findings*

The laboratory analysis report for the September 2016 endpoint groundwater sampling event is presented in **Table 7.** The post ozone injection groundwater results are plotted on **Figure 14 (Series 14A and 14B).** The laboratory analysis report for the June 2017 endpoint groundwater sampling event is presented in **Table 8.** The post ozone injection groundwater results are plotted on **Figure 15 (Series 15A and 15B).** The laboratory data package is presented in **Volume II.**

In 2016, laboratory analysis identified PCB in excess of the applicable NJDEP GWQS of 0.5 µg/L in MW-3, MW-13, MW-8, MW-14 and MW-18. Aroclor 1248 was detected at the concentration of 5.8 µg/L in MW-3. Aroclor 1242 was identified in MW-13 (35 µg/L), MW-8 (0.62 µg/L) and MW-14 (27.4 µg/L). Similarly, Aroclor 1260 was detected at concentrations above the NJDEP GWQS in MW-18 (43 µg/L).

In 2017, laboratory analysis identified PCB in excess of the applicable NJDEP GWQS of 0.5 µg/L in MW-3, MW-4, MW-11, MW-12, MW-13, MW-14, MW-18 and MW-19. Aroclor 1248 was detected at the concentration of 5.9 µg/L in MW-3, 1.4 ug/l in MW-11, 1.5 ug/l in MW-12, 33D ug/l in MW-18 and 16D ug/l in MW-19. Aroclor 1260 was detected at the concentration of 0.76 µg/L in MW-4, 3.6D ug/l in MW-14 and 4.6D ug/l in MW-19. Aroclor 1242 was identified in MW-8 (0.53 µg/L), MW-13 (34D µg/L) and MW-14 (25D µg/L). [D-reflects dilution implications on the reported results]

For these events, Antea Group requested that the lab perform analysis on both unfiltered and lab filtered samples from the same well. Both filtered and unfiltered results are reflected in **Tables 7 and 8**. Based on the comparative results, it appears that PCBs in OU1 unfiltered groundwater are the result of microscopic sediments in the water sample, and not truly representative of dissolved water quality conditions.

There was no evidence of dissolved PCBs (unfiltered samples) in any downgradient and off-site wells.

# 8 REMEDIAL ACTION

The initial remedial strategy for addressing site wide contamination was ozone based in-situ chemical oxidation. While largely effective (there was a 88-92% reduction in PCB mass and overall average PCB concentration of less than 1 mg/kg in soil), levels of residual PCBs remain above the cleanup goal in localized areas and below a buffer zone interval of clean soil on the McCandless site. Off-site at Community Commons, there are isolated areas within OU2 and OU3 which exceed 1 mg/kg. However, the cleanup standard for off-site is the NJDEP Residential Direct Contact Soil Remediation Standard (RDCSRS) of 0.2 mg/kg.

The proposed remedial action to achieve regulatory closure for on-site (OU1) contamination is approval of an alternative remediation standard for residual PCBs (i.e. Risk-based Disposal Alternative - RBDA), strategic excavations of localized “hot spots” exceeding the RBDA, and incorporation of engineering controls (i.e. TSCA cap) and institutional controls (i.e. Deed Notice, Classification Exception Area, and Remedial Action Permits for Soil and Groundwater). These measures will ensure protection of human health and the environment.

Off-site at Community Commons, there are isolated areas within OU2 and OU3 where PCBs in soil exceed 1 mg/kg. However, the cleanup standard for off-site is the NJDEP Residential Direct Contact Soil Remediation Standard (RDCSRS) of 0.2 mg/kg. The proposed remedial action to achieve regulatory closure for the off-site impacted areas is strategic excavations of localized “hot spots” which exceed the NJDEP RDCSRS. Cleanup to the RDCSRS will **not** require any engineering controls (i.e. cap) or institutional controls (i.e. Deed Notice and Permit). The proposed removal measures will ensure protection of human health and the environment.

The proposed remedial action activities will be performed in accordance with the Quality Assurance Project Plan (**QAPP, Appendix C**), the Project Health, Safety and Security Plan (**HASP, Appendix D**) and the Excavation and Disposal Plan (**Appendix E**)**.**

The distribution and extent of residual, post-treatment contamination in OU1, OU2 and OU3 is reflected by the compliance database (**Table 6**) and illustrated in **Figures 13A-13E**.

## 8.1 Soil Excavation

Proposed soil removal and management actions are discussed below and further illustrated in **Appendix E, Figures E-1 through E-5**.

### *Soil Excavations-OU1*

In OU1, the soils from 0-2.5'bgs, and except in three localized areas at 2.5-6' bgs, are compliant with the NJDEP Non-Residential Direct Contact Soil Remediation Standard (NRDCSRS) and US EPA standard of 1 mg/kg for PCBs. In proximity to PMP-24, soils are contaminated with elevated levels of PCBs from the surface to below the water table. The distribution of COCs in soils is represented on **Figures 13A-13E**.

At the surface or Vadose Shallow interval of 0-2.5' bgs in OU1, PCBs exist between 1-25 mg/kg in proximity to PMP-24 and expand laterally to the north and off-site to the south at concentrations that approximate 1 mg/kg (**Figure 13A**). There are three other isolated instances of PCBs that marginally exceeding 1 mg/kg.

For the Vadose Deep interval of 2.5 – 6.0' bgs (**Figure 13B**), PCBs are not indicated above 1 mg/kg except in three isolated locations in OU1. In all the OU1 Vadose Deep instances, except around PMP-24, PCBs occurred at less than 15 mg/kg at the shallower depths (3.75'bgs) and less than 50 mg/kg at the deeper depths (6.25-7.25' bgs).

For the Water Table interval of 6.0 – 8.5' bgs (**Figure 13C**), PCBs approach 1,000 mg/kg at 6.5' bgs around PMP-24D and PMP-24D1. Below 8.5' bgs, PCB concentrations fall below 500 mg/kg (**Figure 13D**) and are completely absent by 16' bgs (**Figure 13E**).

Within OU1, the proposal is to excavate and remove only PCB contaminated soils that are >500 mg/kg in concentration. Based on the compliance database, these soils are exclusively located in proximity to PMP-24 and occur primarily within the water table interval at depths ranging from 4.5-8.5'bgs. Box trenching, or large sized auger excavation techniques might be preferable to open bench approaches. These methods will minimize excessive removal of non-contaminated soils and/or the need to manage and dispose contaminated dewatering liquids.

The extent of excavations proposed in OU1 is depicted in **Appendix E, Figure E-3**.

### *Soil Excavations-OU2*

In OU2, the post treatment soils from 0-2.5' bgs are not compliant with the residential direct contact soil remediation standards (RDCSRS) of 0.2 mg/kg for PCBs. In proximity to PMP-4, PMP 8 and PMP 23, soils

contain PCBs above the RDCSRS at the surface interval (0-2.5' bgs). This contamination is bounded by the following clean (<0.2 mg/kg PCB) locations PMP-11E (0.059J), DSB-102HS1(<0.071), DSB-102IS2 (0.038), DSB-102IE (0.031) and DSB-101B (0.039). Refer to the isopleths in **Figure 13A.**

Within OU2, the proposal is to excavate and remove PCB contaminated soils that are >0.2 mg/kg in concentration from the surface to 2.5'bgs. In addition, an excavation from the ground surface to a depth of 2' bgs will be completed along the property line and will extend two linear feet from OU2 into OU1. The purpose of this excavation will be to create a buffer to eliminate potential runoff induced recontamination or other incidental movement towards off-site soils.

In the OU2 vadose deep interval (2.5-6.0' bgs), PCBs are compliant with the NJDEP RDCSRS; therefore, no further remedial action will be required if post excavation samples in the vadose shallow interval confirm these delineation results.

The extent of excavations proposed in OU2 is depicted in **Appendix E, Figure E-4**.

### *Soil Excavation-OU3*

The extent of the contaminated area of OU3 is illustrated in **Figures 13A-13E**.

In OU3 at the depth interval of vadose shallow zone (0-2.5' bgs), the elevated level of PCBs in excess of 0.2mg/kg are located in the proximity of PRA-25E (0.472 mg/kg) and PRA-B5 (0.269J mg/kg). At the depth interval of vadose deep (2.5-6.0' bgs), the concentration of PCBs in excess of 0.2 mg/kg are located in one isolated area around PRA-25E (3.68 mg/kg) and PRA P25E2 (0.85 mg/kg).

Similarly, soils from 6-8.5' bgs are not compliant with the residential direct contact soil remediation standards (RDCSRS) of 0.2mg/kg in proximity to PRA-P25E1 (1.54 mg/kg) and PRA-P25E3 (3.31 F1 mg/kg). PRA-25S also had an indication of PCBs at 0.423 mg/kg at 8.5' bgs.

Within OU3, the proposal is to excavate and remove PCB contaminated soils that are >0.2 mg/kg in concentration. There is evidence that this area of OU3 contains soils at depth which show PCBs at levels that exceed shallow concentrations. As a precaution, the excavation footprint may be extended in the saturated interval from OU3 into OU1 to create a clean buffer to minimize any potential recontamination.

There was no evidence of PCBs in soils below 8.5'bgs in OU3.

The extent of excavations proposed within OU3 is depicted in **Appendix E, Figure E-5**.

### 8.1.1 *Staging Excavated Soils*

All suspected contaminated soils excavated from OU1, 2 and 3 will be stockpiled onto the McCandless Site for disposal characterization sampling. As described in **Appendix E**, the existing asphalt cap in OU1 will be utilized for temporarily staging the stockpiled materials. Stockpiled soils will be sampled for disposal characterization accordingly with the permit requirements of the selected disposal facilities. RCC has obtained pre-qualified bids from potential facilities based on delineation sample information.

### 8.1.2 *Reuse of Excavated Soils*

Excavated soils that contain PCBs > 1 mg/kg but < 500 mg/kg will be considered for reuse on-site. Soils characterized as compliant with the approved TSCA Risk Based Disposal Application for the McCandless Site will be considered for reuse as backfill for OU1 excavations. Refer to excavation, stockpiling and disposal details within the Excavation and Disposal Plan (**Appendix E**).

### 8.1.3 *Disposal of Excavated Soils*

Excavated soils which are non-compliant with the approved TSCA Risk Based Disposal Application for the McCandless Site (i.e. >500 mg/kg PCB) will be disposed off-site at a TSCA facility in accordance with 40 CFR 761.61(a)(5)(i)(B)(2) (ii) and 40 CFR 761.61(a)(5)(i)(B)(2) (iii). Pre-arrangements have been made with an authorized hauler and disposal facility. Excess volumes of excavated soils that contain PCBs > 1 mg/kg but < 500 mg/kg will be disposed off-site. Excavated soils with PCBs >1 mg/kg but <50 mg/kg will be disposed in accordance with 40 CFR 761.61(a) (5)(i)(B)(2)(ii), while PCB remediation wastes with PCBs at or above 50 ppm will be disposed in accordance with 40 CFR 761.61(a)(5)(i)(B)(2)(iii).

Refer to excavation, stockpiling and disposal details within the Excavation and Disposal Plan (**Appendix E**). All wastes transported off-site for disposal will be properly managed and manifested accordingly with Federal and State regulations.

### 8.1.4 *Post-excavation Sampling*

Based on the extents of the soil excavation, confirmatory post-excavation soil samples (including quality assurance/quality control (QA/QC) samples) will be collected and analyzed for PCBs via USEPA Method SW846-8082 by an EPA and NJDEP certified laboratory. One samples will be collected from every 225 square feet of excavation base with a minimum of three samples per excavation area. Each sample will be collected as a discrete sample from a maximum six-inch depth interval. Any exceedances at the extents of removal will be cause for evaluation and potential continuance of excavation.

### 8.1.5 *Engineering & Institutional Controls*

In addition to the proposed excavation on site, RCC considers the 3-4’ of clean soil in the 0-4’bgs interval an adequate buffer against exposure to the residual contamination at depth. As required by TSCA 761.61(a)7, the existing 4-6” asphalt cap will be repaved to ensure a minimum of 6” of asphalt exists between the surface of the asphalt and the subsurface soil to establish a TSCA compliant engineering control (cap). As part of the remedial action, a Deed Notice will be incorporated as an Institutional Control and a Remedial Action Permit (RAP) for Soil will be established to maintain the cap/buffer.

## 8.2 Remedial Action - Groundwater

Sample results from the 2016 groundwater sampling event indicated that PCB concentrations in groundwater are limited to source area wells within OU1 and there were no detections of PCBs observed in off-site wells (**Figure 14B**). In 2017 June, Antea implemented another complete groundwater sampling event to confirm the results from 2016. The sample results indicate the PCB concentration is still confined to OU1. There were no PCB concentrations detected in offsite wells. The results are presented in **Table 8**. The 2017 groundwater results are plotted on **Figure 15B.**

Both 2016 and 2017 groundwater sampling events confirm that unfiltered groundwater offsite is compliant with GWQS for PCBs. Based on the filtered/unfiltered results in both sampling events, PCBs in OU1 groundwater appear to be the result of microscopic sediments in the water sample. There are other COCs present in the groundwater. No semi-volatile compounds, and only Methyl Tertiary Butyl Ether (MTBE) below the Class II Groundwater Quality Standard in one off-site well, have been identified in the most recent round of sampling. There are volatile and semi-volatile compounds present in on-site wells; however, none exceed the Class II Groundwater Quality Standards.

A long-term sampling program will be implemented to monitor the groundwater conditions both on-site and downgradient. Monitoring wells from upgradient (MW-15 & MW-15D), side gradient (MW-16 & MW-7D) and downgradient (MW-6 & MW-6D) will be incorporated into the monitoring plan, which will be regulated through a NJDEP Remedial Action Permit for Groundwater.

# 9 PATHWAY ANALYSIS

## 9.1 Purpose and Background

The purpose of this pathway analysis (PA) is to review the extent and magnitude of residual PCB contamination at the site and evaluate whether the recommended remedial engineering and institutional controls are sufficient to mitigate, minimize and/or eliminate any potential threats to public health and the environment.

As discussed previously in **Section 1.0** and **Section 2.0**, the four-acre site is located in the Township of Franklinville which is a rural community in southern New Jersey, approximately thirty miles southeast of Philadelphia, PA (**Figure 1**). The McCandless site is bounded immediately to the north, north-east by a former electric substation and a residential property. To the east, directly across Delsea Drive is a used car dealership and a residential neighborhood. To the immediate south is a commercial retail building (Community Commons) and to the west is an active rail line. Beyond the rail line are two surface water bodies (Little Ease Run and a man-made lake) and commercial and residential properties (**Figure 4**).

Based on historical aerial photographs, it appears that only half of the Site was developed (**Figure 2**). Known as the Operations Area, this eastern portion of the property housed four cinderblock on grade slab buildings, an aboveground storage tank (AST) farm comprised of 12 ASTs, multiple elevated horizontal tanks and several Underground Storage Tanks (USTs). A distribution rack for dispensing fuel to delivery trucks was centrally located among the tanks and buildings. The buildings housed administrative offices or maintenance/garage space. The western half of the property (Western Area) has appeared to be undeveloped since the 1930s.

The Site reportedly was operated as a fuel oil distribution facility since the 1940s. At various times, portions of the Site were also used for waste storage purposes, including the stockpiling of PCB laden waste oils in 1970-1972. These waste oils were destined for a nearby facility attempting to secure a permit to incinerate PCBs. Fuel handling operations reportedly ceased at the Site in the late 1980s and all ASTs and most USTs were removed by 1990. Demolition of onsite buildings and the removal of a remaining heating oil UST was completed in 2009. The potential for seepage, spillage and other discharges of petroleum products, chlorinated solvents, and PCB containing materials was high given the materials handled by the various tenants, the number of storage vessels, and the related appurtenances.

Surface elevations of the Site are relatively flat with a gentle slope to the west and southwest. The Site and the off-site properties are underlain by soils classified as Evesboro-Urban land complex, Fallsington loams and Manahawkin muck. The subsurface material consisted primarily of sand with varying amounts of silt and gravel along with occasional boulders. There were no confining layers encountered on the McCandless site and bedrock was not encountered during drilling activities to a depth of approximately 50' bgs.

The Site and off-site properties overlie the Cohansey Aquifer outcrop (the Cohansey is 250 feet thick), a major drinking water supply source. Groundwater flow is west-southwest, with a hydraulic gradient of 0.005 and an average hydraulic conductivity estimated to be 16 feet per day.

## 9.2 Identification of COPCs

Environmental investigations at the site commenced in 1991 and extended through 2009. These investigations identified the primary Constituents of Potential Concern (COPCs) as PCBs, TPH and select VOCs (specifically Trichloroethene - TCE) in soil and groundwater. The secondary COCs included non-chlorinated VOCs and BNAs in groundwater, the latter of which were mostly present as components of oils or waste oil. Inorganics were not discovered at concentrations above background levels. The Operations Area (OU1) was the primary area of affected media by PCBs, TCE, and oil (**Figure 9**). The Western Area was suspected to have been subject to intermittent land filling of wastes from the Operations Area. Off-site impacts in soil were confirmed to extend slightly at two locations at the southern property line, OU2 & OU3 (**Figure 9**).

### 9.2.1 *Historical COPC Threat*

Historical data indicated that total PCB concentrations in soil ranged from non-detectable (ND) to as high as 4,300 mg/kg and the depth of PCB impacts appears to be limited to approximately 11' bgs. Prior to treatment, baseline results would indicate PCBs as high as 9,800 mg/kg (see **Section 6**). The relative distribution of PCB Aroclors among total PCBs identified at the Site was 47% 1242, 20% 1248, 3% 1254, 29% 1260 and 1% Other. Historical groundwater impacts were limited to chlorinated solvents.

The culmination of all the investigations into the distribution of PCBs at the Site is summarized in a series of isopleth maps which were included in the 2009 Remedial Action Workplan submitted to and approved by the New Jersey Department of Environmental Protection (NJDEP). These maps were included herein as **Figures 5A-D**.

Various remedial technologies were considered for this Site including excavation, in-situ dual phase extraction, In-situ Chemical Oxidation (ISCO) and bioremediation based on a variety of oxidants. The distribution of elevated levels of PCB contamination over a wide surface at depth, made excavation a costly, less practical alternative. Bench and pilot testing was performed to evaluate the site-specific application of an ISCO remedial action using ozone and other oxidants. The bench-scale testing clearly indicated that ozone could effectively degrade VOCs, BNAs and PCBs within the Site soil matrix.

The bench studies documented the effectiveness of an ozone based ISCO approach and provided design information for the implementation of this remedial alternative. The proposed remediation system was designed to address the dissolved phase COC concentrations, any aqueous phase liquids present in the subsurface, and the adsorbed phase COC detected at the site. The source and impact areas attributable

to the former petroleum and chemical storage were addressed through implementation and operation of an active ozone injection system.

Paramount to implementing the selected remedial action, a waiver to manage PCBs by methods other than incineration or chemical landfilling had to be secured from US EPA Headquarters. A demonstration permit to destroy PCBs by ozone based ISCO was approved on August 25, 2010. In addition, permits for discharges to groundwater and air were required from the NJDEP and permits for stormwater management and construction were required and obtained from the Township of Franklin.

Characterization of the treatment area was completed by performing a background soil sampling event prior to operating the remedial system. Most of the baseline sampling event was conducted in June and September of 2010, with supplemental events for the Western Area conducted in 2011 and 2012. The soil samples were collected from Performance Monitoring Points (PMP), PMP 1 through PMP 34 (**Figure 10**). Refer to **Section 5.1** for a description of the PMPs and the proposed sampling methodologies.

As reflected in the iso-contour maps (**Figures 11A-E**), pre-treatment levels of PCBs in soil were elevated and distributed at the surface (0-2.5' bgs interval, **Figure 11A**) in proximity to the suspected release area (former pump house and distribution rack) of OU1 and OU2. Levels dropped with depth (2.5-6' bgs, **Figure 11B**) to the water table interval, where they appeared to become more widely distributed at that depth interval (6.5-8' bgs, **Figure 11C**), from the release area in the direction of groundwater flow. PCB concentrations were high below the release areas at saturated depth between 8.5-16' bgs (**Figure 11 D**) but did not appear to migrate below 16' bgs (**Figure 11E**).

The pre-treatment baseline results confirmed evidence of off-site migration of PCBs into OU2 and OU3 at the surface (0-2.5' bgs) to saturated zones (6-11'bgs) zones (Figures 11A-D), but showed no deeper contamination (**Figure 11E**).

The analytical results of the baseline soil sample collected from the Western Area (AOC 7), from PMP 29 through PMP 34, indicated that the PCB concentrations were below the standard of NRDCSCC at all depth interval except PMP-33 at the depth interval of 7.5-8' bgs (**Figure 11C**). The PMP 33 soil sample at 7.5' bgs exceeded the NRDCSRS of 1 mg/kg.

### 9.2.2 *Current COPC Threat*

The distribution and extent of contamination in OU1, OU2 and OU3 after treatment is reflected by a compliance database (**Table 6**) and illustrated in **Figures 13A-13E**.

In OU1, the maximum concentration of PCBs in soil at depth interval 0-2.5'bgs, 2.5-6'bgs, 6-8.5'bgs, 8.5-16'bgs and beyond 16'bgs was detected at concentrations of 360 mg/kg, 1500 mg/kg, 830 mg/kg, 340 mg/kg and 120 mg/kg, respectively. These concentrations exceeds the NJDEP Non-Residential Direct Contact Soil Remediation Standard (NRDCSRS) of 1 mg/kg for PCBs.

In proximity to PMP-24, soils are contaminated with elevated levels of PCBs from the surface to below the water table. This contamination appears to be limited to a cylindrical column no deeper than 8.5' bgs in proximity to PMP-24. The distribution of COCs in soils is represented on **Figures 13A-13E**.

At the surface or Vadose Shallow interval of 0-2.5' bgs in OU1, PCBs exist between 1-25 mg/kg in proximity to PMP-24 and expand laterally to the north and off-site to the south at concentrations that do not exceed 1 mg/kg (**Figure 13A**). There are three other isolated instances of PCBs exceeding 1 mg/kg

For the Vadose Deep interval of 2.5 – 6.0' bgs (**Figure 13B**), PCBs are not indicated above 1 mg/kg except in three isolated locations in OU1. In all the OU1 instances, except around PMP-24, PCBs occurred at less than 15 mg/kg at the shallower depths (3.75'bgs) and less than 50 mg/kg at the deeper depths (6.25-7.25' bgs).

For the Water Table interval of 6.0 – 8.5' bgs (**Figure 13C**), PCBs approach 1,000 mg/kg at 6.5' bgs around PMP-24D and PMP-24D1. Below 8.5' bgs, PCB concentrations fall below 500 mg/kg (**Figure 13D**) and are completely absent by 16' bgs (**Figure 13E**).

In Operable Unit 2 (**Figure 9**), PCBs exceeded the applicable Residential Direct Contact Soil Remediation Standard (RDCSRS) of 0.2 mg/kg at the depth interval of 0-2.5' bgs in 3 of the 6 soil samples collected as end point samples, [PMP-22-SW (0.64mg/kg), PMP-4NW2V (1 mg/kg) and PMP-8 (13mg/kg)]. Only 1 sample (PMP-8 at 13 mg/kg) exceeded the US EPA cleanup standard of 1 mg/kg. Refer to **Figure 13A** for an illustration of the extents remaining off-site in the Vadose Shallow interval (0-2.5' bgs).

In the Vadose Deep zone of OU2 (depth interval 2.5-6' bgs), no soil samples exceeded the applicable RDCSRS (**Figure 13B**). In the Water Table depth interval (6-8.5' bgs), no PCB results were identified in excess of the applicable RDCSRS in the soil sample locations (**Figure 13C**). Based on previous delineation sample results indicating no contamination below 8.5' bgs (**Figure 13D**), no post treatment samples were collected in Operable Unit 2 in the Saturated Interval (8.5-16' bgs) or the depth interval of Saturated Deep Zone (>16' bgs) for the post ISCO sample events.

In Operable Unit 3 (**Figure 9**), PCBs exceeded the applicable NJDEP RDCSRS of 0.2 mg/kg at the depth interval of 0-2.5' bgs in one sample PRA-25E (0.472 mg/Kg). Note, no samples exceeded the EPA standard of 1 mg/kg in the shallow depth (0-2'bgs) of this off-site location (**Figure 13A**).

In the depth interval of 2.5-3.75' bgs, laboratory results indicated PCBs in excess of the applicable NJDEP RDCSRS of 0.2 mg/kg in two PMP samples, PRA-P25E2 (0.85 mg/Kg) at 3.75'bgs and PRA-25E (3.68 mg/kg) at 3.75' bgs (**Figure 13B**). At this location, PRA-25E did exceed the US EPA standard of 1 mg/kg.

In the depth interval of 6-8.5' bgs, PCBs were identified in excess of the applicable NJDEP RDCSRS of 0.2 mg/kg and the US EPA standard of 1 mg/kg at PRA-P-25E1 (1.54 mg/Kg) and PRA-P-25E3 (3.31 mg/Kg) [**Figure 13C**]. No PCB results exceeded the applicable US EPA or NJDEP RDCSRS at the depth interval of 8.5-16' bgs in Operable Unit 3 (**Figure 13D**) or the depth interval of the Saturated Deep Zone, >16' bgs (**Figure 13E**).

### 9.2.3 *Proposed Mitigation*

Within OU1, the proposal is to excavate and remove only PCB contaminated soils that are >500 mg/kg in concentration. Based on the compliance database, these soils are exclusively located in proximity to PMP-24 and occur primarily within the water table interval at depths ranging from 4.5-8.5'bgs.

Within OU2, the proposal is to excavate and remove PCB contaminated soils that are >0.2 mg/kg in concentration from the surface to 2.5'bgs. In addition, an excavation from the ground surface to a depth of 2' bgs will be completed along the property line and may extend up to two (2) linear feet from OU2 into OU1. The purpose of this excavation will be to create a buffer to eliminate potential runoff induced recontamination or other incidental movement towards off-site soils. In the OU2 vadose deep interval (2.5-6.0' bgs), PCBs are compliant with the NJDEP RDCSRS; therefore, no further remedial action will be required if post excavation samples in the vadose shallow interval confirm these delineation results.

Within OU3, the proposal is to excavate and remove PCB contaminated soils that are >0.2 mg/kg in concentration. There is evidence that this area of OU3 contains soils at depth which show PCBs at levels that exceed shallow concentrations. As a precaution, the excavation footprint may be extended in the saturated interval from OU3 into OU1 to create a clean buffer to minimize any potential recontamination. There was no evidence of PCBs in soils below 8.5'bgs in OU3.

Excavated soils from OU2 and OU3 will be either reused on-site where compliant with the site-specific approved RBDA cleanup criteria or disposed off-site in a TSCA compliant manner. In addition to the proposed excavations on site, the 3-4' of clean soil in the 0-4'bgs interval in OU1 is considered an adequate buffer against exposure to the residual contamination at depth. As required by TSCA 761.61(a)7, the existing 4-6" asphalt cap will be repaved to ensure a minimum of 6" of asphalt exists between the surface of the asphalt and the subsurface soil to establish a TSCA compliant engineering control (cap). As part of the remedial action, a Deed Notice will be incorporated as an Institutional Control and a Remedial Action Permit (RAP) for Soil will be established to maintain the cap/buffer.

Sample results from the 2016 and 2017 groundwater sampling events indicated that PCB concentrations in water are limited to source area wells within OU1 and there were no detections of PCBs observed in off-site wells (**Figure 14B and Figure 15B**). Both sampling events confirm that unfiltered groundwater offsite is compliant with GWQS for PCBs. Based on the filtered/unfiltered results in both sampling events, PCBs in OU1 groundwater appear to be the result of microscopic sediments in the water sample.

A long-term sampling program will be implemented to monitor the groundwater conditions both on-site and downgradient. Monitoring wells from upgradient (MW-15 & MW-15D), side gradient (MW-16 & MW-7D) and downgradient (MW-6 & MW-6D) will be incorporated into the monitoring plan, which will be regulated through a NJDEP Remedial Action Permit for Groundwater.

## 9.3 Exposure Assessment

The objective of exposure assessment is to estimate the magnitude, frequency, duration and route of current and reasonable anticipated future human exposure to COPCs associated with the site. This section discusses the selection of chemicals of potential concern (COPCs), exposure factors, and the basis for their selection.

### 9.3.1 *Conceptual Site Model*

The Conceptual Site Model (CSM) for the property is that petroleum hydrocarbons from decades of operating a fuel distribution facility, compounded by the storage and release of waste oils contaminated with chlorinated solvents and PCBs, has led to the contamination of soils and groundwater at the Site. Contamination migrated from release points at the surface through the unsaturated soils to the water

table, where it tended to spread horizontally and fluctuate over time with the water table. Contaminant delineation has been determined to be consistent with the boundaries of the hydrocarbon mass in the unsaturated and saturated zones.

Evidence from at least twenty years of investigation has shown that the extent of contamination has remained stable and mostly confined to the boundaries of the site property. An ozone based in-situ chemical oxidation remedial action initiated in 2010 and suspended in 2015 was largely effective (there was an 88-92% reduction in PCB mass and overall average PCB concentration of less than 1 mg/kg in subsurface soils); however, there remain levels of residual PCBs above the cleanup goal in localized areas and below a buffer zone interval of clean soil on the Site. Off-site at Community Commons, there are isolated areas within OU2 and OU3 which exceed 1 mg/kg.

The primary mechanism for transport of COPCs was petroleum migration along and dissolution of COPCs in groundwater, since most contamination is below asphalt pavement and concentrated at the water table interval. Human and ecological receptor contact is limited by several factors (i.e. low population density, pathway interruption mechanisms and physical barriers). The site is zoned commercial/industrial and is currently vacant. There are no known future plans for the site, except that the owner has indicated an intention to sell the property. Some interest was expressed by a used car business and a solar farm developer, but nothing could be pursued without regulatory closure on the contaminated conditions. Development prospects will be limited to commercial/industrial activities of a surficial nature.

### 9.3.2 *Potential Receptors*

Potential receptors identified for the Site are:

- humans (both on-site and off-site)
- ecological resources (Little Ease Run)

#### *9.3.2.1 Current and future potential exposure pathways – human receptors*

The Health and Safety Plan (**Appendix D**) was designed to provide measures, including use of personal protective equipment and air monitoring, during implementation of the remedy to manage site conditions and address possible exposures during these phases of site work to reduce potential exposure of COPCs to the onsite workers, trespassers and off-site residents.

The McCandless site is bounded immediately to the north, north-east by a former electric substation and a residential property. To the east, directly across Delsea Drive is a used car dealership and a residential neighborhood. To the immediate south is the commercial retail building (Community Commons) and to the west is an active rail line. Beyond the rail line are two surface water bodies (Little Ease Run and a man-made lake) and commercial and residential properties (**Figure 4**).

Based on a review of the current and (potential) future site uses, the primary exposure routes that are of potential concern to humans consist of soil and groundwater. There are three general routes through which individuals could potentially be exposed to residual chemical contamination: ingestion, inhalation, and dermal contact. The following sections describe the possible sources, receptors, and exposure pathways. An identified pathway does not imply that exposures are actually occurring, only implies that the potential exists for the pathway to be complete.

The former buildings on the McCandless site were razed in 2009 and the property is currently vacant. The entire property is currently secured with an eight-foot-high chain link fence and three padlocked gates. Within the Site, OU1 is currently covered by asphalt pavement which limits direct dermal, ingestion and inhalation contact with subsurface contaminated soils. This pathway interruption will be maintained into the future as part of the proposed remedial action which includes installation of TSCA compliant cap and a Remedial Action Permit for Soil (RAP-Soil). The RAP-Soil is a State managed regulatory program to ensure ongoing maintenance and inspection of the cap. The RAP-Soil includes a Deed Notice which is an institutional mechanism for advising future parties that disruption of the subsurface will involve exposure to residual contamination.

Notwithstanding a Deed Notice advisory which will be attached to the property, there is the potential for future on-site construction workers (e.g. utility installers) to be exposed to residual subsurface contamination via dermal, ingestion and inhalation exposure pathways. This exposure could potentially occur within the 0-8.5'bgs subsurface interval, with the greatest exposure risk at 5-8.5'bgs.

A well search of the area identified that no potable wells lie within the 250/500' area of concern for monitoring established by NJDEP regulations on receptor evaluation. The well search map is provided as **Figure 16**. Residential wells downgradient and to the west of the site lie outside the area of potential concern. In addition, the downgradient wells are separated from potential site impacts by a gaining stream (Little Ease Run) that lies between the residences and the Site. More importantly, no PCBs were detected in the on-site potable supply wells sampled (before they were abandoned when the buildings were removed) and none have been detected in any of the off-site monitoring wells over the twenty-six years of investigation.

Both 2016 and 2017 groundwater sampling events confirm that unfiltered groundwater offsite is compliant with GWQS for PCBs. No semi-volatile compounds, and only Methyl Tertiary Butyl Ether (MTBE) below the Class II Groundwater Quality Standard in one off-site well, have been identified in the most recent round of sampling. There are volatile and semi-volatile compounds present in on-site wells; however, none exceed the Class II Groundwater Quality Standards. The absence of PCBs and other COPCs in groundwater reduce the exposure threat to potential nearby human receptors via the ingestion pathway.

#### *9.3.2.2 Current and future potential exposure pathways – ecological receptors.*

There were no environmentally sensitive natural resources (ESNRs) identified on the McCandless site. The McCandless site is bounded immediately to the north, north-east by a former electric substation and a residential property. To the east, directly across Delsea Drive is a used car dealership and a residential neighborhood. To the immediate south is the commercial retail building (Community Commons) and to the west is an active rail line. Beyond the rail line are two surface water bodies (Little Ease Run and a man-made lake) that may be considered ESNRs (**Figure 4**).

Potential groundwater transport from the Site to the surface water ESNR receptors was investigated and documented in the June 2008 Remedial Investigation Report which described the installation and sampling of shallow points adjacent to the stream. Temporary wells were installed upstream, midstream, and downstream to represent groundwater conditions between the Site and both the stream and the man-made lake. At two of the sample locations, a deeper interval temporary well was installed to evaluate any potential vertical impacts in this area, as requested by the NJDEP. Lastly, one shallow temporary well

was installed on the western side of Little Ease Run to evaluate groundwater quality conditions beyond the hydraulic divide. The samples were collected from these temporary wells and two permanent monitoring wells (MW-4A and MW-10). The samples were analyzed for PCBs via EPA Method 608, VOCs via EPA Method 624 plus forward library scan of 10, BNs via EPA Method 625 plus forward library scan of 15 and PAHs via EPA Method 8270 using SIM.

The results for these samples showed that PCBs were not detected in the groundwater samples; therefore, the COPCs presented no threat through this potential pathway. The discussion of other compounds found in these samples is available in the 2008 RIR. For additional information refer to the Response to EPA comments (**Appendix A**) and the Data Repository (**Section 15**).

Potential overland transport of PCBs from the site to Little Ease Brook was also evaluated as a pathway threat. In addition to the current (and future) asphalt cap at the site, the set of elevated railroad tracks provide a formidable physical barrier interrupting the topography which slopes southwest from Delsea Drive towards the surface water body. COPCs would not present a potential surficial runoff threat to existing ESNRs via this pathway.

### 9.3.3 *Exposure Point Concentrations*

Estimates of COPC concentrations at points of potential exposure are used for evaluating chemical intakes by potentially exposed individuals. The concentrations of chemicals in the exposure medium at the exposure point are termed “exposure point concentrations’ (EPC). For this Site, EPCs were only calculated for PCB COPCs in soils (0-8.5’ bgs) for future construction workers’ exposure. The current (and future) asphalt cap is expected to interrupt/eliminate the direct contact EPC threat for PCB COPCs in soils (0-2’ bgs).

The EPC is defined as the 95 percent upper confidence limit (UCL) of the arithmetic mean or maximum observed concentration of an individual COPC, whichever is lower, per media. Calculation of the 95% UCL for total PCBs was conducted in a manner consistent with the USEPA guidance (USEPA 2002, 2015a and b) and available data. RCC evaluated the historical, pre-treatment (PMP location) and post treatment (PMP location) data sets to calculate arithmetic mean concentrations for total PCBs and the relative percentages of detected Aroclors. The ProUCL software package, version 5.1.00 (USEPA 2016) was used to determine the underlying statistical distributions and the EPCs. The historical, pre-excavation (PMP location) and post excavation (PMP location) data sets used for the ProUCL data input and outputs are provided in **Appendix F, Attachment A.**

Based on the EPC calculated for Total PCBs and the relative percent distribution of Aroclors identified in the post treatment dataset, an EPC value per Aroclor was calculated for comparison to the USEPA Residential and Industrial Regional Screening Levels (RSLs) for individual Aroclors (USEPA 2018c). Two summary tables are presented below to represent the EPCs (total and individual Aroclor EPC) for Post Treatment, Pre-Remediation Toxicity Assessment and Post Treatment, Post Remediation Toxicity Assessment scenarios. These scenarios represent the EPC threat for contractors performing the proposed excavations and future workers performing any subsurface construction, respectively. Once the site has been remediated (i.e. excavations completed to the RBDA criteria, TSCA cap installation and Deed Notice), the Post Treatment, Post Remediation EPC will be the remaining potential exposure threat at the site.

The EPCs for each PCB Aroclor in the exposure assessment are presented below:

**Post Treatment, Pre-Remediation Toxicity Assessment**

| | Aroclor % Onsite | EPC (mg/kg-day) | Industrial RSL for PCB (mg/kg) |
|---|---|---|---|
| Aroclor 1016 | - | - | 27 |
| Aroclor 1221 | - | - | 0.83 |
| Aroclor 1232 | - | - | 0.72 |
| Aroclor 1242 | 95.2 | **74.19888** | 0.95 |
| Aroclor 1248 | 0.4 | 0.31176 | 0.95 |
| Aroclor 1254 | - | - | 0.97 |
| Aroclor 1260 | 4.1 | **3.19554** | 0.99 |
| Aroclor 5460 | 0.33 | **0.257202** | 0.044 |
| **Total EPC (Post Treat, Pre-Rem)** | | **77.963382** | |

For the Post Treatment, Pre-Remedial scenario, review of the calculated EPCs in comparison to the USEPA Industrial Soil RSL (USEPA 2018c) indicates that Aroclor 1242, 1260 and 5460 represent an EPC threat greater than their respective Industrial RSLs (bolded results).

**Post Treatment, Post Remediation Toxicity Assessment**

| | % Aroclor Onsite | EPC (mg/kg-day) | Industrial RSL for PCB (mg/kg) |
|---|---|---|---|
| Aroclor 1016 | - | - | 27 |
| Aroclor 1221 | - | - | 0.83 |
| Aroclor 1232 | - | - | 0.72 |
| Aroclor 1242 | 95.2 | **22.487668** | 0.95 |
| Aroclor 1248 | 0.4 | 0.094486 | 0.95 |
| Aroclor 1254 | - | - | 0.97 |
| Aroclor 1260 | 4.1 | 0.9684815 | 0.99 |
| Aroclor 5460 | 0.33 | 0.07795095 | 0.044 |
| **Total EPC (Post Treat, Post Rem)** | | **23.62858645** | |

For the Post Treatment, Post-Remedial scenario, review of the calculated EPCs in comparison to the USEPA Industrial Soil RSL (USEPA 2018c) indicates that only Aroclor 1242 represents an EPC threat greater than its respective Industrial RSLs (bolded result).

### 9.3.4 *Chemical Exposure Intake*

The EPCs were used in combination with exposure factors from USEPA guidance and standard default parameters (USEPA 2011a) to estimate chemical intake via each exposure pathway for each receptor. Some default exposure factors have been updated in the 2014 USEPA Office of Solid Waste and Emergency Response (OSWER, now Office of land and Emergency Management, OLEM) directive 9200.1-120 9USEPA 2014a); these values were incorporated.

Chemical intake is expressed in terms of milligrams of chemical per kilogram of body weight per day (mg/kg-day), using the following general equation, which is adjusted based on the exposure pathway:

$$Intake = \frac{EPC \; X \; IR \; X \; EF \; X \; ED}{BW \; X \; AT}$$

Where:

| | | |
|---|---|---|
| Intake | = | daily intake or exposure does [milligrams per kilogram per day [(mg/kg-day)] |
| EPC | = | exposure point concentration of COPC [milligrams per a kilogram (mg/kg)] |
| IR | = | ingestion rate; the amount of contaminated medium ingested over the exposure period [milligrams per day (mg/day)] |
| EF | = | exposure frequency; describes how often exposure occurs (days/year) |
| ED | = | exposure duration; describes how long exposure occurs (years) |
| BW | = | body weight; the average body weight over the exposure period [kilogram(kg)] |
| AT | = | averaging time; period over which exposure is averaged (days) |

Each of the intake variables in the above equation consists of a range of values taken from *RAGS, Part A through F* (USEPA 1989, 2009) and other applicable risk guidance, e.g., the *Exposure Factors Handbook* (USEPA 2011). The exposure factors and intakes for receptor population groups for each exposure pathway are presented in **Appendix F, Attachment B** for soil exposure scenarios.

The averaging time for cancer risk and body weight are the same for all exposure pathways as follows:

- The averaging time for evaluating cancer risk is equal to a lifetime of 70 years or 25,550 days (USEPA 2014a). The averaging time for evaluating noncancer hazard quotients is equal to the exposure duration, which varies by receptor (USEPA 2014b).
- The body weight of 80 kg is the standard USEPA-recommended body weight for assessing exposure to adults (USEPA 2014a).

*Ingestion Pathway of Exposure*

- *Ingestion Rate*
  The on-Site commercial/industrial worker is assumed to have a soil ingestion rate of 100 mg/day and the construction worker, 330 mg/day (USEPA 2014a, 2018c).
- *Exposure Duration and Frequency*
  The on-site commercial/industrial worker is assumed to be exposed to contaminants in soil for 20 days/year for 25 years (USEPA 2014a, 2018c). [However, based on an assumption of one-time placement of utilities and its non-routine inspection/repairs, exposure scenarios envisioned for this Site would be limited to less than 5 days per year for a maximum of 5 years.]
- The exposure duration for a construction worker is incidentally ingesting soil or groundwater is one year of activity for 250 days/year (USEPA 2018c). [The exposure durations envisioned for this Site would be limited to less than 40 hours per year for a maximum of 5 years.]
- *Relative Bioavailability Factor*
  The relative bioavailability factor (RBA) is incorporated in the ingestion pathway and accounts for the differences in the bioavailability of a constituent between the medium exposure (e.g., soil) and the media associated with the derivation of the toxicity value (e.g., drinking water). A RBA of 1 was assumed for the PCB Aroclors.

*Dermal Contact Pathway of Exposure*

- *Skin Surface Area*
  The skin surface area available for contact with soil for a commercial/industrial worker and construction worker is 3,527 square centimeters ($cm^2$), which is the weighted average of mean values for head, hands and forearms for male and females of ages over 21 years (USEPA 2014a).
- *Soil Adherence Factor*
  The soil adherence factor to skin for a commercial/industrial worker is 0.12 milligrams per square centimeters ($mg/cm^2$), which is the arithmetic mean of weighted average of the adherence factors for hands, forearms and face for adult commercial/industrial activities from Table 7-20 of the *Exposure Factors Handbook* (USPA 2011, 2014a). The adherence factor for a construction worker is 0.3 $mg/cm^2$ (USEPA 2018c).
- *Soil Dermal Absorption Fraction*
  The dermal absorption of constituents into the body is constituent-specific and taken from the USEPA RSL tables (USEPA 2018c), which is a compilation of values from various sources including *RAGS Part E* (USEPA 2004a). The dermal absorption fraction values are derived from Exhibit 3-4 *of RAGS Part E* and presented below:

| Compound | Dermal Absorption Fraction (ABSd) 1 | Reference |
|---|---|---|
| Aroclors 1254/1242 and other PCBs | 0.14 | Wester, et al.(1993b) |

  Dermal exposures were not calculated for COPCs that did not have a dermal absorption fraction value.
- *Exposure Duration and Frequency*
  The exposure duration and frequency for each scenario is the same as those identified for the ingestion pathway above.
- *Event Frequency*
  The event frequency is one event/day for each scenario (USEPA 2004a).

*Inhalation Pathway of Exposure*

- *Concentration in Air*
  To evaluate a receptor's exposure to soil particulates and vapors, a particulate emission factor (PEF) and volatilization factor (VF) is calculated using the USEPA RSL Calculator and incorporating Site-specific characteristics (USEPA 2018C). The PEFs and VFs are used to convert the soil concentrations to air concentrations in the chemical intake equation for each COPC.

  In the calculation of the PEF for the commercial/industrial worker, the climate zone for Mt. Holly, NJ (being the closest available location to the Site) and the Site area of two (2) acres would be appropriate (only half of the four (4) acre McCandless site is impacted). For the PEF for a construction worker, the "Construction Worker – Other Construction Activities" scenario in the RSL calculator should be applied, based on professional judgement. A site area of two (2) acres would be relevant. For this PA, the estimated excavation volume would be 600 CY. Also, it was assumed that the Site will be bull dozed and graded once by the construction worker using Caterpillar Dozer blade of 92 inch (2.337 meters; CAT 2018) and grader blade of 60 inches (1.524 meters; CAT 2018). This is consistent with values used for risk assessment at Superfund sites in EPA Region 2. Default values are used for the remaining inputs.

The calculated VFs should be both receptor-specific and constituent-specific. Default values were used in the "Unlimited Reservoir (at Center of Source)" scenario, except using the Site area of two (2) acres and average shallow groundwater temperature of 47 degrees Fahrenheit (USEPA 2004b).

The calculated PEF and VF values are presented in **Appendix F, Attachment C**.

- *Exposure Time*
  The exposure time for inhalation of soil particulates and soil vapor for a commercial/industrial worker and construction worker would be an eight-hour day (USEPA 2011).
- *Exposure Duration and Frequency*
  The exposure durations and frequencies for each scenario would be the same as those identified for the ingestion pathway above.

  No age-based adjustments for calculating cancer risk over the lifetime are necessary, as the receptors of interest are adult workers.

  USEPA has identified several carcinogens that act via a mutagenic mode of action (MMOA, USEPA 2005a and b). None of the PCB Aroclors have been identified as having a MMOA at this time; therefore, no adjustments are necessary.

## 9.4 Toxicity Assessment

The toxicity assessment provides a framework for characterizing the relationship between the magnitude of exposure to the COPC and the nature and likelihood of adverse health effects that may result from such exposure. For the exposure pathways, there are two approaches for deriving toxicity values. One involves the derivation of a noncancer reference value, i.e., and oral or dermal reference dose (RfD) and inhalation reference concentration (RfC).

### 9.4.1 *Sources of Toxicity Values*

Pertinent toxicological information on COPCs was taken from the following sources, in descending order of hierarchy, in accordance with USEPA's OSWER Directive 9285.7-53, *Human Health Toxicity Values in Superfund Risk Assessments* (USEPA2003).

- Tier 1 – USEPA's Integrated Risk Information System (IRIS) (USEPA 2018a).
- Tier 2 – USEPA's Provisional Peer Reviewed Toxicity Values (PPRTVs) – The Superfund Health Risk Technical Support Center develops PPRTVs on a chemical basis when requested by USEPA's Superfund program (USEPA 2014b).
- Tier 3 – Other Toxicity Values – Tier 3 includes additional USEPA and non-USEPA sources of toxicity information ATSDR 2018, Cal EPA 2018 and USEPA 2011b). Priority is given to sources of information that are the most current, transparent, publicly available and those which have been peer reviewed.

The USEPA RSL tables provide toxicity values following the above hierarchy; therefore, the November 2018 RSL summary table is used as the source of chronic toxicity values 9USEPA 2018c).

The noncancer oral RfD of 0.00007 mg/kg-day for PCB Aroclor 1016 was applied for the COPC PCB Aroclor 1242; similarly, PCB Aroclor 1254's RfD of 0.00002 mg/kg-day was applied for PCB Aroclor 1248 and 1260 (USEPA 2017). For the inhalation pathway, there are no noncancer RfC values currently available for PCBs.

For the cancer oral and inhalation toxicity values, USEPA IRIS provides three toxicity values based on the risk and persistence of PCBs that are called "high risk", "low risk" and "lowest risk". For the COPCs, the USEPA RSL tables apply the "high risk" toxicity values of 2 (mg/kg-day)[1] and 0.00057 (ug/m³)[1]. PCBs have been identified as Group B2 Probable Human Carcinogens, which indicates there is sufficient evidence of carcinogenicity in animals with inadequate or lack of evidence in humans USEPA 1986, 2005a).

For exposure scenarios that are short-term, sub-chronic toxicity values are used in place of chronic values, where available. Since the construction worker scenario evaluates an exposure duration of one year, the sub-chronic noncancer oral RfD of 0.00003 mg/kg-day for PCB Aroclor 1254 will be used and also applied for PCB Aroclor 1248 1260, 1262 and 1268 (ATSDR 2018, USEPA 2017); no other sub chronic toxicity values were identified.

## 9.5 Hazard Identification and Risk Characterization

The information obtained from the exposure assessment (**Section 9.3**) and toxicity assessment (**Section 9.4**) may be used to identify the potential non-carcinogenic hazard and characterize excess lifetime cancer risk (ELCR) posed by the PCB COPC. Descriptions of calculations to estimate hazards and risks associated with exposure to individual Aroclor COPCs, and those associated with exposures to multiple COPCs, is discussed below.

### 9.5.1 *Non-Carcinogenic Hazard Identification*

Estimation of potential hazards for non-carcinogenic effects is the calculation of a hazard quotient (HQ) for each COPC, using the following general equation, which can vary by exposure pathway.

$$HQ = \frac{Intake}{Toxicity}$$

Where:

| | | |
|---|---|---|
| HQ | = | Hazard quotient (unitless) |
| Intake | = | Chronic daily intake of chemicals or exposure dose (mg/kg-day or mg/m³) |
| Toxicity | = | Oral reference dose (mg/kg-day), dermal reference dose (mg/kg-day) or inhalation reference concentration (mg/m³) |

The cumulative noncancer hazard index (HI) from exposure to the combination of COPCs in an environmental medium and across potential media for a receptor is estimated using the following equation (USEPA 1989):

$$Hazard\ Index = \sum HQ$$

When the HI for COPC exceeds unity (one), there may be concern for potential noncancer effects from the COPC. The HI is an indicator that potential hazard for a specific receptor exposed to a COPC in the environment cannot be ruled out, if it is greater than one, not that the hazard actually exists. In interpreting HI values, it is important to understand that the values are estimates, based on predictive

models, and are subject to the uncertainties inherent in both the estimates of exposure and toxicity benchmarks.

### 9.5.2 *Carcinogenic Risk Characterization*

Estimation of potential risks for carcinogenic effects is the calculation of an ELCR resulting from exposure to Site-related carcinogens. Calculation of an ELCR for an exposure pathway involves multiplying the chronic daily intake for each chemical by its upper-bound cancer slope factor, as described by the following general equation 9EPA 1989), which can vary by exposure pathway and COPC:

*Risk = Intake x Toxicity*

| | | |
|---|---|---|
| Where: | | |
| Risk | = | Cancer risk (unitless) |
| Intake | = | Chronic daily intake of chemicals (expressed in mg/kg-day) |
| Toxicity | = | Oral slope factor [(mg/kg-day)$^{-1}$], dermal slope factor [(mg/kg-day)$^{-1}$] or inhalation unit risk [(ug/m$^3$)$^{-1}$] |

Estimation of the cumulative cancer risk from exposure to the combination of constituents in an environmental medium and across potential media for a receptor follows EPA guidance (EPA 1989) and the general equation:

$$Cumulative\ Risk = \sum Risk$$

For known or suspected carcinogens, EPA considers acceptable exposure levels to generally be concentration levels that represent an ELCR to an individual of between one in ten thousand (1E-04) and one in a million (1E-06).

### 9.5.3 *PA Results*

This PA has been prepared as part of the Risk-Based Cleanup and Disposal Application, as provided under 40 CFR §761.61 (c), to allow PCB concentrations above the prescriptive PCB standards at §761.61 (a) to be left in-place over portions of the Site. The PA provides information on current and future land uses and exposure scenarios at and in the vicinity of the Site, as well as justification of how the remedial action and controls proposed address potential exposure to PCBs and are protective of human health and the environment.

The PA compares Aroclor EPCs in soil (reflecting the 95% UCL only for those Aroclors retained as COPCs), to the USEPA Industrial Soil RSL (USEPA 2018c).

- This comparison indicates that one (1) individual Aroclor (1242) EPC is greater than its respective RSLs in subsurface soil (0-8.5 ft.).
- The USEPA RSLs are not cleanup standards. The RSLs are chemical-specific concentrations that indicate there may be contamination warranting further investigation or Site cleanup (USEPA 2018c), as is proposed for the Site in the Risk-Based Clean-up application.
- The NJDEP Residential Direct Contact Soil Screening Level of 0.2 mg/kg and Non-Residential Direct Contact Soil Screening of 1 mg/kg provide for the protection of public health for different land uses.
- The comparison of on-site soil EPCs developed for the PA-under post excavation-indication that the EPCs are above both the NJDEP Residential and Non-Residential Soil Clean-up Standard at the site.

PCB-impacted soil in excess of 500 ppm will be removed from the Site and a buffer of four (4) feet of relatively clean soil (average Total PCB concentration is < 1 mg/kg) will separate residual contamination at the water table from the surface, in addition to a TSCA compliant asphalt cap, as described in this risk-based clean-up application.

Additionally, to address future industrial use scenarios including High or Low-Occupancy use conditions on portions of, or on the Site in entirety, engineering and institutional controls in accordance with §761.61 (a)(4)(i) and other sections of TSCA (and as described in the Risk-Based cleanup and Disposal Application) and NJDEP regulations will be implemented. Specifically, this includes the design, construction and annual monitoring/maintenance of a capping system meeting the closure and post-closure requirements of §264.310(a) and NJDEP issued Remedial Action Permits for Soil and Groundwater.

Appropriate health and safety measures, including remedial worker training, use of personal protective equipment and air monitoring will be employed during implementation of the remedy and recommended for future construction to manage Site conditions and address possible exposures during these phases of Site work. The remedial and site management measures (including institutional controls) are considered appropriate for the PCB-impacted soils and Site conditions and provide long-term protectiveness during remediation, construction, and future Site activities to the receptors identified in the PA.

# 10 Risk-Based Disposal Proposal

Based on the reduction efficiency of ozone based ISCO across the site, the challenges for excavation into the water table in the geology at this site, the stability of the plume which continues to remain within the bounds of the site, and the minimal presence of PCBs in groundwater, this Risk Based Disposal Alternative (RBDA) application seeks approval of an alternative remediation standard of < 500 mg/kg for PCBs in OU1 soils that will remain below a TSCA cap and buffer zone of clean soils (< 25 mg/kg), in conjunction with engineering controls (i.e. TSCA cap) and institutional controls (i.e. Deed Notice, Classification Exception Area, and Remedial Action Permits for Soil and Groundwater). These measures will ensure protection of human health and the environment.

Off-site at Community Commons, there are isolated areas within OU2 and OU3 where PCBs in soil exceed 1 mg/kg. However, the cleanup standard for off-site is the NJDEP Residential Direct Contact Soil Remediation Standard (RDCSRS) of 0.2 mg/kg. The proposed remedial action to achieve regulatory closure for the off-site impacted areas is strategic excavations of localized “hot spots” which exceed the NJDEP RDCSRS. Cleanup to the RDCSRS will **not** require any engineering controls (i.e. cap) or institutional controls (i.e. Deed Notice and Permit). The proposed removal measures will ensure protection of human health and the environment.

# 11 DECONTAMINATION

In accordance with 40 CFR 761.79(h)(2), the following alternative decontamination procedure is hereby submitted for approval as an alternative to the EPA’s self-implementing decontamination procedure set forth in 40 CFR 761.79(c)(2). The excavation equipment (e.g. excavator bucket) and miscellaneous hand

tools (shovels, picks, etc.) potentially in contact with the PCBs as part of remediation will be decontaminated using a high-pressure washer. The pressure washer will use potable water available on-site and has been demonstrated to be effective for residuals removal. Manual scrubbing of equipment using a solution of laboratory grade glassware detergent followed by a thorough water rinse will be available as a backup technique in situations where pressure washing fails to remove visible materials.

This alternative decontamination method is consistent with common practice for decontamination at remediation sites in New Jersey. This alternative decontamination method reduces the risk of potential injury/exposure or environmental spill associated with the use of a double solvent rinse mandated in 40 CFR 761.79(c)(2). At the completion of remediation/decontamination, a validation study will be conducted to confirm the efficacy of the decontamination method. Specifically, one composite wipe sample will be collected from the inside and outside of the decontaminated equipment and submitted to a NJDEP certified laboratory for total PCB analysis.

# 12 CONTINGENCY PLAN

The delineation of PCBs in soils at this site is comprehensive; however, in the event that additional contamination above the proposed cleanup goal of 500 ppm in OU1 and 0.2ppm in OU2 and OU3 is encountered, excavation and off-site disposal will continue.

Certain areas where PCB levels exceed remedial objectives have been identified. These areas will be excavated and soils will be staged for off-site disposal characterization and eventual transport to a regulated facility in accordance with 40 CFR 761.61(a)(5)(i)(B)(2)(iii). The excavations will be sampled to verify attainment of the remedial objectives per EPA and NJDEP rules and guidance. If verification post-excavation PCB sample results are <500 ppm in OU1 and <0.2ppm in OU2 and OU3, the clean-up will be considered complete. If post excavation sample exceeds the standards, then additional soil removals will be performed in the respective grid areas and verification samples collected at the frequency indicated above using offset sampling locations. This process will be repeated until the proposed cleanup level is achieved. Soils removed will be added to the off-site disposal stockpile for characterization and disposal.

Groundwater impacts by PCBs is suspected to be related to microscopic sediment particles. A post remediation groundwater monitoring program will be employed to confirm the absence of PCB contamination above 0.5 ug/l after remediation.

# 13 GREENER CLEANUPS INITIATIVES

Several factors have been considered as part of the proposed remedial action. There are high levels of PCB contamination located in discrete, hot-spot locations; however, PCB contamination at this Site is primarily confined to a 3-3.5’ interval at the water table interface (5-8.5’ bgs). This impacted zone covers an extensive horizontal footprint approximating 1.0-1.5 acres. Furthermore, this impacted interval lies below a 3-5’ interval of relatively clean soils. The proposed remedial actions will involve removal and off-

site disposal of the hot spots and a physical separation of the residual contamination at the water table from direct human contact by both a buffer (clean soils) and barrier (TSCA compliant cap). The proposed remedial action would reduce the potential exposure threats associated with removing, transporting and disposing greater quantities of PCB materials from the Site if a lower cleanup level was chosen, manipulation (removal and replacement) of large volumes of non-impacted or minimally impacted soils to access the PCB contamination at the water table, and management of significantly large volumes of contaminated liquids to access and remove the PCB contamination at depth.

From a Greener Cleanup perspective, this approach promotes the isolation of lesser contaminated soils on-site and reduces carbon emissions that would be associated with larger excavation volumes and transport of materials. Furthermore, the limited removals will preserve space at disposal facilities for other more significant sites. In addition to these primary benefits, the remedial plans call for the use of local staff (including subcontractors) when possible to minimize transportation impacts, source backfill materials from local source to minimize hauling distances, and employ closed loop washing systems for decontamination of equipment.

## 14 REMEDIAL ACTION SCHEDULE

The schedule for the proposed remedial action is presented below:

- Upon approval of Risk Based Disposal Application, a RAR/RAWA will be submitted to NJDEP within 30 days.
- Following RAR/RAWA submittal, site mobilization will commence and extend for 10 days.
- The excavations of OU2 and OU3 will be initiated and completed within 7 days from site mobilization.
- OU1 excavation will be initiated within 5 days from the completion of OU2 & OU3 excavation and OU1 excavation will be completed within 5 days.
- Waste classification sampling will be completed within 11 days of excavation completion.
- 15 days from waste classification completion, disposal activity will commence and be completed with 30 days.
- Upon completion of off-site disposal, placement of the engineering control (TSCA asphalt cap) will be completed within 15 days.
- Within 120 days from placing the engineering control, the institutional controls (deed notice, RAP-Soil, RAP-GW and CEA) will be completed.
- Within 30 days from completion of the RAP-Soil and GW, closure reports will be prepared.
- RAO for the site will be prepared and submitted within 15 days of RAR submittal.

## 15 DATA REPOSITORY

The project will maintain a repository for all the data related to this application and the site. Pursuant to 40 CFR 761.180, the details of the proposed excavation, post excavation sampling, analytical results, and off-site disposal documentation will be maintained for a minimum of five (5) years. A summary report detailing the remedial action will be produced and maintained within the data repository.

The repository will take the form of publicly accessible data files which include electronic versions of the reports, figures, tables and backup information (such as lab reports). The files will be maintained at two business locations:

Antea Group, USA
500 Summit Lake Drive, Suite 150
Valhalla, New York 10595
914-495-9935 Attn: Timothy Fisher, Project Manager

Resource Control Consultants, LLC
10 Lippincott Lane, Unit 1
Mount Holly, New Jersey 08060
856-273-1009 Attn: John Mateo, Project Manager
Jeff Dey, LSRP

# FIGURES

# TABLES

# APPENDICES

**APPENDIX A**

Comments/Responses on May 12, 2017 RBDA

**APPENDIX B**

RemedOzone System

**APPENDIX C**

Quality Assurance and Project Plan

**APPENDIX D**

Health and Safety Plan

**APPENDIX E**

Excavation and Disposal Plan