Screening Ecological Risk Assessment

Toledo 103C Landfill

Revitalizing Auto Communities Environmental Response (RACER) Trust

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Executive Summary

A screening ecological risk assessment (SERA) was conducted for the Soil Stockpile at the RACER Trust Property in Toledo, Lucas County, Ohio. In accordance with guidance developed by the U.S. Environmental Protection Agency (USEPA), the SERA consisted of Steps 1 and 2 of the 8-Step process for conducting ecological risk assessment. Soil samples were collected from the Soil Stockpile in December 2011 and analyzed for volatile organic compounds (VOCs); semi volatile organic compounds (SVOCs), including polycyclic aromatic hydrocarbons (PAHs); polychlorinated biphenyls (PCBs); and metals. In Step 1, constituents of potential ecological concern (COPECs) were identified by comparing maximum concentrations to conservative ecological screening values (ESVs). This initial screening identified high molecular weight (HMW) PAHs, total PCBs, antimony, thallium, and vanadium as COPECs.

In Step 2, second tier screening evaluated the potential for risk to soil invertebrates, terrestrial plants, meadow vole (mammalian herbivore), and short tailed shrew (mammalian insectivore) posed by the five COPECs. The second tier screening eliminated all five constituents as COPECs for soil invertebrates and terrestrial plants. Thallium was retained as a COPEC for meadow vole and short tailed shrew. HMW PAHs, total PCBs, and antimony were also were retained as COPECs for short tailed shrew.

Protective risk goals (PRGs) were developed for HMW PAHs, total PCBs, antimony, and thallium. The maximum concentrations of antimony and thallium are below their PRGs, indicating a potential for risk below the threshold for concern. For total PCBs, concentrations in two samples exceed the PRG whereas the 95 percent upper confidence limit (UCL) concentration is below the PRG. For HMW PAHs, concentrations in two samples and the 95 percent UCL concentration exceed the PRG. Based on the small number of samples exceeding the PRG and, for HMW PAHs, a conservative lowest observed adverse effect level (LOAEL), it is concluded that total PCBs and HMW PAHs do not pose a potential for risk above the threshold for concern.

Based on a limited potential for risk, neither further evaluation of risk nor remedial measures for protection of ecological receptors area is warranted.

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LIST OF ACRONYMS

ATSDR	Agency for Toxic Substances and Disease Registry
B	Concentration in Soil Invertebrates
bgs	Below Ground Surface
CCME	Canadian Council of Ministers of the Environment
COPEC	Constituent of Potential Ecological Concern
CRA	Conestoga-Rovers & Associates
Eco-SSL	Ecological Soil Screening Level
EPC	Exposure Point Concentration
ESL	Ecological Screening Level
ESV	Ecological Screening Value
EV	Ecotoxicity Value
FIR	Food Ingestion Rate
FOD	Frequency of Detection
GM	General Motors
HQ	Hazard Quotient
HMW	High Molecular Weight
K_{oc}	Soil Organic Carbon-Water Partitioning Coefficient
K_{ow}	Octanol-Water Partitioning Coefficient
LMW	Low Molecular Weight
LOAEL	Lowest Observed Adverse Effect Level
Max	Maximum
n/a	Not Available
NI	Not Identified
ORNL	Oak Ridge National Laboratory
P_s	Proportion of Soil
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PRG	Protective Risk Goal
RACER	Revitalizing Auto Communities Environmental Response
SERA	Screening Ecological Risk Assessment
SQ	Screening Quotient
SQG	Soil Quality Guideline
SVOC	Semi-Volatile Organic Compound
TRV	Toxicity Reference Value
UCL	Upper Confidence Limit
USACE	United States Army Corps of Engineers
USACHPM	United States Army Center for Health Promotion and Preventive Medicine
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VOC	Volatile Organic Compound

1. Introduction

In 2007, General Motors (GM) constructed a building addition to the former Plant 2 and approximately 10,600 cubic yards of soil was placed on the property that is now owned by RACER Properties, LLC. The property was owned by Remediation and Liability Management Co., Inc. (REALM), a wholly owned subsidiary of GM, at the time that the Soil Stockpile was created. RACER Properties, LLC acquired the property on March 31, 2011.

GHD Services Inc. (formerly Conestoga-Rovers & Associates [CRA]) collected soil samples from the Soil Stockpile in December 2011. GHD collected 43 soil samples and analyzed them for volatile organic compounds (VOCs), semi volatile organic compounds (SVOCs), and polychlorinated biphenyls (PCBs) in accordance with the Work Plan for the Investigation of the Soil Stockpile and Southwest Corner. Analytical results are provided as Appendix A.

This document presents the methods and results of the Screening Ecological Risk Assessment (SERA) conducted for the Soil Stockpile using available sample data. For VOCs and PCBs, most of the samples were composited subsamples of cores collected deep within the Soil Stockpile rather than from the surface soil layer (e.g., top foot or so) to which ecological receptors are primarily exposed. However, given how the Soil Stockpile was constructed, it can be assumed that concentrations of VOCs and PCBs in the Soil Stockpile are reasonably homogenous. That is, concentrations of chemicals observed deep within the Soil Stockpile were assumed to be representative of those at the surface. This assumption was not necessary for SVOCs and metals, as samples for these analytes were primarily taken from the surface soil layers.

The SERA consists of Steps 1 and 2 of the 8-step process for conducting ecological risk assessment (USEPA, 1997). Section 2.0 of this document presents the methods and results of Step 1 (screening level problem formulation). Section 3.0 presents Step 2 (exposure estimate and risk calculation). Section 4.0 presents the methods and calculation of protective risk goals (PRGs) for the constituent identified as potentially posing risk to ecological receptors. Uncertainties associated with the SERA are discussed in Section 5.0. Section 6.0 presents a summary and conclusions of the SERA. Section 7.0 provides citations for the references.

2. Step 1 - Screening-Level Problem Formulation

2.1 Environmental Setting

The stockpiled soil came from final grading around the building addition. The soil was intended to be used as fill for the City of Toledo's construction of a new roadway connecting Laskey and Hydramatic Drive (to provide an access route to landlocked parcels owned by the Toledo Port Authority). However, the roadway project was never completed and the Soil Stockpile remains to this day. The stockpiled soil is primarily clean-fill brought on-site by the contractor mixed with some soil formerly underlying a parking lot in the extreme eastern edge along the east side of the GM property.

The Soil Stockpile is approximately 0.75 acre is size. Adjacent land use is commercial industrial. Vegetation on the Soil Stockpile is characteristic of early successional taxa that colonize disturbed areas.

2.2 Known or Suspected Contaminants

2.2.1 Overview

Known or suspected contaminants were identified by comparing the maximum concentration of constituents detected in one or more samples to an ecological screening value (ESV). The maximum concentration was divided by its ESV to produce a screening quotient (SQ). A constituent was identified as a constituent of potential ecological concern (COPEC) if the SQ was greater than 1.0 (i.e., the maximum concentration is greater than its ESV).

2.2.2 Ecological Screening Values

Table 1 identifies the ESVs selected for this initial screen. Information presented in Table 1 includes the ESV, source of the ESV, and the receptor group upon which the ESV is based.

The ESVs were selected using a hierarchical approach. The first tier in the hierarchy was ecological soil screening levels (Eco SSLs) developed by USEPA (2005a). Eco-SSLs have been identified for soil invertebrates, terrestrial plants, avian wildlife, and mammalian wildlife. If Eco-SSLs were available for two or more of the receptor groups, the lowest of value was conservatively selected as the ESV. If an Eco-SSL was not available for a detected constituent, then ecological screening levels (ESLs) identified by the U.S. Environmental Protection Agency (USEPA) Region V (2003a) was selected as the ESV. The ESV for thallium was provided by USEPA Region V in correspondence dated April 14, 2015.

Because the ESVs identified in Table 1 are conservative, it can be reasonably assumed that the ESVs account for maximum rate of ingestion or exposure and are protective of the most sensitive receptors and life stage of sensitive receptors. Other assumptions in selection of the most conservative ESVs include 100 bioavailability, 100 percent area use by avian and mammalian wildlife, and a diet consisting of the most contaminated food items.

2.2.3 Screening for Contaminants of Potential Ecological Concern

Table 2 summarizes the results of the initial screening. Information presented in Table 2 includes the number of samples, number of samples with detected concentrations, frequency of detection (FOD), maximum concentration, ESV, identification of a constituent as a COPEC, and rationale for retaining or eliminating a constituent as a COPEC.

Volatile Organic Compounds

Seven VOCs were detected in one or more samples. The SQs for six of the VOCs (2 butanone, acetone, carbon disulfide, chloroform, toluene, and vinyl chloride) are less than 1.0. These six VOCs are eliminated as COPECs.

An ESV is not available for methyl acetate, which was detected in three of the eight samples. Methyl acetate is a highly flammable (flash point of 3.2oF) and water soluble compound (solubility of 250ºg/L at 20ºC). The half-life in water and soil is 6 days and 30 days, respectively. The log K_{ow} and log K_{oc} are 0.18 and 0.959, respectively. Based on these properties, methyl acetate is not expected to persist in the environment or bioaccumulate. Therefore, methyl acetate can reasonably be eliminated a COPEC.

Semi Volatile Organic Compounds

Three SVOCs, exclusive of polycyclic aromatic hydrocarbons (PAHs), were detected in one or more samples. The SQs for all three SVOCs detected (carbazole, dibenzofuran, and dimethyl phthalate) are less than 1.0. All three SVOCs are eliminated as COPECs.

Polycyclic Aromatic Hydrocarbons

PAHs were partitioned into low molecular weight (LMW) PAHs (2 methylnaphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, phenanthrene) and high molecular weight (HMW) PAHs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, and indeno(1,2,3 cd)pyrene). The PAHs were evaluated both individually and as the sum of the LMW and HMW PAHs in a sample. For calculation of the sum of the LMW and HMW PAHs, those individual PAHs not detected in a sample were assigned a concentration of zero.

All seven LMW PAHs were detected in at least three samples. The SQs for all seven LMW PAHs are less than 1.0. The SQ for the sum of the LMW PAHs is also less than 1.0. Based on these results, all seven LMW PAHs are eliminated as COPECs.

All ten HMW PAHs were detected in at least two samples. The SQ for dibenz(a,h)anthracene is less than 1.0. The SQs for the other nine HMW PAHs are greater than 1.0. The SQ for the sum of the HMW PAHs is also greater than 1.0. Based on these results, all 10 HMW PAHs are retained as COPECs. Additional evaluation of HMW PAHs will focus on the sum of the HMW PAHs.

Polychlorinated Biphenyls

Three PCB aroclors were detected in at least three samples. Total PCBs (sum of the detected aroclors) were detected in 12 samples. PCBs were evaluated as both individual aroclors and total PCBs. For calculation of total PCBs, those aroclors not detected in a sample were assigned a concentration of zero. The SQs for all three of the detected aroclors (Aroclor-1248, Aroclor-1254, and Aroclor-1260) and total PCBs are greater than 1.0. Based on these results, all three aroclors and total PCBs are retained as COPECs. Additional evaluation of PCBs will focus on total PCBs.

Metals

Sixteen metals were detected in one or more samples. The ESV for aluminum is based on soil pH. Because the pH of all samples collected from the Soil Stockpile is greater than 5.5, aluminum is eliminated as a COPEC.

The SQs for arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, and zinc are less than 1.0. These 12 metals are eliminated as COPECs.

The SQs for antimony, thallium, and vanadium are greater than 1.0. These three metals are retained as COPECs.

2.3 Fate and Transport

There are several potential mechanisms for transport of constituents from the source area (i.e., Soil Stockpile) to habitats that potentially support ecological receptors. One such mechanism is surface flow during storm events. Constituents dissolved in stormwater, or adsorbed to particles suspended in stormwater may be transported from source areas to habitats within or immediately adjacent to

the Soil Stockpile. The fate of constituents in surface flow is dependent on the chemical and physical properties of the constituents and their interaction with the biological properties of the habitats. For example, hydrophobic compounds, such as PCBs, will likely leave solution and become bound to organic matter in soil. Other less hydrophobic compounds may remain in solution.

Wind is another potential mechanism for transport of COPECs from the Soil Stockpile to ecological receptors. Constituents transported by wind may be deposited in either terrestrial habitats or aquatic habitats

A third potential mechanism of transport is leaching. Those COPECs with relatively high solubilities may dissolve in water in the Soil Stockpile and migrate out of the Soil Stockpile downward and/or laterally.

2.4 Ecotoxicity

High Molecular Weight PAHs

Exposure and toxic effects of PAHs are generally most significant to organisms low in the food chain, via direct exposure to water, soil, and sediments. The primary mode of ecotoxicity in soil invertebrates is non-specific nonpolar narcosis (Sverdrup et al., 2002). PAHs bioaccumulate in some invertebrate taxa, which have limited ability to metabolize and excrete PAHs (Tracey and Hansen 1995). Consequently, consumers of soil invertebrates may face significant exposure to PAHs. Plants do not readily incorporate PAHs due to their generally high hydrophobicity.

In contrast, most vertebrates and some invertebrates rapidly metabolize PAHs (USACE, 1996; Environment Canada and Health Canada, 1994). Consequently, PAHs do not tend to bioconcentrate or biomagnify in either aquatic or terrestrial food chains despite their high lipid solubility. Exposure of animals to PAHs has been documented to have adverse effects on skin, blood, kidneys, gastrointestinal system, immune system, and mammary gland (Shore and Rattner, 2001).

Polychlorinated Biphenyls

PCBs can elicit a broad range of toxic effects in laboratory animals. Adverse reproductive effects (e.g., litter size, offspring survival) appear to be the most sensitive endpoints of PCB toxicity (Golub et al., 1991; Rice and O'Keefe 1995; Hoffman et al. 1996). The primary ecological concerns associated with PCBs are the potential effects on reproduction in higher trophic level wildlife resulting from chronic low level dietary exposure. Reproductive success in birds and mammals can be affected directly by toxic action on the differentiated reproductive tract or indirectly on systems that regulate reproduction (e.g., endocrine and central nervous systems). PCBs have also been implicated in the modulation of other systems important for reproduction, such as the central nervous system, adrenal gland, and thyroid hormone levels. Direct effects on the gonads and the female reproductive tract have also been reported (Fuller and Hobson 1986; Peakall 1986; Barron et al. 1995).

Antimony

Data on the ecotoxicology of antimony are relatively limited. Adverse effects on blood, liver, central nervous system, and gastrointestinal effects have been reported in animals due to oral exposure to antimony (ATSDR, 1992a).

Thallium

Data on the ecotoxicology of thallium are relatively limited. Adverse effects on liver, kidney, central nervous system, and reproductive effects have been reported in animals due to oral exposure to thallium (ATSDR, 1992b). Adverse effects on the reproductive system include changes in the morphology, function, and biochemistry in the testes of male rats.

Vanadium

Adverse effects on blood, respiratory system, cardiovascular system, and reproductive system have been reported in animals due to oral exposure to vanadium (ATSDR, 2012). Reproductive effects include reduced fecundity in female rats and reduced sperm counts in male rats. Reduced growth has also been reported in laboratory animals. However, the reduction in growth is thought to be a secondary effect of reduced water ingestion due to exposure to vanadium.

2.5 Potential Receptors

2.5.1 Receptor Groups for Second Tier Screening

The ESVs used to identify COPECs are generally protective for all ecological receptors. For the second tier screening, four receptor groups most representative of exposure to the COPECs in the Soil Stockpile are evaluated. The four receptor groups are soil invertebrates, terrestrial plants, meadow vole (mammalian herbivore), and short tailed shrew (mammalian insectivore). Section 2.6 discusses the exposure pathways for these receptors. Section 2.7 identifies ecotoxicity values.

2.5.2 Species of Concern

The U.S. Fish and Wildlife Service (USFWS) identifies nine species listed as threatened, endangered, proposed as endangered, or candidate for listing that are known to occur in Lucas, County (http://www.fws.gov/midwest/endangered/section7/sppranges/index.html). The nine species and potential to occur on the Site are discussed below.

Indiana Bat (Myotis sodalist)

The USFWS lists Indiana bat as endangered. Small streams with well-developed riparian corridors and upland forests are the primary habitats for Indiana bat. Hibernacula are located in caves and mines. The Soil Stockpile and adjacent areas do not provide these habitats.

Northern Long Eared Bat (Myotis septentrionalis)

The USFWS lists northern long eared bat as endangered. Wooded areas and forests are the primary habitats for northern long eared bat. Hibernacula are located in caves and mines. The Soil Stockpile and adjacent areas do not provide these habitats.

Kirtland's Warbler (Dendroica kirtlandii)

The USFWS lists Kirtland's warbler as endangered. The shoreline of Lake Erie is migratory habitat for Kirtland's warbler. Migration occurs in late April May and late August early October. The Soil Stockpile and adjacent areas do not provide habitat for Kirtland's warbler.

Piping Plover (Charadrius melodus)

The USFWS lists piping plover as endangered. Beaches along the shore of Lake Erie provide habitat for piping plover. The Soil Stockpile and adjacent areas do not provide this habitat.

Red Knot (Calidris canutus rufa)

The USFWS lists red knot as proposed threatened. Coastal inlets and bays are habitats for red knot. The Soil Stockpile and adjacent areas do not provide these habitats.

Eastern Massasauga (Sisturus catenatus)

The USFWS lists eastern massasauga as a candidate for listing. Wetlands and adjacent uplands are habitats for eastern massasauga. The Soil Stockpile and adjacent areas do not provide wetland habitat.

Karner Blue Butterfly (Lycaeides melissa samuelis)

The USFWS lists Karner blue butterfly as endangered. Pine barrens and oak savannas with sandy soil and wild lupines are habitats for Karner blue butterfly. The Soil Stockpile and adjacent areas do not provide these habitats.

Rayed Bean (Villosa fabilis)

The USFWS lists rayed bean as endangered. Small headwater creeks are the primary habitat for rayed bean. The Soil Stockpile and adjacent areas do not provide habitat for rayed bean.

Eastern Prairie Fringed Orchid (Platanthera leucophaea)

The USFWS lists eastern prairie fringed orchid as threatened. Mesic to wet prairies and meadows are habitats for eastern prairie fringed orchid. The Soil Stockpile and adjacent areas do not provide these habitats.

2.6 Complete Exposure Pathways

2.6.1 Soil Invertebrates

Complete exposure pathways for soil invertebrates are direct contact with soil, absorption through the integument, and direct ingestion. Samples from the Soil Stockpile were collected from depth intervals of 2-4 ft, 3-5 ft, 4-6 ft, 6-8 ft, 8-10 ft, 10-12 ft, 12-14 ft, 14-16 ft, 16-18 ft, and 24-28 ft below ground surface (bgs). It is conservatively assumed that soil invertebrates are exposed to the COPECs at all depth intervals.

2.6.2 Terrestrial Plants

Complete exposure pathways for terrestrial plants are direct contact with soil and absorption through roots and potentially stems and leaves. Similar to soil invertebrates, it is conservatively assumed that terrestrial plants are exposed to COPECs at all depth intervals within the Soil Stockpile.

2.6.3 Meadow Vole

Meadow vole is the indicator species for mammalian herbivores with small foraging ranges. Complete exposure pathways for meadow vole are ingestion of plant tissue that has bioaccumulated COPECs, ingestion of soil adsorbed to the surface of plants, and incidental ingestion of soil. It is conservatively assumed that meadow vole and other small mammalian herbivores obtain all of their diet from the Soil Stockpile.

2.6.4 Short-Tailed Shrew

Short tailed shrew is the indicator species for mammalian insectivores with small foraging ranges. Complete exposure pathways for short tailed shrew are ingestion of soil invertebrates that have bioaccumulated COPECs, ingestion of soil adsorbed to the surface of soil invertebrates, and incidental ingestion of soil. It is conservatively assumed that short tailed shrew and other small mammalian insectivores obtain all of their diet from the Soil Stockpile.

2.7 Ecotoxicity Values

2.7.1 Soil Invertebrates

Sources of ecotoxicity values for soil invertebrates (EV_{SI}s) are Eco-SSLs identified by USEPA (2005a) and soil quality guidelines (SQG_Es) for direct contact identified by the Canadian Council of Ministers of the Environment (CCME, various publications for individual constituents). Table 3 identifies the available EV_{SI}s for the five COPECs. Eco-SSLs were preferentially selected as EV_{SI}s, if available. If an Eco-SSL was not available, the CCME SQG_E was used as the EV_{SI}.

Eco-SSLs for soil invertebrates have been identified for HMW PAHs (USEPA, 2007d) and antimony (USEPA, 2005b). In the absence of Eco-SSLs, CCME SQG_Es were used as the EV_{SI}s for total PCBs, thallium, and vanadium.

Table 3 also identifies the mean reported background concentration for vanadium in Ohio as identified by USEPA (2005a). The ESSI for vanadium (130 mg/kg) is above mean background. The USEPA (2005a) has not identified background concentrations specific to Ohio for HMW PAHs, total PCBs, antimony, and thallium.

2.7.2 Terrestrial Plants

Sources of EVs for terrestrial plants (EVTPs) are Eco-SSLs identified by USEPA (2005a), screening levels identified by Oak Ridge National Laboratory (ORNL) (Efroymson et al., 1997), and SQG_Es for direct contact identified by CCME (various publications for individual constituents). Table 4 identifies the available EV_{TP}s for the five COPECs. Eco-SSLs were preferentially selected as EV_{TP}s, if available. If an Eco-SSL was not available, the lower of the ORNL screening value and CCME SQG_E was selected as the EV_{TP}.

An Eco-SSL for terrestrial plants has been identified for vanadium (USEPA, 2005i). Although USEPA has not identified an Eco-SSL for HMW PAHs, a range of EVs are identified in the source document (see Table 3.1 in USEPA, 2007d). The EVs range from 30 mg/kg to greater than 1,000 mg/kg. The lowest of the reported EVs was identified as the surrogate Eco-SSL. In the absence of Eco-SSLs, CCME SQG_Es were used as the EV_{TP}s for total PCBs and thallium. ORNL also identifies screening value for total PCBs. However, the value is higher than the SQG_E. The only EV for antimony is the ORNL screening value.

Table 4 also identifies the mean reported background concentration for vanadium in Ohio as identified by USEPA (2005a). The ES_{TP} for vanadium (100 mg/kg) is above mean background.

2.7.3 Meadow Vole

Sources of EVs for meadow vole (EV_{MV}s) are Eco-SSLs identified by USEPA (2005a) and SQG_Es for ingestion identified by CCME (various publications for individual constituents). With the exception of total PCBs, the SQG_Es are not specific to herbivores. Because bioaccumulation COPECs in plant tissue is generally lower than for other dietary items, it is reasonable to assume that SQG_Es are protective of meadow vole and other mammalian herbivores. Table 5 identifies the available EV_{MV}s for the five COPECs. Eco-SSLs were preferentially selected as EV_{MV}s, if available. If an Eco-SSL was not available, the SQG_E was selected as the EV_{MV}.

Eco-SSLs for meadow vole have been identified for HMW PAHs (USEPA, 2007d), antimony (USEPA, 2005b), and vanadium (USEPA, 2005i). In the absence of Eco-SSLs, SQG_Es were selected as the EV_{MV}s for total PCBs and thallium. The SQG_E for total PCBs is for primary consumers.

Table 5 also identifies the mean reported background concentration for vanadium in Ohio as identified by USEPA (2005a). The ES_{MV} for vanadium (1,300 mg/kg) is above mean background.

2.7.4 Short-Tailed Shrew

Sources of EVs for short tailed shrew (EV_{SS}s) are Eco-SSLs identified by USEPA (2005a), ESLs based on masked shrew identified by USEPA Region V (USEPA, 2003a), and SQG_Es for ingestion identified by CCME (various publications for individual constituents). Table 6 identifies the available EV_{SS}s for the five COPECs. Eco-SSLs were preferentially selected as EV_{MV}s, if available. If an Eco-SSL was not available, the Region V ESLs were preferentially selected over the CCME SQG_Es.

Eco-SSLs for short tailed shrew have been identified for HMW PAHs (USEPA, 2007d), antimony (USEPA, 2005b), and vanadium (USEPA, 2005i). In the absence of Eco-SSLs, Region V ESLs were selected as the EV_{SS}s for total PCBs and thallium.

Table 6 also identifies the mean reported background concentration for vanadium in Ohio as identified by USEPA (2005a). The ES_{SS} for vanadium (280 mg/kg) is above mean background.

3. Step 2 - Exposure Estimate and Risk Calculations

3.1 Exposure

For soil invertebrates and terrestrial plants, concentrations of the COPECs in each sample were compared to their EVs. Although statistics of central tendency, such as the means and upper confidence limit (UCL), can provide some useful information, these statistics provide limited information on the areal extent and spatial distribution of potential contamination and risk to sessile organisms. Moreover, a small number and percentage of exceedences of a conservative EV is not necessarily indicative of an ecologically significant impact to populations or communities. Accordingly, the potential for risk to soil invertebrates and terrestrial plants is considered to be

ecologically significant if concentrations in greater than 20 percent of samples exceed an EV (Suter, 1993).

For meadow vole and short tailed, the exposure point concentrations (EPCs) evaluated were maximum and 95 percent UCL concentrations. The 95 percent UCL concentrations were calculation using ProUCL, Version 5.0 (USEPA, 2013). Exposure assumptions for the second tier screening include 100 percent bioavailability of all COPECs, exposure of the most sensitive life stage, 100 percent area use (i.e., all of the diet is obtained from the Soil Stockpile), and all of the diet has been exposed to COPECs. The potential for risk is considered to be ecologically significant if the hazard quotient (HQ = EPC/EV) is greater than 1.0. PRGs were developed for those constituents with HQs greater than 1.0.

3.2 Risk Calculation

3.2.1 Soil Invertebrates

Table 7 summarizes the second tier screening for soil invertebrates. Information presented in Table 7 includes number of samples, number of samples with detected concentrations, minimum and maximum detected concentrations, EV, number and percent of samples with concentrations greater than the EV, and the rationale for retaining or eliminating a constituent as COPEC.

For total PCBs, antimony, thallium, and vanadium, concentrations in all samples are below their EVs. These four constituents are eliminated as COPECs. For HMW PAHs, the concentration in one of eight samples (13 percent) slightly exceeds the EV. Based on concentrations in less than 20 percent of samples that exceed the EV, HMW PAHs are also eliminated as a COPEC.

Based on the results of the second tier screening, it can be concluded that concentrations of HMW PAHs, total PCBs, antimony, thallium, and vanadium in the Soil Stockpile do not pose an ecologically significant potential for risk to soil invertebrates.

3.2.2 Terrestrial Plants

Table 8 summarizes the second tier screening for terrestrial plants. Information presented in Table 8 is similar to that presented in Table 7 for soil invertebrates.

For all five COPECs, concentrations in all samples are below their EVs and all five constituents are eliminated as COPECs.

Based on the results of the second tier screening, it can be concluded that concentrations of HMW PAHs, total PCBs, antimony, thallium, and vanadium in the Soil Stockpile do not pose an ecologically significant potential for risk to soil invertebrates.

3.2.3 Meadow Vole

Table 9 summarizes the second tier screening for meadow vole, the indicator species for mammalian herbivores. Information presented in Table 9 includes number of samples, number of samples with detected concentrations, maximum and 95 percent UCL concentrations, EV, HQs for the maximum (HQ_{Max}) and 95 percent UCL (HQ_{UCL}) EPCs, and the rationale for retaining or eliminating a constituent as COPEC.

For HMW PAHs, total PCBs, antimony, and vanadium, both the HQ_{Max} and HQ_{UCL} are less than 1.0. These four constituents are eliminated as COPECs for meadow vole.

For thallium, both the HQ_{Max} and HQ_{UCL} are greater than 1.0. Based on this result, thallium is retained as a COPEC for meadow vole and is carried forward for calculation of a PRG.

3.2.4 Short-Tailed Shrew

Table 10 summarizes the second tier screening for short tailed shrew, the indicator species for mammalian insectivores. Information presented in Table 10 is similar to that presented in Tables 9 for meadow vole.

For vanadium, both the HQ_{Max} and HQ_{UCL} are less than 1.0. Vanadium is eliminated as a COPEC for short tailed shrew.

For HMW PAHs, total PCBs, antimony, and thallium, both the HQ_{Max} and HQ_{UCL} are greater than 1.0. Based on these results, HMW PAHs, total PCBs, antimony, and thallium are retained as COPECs for short tailed shrew and are carried forward for calculation of PRGs.

4. Protective Risk Goals

Based on the results of the second tier screening, PRGs are calculated for HMW PAHs, total PCBs, antimony, and thallium. For thallium, the HQ_{Max} and HQ_{UCL} for both meadow vole and short tailed shrew are greater than 1.0. Because shrew has higher EPCs than meadow vole, development of PRGs focuses on shrew.

The PRGs for HMW PAHs, total PCBs, antimony, and thallium were provided by Region V in correspondence dated April 14, 2015. Table 11 summarizes the exposure parameters, soil to soil invertebrate uptake equations, and toxicity reference values (TRVs) upon which the PRGs are based. The TRVs are lowest observed adverse effect levels (LOAELs). The PRGs were calculated based on the equation:

$$HQ = (FIR * (Conc_{soil} * P_s + B))/TRV \qquad \text{Equation 1}$$

Where:

HQ =	hazard quotient (unitless);
FIR =	food ingestion rate (g/g-day);
$Conc_{soil}$ =	concentration of the COPEC in soil (mg/kg);
P_s =	proportion of soil in ingestion in the diet (unitless);
B =	concentration of the COPEC in soil invertebrates (mg/kg); and
TRV =	toxicity reference value (mg/kg-day).

The PRG is the value for $Conc_{soil}$ when the HQ is set to a value of 1.0.

Table 12 identifies the PRGs for HMW PAHs, total PCBs, antimony, and thallium. Other information presented in Table 12 includes maximum and 95 percent UCL concentration and determination if the EPCs exceed PRGs.

For antimony and thallium, the maximum and 95 percent UCL concentrations are below the PRGs. Consequently, it can be concluded that antimony and thallium do not pose a potential for risk to shrew or meadow vole above the threshold for concern.

For total PCBs, the maximum concentration exceeds the PRGs, whereas the 95 percent UCL concentration is below the PRG. The concentration in one other sample also exceeds the PRG. Because the 95 percent concentration is more representative of exposure than the maximum concentration (i.e., wildlife obtain food throughout their foraging range rather than only the location of the maximum concentration), it can reasonably be concluded that total PCBs do not pose a potential for risk to shrew or meadow vole above the threshold for concern.

For HMW PAHs, both the maximum and 95 percent UCL concentration exceed the PRG. Two of the eight samples have concentrations that exceed the PRG of 7.04 mg/kg. The exceedences are 17.2 mg/kg for sample SP-3 and 24.4 mg/kg for sample SP-7. Elevated concentrations in two samples are not expected to have an ecologically significant adverse impact on shrew populations. Consequently, it can reasonably be concluded that HMW PAHs do not pose a potential for risk to shrew or meadow vole above the threshold for concern.

5. Uncertainties

5.1 Overview

Evaluation of risk to ecological receptors is typically associated with numerous sources of uncertainty. In the absence of data, assumptions must be made regarding exposure concentrations and responses of ecological receptors to COPECs. To avoid incorrectly dismissing actual risk, exposure concentrations and other assumptions are biased toward identifying risk. As a result of this bias, it can be concluded with a high level of certainty that constituents with SQs and HQs below 1.0 do not pose an unacceptable potential for risk to ecological receptors. At the same time, given the conservative nature of the process, an SQ or HQ greater than one does not demonstrate that the risk actually exists. It only demonstrates that current information is insufficient to dismiss risk. Specific sources of uncertainty associated with the SERA are discussed below.

5.2 Exposure Point Concentrations

Samples collected for analysis of VOCs and PCBs were collected at several depth intervals within the Soil Stockpile, with the majority of samples collected from intervals at which ecological receptors are not likely to be exposed. Due to the method in which the Soil Stockpile was constructed, it was assumed that all samples are representative of soil to which ecological receptors are exposed.

For development of PRGs, concentrations of the COPECs in soil invertebrates were calculated using general equations identified in the literature and guidance. As invertebrates were not collected from the Soil Stockpile and analyzed for the COPECs, the actual EPCs for soil invertebrates is uncertain.

5.3 Methyl Acetate

An ESV is not available for methyl acetate. Based on chemical properties, it was concluded that this COPEC is not expected to persist in the environment or bioaccumulate. Because data are

available for a single sampling event, the persistence of methyl acetate in the Soil Stockpile is uncertain.

5.4 Ecotoxicity Values

Some of the EVs for the second tier screening were SQG_Es identified by CCME. The SQG_Es for direct contact are applied to both soil invertebrates and terrestrial plants whereas the SQG_Es for ingestion are applied to both avian and mammalian wildlife. Similarly, the Region V ESLs, which are based on masked shrew, were applied to both meadow vole (herbivore) and short tailed shrew (insectivore). There is some uncertainty with the application of EVs to multiple receptors. However, any uncertainty is biased toward the most exposed and sensitive receptor (e.g., shrew is more highly exposed than meadow vole).

Background concentrations provide a benchmark for assessing the applicability of an EV for naturally occurring COPECs to regional or site specific conditions. Mean background is available only for vanadium. In the absence of data for background, the applicability of EVs for antimony and thallium to northern Ohio is uncertain.

5.5 Protective Risk Goals

The maximum and 95 percent UCL concentrations exceed the PRG for HMW PAHs. As discussed in Section 5.2, there is uncertainty associated with the concentration of HMW PAH in soil invertebrates consumed by shrew. There is also uncertainty associated with the LOAEL for HMW PAHs. The LOAEL used by Region V to develop the PRG for HMW PAHs is 3.07 mg/kg day. This is the lowest of the bounded LOAELs for benzo(a)pyrene identified in the source document for development of the Eco SSLs for PAHs (USEPA, 2007d). For the two samples with concentrations that exceed the PRG, benzo(a)pyrene accounts for approximately 10 percent of the HMW PAHs. Because benzo(a)pyrene is generally considered to be the most toxic of the HMW PAHs, the LOAEL of 3.07 mg/kg day is conservative and overestimates the potential for risk.

The LOAEL of 3.07 mg/kg day is for the survival endpoint. The single bounded LOAEL for reproduction identified in the source document is 45.9 mg/kg day. The bounded LOAELs for growth range from 12.4 mg/kg day to 118 mg/kg day. These LOAELs, which are at least an order of magnitude greater than 3.07 mg/kg day, provide further evidence that that LOAEL used to develop the PRG is conservative and overestimates the potential for risk to shrew.

6. Summary and Conclusions

A SERA, consisting of Steps 1 and 2 of the 8 step process for conducting ecological risk assessments, was conducted based on samples collected from the Soil Stockpile in December 2011. The initial screening using conservative ESVs identified HMW PAHs, total PCBs, antimony, thallium, and vanadium as COPECs. The second tier screening evaluated the potential for risk to soil invertebrates, terrestrial plants, meadow vole (mammalian herbivore), and short tailed shrew (mammalian insectivore) posed by these five COPECs. None of the five COPECs were identified as posing risk to soil invertebrates or terrestrial plants. The secondary screening identified thallium as potentially posing risk to meadow vole and short tailed shrew and HMW PAHs, total PCBs, antimony, and thallium as potentially posing risk to short tailed shrew.

PRGs based on shrew were developed for HMW PAHs, total PCBs, antimony, and thallium. The maximum and the 95 percent UCL concentrations for antimony and thallium are below their PRGs. For total PCBs, concentrations in two samples exceed the PRG whereas the 95 percent UCL, which is more representative of exposure, is below the PRG. For HMW PAHs, both the maximum and 95 percent UCL concentrations exceed the PRG.

Risk posed by HMW PAHs is likely ecologically insignificant. Concentrations in two of the eight samples exceed the PRG. Moreover, the LOAEL used to develop the PRG, which is based on survival, is at least an order of magnitude lower than LOAELs for sub lethal endpoints.

Based on the results of the SERA, neither further evaluation of risk nor remedial measures for protection of ecological receptors area is warranted.

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Table 1

Ecological Screening Values
RACER Trust Property
Toledo, Oho

Constituent	Units	Ecological Screening Values		
		Value	Source	Basis
Volatile Organic Compounds (VOCs)				
2-Butanone	mg/kg	8.96E+01	EPA V	Mammalian
Acetone	mg/kg	2.50E+00	EPA V	Mammalian
Carbon Disulfide	mg/kg	9.00E-02	EPA V	Mammalian
Chloroform	mg/kg	1.19E+00	EPA V	Mammalian
Methyl Acetate	mg/kg	n/a	---	---
Toluene	mg/kg	5.45E+00	EPA V	Mammalian
Vinyl Chloride	mg/kg	6.46E-01	EPA V	Mammalian
Semi-Volatile Organic Compounds (SVOCs)				
Carbazole	mg/kg	2.90E+01	Eco-SSL	Invertebrate
Dibenzofuran	mg/kg	1.10E+00	Eco-SSL	Mammalian
Dimethyl Phthalate	mg/kg	7.34E+02	EPA V	Mammalian
Polycyclic Aromatic Hydrocarbons (PAHs)				
Low Molecular Weight (LMW) PAHs				
2-Methylnaphthalene	mg/kg	2.90E+01	Eco-SSL	Invertebrate
Acenaphthene	mg/kg	2.90E+01	Eco-SSL	Invertebrate
Acenaphthylene	mg/kg	2.90E+01	Eco-SSL	Invertebrate
Anthracene	mg/kg	2.90E+01	Eco-SSL	Invertebrate
Fluorene	mg/kg	2.90E+01	Eco-SSL	Invertebrate
Naphthalene	mg/kg	2.90E+01	Eco-SSL	Invertebrate
Phenanthrene	mg/kg	2.90E+01	Eco-SSL	Invertebrate
Sum of LMW PAHS	mg/kg	2.90E+01	Eco-SSL	Invertebrate
High Molecular Weight (HMW) PAHs				
Benzo(a)anthracene	mg/kg	1.10E+00	Eco-SSL	Mammalian
Benzo(a)pyrene	mg/kg	1.10E+00	Eco-SSL	Mammalian
Benzo(b)fluoranthene	mg/kg	1.10E+00	Eco-SSL	Mammalian
Benzo(g,h,i)perylene	mg/kg	1.10E+00	Eco-SSL	Mammalian
Benzo(k)fluoranthene	mg/kg	1.10E+00	Eco-SSL	Mammalian
Chrysene	mg/kg	1.10E+00	Eco-SSL	Mammalian
Dibenz(a,h)anthracene	mg/kg	1.10E+00	Eco-SSL	Mammalian
Fluoranthene	mg/kg	1.10E+00	Eco-SSL	Mammalian
Indeno(1,2,3-cd)pyrene	mg/kg	1.10E+00	Eco-SSL	Mammalian

Ecological Screening Values
RACER Trust Property
Toledo, Oho

Constituent	Units	Ecological Screening Values		
		Value	Source	Basis
Polycyclic Aromatic Hydrocarbons (PAHs) (continued)				
High Molecular Weight (HMW) PAHs (continued)				
Pyrene	mg/kg	1.10E+00	Eco-SSL	Mammalian
Sum of HMW PAHs	mg/kg	1.10E+00	Eco-SSL	Mammalian
Polychlorinated Biphenyls (PCBs)				
Aroclor-1248 (PCB-1248)	mg/kg	3.32E-04	EPA V	Mammalian
Aroclor-1254 (PCB-1254)	mg/kg	3.32E-04	EPA V	Mammalian
Aroclor-1260 (PCB-1260)	mg/kg	3.32E-04	EPA V	Mammalian
Total PCBs	mg/kg	3.32E-04	EPA V	Mammalian
Metals				
Aluminum	mg/kg	pH < 5.5	Eco-SSL	Solubility
Antimony	mg/kg	2.70E-01	Eco-SSL	Mammalian
Arsenic	mg/kg	1.80E+01	Eco-SSL	Plants
Barium	mg/kg	3.30E+02	Eco-SSL	Invertebrate
Beryllium	mg/kg	2.10E+01	Eco-SSL	Mammalian
Cadmium	mg/kg	3.60E-01	Eco-SSL	Mammalian
Chromium	mg/kg	2.60E+01	Eco-SSL	Avian
Cobalt	mg/kg	1.30E+01	Eco-SSL	Plant
Copper	mg/kg	2.80E+01	Eco-SSL	Avian
Lead	mg/kg	1.10E+01	Eco-SSL	Avian
Manganese	mg/kg	2.20E+02	Eco-SSL	Plant
Mercury	mg/kg	1.00E-01	EPA V	Invertebrate
Nickel	mg/kg	3.80E+01	Eco-SSL	Plant
Thallium [a]	mg/kg	5.90E-01	EPA V	Mammalian
Vanadium	mg/kg	7.80E+00	Eco-SSL	Avian
Zinc	mg/kg	4.60E+01	Eco-SSL	Avian

Notes:

Eco-SSL - Ecological soil screening level (see references for constituent-specific citation)

EPA V - U.S. Environmental Protection Agency (USEPA) ecological screening level (ESL) (USEPA 2003)

n/a - Ecological screening value not available

[a] - Ecological soil screening for thallium provided by Region V in correspondence dated April 14, 2015

Table 2

Screening for Constituents of Potential Ecological Concern
RACER Trust Property
Toledo, Ohio

Constituent	Units	No. Samples	No. Detects	FOD	Maximum Concentration	ESV	SQ	COPEC	Rationale
Volatile Organic Compounds (VOCs)									
2-Butanone	mg/kg	8	4	50%	5.40E-03	8.96E+01	6E-05	No	SQ < 1
Acetone	mg/kg	8	5	63%	2.80E-02	2.50E+00	1.1E-02	No	SQ < 1
Carbon Disulfide	mg/kg	8	6	75%	1.20E-03	9.00E-02	1.3E-02	No	SQ < 1
Chloroform	mg/kg	8	3	38%	3.00E-03	1.19E+00	2.5E-03	No	SQ < 1
Methyl Acetate	mg/kg	8	3	38%	5.80E-03	n/a	n/c	No	See Text
Toluene	mg/kg	8	8	100%	8.40E-04	5.45	1.5E-04	No	SQ < 1
Vinyl Chloride	mg/kg	8	1	13%	5.50E-04	0.646	8.5E-04	No	SQ < 1
Semi-Volatile Organic Compounds (SVOCs)									
Carbazole	mg/kg	8	4	50%	2.90E-01	2.90E+01	1.7E-02	No	SQ < 1
Dibenzofuran	mg/kg	8	6	75%	9.50E-01	1.10E+00	6.8E-01	No	SQ < 1
Dimethyl Phthalate	mg/kg	8	1	13%	3.90E-02	7.34E+02	1.7E-04	No	SQ < 1
Polycyclic Aromatic Hydrocarbons (PAHs)									
Low Molecular Weight (LMW) PAHs									
2-Methylnaphthalene	mg/kg	8	5	63%	3.70E-02	2.90E+01	1.3E-03	No	SQ < 1
Acenaphthene	mg/kg	8	7	88%	1.30E-01	2.90E+01	4.5E-03	No	SQ < 1
Acenaphthylene	mg/kg	8	3	38%	5.30E-02	2.90E+01	1.8E-03	No	SQ < 1
Anthracene	mg/kg	8	7	88%	4.20E-01	2.90E+01	1.4E-02	No	SQ < 1
Fluorene	mg/kg	8	7	88%	1.60E-01	2.90E+01	5.5E-03	No	SQ < 1
Naphthalene	mg/kg	8	5	63%	7.10E-02	2.90E+01	2.4E-03	No	SQ < 1
Phenanthrene	mg/kg	8	7	88%	1.90E+00	2.90E+01	6.6E-02	No	SQ < 1
Sum of LMW PAHS	mg/kg	8	7	88%	2.56E+00	2.90E+01	8.8E-02	No	SQ < 1
High Molecular Weight (HMW) PAHs									
Benzo(a)anthracene	**mg/kg**	**8**	**7**	**88%**	**2.70E+00**	**1.10E+00**	**2.5E+00**	**YES**	**SQ > 1**
Benzo(a)pyrene	**mg/kg**	**8**	**8**	**100%**	**2.40E+00**	**1.10E+00**	**2.2E+00**	**YES**	**SQ > 1**
Benzo(b)fluoranthene	**mg/kg**	**8**	**8**	**100%**	**3.20E+00**	**1.10E+00**	**2.9E+00**	**YES**	**SQ > 1**
Benzo(g,h,i)perylene	**mg/kg**	**8**	**7**	**88%**	**1.50E+00**	**1.10E+00**	**1.4E+00**	**YES**	**SQ > 1**
Benzo(k)fluoranthene	**mg/kg**	**8**	**7**	**88%**	**1.30E+00**	**1.10E+00**	**1.2E+00**	**YES**	**SQ > 1**
Chrysene	**mg/kg**	**8**	**7**	**88%**	**2.40E+00**	**1.10E+00**	**2.2E+00**	**YES**	**SQ > 1**
Dibenz(a,h)anthracene	mg/kg	8	2	25%	5.60E-02	1.10E+00	5.1E-02	No	SQ < 1
Fluoranthene	**mg/kg**	**8**	**8**	**100%**	**5.20E+00**	**1.10E+00**	**4.7E+00**	**YES**	**SQ > 1**
Indeno(1,2,3-cd)pyrene	**mg/kg**	**8**	**7**	**88%**	**1.30E+00**	**1.10E+00**	**1.2E+00**	**YES**	**SQ > 1**

Table 2

Screening for Constituents of Potential Ecological Concern
RACER Trust Property
Toledo, Ohio

Polycyclic Aromatic Hydrocarbons (PAHs) (continued)									
High Molecular Weight (HMW) PAHs (continued)									
Pyrene	**mg/kg**	**8**	**7**	**88%**	**4.40E+00**	**1.10E+00**	**4.0E+00**	**YES**	**SQ > 1**
Sum of HMW PAHs	**mg/kg**	**8**	**8**	**100%**	**2.44E+01**	**1.10E+00**	**2.2E+01**	**YES**	**SQ > 1**
Polychlorinated Biphenyls (PCBs)									
Aroclor-1248 (PCB-1248)	**mg/kg**	**24**	**3**	**13%**	**6.00E-01**	**3.32E-04**	**1.8E+03**	**YES**	**SQ > 1**
Aroclor-1254 (PCB-1254)	**mg/kg**	**24**	**9**	**38%**	**7.50E-01**	**3.32E-04**	**2.3E+03**	**YES**	**SQ > 1**
Aroclor-1260 (PCB-1260)	**mg/kg**	**24**	**3**	**13%**	**1.30E-01**	**3.32E-04**	**3.9E+02**	**YES**	**SQ > 1**
Total PCBs	**mg/kg**	**24**	**12**	**50%**	**7.50E-01**	**3.32E-04**	**2.3E+03**	**YES**	**SQ > 1**
Metals									
Aluminum	mg/kg	8	8	100%	5.90E+03	pH < 5.5			
Antimony	**mg/kg**	**8**	**3**	**38%**	**8.30E-01**	**2.70E-01**	**3.1E+00**	**YES**	**SQ > 1**
Arsenic	mg/kg	8	8	100%	1.00E+01	1.80E+01	5.6E-01	No	SQ < 1
Barium	mg/kg	8	8	100%	4.90E+01	3.30E+02	1.5E-01	No	SQ < 1
Beryllium	mg/kg	8	6	75%	3.20E-01	2.10E+01	1.5E-02	No	SQ < 1
Cadmium	mg/kg	8	5	63%	2.50E-01	3.60E-01	6.9E-01	No	SQ <1
Chromium	mg/kg	8	8	100%	1.00E+01	2.60E+01	3.8E-01	No	SQ < 1
Cobalt	mg/kg	8	8	100%	3.80E+00	1.30E+01	2.9E-01	No	SQ < 1
Copper	mg/kg	8	8	100%	1.00E+01	2.80E+01	3.6E-01	No	SQ < 1
Lead	mg/kg	8	8	100%	1.00E+01	1.10E+01	9.1E-01	No	SQ < 1
Manganese	mg/kg	8	8	100%	2.20E+02	2.20E+02	1.0E+00	No	SQ $\leq$ 1
Mercury	mg/kg	8	1	13%	1.80E-02	1.00E-01	1.8E-01	No	SQ < 1
Nickel	mg/kg	8	8	100%	1.30E+01	3.80E+01	3.4E-01	No	SQ < 1
Thallium	**mg/kg**	**8**	**5**	**63%**	**1.30E+00**	**5.90E-01**	**2.2E+00**	**YES**	**SQ > 1**
Vanadium	**mg/kg**	**8**	**8**	**100%**	**1.40E+01**	**7.80E+00**	**1.8E+00**	**YES**	**SQ > 1**
Zinc	mg/kg	8	8	100%	3.70E+01	4.60E+01	8.0E-01	No	SQ < 1

Notes:

COPEC - Constituent of potential ecological concern
ESV - Ecological screening value
FOD - Frequency of detection
SQ - Screening quotient

Ecotoxicity Values for Soil Invertebrates
RACER Trust Property
Toledo, Ohio

Constituent of Potential Ecological Concern	Units	Ohio Background [a]	Source		Ecotoxicity Value
			Eco-SSL	CCME	
Polycyclic Aromatic Hydrocarbons (PAHs)					
High Molecular Weight PAHs	mg/kg	NI	1.80E+01	2.00E+01 [b]	1.80E+01
Polychlorinated Biphenyls (PCBs)					
Total PCBs	mg/kg	NI	NI	3.30E+01	3.30E+01
Metals					
Antimony	mg/kg	NI	7.80E+01	NI	7.80E+01
Thallium	mg/kg	NI	NI	1.40E+00	1.40E+00
Vanadium	mg/kg	8.80E+01	NI	1.30E+02	1.30E+02

Notes:

[a] - Mean reported soil background (USEPA, 2005a)

[b] - Value for benzo(a)pyrene for Agricultural and Residential/Parkland land uses

CCME - Canadian Council of Ministers of the Environment (see references for citation)

Eco-SSL - Ecological soil screening level

n/a - Screening value not available

NI - Screening value not identified

Table 4

EcotoXicity Values for Terrestrial Plant
RACER Trust Property
Toledo, Ohio

Constituent of Potential Ecological Concern	Units	Ohio Background [a]	Source			Ecotoxicity Value
			Eco-SSL	ORNL [b]	CCME	
Methyl Acetate	mg/kg	NI	NI	NI	NI	n/a
Polycyclic Aromatic Hydrocarbons (PAHs)						
High Molecular Weight PAHs	mg/kg	NI	3.00E+01	NI	2.00E+01 [c]	3.00E+01
Polychlorinated Biphenyls (PCBs)						
Total PCBs	mg/kg	NI	NI	4.00E+01	3.30E+01	3.30E+01
Metals						
Antimony	mg/kg	NI	NI	5.0E+00	NI	5.00E+00
Thallium	mg/kg	NI	NI	NI	1.40E+00	1.40E+00
Vanadium	mg/kg	88	1.00E+02 [d]	2.00E+00	1.30E+02	1.00E+02

Notes:

[a] - Mean reported soil background (USEPA, 2005a)

[b] - Efroymson et al. (1997)

[c] - Value for benzo(a)pyrene for Agricultural and Residential/Parkland land uses

[d] - Value for broccoli identified in Table 3.1 of Eco-SSL source document for vanadium (USEPA, 2005i)

CCME - Canadian Council of Ministers of the Environment (see references for citation)

Eco-SSL - Ecological soil screening level

ORNL - Oak Ridge National Laboratory

n/a - Screening value not available

NI - Screening value not identified

Ecotoxicity Values for Meadow Vole
RACER Trust Property
Toledo, Ohio

Constituent of Potential Ecological Concern	Units	Ohio Background [a]	Source		Ecotoxcity Value
			Eco-SSL	CCME	
Polycyclic Aromatic Hydrocarbons (PAHs)					
High Molecular Weight PAHs	mg/kg	NI	3.90E+01	6.00E-01 [b]	3.90E+01
Polychlorinated Biphenyls (PCBs)					
Total PCBs	mg/kg	NI	NI	2.50E+01 [c]	2.50E+01
Metals					
Antimony	mg/kg	NI	1.00E+01	NI	1.00E+01
Thallium	mg/kg	NI	NI	1.0E+00	1.00E+00
Vanadium	mg/kg	8.80E+01	1.30E+03	NI	1.30E+03

Notes:

[a] - Mean reported soil background (USEPA, 2005a)

[b] - Soil Quality Guideline for benzo(a)pyrene for Agricultural and and Residential land uses

[c] - Soil Quality Guideline for primary consumers for Agricultural and Residential land uses

CCME - Canadian Council of Ministers of the Environment (see references for citation)

Eco-SSL - Ecological soil screening level

n/a - Screening value not available

NI - Screening value not identified

Table 6

Screening Values for Short-Tailed Shrew
RACER Trust Property
Toledo, Ohio

Constituent of Potential Ecological Concern	Units	Ohio Background [a]	Source			Screening Value
			Eco-SSL	Region V ESL	CCME	
Polycyclic Aromatic Hydrocarbons (PAHs)						
High Molecular Weight PAHs	mg/kg	NI	1.10E+00	NI	6.00E-01 [b]	1.10E+00
Polychlorinated Biphenyls (PCBs)						
Total PCBs	mg/kg	NI	NI	3.32E-04 [c]	1.80E+00 [d]	3.32E-04
Metals						
Antimony	mg/kg	NI	2.70E-01	NI	NI	2.70E-01
Thallium	mg/kg	NI	NI	5.90E-01 [c]	1.0E+00	5.90E-01
Vanadium	mg/kg	8.80E+01	2.80E+02	NI	NI	2.80E+02

Notes:

[a] - Mean reported soil background (USEPA, 2005a)
[b] - Soil Quality Guideline for benzo(a)pyrene for Agricultural and Residential land uses
[c] - Ecological screening level for masked shrew
[d] - Soil Quality Guideline for secondary consumers for Agricultural and Residential land uses
CCME - Canadian Council of Ministers of the Environment (see references for citation)
Eco-SSL - Ecological soil screening level
n/a - Screening value not available
NI - Screening value not identified

Table 7

Second Tier Screening - Soil Invertebrates
RACER Trust Property
Toledo, Ohio

COPEC	No. Samples	No. Detects	Detected Concentrations		EV_{SI} (mg/kg)	No. > EV_{SI}	Percent > EVS_I	Retain as COPEC	Rationale
			Minimum (mg/kg)	Maximum (mg/kg)					
Polycyclic Aromatic Hydrocarbons (PAHs)									
High HMW PAHs	8	8	2.35E-02	2.44E+01	1.80E+01	1	13%	No	< 20% > EV_{SI}
Polychlorinated Biphenyls (PCBs)									
Total PCBs	24	24	2.30E-02	7.50E-01	3.30E+01	0	0%	No	Max < EV_{SI}
Metals									
Antimony	8	3	3.70E-01	8.30E-01	7.80E+01	0	0%	No	Max < EV_{SI}
Thallium	8	5	9.20E-01	1.30E+00	1.40E+00	0	0%	No	Max < EV_{SI}
Vanadium	8	8	6.40E+00	1.40E+01	1.30E+02	0	0%	No	Max < EV_{SI}

Notes:

COPEC - Constituent of Potential Ecological Concern

EV_I - Ecotoxicity value for soil invertebrates

HMW - High Molecular Weight

Max - Maximum concentration

Table 8

Second Tier Screening - Terrestrial Plants
RACER Trust Property
Toledo, Ohio

COPEC	No. Samples	No. Detects	Detected Concentrations		EV_{TP} (mg/kg)	No. > EV_{TP}	Percent > EV_{TP}	Retain as COPEC	Rationale
			Minimum (mg/kg)	Maximum (mg/kg)					
Polycyclic Aromatic Hydrocarbons (PAHs)									
High HMW PAHs	8	8	2.35E-02	2.44E+01	3.00E+01	0	0%	No	Max < EV_{TP}
Polychlorinated Biphenyls (PCBs)									
Total PCBs	24	24	2.30E-02	7.50E-01	3.30E+01	0	0%	No	Max < EV_{TP}
Metals									
Antimony	8	3	3.70E-01	8.30E-01	5.00E+00	0	0%	No	Max < EV_{TP}
Thallium	8	5	9.20E-01	1.30E+00	1.40E+00	0	0%	No	Max < EV_{TP}
Vanadium	8	8	6.40E+00	1.40E+01	1.00E+02	0	0%	No	Max < EV_{TP}

Notes:

COPEC - Constituent of Potential Ecological Concern
EV_{TP} - Ecotoxicity value for terrestrial plants
HMW - High Molecular Weight
Max - Maximum concentration

Table 9

Second Tier Screening - Meadow Vole
RACER Trust Property
Toledo, Ohio

COPEC	No. Samples	No. Detects	Exposure Point Concentration		EV_{MV} (mg/kg)	HQ_{Max}	HQ_{UCL}	Retain as COPEC	Rationale
			Maximum (mg/kg)	UCL (mg/kg)					
Polycyclic Aromatic Hydrocarbons (PAHs)									
HMW PAHs	8	8	2.44E+01	2.19E+01	3.90E+01	6.3E-01	5.6E-01	No	$HQ_{Max} < 1.0$
Polychlorinated Biphenyls (PCBs)									
Total PCBs	24	24	7.50E-01	2.49E-01	2.50E+01	3.0E-02	1.0E-02	No	$HQ_{Max} < 1.0$
Metals									
Antimony	8	3	8.30E-01	8.14E-01	1.00E+01	8.3E-02	8.1E-02	No	$HQ_{Max} < 1.0$
Thallium	**8**	**5**	**1.30E+00**	**1.10E+00**	**5.90E-01**	**2.2E+00**	**1.9E+00**	**Yes**	**$HQ_{UCL} > 1.0$**
Vanadium	8	8	1.40E+01	1.01E+01	1.30E+03	1.1E-02	7.8E-03	No	$HQ_{Max} < 1.0$

Notes:

Bold Font identifies constituent retained as a Constituent of Potential Ecological Concern (COPEC)

COPEC - Constituent of Potential Ecological Concern

HMW - High Molecular Weight

EV_{MV} - Ecological Screening Value for Meadow Vole

HQ_{Max} - Hazard Quotient for maximum exposure point concentration

HQ_{UCL} - Hazard Quotient for Upper Confidence Limit (UCL) exposure point concentration

Table 10

Second Tier Screening - Short-Tailed Shrew
RACER Trust Property
Toledo, Ohio

COPEC	No. Samples	No. Detects	Exposure Point Concentration		EV_{ss} (mg/kg)	HQ_{Max}	HQ_{UCL}	Retain as COPEC	Rationale
			Maximum (mg/kg)	UCL (mg/kg)					
Polycyclic Aromatic Hydrocarbons (PAHs)									
High HMW PAHs	**8**	**8**	**2.44E+01**	**2.19E+01**	**1.10E+00**	**2.2E+01**	**2.0E+01**	**Yes**	**HQ_{UCL} > 1.0**
Polychlorinated Biphenyls (PCBs)									
Total PCBs	**24**	**24**	**7.50E-01**	**2.49E-01**	**3.32E-04**	**2.3E+03**	**7.5E+02**	**Yes**	**HQ_{UCL} > 1.0**
Metals									
Antimony	**8**	**3**	**8.30E-01**	**8.14E-01**	**2.70E-01**	**3.1E+00**	**3.0E+00**	**Yes**	**HQ_{UCL} > 1.0**
Thallium	**8**	**5**	**1.30E+00**	**1.10E+00**	**1.00E+00**	**1.3E+00**	**1.1E+00**	**Yes**	**HQ_{UCL} > 1.0**
Vanadium	8	8	1.40E+01	1.01E+01	2.80E+02	5.0E-02	3.6E-02	No	HQ_{Max} < 1.0

Notes:

Bold Font identifies constituent retained as a Constituent of Potential Ecological Concern (COPEC)

COPEC - Constituent of Potential Ecological Concern

HMW - High Molecular Weight

EV_{SS} - Ecological Screening Value for Meadow Vole

HQ_{Max} - Hazard Quotient for maximum exposure point concentration

HQ_{UCL} - Hazard Quotient for Upper Confidence Limit (UCL) exposure point concentration

Parameters for Calculation of Protective Risk Goals
RACER Trust Property
Toledo, Ohio

Parameter	Symbol	Units	Value/Equation	Source
Shrew				
Food Ingestion Rate	FIR	g/g-day	1.67E-01	USEPA Region V
Soil Ingestion	P_s	Proportion of Diet	9.00E-03	USEPA Region V
Concentration in Soil Invertebrates				
HMW PAHs	B	mg/kg	$B = 2.6 * Conc_{soil}$	USEPA (2005a)
Total PCBs			$\ln(B) = 1.41 + 1.361 * \ln(Conc_{soil})$	Sample et al. (1998)
Antimony			$B = 1.0 * Conc_{soil}$	USEPA (2005)
Thallium			$B = 0.054 * Conc_{soil}$	USEPA Region V
Lowest Observed Adverse Effect Level (LOAEL)				
HMW PAHs	TRV	mg/kg-day	3.07E+00	USEPA (2007d)
Total PCBs			3.20E-01	Millsap et al. (2004)
Antimony			5.90E-01	USEPA (2005b)
Thallium			7.50E-02	USACHPM (2004)

Notes:

Protective Risk Goal (PRG) calculated as : Hazard Quotient (HQ) = 1 = FIR * ($Conc_{soil}$ * P_s + B)/TRV

Table 12

Protective Risk Goals
RACER Trust Property
Toledo, Ohio

Constituent of Potential Ecological Concern	Units	PRG	Maximum Concentration	Maximum > PRG	UCL Concentration	UCL > PRG	Ecologically Significant Risk
Polycyclic Aromatic Hydrocarbons (PAHs)							
HMW PAHs	mg/kg	7.04E+00	2.44E+01	Yes	2.19E+01	Yes	No
Polychlorinated Biphenyls (PCBs)							
Total PCBs	mg/kg	5.70E-01	7.50E-01	Yes	2.49E-01	No	No
Metals							
Antimony	mg/kg	3.50E+00	8.30E-01	No	8.14E-01	No	No
Thallium	mg/kg	7.11E+00	1.30E+00	No	1.10E+00	No	No

Notes:
HMW - High Molecular Weight
PRG - Protective Risk Goal
UCL - Upper Confidence Limit

Appendices

Appendix A
Analytical Results

Appendix A

Analytical Data

Sample Location		*SP-1*	*SP-1*	*SP-1*	*SP-1*	*SP-1*	*SP-2*	*SP-2*	*SP-2*	*SP-2*
Sample Identification		*S-12609-120811-DN-13*	*S-12609-120811-DN-14*	*S-12609-120811-DN-17*	*S-12609-120811-DN-15*	*S-12609-120811-DN-16*	*S-12609-120811-DN-18*	*S-12609-120811-DN-19*	*S-12609-120811-DN-22*	*S-12609-120811-DN-20*
Sample Date		*12/8/2011*	*12/8/2011*	*12/8/2011*	*12/8/2011*	*12/8/2011*	*12/8/2011*	*12/8/2011*	*12/8/2011*	*12/8/2011*
Sample Depth		*-*	*(6-8) ft BGS*	*(6-8) ft BGS*	*(12-14) ft BGS*	*(16-18) ft BGS*	*-*	*(3-5) ft BGS*	*(3-5) ft BGS*	*(8-10) ft BGS*
Sample Type										
	Units									
Metals										
Aluminum	mg/kg	2600	--	--	--	--	1800	--	--	--
Antimony	mg/kg	0.87 U	--	--	--	--	1.0 U	--	--	--
Arsenic	mg/kg	**2.5**[ab]	--	--	--	--	**1.8**[ab]	--	--	--
Barium	mg/kg	15 JB	--	--	--	--	6.2 JB	--	--	--
Beryllium	mg/kg	0.075 J	--	--	--	--	0.089 J	--	--	--
Cadmium	mg/kg	0.14 J	--	--	--	--	0.069 J	--	--	--
Chromium	mg/kg	5.0	--	--	--	--	3.5	--	--	--
Cobalt	mg/kg	1.7 J	--	--	--	--	1.5 J	--	--	--
Copper	mg/kg	3.5	--	--	--	--	2.4 J	--	--	--
Lead	mg/kg	4.0	--	--	--	--	1.4	--	--	--
Manganese	mg/kg	61 B	--	--	--	--	29 B	--	--	--
Mercury	mg/kg	0.091 U	--	--	--	--	0.084 U	--	--	--
Nickel	mg/kg	5.2	--	--	--	--	3.8 J	--	--	--
Selenium	mg/kg	0.43 U	--	--	--	--	0.51 U	--	--	--
Silver	mg/kg	0.43 U	--	--	--	--	0.51 U	--	--	--
Thallium	mg/kg	0.87 U	--	--	--	--	1.0 U	--	--	--
Vanadium	mg/kg	7.2 B	--	--	--	--	6.4 B	--	--	--
Zinc	mg/kg	25	--	--	--	--	8.6	--	--	--
PCBs										
Aroclor-1016 (PCB-1016)	mg/kg	--	0.036 U	--	0.037 U	0.038 U	--	0.036 U	--	0.036 U
Aroclor-1221 (PCB-1221)	mg/kg	--	0.036 U	--	0.037 U	0.038 U	--	0.036 U	--	0.036 U
Aroclor-1232 (PCB-1232)	mg/kg	--	0.036 U	--	0.037 U	0.038 U	--	0.036 U	--	0.036 U
Aroclor-1242 (PCB-1242)	mg/kg	--	0.036 U	--	0.037 U	0.038 U	--	0.036 U	--	0.036 U
Aroclor-1248 (PCB-1248)	mg/kg	--	0.036 U	--	0.037 U	0.038 U	--	0.036 U	--	0.036 U
Aroclor-1254 (PCB-1254)	mg/kg	--	0.036 U	--	0.023 J	0.038 U	--	0.036 U	--	0.036 U
Aroclor-1260 (PCB-1260)	mg/kg	--	0.036 U	--	0.037 U	0.038 U	--	0.036 U	--	0.036 U
Total PCBs	mg/kg	--	ND	--	0.023 J	ND	--	ND		ND
Semi-Volatile Organic Compounds										
2,2'-Oxybis(1-chloropropane) (bis(2-Chloroisopropyl) ether)	mg/kg	0.11 U	--	--	--	--	0.11 U	--	--	--
2,4,5-Trichlorophenol	mg/kg	0.16 U	--	--	--	--	0.17 U	--	--	--
2,4,6-Trichlorophenol	mg/kg	0.16 U	--	--	--	--	0.17 U	--	--	--
2,4-Dichlorophenol	mg/kg	0.16 U	--	--	--	--	0.17 U	--	--	--
2,4-Dimethylphenol	mg/kg	0.16 U	--	--	--	--	0.17 U	--	--	--
2,4-Dinitrophenol	mg/kg	0.36 U	--	--	--	--	0.37 U	--	--	--
2,4-Dinitrotoluene	mg/kg	0.22 U	--	--	--	--	0.23 U	--	--	--
2,6-Dinitrotoluene	mg/kg	0.22 U	--	--	--	--	0.23 U	--	--	--
2-Chloronaphthalene	mg/kg	0.055 U	--	--	--	--	0.056 U	--	--	--
2-Chlorophenol	mg/kg	0.055 U	--	--	--	--	0.056 U	--	--	--
2-Methylnaphthalene	mg/kg	0.012	--	--	--	--	0.0075 U	--	--	--
2-Methylphenol	mg/kg	0.22 U	--	--	--	--	0.23 U	--	--	--
2-Nitroaniline	mg/kg	0.22 U	--	--	--	--	0.23 U	--	--	--
2-Nitrophenol	mg/kg	0.055 U	--	--	--	--	0.056 U	--	--	--
3&4-Methylphenol	mg/kg	0.44 U	--	--	--	--	0.45 U	--	--	--
3,3'-Dichlorobenzidine	mg/kg	0.11 U	--	--	--	--	0.11 U	--	--	--
3-Nitroaniline	mg/kg	0.22 U	--	--	--	--	0.23 U	--	--	--
4,6-Dinitro-2-methylphenol	mg/kg	0.16 U	--	--	--	--	0.17 U	--	--	--
4-Bromophenyl phenyl ether	mg/kg	0.055 U	--	--	--	--	0.056 U	--	--	--
4-Chloro-3-methylphenol	mg/kg	0.16 U	--	--	--	--	0.17 U	--	--	--
4-Chloroaniline	mg/kg	0.16 U	--	--	--	--	0.17 U	--	--	--
4-Chlorophenyl phenyl ether	mg/kg	0.055 U	--	--	--	--	0.056 U	--	--	--
4-Nitroaniline	mg/kg	0.22 U	--	--	--	--	0.23 U	--	--	--
4-Nitrophenol	mg/kg	0.36 U	--	--	--	--	0.37 U	--	--	--
Acenaphthene	mg/kg	0.023	--	--	--	--	0.0075 U	--	--	--
Acenaphthylene	mg/kg	0.012	--	--	--	--	0.0075 U	--	--	--
Acetophenone	mg/kg	0.11 U	--	--	--	--	0.11 U	--	--	--
Anthracene	mg/kg	0.066	--	--	--	--	0.0075 U	--	--	--
Atrazine	mg/kg	0.22 U	--	--	--	--	0.23 U	--	--	--
Benzaldehyde	mg/kg	0.11 U	--	--	--	--	0.11 U	--	--	--

Sample Location		SP-1	SP-1	SP-1	SP-1	SP-1	SP-2	SP-2	SP-2	SP-2
Sample Identification		S-12609-120811-DN-13	S-12609-120811-DN-14	S-12609-120811-DN-17	S-12609-120811-DN-15	S-12609-120811-DN-16	S-12609-120811-DN-18	S-12609-120811-DN-19	S-12609-120811-DN-22	S-12609-120811-DN-20
Sample Date		12/8/2011	12/8/2011	12/8/2011	12/8/2011	12/8/2011	12/8/2011	12/8/2011	12/8/2011	12/8/2011
Sample Depth		-	(6-8) ft BGS	(6-8) ft BGS	(12-14) ft BGS	(16-18) ft BGS	-	(3-5) ft BGS	(3-5) ft BGS	(8-10) ft BGS
Sample Type										
	Units									
Benzo(a)anthracene	mg/kg	**0.28[a]**	--	--	--	--	0.0075 U	--	--	--
Benzo(a)pyrene	mg/kg	**0.28[ab]**	--	--	--	--	0.0041 J	--	--	--
Benzo(b)fluoranthene	mg/kg	**0.44[a]**	--	--	--	--	0.0058 J	--	--	--
Benzo(g,h,i)perylene	mg/kg	0.2	--	--	--	--	0.0075 U	--	--	--
Benzo(k)fluoranthene	mg/kg	0.17	--	--	--	--	0.0075 U	--	--	--
Biphenyl (1,1-Biphenyl)	mg/kg	0.055 U	--	--	--	--	0.056 U	--	--	--
bis(2-Chloroethoxy)methane	mg/kg	0.11 U	--	--	--	--	0.11 U	--	--	--
bis(2-Chloroethyl)ether	mg/kg	0.11 U	--	--	--	--	0.11 U	--	--	--
bis(2-Ethylhexyl)phthalate (DEHP)	mg/kg	0.063 B	--	--	--	--	0.037 JB	--	--	--
Butyl benzylphthalate (BBP)	mg/kg	0.055 U	--	--	--	--	0.056 U	--	--	--
Caprolactam	mg/kg	0.36 U	--	--	--	--	0.37 U	--	--	--
Carbazole	mg/kg	0.043 J	--	--	--	--	0.056 U	--	--	--
Chrysene	mg/kg	0.31	--	--	--	--	0.0075 U	--	--	--
Dibenz(a,h)anthracene	mg/kg	0.0073 U	--	--	--	--	0.0075 U	--	--	--
Dibenzofuran	mg/kg	0.016 J	--	--	--	--	0.056 U	--	--	--
Diethyl phthalate	mg/kg	0.055 U	--	--	--	--	0.056 U	--	--	--
Dimethyl phthalate	mg/kg	0.055 U	--	--	--	--	0.056 U	--	--	--
Di-n-butylphthalate (DBP)	mg/kg	0.055 U	--	--	--	--	0.056 U	--	--	--
Di-n-octyl phthalate (DnOP)	mg/kg	0.055 U	--	--	--	--	0.056 U	--	--	--
Fluoranthene	mg/kg	0.66	--	--	--	--	0.0072 J	--	--	--
Fluorene	mg/kg	0.025	--	--	--	--	0.0075 U	--	--	--
Hexachlorobenzene	mg/kg	0.0073 U	--	--	--	--	0.0075 U	--	--	--
Hexachlorobutadiene	mg/kg	0.055 U	--	--	--	--	0.056 U	--	--	--
Hexachlorocyclopentadiene	mg/kg	0.36 U	--	--	--	--	0.37 U	--	--	--
Hexachloroethane	mg/kg	0.055 U	--	--	--	--	0.056 U	--	--	--
Indeno(1,2,3-cd)pyrene	mg/kg	**0.16[a]**	--	--	--	--	0.0075 U	--	--	--
Isophorone	mg/kg	0.055 U	--	--	--	--	0.056 U	--	--	--
Naphthalene	mg/kg	0.013	--	--	--	--	0.0075 U	--	--	--
Nitrobenzene	mg/kg	0.11 U	--	--	--	--	0.11 U	--	--	--
N-Nitrosodi-n-propylamine	mg/kg	0.055 U	--	--	--	--	0.056 U	--	--	--
N-Nitrosodiphenylamine	mg/kg	0.055 U	--	--	--	--	0.056 U	--	--	--
Pentachlorophenol	mg/kg	0.16 U	--	--	--	--	0.17 U	--	--	--
Phenanthrene	mg/kg	0.29	--	--	--	--	0.0075 U	--	--	--
Phenol	mg/kg	0.055 U	--	--	--	--	0.056 U	--	--	--
Pyrene	mg/kg	0.6	--	--	--	--	0.0064 J	--	--	--
Volatile Organic Compounds										
1,1,1-Trichloroethane	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
1,1,2,2-Tetrachloroethane	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
1,1,2-Trichloroethane	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
1,1-Dichloroethane	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
1,1-Dichloroethene	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
1,2,4-Trichlorobenzene	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
1,2-Dibromo-3-chloropropane (DBCP)	mg/kg	--	--	0.0094 U	--	--	--	--	0.011 U	--
1,2-Dibromoethane (Ethylene dibromide)	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
1,2-Dichlorobenzene	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
1,2-Dichloroethane	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
1,2-Dichloropropane	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
1,3-Dichlorobenzene	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
1,4-Dichlorobenzene	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
2-Butanone (Methyl ethyl ketone) (MEK)	mg/kg	--	--	0.0014 J	--	--	--	--	0.022 U	--
2-Hexanone	mg/kg	--	--	0.019 U	--	--	--	--	0.022 U	--
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	mg/kg	--	--	0.019 U	--	--	--	--	0.022 U	--
Acetone	mg/kg	--	--	0.006 JB	--	--	--	--	0.022 U	--
Benzene	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
Bromodichloromethane	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
Bromoform	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
Bromomethane (Methyl bromide)	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
Carbon disulfide	mg/kg	--	--	0.0012 JB	--	--	--	--	0.0055 U	--
Carbon tetrachloride	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
Chlorobenzene	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--

Analytical Data

Sample Location		*SP-1*	*SP-1*	*SP-1*	*SP-1*	*SP-1*	*SP-2*	*SP-2*	*SP-2*	*SP-2*
Sample Identification		*S-12609-120811-DN-13*	*S-12609-120811-DN-14*	*S-12609-120811-DN-17*	*S-12609-120811-DN-15*	*S-12609-120811-DN-16*	*S-12609-120811-DN-18*	*S-12609-120811-DN-19*	*S-12609-120811-DN-22*	*S-12609-120811-DN-20*
Sample Date		*12/8/2011*	*12/8/2011*	*12/8/2011*	*12/8/2011*	*12/8/2011*	*12/8/2011*	*12/8/2011*	*12/8/2011*	*12/8/2011*
Sample Depth		*-*	*(6-8) ft BGS*	*(6-8) ft BGS*	*(12-14) ft BGS*	*(16-18) ft BGS*	*-*	*(3-5) ft BGS*	*(3-5) ft BGS*	*(8-10) ft BGS*
Sample Type										
	Units									
Chloroethane	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
Chloroform (Trichloromethane)	mg/kg	--	--	0.0003 J	--	--	--	--	0.0055 U	--
Chloromethane (Methyl chloride)	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
cis-1,2-Dichloroethene	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
cis-1,3-Dichloropropene	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
Cyclohexane	mg/kg	--	--	0.0094 U	--	--	--	--	0.011 U	--
Dibromochloromethane	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
Dichlorodifluoromethane (CFC-12)	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
Ethylbenzene	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
Isopropyl benzene	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
Methyl acetate	mg/kg	--	--	0.0094 U	--	--	--	--	0.0058 J	--
Methyl cyclohexane	mg/kg	--	--	0.0094 U	--	--	--	--	0.011 U	--
Methyl tert butyl ether (MTBE)	mg/kg	--	--	0.019 U	--	--	--	--	0.022 U	--
Methylene chloride	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
Styrene	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
Tetrachloroethene	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
Toluene	mg/kg	--	--	0.00084 J	--	--	--	--	0.00066 J	--
trans-1,2-Dichloroethene	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
trans-1,3-Dichloropropene	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
Trichloroethene	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
Trichlorofluoromethane (CFC-11)	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
Trifluorotrichloroethane (Freon 113)	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
Vinyl chloride	mg/kg	--	--	0.0047 U	--	--	--	--	0.0055 U	--
Xylenes (total)	mg/kg	--	--	0.0094 U	--	--	--	--	0.011 U	--

Notes:

U - Not present at or above the associated value.

J - Laboratory qualified as an estimated value.

B - Laboratory qualifier: Method blank contamination. The associated method blank contains the target analyte at a reportable level.

Appendix A

Analytical Data

Sample Location		SP-2	SP-3	SP-3	SP-3	SP-3	SP-3	SP-4	SP-4	SP-4
Sample Identification		S-12609-120811-DN-21	S-12609-120811-DN-23	S-12609-120811-DN-24	S-12609-120811-DN-27	S-12609-120811-DN-25	S-12609-120811-DN-26	S-12609-120811-DN-28	S-12609-120811-DN-29	S-12609-120811-DN-30
Sample Date		12/8/2011	12/8/2011	12/8/2011	12/8/2011	12/8/2011	12/8/2011	12/8/2011	12/8/2011	12/8/2011
Sample Depth		(10-12) ft BGS	-	(3-5) ft BGS	(4-6) ft BGS	(8-10) ft BGS	(10-12) ft BGS	-	-	-
Sample Type									Duplicate	
	Units									
Metals										
Aluminum	mg/kg	--	3600	--	--	--	--	5900/5700		--
Antimony	mg/kg	--	0.96 U	--	--	--	--	0.92 U/0.38 J		--
Arsenic	mg/kg	--	**10[ab]**	--	--	--	--	**3.6[ab]/3.5[ab]**		--
Barium	mg/kg	--	31 B	--	--	--	--	42 B/49 B		--
Beryllium	mg/kg	--	0.17 J	--	--	--	--	0.28 J/0.13 J		--
Cadmium	mg/kg	--	0.22	--	--	--	--	0.25/0.031 J		--
Chromium	mg/kg	--	7.5	--	--	--	--	9.4/10		--
Cobalt	mg/kg	--	2.7 J	--	--	--	--	3.4 J/3.8 J		--
Copper	mg/kg	--	8.5	--	--	--	--	9.6/10		--
Lead	mg/kg	--	7.9	--	--	--	--	10/7.4		--
Manganese	mg/kg	--	150 B	--	--	--	--	140 B/220 B		--
Mercury	mg/kg	--	0.095 U	--	--	--	--	0.018 J/0.11 U		--
Nickel	mg/kg	--	8.0	--	--	--	--	13/12		--
Selenium	mg/kg	--	0.48 U	--	--	--	--	0.46 U/0.41 U		--
Silver	mg/kg	--	0.48 U	--	--	--	--	0.46 U/0.41 U		--
Thallium	mg/kg	--	0.96 U	--	--	--	--	0.92 U/1.3[a]		--
Vanadium	mg/kg	--	8.7 B	--	--	--	--	14 B/13		--
Zinc	mg/kg	--	37	--	--	--	--	29/30 B		--
PCBs										
Aroclor-1016 (PCB-1016)	mg/kg	0.037 U	--	0.19 U	--	0.038 U	0.035 U	--	--	0.4 U
Aroclor-1221 (PCB-1221)	mg/kg	0.037 U	--	0.19 U	--	0.038 U	0.035 U	--	--	0.4 U
Aroclor-1232 (PCB-1232)	mg/kg	0.037 U	--	0.19 U	--	0.038 U	0.035 U	--	--	0.4 U
Aroclor-1242 (PCB-1242)	mg/kg	0.037 U	--	0.19 U	--	0.038 U	0.035 U	--	--	0.4 U
Aroclor-1248 (PCB-1248)	mg/kg	0.11	--	0.19 U	--	0.038 U	0.035 U	--	--	0.4 U
Aroclor-1254 (PCB-1254)	mg/kg	0.037 U	--	**0.41[a]**	--	0.033 J	0.035 U	--	--	**0.75[ab]**
Aroclor-1260 (PCB-1260)	mg/kg	0.021 J	--	0.19 U	--	0.038 U	0.035 U	--	--	0.4 U
Total PCBs	mg/kg	0.131 J	--	0.41	--	0.033 J	ND	--	--	0.75
Semi-Volatile Organic Compounds										
2,2'-Oxybis(1-chloropropane) (bis(2-Chloroisopropyl) ether)	mg/kg	--	0.58 U	--	--	--	--	0.11 U/0.11 U		--
2,4,5-Trichlorophenol	mg/kg	--	0.86 U	--	--	--	--	0.17 U/0.17 U		--
2,4,6-Trichlorophenol	mg/kg	--	0.86 U	--	--	--	--	0.17 U/0.17 U		--
2,4-Dichlorophenol	mg/kg	--	0.86 U	--	--	--	--	0.17 U/0.17 U		--
2,4-Dimethylphenol	mg/kg	--	0.86 U	--	--	--	--	0.17 U/0.17 U		--
2,4-Dinitrophenol	mg/kg	--	1.9 U	--	--	--	--	0.37 U/0.38 U		--
2,4-Dinitrotoluene	mg/kg	--	1.2 U	--	--	--	--	0.23 U/0.23 U		--
2,6-Dinitrotoluene	mg/kg	--	1.2 U	--	--	--	--	0.23 U/0.23 U		--
2-Chloronaphthalene	mg/kg	--	0.29 U	--	--	--	--	0.056 U/0.057 U		--
2-Chlorophenol	mg/kg	--	0.29 U	--	--	--	--	0.056 U/0.057 U		--
2-Methylnaphthalene	mg/kg	--	0.037 J	--	--	--	--	0.0075 U/0.0055 J		--
2-Methylphenol	mg/kg	--	1.2 U	--	--	--	--	0.23 U/0.23 U		--
2-Nitroaniline	mg/kg	--	1.2 U	--	--	--	--	0.23 U/0.23 U		--
2-Nitrophenol	mg/kg	--	0.29 U	--	--	--	--	0.056 U/0.057 U		--
3&4-Methylphenol	mg/kg	--	2.3 U	--	--	--	--	0.45 U/0.45 U		--
3,3'-Dichlorobenzidine	mg/kg	--	0.58 U	--	--	--	--	0.11 U/0.11 U		--
3-Nitroaniline	mg/kg	--	1.2 U	--	--	--	--	0.23 U/0.23 U		--
4,6-Dinitro-2-methylphenol	mg/kg	--	0.86 U	--	--	--	--	0.17 U/0.17 U		--
4-Bromophenyl phenyl ether	mg/kg	--	0.29 U	--	--	--	--	0.056 U/0.057 U		--
4-Chloro-3-methylphenol	mg/kg	--	0.86 U	--	--	--	--	0.17 U/0.17 U		--
4-Chloroaniline	mg/kg	--	0.86 U	--	--	--	--	0.17 U/0.17 U		--
4-Chlorophenyl phenyl ether	mg/kg	--	0.29 U	--	--	--	--	0.056 U/0.057 U		--
4-Nitroaniline	mg/kg	--	1.2 U	--	--	--	--	0.23 U/0.23 U		--
4-Nitrophenol	mg/kg	--	1.9 U	--	--	--	--	0.37 U/0.38 U		--
Acenaphthene	mg/kg	--	0.12	--	--	--	--	0.0075 U/0.015		--
Acenaphthylene	mg/kg	--	0.053	--	--	--	--	0.0075 U/0.0048 J		--
Acetophenone	mg/kg	--	0.58 U	--	--	--	--	0.11 U/0.11 U		--
Anthracene	mg/kg	--	0.37	--	--	--	--	0.0081/0.038		--
Atrazine	mg/kg	--	1.2 U	--	--	--	--	0.23 U/0.23 U		--
Benzaldehyde	mg/kg	--	0.58 U	--	--	--	--	0.11 U/0.11 U		--

Sample Location		SP-2	SP-3	SP-3	SP-3	SP-3	SP-3	SP-4	SP-4	SP-4
Sample Identification		S-12609-120811-DN-21	S-12609-120811-DN-23	S-12609-120811-DN-24	S-12609-120811-DN-27	S-12609-120811-DN-25	S-12609-120811-DN-26	S-12609-120811-DN-28	S-12609-120811-DN-29	S-12609-120811-DN-30
Sample Date		12/8/2011	12/8/2011	12/8/2011	12/8/2011	12/8/2011	12/8/2011	12/8/2011	12/8/2011	12/8/2011
Sample Depth		(10-12) ft BGS	-	(3-5) ft BGS	(4-6) ft BGS	(8-10) ft BGS	(10-12) ft BGS	-	-	-
Sample Type									Duplicate	
	Units									
Benzo(a)anthracene	mg/kg	--	**1.8[a]**	--	--	--	--	0.034/0.18[a]		--
Benzo(a)pyrene	mg/kg	--	**1.8[a,b]**	--	--	--	--	**0.035[a]/0.18[a]**		--
Benzo(b)fluoranthene	mg/kg	--	**2.3[a,b]**	--	--	--	--	0.05/0.23[a]		--
Benzo(g,h,i)perylene	mg/kg	--	1.1	--	--	--	--	0.028/0.12		--
Benzo(k)fluoranthene	mg/kg	--	1.3	--	--	--	--	0.023/0.11		--
Biphenyl (1,1-Biphenyl)	mg/kg	--	0.29 U	--	--	--	--	0.056 U/0.057 U		--
bis(2-Chloroethoxy)methane	mg/kg	--	0.58 U	--	--	--	--	0.11 U/0.11 U		--
bis(2-Chloroethyl)ether	mg/kg	--	0.58 U	--	--	--	--	0.11 U/0.11 U		--
bis(2-Ethylhexyl)phthalate (DEHP)	mg/kg	--	0.29 U	--	--	--	--	0.032 JB/0.051 JB		--
Butyl benzylphthalate (BBP)	mg/kg	--	0.29 U	--	--	--	--	0.056 U/0.057 U		--
Caprolactam	mg/kg	--	1.9 U	--	--	--	--	0.37 U/0.38 U		--
Carbazole	mg/kg	--	0.29	--	--	--	--	0.056 U/0.057 U		--
Chrysene	mg/kg	--	1.7	--	--	--	--	0.037/0.18		--
Dibenz(a,h)anthracene	mg/kg	--	0.038 U	--	--	--	--	0.0075 U/0.0076 U		--
Dibenzofuran	mg/kg	--	0.076 J	--	--	--	--	0.056 U/0.0088 J		--
Diethyl phthalate	mg/kg	--	0.29 U	--	--	--	--	0.056 U/0.057 U		--
Dimethyl phthalate	mg/kg	--	0.29 U	--	--	--	--	0.056 U/0.057 U		--
Di-n-butylphthalate (DBP)	mg/kg	--	0.29 U	--	--	--	--	0.056 U/0.057 U		--
Di-n-octyl phthalate (DnOP)	mg/kg	--	0.29 U	--	--	--	--	0.056 U/0.057 U		--
Fluoranthene	mg/kg	--	3.5	--	--	--	--	0.073/0.37		--
Fluorene	mg/kg	--	0.14	--	--	--	--	0.0075 U/0.015		--
Hexachlorobenzene	mg/kg	--	0.038 U	--	--	--	--	0.0075 U/0.0076 U		--
Hexachlorobutadiene	mg/kg	--	0.29 U	--	--	--	--	0.056 U/0.057 U		--
Hexachlorocyclopentadiene	mg/kg	--	1.9 U	--	--	--	--	0.37 U/0.38 U		--
Hexachloroethane	mg/kg	--	0.29 U	--	--	--	--	0.056 U/0.057 U		--
Indeno(1,2,3-cd)pyrene	mg/kg	--	**0.94[a]**	--	--	--	--	0.023/0.12		--
Isophorone	mg/kg	--	0.29 U	--	--	--	--	0.056 U/0.057 U		--
Naphthalene	mg/kg	--	0.06	--	--	--	--	0.0075 U/0.0071 J		--
Nitrobenzene	mg/kg	--	0.58 U	--	--	--	--	0.11 U/0.11 U		--
N-Nitrosodi-n-propylamine	mg/kg	--	0.29 U	--	--	--	--	0.056 U/0.057 U		--
N-Nitrosodiphenylamine	mg/kg	--	0.29 U	--	--	--	--	0.056 U/0.057 U		--
Pentachlorophenol	mg/kg	--	0.86 U	--	--	--	--	0.17 U/0.17 U		--
Phenanthrene	mg/kg	--	1.7	--	--	--	--	0.041/0.18		--
Phenol	mg/kg	--	0.29 U	--	--	--	--	0.056 U/0.057 U		--
Pyrene	mg/kg	--	2.8	--	--	--	--	0.065/0.3		--
Volatile Organic Compounds										
1,1,1-Trichloroethane	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
1,1,2,2-Tetrachloroethane	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
1,1,2-Trichloroethane	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
1,1-Dichloroethane	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
1,1-Dichloroethene	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
1,2,4-Trichlorobenzene	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
1,2-Dibromo-3-chloropropane (DBCP)	mg/kg	--	--	--	0.0095 U	--	--	--	--	--
1,2-Dibromoethane (Ethylene dibromide)	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
1,2-Dichlorobenzene	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
1,2-Dichloroethane	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
1,2-Dichloropropane	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
1,3-Dichlorobenzene	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
1,4-Dichlorobenzene	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
2-Butanone (Methyl ethyl ketone) (MEK)	mg/kg	--	--	--	0.0026 J	--	--	--	--	--
2-Hexanone	mg/kg	--	--	--	0.019 U	--	--	--	--	--
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	mg/kg	--	--	--	0.019 U	--	--	--	--	--
Acetone	mg/kg	--	--	--	0.015 JB	--	--	--	--	--
Benzene	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
Bromodichloromethane	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
Bromoform	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
Bromomethane (Methyl bromide)	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
Carbon disulfide	mg/kg	--	--	--	0.00088 JB	--	--	--	--	--
Carbon tetrachloride	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
Chlorobenzene	mg/kg	--	--	--	0.0048 U	--	--	--	--	--

Analytical Data

Sample Location		SP-2	SP-3	SP-3	SP-3	SP-3	SP-3	SP-4	SP-4	SP-4
Sample Identification		S-12609-120811-DN-21	S-12609-120811-DN-23	S-12609-120811-DN-24	S-12609-120811-DN-27	S-12609-120811-DN-25	S-12609-120811-DN-26	S-12609-120811-DN-28	S-12609-120811-DN-29	S-12609-120811-DN-30
Sample Date		12/8/2011	12/8/2011	12/8/2011	12/8/2011	12/8/2011	12/8/2011	12/8/2011	12/8/2011	12/8/2011
Sample Depth		(10-12) ft BGS	-	(3-5) ft BGS	(4-6) ft BGS	(8-10) ft BGS	(10-12) ft BGS	-	-	-
Sample Type									Duplicate	
	Units									
Chloroethane	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
Chloroform (Trichloromethane)	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
Chloromethane (Methyl chloride)	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
cis-1,2-Dichloroethene	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
cis-1,3-Dichloropropene	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
Cyclohexane	mg/kg	--	--	--	0.0095 U	--	--	--	--	--
Dibromochloromethane	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
Dichlorodifluoromethane (CFC-12)	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
Ethylbenzene	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
Isopropyl benzene	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
Methyl acetate	mg/kg	--	--	--	0.0095 U	--	--	--	--	--
Methyl cyclohexane	mg/kg	--	--	--	0.0095 U	--	--	--	--	--
Methyl tert butyl ether (MTBE)	mg/kg	--	--	--	0.019 U	--	--	--	--	--
Methylene chloride	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
Styrene	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
Tetrachloroethene	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
Toluene	mg/kg	--	--	--	0.00028 J	--	--	--	--	--
trans-1,2-Dichloroethene	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
trans-1,3-Dichloropropene	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
Trichloroethene	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
Trichlorofluoromethane (CFC-11)	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
Trifluorotrichloroethane (Freon 113)	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
Vinyl chloride	mg/kg	--	--	--	0.0048 U	--	--	--	--	--
Xylenes (total)	mg/kg	--	--	--	0.0095 U	--	--	--	--	--

Appendix A

Analytical Data

Sample Location		*SP-4*	*SP-4*	*SP-4*	*SP-5*	*SP-5*	*SP-5*	*SP-5*	*SP-5*	*SP-6*
Sample Identification		*S-12609-120811-DN-31*	*S-12609-120811-DN-32*	*S-12609-120811-DN-33*	*S-12609-120911-DN-34*	*S-12609-120911-DN-35*	*S-12609-120911-DN-36*	*S-12609-120911-DN-38*	*S-12609-120911-DN-37*	*S-12609-120911-DN-39*
Sample Date		*12/8/2011*	*12/8/2011*	*12/8/2011*	*12/9/2011*	*12/9/2011*	*12/9/2011*	*12/9/2011*	*12/9/2011*	*12/9/2011*
Sample Depth		*-*	*-*	*-*	*-*	*(6-8) ft BGS*	*(12-14) ft BGS*	*(12-14) ft BGS*	*(16-18) ft BGS*	*-*
Sample Type										
	Units									
Metals										
Aluminum	mg/kg	--	--	--	2900	--	--	--	--	2900/4000
Antimony	mg/kg	--	--	--	0.85 U	--	--	--	--	0.71 U/0.37 J
Arsenic	mg/kg	--	--	--	**1.7[ab]**	--	--	--	--	**3.5[ab]/8.2[ab]**
Barium	mg/kg	--	--	--	24 B	--	--	--	--	19 B/23 B
Beryllium	mg/kg	--	--	--	0.10 J	--	--	--	--	0.36 U/0.46 U
Cadmium	mg/kg	--	--	--	0.17 U	--	--	--	--	0.040 J/0.039 J
Chromium	mg/kg	--	--	--	4.3	--	--	--	--	7.0/6.7
Cobalt	mg/kg	--	--	--	1.9 J	--	--	--	--	1.9 J/2.6 J
Copper	mg/kg	--	--	--	3.9	--	--	--	--	4.5/4.5
Lead	mg/kg	--	--	--	3.8	--	--	--	--	5.7/5.8
Manganese	mg/kg	--	--	--	170 B	--	--	--	--	130 B/190 B
Mercury	mg/kg	--	--	--	0.099 U	--	--	--	--	0.10 U/0.11 U
Nickel	mg/kg	--	--	--	5.0	--	--	--	--	6.4/6.3
Selenium	mg/kg	--	--	--	0.43 U	--	--	--	--	0.36 U/0.46 U
Silver	mg/kg	--	--	--	0.43 U	--	--	--	--	0.36 U/0.46 U
Thallium	mg/kg	--	--	--	**0.96[a]**	--	--	--	--	**0.98[a]/0.88 J[a]**
Vanadium	mg/kg	--	--	--	7.0	--	--	--	--	7.3/9.3
Zinc	mg/kg	--	--	--	13 B	--	--	--	--	17 B/17 B
PCBs										
Aroclor-1016 (PCB-1016)	mg/kg	0.041 U	0.19 U	--	--	0.039 U	0.039 U	--	0.036 U	--
Aroclor-1221 (PCB-1221)	mg/kg	0.041 U	0.19 U	--	--	0.039 U	0.039 U	--	0.036 U	--
Aroclor-1232 (PCB-1232)	mg/kg	0.041 U	0.19 U	--	--	0.039 U	0.039 U	--	0.036 U	--
Aroclor-1242 (PCB-1242)	mg/kg	0.041 U	0.19 U	--	--	0.039 U	0.039 U	--	0.036 U	--
Aroclor-1248 (PCB-1248)	mg/kg	0.041 U	0.19 U	--	--	0.039 U	0.039 U	--	0.036 U	--
Aroclor-1254 (PCB-1254)	mg/kg	0.059	0.19 U	--	--	0.056	0.039 U	--	0.036 U	--
Aroclor-1260 (PCB-1260)	mg/kg	0.041 U	0.19 U	--	--	0.039 U	0.039 U	--	0.036 U	--
Total PCBs	mg/kg	0.059	ND	--	--	0.056	ND	--	ND	--
Semi-Volatile Organic Compounds										
2,2'-Oxybis(1-chloropropane) (bis(2-Chloroisopropyl) ether)	mg/kg	--	--	--	0.1 U	--	--	--	--	0.11 U/0.11 U
2,4,5-Trichlorophenol	mg/kg	--	--	--	0.16 U	--	--	--	--	0.16 U/0.16 U
2,4,6-Trichlorophenol	mg/kg	--	--	--	0.16 U	--	--	--	--	0.16 U/0.16 U
2,4-Dichlorophenol	mg/kg	--	--	--	0.16 U	--	--	--	--	0.16 U/0.16 U
2,4-Dimethylphenol	mg/kg	--	--	--	0.16 U	--	--	--	--	0.16 U/0.16 U
2,4-Dinitrophenol	mg/kg	--	--	--	0.34 U	--	--	--	--	0.36 U/0.36 U
2,4-Dinitrotoluene	mg/kg	--	--	--	0.21 U	--	--	--	--	0.22 U/0.22 U
2,6-Dinitrotoluene	mg/kg	--	--	--	0.21 U	--	--	--	--	0.22 U/0.22 U
2-Chloronaphthalene	mg/kg	--	--	--	0.052 U	--	--	--	--	0.055 U/0.054 U
2-Chlorophenol	mg/kg	--	--	--	0.052 U	--	--	--	--	0.055 U/0.054 U
2-Methylnaphthalene	mg/kg	--	--	--	0.0038 J	--	--	--	--	0.011/0.028
2-Methylphenol	mg/kg	--	--	--	0.21 U	--	--	--	--	0.22 U/0.22 U
2-Nitroaniline	mg/kg	--	--	--	0.21 U	--	--	--	--	0.22 U/0.22 U
2-Nitrophenol	mg/kg	--	--	--	0.052 U	--	--	--	--	0.055 U/0.054 U
3&4-Methylphenol	mg/kg	--	--	--	0.42 U	--	--	--	--	0.44 U/0.43 U
3,3'-Dichlorobenzidine	mg/kg	--	--	--	0.1 U	--	--	--	--	0.11 U/0.11 U
3-Nitroaniline	mg/kg	--	--	--	0.21 U	--	--	--	--	0.22 U/0.22 U
4,6-Dinitro-2-methylphenol	mg/kg	--	--	--	0.16 U	--	--	--	--	0.16 U/0.16 U
4-Bromophenyl phenyl ether	mg/kg	--	--	--	0.052 U	--	--	--	--	0.055 U/0.054 U
4-Chloro-3-methylphenol	mg/kg	--	--	--	0.16 U	--	--	--	--	0.16 U/0.16 U
4-Chloroaniline	mg/kg	--	--	--	0.16 U	--	--	--	--	0.16 U/0.16 U
4-Chlorophenyl phenyl ether	mg/kg	--	--	--	0.052 U	--	--	--	--	0.055 U/0.054 U
4-Nitroaniline	mg/kg	--	--	--	0.21 U	--	--	--	--	0.22 U/0.22 U
4-Nitrophenol	mg/kg	--	--	--	0.34 U	--	--	--	--	0.36 U/0.36 U
Acenaphthene	mg/kg	--	--	--	0.015	--	--	--	--	0.057/0.11
Acenaphthylene	mg/kg	--	--	--	0.0069 U	--	--	--	--	0.0073 U/0.0072 U
Acetophenone	mg/kg	--	--	--	0.1 U	--	--	--	--	0.11 U/0.11 U
Anthracene	mg/kg	--	--	--	0.031	--	--	--	--	0.14/0.33
Atrazine	mg/kg	--	--	--	0.21 U	--	--	--	--	0.22 U/0.22 U
Benzaldehyde	mg/kg	--	--	--	0.1 U	--	--	--	--	0.11 U/0.11 U

Analytical Data

Sample Location		*SP-4*	*SP-4*	*SP-4*	*SP-5*	*SP-5*	*SP-5*	*SP-5*	*SP-5*	*SP-6*
Sample Identification		*S-12609-120811-DN-31*	*S-12609-120811-DN-32*	*S-12609-120811-DN-33*	*S-12609-120911-DN-34*	*S-12609-120911-DN-35*	*S-12609-120911-DN-36*	*S-12609-120911-DN-38*	*S-12609-120911-DN-37*	*S-12609-120911-DN-39*
Sample Date		*12/8/2011*	*12/8/2011*	*12/8/2011*	*12/9/2011*	*12/9/2011*	*12/9/2011*	*12/9/2011*	*12/9/2011*	*12/9/2011*
Sample Depth		*-*	*-*	*-*	*-*	*(6-8) ft BGS*	*(12-14) ft BGS*	*(12-14) ft BGS*	*(16-18) ft BGS*	*-*
Sample Type										
	Units									
Benzo(a)anthracene	mg/kg	--	--	--	**0.16[a]**	--	--	--	--	**0.43[a]/0.45[a]**
Benzo(a)pyrene	mg/kg	--	--	--	**0.16[a]**	--	--	--	--	**0.4[ab]/0.35[ab]**
Benzo(b)fluoranthene	mg/kg	--	--	--	**0.23[a]**	--	--	--	--	**0.52[a]/0.43[a]**
Benzo(g,h,i)perylene	mg/kg	--	--	--	0.12	--	--	--	--	0.24/0.22
Benzo(k)fluoranthene	mg/kg	--	--	--	0.085	--	--	--	--	0.3/0.22
Biphenyl (1,1-Biphenyl)	mg/kg	--	--	--	0.052 U	--	--	--	--	0.055 U/0.054 U
bis(2-Chloroethoxy)methane	mg/kg	--	--	--	0.1 U	--	--	--	--	0.11 U/0.11 U
bis(2-Chloroethyl)ether	mg/kg	--	--	--	0.1 U	--	--	--	--	0.11 U/0.11 U
bis(2-Ethylhexyl)phthalate (DEHP)	mg/kg	--	--	--	0.043 JB	--	--	--	--	0.04 JB/0.045 JB
Butyl benzylphthalate (BBP)	mg/kg	--	--	--	0.052 U	--	--	--	--	0.055 U/0.054 U
Caprolactam	mg/kg	--	--	--	0.34 U	--	--	--	--	0.36 U/0.36 U
Carbazole	mg/kg	--	--	--	0.052 U	--	--	--	--	0.082/0.14
Chrysene	mg/kg	--	--	--	0.17	--	--	--	--	0.46/0.39
Dibenz(a,h)anthracene	mg/kg	--	--	--	0.0069 U	--	--	--	--	**0.056[a]/0.0072 U**
Dibenzofuran	mg/kg	--	--	--	0.007 J	--	--	--	--	0.032 J/0.95
Diethyl phthalate	mg/kg	--	--	--	0.052 U	--	--	--	--	0.055 U/0.054 U
Dimethyl phthalate	mg/kg	--	--	--	0.052 U	--	--	--	--	0.055 U/0.039 J
Di-n-butylphthalate (DBP)	mg/kg	--	--	--	0.052 U	--	--	--	--	0.055 U/0.054 U
Di-n-octyl phthalate (DnOP)	mg/kg	--	--	--	0.052 U	--	--	--	--	0.055 U/0.054 U
Fluoranthene	mg/kg	--	--	--	0.34	--	--	--	--	1.1/1.2
Fluorene	mg/kg	--	--	--	0.012	--	--	--	--	0.068/0.16
Hexachlorobenzene	mg/kg	--	--	--	0.0069 U	--	--	--	--	0.0073 U/0.0072 U
Hexachlorobutadiene	mg/kg	--	--	--	0.052 U	--	--	--	--	0.055 U/0.054 U
Hexachlorocyclopentadiene	mg/kg	--	--	--	0.34 U	--	--	--	--	0.36 U/0.36 U
Hexachloroethane	mg/kg	--	--	--	0.052 U	--	--	--	--	0.055 U/0.054 U
Indeno(1,2,3-cd)pyrene	mg/kg	--	--	--	0.1	--	--	--	--	**0.23[a]/0.2[a]**
Isophorone	mg/kg	--	--	--	0.052 U	--	--	--	--	0.055 U/0.054 U
Naphthalene	mg/kg	--	--	--	0.008	--	--	--	--	0.013/0.071
Nitrobenzene	mg/kg	--	--	--	0.1 U	--	--	--	--	0.11 U/0.11 U
N-Nitrosodi-n-propylamine	mg/kg	--	--	--	0.052 U	--	--	--	--	0.055 U/0.054 U
N-Nitrosodiphenylamine	mg/kg	--	--	--	0.052 U	--	--	--	--	0.055 U/0.054 U
Pentachlorophenol	mg/kg	--	--	--	0.16 U	--	--	--	--	0.16 U/0.16 U
Phenanthrene	mg/kg	--	--	--	0.15	--	--	--	--	0.66/1.2
Phenol	mg/kg	--	--	--	0.052 U	--	--	--	--	0.055 U/0.054 U
Pyrene	mg/kg	--	--	--	0.3	--	--	--	--	0.79/0.87
Volatile Organic Compounds										
1,1,1-Trichloroethane	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
1,1,2,2-Tetrachloroethane	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
1,1,2-Trichloroethane	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
1,1-Dichloroethane	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
1,1-Dichloroethene	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
1,2,4-Trichlorobenzene	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
1,2-Dibromo-3-chloropropane (DBCP)	mg/kg	--	--	0.0096 U	--	--	--	0.01 U	--	--
1,2-Dibromoethane (Ethylene dibromide)	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
1,2-Dichlorobenzene	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
1,2-Dichloroethane	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
1,2-Dichloropropane	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
1,3-Dichlorobenzene	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
1,4-Dichlorobenzene	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
2-Butanone (Methyl ethyl ketone) (MEK)	mg/kg	--	--	0.019 U	--	--	--	0.0054 J	--	--
2-Hexanone	mg/kg	--	--	0.019 U	--	--	--	0.02 U	--	--
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	mg/kg	--	--	0.019 U	--	--	--	0.02 U	--	--
Acetone	mg/kg	--	--	0.019 U	--	--	--	0.028 B	--	--
Benzene	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
Bromodichloromethane	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
Bromoform	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
Bromomethane (Methyl bromide)	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
Carbon disulfide	mg/kg	--	--	0.0048 U	--	--	--	0.00097 J	--	--
Carbon tetrachloride	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
Chlorobenzene	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--

Analytical Data

Sample Location		*SP-4*	*SP-4*	*SP-4*	*SP-5*	*SP-5*	*SP-5*	*SP-5*	*SP-5*	*SP-6*
Sample Identification		*S-12609-120811-DN-31*	*S-12609-120811-DN-32*	*S-12609-120811-DN-33*	*S-12609-120911-DN-34*	*S-12609-120911-DN-35*	*S-12609-120911-DN-36*	*S-12609-120911-DN-38*	*S-12609-120911-DN-37*	*S-12609-120911-DN-39*
Sample Date		*12/8/2011*	*12/8/2011*	*12/8/2011*	*12/9/2011*	*12/9/2011*	*12/9/2011*	*12/9/2011*	*12/9/2011*	*12/9/2011*
Sample Depth		*-*	*-*	*-*	*-*	*(6-8) ft BGS*	*(12-14) ft BGS*	*(12-14) ft BGS*	*(16-18) ft BGS*	*-*
Sample Type										
	Units									
Chloroethane	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
Chloroform (Trichloromethane)	mg/kg	--	--	0.003 J	--	--	--	0.005 U	--	--
Chloromethane (Methyl chloride)	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
cis-1,2-Dichloroethene	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
cis-1,3-Dichloropropene	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
Cyclohexane	mg/kg	--	--	0.0096 U	--	--	--	0.01 U	--	--
Dibromochloromethane	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
Dichlorodifluoromethane (CFC-12)	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
Ethylbenzene	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
Isopropyl benzene	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
Methyl acetate	mg/kg	--	--	0.0016 J	--	--	--	0.0014 J	--	--
Methyl cyclohexane	mg/kg	--	--	0.0096 U	--	--	--	0.01 U	--	--
Methyl tert butyl ether (MTBE)	mg/kg	--	--	0.019 U	--	--	--	0.02 U	--	--
Methylene chloride	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
Styrene	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
Tetrachloroethene	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
Toluene	mg/kg	--	--	0.00058 J	--	--	--	0.0004 J	--	--
trans-1,2-Dichloroethene	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
trans-1,3-Dichloropropene	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
Trichloroethene	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
Trichlorofluoromethane (CFC-11)	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
Trifluorotrichloroethane (Freon 113)	mg/kg	--	--	0.0048 U	--	--	--	0.005 U	--	--
Vinyl chloride	mg/kg	--	--	0.0048 U	--	--	--	0.00055 J	--	--
Xylenes (total)	mg/kg	--	--	0.0096 U	--	--	--	0.01 U	--	--

Appendix A

Analytical Data

Sample Location		SP-6	SP-6	SP-6	SP-6	SP-6	SP-7	SP-7	SP-7	SP-7
Sample Identification		S-12609-120911-DN-40	S-12609-120911-DN-41	S-12609-120911-DN-42	S-12609-120911-DN-44	S-12609-120911-DN-43	S-12609-120911-DN-45	S-12609-120911-DN-48	S-12609-120911-DN-46	S-12609-120911-DN-47
Sample Date		12/9/2011	12/9/2011	12/9/2011	12/9/2011	12/9/2011	12/9/2011	12/9/2011	12/9/2011	12/9/2011
Sample Depth		-	(4-6) ft BGS	(10-12) ft BGS	(16-20) ft BGS	(24-28) ft BGS	-	(4-6) ft BGS	(6-8) ft BGS	(6-8) ft BGS
Sample Type		Duplicate								Duplicate
	Units									
Metals										
Aluminum	mg/kg		--	--	--	--	3500	--	--	--
Antimony	mg/kg		--	--	--	--	0.83 J	--	--	--
Arsenic	mg/kg		--	--	--	--	**1.8[ab]**	--	--	--
Barium	mg/kg		--	--	--	--	27 B	--	--	--
Beryllium	mg/kg		--	--	--	--	0.32 J	--	--	--
Cadmium	mg/kg		--	--	--	--	0.19 U	--	--	--
Chromium	mg/kg		--	--	--	--	6.2	--	--	--
Cobalt	mg/kg		--	--	--	--	1.9 J	--	--	--
Copper	mg/kg		--	--	--	--	4.2	--	--	--
Lead	mg/kg		--	--	--	--	4.7	--	--	--
Manganese	mg/kg		--	--	--	--	180 B	--	--	--
Mercury	mg/kg		--	--	--	--	0.090 U	--	--	--
Nickel	mg/kg		--	--	--	--	6.7	--	--	--
Selenium	mg/kg		--	--	--	--	0.49 U	--	--	--
Silver	mg/kg		--	--	--	--	0.49 U	--	--	--
Thallium	mg/kg		--	--	--	--	**1.1[a]**	--	--	--
Vanadium	mg/kg		--	--	--	--	7.4	--	--	--
Zinc	mg/kg		--	--	--	--	33 B	--	--	--
PCBs										
Aroclor-1016 (PCB-1016)	mg/kg	--	0.21 U	0.038 U	--	0.036 U	--	0.036 U	0.039 U/0.041 U	
Aroclor-1221 (PCB-1221)	mg/kg	--	0.21 U	0.038 U	--	0.036 U	--	0.036 U	0.039 U/0.041 U	
Aroclor-1232 (PCB-1232)	mg/kg	--	0.21 U	0.038 U	--	0.036 U	--	0.036 U	0.039 U/0.041 U	
Aroclor-1242 (PCB-1242)	mg/kg	--	0.21 U	0.038 U	--	0.036 U	--	0.036 U	0.039 U/0.041 U	
Aroclor-1248 (PCB-1248)	mg/kg	--	**0.6[a]**	0.059	--	0.036 U	--	0.036 U	0.039 U/0.041 U	
Aroclor-1254 (PCB-1254)	mg/kg	--	0.21 U	0.038 U	--	0.036 U	--	0.051	0.039 U/0.041 U	
Aroclor-1260 (PCB-1260)	mg/kg	--	0.13 J	0.021 J	--	0.036 U	--	0.036 U	0.039 U/0.041 U	
Total PCBs	mg/kg	--	0.73 J	0.08 J	--	ND	--	0.051	ND/ND	
Semi-Volatile Organic Compounds										
2,2'-Oxybis(1-chloropropane) (bis(2-Chloroisopropyl) ether)	mg/kg		--	--	--	--	0.44 U	--	--	--
2,4,5-Trichlorophenol	mg/kg		--	--	--	--	0.66 U	--	--	--
2,4,6-Trichlorophenol	mg/kg		--	--	--	--	0.66 U	--	--	--
2,4-Dichlorophenol	mg/kg		--	--	--	--	0.66 U	--	--	--
2,4-Dimethylphenol	mg/kg		--	--	--	--	0.66 U	--	--	--
2,4-Dinitrophenol	mg/kg		--	--	--	--	1.5 U	--	--	--
2,4-Dinitrotoluene	mg/kg		--	--	--	--	0.88 U	--	--	--
2,6-Dinitrotoluene	mg/kg		--	--	--	--	0.88 U	--	--	--
2-Chloronaphthalene	mg/kg		--	--	--	--	0.22 U	--	--	--
2-Chlorophenol	mg/kg		--	--	--	--	0.22 U	--	--	--
2-Methylnaphthalene	mg/kg		--	--	--	--	0.029 U	--	--	--
2-Methylphenol	mg/kg		--	--	--	--	0.88 U	--	--	--
2-Nitroaniline	mg/kg		--	--	--	--	0.88 U	--	--	--
2-Nitrophenol	mg/kg		--	--	--	--	0.22 U	--	--	--
3&4-Methylphenol	mg/kg		--	--	--	--	1.8 U	--	--	--
3,3'-Dichlorobenzidine	mg/kg		--	--	--	--	0.44 U	--	--	--
3-Nitroaniline	mg/kg		--	--	--	--	0.88 U	--	--	--
4,6-Dinitro-2-methylphenol	mg/kg		--	--	--	--	0.66 U	--	--	--
4-Bromophenyl phenyl ether	mg/kg		--	--	--	--	0.22 U	--	--	--
4-Chloro-3-methylphenol	mg/kg		--	--	--	--	0.66 U	--	--	--
4-Chloroaniline	mg/kg		--	--	--	--	0.66 U	--	--	--
4-Chlorophenyl phenyl ether	mg/kg		--	--	--	--	0.22 U	--	--	--
4-Nitroaniline	mg/kg		--	--	--	--	0.88 U	--	--	--
4-Nitrophenol	mg/kg		--	--	--	--	1.5 U	--	--	--
Acenaphthene	mg/kg		--	--	--	--	0.13	--	--	--
Acenaphthylene	mg/kg		--	--	--	--	0.029 U	--	--	--
Acetophenone	mg/kg		--	--	--	--	0.44 U	--	--	--
Anthracene	mg/kg		--	--	--	--	0.42	--	--	--
Atrazine	mg/kg		--	--	--	--	0.88 U	--	--	--
Benzaldehyde	mg/kg		--	--	--	--	0.44 U	--	--	--

Sample Location		SP-6	SP-6	SP-6	SP-6	SP-6	SP-7	SP-7	SP-7	SP-7
Sample Identification		S-12609-120911-DN-40	S-12609-120911-DN-41	S-12609-120911-DN-42	S-12609-120911-DN-44	S-12609-120911-DN-43	S-12609-120911-DN-45	S-12609-120911-DN-48	S-12609-120911-DN-46	S-12609-120911-DN-47
Sample Date		12/9/2011	12/9/2011	12/9/2011	12/9/2011	12/9/2011	12/9/2011	12/9/2011	12/9/2011	12/9/2011
Sample Depth		-	(4-6) ft BGS	(10-12) ft BGS	(16-20) ft BGS	(24-28) ft BGS	-	(4-6) ft BGS	(6-8) ft BGS	(6-8) ft BGS
Sample Type		Duplicate								Duplicate
	Units									
Benzo(a)anthracene	mg/kg		--	--	--	--	2.7[ab]	--	--	--
Benzo(a)pyrene	mg/kg		--	--	--	--	2.4[ab]	--	--	--
Benzo(b)fluoranthene	mg/kg			--	--	--	3.2[ab]	--	--	--
Benzo(g,h,i)perylene	mg/kg		--	--	--	--	1.5	--	--	--
Benzo(k)fluoranthene	mg/kg		--	--	--	--	1.3	--	--	--
Biphenyl (1,1-Biphenyl)	mg/kg		--	--	--	--	0.22 U	--	--	--
bis(2-Chloroethoxy)methane	mg/kg		--	--	--	--	0.44 U	--	--	--
bis(2-Chloroethyl)ether	mg/kg		--	--	--	--	0.44 U	--	--	--
bis(2-Ethylhexyl)phthalate (DEHP)	mg/kg		--	--	--	--	0.11 JB	--	--	--
Butyl benzylphthalate (BBP)	mg/kg		--	--	--	--	0.22 U	--	--	--
Caprolactam	mg/kg		--	--	--	--	1.5 U	--	--	--
Carbazole	mg/kg		--	--	--	--	0.28	--	--	--
Chrysene	mg/kg		--	--	--	--	2.4	--	--	--
Dibenz(a,h)anthracene	mg/kg		--	--	--	--	0.029 U	--	--	--
Dibenzofuran	mg/kg		--	--	--	--	0.047 J	--	--	--
Diethyl phthalate	mg/kg		--	--	--	--	0.22 U	--	--	--
Dimethyl phthalate	mg/kg		--	--	--	--	0.22 U	--	--	--
Di-n-butylphthalate (DBP)	mg/kg		--	--	--	--	0.22 U	--	--	--
Di-n-octyl phthalate (DnOP)	mg/kg		--	--	--	--	0.22 U	--	--	--
Fluoranthene	mg/kg		--	--	--	--	5.2	--	--	--
Fluorene	mg/kg		--	--	--	--	0.11	--	--	--
Hexachlorobenzene	mg/kg		--	--	--	--	0.029 U	--	--	--
Hexachlorobutadiene	mg/kg		--	--	--	--	0.22 U	--	--	--
Hexachlorocyclopentadiene	mg/kg		--	--	--	--	1.5 U	--	--	--
Hexachloroethane	mg/kg		--	--	--	--	0.22 U	--	--	--
Indeno(1,2,3-cd)pyrene	mg/kg		--	--	--	--	1.3[a]	--	--	--
Isophorone	mg/kg		--	--	--	--	0.22 U	--	--	--
Naphthalene	mg/kg		--	--	--	--	0.029 U	--	--	--
Nitrobenzene	mg/kg		--	--	--	--	0.44 U	--	--	--
N-Nitrosodi-n-propylamine	mg/kg		--	--	--	--	0.22 U	--	--	--
N-Nitrosodiphenylamine	mg/kg		--	--	--	--	0.22 U	--	--	--
Pentachlorophenol	mg/kg		--	--	--	--	0.66 U	--	--	--
Phenanthrene	mg/kg		--	--	--	--	1.9	--	--	--
Phenol	mg/kg		--	--	--	--	0.22 U	--	--	--
Pyrene	mg/kg		--	--	--	--	4.4	--	--	--
Volatile Organic Compounds										
1,1,1-Trichloroethane	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
1,1,2,2-Tetrachloroethane	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
1,1,2-Trichloroethane	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
1,1-Dichloroethane	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
1,1-Dichloroethene	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
1,2,4-Trichlorobenzene	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
1,2-Dibromo-3-chloropropane (DBCP)	mg/kg	--	--	--	0.011 U	--	--	--	--	--
1,2-Dibromoethane (Ethylene dibromide)	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
1,2-Dichlorobenzene	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
1,2-Dichloroethane	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
1,2-Dichloropropane	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
1,3-Dichlorobenzene	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
1,4-Dichlorobenzene	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
2-Butanone (Methyl ethyl ketone) (MEK)	mg/kg	--	--	--	0.022 U	--	--	--	--	--
2-Hexanone	mg/kg	--	--	--	0.022 U	--	--	--	--	--
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	mg/kg	--	--	--	0.022 U	--	--	--	--	--
Acetone	mg/kg	--	--	--	0.008 JB	--	--	--	--	--
Benzene	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
Bromodichloromethane	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
Bromoform	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
Bromomethane (Methyl bromide)	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
Carbon disulfide	mg/kg	--	--	--	0.0011 J	--	--	--	--	--
Carbon tetrachloride	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
Chlorobenzene	mg/kg	--	--	--	0.0056 U	--	--	--	--	--

Analytical Data

Sample Location		SP-6	SP-6	SP-6	SP-6	SP-6	SP-7	SP-7	SP-7	SP-7
Sample Identification		S-12609-120911-DN-40	S-12609-120911-DN-41	S-12609-120911-DN-42	S-12609-120911-DN-44	S-12609-120911-DN-43	S-12609-120911-DN-45	S-12609-120911-DN-48	S-12609-120911-DN-46	S-12609-120911-DN-47
Sample Date		12/9/2011	12/9/2011	12/9/2011	12/9/2011	12/9/2011	12/9/2011	12/9/2011	12/9/2011	12/9/2011
Sample Depth		-	(4-6) ft BGS	(10-12) ft BGS	(16-20) ft BGS	(24-28) ft BGS	-	(4-6) ft BGS	(6-8) ft BGS	(6-8) ft BGS
Sample Type		Duplicate								Duplicate
	Units									
Chloroethane	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
Chloroform (Trichloromethane)	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
Chloromethane (Methyl chloride)	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
cis-1,2-Dichloroethene	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
cis-1,3-Dichloropropene	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
Cyclohexane	mg/kg	--	--	--	0.011 U	--	--	--	--	--
Dibromochloromethane	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
Dichlorodifluoromethane (CFC-12)	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
Ethylbenzene	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
Isopropyl benzene	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
Methyl acetate	mg/kg	--	--	--	0.011 U	--	--	--	--	--
Methyl cyclohexane	mg/kg	--	--	--	0.011 U	--	--	--	--	--
Methyl tert butyl ether (MTBE)	mg/kg	--	--	--	0.022 U	--	--	--	--	--
Methylene chloride	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
Styrene	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
Tetrachloroethene	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
Toluene	mg/kg	--	--	--	0.00059 J	--	--	--	--	--
trans-1,2-Dichloroethene	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
trans-1,3-Dichloropropene	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
Trichloroethene	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
Trichlorofluoromethane (CFC-11)	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
Trifluorotrichloroethane (Freon 113)	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
Vinyl chloride	mg/kg	--	--	--	0.0056 U	--	--	--	--	--
Xylenes (total)	mg/kg	--	--	--	0.011 U	--	--	--	--	--

Appendix A

Analytical Data

Sample Location		*SP-7*	*SP-7*	*SP-8*	*SP-8*	*SP-8*	*SP-8*	*SP-8*
Sample Identification		*S-12609-120911-DN-50*	*S-12609-120911-DN-49*	*S-12609-120911-DN-51*	*S-12609-120911-DN-52*	*S-12609-120911-DN-54*	*S-12609-120911-DN-55*	*S-12609-120911-DN-53*
Sample Date		*12/9/2011*	*12/9/2011*	*12/9/2011*	*12/9/2011*	*12/9/2011*	*12/9/2011*	*12/9/2011*
Sample Depth		*(12-14) ft BGS*	*(14-16) ft BGS*	*-*	*(2-4) ft BGS*	*(4-6) ft BGS*	*(6-8) ft BGS*	*(10-12) ft BGS*
Sample Type								
	Units							
Metals								
Aluminum	mg/kg	--	--	2200	--	--	--	--
Antimony	mg/kg	--	--	0.99 U	--	--	--	--
Arsenic	mg/kg	--	--	**2.3**[ab]	--	--	--	--
Barium	mg/kg	--	--	13 JB	--	--	--	--
Beryllium	mg/kg	--	--	0.49 U	--	--	--	--
Cadmium	mg/kg	--	--	0.20 U	--	--	--	--
Chromium	mg/kg	--	--	4.7	--	--	--	--
Cobalt	mg/kg	--	--	2.0 J	--	--	--	--
Copper	mg/kg	--	--	3.5	--	--	--	--
Lead	mg/kg	--	--	2.9	--	--	--	--
Manganese	mg/kg	--	--	140 B	--	--	--	--
Mercury	mg/kg	--	--	0.11 U	--	--	--	--
Nickel	mg/kg	--	--	5.0	--	--	--	--
Selenium	mg/kg	--	--	0.49 U	--	--	--	--
Silver	mg/kg	--	--	0.49 U	--	--	--	--
Thallium	mg/kg	--	--	**0.92 J**[a]	--	--	--	--
Vanadium	mg/kg	--	--	7.6	--	--	--	--
Zinc	mg/kg	--	--	12 B	--	--	--	--
PCBs								
Aroclor-1016 (PCB-1016)	mg/kg	--	0.038 U	--	0.036 U	0.037 U	--	0.035 U
Aroclor-1221 (PCB-1221)	mg/kg	--	0.038 U	--	0.036 U	0.037 U	--	0.035 U
Aroclor-1232 (PCB-1232)	mg/kg	--	0.038 U	--	0.036 U	0.037 U	--	0.035 U
Aroclor-1242 (PCB-1242)	mg/kg	--	0.038 U	--	0.036 U	0.037 U	--	0.035 U
Aroclor-1248 (PCB-1248)	mg/kg	--	0.038 U	--	0.036 U	0.037 U	--	0.035 U
Aroclor-1254 (PCB-1254)	mg/kg	--	0.038 U	--	0.024 J	0.1	--	0.035 U
Aroclor-1260 (PCB-1260)	mg/kg	--	0.038 U	--	0.036 U	0.037 U	--	0.035 U
Total PCBs	mg/kg	--	ND	--	0.024 J	0.1	--	ND
Semi-Volatile Organic Compounds								
2,2'-Oxybis(1-chloropropane) (bis(2-Chloroisopropyl) ether)	mg/kg	--	--	0.11 U	--	--	--	--
2,4,5-Trichlorophenol	mg/kg	--	--	0.17 U	--	--	--	--
2,4,6-Trichlorophenol	mg/kg	--	--	0.17 U	--	--	--	--
2,4-Dichlorophenol	mg/kg	--	--	0.17 U	--	--	--	--
2,4-Dimethylphenol	mg/kg	--	--	0.17 U	--	--	--	--
2,4-Dinitrophenol	mg/kg	--	--	0.36 U	--	--	--	--
2,4-Dinitrotoluene	mg/kg	--	--	0.22 U	--	--	--	--
2,6-Dinitrotoluene	mg/kg	--	--	0.22 U	--	--	--	--
2-Chloronaphthalene	mg/kg	--	--	0.055 U	--	--	--	--
2-Chlorophenol	mg/kg	--	--	0.055 U	--	--	--	--
2-Methylnaphthalene	mg/kg	--	--	0.0074 U	--	--	--	--
2-Methylphenol	mg/kg	--	--	0.22 U	--	--	--	--
2-Nitroaniline	mg/kg	--	--	0.22 U	--	--	--	--
2-Nitrophenol	mg/kg	--	--	0.055 U	--	--	--	--
3&4-Methylphenol	mg/kg	--	--	0.44 U	--	--	--	--
3,3'-Dichlorobenzidine	mg/kg	--	--	0.11 U	--	--	--	--
3-Nitroaniline	mg/kg	--	--	0.22 U	--	--	--	--
4,6-Dinitro-2-methylphenol	mg/kg	--	--	0.17 U	--	--	--	--
4-Bromophenyl phenyl ether	mg/kg	--	--	0.055 U	--	--	--	--
4-Chloro-3-methylphenol	mg/kg	--	--	0.17 U	--	--	--	--
4-Chloroaniline	mg/kg	--	--	0.17 U	--	--	--	--
4-Chlorophenyl phenyl ether	mg/kg	--	--	0.055 U	--	--	--	--
4-Nitroaniline	mg/kg	--	--	0.22 U	--	--	--	--
4-Nitrophenol	mg/kg	--	--	0.36 U	--	--	--	--
Acenaphthene	mg/kg	--	--	0.0096	--	--	--	--
Acenaphthylene	mg/kg	--	--	0.0074 U	--	--	--	--
Acetophenone	mg/kg	--	--	0.11 U	--	--	--	--
Anthracene	mg/kg	--	--	0.046	--	--	--	--
Atrazine	mg/kg	--	--	0.22 U	--	--	--	--
Benzaldehyde	mg/kg	--	--	0.11 U	--	--	--	--

Analytical Data

Sample Location		SP-7	SP-7	SP-8	SP-8	SP-8	SP-8	SP-8
Sample Identification		S-12609-120911-DN-50	S-12609-120911-DN-49	S-12609-120911-DN-51	S-12609-120911-DN-52	S-12609-120911-DN-54	S-12609-120911-DN-55	S-12609-120911-DN-53
Sample Date		12/9/2011	12/9/2011	12/9/2011	12/9/2011	12/9/2011	12/9/2011	12/9/2011
Sample Depth		(12-14) ft BGS	(14-16) ft BGS	-	(2-4) ft BGS	(4-6) ft BGS	(6-8) ft BGS	(10-12) ft BGS
Sample Type								
	Units							
Benzo(a)anthracene	mg/kg	--	--	**0.25[a]**	--	--	--	--
Benzo(a)pyrene	mg/kg	--	--	**0.23[ab]**	--	--	--	--
Benzo(b)fluoranthene	mg/kg	--	--	**0.33[a]**	--	--	--	--
Benzo(g,h,i)perylene	mg/kg	--	--	0.15	--	--	--	--
Benzo(k)fluoranthene	mg/kg	--	--	0.13	--	--	--	--
Biphenyl (1,1-Biphenyl)	mg/kg	--	--	0.055 U	--	--	--	--
bis(2-Chloroethoxy)methane	mg/kg	--	--	0.11 U	--	--	--	--
bis(2-Chloroethyl)ether	mg/kg	--	--	0.11 U	--	--	--	--
bis(2-Ethylhexyl)phthalate (DEHP)	mg/kg	--	--	0.031 JB	--	--	--	--
Butyl benzylphthalate (BBP)	mg/kg	--	--	0.055 U	--	--	--	--
Caprolactam	mg/kg	--	--	0.36 U	--	--	--	--
Carbazole	mg/kg	--	--	0.055 U	--	--	--	--
Chrysene	mg/kg	--	--	0.22	--	--	--	--
Dibenz(a,h)anthracene	mg/kg	--	--	**0.045[a]**	--	--	--	--
Dibenzofuran	mg/kg	--	--	0.055 U	--	--	--	--
Diethyl phthalate	mg/kg	--	--	0.055 U	--	--	--	--
Dimethyl phthalate	mg/kg	--	--	0.055 U	--	--	--	--
Di-n-butylphthalate (DBP)	mg/kg	--	--	0.055 U	--	--	--	--
Di-n-octyl phthalate (DnOP)	mg/kg	--	--	0.055 U	--	--	--	--
Fluoranthene	mg/kg	--	--	0.43	--	--	--	--
Fluorene	mg/kg	--	--	0.01	--	--	--	--
Hexachlorobenzene	mg/kg	--	--	0.0074 U	--	--	--	--
Hexachlorobutadiene	mg/kg	--	--	0.055 U	--	--	--	--
Hexachlorocyclopentadiene	mg/kg	--	--	0.36 U	--	--	--	--
Hexachloroethane	mg/kg	--	--	0.055 U	--	--	--	--
Indeno(1,2,3-cd)pyrene	mg/kg	--	--	0.13	--	--	--	--
Isophorone	mg/kg	--	--	0.055 U	--	--	--	--
Naphthalene	mg/kg	--	--	0.0074 U	--	--	--	--
Nitrobenzene	mg/kg	--	--	0.11 U	--	--	--	--
N-Nitrosodi-n-propylamine	mg/kg	--	--	0.055 U	--	--	--	--
N-Nitrosodiphenylamine	mg/kg	--	--	0.055 U	--	--	--	--
Pentachlorophenol	mg/kg	--	--	0.17 U	--	--	--	--
Phenanthrene	mg/kg	--	--	0.15	--	--	--	--
Phenol	mg/kg	--	--	0.055 U	--	--	--	--
Pyrene	mg/kg	--	--	0.38	--	--	--	--
Volatile Organic Compounds								
1,1,1-Trichloroethane	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
1,1,2,2-Tetrachloroethane	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
1,1,2-Trichloroethane	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
1,1-Dichloroethane	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
1,1-Dichloroethene	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
1,2,4-Trichlorobenzene	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
1,2-Dibromo-3-chloropropane (DBCP)	mg/kg	0.0082 U	--	--	--	--	0.0099 U	--
1,2-Dibromoethane (Ethylene dibromide)	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
1,2-Dichlorobenzene	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
1,2-Dichloroethane	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
1,2-Dichloropropane	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
1,3-Dichlorobenzene	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
1,4-Dichlorobenzene	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
2-Butanone (Methyl ethyl ketone) (MEK)	mg/kg	0.0021 J	--	--	--	--	0.02 U	--
2-Hexanone	mg/kg	0.016 U	--	--	--	--	0.02 U	--
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	mg/kg	0.016 U	--	--	--	--	0.02 U	--
Acetone	mg/kg	0.013 JB	--	--	--	--	0.02 U	--
Benzene	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
Bromodichloromethane	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
Bromoform	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
Bromomethane (Methyl bromide)	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
Carbon disulfide	mg/kg	0.00082 J	--	--	--	--	0.00085 J	--
Carbon tetrachloride	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
Chlorobenzene	mg/kg	0.0041 U	--	--	--	--	0.005 U	--

Analytical Data

Sample Location		*SP-7*	*SP-7*	*SP-8*	*SP-8*	*SP-8*	*SP-8*	*SP-8*
Sample Identification		*S-12609-120911-DN-50*	*S-12609-120911-DN-49*	*S-12609-120911-DN-51*	*S-12609-120911-DN-52*	*S-12609-120911-DN-54*	*S-12609-120911-DN-55*	*S-12609-120911-DN-53*
Sample Date		*12/9/2011*	*12/9/2011*	*12/9/2011*	*12/9/2011*	*12/9/2011*	*12/9/2011*	*12/9/2011*
Sample Depth		*(12-14) ft BGS*	*(14-16) ft BGS*	*-*	*(2-4) ft BGS*	*(4-6) ft BGS*	*(6-8) ft BGS*	*(10-12) ft BGS*
Sample Type								
	Units							
Chloroethane	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
Chloroform (Trichloromethane)	mg/kg	0.0041 U	--	--	--	--	0.00058 J	--
Chloromethane (Methyl chloride)	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
cis-1,2-Dichloroethene	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
cis-1,3-Dichloropropene	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
Cyclohexane	mg/kg	0.0082 U	--	--	--	--	0.0099 U	--
Dibromochloromethane	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
Dichlorodifluoromethane (CFC-12)	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
Ethylbenzene	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
Isopropyl benzene	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
Methyl acetate	mg/kg	0.0082 U	--	--	--	--	0.0099 U	--
Methyl cyclohexane	mg/kg	0.0082 U	--	--	--	--	0.0099 U	--
Methyl tert butyl ether (MTBE)	mg/kg	0.016 U	--	--	--	--	0.02 U	--
Methylene chloride	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
Styrene	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
Tetrachloroethene	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
Toluene	mg/kg	0.00025 J	--	--	--	--	0.00051 J	--
trans-1,2-Dichloroethene	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
trans-1,3-Dichloropropene	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
Trichloroethene	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
Trichlorofluoromethane (CFC-11)	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
Trifluorotrichloroethane (Freon 113)	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
Vinyl chloride	mg/kg	0.0041 U	--	--	--	--	0.005 U	--
Xylenes (total)	mg/kg	0.0082 U	--	--	--	--	0.0099 U	--

Appendix B
ProUCL Input/Output Files

APPENDIX B-1A
PROUCL INPUT
HIGH MOLUCULAR WEIGHT PAHs. ANTIMONY, THALLIIUM, AND VANADIUM

Sample Location	HMW PAHs	D_HMW PAHs	Antimony	D_Antimony
SP-1	3.1000	1	0.87	0
SP-2	0.0235	1	1	0
SP-3	17.2400	1	0.96	0
SP-4	1.7900	1	0.38	1
SP-5	1.6650	1	0.85	0
SP-6	4.7260	1	0.37	1
SP-7	24.4000	1	0.83	1
SP-8	2.2950	1	0.99	0

Sample Location	Thallium	D_Thallium	Vanadium	D_Vanadium
SP-1	0.87	0	7.2	1
SP-2	1	0	6.4	1
SP-3	0.96	0	8.7	1
SP-4	1.3	1	14	1
SP-5	0.96	1	7	1
SP-6	0.98	1	9.3	1
SP-7	1.1	1	7.4	1
SP-8	0.92	1	7.6	1

APPENDIX B-1B

PROUCL OUTPUT

HIGH MOLECULAR WEIGHT PAHs. ANTIMONY, THALLIUM, AND VANADIUM

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	5/25/2015 1:04:43 PM
From File	ProUCL Input - PAH and Metals 05-25-15.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

HMW PAHs

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	0.0235	Mean	6.905
Maximum	24.4	Median	2.698
SD	8.899	Std. Error of Mean	3.146
Coefficient of Variation	1.289	Skewness	1.538

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.0

Normal GOF Test

Shapiro Wilk Test Statistic	0.739	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.347	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.313	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	12.87	95% Adjusted-CLT UCL (Chen-1995)	13.91
		95% Modified-t UCL (Johnson-1978)	13.15

Gamma GOF Test

A-D Test Statistic	0.394	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.757	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.216	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.307	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.58	k star (bias corrected MLE)	0.446
Theta hat (MLE)	11.9	Theta star (bias corrected MLE)	15.48
nu hat (MLE)	9.285	nu star (bias corrected)	7.137
MLE Mean (bias corrected)	6.905	MLE Sd (bias corrected)	10.34
		Approximate Chi Square Value (0.05)	2.246
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	1.617

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	21.94	95% Adjusted Gamma UCL (use when n<50)	30.47

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.837	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.309	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.313	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

APPENDIX B-1B

PROUCL OUTPUT

HIGH MOLECULAR WEIGHT PAHs. ANTIMONY, THALLIUM, AND VANADIUM

Minimum of Logged Data	-3.751	Mean of logged Data	0.862
Maximum of Logged Data	3.195	SD of logged Data	2.118

Assuming Lognormal Distribution

95% H-UCL	3971	90% Chebyshev (MVUE) UCL	39.14
95% Chebyshev (MVUE) UCL	51.2	97.5% Chebyshev (MVUE) UCL	67.93
99% Chebyshev (MVUE) UCL	100.8		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	12.08	95% Jackknife UCL	12.87
95% Standard Bootstrap UCL	11.75	95% Bootstrap-t UCL	36.21
95% Hall's Bootstrap UCL	47.09	95% Percentile Bootstrap UCL	12.01
95% BCA Bootstrap UCL	13.18		
90% Chebyshev(Mean, Sd) UCL	16.34	95% Chebyshev(Mean, Sd) UCL	20.62
97.5% Chebyshev(Mean, Sd) UCL	26.55	99% Chebyshev(Mean, Sd) UCL	38.21

Suggested UCL to Use

95% Adjusted Gamma UCL	30.47

Recommended UCL exceeds the maximum observation

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Antimony

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
Number of Detects	3	Number of Non-Detects	5
Number of Distinct Detects	3	Number of Distinct Non-Detects	5
Minimum Detect	0.37	Minimum Non-Detect	0.85
Maximum Detect	0.83	Maximum Non-Detect	1
Variance Detects	0.069	Percent Non-Detects	62.5%
Mean Detects	0.527	SD Detects	0.263
Median Detects	0.38	CV Detects	0.499
Skewness Detects	1.729	Kurtosis Detects	N/A
Mean of Logged Detects	-0.716	SD of Logged Detects	0.459

Warning: Data set has only 3 Detected Values.

This is not enough to compute meaningful or reliable statistics and estimates.

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.0

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.766	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.378	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.512	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.527	Standard Error of Mean	0.152
SD	0.215	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.814	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.776	95% KM Bootstrap t UCL	N/A

90% KM Chebyshev UCL	0.982	95% KM Chebyshev UCL	1.188
97.5% KM Chebyshev UCL	1.474	99% KM Chebyshev UCL	2.036

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	6.841	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.077	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	41.04	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A	MLE Sd (bias corrected)	N/A

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	6.027	nu hat (KM)	96.43
		Adjusted Level of Significance (β)	0.0195
Approximate Chi Square Value (96.43, α)	74.78	Adjusted Chi Square Value (96.43, β)	69.97
95% Gamma Approximate KM-UCL (use when n>=50)	0.679	95% Gamma Adjusted KM-UCL (use when n<50)	0.726

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.775	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.375	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.512	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.503	Mean in Log Scale	-0.716
SD in Original Scale	0.142	SD in Log Scale	0.245
95% t UCL (assumes normality of ROS data)	0.598	95% Percentile Bootstrap UCL	N/A
95% BCA Bootstrap UCL	N/A	95% Bootstrap t UCL	N/A
95% H-UCL (Log ROS)	0.606		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-0.716	95% H-UCL (KM -Log)	0.712
KM SD (logged)	0.375	95% Critical H Value (KM-Log)	2.158
KM Standard Error of Mean (logged)	0.265		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.489	Mean in Log Scale	-0.746
SD in Original Scale	0.146	SD in Log Scale	0.253
95% t UCL (Assumes normality)	0.587	95% H-Stat UCL	0.593

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.814	95% KM (Percentile Bootstrap) UCL	N/A

Warning: One or more Recommended UCL(s) not available!

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Thallium

General Statistics

Total Number of Observations	8	Number of Distinct Observations	7
Number of Detects	5	Number of Non-Detects	3
Number of Distinct Detects	5	Number of Distinct Non-Detects	3
Minimum Detect	0.92	Minimum Non-Detect	0.87
Maximum Detect	1.3	Maximum Non-Detect	1

APPENDIX B-1B

PROUCL OUTPUT

HIGH MOLECULAR WEIGHT PAHs. ANTIMONY, THALLIUM, AND VANADIUM

Variance Detects	0.0237	Percent Non-Detects	37.5%
Mean Detects	1.052	SD Detects	0.154
Median Detects	0.98	CV Detects	0.146
Skewness Detects	1.359	Kurtosis Detects	1.309
Mean of Logged Detects	0.0427	SD of Logged Detects	0.14

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.0

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.864	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.28	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.396	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.994	Standard Error of Mean	0.0537
SD	0.134	95% KM (BCA) UCL	1.084
95% KM (t) UCL	1.095	95% KM (Percentile Bootstrap) UCL	1.075
95% KM (z) UCL	1.082	95% KM Bootstrap t UCL	1.178
90% KM Chebyshev UCL	1.155	95% KM Chebyshev UCL	1.228
97.5% KM Chebyshev UCL	1.329	99% KM Chebyshev UCL	1.528

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.421	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.678	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.295	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.357	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	62.36	k star (bias corrected MLE)	25.08
Theta hat (MLE)	0.0169	Theta star (bias corrected MLE)	0.042
nu hat (MLE)	623.6	nu star (bias corrected)	250.8
MLE Mean (bias corrected)	1.052	MLE Sd (bias corrected)	0.21

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	54.85	nu hat (KM)	877.6
Approximate Chi Square Value (877.64, α)	809.9	Adjusted Chi Square Value (877.64, β)	793.3
95% Gamma Approximate KM-UCL (use when n>=50)	1.077	95% Gamma Adjusted KM-UCL (use when n<50)	1.099

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.725	Mean	0.96
Maximum	1.3	Median	0.94
SD	0.178	CV	0.185
k hat (MLE)	34.94	k star (bias corrected MLE)	21.92
Theta hat (MLE)	0.0275	Theta star (bias corrected MLE)	0.0438
nu hat (MLE)	559.1	nu star (bias corrected)	350.8
MLE Mean (bias corrected)	0.96	MLE Sd (bias corrected)	0.205
		Adjusted Level of Significance (β)	0.0195
Approximate Chi Square Value (350.78, α)	308.4	Adjusted Chi Square Value (350.78, β)	298.3
95% Gamma Approximate UCL (use when n>=50)	1.092	95% Gamma Adjusted UCL (use when n<50)	1.129

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.886	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.274	**Lilliefors GOF Test**	

APPENDIX B-1B

PROUCL OUTPUT

HIGH MOLECULAR WEIGHT PAHs. ANTIMONY, THALLIUM, AND VANADIUM

5% Lilliefors Critical Value	0.396	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.968	Mean in Log Scale	-0.045
SD in Original Scale	0.168	SD in Log Scale	0.167
95% t UCL (assumes normality of ROS data)	1.081	95% Percentile Bootstrap UCL	1.059
95% BCA Bootstrap UCL	1.085	95% Bootstrap t UCL	1.134
95% H-UCL (Log ROS)	1.093		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-0.0145	95% H-UCL (KM -Log)	1.086
KM SD (logged)	0.126	95% Critical H Value (KM-Log)	1.871
KM Standard Error of Mean (logged)	0.0505		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.834	Mean in Log Scale	-0.256
SD in Original Scale	0.323	SD in Log Scale	0.427
95% t UCL (Assumes normality)	1.05	95% H-Stat UCL	1.217

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	1.095	95% KM (Percentile Bootstrap) UCL	1.075

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Vanadium

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	6.4	Mean	8.45
Maximum	14	Median	7.5
SD	2.428	Std. Error of Mean	0.859
Coefficient of Variation	0.287	Skewness	2.078

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.0

Normal GOF Test

Shapiro Wilk Test Statistic	0.76	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.262	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.313	Data appear Normal at 5% Significance Level	

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	10.08	95% Adjusted-CLT UCL (Chen-1995)	10.54
		95% Modified-t UCL (Johnson-1978)	10.18

Gamma GOF Test

A-D Test Statistic	0.685	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.716	Detected data appear Gamma Distributed at 5% Significance Level	

APPENDIX B-1B

PROUCL OUTPUT

HIGH MOLECULAR WEIGHT PAHs. ANTIMONY, THALLIUM, AND VANADIUM

K-S Test Statistic	0.262	**Kolmogrov-Smirnoff Gamma GOF Test**	
5% K-S Critical Value	0.294	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	17.18	k star (bias corrected MLE)	10.82
Theta hat (MLE)	0.492	Theta star (bias corrected MLE)	0.781
nu hat (MLE)	275	nu star (bias corrected)	173.2
MLE Mean (bias corrected)	8.45	MLE Sd (bias corrected)	2.568
		Approximate Chi Square Value (0.05)	143.7
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	137

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	10.18	95% Adjusted Gamma UCL (use when n<50)	10.68

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.841	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.247	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.313	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.856	Mean of logged Data	2.105
Maximum of Logged Data	2.639	SD of logged Data	0.246

Assuming Lognormal Distribution

95% H-UCL	10.18	90% Chebyshev (MVUE) UCL	10.63
95% Chebyshev (MVUE) UCL	11.63	97.5% Chebyshev (MVUE) UCL	13.02
99% Chebyshev (MVUE) UCL	15.75		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	9.862	95% Jackknife UCL	10.08
95% Standard Bootstrap UCL	9.724	95% Bootstrap-t UCL	12.55
95% Hall's Bootstrap UCL	15.47	95% Percentile Bootstrap UCL	9.838
95% BCA Bootstrap UCL	10.41		
90% Chebyshev(Mean, Sd) UCL	11.03	95% Chebyshev(Mean, Sd) UCL	12.19
97.5% Chebyshev(Mean, Sd) UCL	13.81	99% Chebyshev(Mean, Sd) UCL	16.99

Suggested UCL to Use

95% Student's-t UCL	10.08

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

APPENDIX B-2A
PROUCL INPUT
TOTAL PCBs

Sample Location	Depth	Total PCBs	D_Total PCBs
SP-1	(6-8) ft BGS	0.036	0
SP-1	(12-14) ft BGS	0.023	1
SP-1	(16-18) ft BGS	0.038	0
SP-2	(3-5) ft BGS	0.036	0
SP-2	(8-10) ft BGS	0.036	0
SP-2	(10-12) ft BGS	0.131	1
SP-3	(3-5) ft BGS	0.41	1
SP-3	(8-10) ft BGS	0.033	1
SP-3	(10-12) ft BGS	0.035	0
SP-4		0.75	1
SP-4		0.059	1
SP-4		0.19	0
SP-5	(6-8) ft BGS	0.056	1
SP-5	(12-14) ft BGS	0.039	0
SP-5	(16-18) ft BGS	0.036	0
SP-6	(4-6) ft BGS	0.73	1
SP-6	(10-12) ft BGS	0.08	1
SP-6	(24-28) ft BGS	0.036	0
SP-7	(4-6) ft BGS	0.051	1
SP-7	(6-8) ft BGS	0.039	0
SP-7	(14-16) ft BGS	0.038	0
SP-8	(2-4) ft BGS	0.024	1
SP-8	(4-6) ft BGS	0.1	1
SP-8	(10-12) ft BGS	0.035	0

APPENDIX B-2B

PROUCL OUTPUT

TOTAL PCBs

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	5/25/2015 1:02:59 PM
From File	ProUCL Input - Total PCBs.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Total PCBs

General Statistics

Total Number of Observations	24	Number of Distinct Observations	17
Number of Detects	12	Number of Non-Detects	12
Number of Distinct Detects	12	Number of Distinct Non-Detects	5
Minimum Detect	0.023	Minimum Non-Detect	0.035
Maximum Detect	0.75	Maximum Non-Detect	0.19
Variance Detects	0.0736	Percent Non-Detects	50%
Mean Detects	0.204	SD Detects	0.271
Median Detects	0.0695	CV Detects	1.33
Skewness Detects	1.569	Kurtosis Detects	0.976
Mean of Logged Detects	-2.33	SD of Logged Detects	1.229

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.674	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.356	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.256	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.116	Standard Error of Mean	0.0435
SD	0.204	95% KM (BCA) UCL	0.192
95% KM (t) UCL	0.19	95% KM (Percentile Bootstrap) UCL	0.189
95% KM (z) UCL	0.187	95% KM Bootstrap t UCL	0.294
90% KM Chebyshev UCL	0.246	95% KM Chebyshev UCL	0.306
97.5% KM Chebyshev UCL	0.388	99% KM Chebyshev UCL	0.549

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.952	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.764	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.243	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.254	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.802	k star (bias corrected MLE)	0.657
Theta hat (MLE)	0.254	Theta star (bias corrected MLE)	0.31
nu hat (MLE)	19.25	nu star (bias corrected)	15.77
MLE Mean (bias corrected)	0.204	MLE Sd (bias corrected)	0.252

APPENDIX B-2B

PROUCL OUTPUT

TOTAL PCBs

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.324	nu hat (KM)	15.54
Approximate Chi Square Value (15.54, α)	7.641	Adjusted Chi Square Value (15.54, β)	7.252
95% Gamma Approximate KM-UCL (use when n>=50)	0.236	95% Gamma Adjusted KM-UCL (use when n<50)	0.249

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.107
Maximum	0.75	Median	0.0165
SD	0.212	CV	1.983
k hat (MLE)	0.513	k star (bias corrected MLE)	0.477
Theta hat (MLE)	0.208	Theta star (bias corrected MLE)	0.224
nu hat (MLE)	24.64	nu star (bias corrected)	22.9
MLE Mean (bias corrected)	0.107	MLE Sd (bias corrected)	0.155
		Adjusted Level of Significance (β)	0.0392
Approximate Chi Square Value (22.90, α)	13.01	Adjusted Chi Square Value (22.90, β)	12.49
95% Gamma Approximate UCL (use when n>=50)	0.188	95% Gamma Adjusted UCL (use when n<50)	0.196

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.891	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.158	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.256	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.114	Mean in Log Scale	-3.086
SD in Original Scale	0.209	SD in Log Scale	1.208
95% t UCL (assumes normality of ROS data)	0.187	95% Percentile Bootstrap UCL	0.187
95% BCA Bootstrap UCL	0.215	95% Bootstrap t UCL	0.283
95% H-UCL (Log ROS)	0.193		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-2.971	95% H-UCL (KM -Log)	0.161
KM SD (logged)	1.063	95% Critical H Value (KM-Log)	2.626
KM Standard Error of Mean (logged)	0.234		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.114	Mean in Log Scale	-3.095
SD in Original Scale	0.209	SD in Log Scale	1.201
95% t UCL (Assumes normality)	0.188	95% H-Stat UCL	0.189

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.19	95% GROS Adjusted Gamma UCL	0.196

APPENDIX B-2B

PROUCL OUTPUT

TOTAL PCBs

95% Adjusted Gamma KM-UCL	0.249

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

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