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ECOLOGICAL RISK ASSESSMENT STEP 3 EVALUATION OF THE DRAINAGE DITCH AND CEDAR CREEK NEAR THE SOUTHERN WOOD PIEDMONT FACILITY IN GULF, NORTH CAROLINA

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17 March 2008

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LIST OF ACRONYMS

BERA	Baseline Ecological Risk Assessment
COPEC	Chemical of Potential Ecological Concern
CSM	Conceptual Site Model
ERA	Ecological Risk Assessment
ERAGS	Ecological Risk Assessment Guidance for Superfund
ESI	Environmental Site Inspection
ESVs	Ecological Screening Values
HpCDD	Heptachlorodibenzo-p-dioxin Congeners
HQ	Hazard Quotient
HQ_{screen}	Hazard Quotient based on SLERA screening values
$HQ_{screen2}$	Hazard Quotient based on revised screening values
LCV	Lowest Chronic Value
NCDENR	North Carolina Department of Environment and Natural Resources
NCNHP	North Carolina Natural Heritage Program
PEC	Probable Effect Concentration
RTE	Rare, Threatened and Endangered
OCDD	Octachlorodibenzo-p-dioxin
PAHs	Polycyclic Aromatic Hydrocarbons
PCDD/Fs	Polychlorinated dibenzo-p-dioxins/polychlorinated dibenzofurans
RSV	Refined Screening Value
SLERA	Screening-Level Ecological Risk Assessment
SMDP	Scientific/Management Decision Point
SVOCs	Semi-Volatile Organic Compounds
SWP	Southern Wood Piedmont
TEC	Threshold Effect Concentration
TEF	Toxic Equivalency Factor
TEQ	Toxic Equivalents Quotient
TOC	Total Organic Carbon
TRVs	Toxicity Reference Values
USEPA	US Environmental Protection Agency
USF&WS	US Fish and Wildlife Service
USGS	US Geological Survey
VOCs	Volatile Organic Compounds
WPM	Work Plan Memorandum

EXECUTIVE SUMMARY

AMEC has prepared this Ecological Risk Assessment Step 3 Assessment of Cedar Creek and the Drainage Ditch adjacent to the former Southern Wood Piedmont (SWP) property in Gulf, North Carolina, in accordance with USEPA (1997) guidance and NCDENR (2006, 2007a) recommendations. This report is a follow-up to the SLERA report (AMEC, 2007) that was prepared in accordance with NCDENR (2003) guidance, and satisfied Steps 1 and 2 of the USEPA *Ecological Risk Assessment Guidance for Superfund* (ERAGS; USEPA 1997). The SLERA was recently approved by NCDENR.

Since the ERAGS Step 3 report was prepared as a stand-alone document, some of the introductory information related to site history, as well as the analytical results, are provided for completeness.

E.1 Facility Summary

The SWP facility was a former wood-preserving plant that treated wood using creosote and pentachlorophenol. Figure 1-1 shows the general site location for this facility. Historical aerial photographs of the facility were provided in the SLERA (AMEC, 2007). Operations at this facility ceased in 1980. An on-property Drainage Ditch discharges to Cedar Creek, which merges with the Deep River about 1.75 miles east of the property. Cedar Creek is not part of the SWP property, except for a small portion on the northern side where the creek serves as the property boundary with the adjoining parcel. Historical sampling of the creek has shown evidence of polycyclic aromatic hydrocarbons (PAHs), pentachlorophenol, and polychlorinated dibenzo-p-dioxins/polychlorinated dibenzofurans (PCDD/Fs) in the near creek soils and sediments. Trace levels of PAHs and pentachlorophenol were reported in the historical surface water samples. Based on the current understanding of local transport mechanisms, these chemicals likely entered the creek either dissolved in the aqueous phase or adsorbed to the particulate phase during historical releases, rather than as non-aqueous oil phase.

E.2 Site-Specific Ecological Setting

An ecological field survey of the Drainage Ditch and Cedar Creek was performed in July 2006. There were areas of standing water, areas of low stream flow between ponded areas in Cedar Creek, and areas of dry streambeds. The only discernible flow was observed in the riffle areas between the areas of standing water within the creek.

It has been reported that the benthic community in Cedar Creek is depauperate due to natural conditions (NCDENR, 1999a). The substrate is clayey with some sands and silt, and rock. Suitable substrates are available only on leaf packs and fallen limbs. Furthermore, as reported

by NCDENR (1999b), the creek tends to have low to non-existent flows during drier periods, further reducing the potential for the establishment of a significant benthic community. The macroinvertebrates that were observed during July 2006 were limited in both number and species. Macroinvertebrates that spend their entire life cycle in aquatic environments, such as amphipods, were absent from nearly all sampling locations. Semi-aquatic invertebrates, which spend their larval stages in aquatic environments but are aerial as adults (e.g., mayflies), were observed at a number of stations. The stations with the largest number and diversity of semi-aquatic invertebrates were located near the confluence of Cedar Creek and the Deep River, and in the second north tributary (Trib-N2) to Cedar Creek.

These factors likely contribute to the absence of a significant fish population in Cedar Creek. During the July 2006 field survey fish were not observed within Cedar Creek. The eastern mosquitofish, *Gambusia affinis*, was observed in the Drainage Ditch. Mosquitofish are commonly found in ditches and small ponds in the southeastern US and are native to North Carolina.

E.3 Chemical Database

Analytical data were available for sediments and surface water samples collected as part of prior field investigations. The historical datasets were supplemented with sediment samples collected for total organic carbon and grain size analyses as part of the ecological field survey in July 2006.

All sediment samples represented surface samples collected from depths no greater than one foot. Sediments were collected from the Drainage Ditch in 1983, 1990, 1995, 2002, and 2006 (TOC and grain size only). Sediments were collected from the Drainage Ditch in 1983, 1990, 1995, 1998, 2002, and 2006 (TOC and grain size only). These samples were analyzed for one or more of the following parameters: volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), inorganics, PCDD/Fs, TOC and grain size. Sediment samples from both the Drainage Ditch and Cedar Creek were also collected in 2004 for toxic characteristic leaching procedure (TCLP) analysis.

Unfiltered surface water samples were collected from Cedar Creek in 1990 and 1995. Many of these were co-located with sediment samples. Samples collected in 1990 were analyzed only for VOCs and SVOCs. Samples collected in 1995 were analyzed for VOCs, SVOCs, and inorganics. There was no standing water in the Drainage Ditch during either of these two prior field investigations, so there is no surface water data available from this area.

E.4 Abiotic Screening of Sampled Media

In the SLERA, the abiotic screen is performed using the EPA Region IV Ecological Screening Value (ESV), although alternate values were evaluated when an ESV was not available for a given chemical or media.

E.4.1 Surface Water Abiotic Screen Results

Six SVOCs (2-methylphenol, isophorone, pentachlorophenol, naphthalene, pyrene, and total PAHs) were positively detected in the unfiltered surface water samples. All of the PAHs were detected in a single sample (SW-034-SW) in Cedar Creek near the Deep River (unlikely to be site-related), while pentachlorophenol was detected in two samples and a corresponding field duplicate (8747, SW-029-SW and SW-129-SW) at the juncture of the ditch and Cedar Creek. Eleven inorganics were detected in the unfiltered surface water samples. Based on the conservative screening performed as part of the SLERA (AMEC, 2007), 14 inorganics were retained as preliminary COPECs based upon the SLERA screening.

A refined screening was performed as part of this ERAGS Step 3 report. This included comparison of the analytical results to refined screening values (RSVs), comparison to local background, identification of essential nutrients, and spatial analysis of results. Only pentachlorophenol met some of the refined screening criteria. Even though pentachlorophenol was detected at only one location and exhibited declining concentrations between the sampling events, it was conservatively retained as a COPEC.

E.4.2 Sediment Abiotic Screen Results

Five VOCs, 24 SVOCs, 17 inorganics, and PCDD/Fs were detected in the sediment samples. Based on the conservative screening performed as part of the SLERA (AMEC, 2007), five VOCs, 24 SVOCs, 14 Inorganics, and PCDD/Fs were initially retained as COPECs. Using a combination of comparison to background, RSVs, and spatial distribution of the results, none of the VOCs, all of the PAHs, pentachlorophenol, two of the inorganics, and PCDD/Fs met the refined screening criteria and were retained as COPECs as part of the ERAGS Step 3 refined screening.

The sediment results and those locations that exceeded the RSVs for the PAHs and PCDD/Fs in the Drainage Ditch are presented in Figures 2-8 and 2-4 (respectively). The sediment results and those locations that exceeded the RSVs for the PAHs and PCDD/Fs in Cedar Creek are presented in Figures 2-9 and 2-5 (respectively). For all four figures, there are instances where samples collected prior to 1998 exceeded the RSVs but the more contemporary samples collected from the same locations were below the RSVs, or were not detected. These results

indicate that historical PAH results should not be used to guide further steps in the ERAGS process. The decline in concentration over time suggests natural PAH degradation within drainage ditch and Cedar Creek sediments.

E.5 Transport of COPECs During Flooding Events

NCDENR (2007a) requested an evaluation of the potential for transport of COPECs during flooding events. This potential was evaluated for two primary areas: (1) the potential transport into the existing tributaries, and (2) transport to adjoining overbank areas.

As discussed earlier, the transport from the site to the Drainage Ditch and Cedar Creek likely occurred as surface overflows from the on-property settling ponds. Examination of the spatial distribution of the PAH and PCDD/F concentrations in the sediments suggests that surface water transport (via suspended sediments) facilitated the dispersion of these COPECs. However, there was a large amount of variability in the dataset (e.g., samples collected from the same location during different years had widely varying analytical results), and a clear concentration gradient was not obvious within the main channel of Cedar Creek. Nonetheless, COPEC concentrations were generally greater within the Drainage Ditch and near the juncture of the ditch and Cedar Creek, than at the downstream locations. Sediment PAH and PCDD/F concentrations are comparable to background in Cedar Creek near the juncture with the Deep River and within the Deep River.

NCDENR (2007a) also requested whether there was the potential for transport and deposition of impacted sediments in overbank deposits, such as the small areas of "moist woods"[1] adjoining Cedar Creek, during historical flooding events. There was some evidence of historical flooding in the areas of the moist woods, based on debris lines on some of the vegetation (see SLERA, Appendix A, page A-32; AMEC, 2007). However, the debris lines were within a fairly narrow band of variable width (generally up to a maximum of 15-ft depending upon the local topography) about the edge of the creek. During the July 2006 ecological survey most of these areas were well vegetated with little apparent sediment deposits. There was evidence of eroded areas along some of the banks, predominantly near the junctures of the tributaries and the creek, likely due to sporadic high flow conditions during storm events (e.g., SLERA, Appendix D, Figure D-2, photographs 19 and 21; AMEC, 2007).

Although the surface water in Cedar Creek was turbid during the July 2006 ecological survey, indicating the potential for sediment transport, the historical results do not suggest extensive

[1] These "moist woods" are highly fragmented and the US Army Corps of Engineers (Raleigh, NC office) concluded that they would not be considered jurisdictional wetlands (see SLERA, Appendix A, Attachment A4; AMEC, 2007). The nearest significant wetland is located 3.25 miles downstream of the site on the Deep River.

long-range transport of the PAHs or pentachlorophenol. PCDD/Fs were detected in nearly all of the samples, but the concentrations approached site-specific or regional background near the easternmost tributaries (Trib-N3 and Trib-S2), and within the Deep River. Any sedimentation that has occurred since capping of the settling ponds in 1980 would likely introduce cleaner sediments to many of these areas.

E.6 Chemical Fingerprinting Assessment

A chemical fingerprinting assessment, principally using Principal Components Analysis and Cluster Analysis, was performed using the sediment PAH, pentachlorophenol, and PCDD/F results. Surface water was not evaluated since PCDD/F congeners were not included as part of the historical analytical suites, and there were limited detections of PAHs in these samples.

The primary objective of the fingerprinting assessment was to determine whether the PAH and PCDD/F congener patterns in the Drainage Ditch and Cedar Creek samples are related to the materials historically used at the SWP facility and to determine whether the SWP facility represents the only source of these chemicals to these areas. The PAH results were variable, both in time and space, which complicated the interpretation of these results. When detected, only a small number of the sediment samples found in the Drainage Ditch and Cedar Creek at the juncture with the ditch and at the property boundary had a PAH pattern similar to that for creosote at a concentration above the RSV. It should be noted that these PAH results and pattern matches were present in the older samples with the more contemporary samples showing lower (or no detectable) PAH concentrations and PAH patterns that differ from creosote material.

Other sources, such as runoff from vehicles (on- and off-road) may be contributing to the sporadic detections of PAHs found within the Cedar Creek main channel and its associated tributaries. The PCDD/F results showed less variability with time but the chemical fingerprinting was affected by inter-laboratory variation of the samples split between SWP and NCDENR. The PCDD/F patterns in the Cedar Creek sediments did not match those reported for unused PCP, but there appeared to be some similarity in the PCDD/F patterns of the downstream creek sediments and the downstream ditch sediments. The most significant of these areas is near the juncture of the ditch and creek. Several individual downstream creek samples also have similar patterns to those in the ditch sediments. Although PCDD/F congeners were detected in some of the creek tributary samples, the patterns for most of these differ from that observed in the ditch suggesting potential other sources in these areas.

E.7 Preliminary Assessment Endpoint and Candidate Receptors

One of the objectives of ERAGS Step 3 (USEPA, 1997) is to develop preliminary assessment endpoints and candidate receptors. This is done to provide context for the abiotic screening results. For example, abiotic screening values developed based on benthic toxicity may not be relevant to assessing systems that are naturally lacking a robust benthic community.

A total of five assessment endpoints were developed at this stage:

- *Assessment Endpoint No. 1*: Evaluate the potential for adverse effects to upper trophic level insectivorous avian populations resulting from exposures to COPECs in background, drainage ditch, or Cedar Creek sediments, surface water, and/or prey.

  Candidate representative receptor: Eastern Kingbird

- *Assessment Endpoint No. 2:* Evaluate the potential for adverse effects to upper trophic level invertivorous avian populations resulting from exposures to COPECs in background, drainage ditch, or Cedar Creek sediments, surface water, and/or prey.

  Candidate representative receptor: American Robin

- *Assessment Endpoint No. 3*: Evaluate the potential for adverse effects to upper trophic level carnivorous mammal populations resulting from exposures to COPECs in background, drainage ditch, or Cedar Creek sediments, surface water, and/or prey.

  Candidate representative receptor: Red Fox

- *Assessment Endpoint No. 4*: Evaluate the potential for adverse effects to upper trophic level herbivorous mammal populations resulting from exposures to COPECs in background, drainage ditch, or Cedar Creek sediments, surface water, and/or prey.

  Candidate representative receptor: White-tailed Deer

- *Assessment Endpoint No. 5*: Evaluate the potential for adverse effects to upper trophic level omnivorous mammal populations resulting from exposures to COPECs in background, drainage ditch, or Cedar Creek sediments, surface water, and/or prey.

  Candidate representative receptor: Raccoon

Consistent with ERAGS guidance (USEPA, 1997), the relevant Measurement Endpoints for each of these proposed Assessment Endpoints is developed as part of ERAGS Step 4.

E.8 Scientific Management Decision Point

The final portion of ERAGS Step 3 is the Scientific Management Decision Point (SMDP). SMDPs provide an opportunity to fine tune and focus any additional activities to address the specific goals of the different steps in the ERAGS process (USEPA, 1997). For example, SMDPs provide the opportunity to exit the process where the weight of evidence supports no further action.

Existing habitat conditions in the Drainage Ditch and Cedar Creek were determined to be poor or poor-to-fair, based on application of the RBP process during the ecological survey performed in July 2006. These results are consistent with the conclusions made during a prior survey of Cedar Creek reported by NCDENR (1999b). The naturally depauperate conditions of Cedar Creek preclude the development of a robust creek-wide benthic or fish community. Mosquitofish, a native fish species in North Carolina often used for mosquito control, was observed only in the Drainage Ditch near the confluence with Cedar Creek.

Based on the results of the July 2006 field survey, and review of prior studies performed on both Cedar Creek and the Drainage Ditch (e.g., NCDENR, 1999b) it was concluded that that natural low flow conditions of the creek and ditch preclude the development of a robust system-wide benthic population or fishery. Consequently, assessment endpoints based upon direct contact of sediments to these receptors would have limited value for risk management decisions.

The abiotic chemical screen performed as part of the SLERA indicated that the maximum chemical concentrations for several organics and inorganics in surface water, and PCDD/Fs, some metals, PAHs, and phenolics in sediment, exceeded their screening benchmarks (i.e., HQ_{screen} values greater than one) indicating that there is the potential for adverse ecological effects and a need for a more thorough assessment. The refined screening performed in this ERAGS Step 3 report, which included a comparison of the results to alternate screening benchmarks and a spatial evaluation of the results, yielded a refined COPEC list. None of the SLERA COPECs for surface water were retained as part of this updated screen except for pentachlorophenol. For the sediments, PAHs, pentachlorophenol and PCDD/Fs were retained as part of the refined COPECs. Although two inorganics (nickel and silver) when detected were detected above the RSV, neither were site-related, and therefore were not retained as part of the refined COPEC list. The samples that exceeded the pentachlorophenol and PAH revised screening values were generally located in the Drainage Ditch or in Cedar Creek samples collected near the juncture with the Drainage Ditch.

A revised screening was not performed for the PCDD/Fs or Dioxin-TEQs due to the lack of a suitable revised screening value for these chemicals. Therefore, the focus for their evaluation was on their spatial distribution and chemical fingerprinting evaluation. The PCDD/F congener that was most frequently detected was OCDD, which is not unexpected since this congener is commonly observed in environmental samples. The spatial analysis showed that the greatest Dioxin-TEQs concentrations were observed in the Drainage Ditch and in Cedar Creek near the juncture with the Drainage Ditch. There were also sporadic elevated results (relative to neighboring locations) at more downstream locations in Cedar Creek suggesting that these may reflect historical transport events. Nonetheless, the dioxin-TEQ concentrations in most of the Cedar Creek tributaries and in the downstream sediment samples collected near and within the Deep River are similar to the site-specific background Dioxin-TEQ concentrations.

Based on the results presented in this report, it is recommended to proceed to the subsequent steps of the ERAGS process. If requested by NCDENR, the ERAGS Step 4 report will be submitted following approval of the ERAGS Step 3 report. It is also recommended to combine together the ERAGS Steps 4 and 5 into a single report, since the latter focuses on the field verification and feasibility of the study design that may be developed as part of ERAGS Step 4.

1.0 INTRODUCTION

AMEC has prepared this Ecological Risk Assessment (ERAGS) Step 3 Assessment of Cedar Creek and the Drainage Ditch adjacent to the former Southern Wood Piedmont (SWP) property in Gulf, North Carolina, in accordance with United States Environmental Protection Agency (USEPA, 1997) guidance and North Carolina Department of Environment and Natural Resources (NCDENR, 2006, 2007a) recommendations. This report is a follow-up to the Screening Level Ecological Risk Assessment (SLERA) report (AMEC, 2007). The latter was prepared in accordance with NCDENR (2003) guidance, and satisfied Steps 1 and 2 of the USEPA *Ecological Risk Assessment Guidance for Superfund* (ERAGS; USEPA 1997). The primary objectives of this ERAGS Step 3 report include the following:

- Refining the Chemicals of Potential Ecological Concern (COPECs) developed in the SLERA (AMEC, 2007) using alternate screening values.
- Developing a Conceptual Site Model that reflects the potential fate and transport pathways and exposure routes for ecological receptors.
- Identifying assessment endpoints to frame the evaluation.
- Selecting candidate representative receptors for further evaluation, if warranted.
- Developing toxicological profiles for the refined COPECs identifying those studies that can be used to derive Toxicity Reference Values (TRVs).
- Providing figures showing the spatial extent of the contaminated medium that may potentially result in adverse effects.

The remainder of Section 1 will summarize information related to the site history and ecological setting of the ditch and creek, as described in the SLERA (AMEC, 2007). Section 2 presents the results of the ERAGS Step 3 assessment, which includes refinements to the chemicals of potential ecological concern (COPECs) and revises the Conceptual Site Model (CSM) and other components that were presented in the SLERA (AMEC, 2007). Section 3 summarizes the Scientific/Management Decision Point (SMDP) for ERAGS Step 3. Additional supporting documentation is provided in four appendices.

Since this report was prepared as a stand-alone document, some of the introductory information related to site history, as well as the analytical results discussed in detail in the SLERA (AMEC, 2007), are provided here for completeness.

1.1 Ecological Setting

This section provides information concerning the SWP facility operations history and regional and site-specific ecological conditions relevant to the ERAGS process.

1.1.1 Facility Summary

The SWP-Gulf facility (Gulf, North Carolina) was a former wood-preserving plant that treated wood using creosote and pentachlorophenol. Figure 1-1 shows the general location of the site. Historical aerial photographs of the facility from 1962, 1979 and 2004 were provided in the SLERA (AMEC, 2007). Operations at this facility ceased in 1980. An on-site Drainage Ditch discharges to Cedar Creek, which merges with the Deep River about 1.75 miles east of the property. Cedar Creek is not part of the SWP property, except for a small portion on the northern side where the creek serves as the property boundary with the adjoining parcel[2]. Historical sampling of the creek has shown evidence of polycyclic aromatic hydrocarbons (PAHs), pentachlorophenol, and polychlorinated dibenzo-p-dioxins/polychlorinated dibenzofurans (PCDD/Fs) in the near creek soils and sediments. Trace levels of PAHs and pentachlorophenol were reported in the historical surface water samples. Based on the current understanding of local transport mechanisms, these chemicals likely entered the creek either dissolved in the aqueous phase or adsorbed to the particulate phase during historical releases, rather than as non-aqueous oil phase. The 1999 Revised Expanded Site Inspection (ESI) prepared by NCDENR (1999a) concluded that no water supply wells, intakes, or wetlands had been impacted due to site-related activities.

1.1.2 Regional Ecological Summary

Cedar Creek, part of the upper Cape Fear watershed, traverses an undeveloped area used for pines grown for timber as well as natural pines and hardwood forest. In addition to receiving surface water flow from the Drainage Ditch during storm events, there are three northern tributaries and two southern tributaries to Cedar Creek downstream from the SWP property (see SLERA Appendix D, Figure D-1 [AMEC, 2007]). Historically clay and coal mining has occurred in the area. Naturally occurring coal seam outcrops are also present. Flow in Cedar Creek has been reported to be seasonally intermittent, reducing to pools of water between dry streambeds during the summer months (NCDENR, 1999b). Streamflow data for Cedar Creek are not available from the United States Geological Survey (USGS), although the hydrologic condition of Cedar Creek reported by NCDENR (1999b) was confirmed during the July 2006 field survey.

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[2] Additional detail concerning the property boundaries and adjoining properties is provided in the *Remedial Action Plan* prepared by Schnabel Engineering South, LLC.

Runoff is the major source of water for the creek due to the reported poor groundwater recharge capacity through the surface soils in the upper Cape Fear basin (NCDENR, 1999b). There is also a small man-made pond (about 0.03 acre in area) that is not hydrologically connected to Cedar Creek located east of the Drainage Ditch. This pond was created during excavation of soils used as backfill for the southern ponds on the SWP property after facility operations had ceased.

Rare, Threatened or Endangered Species

The North Carolina National Heritage Program (NCNHP) maintains a database of the rare, threatened and endangered (RTE) species throughout the state. A total of 57 species or groups of organisms were identified in the 2 July 2007 update of the NCNHP database for the Chatham County area. These include one animal assemblage (colonial wading bird colony), 14 invertebrate species, 18 natural communities (Piedmont longleaf pine forest), 14 vascular plants, and 10 vertebrate animals. Additional discussion concerning the presence of rare, threatened or endangered species that may be present in the Chatham county area was provided in the SLERA (AMEC, 2007).

An ecological field survey was conducted in July 2006 as part of the SLERA (AMEC, 2007). During this survey the twig rush (*Cladium mariscoides*), a rare North Carolina plant, was erroneously identified. In a correspondence dated 4 June 2007 in response to AMEC's request for records of RTE species in the site area, NCNHP indicated that the habitat along Cedar Creek differed from the preferred bog habitat of this species. The photographs and notes were re-evaluated by the field ecologist that performed the field survey and the plant identification corrected to the dark green bulrush (*Scirpus atrovirens*), which is found in North Carolina and is common throughout most of the US. Appendix D contains the supporting correspondence for this re-evaluation.

1.1.3 Site-Specific Ecological Setting

Cedar Creek and the Drainage Ditch

The benthic community in Cedar Creek is depauperate due to natural conditions (NCDENR, 1999a). The substrate is clayey with some sands and silt, and rock (see photographs provided in the SLERA [AMEC, 2007]). Favorable substrates for benthic invertebrates are limited to leaf packs and fallen limbs. Furthermore, as reported by NCDENR (1999b), the creek tends to have low to non-existent flows during drier periods, further reducing the potential for the establishment of a significant benthic community. During the field survey performed in July 2006 there were areas of standing water, areas of low stream flow between ponded areas in

Cedar Creek, and areas of dry streambed. The only discernible flow was observed in the riffle areas between the areas of standing water within the creek.

The macroinvertebrates that were observed in July 2006 were limited in both number and species. Macroinvertebrates that spend their entire life cycle in aquatic environments, such as amphipods, were absent from nearly all sampling locations. Semi-aquatic invertebrates, which spend their larval stages in aquatic environments but are aerial as adults (e.g., mayflies), were observed at a number of stations. The stations with the largest number and diversity of semi-aquatic invertebrates were located in the main stem of Cedar Creek near the confluence with the Deep River (station E2), and in the second northern tributary (Trib-N2) of Cedar Creek near the confluence with Cedar Creek (station E6). The sample locations are shown in Appendix D (Figure D-1) of the SLERA, and the results are tabulated in Appendix A, Attachment A1, Table A1-6 of the SLERA (AMEC, 2007).

These same characteristics - intermittent flow, lack of habitat, and low food abundance - likely contribute to the absence of a significant fish population in Cedar Creek. During the July 2006 field survey fish were not observed within Cedar Creek. The eastern mosquitofish, *Gambusia affinis*, was observed in the Drainage Ditch. Mosquitofish are commonly found in ditches and small ponds in the southeastern US, are native to North Carolina, and are often part of integrated pest management programs where they provide mosquito control (Apperson et al., 2004).

Shells from the invasive freshwater clam *Corbicula fluminea* were also commonly observed in the dry streambeds of Cedar Creek during the July 2006 survey. No attempts were made during this survey to locate live beds of this species within Cedar Creek or the Drainage Ditch.

Wetland-Like Areas

Although wetland-like areas are present both on the SWP property and adjacent to the property, they have not been mapped by the United States Fish and Wildlife Service (USFWS) National Wetlands Inventory, presumably because of their relatively small size. The NCDENR concluded that wetland-like areas of any significant size are restricted to the Cedar Creek channel itself. These wetland areas near the creek are also fragmented and may be characterized as "moist woods" which are not readily apparent in aerial photography. These "moist woods" along Cedar Creek, Deep River, and tributaries to both systems are considered to be temporarily and seasonally flooded broad-leaved deciduous forested areas (Geraghty and Miller, 1994).

As summarized by Geraghty and Miller (1994), the "moist woods"[3] associated with Cedar Creek and nearby waterbodies are typically vegetated by river birch (*Betula nigra*), sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), yellow poplar (*Liriodendron tulipifera*), sycamore (*Platanus occidentalis*), American elm (*Ulmus americana*), sugar berry (*Celtis laevigata*), bitternut hickory (*Carya cordiformis*), box elder (*Acer negundo*), and swamp chestnut oak (*Quercus michauxii*); seasonally-flooded wetlands have increased occurrence of swamp chestnut oak, black gum (*Nyssa sylvatica*), willow oak (*Quercus phellos*), water hickory (*Carya aquatica*), river birch, and Southern red oak (*Quercus falcata*). Additional observations of the flora of these areas are provided in the appendices to the SLERA (AMEC, 2007).

Man-Made Pond

There is a man-made pond located off the SWP property, southeast of the juncture of the Drainage Ditch and Cedar Creek (see SLERA Appendix A, Figure A3-2; AMEC, 2007). This pond is approximately 90,700 ft^2 (2.08 acres) in size and is approximately 6-ft deep based on surface observations. It was constructed after SWP facility operations ceased and was excavated for borrow material to cover the southern on-site settling ponds. The pond is located upstream of the Drainage Ditch and Cedar Creek, and there is no hydrologic connection between the pond and Cedar Creek. Overflow from the pond after a storm event enters a smaller depression area and ultimately discharges to the Drainage Ditch. This depression area is approximately 2,480 ft^2 (0.06 acre) in size and was constructed as a sediment catch basin during excavation of the larger pond. Overflow to this smaller depression area likely occurs only during pond overflow events following significant precipitation. Groundwater infiltration into the pond is not apparent.

The man-made pond located off the SWP property appears to be stocked by the landowner, since uniform sized fish (bass) were observed during the July 2006 field survey. Herons were noted in the pond shallows, but not at either the Drainage Ditch or Cedar Creek. The pond was examined as part of the ecological survey, but was not a component of any of the prior field investigations. Due to the absence of a potential for site contaminants to be discharged to the pond (as it did not exist during site operation) and any hydrologic connection to either the Drainage Ditch or Cedar Creek, further evaluation of the man-made pond was not recommended in the SLERA.

[3] Geraghty and Miller (1994) called these wetlands but in a subsequent (1995) survey and evaluation by USACE it was concluded that these areas do not meet the requirements of a wetland [see Appendix A, Attachment A4 of the SLERA (AMEC, 2007) for supporting documentation].

1.2 FIELD INVESTIGATION SUMMARY

Figures 1-2a and 1-2b show the locations for the samples collected as part of the different field investigations from the Drainage Ditch and Cedar Creek, respectively. Table 1-1 summarizes the media, depths of samples collected, date collected, target analyte groups, and data sources for the historical and 2006 sampling efforts of the Drainage Ditch and Cedar Creek. These results were evaluated in the SLERA (AMEC, 2007).

Appendix A presents the analytical results for the individual sample locations by media and chemical class. There has been no further sampling of the Drainage Ditch or Cedar Creek since the revised SLERA was submitted (June 2007).

All sediment samples represented surface samples collected from depths no greater than one foot. Sediments were collected from the Drainage Ditch in 1983, 1990, 1995, 2002, and 2006 (TOC and grain size only). Sediments were collected from the Drainage Ditch in 1983, 1990, 1995, 1998, 2002, and 2006 (TOC and grain size only). These samples were analyzed for one or more of the following parameters: volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), inorganics, PCDD/Fs, TOC and grain size. Sediment samples from both the Drainage Ditch and Cedar Creek were also collected in 2004 for toxic characteristic leaching procedure (TCLP) analysis.

The Sample IDs SW-053-SD, SW-054-SD, and SW-055-SD were used for two different samples locations (Tributaries and Drainage Ditch) depending upon the sampling event. In 1999, these Sample IDs were used for the PCDD/F analyses of the upstream tributary sediments collected from three Cedar Creek tributaries (Trib-S1, Trib-S2, and Trib-N3). For samples collected in 2002, these same Sample IDs were used for SVOC and PCDD/F analysis of the drainage ditch samples. These have been distinguished on Figures 1-2a and 1-2b by including the year along with the Sample IDs.

Unfiltered surface water samples were collected from Cedar Creek in 1990 and 1995. Many of these were co-located with sediment samples. Samples collected in 1990 were analyzed only for VOCs and SVOCs. Samples collected in 1995 were analyzed for VOCs, SVOCs, and inorganics. There was no standing water in the Drainage Ditch during either of these two prior field investigations, so there is no surface water data available from this area.

1.3 SUMMARY OF SLERA SCREENING RESULTS

Existing habitat conditions in the Drainage Ditch and Cedar Creek were determined to be poor or poor-to-fair, based on application of the Rapid Bioassessment Protocol (RBP) that was performed as part of the ecological survey in July 2006 (AMEC, 2007). These results are

consistent with the conclusions made during an earlier survey of Cedar Creek reported by NCDENR (1999b). As discussed above, the naturally depauperate conditions of Cedar Creek preclude the development of a robust creek-wide benthic or fish community. Mosquitofish, a native fish species in North Carolina often used for mosquito control, were observed only in the Drainage Ditch near the confluence with Cedar Creek. Consequently, any assessment endpoints based upon direct contact of sediments to these receptors would have limited value for risk management decisions.

Cedar Creek may also receive chemical inputs from other sources. For example, woodland fires caused by accident (e.g., lightning strikes), for maintenance of fire breaks, or for removal of underbrush and unsuitable woody material occur in the vicinity of the former SWP facility. These fires can contribute to PCDD/F loadings (typically as octachlorodibenzo-p-dioxin [OCDD] and hepta-chlorinated dibenzo-p-dioxins [HpCDD]) in the area (USEPA, 1998a).

The conservative abiotic chemical screen performed as part of the SLERA indicated that the maximum chemical concentrations for several organics and inorganics in surface water, and PCDD/Fs, some metals, PAHs, and phenolics in sediment, exceeded their screening benchmarks (i.e., HQ_{screen} values greater than one) indicating that there is the potential for adverse ecological effects and a more thorough assessment is warranted. Table 1-2 summarizes the positively detected chemicals by media that were retained as COPECs at the completion of the SLERA (AMEC, 2007). This table also shows the category labels used by NCDENR (2003):

- *Chemical Category 1*: The chemical's maximum concentration exceeds the screening value;
- *Chemical Category 3*: The chemical's maximum concentration exceeds the standard quantitation limit (SQL) but it lacks an NCDENR screening value; and
- *Chemical Category 5*: The chemical's SQL or maximum concentration exceeded the NCDENR Surface Water Quality Standard (aqueous samples only).

This ERAGS Step 3 report will refine the screening of the COPECs based on alternate (and relevant) benchmarks and site-specific information, and additional weight-of-evidence criteria, such as the ecological condition of the creek and ditch. Tables 1-3a and 1-3b outline the supplemental comparisons that will be performed for the surface water and sediments, respectively.

2.0 ERAGS STEP 3: PROBLEM FORMULATION

ERAGS Step 3 (Problem Formulation) is the first step in conducting a quantitative ERA following the initial screening steps (USEPA, 1997). As described by USEPA (1998b), it is a process "*for*

generating and evaluating preliminary hypotheses about why ecological effects have occurred, or may occur, from human activities." The components of problem formulation are listed below:

- Developing preliminary COPECs based on the evaluation of site-specific data.
- Developing a Conceptual Site Model that reflects the potential fate and transport pathways and exposure routes for ecological receptors.
- Identifying assessment and measurement endpoints to frame the evaluation.
- Selecting receptors to be evaluated.

Some of the components of ERAGS Step 3 were addressed in the Work Plan Memorandum (WPM: AMEC, 2006) and will be discussed in detail in subsequent sections. In the comment letter to the WPM, NCDENR (2006) outlined the following elements to include as part of ERAGS Step 3 (USEPA, 1997, 1998b):

1. COPECs from the SLERA Steps 1 and 2 can be refined by eliminating all chemicals that were not detected, and not expected to be released from the site.

   The remaining COPECs should then be summarized using a table format similar to that used in the SLERA, but including additional refinements such as the number of detections above Ecological Screening Values (ESVs; NCDENR, 2003), mean concentrations, locations exceeding the ESVs, and alternate screening values.

2. Toxicological profiles for the remaining COPECs should be prepared, including those studies that can be used to derive Toxicity Reference Values (TRVs).

3. A figure showing the spatial extent of the contaminated medium that may potentially result in adverse effects should be included.

The following will be used to refine the surface water and sediment COPECs identified in the SLERA:

- Compare the frequency of detection to a value of 5%, and assess the pattern and spatial distribution of the potential COPECs. The spatial distribution of the results will be used to determine how representative each COPEC may be for site conditions, or whether it represents a localized area of elevated concentrations only.

- Compare the average and maximum observed results to the site-specific background. Regional background concentrations (e.g., USGS, 2003) will be used to identify the

potential concentrations that may exist on a landscape-scale, but not be used for the primary screening.

- Compare the average and maximum observed concentrations to alternate surface water and sediment benchmarks, such as those compiled in the on-line database maintained by Oak Ridge National Laboratory (ORNL, 2007).

- Screen out SLERA COPECs that are considered to be essential nutrients (e.g., calcium).

- Screen out SLERA COPECs that were not detected in any of the samples but were originally retained due to elevated detection limits, as per NCDENR (2007a).

2.1 Refined Screening Values

This section summarizes the refined screening values (RSVs) that will be used to assess the average and maximum chemical concentrations in the surface water and sediments from prior sampling events. Tables 2-1a and 2-1b compare the SLERA screening benchmarks and the RSVs that will be used in the quantitative ERA for surface water and sediment, respectively.

2.1.1 Refined Surface Water Screening Values

Three SVOCs and ten inorganics were retained as COPECs for surface water following the SLERA screening. For the SVOCs, two of the three COPECs (2-methylphenol and pyrene) were retained since they lacked a SLERA screening value (i.e., chemical category 3). One SVOC (pentachlorophenol) was retained since the maximum observed concentration exceeded the pH-dependent screening values. For the inorganics, six of the ten COPECs (barium, calcium, magnesium, manganese, potassium and sodium) were retained since they lacked a SLERA screening value. The maximum detected values for the remaining four inorganics (aluminum, iron, mercury and zinc) all exceeded their respective SLERA screening values (i.e., chemical category 1).

The NC Class C Surface Water criteria were initially reviewed as a potential source of RSVs, since this is the use classification for Cedar Creek (as of November 2007)[4]. However, in most cases appropriate values were not available. As a result, most of the RSVs for surface water were obtained from the on-line ORNL database (ORNL, 2007). The data sources for the surface water RSVs are identified on Table 2-1a, and discussed briefly below.

[4] Cedar Creek is located in the Cape Fear Basin, sub basin 03-06-11. The use classification information was taken from the following NCDENR document (accessed on 30 November 2007): [URL: http://h2o.enr.state.nc.us/bims/reports/basinsandwaterbodies/Chatham.pdf]

Semivolatile Organics

- *2-Methylphenol (o-cresol)*: The alternate screening value was the Ecological Screening Level (ESL) from USEPA Region V (USEPA, 2003).
- *Pentachlorophenol*: The acute and chronic screening values for pentachlorophenol are dependent upon the pH of the surface water samples. The calculated acute and chronic criteria for pentachlorophenol from the SLERA, which are specific to the creek and ditch, will be used for this refined screening
- *Pyrene*: The alternate screening value was the final chronic value reported by Di Toro et al (2000).

Inorganics

- *Aluminum:* Multiple values will be used for this comparison. Comparisons will be made to both the acute and chronic surface water values from USEPA Region IV. Only the chronic value was used in the SLERA. In addition, the Lowest Acceptable Chronic Values (LCV) for daphnid survival (ORNL, 2007) will be used.
- *Barium*: The alternate screening value is the ESL from USEPA Region V (USEPA, 2003).
- *Iron*: The chronic value from EPA Region IV will be used since an acute value was not available for comparison purposes.
- *Calcium, Magnesium, Manganese, Potassium and Sodium*: The surface water values were obtained from ORNL (2007), and were the LCVs for daphnid survival.
- Mercury: The chronic value from EPA Region IV was used for the refined screening. The acute value was used for the SLERA screening.
- *Zinc*: The alternate screening value is the zinc action limit for NC Class C waters (NCDENR, 2007b)

The LCV values for daphnia were based on either the geometric mean of the Lowest Observed Effect Concentration and the No Observed Effect Concentration or an extrapolation from 48-hour LC_{50} values using equations from Suter et al. (1987) and Suter (1993), as reported by ORNL (2007).

2.1.2 Refined Sediment Screening Values

Five VOCs, 24 SVOCs, 14 inorganics, and dioxin-TEQs were retained as COPECs for sediments following the SLERA screening. For the VOCs, all five were retained since they lacked a SLERA screening value (i.e., chemical category 3). Ten of the 24 SVOC COPECs [2,4-dimethylphenol, 2-methylphenol, benzo(b)fluoranthene, benzo(g,h,i)perylene,

benzo(k)fluoranthene, carbazole, dibenzofuran, indeno(1,2,3-cd)pyrene, pentachlorophenol and phenol] were retained since they lacked a SLERA screening value. For the inorganics, ten of the 14 COPECs (aluminum, barium, beryllium, calcium, cobalt, iron, magnesium, manganese, potassium, and vanadium) were retained since they lacked a SLERA screening value.

As with the surface water screening benchmarks, the refined sediment screening values (RSVs) were primarily identified from the on-line collection maintained by Oak Ridge National Laboratory (ORNL, 2007). The data sources for the sediment RSVs are identified on Table 2-1b, and discussed briefly below.

Volatile Organics

- *Benzene, Ethylbenzene, Styrene, Toluene, and Xylenes (Total):* The alternate screening values were the ESL from USEPA Region V (USEPA, 2003).

Semivolatile Organics

- *2,4-Dimethylphenol, 2-Methylphenol, Pentachlorophenol and Phenol*: The alternate screening values were the sediment ESLs from USEPA Region V (USEPA, 2003).
- *2-Methylnapthalene, Acenaphthene, and Acenaphthylene*: The alternate screening value was the Florida Department of Environmental Protection (DEP) Probable Effect Level (PEL) Sediment Screening Benchmark reported by ORNL (2007). This is the same value used by Canada.
- *Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(g,h,i)perylene, and Benzo(k)fluoranthene:* The alternate screening values were the sediment ESLs from USEPA Region V (USEPA, 2003).
- *Carbazole:* There were no alternate sediment benchmark values available in the ORNL (2007) collection. A value of 140 µg/Kg was derived by WDOE (1997) based on Microtox® toxicity test results.
- *Chrysene, Dibenz(a,h)anthracene, Dibenzofuran, Fluoranthene, Fluorene, Indeno(1,2,3-cd)pyrene, Naphthalene, Phenanthrene, and Pyrene*: The alternate screening values were the sediment ESLs from USEPA Region V (USEPA, 2003).
- *Total PAHs*: An alternate screening benchmark was not available.

Inorganics

- *Aluminum:* The alternate screening value was the ARCS Probable Effect Concentration (PEC) Sediment Screening Benchmark reported by ORNL (2007).

- *Arsenic, Copper, and Nickel:* The alternate screening values were the Consensus Threshold Effect Concentration (TEC) reported by ORNL (2007).
- *Barium and Beryllium*: There were no alternate sediment benchmark values available in the ORNL (2007) collection. Friday (2005) compiled a number of screening values for different media and reported that the Dutch Ministry used values of 160 and 1.1 mg/Kg as the target concentrations for barium and beryllium, respectively.
- *Calcium, Magnesium and Potassium*: There were no alternate screening benchmarks available in the ORNL (2007) collection. Therefore, the alternate screening benchmarks will be site-specific background concentrations.
- *Cobalt and Silver*: The alternate screening values were the sediment ESL from USEPA Region V (USEPA, 2003).
- *Iron and Manganese*: The alternate screening values were the Ontario Low Sediment Screening Benchmark as reported by ORNL (2007).
- *Vanadium:* There were no alternate screening benchmarks available in the ORNL (2007) collection. The "background" value as reported by NOAA for freshwater sediments (Buchman, 2006) is 50 mg/Kg. Site-specific background concentrations will also be used for this screening.

A suitable RSV for PCDD/Fs (or as Dioxin-TEQ) was not identified. Therefore, PCDD/Fs will not undergo any refined screening.

2.2 Background Concentrations

Site-specific background surface water and sediment samples, collected upstream of the SWP facility or from tributaries to Cedar Creek that are not hydrologically connected to the SWP facility, are available. These are summarized in Tables 2-2 and 2-3 for surface water and sediments, respectively.

2.2.1 Upstream (Background) Cedar Creek Surface Water Samples

Table 2-2 summarizes the background surface water results for the SLERA COPECs. The sample specific results are shown in Appendix A. There were no detectable VOCs or SVOCs in any of the background surface water samples. Seven of the SLERA COPEC metals (aluminum, barium, iron, magnesium, manganese, sodium and zinc) were detected in the site-specific background samples. PCDD/Fs were not analyzed in any of the historical surface water samples.

2.2.2 Upstream (Background) Sediment Samples

Table 2-3 summarizes the background sediment results for the SLERA COPECs. The sample specific results are shown in Appendix A. Only one VOC (toluene) was detected in one of the sediment samples collected from the background area. Up to 13 SVOCs, all of which were PAHs, were reported in the background samples. These chemicals were detected infrequently in these samples, and were present in only one or two of the collected samples. Fourteen of the SLERA COPEC inorganics were reported in the background samples. These concentrations were generally consistent with background concentrations reported in North Carolina (USGS, 2003). PCDD/F congeners were detected in most of the background samples. Three congeners (1,2,3,4,6,7,8-HpCDD, 1,2,3,4,6,7,8-HpCDF and OCDD) were the most frequently detected PCDD/F congeners. The toxic equivalence quotient (TEQ) concentrations were similar to those reported as background (USEPA, 1998b).

2.2.3 Other Sources of Background Information

In addition to the site-specific data, there are two additional sources of information related to background concentrations of some of the SLERA COPECs:

- USGS (2003) report entitled "*Geochemistry of North Carolina and South Carolina, National Uranium Resource Evaluation, Hydrogeochemical and Stream Sediment Reconnaissance Program, Raleigh Quadrangle, U.S. Geological Survey National Geochemical Database*"; and

- USEPA (2007) report entitled "*Pilot Survey of Levels of Polychlorinated Dibenzo-p-Dioxins, Polychlorinated Dibenzofurans, Polychlorinated Biphenyls, and Mercury in Rural Soils of the United States.*"

Both of these studies provide a perspective on how comparable the site-specific background conditions are relative to larger "regional" conditions, but were not used as part of the refined screening *per se* that was performed as part of ERAGS Step 3. For the surface water samples, USGS (2003) background levels were available for four of the SLERA COPEC metals (Table 2-2). The observed site-specific background was well within the ranges reported by USGS (2003). For the sediment samples, USGS (2003) background levels were available for 13 of the SLERA COPEC metals (Table 2-3). The observed site-specific sediment background values were also well within the ranges reported by USGS (2003) for these metals.

Rural background concentrations for PCDD/Fs (and calculated TEQs) in soils have been recently reported by USEPA (2007). Although based on soil results, this information can be used to identify typical values that may be anticipated in soils or sediments. Twenty-seven soil

samples (plus six duplicates) were collected from rural areas throughout the US. One of the sample locations was from the Clinton Crops Air Monitoring Station (Clinton, NC), which is located about 110 miles southeast of the Gulf site. Table 2-4 summarizes the mammalian and avian Dioxin-TEQ results from this station, as well as the information reported by USEPA for all stations combined. The latter were re-calculated using the more recent mammalian TEF scheme (Van den Berg et al., 2006) and avian TEFs (Van den Berg et al., 1998)[5]. The mean Dioxin-TEQ values using the avian or mammalian TEFs, and different non-detect substitution schemes, were similar to those calculated using the site-specific background data. Based on this information it can be concluded that the background samples would be representative of unimpacted sediments.

2.3 Refined Abiotic Screens

In the SLERA, the abiotic screen was performed using screening hazard quotients (HQ_{screen}). These were calculated as the ratio of the maximum concentration of each contaminant detected in each medium (or the maximum sample quantitation limit if the results were all non-detect) and the screening benchmark for each chemical. A similar approach was used for the refined screening, although both the maximum positive and average chemical results were compared against the RSVs. These results were compared to the site-specific background values, whether the SLERA COPEC is an essential nutrient or not, and the spatial distribution of the results was evaluated, as appropriate. To ensure differentiation from the SLERA screen, the HQ values are identified as $HQ_{screen2}$ for the refined screening comparisons.

The downstream surface water or sediment results from the Drainage Ditch and Cedar Creek were combined for this refined screen.

2.3.1 Refined Surface Water Screen

The analytical results for the individual surface water samples are compiled in Appendix Table A-1. The refined screening was performed using only the 13 preliminary COPECs retained as part of the conservative SLERA screening. Table 2-5a presents the refined screening for surface water COPECs.

2.3.1.1 Surface Water Organics

Four SVOCs (2-methylphenol, pentachlorophenol, pyrene and total PAHs) were retained in the SLERA screening. All four met the minimum 5% detection frequency requirement, although

[5] USEPA (2007) did not discuss the basis for electing to use the older TEF scheme to calculate the Dioxin-TEQs in this recent document, but this may have been done to allow comparisons to historical studies.

fewer than 20 samples were collected. Pyrene and total PAHs were detected in a single sample (SW-034-SW), while pentachlorophenol was detected in two samples and a corresponding field duplicate (8747, SW-029-SW and SW-129-SW), all from the same location near the confluence of the Drainage Ditch and Cedar Creek (Figure 1-2b).

None of these four SVOCs were detected in the site-specific background samples. Therefore, $HQ_{screen2}$ values were not calculated for the comparison to background. The comparison of the average and maximum concentrations for pentachlorophenol to the RSV yielded $HQ_{screen2}$ values of 1.8 and 10.9, respectively. Since pentachlorophenol is not considered an essential nutrient, it was retained as a surface water COPEC based on the refined screening.

Only one PAH (pyrene) was retained as COPEC in the SLERA. The single positive result for pyrene was detected at a trace level (0.003 mg/L) that was below the reporting limits (0.010 mg/L). The comparison of this result to the alternate screening benchmark yielded an $HQ_{screen2}$ value below one. In addition, this sample is located more than 1,000 feet from the SWP property and may reflect contributions from other sources. Therefore, pyrene and total PAHs were not retained as surface water COPECs based on the refined screening.

2.3.1.2 Surface Water Inorganics

Nine inorganics (aluminum, barium, calcium, iron, magnesium, manganese, mercury, potassium, and sodium were retained in the SLERA screening. All nine inorganics met the minimum 5% detection frequency requirement, although fewer than 20 samples were collected. All nine inorganics were also detected in the site-specific background samples, except for mercury. The average concentrations for four of the inorganics (aluminum, barium, iron, and manganese) and maximum concentrations for six of the inorganics (aluminum, barium, iron, magnesium, manganese, and sodium) had $HQ_{screen2}$ values greater than one. Many of these are also considered to be essential nutrients.

Although several of the inorganics exceeded the site-specific background concentrations, only the average and maximum concentrations for iron also exceeded the RSV. Five of the samples [SW-029-SW (NCDENR), SW-129-SW (NCDENR), SW-033-SW (NCDENR), SW-034-SW (NCDENR), SW-032-SW (NCDENR)] exceeded the RSV for iron.

Spatial evaluation of the iron results does not suggest a clear gradient from the SWP facility (Figure 2-1). Two of these samples [SW-029-SW (NCDENR) and SW-129-SW (NCDENR)] represent the sample and field duplicate collected near the juncture of the Drainage Ditch and Cedar Creek, two [SW-032-SW (NCDENR) and SW-033-SW (NCDENR)] were located in two of the downstream tributaries to the creek, and the remaining sample was located in the creek near the juncture with the Deep River. In addition, the overall median iron concentration (0.95

mg/L) is similar to the median concentration for streams in the Upper Cape Fear River Basin (1 mg/L) reported by USGS (Childress and Bathala, 1997). Based on this information these exceedances of the RSV are not considered significant. Therefore, none of the surface water inorganics were retained as COPECs following the revised screening.

In summary, of the four organics and nine inorganics that were initially retained as COPECS in the SLERA, only pentachlorophenol met some of the refined screening criteria. Even though pentachlorophenol was detected at only one location and exhibited declining concentrations between the sampling events, it was conservatively retained as a COPEC.

2.3.2 Refined Sediment Screen

The analytical results for the individual surface water samples are compiled in Appendix Table A-1. The refined screening was performed using only the 44 preliminary COPECs retained as part of the conservative SLERA screening. Table 2-5b presents the refined screening for the sediments.

2.3.2.1 Sediment Volatile Organic Compounds

Five VOCs were retained as COPECs following the screening that was performed in the SLERA. These were retained at that stage since there were no screening values provided for VOCs in NCDENR (2003). For the refined screening, sediment ESLs from EPA Region V (USEPA, 2003) were selected as RSVs.

Toluene was the only VOC detected in the site-specific background samples. Comparison of the average and maximum observed toluene concentration yielded $HQ_{screen2}$ values of 0.2 and 1.7, respectively. However, the comparison of the average and maximum values to the RSV yielded $HQ_{screen2}$ values less than one for toluene and the other four VOCs. Therefore, VOCs were not retained as sediment COPECs based on the refined screening.

2.3.2.2 Sediment Semivolatile Organic Compounds

Twenty-four SVOCs, which include four phenolic compounds and twenty PAHs, were retained as COPECs following the SLERA screen. Ten of these were originally retained since they lacked screening criteria in NCDENR (2003). Due to the large number of SVOCs that were retained, the screening discussion is organized by chemical groups – phenolics and PAHs.

Phenolic Compounds Sediment Screen

Three of the four phenolic compounds (2,4-dimethylphenol, 2-methylphenol, and phenol) were detected at a frequency less than 5% and were therefore not retained as COPECs in the refined screen. The remaining phenolic, pentachlorophenol, was not detected in any of the background samples. Therefore, $HQ_{screen2}$ values were not calculated for the comparison to background. The comparison of the average and maximum concentrations for pentachlorophenol to the RSV yielded $HQ_{screen2}$ values of 0.1 and 4.8, respectively. Since pentachlorophenol is not considered an essential nutrient, and is a site-related chemical, it was retained as a sediment COPEC based on the refined screening.

Table 2-6 lists the sample that exceeded the RSV for pentachlorophenol. Review of Figure 1-2b shows that this sample was located near the confluence of the Drainage Ditch and Cedar Creek. This was also the only location where pentachlorophenol was detected in the surface water samples).

PAH Sediment Screen

Nearly all of the PAHs were detected at a frequency greater than 5% in these samples. Although PAHs were detected in the upstream background samples, the downstream sediment PAH concentrations were greater than these background concentrations. For all of the PAHs except benzo(b)fluoranthene, the $HQ_{screen2}$ values based on comparisons of the mean or maximum concentrations to the RSVs were greater than one. Therefore, all the PAHs except benzo(b)fluoranthene were retained as COPECs based upon this refined screening.

Table 2-6 lists the samples that exceeded the alternate screening benchmarks for the individual PAHs. Three to 29 samples, depending upon the PAH examined, had PAH results that were greater than the RSVs.

2.3.2.3 Sediment Inorganics

Fourteen inorganics were retained as COPECs following the screening that was performed in the SLERA. Many of these were retained in the SLERA since they lacked screening values in NCDENR (2003). A number of literature sources were identified that provide RSVs for the refined screening, as discussed in Section 2.2.2.

All 14 inorganics met the minimum 5% detection frequency requirement of the refined screening. Site-specific background concentrations were available for all of the inorganics. Comparison of the average and maximum observed downstream sediment concentrations to the maximum background concentration yielded $HQ_{screen2}$ values greater than one for 11 and 13

inorganics, respectively. Subsequent comparison of the average and maximum values to the alternate screening values yielded $HQ_{screen2}$ values greater than one for one inorganic (silver) based on the average sediment concentrations, and four inorganics (iron, manganese, nickel, and silver) based on the maximum concentrations. Two inorganics had $HQ_{screen2}$ values slightly greater than one (arsenic: 1.01; and vanadium: 1.02) but these were not considered to be significant.

Table 2-6 lists the inorganic samples that exceeded the RSVs. Ten samples exceeded the RSV (background) for calcium, five exceeded the alternate screening benchmark for iron, eight samples exceeded the RSV (background) for magnesium, four samples exceeded the alternate screening benchmark for manganese, five samples exceeded the alternate screening benchmark for nickel, and three samples exceeded the alternate screening benchmark for silver.

- *Calcium and Magnesium*: The downstream sediment results were compared to the upstream (background) sediments for these two inorganics since suitable RSVs were not available. These are both common cations that can be naturally elevated in soils. Therefore, neither of these inorganics were retained as COPECs.

- *Iron*: Five of the 14 sediment samples exceeded the RSV of 20,000 mg/Kg. Iron is commonly encountered in sediments, especially those from clayey areas. Figure 2-2 shows that the iron sediment results did not exhibit a clear gradient from the SWP facility. In addition, the range, mean, and median iron concentrations in the downstream sediments were similar to those reported as background in North Carolina by the USGS (2003), as summarized in the table below.

Iron Concentrations in Sediments (mg/Kg)			
Location	**Range**	**Mean**	**Median**
Downstream Sediments	4,000 to 37,000	19,486	18,500
USGS NC Background	5,000 to 294,600	28,082	17,700

  Therefore, iron was not retained as a COPEC based upon this refined screening.

- *Manganese*: Four of the 14 sediment samples exceeded the RSV of 460 mg/Kg. Manganese is often associated with iron, which is commonly encountered in clayey sediments. Figure 2-2 shows that the manganese sediment results did not exhibit a clear gradient from the SWP facility. In addition, the range, mean, and median manganese concentrations in downstream sediments were within the range of those reported as background in North Carolina by the USGS (2003), as summarized in the table below.

Manganese Concentrations in Sediments (mg/Kg)			
Location	**Range**	**Mean**	**Median**
Downstream Sediments	92 to 900	387	320
USGS NC Background	40 to 11,350	714	380

The absence of a clear gradient from the site, sporadic elevated detections, lack of known historical use at the SWP site, and similarity to regional background manganese sediment concentrations, indicate that manganese is unlikely site-related and should not be retained as a COPEC.

- *Nickel*: Five of the nine sediment samples exceeded the RSV of 22.7 mg/Kg. Figure 2-3 shows the spatial distribution of nickel in the creek sediments. The three highest nickel concentrations were detected from two of the sampling locations (samples SWP-002 and SW-129-SD were from the same location collected in different years). Although there is a slight concentration gradient from the site, there was no known use of nickel as part of historical site operations. Therefore, the nickel results are likely not site-related.

- *Silver*: Three of the 17 sediment samples, the only samples in which silver was detected, had concentrations that exceeded the RSV of 0.5 mg/Kg. USGS (2003) also reported a low detection frequency (35%) of silver in sediments collected from throughout North Carolina. Figure 2-3 shows the spatial distribution of silver in Cedar creek sediments. All three samples with positive silver results were located near the juncture of the Drainage Ditch and Cedar Creek. As with the nickel results, there was a slight concentration gradient based on their proximity to the SWP facility but there was no known use of silver as part of historical site operations. Therefore, the silver results are likely not site-related.

Since there were no known or suspected use of inorganics at the former SWP facility, none of the metals retained as SLERA COPECs were retained as refined COPECs.

2.3.2.4 Sediment PCDD/Fs

Dioxin-TEQs (calculated using the mammalian and avian TEFs) were present at a frequency of at least 5%. The maximum observed concentrations were greater than background concentrations and the conservative sediment screening criteria; therefore, Dioxin-TEQs were retained as a COPEC for the ERA. The spatial distribution of the Dioxin-TEQs is shown in Figures 2-4 and 2-5 for the drainage ditch and Cedar Creek, respectively.

In summary, of the five VOCs, 24 SVOCs, 14 Inorganics, and PCDD/Fs that were initially retained as COPECS in the SLERA, none of the VOCs, all of the PAHs and pentachlorophenol, none of the inorganics, and PCDD/Fs exceeded their refined screening criteria and have the potential to be site-related. Therefore, these chemicals or chemical groups were retained as COPECs.

2.4 Conceptual Site Model

The Conceptual Site Model (CSM) developed for the SLERA used previously collected information to identify complete exposure pathways. Only complete pathways provide a route of exposure, and therefore a potential risk. Complete pathways are defined by four components. If any one of the components is missing, the pathway is not considered complete and, therefore, no risk will be associated with that pathway. Based on the additional evaluation performed as part of this ERAGS Step 3 Report, the CSM originally developed for the SLERA was modified slightly. It is presented in Figure 2-6 and summarized in Table 2-7.

Transport of COPECs from the former SWP facility to the Drainage Ditch and Cedar Creek likely occurred in the particulate or dissolved phases, since there is no history of an oil-phase release during any of the facility operations. When water is present in the ditch or creek, larval stages of emergent insects may come in contact with and accumulate COPECs, which can then represent a source of exposure to predators that feed on these organisms. Similarly, when the ditch or creek are dry, terrestrial invertebrates or plants may accumulate some of the COPECs which in turn serve as a potential exposure pathway for higher trophic level organisms that feed on these prey species.

Based on the results of the July 2006 field survey and review of prior studies performed on both Cedar Creek and the Drainage Ditch (e.g., NCDENR, 1999b) it was concluded that natural low flow conditions of the creek and ditch preclude the development of a robust system-wide benthic population or fishery. Consequently, assessment endpoints based upon direct contact of sediments to these receptors would have limited value for risk management decisions.

In their review of the draft SLERA, NCDENR (2007a) requested information concerning the potential contribution of COPECs from the tributaries to Cedar Creek. A semi-quantitative assessment of this was performed by (1) evaluating the local hydrology of the area; (2) assessing the chemical concentrations in the sediments (and surface water) in the tributaries relative to those in Cedar Creek; and (3) using chemical fingerprinting methods to assess the PAH and PCDD/F congener pattern in the different media.

2.4.1 Hydrology Assessment of Creek Tributaries

There are three northern and two southern tributaries (excluding the Drainage Ditch) that discharge to Cedar Creek (Figure 2-7). None of these tributaries appear to be manmade. They originate as topographic lows in the terrain, which allows the conveyance of surface water to the creek. Streamflow data for Cedar Creek or its tributaries are not available from the USGS. The closest USGS gage station is at Moncure, NC (USGS 02102000), which is located 15 miles downstream of the confluence of Cedar Creek and the Deep River. The nearest upstream USGS station (USGS 02100500) is located near Ramseur, NC, and is 30 miles upstream of the confluence of Cedar Creek and the Deep River. Information related to the hydrology of the creek tributaries is available from observations made during prior field investigation activities, and limited published information. The following is a brief description of each of the tributaries, which are named as shown on Figure 2-7:

- *Tributary N1 (Trib-N1)*: This is the first northern tributary located east of the SWP property. This tributary has the largest drainage basin to Cedar Creek and also includes several branches. It receives drainage from several roads including Henry Oldham Road located about 3,800 feet north/northeast of Cedar Creek near the SWP facility. It contains widely scattered residential properties and silviculture areas.
- *Tributary N2 (Trib-N2)*: This is the second northern tributary located east of the SWP property. It also receives drainage from the undeveloped area north of the site. The area closest to the juncture with Cedar Creek has standing water, but the tributary is fairly dry upstream of the confluence.
- *Tributary N3 (Trib-N3)*: This is the third northern tributary located east of the SWP property and the closest tributary to the Deep River. It is also includes multiple branches. It drains the pine plantation located north and east of the SWP facility.
- *Tributary S1 (Trib-S1)*: This is the first southern tributary located east of the SWP property. It receives drainage from the area east of the site, Norfolk-Southern railroad tracks, a former brick plant, and private properties used for silviculture.
- *Tributary S2 (Trib-S2)*: This is the second southern tributary located east of the SWP property. It receives drainage from R. Jordan Road east of the site, which is partially undeveloped. As with Trib-S1, it receives drainage from the area east of the site, Norfolk-Southern railroad tracks, and private properties.

Runoff is the major source of water for the tributaries and Cedar Creek due to the poor reported groundwater recharge capacity (i.e., high clay content) of the surface soils, characteristic of the upper Cape Fear basin (NCDENR, 1999b) where the site is located. Based on observations made during prior field investigations by staff from Schnabel Engineering, and observations made during the ecological habitat assessment, flow is not perennial in many of these tributaries (e.g., presence of dry stream beds), which are also highly responsive to storm events.

Some of the areas adjoining Cedar Creek show evidence of flooding (i.e., water-saturated soils, debris lines on trees or other structural features) but the extent of flooding varies by the topography and is not extensive in most areas. These areas are not associated with the tributaries that discharge to Cedar Creek.

2.4.2 Chemical Concentrations in Creek Tributaries

This assessment focused on the sediment PAH and PCDD/F results. Surface water was not evaluated since PCDD/F congeners were not included as part of the historical analytical suites, and there were limited detections of PAHs from this medium. The spatial distributions of the dioxin-TEQ results are presented in Figures 2-4 and 2-5 for the Drainage Ditch and Cedar Creek sediments, respectively. Figures 2-8 and 2-9 present the total PAH (and L-PAH and H-PAH) results for the Drainage Ditch and Cedar Creek sediments, respectively. Sediment samples were not collected from Tributary N2 in any of the prior studies. The tables provided in Appendix A show the sample- and chemical-specific results and detection limits for the non-detect results.

PAHs in the Tributaries

Sediment samples were collected for PAH analysis from three of the Cedar Creek tributaries: Trib-N1, Trib-N3 and Trib-S2. There were no sediment sample results available for PAHs (or other SVOCs) from Trib-S1 or from Trib-N2. The sum L-PAHs, sum H-PAHs, and total PAHs are shown on Figure 2-9.

Three of the four sediment samples collected from Trib-N3 [03SW-032-SD, 98SW-048-SD and 98SW-048-SD (NCDENR)] and all three of the sediment samples collected from Trib-S2 [98SW-050-SD, 98SW-050-SD (NCDENR) and 95SW-033-SD) contained no detectable PAHs. Sample 95SW-032-SD (NCDENR) from Trib-N3 had trace positive results reported for the individual PAHs, although all were below the reporting limit (0.54 mg/Kg_{dw}). The total PAH concentration from this location was 5.9 mg/Kg_{dw}. This location was re-sampled in 2003 (03SW-032-SD) and none of these PAHs were detected (reporting limit of 0.69 mg/Kg_{dw}). The variation in PAH concentrations in sediments over time is examined further in Appendix C. Both of these tributaries were located near the Deep River confluence.

Three sediment samples were collected from Trib-N1 [98SW-046-SD, 98SW-046-SD (NCDENR), and 95SW-031-SD]. The most upstream samples [98SW-046-SD and 98SW-046-SD (NCDENR)] contained no detectable PAHs. Sample 95SW-031-SD, collected about 100 feet upstream of the junction with Cedar Creek, contained a total PAH concentration of 0.993 mg/Kg_{dw}, which consisted of L-PAH and H-PAH concentrations of 0.44 and 0.553 mg/Kg_{dw},

respectively. These concentrations were less than the total PAH concentrations detected in the nearby samples within Cedar Creek, and the relative ratios of the L-PAH and H-PAH concentrations also differed from that in the creek, as shown in the table below.

PAH concentrations (mg/Kg$_{dw}$) in Trib-N1 and nearby sediment samples from Cedar Creek					
Location	**Sample ID**	**Total PAHs**	**L-PAHs**	**H-PAHs**	**L-PAH/H-PAH**
Trib-N1	95SW-031-SD	0.993	0.44	0.553	0.796
Cedar Creek	98SW-045-SD	36.16	7.86	28.3	0.278
	98SW-045-SD (NCDENR)	38.53	28.39	10.14	2.800
	98SW-047-SD	6.9	0.9	6	0.150
	98SW-047-SD (NCDENR)	4.948	1.328	4.948	0.268

These results suggest that the source of the PAHs for the sample in Trib-N1 located near Cedar Creek was not site-related, or that the PAHs in this sample may have undergone significant environmental degradation. This will be examined further in the chemical fingerprinting assessment (Section 2.5.3 and Appendix C).

PCDD/F Congeners in the Tributaries

Figure 2-5 shows the spatial distribution of Dioxin-TEQs in the Cedar Creek sediments. Although these results clearly show that the tributary sediments had lower Dioxin-TEQ concentrations than the creek samples, evaluation using the congener results is more appropriate since it better represents the individual PCDD/F congener fate and transport behavior.

Appendix Table A-4 shows that the detection frequencies of the individual PCDD/F congeners in the Cedar Creek tributary sediments were lower than observed in the samples collected from Main Stem Cedar Creek, with the exception of OCDD, which was detected at approximately the same frequency in all of the sampled sediments. Therefore, the remaining discussion will focus on the behavior of this congener in the tributary sediments.

Table 2-8 compiles the OCDD chemical concentrations by tributary. There were no analytical results available from Trib-N2, likely due to the absence of standing water during the historical sampling events. The plot of the ranking from lowest to highest concentrations of the OCDD results in Cedar Creek, its associated tributaries, and the Deep River is shown in Figure 2-10. Review of this figure shows that a plateau in the OCDD concentrations is reached at about 10,000 ng/Kg$_{dw}$. Both of the samples collected from Trib-N1, one of the four samples from Trib-N3, three of the four samples from Trib-S2, and the Deep River were all less than this value. The OCDD result from Trib-S1, the remaining one Trib-S2 sample (collected in 1999) and three of the samples from Trib-N3 were greater than this value. Backflows from Cedar Creek into the

upper portions of Trib-S1, Trib-S2 and Trib-N3 are unlikely due to the topography in these areas, although flooding near the junctures of these tributaries and Cedar Creek likely occur during heavy rainfall events. OCDD concentrations detected at SW-048-SD and SW-032-SD in Trib-N3 are significantly greater than results for sediment samples collected in Cedar Creek in the vicinity of Trib-N3. Therefore, these results suggest that there may be other sources of OCDD loading into the two downstream tributaries (Trib-S2 and Trib-N3).

As an additional comparison, OCDD was detected in all of the rural background soil samples collected by USEPA (2007). The OCDD concentrations ranged from 12 to 10,900 ng/Kg_{dw}, with a mean concentration of 1,290 ng/Kg_{dw}. Thus, most of the tributary sediment samples fall within the range reported as background, except for those collected from Trib-S1, Trib-S2 and Trib-N3, where other sources may be present.

Sample SW-032-SD (NCDENR), collected in 1995 and located on Trib-N3 near the juncture with Cedar Creek, had the largest Dioxin-TEQ sediment results of the tributary samples. These results are suspect based principally on the two rounds of PAH collections from this sample location (in 1995 and 2003). The 2003 sample (SW-032-SD) showed no detectable PAHs while the 1995 sample [SW-032-SD (NCDENR)] showed total PAH concentrations of 5.9 mg/Kg_{dw} (Figure 2-9). If further sampling is performed for subsequent steps of the ERA process it is recommended to recollect sediments from this location for PCDD/Fs to determine whether or not the elevated Dioxin-TEQ results from 1995 are still valid to include in any further assessments.

2.4.3 Chemical Fingerprinting of the Drainage Ditch and Creek Sediments

Appendix C presents the detailed assessment of the chemical fingerprinting of PAHs and PCDD/F congeners in the ditch and creek sediments. As discussed previously, surface water was not evaluated since PCDD/F congeners were not included as part of the historical analytical suites, and there were limited detections of PAHs in these samples. The principal conclusions from this evaluation are summarized below:

1. Published PAH patterns in creosote and PCDD/Fs in pentachlorophenol were used for the initial comparisons to the sample results. However, since these materials had undergone the heating and high pressure process used for treating the wood, as well as possible attenuation processes in the settling ponds, the "spent" chemical patterns may differ form their unused forms. Therefore, the patterns of the PAHs and PCDD/Fs in the Drainage Ditch sediments were evaluated as possible signatures relating to the spent chemical forms derived from facility operations that may have been transported to Cedar Creek sediments.

2. The evaluation of the field QC samples, which included comparisons of split samples, field duplicates, and samples collected from the same locations but on different dates, was performed prior to the fingerprinting assessment. There was a significant decline in total PAH concentrations with time for samples collected from the same location. Biodegradation of the PAHs with time may be responsible for the significant decline in PAH concentrations.

3. Sample homogeneity issues, biodegradation of PAHs with time, and inter-laboratory variation issues present in the PAH data set significantly complicated the fingerprinting assessment, to the point that no conclusions could be drawn using PCA and CA techniques. An alternate fingerprinting evaluation technique based on the comparison of select individual PAH isomer ratios were utilized to evaluate potential sources for the PAHs. There were less temporal changes in the PCDD/F results, although variability in the results between the split samples was observed which may impact the chemical fingerprinting.

4. One sediment sample [SW-015-SL (NCDENR)] collected from the Drainage Ditch showed an approximate match to the creosote PAH pattern based on comparison of isomer ratios. This sample is located near the railroad tracks at the southeastern corner of the Drainage Ditch which represented the first area where runoff would leave the former on-site settling ponds. This sample also had the third highest relative total PAH concentration (362 mg/Kg) of the Drainage Ditch samples. The remaining samples had different PAH patterns, which also differed from the upstream (background) sample. This may be due to biodegradation of the PAHs with time.

5. One main stem Cedar Creek sediment sample [95SW-129-SD (NCDENR)] from the juncture of the ditch and creek and one sediment sample [98SW-044-SD (NCDENR)] from the property boundary had similar PAH patterns to the two creosote standards and exceeded the RSV. One of these samples [95SW-029-SD (NCDENR)] had the highest total PAH concentration of the collected data (1,050 mg/Kg). Two downstream off-site main stem Cedar Creek sediment samples (02SW-061-SD and 02SW-065-SD) also had similar PAH patterns to the two creosote standards, but both contained only trace levels of PAHs that did not exceed the RSV.

   None of the sediment samples collected from the Cedar Creek tributaries exhibited a creosote-like PAH pattern based on PAH isomer ratio comparisons.

6. The comparison of the PCDD/F congener patterns in the two PCP standards to those from the Drainage Ditch sediment samples showed that the sediments had a different congener pattern relative to that reported for PCP. Although this might suggest that

PCP was not the source of the PCDD/Fs in the Drainage Ditch sediments, the source patterns for the PCP used in this assessment are based on unused PCP. The PCP that was intermittently released from the SWP facility represented waste PCP from the settling basins that had undergone heating and the high pressure process used for treating the wood. Therefore, even if the presence of PCDD/Fs in sediments is related to site activities, it is not unexpected that the PCDD/F patterns in the sediments would differ from that present in unused PCP. Unfortunately, data representing typical PCDD/F patterns for processed PCP is unavailable. Therefore, comparisons were made between the Drainage Ditch PCDD/F patterns – which would be most representative of the PCDD/F patterns in any of the historical site releases – and the remaining downstream samples.

7. The PCDD/F pattern in the upstream (background) Drainage Ditch sediment had a different pattern than observed in the downstream Drainage Ditch sediment samples. The latter grouped together, except for sample 02SW-059-SD collected in 2002. This sample was collected near the southernmost of the former northern settling ponds and had the highest Dioxin-TEQ concentrations from the Drainage Ditch. The normalized ratios for 1,2,3,4,6,7,8-HpCDD and (to a lesser extent) OCDF were the dominant features in this sample, while lower ratios for these congeners were calculated for the other sediment samples.

8. The PCA and CA evaluation of the PCDD/F congener results from the Drainage Ditch showed variations in the sample groupings that were not directly related to their spatial locations. The variability in these results may reflect different release events from the former settling ponds during facility operations. This is consistent with the variability in the Dioxin-TEQ concentration gradient along the Drainage Ditch.

9. Due to the large dataset, the PCDD/F results for the Cedar Creek samples were evaluated several different ways. The initial PCA plot was distorted due to the apparent unique congener pattern in downstream sample 98SW-044-SD (NCDENR), relative to the other samples (including background and tributaries). This sample had the second highest TEQ concentrations (e.g., Dioxin-TEQ_{mammal} of 547 ng/Kg_{dw}) of the samples collected from within Cedar Creek, and was located near the juncture of the Drainage Ditch and Cedar Creek. As with the Drainage Ditch sample that had a unique PCDD/F pattern relative to the other sediments, the normalized ratios for 1,2,3,4,6,7,8-HpCDD and OCDF were the dominant features in sample 98SW-044-SD (NCDENR).

10. To facilitate the evaluation of the Cedar Creek data, sample 98SW-044-SD (NCDENR) was removed and the PCA was repeated. The PCDD/F patterns in the background

samples were similar to the Deep River samples and several of the tributary samples, but these were distinct from the main stem downstream samples.

11. Due to its proximity to the SWP facility, the Drainage Ditch can represent the PCDD/F pattern that would be representative of the possible loadings to Cedar Creek from the site. First, the PCDD/F patterns in the Drainage Ditch sediments were compared to those in the Cedar Creek tributaries. Four of the tributary samples [98SW-048-SD from Trib-N3, 98SW-046-SD and 98SW-046-SD (NCDENR) from Trib-N1, and 95SW-033-SD (NCDENR) from Trib-S2] closely grouped with the background sample from the Drainage Ditch, indicating no contribution of the downstream portion of the drainage ditch on their PCDD/F congener patterns. Two tributary samples [99SW-053-SD and 98SW-050-SD (NCDENR)], both from Trib-S2, appear to be outliers relative to the other evaluated samples. This suggests inputs from sources other than the Drainage Ditch to tributary Trib-S2.

12. A comparison of the PCDD/F patterns in the Drainage Ditch samples and main stem Cedar Creek samples was also performed. The upstream samples from the Drainage Ditch and Cedar Creek, the river sample, and two of the downstream samples collected from Cedar Creek grouped closely together suggesting no input to these sample locations from the site. Six of the downstream sediment samples [02SW-066-SD, 02SW-067-SD, 02SW-167-SD, 98SW-049-SD, 98SW-051-SD, and 02SW-064-SD] plotted within the patterns observed for the downstream Drainage Ditch samples. The remaining samples did not group with either the background samples or the Drainage Ditch samples. Two samples diverged widely from the other samples on this plot [98SW-152-SD (NCDENR) and 98SW-049-SD (NCDENR)]. Both of these samples were located near the downstream portion of Cedar Creek prior to the junction with the Deep River, and may indicate other potential sources of PCDD/Fs in this area.

13. There was no correlation between the sediment pentachlorophenol and PCDD/F congener concentrations in the Drainage Ditch or in Cedar Creek. This may be due to the degradation potential of pentachlorophenol compared to the more recalcitrant PCDD/F congeners. Similarly, there was no correlation between the biodegradable PAHs and PCDD/F congener concentrations in the Drainage Ditch or in Cedar Creek sediments. Therefore, neither the pentachlorophenol nor the PAH concentrations in the sediments can be used as indicators of the PCDD/F concentrations as part of any future remedial measure development.

The primary objective of the fingerprinting assessment was to determine whether the PAH and PCDD/F congener patterns in the Drainage Ditch and Cedar Creek samples are related to the materials historically used at the SWP facility and to determine whether the SWP facility

represents the only source of these chemicals to these areas. The PAH results were variable, both in time and space, which complicated the interpretation of these results. Only a small number of the sediment samples found in the Drainage Ditch and Cedar Creek (at the juncture with the ditch and at the property boundary) exceeded the RSV, and had a PAH pattern similar to that for creosote. Other sources, such as runoff from vehicles (on- and off-road) may be contributing to the sporadic detections of PAHs found within the Cedar Creek main channel and its associated tributaries. The PCDD/F results showed less variability with time but the chemical fingerprinting was affected by inter-laboratory variation of the samples split between SWP and NCDENR. The PCDD/F patterns in the Cedar Creek sediments did not match those reported for unused PCP, but there appeared to be some similarity in the PCDD/F patterns for some of the downstream main stem Cedar Creek sediments when compared to the Drainage Ditch sediments. The most significant of these areas is near the juncture of the ditch and creek. Several downstream creek samples also have similar patterns to those in the ditch sediments. Although PCDD/F congeners were detected in some of the creek tributary samples, the patterns for most of these differ from that observed in the ditch suggesting potential other sources in these areas.

2.4.4 Transport of COPECs During Flooding Events

NCDENR (2007a) requested an evaluation of the potential for transport of COPECs during flooding events. This potential was evaluated for two primary areas: (1) the potential transport into the existing tributaries, and (2) transport to adjoining overbank areas. Examination of the spatial distribution of the PAH and PCDD/F concentrations in the sediments suggests that surface water transport (via suspended sediments) facilitated the dispersion of these COPECs. However, there was a large amount of variability in the dataset (e.g., samples collected from the same location during different years had widely varying analytical results), and a clear concentration gradient was not obvious within the main channel of Cedar Creek. Nonetheless, COPEC concentrations were generally greater within the Drainage Ditch and near the juncture of the ditch and Cedar Creek, than at the downstream locations. Sediment PAH and PCDD/F concentrations are comparable to background in Cedar Creek near the juncture with the Deep River and within the Deep River.

NCDENR (2007a) also requested whether there was the potential for transport and deposition of impacted sediments in overbank deposits, such as the small areas of "moist woods" adjoining Cedar Creek, during historical flooding events. There was some evidence of historical flooding in the areas of the moist woods, based on debris lines on some of the vegetation (see SLERA, Appendix A, page A-32; AMEC, 2007). However, the debris lines were within a fairly narrow band of variable width (generally up to a maximum of 15-ft depending upon the local topography) about the edge of the creek. During the July 2006 ecological survey most of these areas were well vegetated with little apparent sediment deposits. There was

evidence of eroded areas along some of the banks, predominantly near the junctures of the tributaries and the creek, likely due to sporadic high flow conditions during storm events (e.g., SLERA, Appendix D, Figure D-2, photographs 19 and 21; AMEC, 2007).

Although the surface water in Cedar Creek was turbid during the July 2006 ecological survey, indicating the potential for sediment transport, the historical results do not suggest extensive long-range transport of the PAHs or pentachlorophenol. PCDD/Fs were detected in nearly all of the samples, but the concentrations approached site-specific or regional background near the easternmost tributaries (Trib-N3 and Trib-S2), and within the Deep River. Any sedimentation that has occurred since site closure in 1980 would likely introduce cleaner sediments to many of these areas, as evidenced by the decrease in COPEC concentrations (to non-detects in several cases for the PAHs) at locations collected during the different sampling events.

2.5 Preliminary Assessment Endpoints

Based on ecological survey information collected as part of the development of the SLERA checklist and report (AMEC, 2007), a preliminary set of Assessment Endpoints was developed that is relevant to the species that may inhabit the Drainage Ditch or Cedar Creek. A total of five Assessment Endpoints were developed.

- *Assessment Endpoint No. 1*: Evaluate the potential for adverse effects to upper trophic level insectivorous avian populations resulting from exposures to COPECs in background, drainage ditch, or Cedar Creek sediments, surface water, and/or prey.

- *Assessment Endpoint No. 2:* Evaluate the potential for adverse effects to upper trophic level invertivorous avian populations resulting from exposures to COPECs in background, drainage ditch, or Cedar Creek sediments, surface water, and/or prey.

- *Assessment Endpoint No. 3*: Evaluate the potential for adverse effects to upper trophic level carnivorous mammal populations resulting from exposures to COPECs in background, drainage ditch, or Cedar Creek sediments, surface water, and/or prey.

- *Assessment Endpoint No. 4*: Evaluate the potential for adverse effects to upper trophic level herbivorous mammal populations resulting from exposures to COPECs in background, drainage ditch, or Cedar Creek sediments, surface water, and/or prey.

- *Assessment Endpoint No. 5*: Evaluate the potential for adverse effects to upper trophic level omnivorous mammal populations resulting from exposures to COPECs in background, drainage ditch, or Cedar Creek sediments, surface water, and/or prey.

Consistent with ERAGS guidance (USEPA, 1997), the relevant Measurement Endpoints for each of these proposed Assessment Endpoints would be developed as part of ERAGS Step 4.

2.6 Initial Selection of Representative Receptors

The selection of the appropriate receptors that may be exposed to prey items that had contact with sediments, or surface water from Cedar Creek or the drainage ditch were based on the following selection criteria specified in EPA guidance (e.g., USEPA 1997):

- The occurrence of potentially complete pathways for exposure of ecological resources to chemicals in environmental media;
- Resident communities or species exposed to the highest concentrations of the evaluated chemicals in environmental media;
- Species or functional groups considered to be essential to, or indicative of, the normal functioning of the affected habitat; and
- The feasibility of completing a quantitative assessment for the identified pathways and receptors.

The key feeding guilds for the environmental setting of the drainage ditch and Cedar Creek include the following:

- Insectivorous Avian Species
- Invertivorous Avian Species
- Carnivorous Mammalian Species
- Herbivorous Mammalian Species
- Omnivorous Mammalian Species

Brief summaries of the key life history components of the proposed receptors for each of these feeding guilds, and assessment of their relevance to the four selection criteria discussed above, are presented below.

Insectivorous Avian Species: Eastern Kingbird

The Eastern kingbird (*Tyrannus tyrannus*) is an insectivorous bird that can be found in varying habitats including forest edges or hedgerows along pastures, swamps, marshes, fields, or highways (De Graaf et al., 1991). This species is common in North Carolina (and throughout the US) and migrates to the Gulf coast and South America in the winter (NCWRC, 2001). The Canadian Wildlife Service reports that their home range is 8.4 hectares (CWS, 2002). This species is an air sallier, which is a foraging habit where the species perches on an exposed

branch or twig, waits for an insect to fly by, and then captures the prey in the air (DeGraaf et al., 1985). This species is commonly found in North Carolina (NCWRC, 2001) and based on its habitat use; it could utilize any portion of Cedar Creek or the drainage ditch. Furthermore, this species would also likely use this area if any future land-use changes occurred, including harvesting of trees in the nearby pine plantations. Based on this assessment, it was concluded that the Eastern Kingbird would be an appropriate representative avian insectivorous bird for this exposure pathway.

Invertivorous Avian Species: American Robin

The American Robin (*Turdus migratorius*) is an invertivorous bird that can be found in nearly all habitats from tree limit in the mountains of the West, along forest borders, hedges, orchards, gardens, city parks, and in suburban yards (De Graaf et al., 1991). This species is common in North Carolina (and throughout the US) and is considered to be a short distance migrant. The Canadian Wildlife Service reports that their home range is 0.2 hectares (CWS, 2005a) while USEPA (1993) reports that their home range can be from 0.1 to 0.4 hectares. This species is a ground gleaner, which is a foraging habit where the species selects food items from the ground surface (DeGraaf et al., 1985). Based on its habitat use the American robin could utilize any portion of Cedar Creek or the drainage ditch. As with the Eastern Kingbird, this species would also likely use this area if any future land-use changes include harvesting of trees in the nearby pine plantations. Based on this assessment, it was concluded that the American Robin would be an appropriate representative invertivorous bird for this exposure pathway.

Carnivorous Mammalian Species: Red Fox

The red fox is a member of the family Canidae and is found throughout most of North America except in some portions of the southeastern and southwestern US (USEPA, 1993); it is common in NC (NCWRC, 1992). They inhabit upland woods and farmlands with meadows, fields, pastures and woodlots (NCWRC, 1992). They usually avoid thick cover as well as open, brushless plains (Godin, 1977; Sealander and Heidt, 1990). Also, red foxes use edge habitat heavily (DeGraaf and Rudis, 1983).

Generally, the home range of the red fox is less than 4.8 kilometers in diameter (approximately 1,800 hectares; DeGraaf and Rudis, 1983), with larger home ranges occurring in low population density areas or poorer habitats (USEPA, 1993). The home range reported in North Carolina is from 1,235 to 4,940 acres (500 to 2,000 hectares; NCWRC, 1992). The home range is shared by the pair and seasonally, by their pups (Godin, 1977; DeGraaf and Rudis, 1983). Red foxes commonly move 24 to 32 km from their natal range to establish adult home ranges (DeGraaf and Rudis, 1983).

Red foxes are opportunistic feeders, and will consume whatever food source is most readily available (USEPA, 1993). Depending on the food source and time of year, the red fox diet consists of mammals such as meadow voles and eastern cottontail, birds such as domestic chicken, pheasant and duck, fruits such as black cherry or juniper berries, insects or carrion (Reader's Digest, 1982; Hockman and Chapman, 1983; Cavallini and Lovari, 1991; Cypher and Yahner, 1996). In a study of feeding habits in Maryland, meadow voles and eastern cottontail were the largest food source by percentage weight and frequency of occurrence (Hockman and Chapman, 1983). Cavallini and Lovari (1991) found that the food selections of red foxes were positively correlated with seasonal abundance, or availability, of the most important local resources. Based on this assessment, it was concluded that the red fox would be an appropriate representative carnivorous mammal for this exposure pathway.

Herbivorous Mammalian Species: White-Tailed Deer

The white-tailed deer (*Odocoileus virginianus*) is found throughout the US (Snyder, 1991). Whitetails are extremely adaptable animals and are common anywhere forested areas are interspersed with open fields, fruit orchards, or agricultural land (Snyder, 1991). In the Southeast they inhabit the southern pine-oak forests interspersed with swamps and bottomland (Snyder, 1991). Deer are herbivores and they prefer to browse and graze on succulent green leaves, tender woody sprouts, and fruits of a variety of woody plants and vines, herbaceous plants, native legumes and grasses, and agricultural crops (NCWRC, 2006). Studies in the southeastern states have revealed home ranges from 81 to over 404 hectares, although individuals in areas of high population densities may have smaller home ranges (NCWRC, 2006). Based on this assessment, it was concluded that the white-tailed deer would be an appropriate representative herbivorous mammal for this exposure pathway.

Omnivorous Mammalian Species: Raccoon

The raccoon (*Procyon lotor*) is the most abundant and widespread medium-sized omnivore in the North America (USEPA, 1993). They are most abundant in hardwood swamps, mangroves, floodplain forests, fresh- and saltwater marshes, mesic hardwood stands, cultivated and abandoned farmlands, and suburban residential areas (Tesky, 1995). They prey on insects, small mammals, birds, lizards, and fruits, and can become nuisance species in developed areas where they frequently raid garbage cans and landfills (USEPA, 1993). The size of a raccoon's home range depends on its sex and age, habitat, food sources, and the season (USEPA, 1993). Their home range can be highly variable (Tesky, 1995). USEPA (1993) reported the home range of males and female raccoons of 65 and 39 hectares, respectively, for a Georgia coastal island. Based on this assessment, it was concluded that the raccoon would be an appropriate representative omnivorous mammal for this exposure pathway.

2.7 Toxicological Profiles for Refined COPEC List

Table 2-9 compiles the proposed TRVs based upon the refined COPEC list. Summaries of the studies selected to derive the NOAEL-based and LOAEL-based TRVs, and the proposed TRVs for the revised COPECs, are presented in Appendix B. If a determination is made that a BERA is required, the TRVs will be re-examined and updated based on recent relevant toxicological studies.

3.0 ERAGS STEP 3 SCIENTIFIC/MANAGEMENT DECISION POINT

Generally, SMDPs provide an opportunity to fine tune and focus any additional activities needed to address the specific goals of the different steps in the ERAGS process (USEPA, 1997). For example, SMDPs provide the opportunity to exit the process where the weight of evidence supports no further action.

Existing habitat conditions in the Drainage Ditch and Cedar Creek were determined to be poor or poor-to-fair, based on application of the RBP during the ecological survey performed in July 2006. These results are consistent with the conclusions made during a prior survey of Cedar Creek reported by NCDENR (1999b). The naturally depauperate conditions of Cedar Creek preclude the development of a robust creek-wide benthic or fish community. Mosquitofish, a native fish species in North Carolina often used for mosquito control, was observed only in the Drainage Ditch near the confluence with Cedar Creek. Consequently, any assessment endpoints based upon direct contact of sediments to these receptors would have limited value for risk management decisions.

Cedar Creek may also receive chemical inputs from other sources. For example, woodland fires caused by accident (e.g., lightning strikes), for maintenance of fire breaks, or for removal of underbrush and unsuitable woody material occur in the vicinity of the former SWP facility. These fires can contribute to PCDD/F loadings (typically as OCDD and HpCDD) in the area (USEPA, 1998b). The chemical fingerprinting assessment of the PCDD/F congener patterns in the creek sediments also suggested potential for other sources of PCDD/Fs at some of the locations, particularly in the creek tributaries.

Table 3-1 summarizes the refined COPEC list by medium. The abiotic chemical screen performed as part of the SLERA indicated that the maximum chemical concentrations for several organics and inorganics in surface water, and PCDD/Fs, some metals, PAHs, and phenolics in sediment, exceeded their screening benchmarks (i.e., HQ_{screen} values greater than one) indicating that there is the potential for adverse ecological effects and a need for a more thorough assessment. The refined screening performed in this current report, which included a comparison of the results to alternate screening benchmarks (RSVs), a spatial evaluation of the

results, and an evaluation of whether the chemical was site-related, yielded a refined COPEC list. None of the SLERA COPECs for surface water were retained as part of this updated screen except for pentachlorophenol. For the sediments, two inorganics, PAHs, pentachlorophenol and PCDD/Fs were retained as part of the refined COPECs.

Figures 2-4, 2-5, 2-8 and 2-9 show the spatial distribution of the results and those samples that had PAH or Dioxin-TEQ concentrations greater than the RSVs. For the figures summarizing the PAH results, there are instances where samples collected from prior to 1998 exceeded the RSVs but the more contemporary samples collected from the same locations were below the RSVs, or were not detected. These results indicate that the PAH results should not be used to guide further steps in the ERAGS process.

If requested by NCDENR, the ERAGS Step 4 report will be submitted following approval of the ERAGS Step 3 report. It is also recommended to combine together the ERAGS Steps 4 and 5 into a single report, since the latter focuses on the field verification and feasibility of the study design developed as part of ERAGS Step 4.

4.0 REFERENCES

AMEC. 2006. *Work Plan Memorandum for the Preparation of Human Health and Ecological Risk Assessments at the Former Southern Wood Piedmont Facility in Gulf, North Carolina.* Prepared for the Southern Wood Piedmont Company. 7 February.

AMEC. 2007. *Screening-Level Ecological Risk Assessment of the Drainage Ditch and Cedar Creek near the Southern Wood Piedmont Facility in Gulf, North Carolina – Revision 1.* Prepared for the Southern Wood Piedmont Company. 15 June.

Apperson, C.S., B.A. Engber, B.A. Harrison, and N.H. Newton. 2004. *Crop Profile for Public Health in North Carolina.* March. 9p.
[URL: http://cipm.ncsu.edu/cropprofiles/docs/NCpublichealth.html]

Brooks, K.M. 2004. *Polycyclic aromatic hydrocarbon migration from creosote-treated railway ties into ballast and adjacent wetlands.* Research Paper FPL-RP-617. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory. 53 p.
[URL: http://www.fpl.fs.fed.us/documnts/fplrp/fpl_rp617.pdf]

Buchman, M.F. 2006. *NOAA Screening Quick Reference Tables.* NOAA Coastal Protection and Restoration Division, HAZMAT Report 99-1, Seattle, WA. 12p. November Update.
[URL: http://response.restoration.noaa.gov/book_shelf/122_squirt_cards.pdf]

Canadian Wildlife Service (CWS). 2002. Life History Information: Eastern Kingbird [http://www.on.ec.gc.ca/wildlife/wildspace/life.cfm?ID=EAKI&Page=More&Lang=e]

Canadian Wildlife Service (CWS). 2005. Life History Information: American Robin [http://www.on.ec.gc.ca/wildlife/wildspace/life.cfm?ID=AMRO&Page=More&Lang=e]

Cavallini, P., and S. Lovari. 1991. Environmental factors influencing the use of habitat in the red fox, *Vulpes vulpes*. *Journal of Zoology (London)*. 223:323-339.

Childress, C.J.O and N. Bathala. 1997. *Water-Quality Trends for Streams and Reservoirs in the Research Triangle Area of North Carolina, 1983-95.* Water-Resources Investigations Report 97-4061. 18p.
[URL: http://nc.water.usgs.gov/reports/abstracts/wri974061.html]

Cypher, Brian L., and Richard H. Yahner. 1996. Foods used by red foxes at Valley Forge National Historical Park. *Northeast Wildlife*. 53:19-24.

DeGraaf, R.M., and D.D. Rudis. 1983. *New England Wildlife: Habitat, Natural History, and Distribution*. U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station, General Technical Report NE-108.

DeGraaf, R.M., N.G. Tilghman, and S.H. Anderson. 1985. Foraging guilds of North American birds. *Environmental Management*. 9(6): 493-536.

DeGraaf, R.M., V.E. Scott, R.H. Hamre, L. Ernst, and S.H. Anderson. 1991. *Forest and Rangeland Birds of the United States: Natural History and Habitat Use.* U.S. Department of Agriculture, Forest Service, Agriculture Handbook 688. Northern Prairie Wildlife Research Center Home Page, [http://www.npwrc.usgs.gov/resource/1998/forest/forest.htm]

Di Toro, D.M., J.A. McGrath, and D.J. Hansen. 2000. Technical basis for narcotic chemicals and polycylic aromatic hydrocarbon criteria. I. Water and tissue. *Environmental Toxicology and Chemistry*. 19: 1951-1970.

Friday, G.P. 2005. *Ecological Screening Values for Surface Water, Sediment and Soil: 2005 Update*. Savannah River National Laboratory. WSRC-TR-2004-00227 August. 60p.
[URL: http://www.osti.gov/bridge/product.biblio.jsp?osti_id=881510]

Geraghty & Miller. 1994. *Remedial Investigation Report, Southern Wood Piedmont Company, Gulf, North Carolina, Facility*. 7 October.

Godin, A.J. 1977. Wild Mammals of New England. The Johns Hopkins University Press, Baltimore, MD.

Hockman, J. Gregory, and Joseph A. Chapman. 1983. Comparative Feeding Habits of Red Foxes (*Vulpes vulpes*) and Gray Foxes (*Urocyon cinereoargenteus*) in Maryland. *American Midland Naturalist*. 110:276-285.

North Carolina Department of Environment and Natural Resources (NCDENR). 1999a. *Revised Expanded Site Inspection, Southern Wood Piedmont Co (NCD 053488557), Gulf, Chatham County, NC.* Memorandum from G.D. Rumford to J. Wendell, 8 June. 4p.

North Carolina Department of Environment and Natural Resources (NCDENR). 1999b. *Basinwide Assessment Report. Cape Fear River Basin*, June 1999.

North Carolina Department of Environment and Natural Resources (NCDENR). 2003. *Guidelines for Performing Screening Level Ecological Risk Assessments within the North Carolina Division of Waste Management.* North Carolina Department of Environment and Natural Resources. Division of Waste Management. October.
[URL: http://www.wastenotnc.org/SFHOME/SLERA.doc]

North Carolina Department of Environment and Natural Resources (NCDENR). 2006. Comments to the Work Plan for Human Health and Ecological Risk Assessments, Southern Wood Piedmont, Gulf, Chatham County. Letter from Keith Snavely (NCDENR) to William Arrants (SWP), dated 24 April 2006.

North Carolina Department of Environment and Natural Resources (NCDENR). 2007a. Evaluation of the SLERA, Southern Wood Piedmont, Gulf, Chatham County. Letter from Keith Snavely (NCDENR) to William Arrants (SWP), dated 28 March 2007.

NCDENR. 2007b. *NCDENR Division of Water Quality "Redbook" Surface Waters and Wetlands Standards, NC Administrative Code 15a NCAC 02b .0100, .0200 & .0300.* Amended Effective: May 1, 2007
[URL: http://h2o.enr.state.nc.us/admin/rules/documents/Redbook2007.pdf]

North Carolina Wildlife Resources Commission (NCWRC). 1992. North Carolina Wildlife Profiles: Red Fox.
[http://www.ncwildlife.org/pg07_WildlifeSpeciesCon/Profiles/foxred.pdf]

North Carolina Wildlife Resources Commission (NCWRC). 2001. North Carolina Wildlife Profiles: Eastern Kingbird.

[http://www.ncwildlife.org/pg07_WildlifeSpeciesCon/Profiles/kingbirdeastern.pdf]

North Carolina Wildlife Resources Commission (NCWRC). 2006. The White-Tailed Deer in North Carolina.
[http://www.wildlife.state.nc.us/fs_index_07_conservation.htm]

Oak Ridge National Laboratory (ORNL). 2007. *Risk Assessment Information System: Ecological Benchmark Tool.* {Accessed 20 August 2007}
[URL: http://rais.ornl.gov/cgi-bin/eco/ECO_select]

Reader's Digest. 1982. North American Wildlife. The Reader's Digest Association, Inc. Pleasantville, NY.

Sealander, J.A., and G.A. Heidt. 1990. *Arkansas Mammals; Their Natural History, Classification, and Distribution.* The Arkansas Game and Fish Commission.

Snyder, S. A. 1991. *Odocoileus virginianus.* In: Fire Effects Information System, [Online].
U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer).
Available: http://www.fs.fed.us/database/feis/ [Accessed: 11 January 2006].

Suter, G.W. II, A.E. Rosen, E. Linder, and D.F. Parkhurst. 1987. End points for responses of fish to chronic toxic exposures. *Environmental Toxicology and Chemistry.* 6: 793-809.

Suter II, G.W. 1993. Ecological Risk Assessment.. Lewis Publishers, Chelsea, Michigan.

Tesky, J.L. 1995. *Procyon lotor.* In: Fire Effects Information System, [Online].
U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer).
Available: http://www.fs.fed.us/database/feis/ [Accessed: 11 January 2006].

USEPA. 1993. *Wildlife Exposure Factors Handbook.* U.S. Environmental Protection Agency, Office of Research and Development. EPA/600/R-93/187. December.

USEPA. 1997. *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments.* U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. EPA 540-R-97-006. June.
[URL: http://www.epa.gov/oswer/riskassessment/ecorisk/ecorisk.htm]

USEPA. 1998a. *The Inventory of Sources of Dioxin in the United States.* EPA/600/P-98/002Aa. External Review Draft. April.

USEPA. 1998b. *Guidelines for Ecological Risk Assessment.* 63FR26845. May.

USEPA. 2003. *Ecological Screening Levels.* USEPA Region V, RCRA. 22 August. [URL: http://www.epa.gov/RCRIS-Region-5/ca/ESL.pdf]

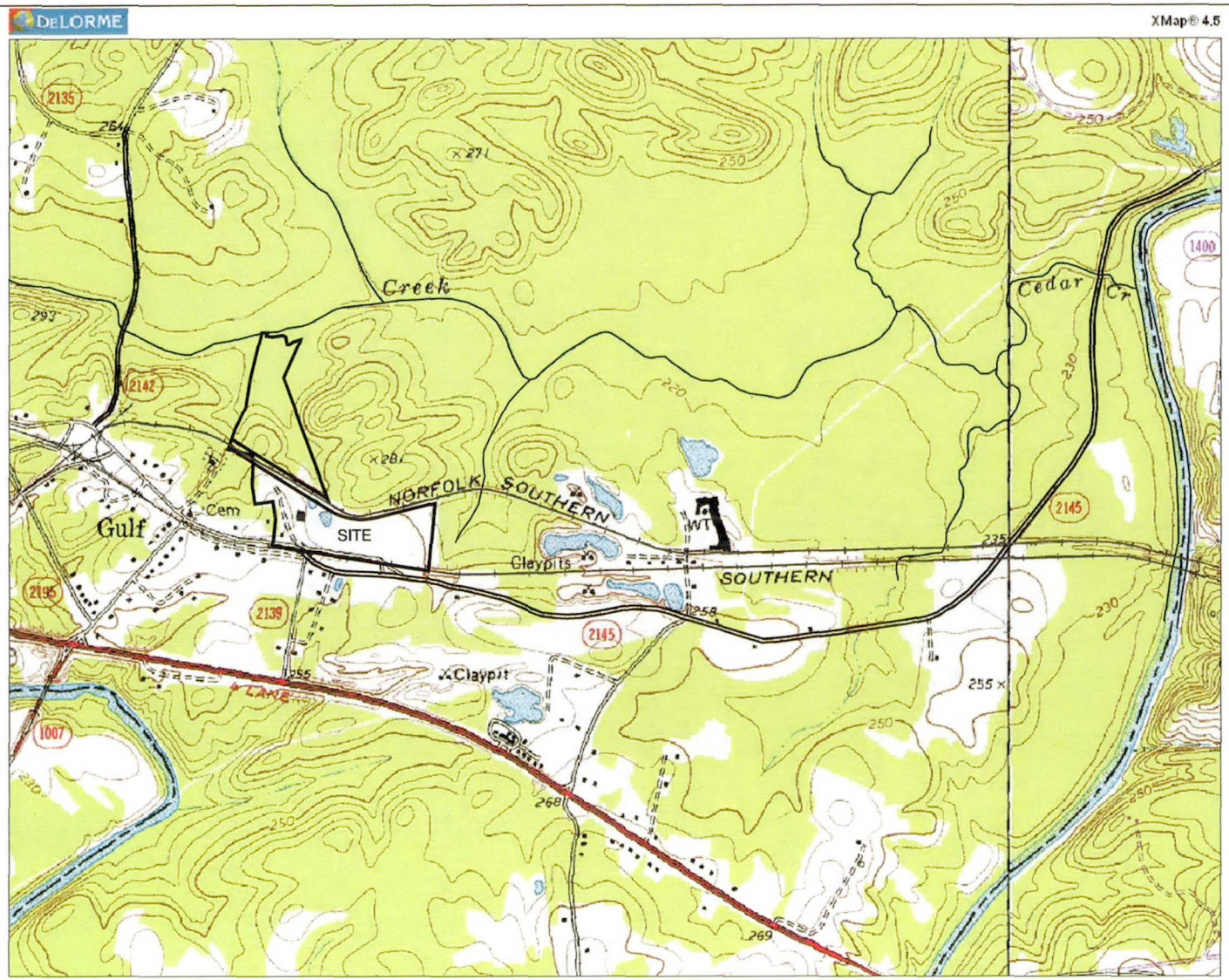
USEPA. 2007. *Pilot Survey of Levels of Polychlorinated Dibenzo-p-Dioxins, Polychlorinated Dibenzofurans, Polychlorinated Biphenyls, and Mercury in Rural Soils of the United States.* National Center for Environmental Assessment, Washington, DC; EPA/600/R-05/048F. [URL: http://oaspub.epa.gov/eims/xmlreport.display?deid=150944&z_chk=31800&format=print]

US Geological Survey (USGS). 2003. *Geochemistry of North Carolina and South Carolina, National Uranium Resource Evaluation, Hydrogeochemical and Stream Sediment Reconnaissance Program, Raleigh Quadrangle, U.S. Geological Survey National Geochemical Database.* Open-File Report 97-492. [URL: http://pubs.usgs.gov/of/1997/ofr-97-0492/quad/q_ralegh.htm]

Van den Berg, M., L. Birnbaum, A.T.C. Bosveld, B. Brunstrom, P. Cook, M. Freeley, J.P. Giesy, A. Hanberg, R. Hasegawa, S.W. Kennedy, T. Kubiak, J.C. Larsen, F.X. Rolaf van Leeuwen, A.K. Djien Liem, C. Nolt, R.E. Peterson, L. Poellinger, S. Safe, D. Schrenk, D. Tillitt, M. Tysklind, F. Waern, and T. Zachareweski. 1998. Toxic equivalency factors (TEFs) for PCBs, PCDDs, PCDFs for humans and wildlife. *Environmental Health Perspectives.* 106(12): 775-792.

Van den Berg, M., L.S. Birnbaum, M. Denison, M. De Vito, W. Farland, M. Feeley, H. Fiedler, H. Hakansson, A. Hanberg, L. Haws, M. Rose, S. Safe, D. Schrenk, C. Tohyama, A. Tritscher, J. Tuomisto, M. Tysklind, N. Walker, and R.E. Peterson. 2006. The 2005 World Health Organization reevaluation of human and mammalian toxic equivalency factors for dioxins and dioxin-like compounds. *Toxicological Sciences.* 93(2): 223–241.

Washington Department of Ecology (WDOE). 1997. *Creation and Analysis of Freshwater Sediment Quality Values in Washington State.* Publication No. 97-323A. July. 114p. [URL: http://www.ecy.wa.gov/pubs/97323a.pdf]



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SITE LOCATION AND TOPOGRAPHIC MAP

SOUTHERN WOOD PIEDMONT
GULF, N.C. FACILITY

FIGURE 1–1

3/13/08 G:\SWP\Gulf\Risk Assessment\DWGS\Cedar Creek Site Location and Topo Map Fig 1-1.dwg

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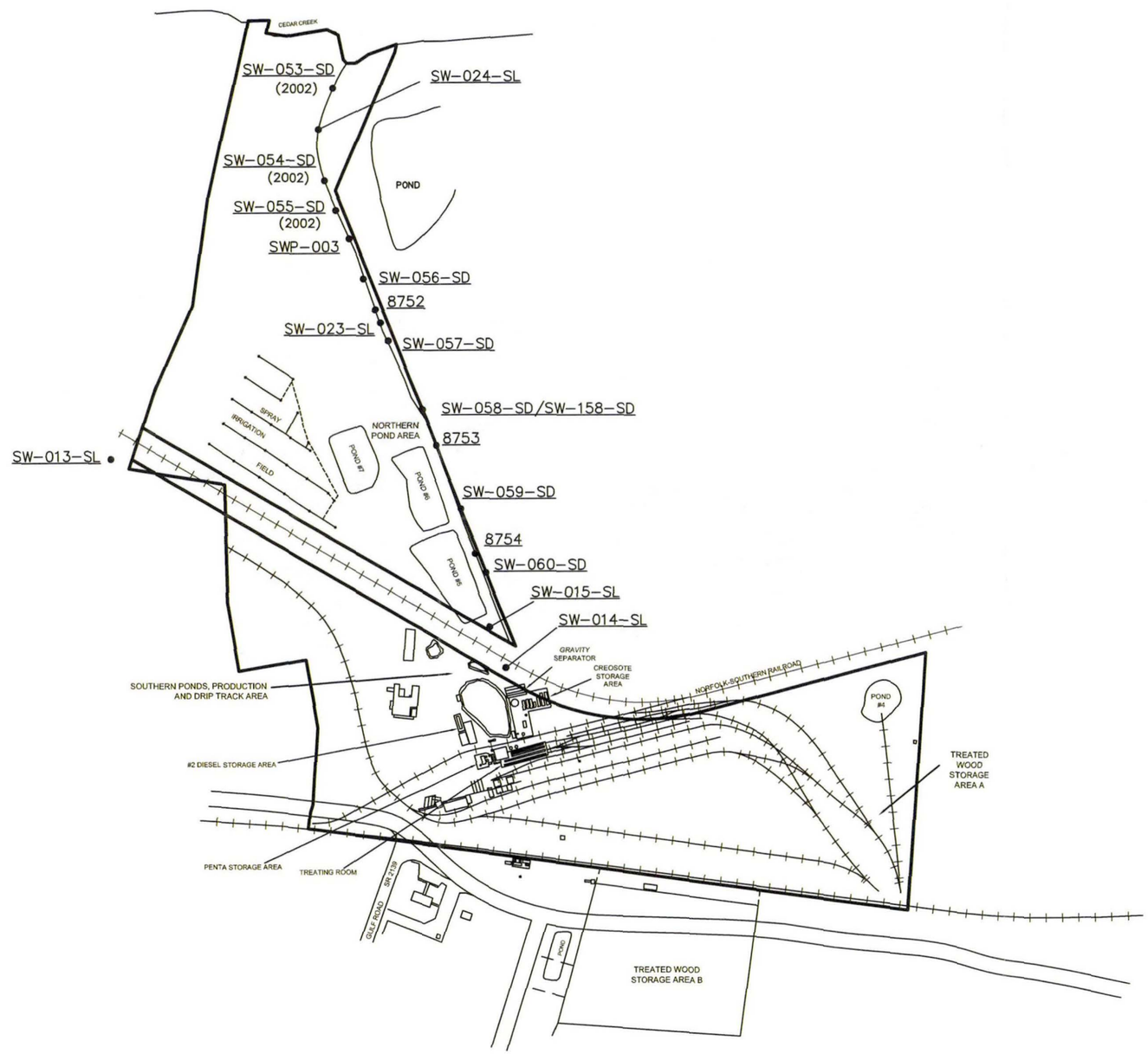

GRAPHIC SCALE

0 200 400

1 inch = 400 ft.

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DRAINAGE DITCH
SEDIMENT SAMPLES

SOUTHERN WOOD PIEDMONT
GULF, N.C. FACILITY

FIGURE 1-2a

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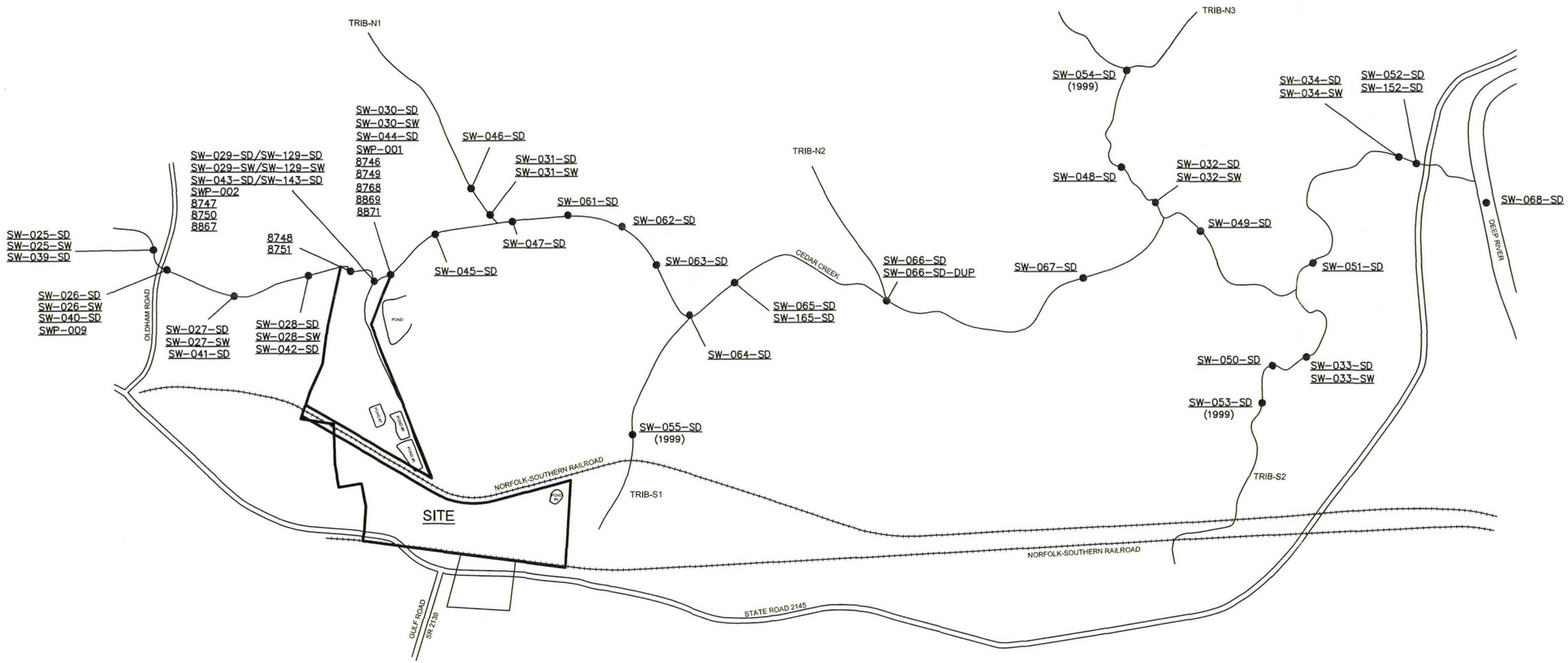
3/13/08 G:SWP\979010-Gulf\Gulf-SEA\Risk Assessment\DWGS\Cedar Creek Drainage Ditch Sediment Samples FIGURE 1-2a.dwg



GRAPHIC SCALE

0 500 1000

1 inch = 1000 ft.

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CEDAR CREEK
SEDIMENT AND
SURFACE WATER
SAMPLES

SOUTHERN WOOD PIEDMONT
GULF, N.C. FACILITY

FIGURE 1-2b

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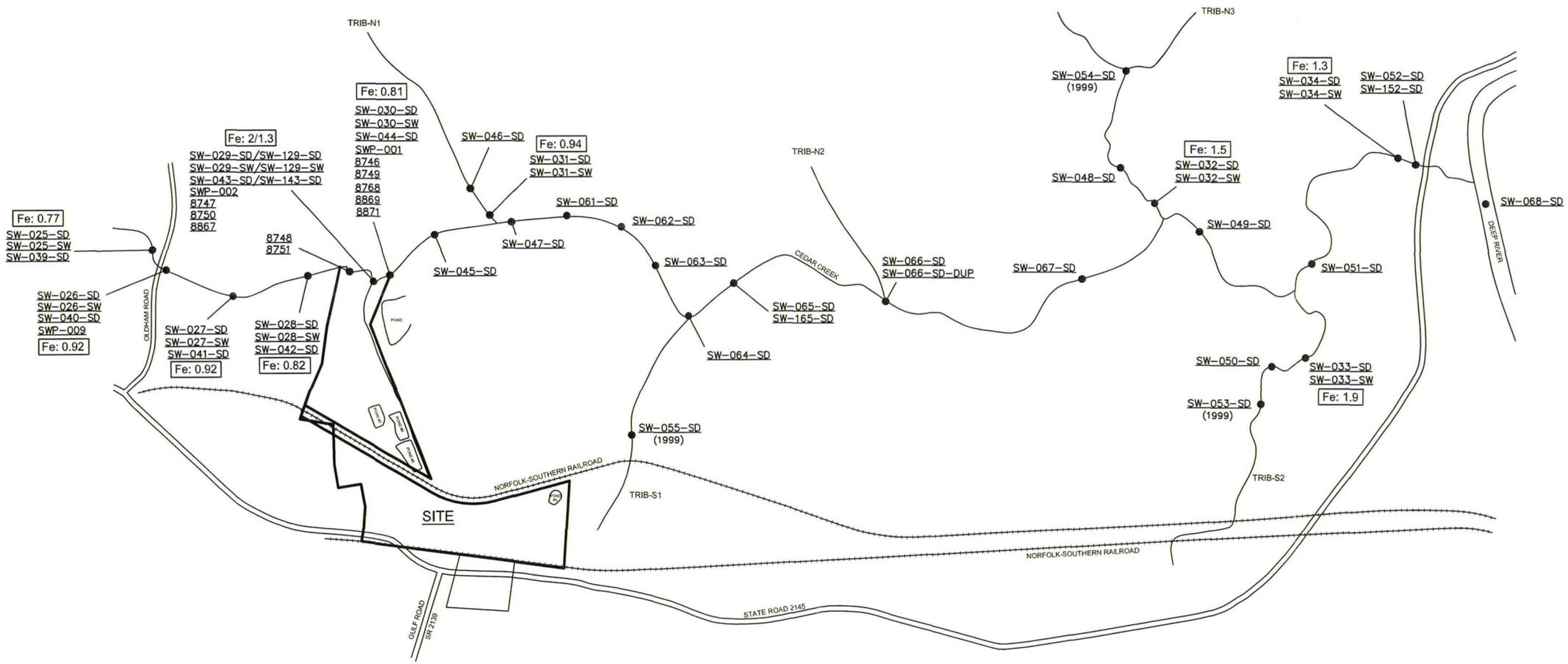
3/12/08 G:SWP\979010-Gulf\Gulf-SEA\Risk Assessment\DWGS\Cedar Creek Sediment Samples FIGURES 1-2b.dwg



GRAPHIC SCALE

0 500 1000

1 inch = 1000 ft.

Notes:
All concentration units are in mg/L.
Unfiltered water samples were collected.
Fe = iron
Locations lacking data boxes had no chemistry data collected for metals.

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SPATIAL DISTRIBUTION OF IRON IN UNFILTERED SURFACE WATER SAMPLES

SOUTHERN WOOD PIEDMONT GULF, N.C. FACILITY

FIGURE 2-1

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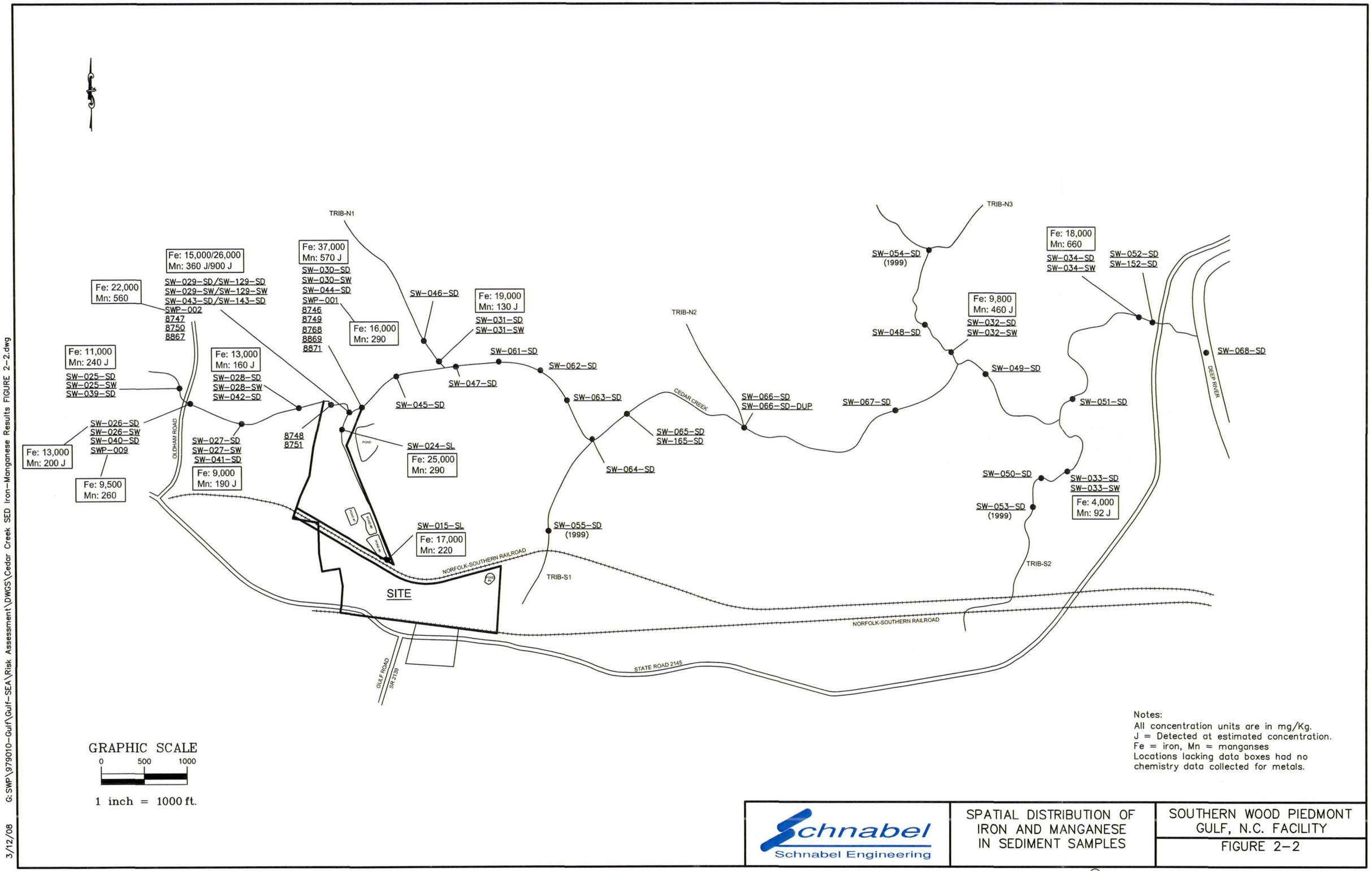
3/12/08 G:\SWP\979010-Gulf\Gulf-SEA\Risk Assessment\DWGS\Cedar Creek SW Iron Results FIGURE 2-1.dwg



Notes:
All concentration units are in mg/Kg.
J = Detected at estimated concentration.
Fe = iron, Mn = manganses
Locations lacking data boxes had no chemistry data collected for metals.

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SPATIAL DISTRIBUTION OF IRON AND MANGANESE IN SEDIMENT SAMPLES

SOUTHERN WOOD PIEDMONT
GULF, N.C. FACILITY

FIGURE 2-2

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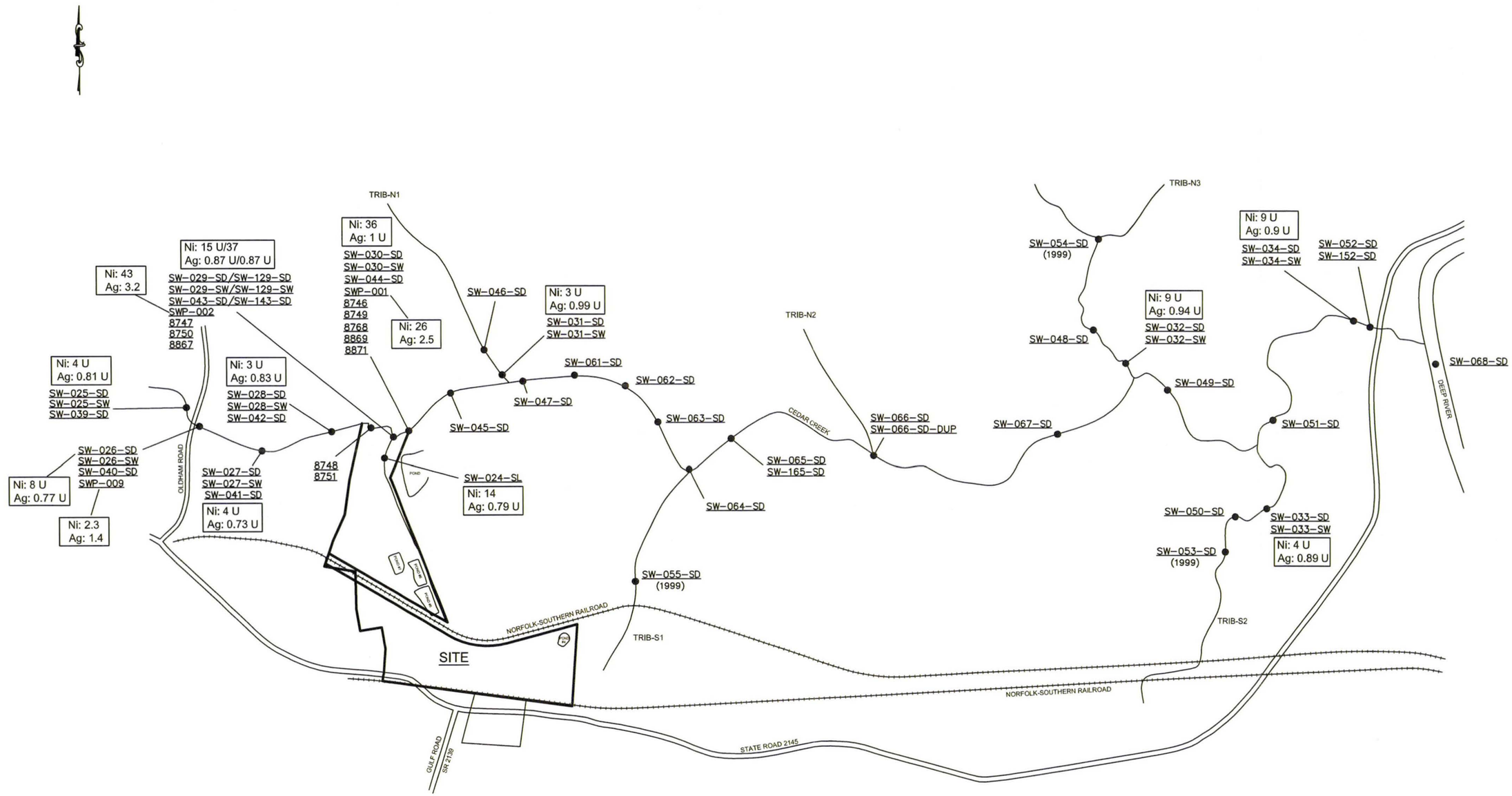
3/12/08 G:SWP\979010-Gulf\Gulf-SEA\Risk Assessment\DWGS\Cedar Creek SED Iron-Manganese Results FIGURE 2-2.dwg



GRAPHIC SCALE

0 500 1000

1 inch = 1000 ft.

Notes:
All concentration units are in mg/Kg.
U = Not detected at concentration shown.
Ni = nickel, Ag = silver
Locations lacking data boxes had no chemistry data collected for metals.

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SPATIAL DISTRIBUTION OF NICKEL AND SILVER IN SEDIMENT SAMPLES

SOUTHERN WOOD PIEDMONT GULF, N.C. FACILITY

FIGURE 2-3

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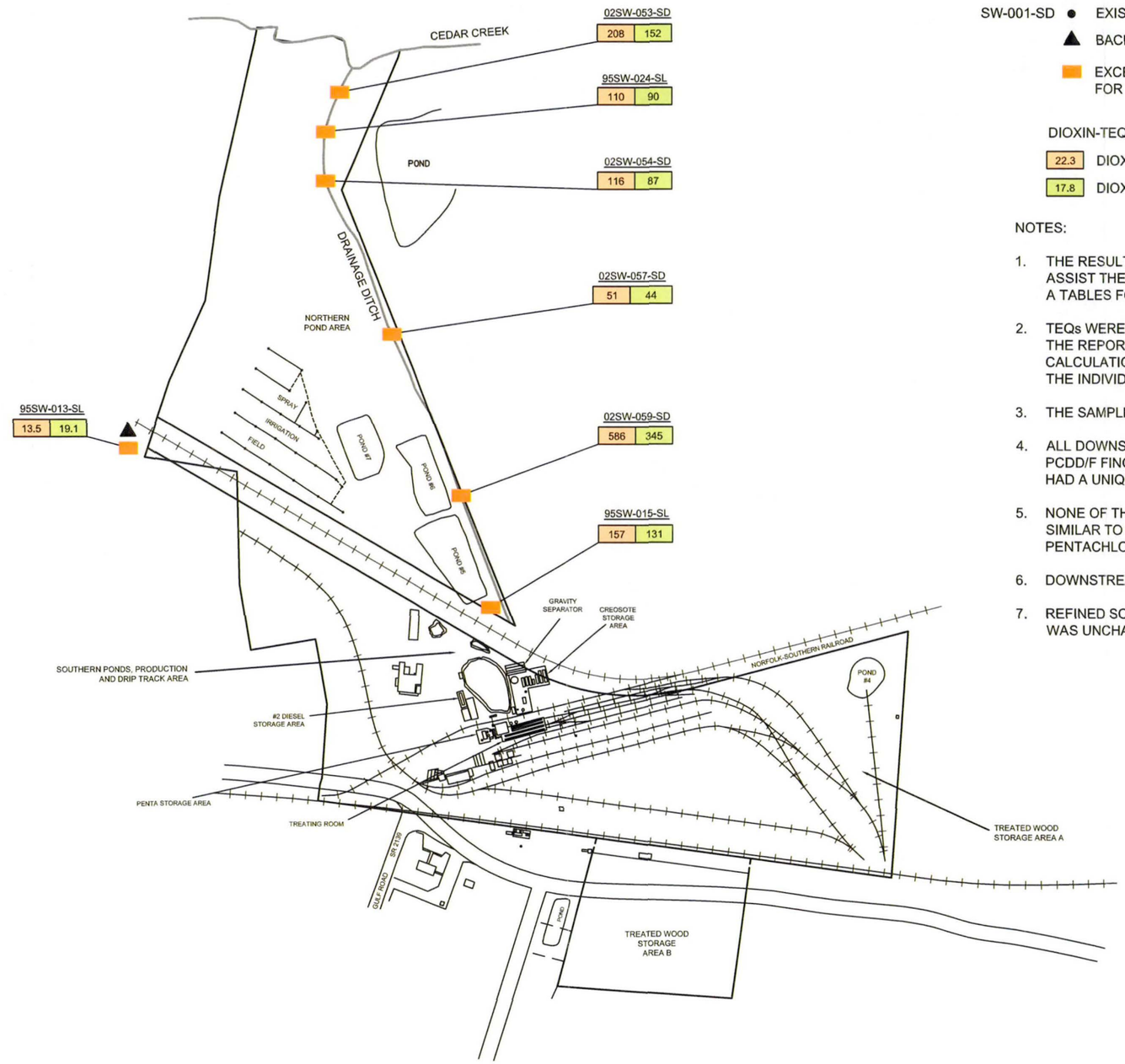
3/12/08 G:\SWP\979010-Gulf\Gulf-SEA\Risk Assessment\DWGS\Cedar Creek SED Nickel-Silver Results FIGURE 2-3.dwg



GRAPHIC SCALE

0 200 400

1 inch = 400 ft.

KEY

SW-001-SD ● EXISTING SEDIMENT SAMPLE LOCATIONS

▲ BACKGROUND LOCATION

EXCEEDS REFINED SCREENING VALUE (RSV) FOR TOTAL DIOXIN-TEQs (2.5 ng/Kg)

DIOXIN-TEQ Results (ng/Kg)

22.3 DIOXIN-TEQ (mammal)

17.8 DIOXIN-TEQ (avian)

NOTES:

1. THE RESULTS SHOWN ON THIS FIGURE WERE ROUNDED TO ASSIST THE DISPLAY OF THE INFORMATION. REFER TO APPENDIX A TABLES FOR DETAILED COMPILATION OF THE RESULTS.
2. TEQs WERE CALCULATED SETTING NON-DETECTS TO ONE-HALF THE REPORTED DETECTION LIMITS. SEE APPENDIX A TABLES FOR CALCULATIONS SETTING NON-DETECTS TO ZERO VALUES FOR THE INDIVIDUAL SAMPLES.
3. THE SAMPLE YEAR PRECEDES THE SAMPLE ID.
4. ALL DOWNSTREAM DRAINAGE DITCH SAMPLES HAD SIMILAR PCDD/F FINGERPRINT PATTERN EXCEPT FOR 02SW-059-SD, WHICH HAD A UNIQUE PATTERN.
5. NONE OF THE DRAINAGE DITCH SAMPLES HAD PCDD/F PATTERNS SIMILAR TO PCDD/F CONGENER PATTERNS REPORTED IN PENTACHLOROPHENOL STANDARDS.
6. DOWNSTREAM DRAINAGE DITCH DISTINCT FROM BACKGROUND.
7. REFINED SCREENING VALUE FOR DIOXIN-TEQs WAS 2.5 ng/Kg AND WAS UNCHANGED FROM THE SLERA SCREENING VALUE.

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DRAINAGE DITCH SEDIMENT DIOXINS–TEQ(mammals) and DIOXINS–TEQ(avian) RESULTS

SOUTHERN WOOD PIEDMONT GULF, N.C. FACILITY

FIGURE 2–4

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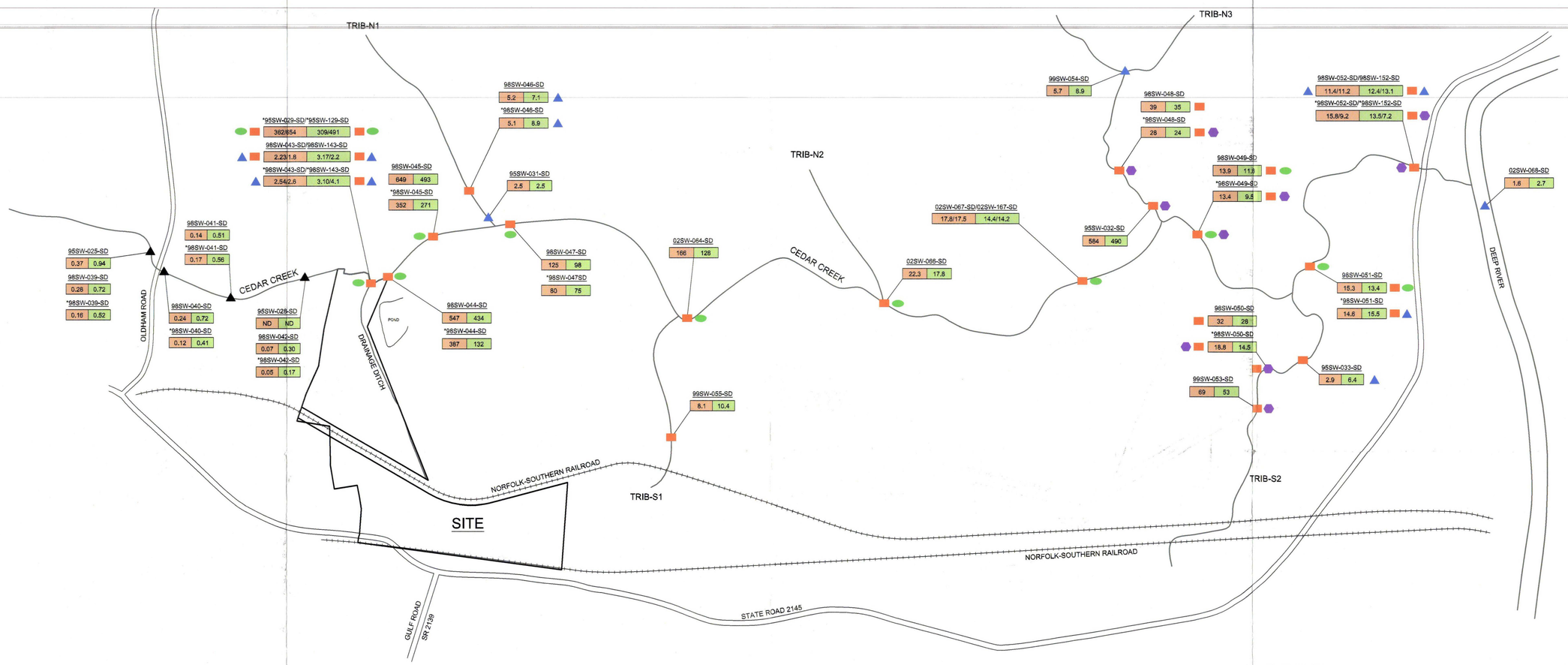
3/14/08 G:\SWP\979010-Gulf\Gulf-SEA\Risk Assessment\DWGS\SLERA Drainge Ditch Dioxin-TEQ Results FIGURE 2-4.dwg



SW-001-SD ● EXISTING SOIL SAMPLE LOCATIONS

*SW-001-SD SAMPLES COLLECTED BY NCDENR AND SPLIT WITH SWP

▲ BACKGROUND LOCATIONS

▲ BACKGROUND-LIKE LOCATIONS

■ EXCEEDS REFINED SCREENING VALUE (RSV) FOR DIOXIN-TEQ (2.5 ng/Kg)

● SIMILAR TO DITCH PCDD/F PATTERN

⬢ SUGGEST UNIQUE SOURCE OF PCDD/F

DIOXIN-TEQ Results (ng/Kg)

22.3 DIOXIN-TEQ (mammal)

17.8 DIOXIN-TEQ (avian)

NOTES:

1. THE RESULTS SHOWN ON THIS FIGURE WERE ROUNDED TO ASSIST THE DISPLAY OF THE INFORMATION. REFER TO APPENDIX A TABLES FOR DETAILED COMPILATION OF THE RESULTS.
2. DIOXIN-TEQ VALUES WERE CALCULATED BY SETTING NON-DETECTS TO ZERO VALUES.
3. ND = NOT DETECTED.
4. THE SAMPLE YEAR PRECEDES THE SAMPLE ID.
5. CEDAR CREEK BACKGROUND SAMPLES WERE DISTINCT RELATIVE TO DOWNSTREAM SAMPLES.
6. THE SAMPLES MARKED WITH THE BLUE TRIANGLES HAD SIMILAR PCDD/F CONGENER PATTERNS TO THE BACKGROUND SAMPLES.
7. TRIB-S1 & TRIB-S2 NOT FINGERPRINTED DUE TO LACK OF SAMPLES.
8. SCREENING VALUE FOR DIOXIN-TEQs WAS 2.5 ng/Kg.

GRAPHIC SCALE
0 250 500
1 inch = 500 ft.

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PROJECT: SOUTHERN WOOD PIEDMONT GULF, N.C. FACILITY

DESIGNED BY: GBK	DRAWN BY: CAB	CHECKED BY: GBK

SHEET TITLE: CEDAR CREEK SEDIMENT DIOXIN–TEQ(mammal) and DIOXIN–TEQ(avain) RESULTS

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104 Corporate Boulevard
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REV	DESCRIPTION	DATE

SCALE: 1"=500' | DATE: 2/4/08 | FIGURE NO: 2-5 | SHEET:

G:\SWP\Gulf\Gulf-SEA\Risk Assess\AMEC CC Risk Assess\Final SCLERA\Drawings 2-4-08\Cedar Creek Dioxin-TEQ Results Revised 2-4-08.dwg
2/4/08

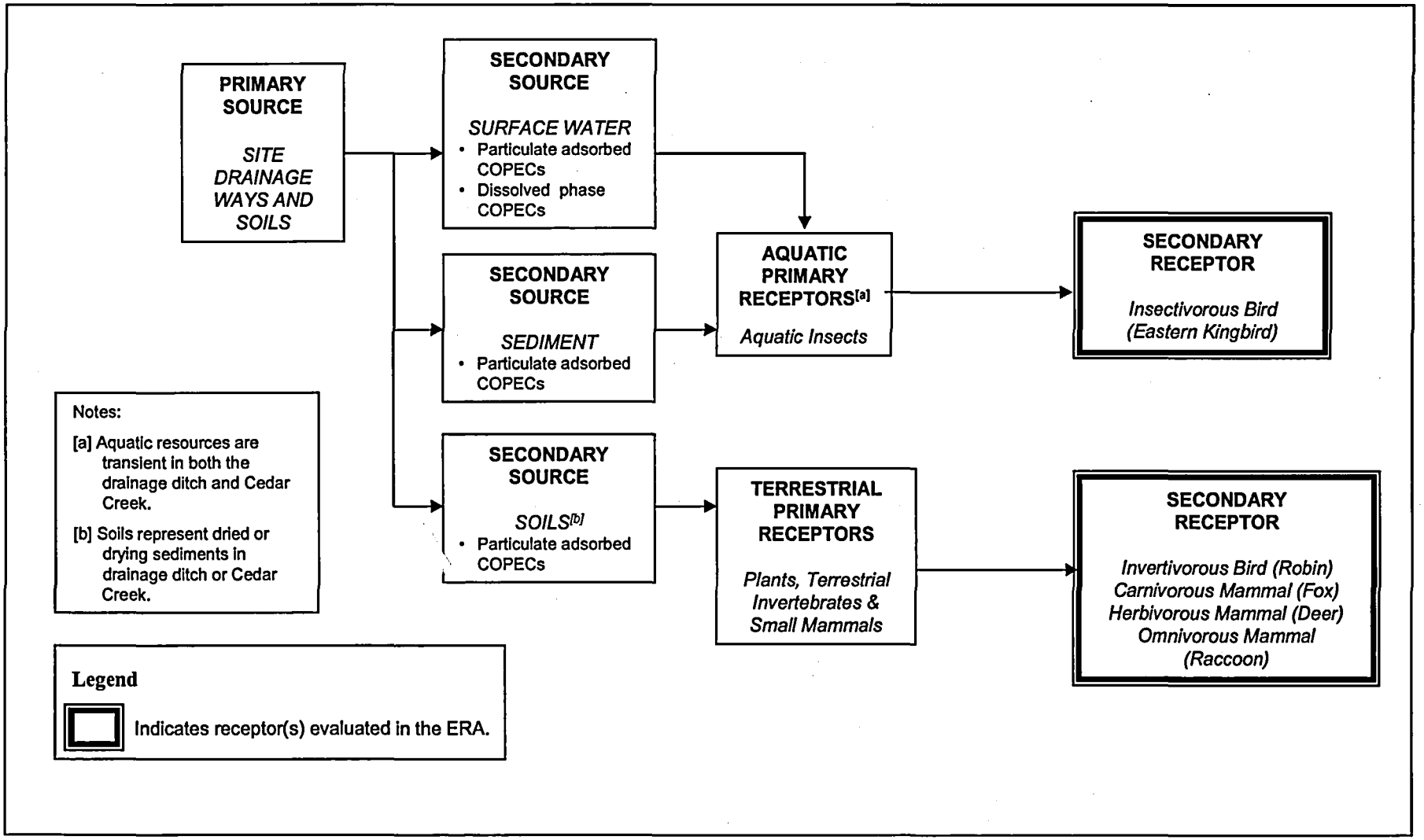
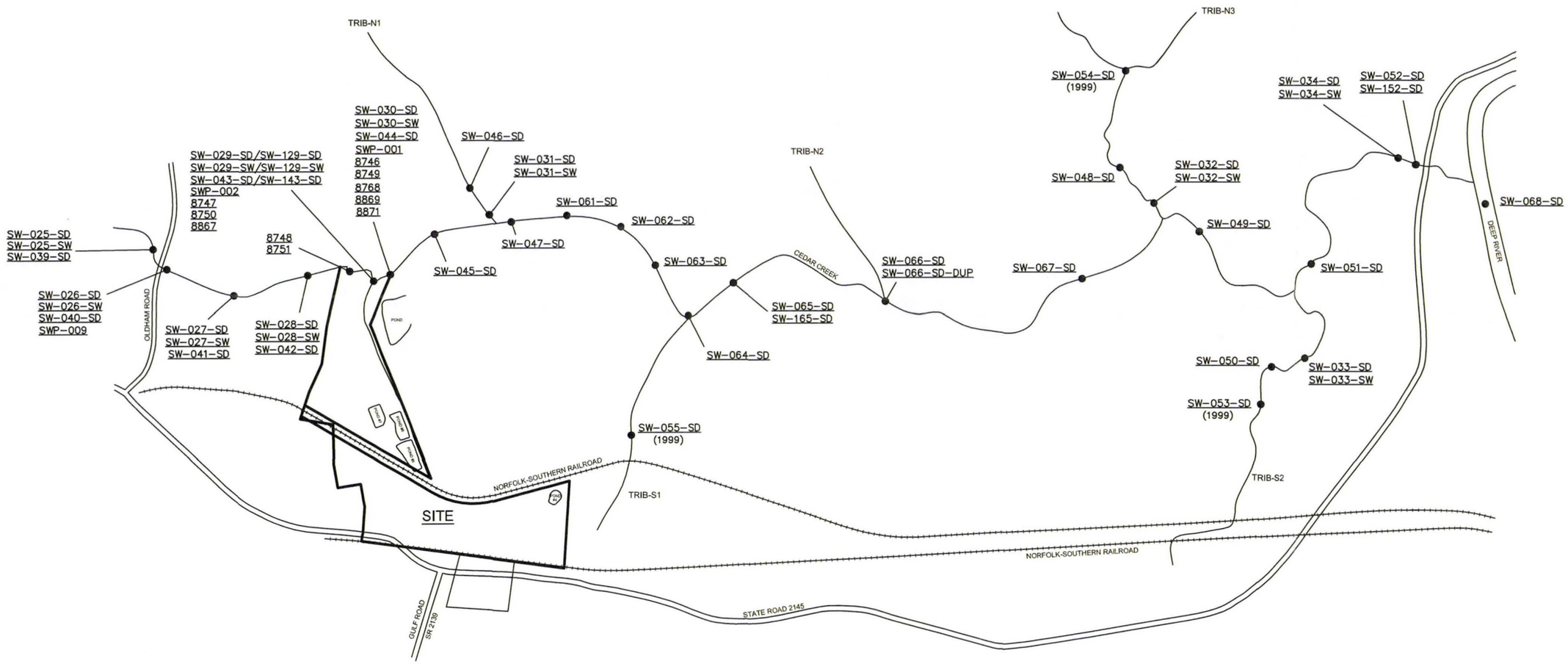


Figure 2-6. Conceptual Site Model for the Ecological Risk Assessment near the Former Southern Wood Piedmont–Gulf Facility



GRAPHIC SCALE

0 500 1000

1 inch = 1000 ft.

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CEDAR CREEK SURFACE WATER AND SEDIMENT SAMPLES

SOUTHERN WOOD PIEDMONT GULF, N.C. FACILITY

FIGURE 2-7

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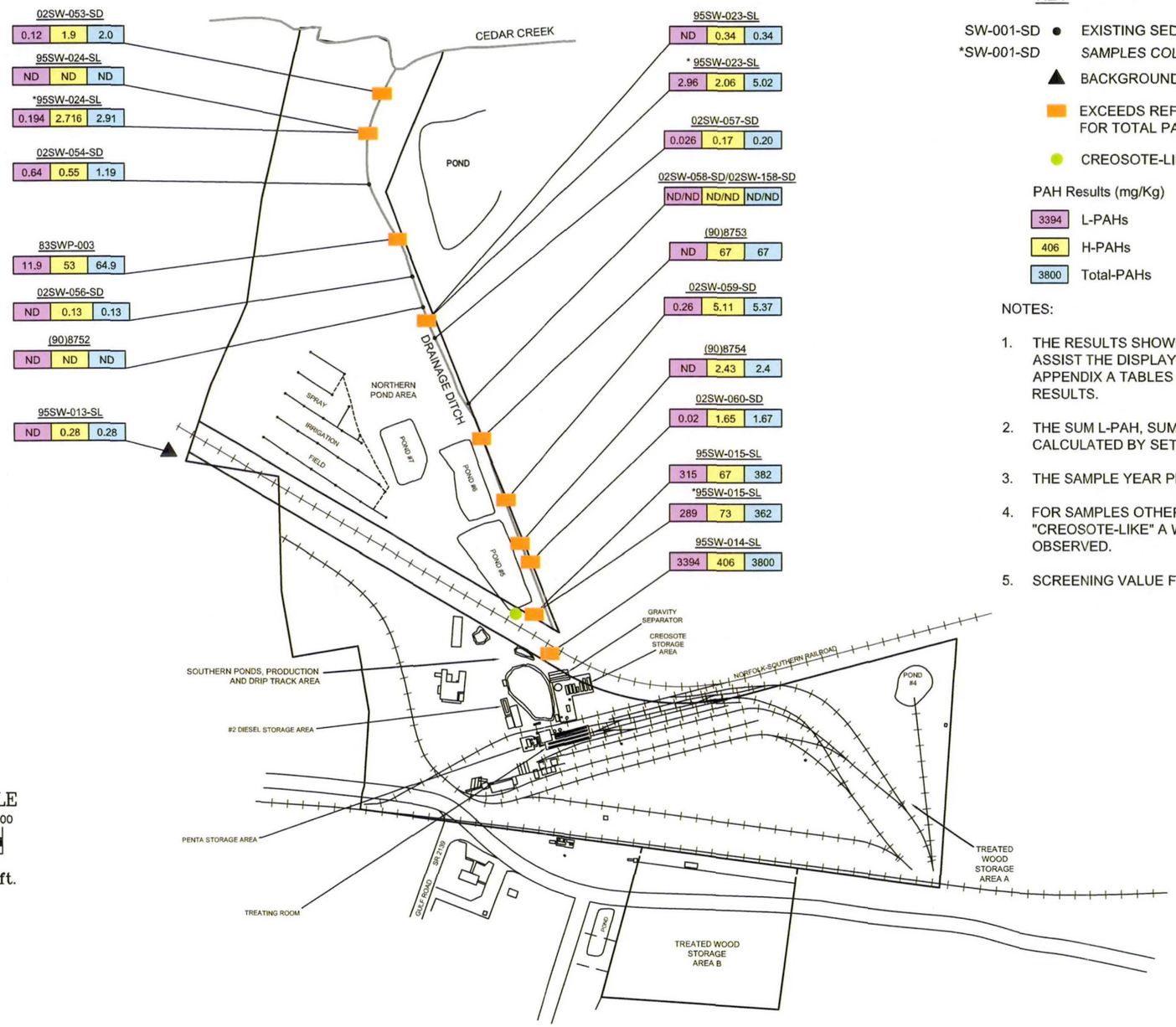
3/12/08 G:SWP\979010-Gulf\Gulf-SEA\Risk Assessment\DWGS\Cedar Creek Sediment Samples FIGURE 2-7.dwg



KEY

SW-001-SD ● EXISTING SEDIMENT SAMPLE LOCATIONS

*SW-001-SD SAMPLES COLLECTED BY NCDENR AND SPLIT WITH SWP

▲ BACKGROUND LOCATION

EXCEEDS REFINED SCREENING VALUE (RSV) FOR TOTAL PAHs (1.6mg/Kg)

CREOSOTE-LIKE PAH PATTERN

PAH Results (mg/Kg)

3394	L-PAHs
406	H-PAHs
3800	Total-PAHs

NOTES:

1. THE RESULTS SHOWN ON THIS FIGURE WERE ROUNDED TO ASSIST THE DISPLAY OF THE INFORMATION. REFER TO APPENDIX A TABLES FOR DETAILED COMPILATION OF THE RESULTS.
2. THE SUM L-PAH, SUM H-PAH AND TOTAL PAHs WERE CALCULATED BY SETTING NON-DETECTS TO ZERO VALUES.
3. THE SAMPLE YEAR PRECEDES THE SAMPLE ID.
4. FOR SAMPLES OTHER THAN THOSE DESIGNATED AS "CREOSOTE-LIKE" A WEATHERED PAH PATTERN WAS OBSERVED.
5. SCREENING VALUE FOR TOTAL PAHs WAS 1.6 mg/Kg.

GRAPHIC SCALE

0 200 400

1 inch = 400 ft.

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DRAINAGE DITCH SEDIMENT L-PAH, H-PAH and TOTAL PAH RESULTS

SOUTHERN WOOD PIEDMONT GULF, N.C. FACILITY

FIGURE 2-8

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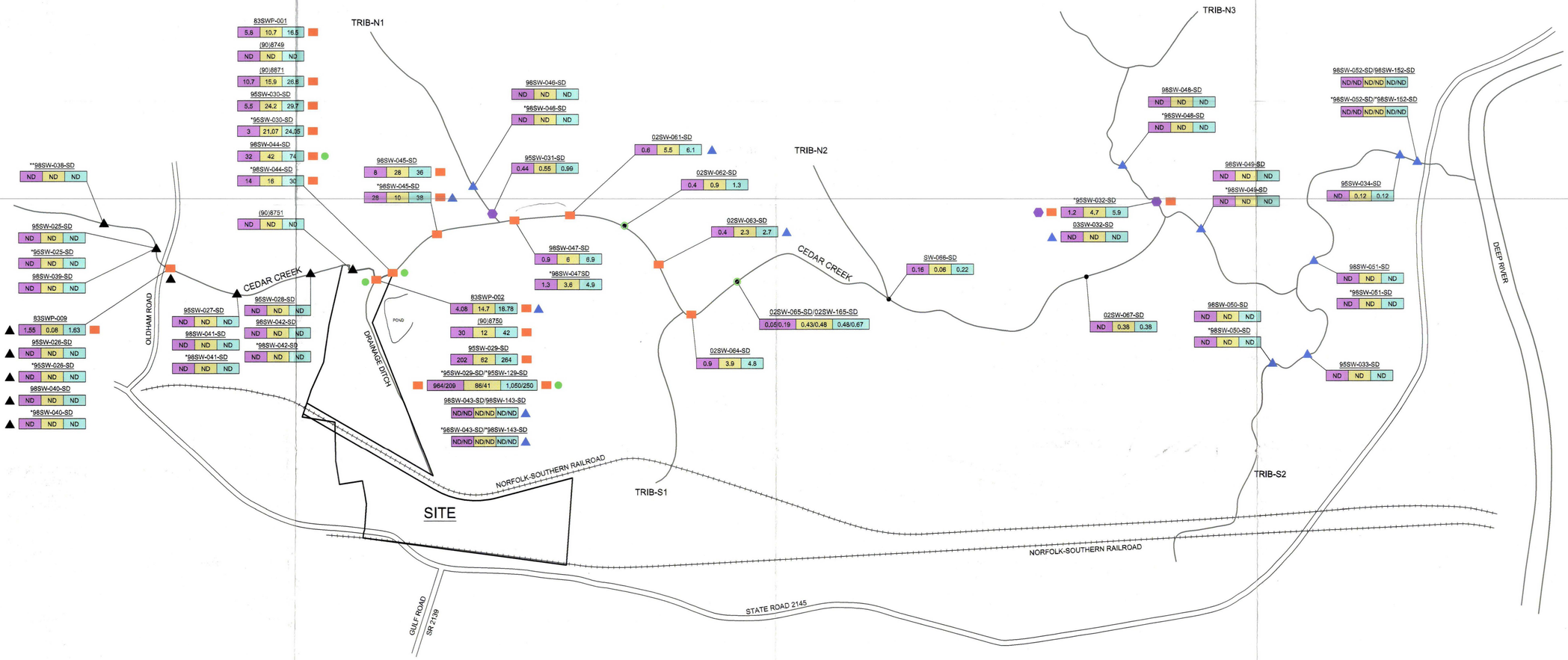
3/14/08 G:SWP\979010-Gulf\Gulf-SEA\Risk Assessment\DWGS\SLERA Drainge Ditch PAH Results FIGURE 2-8.dwg



SW-001-SD ● EXISTING SOIL SAMPLE LOCATIONS

*SW-001-SD SAMPLES COLLECTED BY NCDENR AND SPLIT WITH SWP

**SW-001-SD SW-038-SD COLLECTED BY NCDENR. THE ACTUAL SAMPLE LOCATION IS UNKNOWN. THE SAMPLE LOCATION IS ASSUMED TO BE UPGRADIENT OF THE OLDHAM ROAD BRIDGE UPGRADIENT OF THE SITE.

▲ BACKGROUND LOCATIONS

▲ BACKGROUND-LIKE LOCATIONS

■ EXCEEDS REFINED SCREENING VALUE (RSV) FOR TOTAL PAHs (1.6mg/Kg)

● CREOSOTE-LIKE PAH PATTERN ABOVE RSV

○ CREOSOTE-LIKE PAH PATTERN BELOW RSV

⬢ SUGGEST UNIQUE SOURCE

PAH Results (mg/Kg)

3394 L-PAHs

406 H-PAHs

3800 Total-PAHs

NOTES:

1. THE RESULTS SHOWN ON THIS FIGURE WERE ROUNDED TO ASSIST THE DISPLAY OF THE INFORMATION. REFER TO APPENDIX A TABLES FOR DETAILED COMPILATION OF THE RESULTS.
2. TOTAL PAHs WERE CALCULATED BY SETTING NON-DETECT RESULTS TO ZERO VALUES.
3. ND = NOT DETECTED.
4. THE SAMPLE YEAR PRECEDES THE SAMPLE ID.
4. FOR SAMPLES OTHER THAN THOSE DESIGNATED AS "CREOSOTE-LIKE" A WEATHERED PAH PATTERN WAS OBSERVED.
5. SCREENING VALUE FOR TOTAL PAHs WAS 1.6 mg/Kg.

GRAPHIC SCALE
0 250 500
1 inch = 500 ft.

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PROJECT: SOUTHERN WOOD PIEDMONT GULF, N.C. FACILITY

SHEET TITLE: CEDAR CREEK SEDIMENT L-PAH, H-PAH AND TOTAL PAH RESULTS

DESIGNED BY:	DRAWN BY:	CHECKED BY:
GBK	CAB	GBK

REV	DESCRIPTION	DATE

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SCALE: 1"=500' | DATE: 2/4/08 | FIGURE NO: 2-9 | SHEET:

2/4/08 G:\SWP\Gulf\GULF-SEA\Risk Assess\AMEC CC Risk Assess\Final SCLERA\Drawings 2-4-08\Cedar Creek PAH Results Revised 2/4/08.dwg

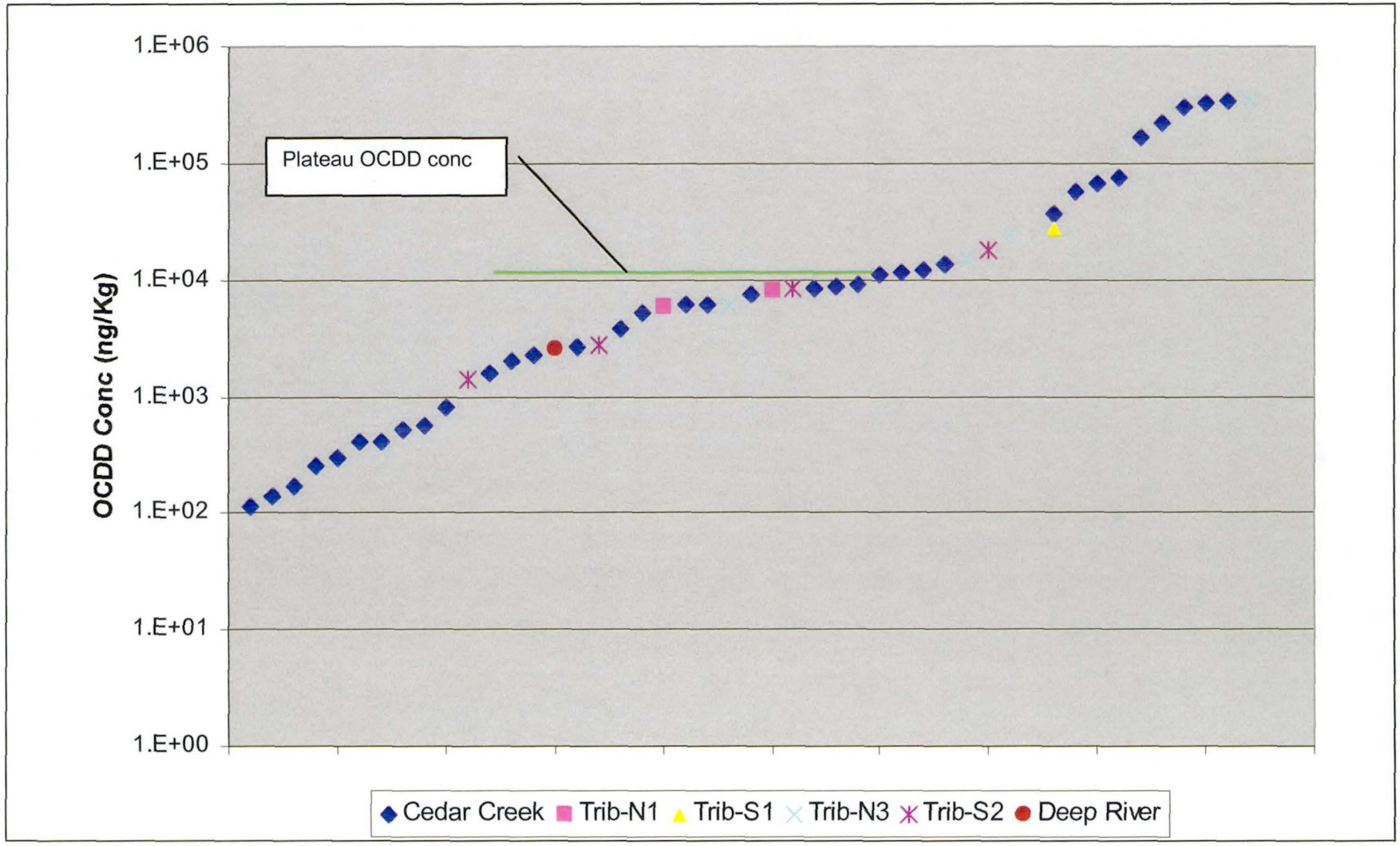

Figure 2-10. Concentration Rank Plot of OCDD Sediment Concentrations in Cedar Creek, Associated Tributaries, and Deep River

Table 1-1. Summary of Analytical Program for Cedar Creek and Drainage Ditch
Southern Wood Piedmont - Gulf, North Carolina Facility

Sample ID	Date Collected	Data Source	Target Analyte(s)	Depth Interval	Comment
Drainage Ditch Sediment Samples					
SWP-003	09/21/1983	EPA	Inorganics, VOC, SVOC	Surface	
8752	05/03/1990	SWP	VOC, SVOC	Not stated	
8753	05/03/1990	SWP	VOC, SVOC	Not stated	
8754	05/03/1990	SWP	VOC, SVOC	Not stated	
SW-013-SL	11/14/1995	NCDENR	Inorganics, SVOC, Dioxins/Furans	0 to 12 inches	Background
SW-014-SL	11/14/1995	NCDENR	Inorganics, VOC, SVOC	0 to 12 inches	
SW-015-SL	11/14/1995	NCDENR	Inorganics, VOC, SVOC, Dioxins/Furans	0 to 6 inches	
SW-015-SL	11/14/1995	SWP	VOC, SVOC	Split with NCDENR	
SW-023-SL	11/14/1995	NCDENR	Inorganics, VOC, SVOC	0 to 6 inches	
SW-023-SL	11/14/1995	SWP	VOC, SVOC	Split with NCDENR	
SW-024-SL	11/14/1995	NCDENR	Inorganics, VOC, SVOC, Dioxins/Furans	0 to 6 inches	
SW-024-SL	11/14/1995	SWP	VOC, SVOC	Split with NCDENR	
SW-053-SD	07/16/2002	SWP	SVOC, Dioxins/Furans	0 to 3 inches	
SW-053-SD	07/19/2006	SWP	TOC, grain size	0 to 3 inches	
SW-054-SD	07/16/2002	SWP	SVOC, Dioxins/Furans	0 to 3 inches	
SW-055-SD	07/16/2002	SWP	SVOC	0 to 3 inches	
SW-056-SD	07/16/2002	SWP	SVOC	0 to 3 inches	
SW-057-SD	07/16/2002	SWP	SVOC, Dioxins/Furans	0 to 3 inches	
SW-058-SD	07/18/2002	SWP	SVOC	0 to 3 inches	
SW-158-SD	07/18/2002	SWP	SVOC	Duplicate	
SW-059-SD	07/18/2002	SWP	SVOC, Dioxins/Furans	0 to 3 inches	
SW-059-SD	07/19/2006	SWP	TOC, grain size	0 to 3 inches	
SW-059-SD-TCLP	03/18/2004	SWP	TCLP SVOC	0 to 3 inches	
SW-060-SD	07/18/2002	SWP	SVOC	0 to 3 inches	
Cedar Creek, Tributaries, and Deep River Sediment Samples					
SWP-001	09/21/1983	EPA	Inorganics, VOC, SVOC	Surface	
SWP-002	09/21/1983	EPA	Inorganics, VOC, SVOC	Surface	
SWP-009	09/21/1983	EPA	Inorganics, VOC, SVOC	Surface	
8749	05/03/1990	SWP	VOC, SVOC	Not stated	
8750	05/03/1990	SWP	VOC, SVOC	Not stated	
8751	05/03/1990	SWP	VOC, SVOC	Not stated	
8871	08/13/1990	SWP	VOC, SVOC	Not stated	
SW-025-SD	11/13/1995	NCDENR	Inorganics, SVOC, Dioxins/Furans	0 to 12 inches	Background
SW-025-SD	11/13/1995	SWP	VOC, SVOC	Split with NCDENR	Background
SW-026-SD	11/13/1995	NCDENR	Inorganics, SVOC	0 to 12 inches	Background
SW-026-SD	11/13/1995	SWP	VOC, SVOC	Split with NCDENR	Background
SW-027-SD	11/13/1995	NCDENR	Inorganics, SVOC	0 to 12 inches	Background
SW-028-SD	11/13/1995	NCDENR	Inorganics, SVOC, Dioxins/Furans	0 to 12 inches	Background
SW-029-SD	11/13/1995	NCDENR	Inorganics, SVOC, Dioxins/Furans	0 to 12 inches	
SW-029-SD	11/13/1995	SWP	VOC, SVOC	Split with NCDENR	
SW-129-SD	11/13/1995	NCDENR	Inorganics, SVOC, Dioxins/Furans	Duplicate	
SW-029-SD-TCLP	03/17/2004	SWP	TCLP SVOC	0 to 3 inches	
SW-030-SD	11/13/1995	NCDENR	Inorganic, SVOC	0 to 12 inches	
SW-030-SD	11/13/1995	SWP	VOC, SVOC	Split with NCDENR	
SW-031-SD	11/13/1995	NCDENR	Inorganics, SVOC, Dioxins/Furans	0 to 12 inches	Trib-N1
SW-032-SD	11/14/1995	NCDENR	Inorganics, SVOC, Dioxins/Furans	0 to 12 inches	Trib-S3
SW-032-SD	06/22/2003	SWP	SVOC	0 to 3 inches	Trib-S3
SW-032-SD	07/18/2006	SWP	TOC, grain size	0 to 3 inches	Trib-S3
SW-033-SD	11/13/1995	NCDENR	Inorganics, SVOC, Dioxins/Furans	0 to 12 inches	Trib-S2
SW-034-SD	11/14/1995	NCDENR	Inorganics, SVOC, Dioxins/Furans	0 to 12 inches	
SW-034-SD	07/18/2006	SWP	TOC, grain size	0 to 3 inches	
SW-039-SD	11/09/1998	NCDENR	Dioxins/Furans	0 to 4 inches	
SW-039-SD	11/09/1998	SWP	SVOC, Dioxins/Furans	Split with NCDENR	
SW-040-SD	11/09/1998	NCDENR	Dioxins/Furans	0 to 4 inches	
SW-040-SD	11/09/1998	SWP	SVOC, Dioxins/Furans	Split with NCDENR	
SW-041-SD	11/09/1998	NCDENR	Dioxins/Furans	0 to 4 inches	
SW-041-SD	11/09/1998	SWP	SVOC, Dioxins/Furans	Split with NCDENR	
SW-042-SD	11/09/1998	NCDENR	Dioxins/Furans	0 to 4 inches	
SW-042-SD	11/09/1998	SWP	SVOC, Dioxins/Furans	Split with NCDENR	
SW-043-SD	11/09/1998	NCDENR	Dioxins/Furans	0 to 4 inches	
SW-043-SD	11/09/1998	SWP	SVOC, Dioxins/Furans	Split with NCDENR	

Table 1-1. Summary of Analytical Program for Cedar Creek and Drainage Ditch
Southern Wood Piedmont - Gulf, North Carolina Facility

Sample ID	Date Collected	Data Source	Target Analyte(s)	Depth Interval	Comment
SW-143-SD	11/09/1998	NCDENR	Dioxins/Furans	Duplicate	
SW-143-SD	11/09/1998	SWP	SVOC, Dioxins/Furans	Duplicate Split	
SW-044-SD	11/09/1998	NCDENR	SVOC, Dioxins/Furans	0 to 4 inches	
SW-044-SD	11/09/1988	SWP	SVOC, Dioxins/Furans	Split with NCDENR	
SW-045-SD	11/09/1998	NCDENR	SVOC, Dioxins/Furans	0 to 4 inches	
SW-045-SD	11/09/1998	SWP	SVOC, Dioxins/Furans	Split with NCDENR	
SW-045-SD	07/19/2006	SWP	TOC, grain size	0 to 3 inches	
SW-046-SD	11/09/1998	NCDENR	Dioxins/Furans	0 to 2 inches	Trib-N1
SW-046-SD	11/09/1998	SWP	SVOC, Dioxins/Furans	Split with NCDENR	Trib-N1
SW-046-SD	07/19/2006	SWP	TOC, grain size	0 to 3 inches	Trib-N1
SW-047-SD	11/09/1998	NCDENR	SVOC, Dioxins/Furans	0 to 2 inches	
SW-047-SD	11/09/1998	SWP	SVOC, Dioxins/Furans	Split with NCDENR	
SW-047-SD	07/19/2006	SWP	TOC, grain size	0 to 3 inches	
SW-048-SD	11/09/1998	NCDENR	Dioxins/Furans	0 to 2 inches	Trib-S3
SW-048-SD	11/09/1998	SWP	SVOC, Dioxins/Furans	Split with NCDENR	Trib-S3
SW-048-SD	07/18/2006	SWP	TOC, grain size	0 to 3 inches	Trib-S3
SW-049-SD	11/09/1998	NCDENR	Dioxins/Furans	0 to 2 inches	
SW-049-SD	11/09/1998	SWP	SVOC, Dioxins/Furans	Split with NCDENR	
SW-049-SD	07/18/2006	SWP	TOC, grain size	0 to 3 inches	
SW-050-SD	11/09/1998	NCDENR	Dioxins/Furans	0 to 2 inches	Trib-S2
SW-050-SD	11/09/1998	SWP	SVOC, Dioxins/Furans	Split with NCDENR	Trib-S2
SW-050-SD	07/18/2006	SWP	TOC, grain size	0 to 3 inches	Trib-S2
SW-051-SD	11/09/1998	NCDENR	Dioxins/Furans	0 to 2 inches	
SW-051-SD	11/09/1998	SWP	SVOC, Dioxins/Furans	Split with NCDENR	
SW-051-SD	07/18/2006	SWP	TOC, grain size	0 to 3 inches	
SW-052-SD	11/09/1998	NCDENR	Dioxins/Furans	0 to 2 inches	
SW-052-SD	11/09/1998	SWP	SVOC, Dioxins/Furans	Split with NCDENR	
SW-052-SD	07/18/2006	SWP	TOC, grain size	0 to 3 inches	
SW-152-SD	11/09/1998	NCDENR	Dioxins/Furans	Duplicate	
SW-152-SD	11/09/1998	SWP	SVOC, Dioxins/Furans	Duplicate Split	
SW-052-SD Dup	07/18/2006	SWP	TOC	Duplicate	
SW-053-SD	04/07/1999	SWP	Dioxins/Furans	0 to 2 inches	Trib-S2
SW-054-SD	04/07/1999	SWP	Dioxins/Furans	0 to 2 inches	Trib-S3
SW-055-SD	04/07/1999	SWP	Dioxins/Furans	0 to 2 inches	Trib-S1
SW-061-SD	07/17/2002	SWP	SVOC	0 to 3 inches	
SW-062-SD	07/17/2002	SWP	SVOC	0 to 3 inches	
SW-063-SD	07/17/2002	SWP	SVOC	0 to 3 inches	
SW-064-SD	07/17/2002	SWP	SVOC, Dioxins/Furans	0 to 3 inches	
SW-064-SD	07/19/2006	SWP	TOC, grain size	0 to 3 inches	
SW-064-SD-TCLP	03/19/2004	SWP	TCLP SVOC	0 to 3 inches	
SW-065-SD	07/17/2002	SWP	SVOC	0 to 3 inches	
SW-165-SD	07/17/2002	SWP	SVOC	Duplicate	
SW-066-SD	07/17/2002	SWP	Dioxins/Furans	0 to 3 inches	
SW-066-SD	06/22/2003	SWP	SVOC	0 to 3 inches	
SW-066-SD	07/19/2006	SWP	TOC, grain size	0 to 3 inches	
SW-066-SD-Dup	06/22/2003	SWP	SVOC	Duplicate	
SW-066-SD-TCLP	03/19/2004	SWP	TCLP SVOC	0 to 3 inches	
SW-067-SD	07/17/2002	SWP	Dioxins/Furans	0 to 3 inches	
SW-067-SD	07/19/2006	SWP	TOC, grain size	0 to 3 inches	
SW-067-SD Dup	07/19/2006	SWP	TOC	0 to 3 inches	
SW-167-SD	07/17/2002	SWP	Dioxins/Furans	Duplicate	
SW-067-SD	06/22/2003	SWP	SVOC	0 to 3 inches	
SW-068-SD	07/17/2002	SWP	Dioxins/Furans	0 to 3 inches	Deep River
Cedar Creek and Tributaries Surface Water Samples					
8746	05/03/1990	SWP	VOC, SVOC		
8747	05/03/1990	SWP	VOC, SVOC		
8748	05/03/1990	SWP	VOC, SVOC		
8867	08/13/1990	SWP	VOC, SVOC		
8868	08/13/1990	SWP	VOC, SVOC		
8869	08/13/1990	SWP	VOC, SVOC	Contained disturbed sediment	
SW-025-SW	11/13/1995	NCDENR	Inorganics, SVOC		Background

Table 1-1. Summary of Analytical Program for Cedar Creek and Drainage Ditch
Southern Wood Piedmont - Gulf, North Carolina Facility

Sample ID	Date Collected	Data Source	Target Analyte(s)	Depth Interval	Comment
SW-025-SW	11/13/1995	SWP	VOC, SVOC	Split with NCDENR	Background
SW-026-SW	11/13/1995	NCDENR	Inorganics, SVOC		Background
SW-026-SW	11/13/1995	SWP	VOC, SVOC	Split with NCDENR	Background
SW-027-SW	11/13/1995	NCDENR	Inorganics, SVOC		Background
SW-028-SW	11/13/1995	NCDENR	Inorganics, SVOC		Background
SW-029-SW	11/13/1995	NCDENR	Inorganics, SVOC		
SW-029-SW	11/13/1995	SWP	VOC, SVOC	Split with NCDENR	
SW-129-SW	11/13/1995	NCDENR	Inorganics, SVOC	Duplicate	
SW-030-SW	11/13/1995	NCDENR	Inorganics, SVOC		
SW-030-SW	11/13/1995	SWP	VOC, SVOC	Split with NCDENR	
SW-031-SW	11/13/1995	NCDENR	Inorganics, SVOC		Trib-N1
SW-032-SW	11/13/1995	NCDENR	Inorganics, SVOC		Trib-S3
SW-033-SW	11/13/1995	NCDENR	Inorganics, SVOC		Trib-S2
SW-034-SW	11/13/1995	NCDENR	Inorganics, SVOC		

Table 1-2. Compilation of Preliminary COPECs based on the SLERA Screening for Further Assessment as Part of ERAGS Step 3
Southern Wood Piedmont - Gulf, North Carolina Facility

Chemical Class	Preliminary Sediment COPEC	Cat [a]	Preliminary Surface Water COPEC	Cat [a]
VOCs	Benzene	3		
	Ethylbenzene	3		
	Styrene	3		
	Toluene	3		
	Xylenes (Total)	3		
SVOCs	2,4-Dimethylphenol	3	2-Methylphenol	3
	2-Methylnaphthalene	1	Pentachlorophenol	1
	2-Methylphenol	3	Pyrene	3
	Acenaphthene	1		
	Acenaphthylene	1		
	Anthracene	1		
	Benzo(a)anthracene	1		
	Benzo(a)pyrene	1		
	Benzo(b)fluoranthene	3		
	Benzo(g,h,i)perylene	3		
	Benzo(k)fluoranthene	3		
	Carbazole	3		
	Chrysene	1		
	Dibenz(a,h)anthracene	1		
	Dibenzofuran	3		
	Fluoranthene	1		
	Fluorene	1		
	Indeno(1,2,3-cd)pyrene	3		
	Naphthalene	1		
	Pentachlorophenol	3		
	Phenanthrene	1		
	Phenol	3		
	Pyrene	1		
	Total PAHs	1		
Inorganics	Aluminum	3	Aluminum	1
	Arsenic	1	Barium	3
	Barium	3	Calcium	3
	Beryllium	3	Iron	1, 5
	Calcium	3	Magnesium	3
	Cobalt	3	Manganese	3
	Copper	1	Mercury	1, 5
	Iron	3	Potassium	3
	Magnesium	3	Sodium	3
	Manganese	3		
	Nickel	1		
	Potassium	3		
	Silver	1		
	Vanadium	3		
Dioxin-TEQs	Dioxin-TEQs	1		

Note:
The preliminary COPECs were identified based on comparison to conservative screening benchmarks in the SLERA (AMEC, 2007).
Only those chemicals that were detected in at least one sample are shown in this table.
[a] Cat: Chemical category values from NCDNER (2003).

Table 1-3a. Preliminary Refinement Approaches for Surface Water COPECs Identified as Part of SLERA Screening
Southern Wood Piedmont - Gulf, North Carolina Facility

Chemical Class	Preliminary Surface Water COPEC	Cat [a]	Site-Related	Transient in Environment	Detect Freq and Spatial Distribution	Compare to Alternate Benchmarks	Compare to Regional/Site Background	Is Essential Nutrient?
SVOCs	2-Methylphenol	3	Yes	Yes	Yes	Yes	Yes	No
	Pentachlorophenol	1	Yes	Yes	Yes	Yes	Yes	No
	Pyrene	3	Yes	Yes	Yes	Yes	Yes	No
Inorganics	Aluminum	1	No	No	Yes	Yes	Yes	No
	Barium	3	No	No	Yes	Yes	Yes	No
	Calcium	3	No	No	Yes	Yes	Yes	Yes
	Iron	1	No	No	Yes	Yes	Yes	Yes
	Magnesium	3	No	No	Yes	Yes	Yes	Yes
	Manganese	3	No	No	Yes	Yes	Yes	Yes
	Mercury	1	No	No	Yes	Yes	Yes	No
	Potassium	3	No	No	Yes	Yes	Yes	Yes
	Sodium	3	No	No	Yes	Yes	Yes	Yes

Note:
Additional supplemental screening approaches may be used as part of ERAGS Step 3.
[a] Cat: Chemical category entries from SLERA (AMEC, 2007) as defined in NCDNER (2003).

Table 1-3b. Preliminary Refinement Approaches for Sediment COPECs Identified as Part of SLERA Screening
Southern Wood Piedmont - Gulf, North Carolina Facility

Chemical Class	Preliminary Sediment COPEC	Cat [a]	Site-Related	Transient in Environment	Detect Freq and Spatial Distribution	Compare to Alternate Benchmarks	Compare to Regional/Site Background	Is Essential Nutrient?
VOCs	Benzene	3	No	Yes	Yes	Yes	Yes	No
	Ethylbenzene	3	No	Yes	Yes	Yes	Yes	No
	Styrene	3	No	Yes	Yes	Yes	Yes	No
	Toluene	3	No	Yes	Yes	Yes	Yes	No
	Xylenes (Total)	3	No	Yes	Yes	Yes	Yes	No
SVOCs	2,4-Dimethylphenol	3	Yes	Yes	Yes	Yes	Yes	No
	2-Methylnaphthalene	1	Yes	Yes	Yes	Yes	Yes	No
	2-Methylphenol	3	Yes	Yes	Yes	Yes	Yes	No
	Acenaphthene	1	Yes	Yes	Yes	Yes	Yes	No
	Acenaphthylene	1	Yes	Yes	Yes	Yes	Yes	No
	Anthracene	1	Yes	Yes	Yes	Yes	Yes	No
	Benzo(a)anthracene	1	Yes	Yes	Yes	Yes	Yes	No
	Benzo(a)pyrene	1	Yes	Yes	Yes	Yes	Yes	No
	Benzo(b)fluoranthene	3	Yes	Yes	Yes	Yes	Yes	No
	Benzo(g,h,i)perylene	3	Yes	Yes	Yes	Yes	Yes	No
	Benzo(k)fluoranthene	3	Yes	Yes	Yes	Yes	Yes	No
	Carbazole	3	Yes	Yes	Yes	Yes	Yes	No
	Chrysene	1	Yes	Yes	Yes	Yes	Yes	No
	Dibenz(a,h)anthracene	1	Yes	Yes	Yes	Yes	Yes	No
	Dibenzofuran	3	Yes	Yes	Yes	Yes	Yes	No
	Fluoranthene	1	Yes	Yes	Yes	Yes	Yes	No
	Fluorene	1	Yes	Yes	Yes	Yes	Yes	No
	Indeno(1,2,3-cd)pyrene	3	Yes	Yes	Yes	Yes	Yes	No
	Naphthalene	1	Yes	Yes	Yes	Yes	Yes	No
	Pentachlorophenol	3	Yes	Yes	Yes	Yes	Yes	No
	Phenanthrene	1	Yes	Yes	Yes	Yes	Yes	No
	Phenol	3	Yes	Yes	Yes	Yes	Yes	No
	Pyrene	1	Yes	Yes	Yes	Yes	Yes	No
	Total PAHs	1	Yes	Yes	Yes	Yes	Yes	No

Table 1-3b. Preliminary Refinement Approaches for Sediment COPECs Identified as Part of SLERA Screening
Southern Wood Piedmont - Gulf, North Carolina Facility

Chemical Class	Preliminary Sediment COPEC	Cat [a]	Site-Related	Transient in Environment	Detect Freq and Spatial Distribution	Compare to Alternate Benchmarks	Compare to Regional/Site Background	Is Essential Nutrient?
Inorganics	Aluminum	3	No	No	Yes	Yes	Yes	No
	Arsenic	1	No	No	Yes	Yes	Yes	No
	Barium	3	No	No	Yes	Yes	Yes	No
	Beryllium	3	No	No	Yes	Yes	Yes	No
	Calcium	3	No	No	Yes	Yes	Yes	Yes
	Cobalt	3	No	No	Yes	Yes	Yes	No
	Copper	1	No	No	Yes	Yes	Yes	No
	Iron	3	No	No	Yes	Yes	Yes	Yes
	Magnesium	3	No	No	Yes	Yes	Yes	Yes
	Manganese	3	No	No	Yes	Yes	Yes	Yes
	Nickel	1	No	No	Yes	Yes	Yes	No
	Potassium	3	No	No	Yes	Yes	Yes	Yes
	Silver	1	No	No	Yes	Yes	Yes	No
	Vanadium	3	No	No	Yes	Yes	Yes	No
Dioxin-TEQs	Dioxin-TEQs	1	Yes	No	Yes	Yes [b]	No	No

Note:
Additional supplemental screening approaches may be used as part of ERAGS Step 3.
[a] Cat: Chemical category entries from SLERA (AMEC, 2007) as defined in NCDNER (2003).
[b] A suitable alternate sediment benchmark for Dioxin-TEQs was not identified for this report.

Table 2-1a. Comparison of Screening Benchmarks used in the SLERA and the Refined Screening Values (RSVs) for Surface Water Southern Wood Piedmont - Gulf, North Carolina Facility

Chemical Class	Preliminary Surface Water COPEC	Cat [a]	SLERA Screening Value	Refined Screening Value (RSV)	Comment
VOCs	NA	–	–	–	–
SVOCs	2-Methylphenol	3	NSV	67	Ecological Screening Level (ESL) from EPA Region V (ORNL, 2007)
	Pentachlorophenol	1	13	13.7 (Cedar Creek-acute)	Values are pH dependent and adjusted based on the average pH values from creek or ditch.
				8.6 (Cedar Creek-chronic)	
				8.3 (Drainage Ditch-acute)	
				5.2 (Drainage Ditch-chronic)	
	Pyrene	3	NSV	17.2	Di Toro et al (2000)
Inorganics	Aluminum	1	87	1,900	Value is the LCV Daphnids Surface Water Screening Benchmark compiled by ORNL (2007)
				750 (acute)	Comparisons will be made to both the acute and chronic values for EPA Region IV (ORNL, 2007). The chronic value was used for the SLERA.
				87 (chronic)	
	Barium	3	NSV	220	Ecological Screening Level (ESL) from EPA Region V (ORNL, 2007)
	Calcium	3	NSV	1.16E+05	Value is the LCV Daphnids Surface Water Screening Benchmark compiled by ORNL (2007)
	Iron	1, 5	1,000	1,000	Comparisons will be made to chronic value from EPA Region IV (ORNL, 2007). An acute value was not available.
	Magnesium	3	NSV	8.20E+04	Value is the LCV Daphnids Surface Water Screening Benchmark compiled by ORNL (2007)
	Manganese	3	NSV	1.10E+03	Value is the LCV Daphnids Surface Water Screening Benchmark compiled by ORNL (2007)
	Mercury	1, 5	0.012	2.4 (acute)	Comparisons will be made to both the acute and chronic values for EPA Region IV (ORNL, 2007). The chronic value was used for the SLERA.
				0.012 (chronic)	
	Potassium	3	NSV	5.30E+04	Value is the LCV Daphnids Surface Water Screening Benchmark compiled by ORNL (2007)
	Sodium	3	NSV	6.80E+05	Value is the LCV Daphnids Surface Water Screening Benchmark compiled by ORNL (2007)
	Zinc	1	34.9	50	Value is action limit for NC Class C waters (NCDENR, 2007)
Dioxin-TEQs	NA	–	–	–	–

Note:
All concentration units are in µg/L.
SLERA Screening Values are from NCDENR (2003).
NA: Not applicable. Chemical not retained as Preliminary COPEC or was not analyzed in these samples.
NSV: No SLERA screening value available.
[a] Cat: Chemical category values from NCDNER (2003). See text for description.

Table 2-1b. Comparison of Screening Benchmarks used in the SLERA and the Refined Screening Values (RSVs) for Sediments
Southern Wood Piedmont - Gulf, North Carolina Facility

Chemical Class	Preliminary Sediment COPEC	Cat [a]	Units	SLERA Screening Value	Refined Screening Value (RSV)	Comment
VOCs	Benzene	3	µg/Kg	NSV.	142	Sediment Ecological Screening Level (ESL) from EPA Region V (ORNL, 2007)
	Ethylbenzene	3	µg/Kg	NSV	175	Sediment ESL from EPA Region V (USEPA, 2003)
	Styrene	3	µg/Kg	NSV	254	Sediment ESL from EPA Region V (USEPA, 2003)
	Toluene	3	µg/Kg	NSV	1,220	Sediment ESL from EPA Region V (USEPA, 2003)
	Xylenes (Total)	3	µg/Kg	NSV	433	Sediment ESL from EPA Region V (USEPA, 2003)
SVOCs	2,4-Dimethylphenol	3	µg/Kg	NSV	305	Sediment ESL from EPA Region V (USEPA, 2003)
	2-Methylnaphthalene	1	µg/Kg	20.2	201	Florida DEP PEL Sediment Screening Benchmark (ORNL, 2007)
	2-Methylphenol	3	µg/Kg	NSV	55.4	Sediment ESL from EPA Region V (USEPA, 2003)
	Acenaphthene	1	µg/Kg	6.71	88.9	Florida DEP PEL Sediment Screening Benchmark (ORNL, 2007)
	Acenaphthylene	1	µg/Kg	5.87	128	Florida DEP PEL Sediment Screening Benchmark (ORNL, 2007)
	Anthracene	1	µg/Kg	46.9	57.2	Sediment ESL from EPA Region V (USEPA, 2003)
	Benzo(a)anthracene	1	µg/Kg	74.8	108	Sediment ESL from EPA Region V (USEPA, 2003)
	Benzo(a)pyrene	1	µg/Kg	88.8	150	Sediment ESL from EPA Region V (USEPA, 2003)
	Benzo(b)fluoranthene	3	µg/Kg	NSV	10,400	Sediment ESL from EPA Region V (USEPA, 2003)
	Benzo(g,h,i)perylene	3	µg/Kg	NSV	170	Sediment ESL from EPA Region V (USEPA, 2003)
	Benzo(k)fluoranthene	3	µg/Kg	NSV	240	Sediment ESL from EPA Region V (USEPA, 2003)
	Carbazole	3	µg/Kg	NSV	140	Value from WDOE (1997).
	Chrysene	1	µg/Kg	108	166	Sediment ESL from EPA Region V (USEPA, 2003)
	Dibenz(a,h)anthracene	1	µg/Kg	6.22	33	Sediment ESL from EPA Region V (USEPA, 2003)
	Dibenzofuran	3	µg/Kg	NSV	449	Sediment ESL from EPA Region V (USEPA, 2003)
	Fluoranthene	1	µg/Kg	113	423	Sediment ESL from EPA Region V (USEPA, 2003)
	Fluorene	1	µg/Kg	21.2	77.2	Sediment ESL from EPA Region V (USEPA, 2003)
	Indeno(1,2,3-cd)pyrene	3	µg/Kg	NSV	200	Sediment ESL from EPA Region V (USEPA, 2003)
	Naphthalene	1	µg/Kg	34.6	176	Sediment ESL from EPA Region V (USEPA, 2003)
	Pentachlorophenol	3	µg/Kg	NSV	23,000	Sediment ESL from EPA Region V (USEPA, 2003)
	Phenanthrene	1	µg/Kg	86.7	204	Sediment ESL from EPA Region V (USEPA, 2003)
	Phenol	3	µg/Kg	NSV	49.1	Sediment ESL from EPA Region V (USEPA, 2003)
	Pyrene	1	µg/Kg	153	195	Sediment ESL from EPA Region V (USEPA, 2003)
	Total PAHs	1	µg/Kg	1,684	1,684	Alternate screening benchmarks were not identified.

Table 2-1b. Comparison of Screening Benchmarks used in the SLERA and the Refined Screening Values (RSVs) for Sediments
Southern Wood Piedmont - Gulf, North Carolina Facility

Chemical Class	Preliminary Sediment COPEC	Cat [a]	Units	SLERA Screening Value	Refined Screening Value (RSV)	Comment
Inorganics	Aluminum	3	mg/Kg	NSV	58,000	ARCS PEC Sediment Screening Benchmark (ORNL, 2007).
	Arsenic	1	mg/Kg	7.24	9.8	Consensus Threshold Effect Concentration (TEC) from ORNL (2007)
	Barium	3	mg/Kg	NSV	160	Dutch Ministry Target Value (Friday, 2005)
	Beryllium	3	mg/Kg	NSV	1.1	Dutch Ministry Target Value (Friday, 2005)
	Calcium	3	mg/Kg	NSV	(Bkgd)	No screening value was available so will compare against local background.
	Cobalt	3	mg/Kg	NSV	50	Sediment ESL from EPA Region V (ORNL, 2007)
	Copper	1	mg/Kg	18.7	32	Consensus Threshold Effect Concentration (TEC) from ORNL (2007)
	Iron	3	mg/Kg	NSV	20,000	Ontario Low Sediment Screening Benchmark (ORNL, 2007)
	Magnesium	3	mg/Kg	NSV	(Bkgd)	No screening value was available so will compare against local background.
	Manganese	3	mg/Kg	NSV	460	Ontario Low Sediment Screening Benchmark (ORNL, 2007)
	Nickel	1	mg/Kg	15.9	22.7	Consensus Threshold Effect Concentration (TEC) from ORNL (2007)
	Potassium	3	mg/Kg	NSV	(Bkgd)	No screening value was available so will compare against local background.
	Silver	1	mg/Kg	2	0.5	Sediment ESL from EPA Region V (ORNL, 2007)
	Vanadium	3	mg/Kg	NSV	50	"Background" value as reported by NOAA for freshwater sediments (Buchman, 2006). Site-specific background will also be evaluated.
Dioxin-TEQs	Dioxin-TEQs	1	µg/Kg	2.50E-03	2.50E-03	Alternate screening benchmarks were not identified.

Note:
SLERA Screening Values are from NCDENR (2003).
NSV: No SLERA screening value available.
(Bkgd): Refers to site-specific background concentrations.
[a] Cat: Chemical category values from NCDNER (2003). See text for description.

Table 2-2. Summary of Analytical Results for SLERA COPECs from Surface Water Background Samples Collected from Cedar Creek Southern Wood Piedmont - Gulf, North Carolina Facility

Summary Stats	Regional Bkgd (USGS, 2003)	Background Samples		
		Freq	Mean	Range
Semi-Volatiles				
2-Methylphenol	NA	0/2	ND	ND
Pentachlorophenol	NA	0/6	ND	ND
Pyrene	NA	0/4	ND	ND
Inorganics				
Aluminum	0.007 to 1.47	4/4	0.51	0.40 - 0.59
Barium	NA	4/4	0.02	0.02 - 0.02
Calcium	NA	4/4	6.30	6.2 - 6.3
Magnesium	1.1 to 6.0	4/4	3.33	3.3 - 3.4
Manganese	0.002 to 0.59	4/4	0.04	0.037 - 0.043
Mercury	NA	0/4	ND	ND
Potassium	NA	4/4	1.93	1.9 - 2
Sodium	2.0 to 19.0	4/4	5.10	5.0 - 5.2
Associated Samples	SW-025-SW (NCDENR), SW-025-SW, SW-026-SW (NCDENR), SW-026-SW, SW-027-SW (NCDENR), SW-028-SW (NCDENR)			

Notes:
All concentration units are in mg/L.
Only the SLERA COPECs were included in this table.
There were no surface water samples available from the drainage ditch.
Average concentrations were calculated by setting non-detects to one-half their reported detection limits.
Regional background data from USGS (2003).
NA = Not available or not applicable.
ND = Not Detected

Table 2-3. Summary of Analytical Results for SLERA COPECs from Sediment Background Samples
Southern Wood Piedmont - Gulf, North Carolina Facility

Chemical	Units	Regional Bkgd [1]	Background Samples		
			Freq	Mean	Range
VOLATILES					
Benzene	mg/Kg (dw)	NA	0/3	ND	ND
Ethylbenzene	mg/Kg (dw)	NA	0/3	ND	ND
Styrene	mg/Kg (dw)	NA	NA	NA	NA
Toluene	mg/Kg (dw)	NA	1/3	0.031	ND - 0.084
Xylenes	mg/Kg (dw)	NA	0/3	ND	ND
SEMI-VOLATILES					
2,4-Dimethylphenol	mg/Kg (dw)	NA	0/11	ND	ND
2-Methylphenol	mg/Kg (dw)	NA	0/6	ND	ND
Acenaphthene	mg/Kg (dw)	NA	0/12	ND	ND
Acenaphthylene	mg/Kg (dw)	NA	1/10	0.29	ND - 1.2
Anthracene	mg/Kg (dw)	NA	1/12	0.49	ND - 3.8
Benzo(a)anthracene	mg/Kg (dw)	NA	1/12	0.65	ND - 5.7
Benzo(a)pyrene	mg/Kg (dw)	NA	1/12	0.93	ND - 9.1
Benzo(b)fluoranthene	mg/Kg (dw)	NA	1/7	2.00	ND - 13
Benzo(g,h,i)perylene	mg/Kg (dw)	NA	1/10	0.47	ND - 3
Benzo(k)fluoranthene	mg/Kg (dw)	NA	0/6	ND	ND
Carbazole	mg/Kg (dw)	NA	0/8	ND	ND
Chrysene	mg/Kg (dw)	NA	2/12	1.74	ND - 19
Dibenzo(a,h)anthracene	mg/Kg (dw)	NA	0/12	ND	ND
Dibenzofuran	mg/Kg (dw)	NA	0/10	ND	ND
Fluoranthene	mg/Kg (dw)	NA	2/12	1.33	ND - 14
Fluorene	mg/Kg (dw)	NA	1/12	0.2	ND - 0.34
Indeno(1,2,3-cd)pyrene	mg/Kg (dw)	NA	1/12	0.54	ND - 4.4
Naphthalene	mg/Kg (dw)	NA	0/12	ND	ND
Pentachlorophenol	mg/Kg (dw)	NA	0/12	ND	ND
Phenanthrene	mg/Kg (dw)	NA	1/12	0.38	ND - 2.5
Phenol	mg/Kg (dw)	NA	0/6	ND	ND
Pyrene	mg/Kg (dw)	NA	2/10	1.46	ND - 13
Total PAHs	mg/Kg (dw)	NA			

Table 2-3. Summary of Analytical Results for SLERA COPECs from Sediment Background Samples
Southern Wood Piedmont - Gulf, North Carolina Facility

Chemical	Units	Regional Bkgd [1]	Background Samples		
			Freq	Mean	Range
METALS					
Aluminum	mg/Kg (dw)	1,100 - 202,000	6/6	5,733	1,900 - 11,000
Arsenic	mg/Kg (dw)	ND - 40	4/6	3.1	ND - 7.9
Barium	mg/Kg (dw)	ND - 602	6/6	41	14 - 70
Beryllium	mg/Kg (dw)	ND - 3.9	3/6	0.44	ND - 0.75
Calcium	mg/Kg (dw)	ND - 5,700	5/6	370	ND - 550
Cobalt	mg/Kg (dw)	ND - 65	1/6	3.6	ND - 5.4
Copper	mg/Kg (dw)	ND - 79	2/6	8.0	ND - 32
Iron	mg/Kg (dw)	ND - 294,600	6/6	13,583	9,000 - 26,000
Magnesium	mg/Kg (dw)	ND - 8,600	5/5	806	250 - 1,500
Manganese	mg/Kg (dw)	40 - 11,350	6/6	192	100 - 260
Nickel	mg/Kg (dw)	ND - 115	2/6	4.8	ND - 17
Potassium	mg/Kg (dw)	ND - 41,000	5/5	217	46 - 570
Silver	mg/Kg (dw)	NA	1/6	0.6	ND - 1.4
Vanadium	mg/Kg (dw)	10 - 1,010	6/6	23	12 - 30
DIOXINS/FURANS					
2,3,7,8-TCDD	ng/Kg (dw)	NA	2/11	MNC	ND - 0.6
1,2,3,7,8-PeCDD	ng/Kg (dw)	NA	1/11	MNC	ND - 2.3
1,2,3,4,7,8-HxCDD	ng/Kg (dw)	NA	1/11	3.14	ND - 3.7
1,2,3,6,7,8-HxCDD	ng/Kg (dw)	NA	1/11	3.52	ND - 7.9
1,2,3,7,8,9-HxCDD	ng/Kg (dw)	NA	1/11	MNC	ND - 9.1
1,2,3,4,6,7,8-HpCDD	ng/Kg (dw)	NA	4/11	4.84	ND - 320
OCDD	ng/Kg (dw)	NA	9/11	355.7	ND - 2,000
2,3,7,8-TCDF	ng/Kg (dw)	NA	3/11	1.05	ND - 0.29
1,2,3,7,8-PeCDF	ng/Kg (dw)	NA	0/7	ND	ND
2,3,4,7,8-PeCDF	ng/Kg (dw)	NA	1/11	ND	ND - 1.4
1,2,3,4,7,8-HxCDF	ng/Kg (dw)	NA	1/11	MNC	ND - 0.12
1,2,3,6,7,8-HxCDF	ng/Kg (dw)	NA	1/11	MNC	ND - 2.5
1,2,3,7,8,9-HxCDF	ng/Kg (dw)	NA	1/11	MNC	ND - 15
2,3,4,6,7,8-HxCDF	ng/Kg (dw)	NA	1/11	3.43	ND - 6.9
1,2,3,4,6,7,8-HpCDF	ng/Kg (dw)	NA	4/11	5.84	ND - 31
1,2,3,4,7,8,9-HpCDF	ng/Kg (dw)	NA	1/11	2.98	ND - 1.9

Table 2-3. Summary of Analytical Results for SLERA COPECs from Sediment Background Samples
Southern Wood Piedmont - Gulf, North Carolina Facility

Chemical	Units	Regional Bkgd [1]	Background Samples		
			Freq	Mean	Range
OCDF	ng/Kg (dw)	NA	1/10	16.66	ND - 120
Dioxin-TEQ (mammalian) - HalfDL	ng/Kg (dw)	0.94	10/11	1.16	ND - 11.85
Dioxin-TEQ (mammalian) - ZeroDL	ng/Kg (dw)	0.93	10/11		
Dioxin-TEQ (avian) - HalfDL	ng/Kg (dw)	1.82	10/11		
Dioxin-TEQ (avian) - ZeroDL	ng/Kg (dw)	1.81	10/11	0.950	ND - 8.78
Associated Samples	SW-013-SL (NCDENR), SW-025-SD, SW-025-SD (NCDENR), SW-026-SD, SW-026-SD (NCDENR), SW-027-SD (NCDENR), SW-028-SD (NCDENR), SW-038-SD (NCDENR), SW-039-SD, SW-039-SD (NCDENR), SW-040-SD, SW-040-SD (NCDENR), SW-041-SD, SW-041-SD (NCDENR), SW-042-SD, SW-042-SD(NCDENR), and SWP-009				

Notes:
Background areas combine the samples from the creek and drainage ditch background samples.
ND: Not Detected
NA: Not available or not applicable.
MNC: Mean not calculated due to detection limits greater than the positive results.
[1] Regional background data for metals from USGS (2003). Background soil data for dioxin-TEQs from survey site in NC from USEPA (2007).

Table 2-4. Summary of National Survey Rural Background Dioxin-TEQ Concentrations in Soils Southern Wood Piedmont - Gulf, North Carolina Facility

Location	Metric	Dioxin-TEQ$_{mammal}$		Dioxin-TEQ$_{avian}$	
		Half DL	Zero DL	Half DL	Zero DL
Clinton Crops Air Monitoring Stn (NC)	Value	0.94	0.93	1.82	1.81
All Stations	Avg	1.77	1.72	2.51	2.44
	Range	0.20 to 11.69	0.06 to 11.64	0.25 to 14.91	0.10 to 14.91

Notes:
Units are pg/g (dry weight).
Data from USEPA (2007).
TEQs for the Clinton Corps station (Clinton, NC) were calculated using the TEFs reported in Van den Berg et al (1998, 2006).
The TEQs for all stations were re-calculated from the concentration data provided in USEPA (2007) using the updated TEF schemes.

Table 2-5a. Refined Screening of COPECs for Surface Water Samples
SWP-Gulf Facility, Gulf, North Carolina

Analyte	Freq Det	Freq Det (%)	Avg	Range of Detections				Location of MaxConc	Site-Specific Background Samples			Revised Screen Value (RSV)	$HQ_{screen2}$ Values				Essential Nutrient?	Retain as COPEC?	Samples that Exceed Alt Screen Value
				Min.	Q	Max.	Q		Freq	Mean	Range		Avg vs. SS Bkgd	Max vs. SS Bkgd	Avg vs. RSV	Max vs. RSV			
Semivolatile Organics																			
2-Methylphenol	1/15	7%	NR	0.001		0.001		SW-034-SW	0/2	ND	ND	0.067	NA	NA	NA	0.01	No	No	
Pentachlorophenol	3/15	20%	0.025	0.011	J	0.15		8747	0/6	ND	ND	0.0137	NA	NA	1.8	10.9	No	Yes	8747, SW-129-SW [2]
Pyrene	1/7	14%	NR	0.003	J	0.003	J	SW-034-SW	0/4	ND	ND	0.017	NA	NA	NA	0.2	No	No	
Total PAHs	1/7	14%	NR	0.003	J	0.003	J	SW-034-SW	0/4	ND	ND	0.017	NA	NA	NA	0.2	No	No	
Inorganics																			
Aluminum	7/7	100%	0.833	0.45		1.3		SW-033-SW	4/4	0.508	0.40 - 0.59	1.9	1.4	2.2	0.4	0.7	No	No	
Barium	7/7	100%	0.028	0.024		0.038		SW-032-SW	4/4	0.02	0.02 - 0.02	0.22	1.4	1.9	0.13	0.2	No	No	
Calcium	7/7	100%	4.414	2		6.2	J	SW-029-SW SW-129-SW	4/4	6.3	6.2 - 6.3	116	0.7	0.98	0.04	0.1	Yes	No	
Iron	7/7	100%	1.393	0.81		2	J	SW-029-SW	4/4	0.865	0.77 - 0.95	1	1.5	2.1	1.4	2.0	No	No [1]	SW-029-SW (NCDENR), SW-129-SW (NCDENR), SW-033-SW (NCDENR), SW-034-SW (NCDENR), SW-032-SW (NCDENR)
Magnesium	7/7	100%	2.400	1		3.7	J	SW-029-SW	4/4	3.325	3.3 - 3.4	82	0.7	1.1	0.03	0.0	No	No	
Manganese	7/7	100%	0.068	0.037		0.11		SW-032-SW	4/4	0.04	0.037 - 0.043	1.1	1.6	2.6	0.06	0.1	No	No	
Mercury	1/7	14%	1.1E-04	2.0E-04	J	2.0E-04	J	SW-029-SW	0/4	ND	ND	0.0024	NA	NA	0.04	0.1	No	No	
Potassium	7/7	100%	1.379	0.86		1.9		SW-129-SW	4/4	1.925	1.9 - 2	53	0.7	1.0	0.03	0.0	Yes	No	
Sodium	7/7	100%	4.357	3.1		5.9	J	SW-029-SW	4/4	5.1	5.0 - 5.2	680	0.8	1.1	0.01	0.0	Yes	No	

Note:
Only the SLERA COPECs are included in this table.
All concentration units are mg/L.
Surface water concentrations are for the combined downstream Drainage Ditch and Cedar Creek locations only.
Average concentrations calculated by setting non-detects to one-half the reported detection limits.
NA: Not applicable.
NR: Not reported. The average concentration exceeded the maximum postive results so it was not reported in this table.
[1] Although iron exceeded the RSV, a clear concentration gradient was not apparent from the SWP property, so it was not retained as a COPEC. See text for discussion.
[2] Although two samples are shown that exceed the pentachlorophenol RSV, both were collected from the same location but at different sampling years.

Table 2-5b. Refined Screening of COPECs for Sediment Samples
SWP-Gulf Facility, Gulf, North Carolina

Analyte	Units	Freq Det	Freq Det (%)	Avg	Range of Detections Min.	Q	Max.	Q	Location of MaxConc	Site-Specific Background Samples Freq	Mean	Range	Revised Screening Value (RSV)	HQ_{screen} Values Avg vs. SS Bkgd	Max vs. SS Bkgd	Avg vs. RSV	Max vs. RSV	Essential Nutrient?	Retain as COPEC?
Volatile Organic Compounds																			
Benzene	mg/Kg	1/23	4.3%	0.006	0.039		0.039		SW-014-SL (NCDENR)	0/6	ND	ND	0.142	NA	NA	0.0	0.3	NA	No
Ethylbenzene	mg/Kg	4/23	17.4%	0.016	0.004		0.1		SW-015-SL, 8750	0/6	ND	ND	0.175	NA	NA	0.1	0.6	NA	No
Styrene	mg/Kg	1/11	9.1%	0.014	0.082		0.082		SW-014-SL (NCDENR)	0/4	ND	ND	0.254	NA	NA	0.1	0.3	NA	No
Toluene	mg/Kg	6/23	26.1%	0.018	0.0086		0.14		SW-014-SL (NCDENR)	1/6	0.019	0.084 to 0.084	1.220	0.2	1.7	0.0	0.1	NA	No
Xylenes (Total)	mg/Kg	6/23	26.1%	0.050	0.002		0.42		SW-015-SL	0/6	ND	ND	0.433	NA	NA	0.1	1.0	NA	No
Semivolatile Organic Compounds																			
2,4-Dimethylphenol	mg/Kg	1/69	1.4%	0.314	3.9		3.9		SW-014-SL (NCDENR)	0/16	ND	ND	0.305	NA	NA	NA	NA	NA	No
2-Methylnaphthalene	mg/Kg	10/69	14.5%	9.5	0.051		260		SW-014-SL (NCDENR)	0/16	ND	ND	0.201	NA	NA	47	1,294	NA	Yes
2-Methylphenol	mg/Kg	1/69	1.4%	3.8	1.2		1.2		SW-014-SL (NCDENR)	0/16	ND	ND	0.055	NA	NA	NA	NA	NA	No
Acenaphthene	mg/Kg	17/69	24.6%	8.1	0.05		200		SW-014-SL (NCDENR)	0/16	ND	ND	0.089	NA	NA	91	2,250	NA	Yes
Acenaphthylene	mg/Kg	5/57	8.8%	4.5	0.074		4.3		SW-014-SL (NCDENR)	1/14	0.263	1.2 to 1.2	0.128	3.7	3.6	35	34	NA	Yes
Anthracene	mg/Kg	30/69	43.5%	14.08	0.052		860		SW-014-SL (NCDENR)	1/16	NC	0.0038 to 0.0038	0.057	3,705	228,316	246	15,035	NA	Yes
Benzo(a)anthracene	mg/Kg	31/69	44.9%	1.37	0.014		32		SW-014-SL (NCDENR)	1/16	NC	0.0057 to 0.0057	0.108	240	5,614	13	296	NA	Yes
Benzo(a)pyrene	mg/Kg	30/69	43.5%	0.61	0.064		8.1		SW-014-SL (NCDENR)	1/16	NC	0.0091 to 0.0091	0.150	67	890	4.1	54	NA	Yes
Benzo(b)fluoranthene	mg/Kg	17/39	43.6%	6.15	0.03		7.9		SWP-003	1/7	NC	0.013 to 0.013	10.400	473	608	0.6	0.8	NA	No
Benzo(g,h,i)perylene	mg/Kg	15/57	26.3%	0.37	0.032		0.5		SW-030-SD (NCDENR)	1/14	NC	0.003 to 0.003	0.170	123	167	2.2	2.9	NA	Yes
Benzo(k)fluoranthene	mg/Kg	12/36	33.3%	6.19	0.027		2.2		SW-045-SD	0/6	ND	ND	0.240	NA	NA	26	9.2	NA	Yes
Carbazole	mg/Kg	13/54	24.1%	6.26	0.044		300		SW-014-SL (NCDENR)	0/11	ND	ND	0.140	NA	NA	45	2,143	NA	Yes
Chrysene	mg/Kg	35/69	50.7%	1.63	0.027		29		SW-014-SL (NCDENR)	2/16	NC	0.019 to 0.087	0.166	24.4	433	9.8	175	NA	Yes
Dibenzo(a,h)anthracene	mg/Kg	10/65	15.4%	0.34	0.057		0.9		SWP-001	0/16	ND	ND	0.033	NA	NA	10	27	NA	Yes
Dibenzofuran	mg/Kg	12/57	21.1%	7.78	0.026		220		SW-014-SL (NCDENR)	0/14	ND	ND	0.449	NA	NA	17	490	NA	Yes
Fluoranthene	mg/Kg	35/69	50.7%	7.83	0.06		200		SW-014-SL (NCDENR)	2/16	NC	0.014 to 0.072	0.423	109	2,778	18	473	NA	Yes
Fluorene	mg/Kg	24/69	34.8%	9.58	0.054		370		SW-014-SL (NCDENR)	1/16	0.197	0.34 to 0.34	0.077	28.2	1,088	124	4,793	NA	Yes
Indeno(1,2,3-cd)pyrene	mg/Kg	15/69	21.7%	0.37	0.058		0.99		SW-030-SD (NCDENR)	1/16	NC	0.0044 to 0.0044	0.200	83.3	225.0	1.8	5.0	NA	Yes
Naphthalene	mg/Kg	10/69	14.5%	9.66	0.079		480		SW-014-SL (NCDENR)	0/16	ND	ND	0.176	NA	NA	55	2,727	NA	Yes
Pentachlorophenol	mg/Kg	10/69	14.5%	3.08	0.25		110		SW-029-SD (NCDENR)	0/16	ND	ND	23	NA	NA	0.1	4.8	NA	Yes
Phenanthrene	mg/Kg	31/69	44.9%	19.05	0.021		700		SW-014-SL (NCDENR)	1/16	NC	0.0025 to 0.0025	0.204	7,618	280,000	93	3,431	NA	Yes
Phenol	mg/Kg	3/68	4.4%	0.34	0.065		0.12		SW-056-SD	0/16	ND	ND	0.049	NA	NA	NA	NA	NA	No
Pyrene	mg/Kg	28/57	49.1%	8.23	0.068		120		SW-014-SL (NCDENR)	2/14	NC	0.013 to 0.061	0.195	134.9	1,967	42	615	NA	Yes
Total PAHs	mg/Kg												1.684			0.0	0.0	NA	Yes
Inorganics																			
Aluminum	mg/Kg	14/14	100%	9,921	3,900		13,000		SW-034-SD (NCDENR) SW-024-SL (NCDENR)	5/5	4,680	1,900 to 9,700	58,000	1.0	1.3	0.2	0.2	NA	No
Arsenic	mg/Kg	11/14	79%	4.41	2.9		9.9		SW-030-SD (NCDENR)	3/5	2.1	2.1 to 3.3	9.600	1.3	3.0	0.5	1.01	NA	Yes
Barium	mg/Kg	14/14	100%	98.9	34		160		SW-129-SD (NCDENR)	5/5	37	14 to 70	160	1.4	2.3	0.6	1.0	NA	No
Beryllium	mg/Kg	10/14	71%	0.64	0.32		1.1		SW-030-SD (NCDENR)	2/5	0.40	0.24 to 0.65	1.10	1.0	1.7	0.6	1.0	NA	No
Calcium	mg/Kg	11/11	100%	1,092	360		2,100		SW-129-SD (NCDENR)	4/4	452.5	250 to 550	(Bkgd)	2.0	3.8	NA	NA	NA	Yes
Cobalt	mg/Kg	6/14	43%	11.43	10		27		SW-129-SD (NCDENR)	1/5	3.38	5.4 to 5.4	50	2.1	5.0	0.2	0.5	NA	No
Copper	mg/Kg	9/14	64%	17.928571	13		29		SWP-002	1/5	3.18	3.9 to 3.9	32	4.6	7.4	0.6	0.9	NA	No
Iron	mg/Kg	14/14	100%	19,486	4,000		37,000		SW-030-SD (NCDENR)	5/5	11,100	9,000 to 13,000	20,000	1.5	2.8	1.0	1.9	NA	Yes
Magnesium	mg/Kg	11/11	100%	2,052	390		4,000		SW-129-SD (NCDENR)	4/4	813	250 to 1,500	(Bkgd)	1.4	2.7	NA	NA	NA	Yes
Manganese	mg/Kg	14/14	100%	387	92		900		SW-129-SD (NCDENR)	6/6	192	100 to 260	460	1.5	3.5	0.8	2.0	NA	Yes
Nickel	mg/Kg	9/14	64%	17.8	14		43		SWP-002	2/6	4.8	2.3 to 17	22.7	1.0	2.5	0.8	1.9	NA	Yes
Potassium	mg/Kg	11/11	100%	319	70		530		SW-014-SL (NCDENR)	5/5	217.2	46 to 570	(Bkgd)	0.6	0.9	NA	NA	NA	No
Silver	mg/Kg	3/14	21%	0.97	2.5		3.2		SWP-002	1/6	0.56	1.4 to 1.4	0.5	0.7	2.3	1.9	6.4	NA	Yes
Vanadium	mg/Kg	14/14	100%	31.86	14		51		SW-030-SD (NCDENR)	6/6	22.8	12 to 30	50	1.1	1.7	0.6	1.02	NA	Yes

Table 2-5b. Refined Screening of COPECs for Sediment Samples
SWP-Gulf Facility, Gulf, North Carolina

Analyte	Units	Freq Det	Freq Det (%)	Avg	Range of Detections Min.	Q	Max.	Q	Location of MaxConc	Site-Specific Background Samples Freq	Mean	Range	Revised Screening Value (RSV)	$HQ_{screen2}$ Values Avg vs. SS Bkgd	Max vs. SS Bkgd	Avg vs. RSV	Max vs. RSV	Essential Nutrient?	Retain as COPEC?
Dioxin-TEQs																			
Dioxin-TEQs [1]	µg/Kg	41/41	100%	1.35E-01	1.65E-03		6.54E-01		SW-129-SD (NCDENR)	10/11	1.37E-03	ND - 1.35E-02	2.50E-03	98	477	53.8	261.8	NA	Yes

Note:
Only the SLERA COPECs are included in this table.
Sediment concentrations are for the combined downstream Drainage Ditch and Cedar Creek locations only.
Average concentrations calculated by setting non-detects to one-half the reported detection limits.
NA: Not applicable.
NR: Not reported. The average concentration exceeded the maximum postive results so it was not reported in this table.
A seperate table compiles the samples that exceeded the alternate screening table due to the large number of PAHs that fall into this category.
[1] Values shown are Dioxin-TEQ(mammals) with Zero DL substitution.

Table 2-6. Summary of Sediment Samples that Exceeded the RSVs for the Refined Screening of COPECs
SWP-Gulf Facility, Gulf, North Carolina

Analyte	Freq Det	Retained as COPEC?	Sample Count Above Benchmark	Samples that Exceeded Alternate Benchmarks
Volatile Organic Compounds				
Benzene	1/23	No	0	None
Ethylbenzene	4/23	No	0	None
Styrene	1/11	No	0	None
Toluene	6/23	No	0	None
Xylenes (Total)	6/23	No	0	None
Semivolatile Organic Compounds				
2,4-Dimethylphenol	1/69	No	0	None
2-Methylnaphthalene	10/69	Yes	7	SW-045-SD (NCDENR), SW-029-SD (NCDENR), SW-129-SD (NCDENR), SW-014-SL (NCDENR), SW-015-SL (NCDENR), SW-015-SL, and SW-029-SD
2-Methylphenol	1/69	No	0	None
Acenaphthene	17/69	Yes	12	SW-044-SD (NCDENR), SW-029-SD (NCDENR), SW-129-SD (NCDENR), SW-030-SD (NCDENR), SW-014-SL (NCDENR), SW-015-SL (NCDENR), SW-015-SL, 8750, 8871, SW-029-SD, SW-044-SD, and SW-066-SD
Acenaphthylene	5/57	Yes	3	SW-014-SL (NCDENR), SW-015-SL (NCDENR), and SWP-003
Anthracene	30/69	Yes	29	SW-044-SD (NCDENR), SW-045-SD (NCDENR), SW-047-SD (NCDENR), SW-029-SD (NCDENR), SW-129-SD (NCDENR), SW-030-SD (NCDENR), SW-032-SD (NCDENR), SW-014-SL (NCDENR), SW-015-SL (NCDENR), SW-023-SL (NCDENR), SW-024-SL (NCDENR), SW-015-SL, SW-053-SD, SW-054-SD, SW-059-SD, 8871, SW-029-SD, SW-030-SD, SW-044-SD SW-045-SD, SW-047-SD, SW-061-SD, SW-062-SD, SW-063-SD, SW-064-SD, SW-165-SD, SWP-001, SWP-002, and SWP-003
Benzo(a)anthracene	31/69	Yes	25	SW-044-SD (NCDENR), SW-045-SD (NCDENR), SW-047-SD (NCDENR), SW-029-SD (NCDENR), SW-129-SD (NCDENR), SW-030-SD (NCDENR), SW-032-SD (NCDENR), SW-014-SL (NCDENR), SW-015-SL (NCDENR), SW-024-SL (NCDENR), 8753, SW-053-SD, SW-059-SD, SW-060-SD, 8871, SW-029-SD, SW-030-SD, SW-044-SD, SW-045-SD, SW-047-SD, SW-061-SD, SW-063-SD, SW-064-SD, SWP-002, and SWP-003

Table 2-6. Summary of Sediment Samples that Exceeded the RSVs for the Refined Screening of COPECs
SWP-Gulf Facility, Gulf, North Carolina

Analyte	Freq Det	Retained as COPEC?	Sample Count Above Benchmark	Samples that Exceeded Alternate Benchmarks
Benzo(a)pyrene	30/69	Yes	22	SW-044-SD (NCDENR), SW-045-SD (NCDENR), SW-047-SD (NCDENR), SW-029-SD (NCDENR), SW-129-SD (NCDENR), SW-030-SD (NCDENR), SW-032-SD (NCDENR), SW-014-SL (NCDENR), SW-015-SL (NCDENR), SW-024-SL (NCDENR), 8753, SW-059-SD, SW-060-SD, 8871, SW-030-SD, SW-045-SD, SW-047-SD, SW-061-SD, SW-063-SD, SW-064-SD, SWP-002, and SWP-003
Benzo(b)fluoranthene	17/39	No	0	None
Benzo(g,h,i)perylene	15/57	Yes	5	SW-045-SD (NCDENR), SW-047-SD (NCDENR), SW-030-SD (NCDENR), SW-032-SD (NCDENR), and SW-059-SD
Benzo(k)fluoranthene	12/36	Yes	7	SW-059-SD, SW-060-SD, SW-030-SD, SW-045-SD, SW-047-SD, SW-061-SD, and SW-063-SD
Carbazole	13/54	Yes	8	SW-045-SD (NCDENR), SW-029-SD (NCDENR), SW-129-SD (NCDENR), SW-030-SD (NCDENR), SW-014-SL (NCDENR), SW-015-SL (NCDENR), SW-023-SL (NCDENR), and SW-029-SD
Chrysene	35/69	Yes	29	SW-044-SD (NCDENR), SW-045-SD (NCDENR), SW-047-SD (NCDENR), SW-029-SD (NCDENR), SW-129-SD (NCDENR), SW-030-SD (NCDENR), SW-032-SD (NCDENR), SW-014-SL (NCDENR), SW-015-SL (NCDENR), SW-023-SL (NCDENR), SW-024-SL (NCDENR), 8753, 8754, SW-053-SD, SW-059-SD, SW-060-SD, 8871, SW-029-SD, SW-030-SD, SW-044-SD, SW-045-SD, SW-047-SD, SW-061-SD, SW-063-SD, SW-064-SD, SW-165-SD, SWP-001, SWP-002, and SWP-003
Dibenzo(a,h)anthracene	10/65	Yes	3	SW-045-SD (NCDENR), SW-030-SD (NCDENR), and SWP-001
Dibenzofuran	12/57	Yes	8	SW-044-SD (NCDENR), SW-045-SD (NCDENR), SW-029-SD (NCDENR), SW-129-SD (NCDENR), SW-014-SL (NCDENR), SW-015-SL (NCDENR), SW-023-SL (NCDENR), and SW-044-SD
Fluoranthene	35/69	Yes	22	SW-044-SD (NCDENR), SW-045-SD (NCDENR), SW-029-SD (NCDENR), SW-129-SD (NCDENR), SW-030-SD (NCDENR), SW-014-SL (NCDENR), SW-015-SL (NCDENR), 8753, 8754, SW-015-SL, 8750, 8871, SW-029-SD, SW-030-SD, SW-044-SD, SW-045-SD, SW-047-SD, SW-061-SD, SW-064-SD, SWP-001, SWP-002, and SWP-003

Table 2-6. Summary of Sediment Samples that Exceeded the RSVs for the Refined Screening of COPECs
SWP-Gulf Facility, Gulf, North Carolina

Analyte	Freq Det	Retained as COPEC?	Sample Count Above Benchmark	Samples that Exceeded Alternate Benchmarks
Fluorene	24/69	Yes	22	SW-044-SD (NCDENR), SW-045-SD (NCDENR), SW-047-SD (NCDENR), SW-029-SD (NCDENR), SW-129-SD (NCDENR), SW-030-SD (NCDENR), SW-032-SD (NCDENR), SW-014-SL (NCDENR), SW-015-SL (NCDENR), SW-023-SL (NCDENR), SW-015-SL, 8750, 8871, SW-029-SD, SW-044-SD, SW-062-SD, SW-063-SD, SW-064-SD, SW-066-SD, SWP-001, SWP-002, and SWP-003
Indeno(1,2,3-cd)pyrene	15/69	Yes	8	SW-045-SD (NCDENR), SW-047-SD (NCDENR), SW-129-SD (NCDENR), SW-030-SD (NCDENR), SW-032-SD (NCDENR), SW-024-SL (NCDENR), SW-059-SD, and SW-061-SD
Naphthalene	10/69	Yes	8	SW-045-SD (NCDENR), SW-047-SD (NCDENR), SW-129-SD (NCDENR), SW-030-SD (NCDENR), SW-032-SD (NCDENR), SW-024-SL (NCDENR), SW-059-SD, and SW-061-SD
Pentachlorophenol	10/69	Yes	1	SW-029-SD (NCDENR)
Phenanthrene	31/69	Yes	6	SW-029-SD (NCDENR), SW-129-SD (NCDENR), SW-014-SL (NCDENR), SW-015-SL (NCDENR), SW-015-SL, and SW-029-SD
Phenol	3/68	No	0	None
Pyrene	28/57	Yes	22	SW-044-SD (NCDENR), SW-045-SD (NCDENR), SW-047-SD (NCDENR), SW-029-SD (NCDENR), SW-129-SD (NCDENR), SW-030-SD (NCDENR), SW-032-SD (NCDENR), SW-014-SL (NCDENR), SW-015-SL (NCDENR), SW-023-SL (NCDENR), SW-024-SL (NCDENR), SW-053-SD, SW-059-SD, SW-060-SD, SW-044-SD, SW-045-SD, SW-047-SD, SW-061-SD, SW-062-SD, SW-063-SD, SW-064-SD, SWP-001, SWP-002, and SWP-003
Total PAHs		Yes		

Table 2-6. Summary of Sediment Samples that Exceeded the RSVs for the Refined Screening of COPECs
SWP-Gulf Facility, Gulf, North Carolina

Analyte	Freq Det	Retained as COPEC?	Sample Count Above Benchmark	Samples that Exceeded Alternate Benchmarks
Inorganics				
Aluminum	14/14	No	0	None
Arsenic	11/14	No	0	None
Barium	14/14	No	0	None
Beryllium	10/14	No	0	None
Calcium	11/11	No [1]	10	SW-029-SD (NCDENR), SW-129-SD (NCDENR), SW-030-SD (NCDENR), SW-032-SD (NCDENR), SW-033-SD (NCDENR), SW-034-SD (NCDENR), SW-014-SL (NCDENR), SW-015-SL (NCDENR), SW-023-SL (NCDENR), and SW-024-SL (NCDENR)
Cobalt	6/14	No	0	None
Copper	9/14	No	0	None
Iron	14/14	No [1]	5	SW-129-SD (NCDENR), SW-030-SD (NCDENR), SW-014-SL (NCDENR), SW-024-SL (NCDENR), and SWP-002
Magnesium	11/11	No [1]	8	SW-029-SD (NCDENR), SW-129-SD (NCDENR), SW-030-SD (NCDENR), SW-034-SD (NCDENR), SW-014-SL (NCDENR), SW-015-SL (NCDENR), SW-023-SL (NCDENR), and SW-024-SL (NCDENR)
Manganese	14/14	No [1]	4	SW-129-SD (NCDENR), SW-030-SD (NCDENR), SW-034-SD (NCDENR), and SWP-002
Nickel	9/14	Yes	5	SW-129-SD (NCDENR), SW-030-SD (NCDENR), SW-023-SL (NCDENR), SWP-001, and SWP-002
Potassium	11/11	No	0	None
Silver	3/14	Yes	3	SWP-001, SWP-002, and SWP-003
Vanadium	14/14	No	0	None
Dioxin-TEQs				
Dioxin-TEQs		Yes		

Note:
Frequency of Detection reflects results for the combined downstream Drainage Ditch and Cedar Creek sediments.
[1] Although some of the samples for these analytes exceeded the alternate screening benchmarks, they were not retained for other reasons. See text for discussion.

Table 2-7. Preliminary Assessment of Potential Ecological Risk Assessment Exposure Pathways
Southern Wood Piedmont - Gulf, North Carolina Facility

Exposure Medium	Exposure Point	Exposure Type	Receptor Group	Rationale for Selection or Exclusion of Exposure Pathway
Sediment or SW	Sediment or SW	Direct	Benthic Organisms	Pathway incomplete due to naturally depauperate benthos in Cedar Creek.
Sediment or SW	Sediment or SW	Direct	Fish	Pathway incomplete for Cedar Creek due to absence of suitable fishery. Pathway complete for Drainage Ditch due to presence of mosquitofish during July 2006 field survey.
Sediment or SW	Fish	Indirect (Food-chain)	Piscivorous Bird (e.g., heron)	Pathway incomplete due to absence of suitable fishery on Cedar Creek
Sediment or SW	Insects	Indirect (Food-chain)	Insectivorous Bird (e.g., kingbird)	Pathway complete.
Sediment or SW	Small mammals	Indirect (Food-chain)	Carnivorous Bird (e.g., hawk)	Pathway is likely minor due to heavily wooded environment preventing sufficient line-of-sight and flyway for foraging.
Sediment or SW	Plants, seeds	Indirect (Food-chain)	Herbivorous Mammal (e.g., deer)	Potential pathway for exposure.
Sediment or SW	Fish	Indirect (Food-chain)	Piscivorous Mammal (e.g., mink)	Pathway incomplete due to absence of suitable fishery on Cedar Creek
Sediment or SW	Small mammals	Indirect (Food-chain)	Carnivorous Mammal (e.g., fox)	Potential pathway for exposure.
Sediment or SW	Multiple	Indirect (Food-chain)	Omnivorous Mammal (e.g., raccoon)	Potential pathway for exposure.

Table 2-8. Summary of OCDD Results in Sediments of Tributaries to Cedar Creek Southern Wood Piedmont - Gulf, North Carolina Facility

Location	Sample ID	Year Collected	OCDD Conc (ng/Kg_{dw})
Trib-N1	SW-046-SD	1998	5,800
Trib-N1	SW-046-SD (NCDENR)	1998	8,200
Trib-N1	SW-031-SD (NCDENR)	1995	2,000
Trib-S1	SW-055-SD	1999	27,500
Trib-N3	SW-054-SD	1999	6,210
Trib-N3	SW-048-SD	1998	24,490
Trib-N3	SW-048-SD (NCDENR)	1998	15,000
Trib-N3	SW-032-SD (NCDENR)	1995	360,000
Trib-S2	SW-053-SD	1999	2,780
Trib-S2	SW-050-SD (NCDENR)	1998	8,300
Trib-S2	SW-033-SD (NCDENR)	1995	1,400

Note:
Samples for PCDD/F analysis were not collected from Trib-N2.
See Figure 2-5 for sample locations. Samples were ordered from west to east and upstream to downstrean within the tributaries.

Table 2-9. Compilation of Proposed TRVs for the Refined List of COPECs
Southern Wood Piedmont - Gulf, North Carolina Facility

		Proposed TRVs and Representative Receptor									
		Insectivorous Avian		Invertivorous Avian		Carnivorous Mammal		Herbivorous Mammal		Omnivorous Mammal	
	Chemical	Eastern Kingbird		American Robin		Red Fox		Deer		Raccoon	
COPEC	Class	TRV_{NOAEL}	TRV_{LOAEL}	TRV_{NOAEL}	TRV_{LOAEL}	TRV_{NOAEL}	TRV_{LOAEL}	TRV_{NOAEL}	TRV_{LOAEL}	TRV_{NOAEL}	TRV_{LOAEL}
Pentachlorophenol	SVOCs	4.03	40.3	4.03	40.3	8.40	22.65	8.40	22.65	8.40	22.65
2-Methylnaphthalene	SVOCs	0.101	1.01	0.101	1.01	0.53	17.09	0.28	2.81	0.50	4.96
Acenaphthene	SVOCs	0.101	1.01	0.101	1.01	0.53	17.09	0.28	2.81	0.50	4.96
Acenaphthylene	SVOCs	0.101	1.01	0.101	1.01	0.53	17.09	0.28	2.81	0.50	4.96
Anthracene	SVOCs	0.111	1.11	0.111	1.11	0.53	17.09	0.28	2.81	0.50	4.96
Benzo(a)anthracene	SVOCs	0.101	1.01	0.101	1.01	0.26	20.31	0.14	1.40	0.25	2.48
Benzo(a)pyrene	SVOCs	0.101	1.01	0.101	1.01	0.26	20.31	0.14	1.40	0.25	2.48
Benzo(b)fluoranthene [1]	SVOCs	0.101	1.01	0.101	1.01	0.26	20.31	0.14	1.40	0.25	2.48
Benzo(g,h,i)perylene	SVOCs	0.101	1.01	0.101	1.01	0.26	20.31	0.14	1.40	0.25	2.48
Benzo(k)fluoranthene	SVOCs	0.101	1.01	0.101	1.01	0.26	20.31	0.14	1.40	0.25	2.48
Carbazole	SVOCs	0.101	1.01	0.101	1.01	0.53	17.09	0.28	2.81	0.50	4.96
Chrysene	SVOCs	0.101	1.01	0.101	1.01	0.26	20.31	0.14	1.40	0.25	2.48
Dibenz(a,h)anthracene	SVOCs	0.101	1.01	0.101	1.01	0.26	20.31	0.14	1.40	0.25	2.48
Dibenzofuran	SVOCs	0.102	1.02	0.102	1.02	0.53	17.09	0.28	2.81	0.50	4.96
Fluoranthene	SVOCs	0.102	1.02	0.102	1.02	0.26	20.31	0.14	1.40	0.25	2.48
Fluorene	SVOCs	0.101	1.01	0.101	1.01	0.53	17.09	0.28	2.81	0.50	4.96
Indeno(1,2,3-cd)pyrene	SVOCs	0.101	1.01	0.101	1.01	0.26	20.31	0.14	1.40	0.25	2.48
Naphthalene	SVOCs	0.101	1.01	0.101	1.01	0.53	17.09	0.28	2.81	0.50	4.96
Phenanthrene	SVOCs	0.113	1.13	0.113	1.13	0.53	17.09	0.28	2.81	0.50	4.96
Pyrene	SVOCs	0.101	1.01	0.101	1.01	0.26	20.31	0.14	1.40	0.25	2.48
Total PAHs	SVOCs	NA [1]	NA [1]	NA [1]	NA [1]	NA [1]	NA [1]	NA [1]	NA [1]	NA [1]	NA [1]
Nickel	Inorganics	77.4	107	77.4	107	10	13.3	10	13.3	10	13.3
Silver	Inorganics	7.96	79.6	7.96	79.6	83.6	121.9	83.6	121.9	83.6	121.9
Dioxin-$TEQ_{mammalian}$	Dioxin-TEQs	NR	NR	NR	NR	5.28E-07	5.28E-06	2.81E-07	2.81E-06	4.96E-07	4.96E-06
Dioxin-TEQ_{avian}	Dioxin-TEQs	1.40E-05	1.40E-04	1.40E-05	1.40E-04	NR	NR	NR	NR	NR	NR

Notes:
TRVs have units of mg/Kg-day.
See Appendix B for derivation of proposed TRVs.
[1] A TRV was developed for the individual PAHs and not total PAHs. For the latter, the calculated HQ will represent the sum of the HQs for the individual PAHs.

Table 3-1. Compilation of COPECs based on the ERAGS Step 3 Refined Screening
Southern Wood Piedmont - Gulf, North Carolina Facility

Chemical Class	Preliminary Surface Water COPEC	Preliminary Sediment COPEC
VOCs	(none)	(none)
SVOCs	Pentachlorophenol	Pentachlorophenol
		2-Methylnaphthalene
		Acenaphthene
		Acenaphthylene
		Anthracene
		Benzo(a)anthracene
		Benzo(a)pyrene
		Benzo(b)fluoranthene [1]
		Benzo(g,h,i)perylene
		Benzo(k)fluoranthene
		Carbazole
		Chrysene
		Dibenz(a,h)anthracene
		Dibenzofuran
		Fluoranthene
		Fluorene
		Indeno(1,2,3-cd)pyrene
		Naphthalene
		Phenanthrene
		Pyrene
		Total PAHs
Inorganics	(none)	(none) [2]
Dioxin-TEQs		Dioxin-TEQs

Notes:
Only those chemicals that were detected in at least one sample are shown in this table.
[1] Although benzo(b)fluoranthene did not exceed the RSV, it was retained as a COPEC since the remaining PAHs were also COPECs.
[2] Although nickel and silver exceeded their RSVs at a small number of locations they were not retained as refined COPECs since they were not site-related chemicals.

amec

Appendix A
Compilation of Analytical Results

APPENDIX A
COMPILATION OF ANALYTICAL RESULTS

Preface

This appendix contains the most current compilation of analytical results from samples collected as part of prior field investigations of the Former SWP-Gulf facility. These tables were created from the MS-Access database developed to facilitate data evaluation. The analytical data summaries presented in the WPM (AMEC, 2006) were based on summary tables included in prior reports, which were often missing detection limits for non-detect results. Since the submission of the WPM these data gaps were identified, the missing data located to the extent possible, and the database was updated to reflect the missing results. The original laboratory reports were also reviewed to the extent available to adjust for any transcription errors. The sediment total organic carbon and particle size results from the supplemental field investigation performed in July 2006 were also included in these tabulations.

The PCDD/F results were reported both as individual congeners and also as Toxicity Equivalent Quotients (TEQs). Van den Berg et al. (1998, 2006)[6] compiled dioxin Toxic Equivalency Factors (TEFs) for mammals, fish and birds. TEFs are used as weighting factors for the non-2,3,7,8-TCDD dioxin and furan congeners to generate 2,3,7,8-TCDD equivalent toxic potency (i.e., toxic equivalents; TEQ). The equation used for the TEQ calculations is shown below.

$$TEQ = \sum[PCDD_i \times TEF_i] + \sum[PCDF_i \times TEF_i]$$

Where:

TEQ	=	2,3,7,8-TCDD toxic equivalents;
$PCDD_i$	=	the concentration of the individual polychlorinated dibenzo-p-dioxin congener;
$PCDF_i$	=	the concentration of the individual polychlorinated dibenzofuran congener; and
TEF_i	=	the TEFs for the individual non-2,3,7,8-TCDD congeners

The sum of these products - the TEQ - is assumed to yield a comparable toxicological effect as 2,3,7,8-TCDD. The TEQ is treated like an individual chemical for summary statistics and exposure calculations. The Dioxin-TEQs for the mammals [Dioxin-TEQ(mammal)] and birds [Dioxin-TEQ(avian)] were calculated separately. TEQs were calculated by setting any non-detect PCDD/F congener results to zero, and also to one-half the reported detection limit. These are identified as separate entries on the tables.

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[6] Van den Berg (2006) only updated the mammalian TEFs. The avian and fish TEFs were from the Van den Berg (1998) publication.

References

Van den Berg, M., L. Birnbaum, A.T.C. Bosveld, B. Brunstrom, P. Cook, M. Freeley, J.P. Giesy, A. Hanberg, R. Hasegawa, S.W. Kennedy, T. Kubiak, J.C. Larsen, F.X. Rolaf van Leeuwen, A.K. Djien Liem, C. Nolt, R.E. Peterson, L. Poellinger, S. Safe, D. Schrenk, D. Tillitt, M. Tysklind, F. Waern, and T. Zachareweski. 1998. Toxic equivalency factors (TEFs) for PCBs, PCDDs, PCDFs for humans and wildlife. *Environmental Health Perspectives.* 106(12): 775-792.

Van den Berg, M., L.S. Birnbaum, M. Denison, M. De Vito, W. Farland, M. Feeley, H. Fiedler, H. Hakansson, A. Hanberg, L. Haws, M. Rose, S. Safe, D. Schrenk, C. Tohyama, A. Tritscher, J. Tuomisto, M. Tysklind, N. Walker, and R.E. Peterson. 2006. The 2005 World Health Organization reevaluation of human and mammalian toxic equivalency factors for dioxins and dioxin-like compounds. *Toxicological Sciences.* 93(2): 223–241.

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Table A-4 Summary of Detection Frequencies of PCDD/F Congeners in Sediment Samples, Southern Wood Piedmont - Former Gulf, NC Facility

Table A-5 Acronym List for PAHs, Southern Wood Piedmont - Gulf, North Carolina Facility

Table A-1. Compilation of Surface Water Results
Southern Wood Piedmont - Former Gulf, NC Facility

		Sample ID	SW-025-SW	SW-025-SW (NCDENR)	SW-026-SW	SW-026-SW (NCDENR)	SW-027-SW (NCDENR)	SW-028-SW (NCDENR)	8746	8747	8748	8867	8868	8869 [1]
		Station ID	SW-025-SW	SW-025-SW	SW-026-SW	SW-026-SW	SW-027-SW	SW-028-SW	SW-01	SW-02	SW-03	SS-DRAINDT	SS-DWNSDIS	SS-DWNSSUF
		Date Collected	11/13/1995	11/13/1995	11/13/1995	11/13/1995	11/13/1995	11/13/1995	5/3/1990	5/3/1990	5/3/1990	8/13/1990	8/13/1990	8/13/1990
		Waterbody	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek
		Location	Background	Background	Background	Background	Background	Background	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream
ChemClass	Analyte Name	Conc Unit												
VOCs	1,1,1-Trichloroethane	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	1,1,2,2-Tetrachloroethane	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	1,1,2-Trichloroethane	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	1,1-Dichloroethane	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	1,1-Dichloroethene	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	1,2,4-Trichlorobenzene	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	1,2-Dichlorobenzene	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	1,2-Dichloroethane	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	1,2-Dichloroethene (total)	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	1,2-Dichloropropane	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	1,3-Dichlorobenzene	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	1,4-Dichlorobenzene	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	2-Butanone	mg/L	0.025 U	0.01 U	0.025 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	4-Bromophenyl phenyl ether	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	Acetone	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	Benzene	mg/L	0.005 U	0.01 U	0.005 U	0.01 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
VOCs	Bis(2-chloroethoxy) methane	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	Bis(2-Chloroethyl) ether	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	Bis(2-Chloroisopropyl) ether	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	Bromodichloromethane	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	Bromoform	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	Bromomethane	mg/L		0.01 UR		0.01 UR	0.01 UR	0.01 UR						
VOCs	Carbon disulfide	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	Carbon tetrachloride	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	Chlorobenzene	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	Chloroethane	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	Chloroform	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	Chloromethane	mg/L		0.01 U		0.01 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U			
VOCs	cis-1,3-Dichloropropene	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	Dibromochloromethane	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	Ethylbenzene	mg/L	0.005 U	0.01 U	0.005 U	0.01 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
VOCs	Methyl butyl ketone	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	Methyl isobutyl ketone	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	Methylene chloride	mg/L	0.005 U	0.01 U	0.005 U	0.01 U	0.01 U	0.01 U				0.001 U	0.001 U	0.001 U
VOCs	m-Xylene	mg/L								0.001 U	0.001 U			
VOCs	o-Xylene	mg/L								0.001 U	0.001 U			
VOCs	p-Xylene	mg/L								0.001 U	0.001 U			
VOCs	Styrene	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	Tetrachloroethene	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	Toluene	mg/L	0.005 U	0.01 U	0.005 U	0.01 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
VOCs	trans-1,3-Dichloropropene	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	Trichloroethene	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	Vinyl chloride	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
VOCs	Xylenes (total)	mg/L	0.005 U	0.01 U	0.005 U	0.01 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
SVOCs	2,4-Dinitrotoluene	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
SVOCs	2,6-Dinitrotoluene	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
SVOCs	2-Chloronaphthalene	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
SVOCs	2-Methylphenol	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
SVOCs	2-Nitroaniline	mg/L		0.025 U		0.025 U	0.025 U	0.025 U						
SVOCs	3,3'-Dichlorobenzidine	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
SVOCs	3-Nitroaniline	mg/L		0.025 U		0.025 U	0.025 U	0.025 U						
SVOCs	4-Chloroaniline	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
SVOCs	4-Chlorophenyl Phenyl Ether	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
SVOCs	4-Nitroaniline	mg/L		0.025 U		0.025 U	0.025 U	0.025 U						
SVOCs	Aniline	mg/L	0.05 U		0.05 U				0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
SVOCs	Bis(2-ethylhexyl) phthalate	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
SVOCs	Butyl benzyl phthalate	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
SVOCs	Diethylphthalate	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
SVOCs	Dimethylphthalate	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
SVOCs	Di-n-butylphthalate	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
SVOCs	Di-n-octylphthalate	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
SVOCs	Hexachlorobenzene	mg/L		0.01 UJ		0.01 UJ	0.01 UJ	0.01 UJ						
SVOCs	Hexachlorobutadiene	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
SVOCs	Hexachlorocyclopentadiene	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
SVOCs	Hexachloroethane	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
SVOCs	Isophorone	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
SVOCs	Nitrobenzene	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
SVOCs	N-nitrosodi-n-propylamine	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						

Table A-1. Compilation of Surface Water Results
Southern Wood Piedmont - Former Gulf, NC Facility

		Sample ID	SW-025-SW	SW-025-SW (NCDENR)	SW-026-SW	SW-026-SW (NCDENR)	SW-027-SW (NCDENR)	SW-028-SW (NCDENR)	6746	6747	6748	6867	6868	6869 [1]
		Station ID	SW-025-SW	SW-025-SW	SW-026-SW	SW-026-SW	SW-027-SW	SW-028-SW	SW-01	SW-02	SW-03	SS-DRAINDT	SS-DWNSDIS	SS-DWNSSUF
		Date Collected	11/13/1995	11/13/1995	11/13/1995	11/13/1995	11/13/1995	11/13/1995	5/3/1990	5/3/1990	5/3/1990	8/13/1990	8/13/1990	8/13/1990
		Waterbody	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek
		Location	Background	Background	Background	Background	Background	Background	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream
ChemClass	Analyte Name	Conc Unit												
SVOCs	N-nitrosodiphenylamine	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
Phenolics	2,3,4,6-Tetrachlorophenol	mg/L	0.05 U		0.05 U				0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Phenolics	2,4,5-Trichlorophenol	mg/L		0.025 U		0.025 U	0.025 U	0.025 U						
Phenolics	2,4,6-Trichlorophenol	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Phenolics	2,4-Dichlorophenol	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
Phenolics	2,4-Dimethylphenol	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Phenolics	2,4-Dinitrophenol	mg/L		0.025 U		0.025 U	0.025 U	0.025 U						
Phenolics	2-Chlorophenol	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Phenolics	2-Methyl-4,6-dinitrophenol	mg/L		0.025 U		0.025 U	0.025 U	0.025 U						
Phenolics	2-Nitrophenol	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
Phenolics	3&4-Methylphenol	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Phenolics	4-Chloro-3-methylphenol	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Phenolics	4-Nitrophenol	mg/L		0.025 U		0.025 U	0.025 U	0.025 U						
Phenolics	Pentachlorophenol	mg/L	0.05 U	0.025 U	0.05 U	0.025 U	0.025 U	0.025 U	0.01 U	0.15	0.01 U	0.05 U	0.05 U	0.05 U
Phenolics	Phenol	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
PAHs	2-Methylnaphthalene	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
PAHs	Acenaphthene	mg/L	0.01 U	0.01 UJ	0.01 U	0.01 UJ	0.01 UJ	0.01 UJ	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
PAHs	Acenaphthylene	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
PAHs	Anthracene	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
PAHs	Benzo(a)anthracene	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
PAHs	Benzo(a)pyrene	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
PAHs	Benzo(b&k)fluoranthene	mg/L		0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
PAHs	Benzo(b)fluoranthene	mg/L	0.01 U		0.01 U									
PAHs	Benzo(g,h,i)perylene	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
PAHs	Benzo(k)fluoranthene	mg/L	0.01 U		0.01 U									
PAHs	Carbazole	mg/L	0.05 U	0.01 U	0.05 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
PAHs	Chrysene	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
PAHs	Dibenzo(a,h)anthracene	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
PAHs	Dibenzofuran	mg/L		0.01 U		0.01 U	0.01 U	0.01 U						
PAHs	Fluoranthene	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.58	0.01 U
PAHs	Fluorene	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.013	0.01 U
PAHs	Indeno(1,2,3-cd)pyrene	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
PAHs	Naphthalene	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.05 U	0.05 U	0.05 U	0.01 U	0.01 U	0.01 U
PAHs	Phenanthrene	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.057	0.01 U
PAHs	Pyrene	mg/L		0.01 UJ		0.01 UJ	0.01 UJ	0.01 UJ						
Metals	Aluminum	mg/L		0.4 J		0.57	0.59	0.47 J						
Metals	Antimony	mg/L		0.02 UJ		0.02 U	0.02 U	0.02 UJ						
Metals	Arsenic	mg/L		0.003 UJ		0.003 U	0.003 U	0.003 UJ						
Metals	Barium	mg/L		0.02 UJ		0.02 U	0.02 U	0.02 J						
Metals	Beryllium	mg/L		0.001 UJ		0.001 U	0.001 U	0.001 UJ						
Metals	Cadmium	mg/L		0.002 UJ		0.002 U	0.002 U	0.002 UJ						
Metals	Calcium	mg/L		6.2 J		6.4	6.3	6.2 J						
Metals	Chromium	mg/L		0.002 UJ		0.002 U	0.003 U	0.002 UJ						
Metals	Cobalt	mg/L		0.004 UJ		0.004 U	0.003 U	0.003 UJ						
Metals	Copper	mg/L		0.007 UJ		0.007 U	0.004 U	0.007 UJ						
Metals	Iron	mg/L		0.77 J		0.92	0.95	0.82 J						
Metals	Lead	mg/L		0.001 UJ		0.001 U	0.001 U	0.001 UJ						
Metals	Magnesium	mg/L		3.3 J		3.4	3.3	3.3 J						
Metals	Manganese	mg/L		0.037 J		0.043	0.04	0.04 J						
Metals	Mercury	mg/L		0.0002 UJ		0.0002 U	0.0002 U	0.0002 UJ						
Metals	Nickel	mg/L		0.007 UJ		0.007 U	0.007 U	0.007 UJ						
Metals	Potassium	mg/L		1.9 J		1.9	2	1.9 J						
Metals	Selenium	mg/L		0.003 UJ		0.003 U	0.003 U	0.003 UJ						
Metals	Silver	mg/L		0.003 UJ		0.003 U	0.004 U	0.003 UJ						
Metals	Sodium	mg/L		5.1 J		5.2	5.1	5 J						
Metals	Thallium	mg/L		0.003 UJ		0.003 U	0.003 U	0.003 UJ						
Metals	Tin	mg/L												
Metals	Vanadium	mg/L		0.003 UJ		0.003 U	0.004 U	0.003 UJ						
Metals	Zinc	mg/L		0.007 UJ		0.011 J	0.008 U	0.028 J						
General Parameters	Total Suspended Solids	mg/L										110	21	5 U

Table A-1. (continued)

		Sample ID	SW-029-SW	SW-029-SW (NCDENR)	SW-129-SW (NCDENR) [SW-029-SW (NCDENR) Dup]	SW-030-SW	SW-030-SW (NCDENR)	SW-031-SW (NCDENR)	SW-032-SW (NCDENR)	SW-033-SW (NCDENR)	SW-034-SW (NCDENR)
		Station ID	SW-029-SW	SW-029-SW	SW-129-SW	SW-030-SW	SW-030-SW	SW-031-SW	SW-032-SW	SW-033-SW	SW-034-SW
		Date Collected	11/13/1995	11/13/1995	11/13/1995	11/13/1995	11/13/1995	11/13/1995	11/13/1995	11/13/1995	11/13/1995
		Waterbody	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek
		Location	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream
ChemClass	Analyte Name	Conc Unit									
VOCs	1,1,1-Trichloroethane	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	1,1,2,2-Tetrachloroethane	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	1,1,2-Trichloroethane	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	1,1-Dichloroethane	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	1,1-Dichloroethene	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	1,2,4-Trichlorobenzene	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	1,2-Dichlorobenzene	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	1,2-Dichloroethane	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	1,2-Dichloroethene (total)	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	1,2-Dichloropropane	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	1,3-Dichlorobenzene	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	1,4-Dichlorobenzene	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	2-Butanone	mg/L	0.025 U	0.01 U	0.01 U	0.025 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	4-Bromophenyl phenyl ether	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	Acetone	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	Benzene	mg/L	0.005 U	0.01 U	0.01 U	0.005 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	Bis(2-chloroethoxy) methane	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	Bis(2-Chloroethyl) ether	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	Bis(2-Chloroisopropyl) ether	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	Bromodichloromethane	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	Bromoform	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	Bromomethane	mg/L		0.01 UR	0.01 UR		0.01 UR	0.01 UR	0.01 UR	0.01 UR	0.01 UR
VOCs	Carbon disulfide	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	Carbon tetrachloride	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	Chlorobenzene	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	Chloroethane	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	Chloroform	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	Chloromethane	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U		
VOCs	cis-1,3-Dichloropropene	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	Dibromochloromethane	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	Ethylbenzene	mg/L	0.005 U	0.01 U	0.01 U	0.005 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	Methyl butyl ketone	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	Methyl isobutyl ketone	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	Methylene chloride	mg/L	0.005 U	0.01 U	0.01 U	0.005 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	m-Xylene	mg/L									
VOCs	o-Xylene	mg/L									
VOCs	p-Xylene	mg/L									
VOCs	Styrene	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	Tetrachloroethene	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	Toluene	mg/L	0.005 U	0.01 U	0.01 U	0.005 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	trans-1,3-Dichloropropene	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	Trichloroethene	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	Vinyl chloride	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
VOCs	Xylenes (total)	mg/L	0.005 U	0.01 U	0.01 U	0.005 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
SVOCs	2,4-Dinitrotoluene	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
SVOCs	2,6-Dinitrotoluene	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
SVOCs	2-Chloronaphthalene	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
SVOCs	2-Methylphenol	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.001 J
SVOCs	2-Nitroaniline	mg/L		0.025 U	0.025 U		0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
SVOCs	3,3'-Dichlorobenzidine	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
SVOCs	3-Nitroaniline	mg/L		0.025 U	0.025 U		0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
SVOCs	4-Chloroaniline	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
SVOCs	4-Chlorophenyl Phenyl Ether	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
SVOCs	4-Nitroaniline	mg/L		0.025 U	0.025 U		0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
SVOCs	Aniline	mg/L	0.05 U			0.05 U					
SVOCs	Bis(2-ethylhexyl) phthalate	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
SVOCs	Butyl benzyl phthalate	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
SVOCs	Diethylphthalate	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
SVOCs	Dimethylphthalate	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
SVOCs	Di-n-butylphthalate	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
SVOCs	Di-n-octylphthalate	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
SVOCs	Hexachlorobenzene	mg/L		0.01 UJ	0.01 UJ		0.01 UJ	0.01 UJ	0.01 UJ	0.01 UJ	0.01 UJ
SVOCs	Hexachlorobutadiene	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
SVOCs	Hexachlorocyclopentadiene	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
SVOCs	Hexachloroethane	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
SVOCs	Isophorone	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.001 J
SVOCs	Nitrobenzene	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
SVOCs	N-nitrosodi-n-propylamine	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U

Table A-1. (continued)

		Sample ID	SW-029-SW	SW-029-SW (NCDENR)	SW-129-SW (NCDENR) [SW-029-SW (NCDENR) Dup]	SW-030-SW	SW-030-SW (NCDENR)	SW-031-SW (NCDENR)	SW-032-SW (NCDENR)	SW-033-SW (NCDENR)	SW-034-SW (NCDENR)
		Station ID	SW-029-SW	SW-029-SW	SW-129-SW	SW-030-SW	SW-030-SW	SW-031-SW	SW-032-SW	SW-033-SW	SW-034-SW
		Date Collected	11/13/1995	11/13/1995	11/13/1995	11/13/1995	11/13/1995	11/13/1995	11/13/1995	11/13/1995	11/13/1995
		Waterbody	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek
		Location	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream
ChemClass	Analyte Name	Conc Unit									
SVOCs	N-nitrosodiphenylamine	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Phenolics	2,3,4,6-Tetrachlorophenol	mg/L	0.05 U			0.05 U					
Phenolics	2,4,5-Trichlorophenol	mg/L		0.025 U	0.025 U		0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Phenolics	2,4,6-Trichlorophenol	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Phenolics	2,4-Dichlorophenol	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Phenolics	2,4-Dimethylphenol	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Phenolics	2,4-Dinitrophenol	mg/L		0.025 U	0.025 U		0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Phenolics	2-Chlorophenol	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Phenolics	2-Methyl-4,6-dinitrophenol	mg/L		0.025 U	0.025 U		0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Phenolics	2-Nitrophenol	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Phenolics	3&4-Methylphenol	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Phenolics	4-Chloro-3-methylphenol	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Phenolics	4-Nitrophenol	mg/L		0.025 U	0.025 U		0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Phenolics	Pentachlorophenol	mg/L	0.05 U	0.011 J	0.016 J	0.05 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
Phenolics	Phenol	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
PAHs	2-Methylnaphthalene	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
PAHs	Acenaphthene	mg/L	0.01 U	0.01 UJ	0.01 UJ	0.01 U	0.01 UJ	0.01 UJ	0.01 UJ	0.01 UJ	0.01 UJ
PAHs	Acenaphthylene	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
PAHs	Anthracene	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
PAHs	Benzo(a)anthracene	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
PAHs	Benzo(a)pyrene	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
PAHs	Benzo(b&k)fluoranthene	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
PAHs	Benzo(b)fluoranthene	mg/L	0.01 U			0.01 U					
PAHs	Benzo(g,h,i)perylene	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
PAHs	Benzo(k)fluoranthene	mg/L	0.01 U			0.01 U					
PAHs	Carbazole	mg/L	0.05 U	0.01 U	0.01 U	0.05 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
PAHs	Chrysene	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
PAHs	Dibenzo(a,h)anthracene	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
PAHs	Dibenzofuran	mg/L		0.01 U	0.01 U		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
PAHs	Fluoranthene	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
PAHs	Fluorene	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
PAHs	Indeno(1,2,3-cd)pyrene	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
PAHs	Naphthalene	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.001 J
PAHs	Phenanthrene	mg/L	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
PAHs	Pyrene	mg/L		0.01 UJ	0.01 UJ		0.01 UJ	0.01 UJ	0.01 UJ	0.01 UJ	0.003 J
Metals	Aluminum	mg/L		1.2 J	0.73		0.45	0.68	0.64	1.3	0.83 J
Metals	Antimony	mg/L		0.02 UJ	0.02 U		0.02 U	0.02 U	0.02 U	0.02 U	0.02 UJ
Metals	Arsenic	mg/L		0.003 UJ	0.003 U		0.003 U	0.003 U	0.003 U	0.003 U	0.003 UJ
Metals	Barium	mg/L		0.027 J	0.025		0.024	0.026	0.038	0.028	0.031 J
Metals	Beryllium	mg/L		0.001 UJ	0.001 U		0.001 U	0.001 U	0.001 U	0.001 U	0.001 UJ
Metals	Cadmium	mg/L		0.002 UJ	0.002 U		0.002 U	0.002 U	0.002 U	0.002 U	0.002 UJ
Metals	Calcium	mg/L		6.2 J	6.2		5.9	2	3.6	2.2	4.8 J
Metals	Chromium	mg/L		0.002 UJ	0.002 U		0.002 U	0.002 U	0.002 U	0.003 U	0.002 UJ
Metals	Cobalt	mg/L		0.003 UJ	0.003 U		0.003 U	0.003 U	0.003 U	0.003 U	0.003 UJ
Metals	Copper	mg/L		0.006 UJ	0.005 U		0.004 U	0.006 U	0.005 U	0.007 U	0.005 UJ
Metals	Iron	mg/L		2 J	1.3		0.61	0.94	1.5	1.9	1.3 J
Metals	Lead	mg/L		0.001 UJ	0.002 UJ		0.002 UJ	0.002 UJ	0.001 U	0.002 UJ	0.001 UJ
Metals	Magnesium	mg/L		3.7 J	3.5		3.1	1.7	1.4	1	2.4 J
Metals	Manganese	mg/L		0.069 J	0.052		0.037	0.057	0.11	0.072	0.078 J
Metals	Mercury	mg/L		0.0002 J	0.0002 UJ		0.0002 UJ	0.0002 UJ	0.0002 UJ	0.0002 UJ	0.0001 UJ
Metals	Nickel	mg/L		0.007 UJ	0.007 U		0.007 U	0.007 U	0.007 U	0.007 U	0.007 UJ
Metals	Potassium	mg/L		1.8 J	1.9		1.8	0.86	0.89	1	1.4 J
Metals	Selenium	mg/L		0.003 UJ	0.003 U		0.003 U	0.003 U	0.003 U	0.003 U	0.003 UJ
Metals	Silver	mg/L		0.003 UJ	0.003 U		0.003 U	0.003 U	0.003 U	0.003 U	0.005 UJ
Metals	Sodium	mg/L		5.9 J	5.5		4.8	3.2	3.2	3.1	4.8 J
Metals	Thallium	mg/L		0.003 UJ	0.003 U		0.003 U	0.003 U	0.003 U	0.003 U	0.003 UJ
Metals	Tin	mg/L									
Metals	Vanadium	mg/L		0.005 UJ	0.005 U		0.005 U	0.004 U	0.003 U	0.004 U	0.004 UJ
Metals	Zinc	mg/L		0.008 UJ	0.007 U		0.02 U	0.007 U	0.007 U	0.013 J	0.009 UJ
General Parameters	Total Suspended Solids	mg/L									

Table A-1 Notes

Notes:
Data compiled from databases from multiple sources. Missing values indicate chemical not analyzed or not reported by original data source.
Qualifiers: U = Not detected; UJ = Not detected at estimated concentration shown; J = estimated concentration; UR = Not detected and rejected (unusable result).
[1] Sample 8869 was reported to contain contained intentionally disturbed sediment. As a result, this was not a representative surface water sample and was excluded for further assessment in this SLERA.

Table A-1 Notes

Notes:
Data compiled from databases from multiple sources. Missing values indicate chemical *not analyzed or not reported by original data source.*
Qualifiers: U = Not detected; UJ = Not detected at estimated concentration shown; J = estimated concentration; UR = Not detected and rejected (unusable result).
[1] Sample 8869 was reported to contain contained intentionally disturbed sediment. As a result, this was not a representative surface water sample and was *excluded for further assessment* in this SLERA.

Table A-2. Compilation of Sediment Results from the On-Site Drainage Ditch
Southern Wood Piedmont - Former Gulf, NC Facility

		Sample ID	SW-013-SL (NCDENR)	8752	8753	8754	SW-014-SL (NCDENR)	SW-015-SL	SW-016-SL (NCDENR)	SW-023-SL	SW-023-SL (NCDENR)
		Station ID	SW-013-SL	8752	8753	8754	SW-014-SL	SW-015-SL	SW-016-SL	SW-023-SL	SW-023-SL
		Date Collected	11/14/1995	5/3/1990	5/3/1990	5/3/1990	11/14/1995	11/14/1995	11/14/1995	11/14/1995	11/14/1995
		Waterbody	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch
		Location	Background	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream
		Depth Interval	0 - 12"	NA	NA	NA	0 - 12"	0 - 6"	0 - 6"	0 - 6"	0 - 6"
ChemClass	Analyte Name	Conc Unit									
VOCs	1,1,1-Trichloroethane	mg/Kg dw	0.012 U				0.013 U		0.015 U		0.014 U
VOCs	1,1,2,2-Tetrachloroethane	mg/Kg dw	0.012 U				0.013 U		0.015 U		0.014 U
VOCs	1,1,2-Trichloroethane	mg/Kg dw	0.012 U				0.013 U		0.015 U		0.014 U
VOCs	1,1-Dichloroethane	mg/Kg dw	0.012 U				0.013 U		0.015 U		0.014 U
VOCs	1,1-Dichloroethene	mg/Kg dw	0.012 U				0.013 U		0.015 U		0.014 U
VOCs	1,2,4-Trichlorobenzene	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
VOCs	1,2-Dichlorobenzene	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
VOCs	1,2-Dichloroethane	mg/Kg dw	0.012 U				0.013 U		0.015 U		0.014 U
VOCs	1,2-Dichloroethene (total)	mg/Kg dw	0.012 U				0.013 U		0.015 U		0.014 U
VOCs	1,2-Dichloropropane	mg/Kg dw	0.012 U				0.013 U		0.015 U		0.014 U
VOCs	1,3-Dichlorobenzene	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
VOCs	1,4-Dichlorobenzene	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
VOCs	2-Butanone	mg/Kg dw	0.012 U	0.05 U	0.05 U	0.05 U	0.013 U	0.025 U	0.015 U	0.025 U	0.014 U
VOCs	4-Bromophenyl phenyl ether	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
VOCs	Acetone	mg/Kg dw	0.012 U				0.02 U		0.015 U		0.014 U
VOCs	Benzene	mg/Kg dw	0.012 U	0.005 U	0.005 U	0.005 U	0.039	0.005 U	0.015 U	0.005 U	0.014 U
VOCs	Bis(2-chloroethoxy) methane	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
VOCs	Bis(2-Chloroethyl) ether	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
VOCs	Bis(2-Chloroisopropyl) ether	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
VOCs	Bromodichloromethane	mg/Kg dw	0.012 U				0.013 U		0.015 U		0.014 U
VOCs	Bromoform	mg/Kg dw	0.012 U				0.013 U		0.015 U		0.014 U
VOCs	Bromomethane	mg/Kg dw	0.012 UR				0.013 UR		0.015 UR		0.014 UR
VOCs	Carbon disulfide	mg/Kg dw	0.012 U				0.013 U		0.015 U		0.014 U
VOCs	Carbon tetrachloride	mg/Kg dw	0.012 U				0.013 U		0.015 U		0.014 U
VOCs	Chlorobenzene	mg/Kg dw	0.012 U				0.013 U		0.015 U		0.014 U
VOCs	Chloroethane	mg/Kg dw	0.012 U				0.013 U		0.015 U		0.014 U
VOCs	Chloroform	mg/Kg dw	0.012 U				0.013 U		0.015 U		0.014 U
VOCs	Chloromethane	mg/Kg dw	0.012 U				0.013 U		0.015 U		0.014 U
VOCs	cis-1,3-Dichloropropene	mg/Kg dw	0.012 U				0.013 U		0.015 U		0.014 U
VOCs	Dibromochloromethane	mg/Kg dw	0.012 U				0.013 U		0.015 U		0.014 U
VOCs	Ethylbenzene	mg/Kg dw	0.012 U	0.005 U	0.005 U	0.005 U	0.08	0.1	0.004 J	0.005 U	0.014 U
VOCs	Methyl butyl ketone	mg/Kg dw	0.012 U				0.013 U		0.015 U		0.014 U
VOCs	Methyl isobutyl ketone	mg/Kg dw	0.012 U				0.013 U		0.015 U		0.014 U
VOCs	Methylene chloride	mg/Kg dw	0.02 U	5 U	5 U	5 U	0.03 U	0.005 U	0.02 U	0.005 U	0.014 U
VOCs	m-Xylene	mg/Kg dw		0.05 U	0.05 U	0.05 U					
VOCs	o-Xylene	mg/Kg dw		0.05 U	0.05 U	0.05 U					
VOCs	p-Xylene	mg/Kg dw		0.005 U	0.005 U	0.005 U					
VOCs	Styrene	mg/Kg dw	0.012 U				0.082		0.015 U		0.014 U
VOCs	Tetrachloroethene	mg/Kg dw	0.012 U				0.013 U		0.015 U		0.014 U
VOCs	Toluene	mg/Kg dw	0.012 U	0.005 U	0.005 U	0.005 U	0.14	0.043	0.015 U	0.005 U	0.014 U
VOCs	trans-1,3-Dichloropropene	mg/Kg dw	0.012 U				0.013 U		0.015 U		0.014 U
VOCs	Trichloroethene	mg/Kg dw	0.012 U				0.013 U		0.015 U		0.014 U
VOCs	Vinyl chloride	mg/Kg dw	0.012 U				0.013 U		0.015 U		0.014 U
VOCs	Xylenes (total)	mg/Kg dw	0.012 U	0.005 U	0.005 U	0.005 U	0.29	0.42	0.016	0.005 U	0.014 U
SVOCs	2,4-Dinitrotoluene	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
SVOCs	2,6-Dinitrotoluene	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
SVOCs	2-Chloronaphthalene	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
SVOCs	2-Methylphenol	mg/Kg dw	0.41 U	0.41 U	0.41 U	0.41 U	1.2 J	0.01 U	5.1 U	0.01 U	0.44 U
SVOCs	2-Nitroaniline	mg/Kg dw	1 U				32 U		13 U		1.1 U
SVOCs	3,3'-Dichlorobenzidine	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
SVOCs	3-Nitroaniline	mg/Kg dw	1 U				32 U		13 U		1.1 U
SVOCs	4-Chloroaniline	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
SVOCs	4-Chlorophenyl Phenyl Ether	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
SVOCs	4-Nitroaniline	mg/Kg dw	1 U				32 U		13 U		1.1 U
SVOCs	Aniline	mg/Kg dw		0.41 U	0.41 U	0.41 U		0.05 U		0.05 U	
SVOCs	Biphenyl	mg/Kg dw									
SVOCs	Bis(2-ethylhexyl) phthalate	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
SVOCs	Butyl benzyl phthalate	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
SVOCs	Diethylphthalate	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
SVOCs	Dimethylphthalate	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U

Table A-2. Compilation of Sediment Results from the On-Site Drainage Ditch
Southern Wood Piedmont - Former Gulf, NC Facility

		Sample ID	SW-013-SL (NCDENR)	8752	8753	8754	SW-014-SL (NCDENR)	SW-015-SL	SW-016-SL (NCDENR)	SW-023-SL	SW-023-SL (NCDENR)
		Station ID	SW-013-SL	8752	8753	8754	SW-014-SL	SW-015-SL	SW-016-SL	SW-023-SL	SW-023-SL
		Date Collected	11/14/1995	5/3/1990	5/3/1990	5/3/1990	11/14/1995	11/14/1995	11/14/1995	11/14/1995	11/14/1995
		Waterbody	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch
		Location	Background	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream
		Depth Interval	0 - 12"	NA	NA	NA	0 - 12"	0 - 6"	0 - 6"	0 - 6"	0 - 6"
ChemClass	**Analyte Name**	**Conc Unit**									
SVOCs	Di-n-butylphthalate	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
SVOCs	Di-n-octylphthalate	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
SVOCs	Hexachlorobenzene	mg/Kg dw	0.41 UJ				13 UJ		5.1 UJ		0.44 UJ
SVOCs	Hexachlorobutadiene	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
SVOCs	Hexachlorocyclopentadiene	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
SVOCs	Hexachloroethane	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
SVOCs	Isophorone	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
SVOCs	Nitrobenzene	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
SVOCs	N-nitrosodi-n-propylamine	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
SVOCs	N-nitrosodiphenylamine	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
Phenolics	2,3,4,6-Tetrachlorophenol	mg/Kg dw		0.33 U	0.33 U	0.33 U		0.05 U		0.05 U	
Phenolics	2,4,5-Trichlorophenol	mg/Kg dw	1 U				32 U		13 U		1.1 U
Phenolics	2,4,6-Trichlorophenol	mg/Kg dw	0.41 U	0.41 U	0.41 U	0.41 U	13 U	0.01 U	5.1 U	0.01 U	0.44 U
Phenolics	2,4-Dichlorophenol	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
Phenolics	2,4-Dimethylphenol	mg/Kg dw	0.41 U	0.41 U	0.41 U	0.41 U	3.9 J	0.01 U	5.1 U	0.01 U	0.44 U
Phenolics	2,4-Dinitrophenol	mg/Kg dw	1 U				32 U		13 U		1.1 U
Phenolics	2-Chlorophenol	mg/Kg dw	0.41 U	0.41 U	0.41 U	0.41 U	13 U	0.01 U	5.1 U	0.01 U	0.44 U
Phenolics	2-Methyl-4,6-dinitrophenol	mg/Kg dw	1 U				32 U		13 U		1.1 U
Phenolics	2-Nitrophenol	mg/Kg dw	0.41 U				13 U		5.1 U		0.44 U
Phenolics	3&4-Methylphenol	mg/Kg dw	0.41 U	0.41 U	0.41 U	0.41 U	2.5 J	0.01 U	5.1 U	0.01 U	0.44 U
Phenolics	4-Chloro-3-methylphenol	mg/Kg dw	0.41 U	0.83 U	0.83 U	0.83 U	13 U	0.01 U	5.1 U	0.01 U	0.44 U
Phenolics	4-Methylphenol	mg/Kg dw									
Phenolics	4-Nitrophenol	mg/Kg dw	1 U				32 U		13 U		1.1 U
Phenolics	Pentachlorophenol	mg/Kg dw	1 U	2.1 U	2.1 U	2.1 U	32 U	0.05 U	32 U	2	7.6 J
Phenolics	Phenol	mg/Kg dw	0.41 U	0.41 U	0.41 U	0.41 U	13 U	0.01 U	5.1 U	0.01 U	0.44 U
PAHs	1-Methylnaphthalene	mg/Kg dw									
PAHs	2-Methylnaphthalene	mg/Kg dw	0.41 U	0.33 U	0.33 U	0.33 U	260	35	31	0.01 U	0.051 J
PAHs	Acenaphthene	mg/Kg dw	0.41 UJ	0.41 U	0.41 U	0.41 U	200 J	47	32 J	0.01 U	0.069 J
PAHs	Acenaphthylene	mg/Kg dw	0.41 U				4.3 J		0.66 J		0.44 U
PAHs	Anthracene	mg/Kg dw	0.41 U	0.41 U	0.41 U	0.41 U	860	15	7.3	0.01 U	0.1 J
PAHs	Benzo(a)anthracene	mg/Kg dw	0.41 U	0.41 U	7.8	0.41 U	32	0.01 U	6.7	0.01 U	0.44 U
PAHs	Benzo(a)pyrene	mg/Kg dw	0.41 U	0.41 U	6.3	0.41 U	8.1 J	0.01 U	1.6 J	0.01 U	0.14 J
PAHs	Benzo(b&k)fluoranthene	mg/Kg dw	0.079 J	0.82 U	22	1.1	17		4.5		0.64
PAHs	Benzo(b)fluoranthene	mg/Kg dw						0.01 U		0.34	
PAHs	Benzo(g,h,i)perylene	mg/Kg dw	0.41 U				13 U		5.1 U		0.08 J
PAHs	Benzo(k)fluoranthene	mg/Kg dw						0.01 U		0.01 U	
PAHs	Carbazole	mg/Kg dw	0.41 U	0.41 U	0.41 U	0.41 U	300	0.01 U	2.6 J	0.01 U	0.44 J
PAHs	Chrysene	mg/Kg dw	0.067 J	0.41 U	12	0.45	29	0.01 U	6.1	0.01 U	0.31 J
PAHs	Dibenzo(a,h)anthracene	mg/Kg dw	0.41 U	0.41 U	0.41 U	0.41 U	13 U	0.01 U	5.1 U	0.01 U	0.44 U
PAHs	Dibenzofuran	mg/Kg dw	0.41 U				220		26		0.99
PAHs	Fluoranthene	mg/Kg dw	0.072 J	0.41 U	19	0.88	200	67	30	0.01 U	0.36 J
PAHs	Fluorene	mg/Kg dw	0.41 U	0.33 U	0.33 U	0.33 U	370	52	30	0.01 U	0.48
PAHs	Indeno(1,2,3-cd)pyrene	mg/Kg dw	0.41 U	0.41 U	0.41 U	0.41 U	13 U	0.01 U	5.1 U	0.01 U	0.14 J
PAHs	Naphthalene	mg/Kg dw	0.41 U	0.41 U	0.41 U	0.41 U	480	56	39	0.01 U	0.35 J
PAHs	Phenanthrene	mg/Kg dw	0.41 U	0.41 U	0.41 U	0.41 U	700	110	120	0.01 U	0.48
PAHs	Pyrene	mg/Kg dw	0.061 J				120 J		24 J		0.39 J
PCDD/Fs	1,2,3,4,6,7,8-HpCDD	ng/Kg dw	320						8200		
PCDD/Fs	1,2,3,4,6,7,8-HpCDF	ng/Kg dw	31						950		
PCDD/Fs	1,2,3,4,7,8,9-HpCDF	ng/Kg dw	1.9 J						92		
PCDD/Fs	1,2,3,4,7,8-HxCDD	ng/Kg dw	3.7 J						29		
PCDD/Fs	1,2,3,4,7,8-HxCDF	ng/Kg dw	15 U						210 U		
PCDD/Fs	1,2,3,6,7,8-HxCDD	ng/Kg dw	7.9 J						160		
PCDD/Fs	1,2,3,6,7,8-HxCDF	ng/Kg dw	2.5 J						18 U		
PCDD/Fs	1,2,3,7,8,9-HxCDD	ng/Kg dw	9.1 J						97		
PCDD/Fs	1,2,3,7,8,9-HxCDF	ng/Kg dw	15 U						18 U		
PCDD/Fs	1,2,3,7,8-PeCDD	ng/Kg dw	2.3 J						7 J		
PCDD/Fs	1,2,3,7,8-PeCDF	ng/Kg dw	15 U						18 U		
PCDD/Fs	2,3,4,6,7,8-HxCDF	ng/Kg dw	6.9 J						18 U		
PCDD/Fs	2,3,4,7,8-PeCDF	ng/Kg dw	1.4 J						18 U		
PCDD/Fs	2,3,7,8-TeCDD	ng/Kg dw	0.6 J						7 U		

Table A-2. Compilation of Sediment Results from the On-Site Drainage Ditch
Southern Wood Piedmont - Former Gulf, NC Facility

		Sample ID	SW-013-SL (NCDENR)	8752	8753	8754	SW-014-SL (NCDENR)	SW-015-SL	SW-015-SL (NCDENR)	SW-023-SL	SW-023-SL (NCDENR)
		Station ID	SW-013-SL	8752	8753	8754	SW-014-SL	SW-015-SL	SW-015-SL	SW-023-SL	SW-023-SL
		Date Collected	11/14/1995	5/3/1990	5/3/1990	5/3/1990	11/14/1995	11/14/1995	11/14/1995	11/14/1995	11/14/1995
		Waterbody	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch
		Location	Background	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream
		Depth Interval	0 - 12"	NA	NA	NA	0 - 12"	0 - 6"	0 - 6"	0 - 6"	0 - 6"
ChemClass	Analyte Name	Conc Unit									
PCDD/Fs	2,3,7,8-TeCDF	ng/Kg dw	6 U						7 U		
PCDD/Fs	OCDD	ng/Kg dw	12000 J						92000 J		
PCDD/Fs	OCDF	ng/Kg dw	120						5000		
PCDD/F homologs	TeCDDs (total)	ng/Kg dw	7.4 J						32 J		
PCDD/F homologs	TeCDFs (total)	ng/Kg dw	23 J						27 J		
PCDD/F homologs	PeCDDs (total)	ng/Kg dw	18 J						67 J		
PCDD/F homologs	PeCDFs (total)	ng/Kg dw	120 J						140 J		
PCDD/F homologs	HxCDD (total)	ng/Kg dw	87 J						2000 J		
PCDD/F homologs	HxCDF (total)	ng/Kg dw	100 J						860 J		
PCDD/F homologs	HpCDD (total)	ng/Kg dw	1100 J						32000 J		
PCDD/F homologs	HpCDF (total)	ng/Kg dw	130 J						1200 J		
Dioxin-TEQ	Dioxin-TEQ(mammal) - Zero DL	ng/Kg dw	13.50	NC	NC	NC	NC	NC	157.12	NC	NC
Dioxin-TEQ	Dioxin-TEQ(mammal) - Half DL	ng/Kg dw	15.52	NC	NC	NC	NC	NC	177.14	NC	NC
Dioxin-TEQ	Dioxin-TEQ(avian)-Zero DL	ng/Kg dw	19.08	NC	NC	NC	NC	NC	130.87	NC	NC
Dioxin-TEQ	Dioxin-TEQ(avian)-Half DL	ng/Kg dw	24.33	NC	NC	NC	NC	NC	160.97	NC	NC
Metals	Aluminum	mg/Kg dw					12000		8100		7400
Metals	Antimony	mg/Kg dw					3 UR		3.4 UR		4 UJ
Metals	Arsenic	mg/Kg dw					6.9		3.2		3.1
Metals	Barium	mg/Kg dw					94		62		69
Metals	Beryllium	mg/Kg dw					0.71 J		0.68 J		0.5 J
Metals	Cadmium	mg/Kg dw					0.3 U		0.34 U		0.3 U
Metals	Calcium	mg/Kg dw					1400		980		1500
Metals	Chromium	mg/Kg dw					23		14		23
Metals	Cobalt	mg/Kg dw					20 U		9 U		15
Metals	Copper	mg/Kg dw					25		20 U		13
Metals	Iron	mg/Kg dw					29000		17000		15000
Metals	Lead	mg/Kg dw					14		9.7		6.2 J
Metals	Magnesium	mg/Kg dw					2200		1800		2500
Metals	Manganese	mg/Kg dw	100				350		220		260 J
Metals	Mercury	mg/Kg dw	0.06 U				0.06 U		0.07 U		0.06 U
Metals	Nickel	mg/Kg dw	17				16		14		23
Metals	Potassium	mg/Kg dw	570				530		500		170
Metals	Selenium	mg/Kg dw	0.53 U				1 U		0.52 U		0.53 U
Metals	Silver	mg/Kg dw	0.8 U				0.82 U		0.93 U		0.83 U
Metals	Sodium	mg/Kg dw	90 U				220 U		80 U		140 U
Metals	Thallium	mg/Kg dw	0.54 U				0.54 U		0.62 U		0.55 U
Metals	Tin	mg/Kg dw									
Metals	Vanadium	mg/Kg dw	30				35		24		32
Metals	Zinc	mg/Kg dw	40 U				40 U		50 U		30 UJ
General Parameters	Percent Clay	%									
General Parameters	Percent Gravel	%									
General Parameters	Percent Sand	%									
General Parameters	Percent Silt	%									
General Parameters	Total Organic Carbon	mg/Kg dw									
General Parameters	Total Solids	mg/Kg dw		79	81	81					
General Parameters	Percent Moisture (metals)	%	20						31		24
General Parameters	Percent Moisture (PCDD/F)	%	18						30		
General Parameters	Percent Moisture (SVOC)	%	20				22		35		26
General Parameters	Percent Moisture (SVOCs)	%									
General Parameters	Percent Moisture (VOCs)	%	20				22		35		26
TCLP-PAHs	Acenaphthene in TCLP Extract	mg/L									
TCLP-PAHs	Acenaphthylene in TCLP Extract	mg/L									
TCLP-PAHs	Anthracene in TCLP Extract	mg/L									
TCLP-PAHs	Benzo(a)anthracene in TCLP Extract	mg/L									
TCLP-PAHs	Benzo(a)pyrene in TCLP Extract	mg/L									
TCLP-PAHs	Benzo(b)fluoranthene in TCLP Extract	mg/L									
TCLP-PAHs	Benzo(g,h,i)perylene in TCLP Extract	mg/L									
TCLP-PAHs	Benzo(k)fluoranthene in TCLP Extract	mg/L									
TCLP-PAHs	Carbazole in TCLP Extract	mg/L									
TCLP-PAHs	Chrysene in TCLP Extract	mg/L									

Table A-2. Compilation of Sediment Results from the On-Site Drainage Ditch
Southern Wood Piedmont - Former Gulf, NC Facility

		Sample ID	SW-013-SL (NCDENR)	8752	8753	8754	SW-014-SL (NCDENR)	SW-015-SL	SW-015-SL (NCDENR)	SW-023-SL	SW-023-SL (NCDENR)
		Station ID	SW-013-SL	8752	8753	8754	SW-014-SL	SW-015-SL	SW-015-SL	SW-023-SL	SW-023-SL
		Date Collected	11/14/1995	5/3/1990	5/3/1990	5/3/1990	11/14/1995	11/14/1995	11/14/1995	11/14/1995	11/14/1995
		Waterbody	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch
		Location	Background	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream
		Depth Interval	0 - 12"	NA	NA	NA	0 - 12"	0 - 6"	0 - 6"	0 - 6"	0 - 6"
ChemClass	Analyte Name	Conc Unit									
TCLP-PAHs	Dibenzo(a,h)anthracene in TCLP Extract	mg/L									
TCLP-PAHs	Dibenzofuran in TCLP Extract	mg/L									
TCLP-PAHs	Dimethyl Naphthalene in TCLP Extract	mg/L									
TCLP-PAHs	Fluoranthene in TCLP Extract	mg/L									
TCLP-PAHs	Fluorene in TCLP Extract	mg/L									
TCLP-PAHs	Indeno(1,2,3-cd)pyrene in TCLP Extract	mg/L									
TCLP-PAHs	Isophorone in TCLP Extract	mg/L									
TCLP-PAHs	Naphthalene in TCLP Extract	mg/L									
TCLP-PAHs	Phenanthrene in TCLP Extract	mg/L									
TCLP-PAHs	Pyrene in TCLP Extract	mg/L									
TCLP-Phenolics	2,3,4,6-Tetrachlorophenol in TCLP Extract	mg/L									
TCLP-Phenolics	2,4,5-Trichlorophenol in TCLP Extract	mg/L									
TCLP-Phenolics	2,4-Dimethylphenol in TCLP Extract	mg/L									
TCLP-Phenolics	2-Chlorophenol in TCLP Extract	mg/L									
TCLP-Phenolics	o-Cresol in TCLP Extract	mg/L									
TCLP-Phenolics	p-chloro-m-cresol in TCLP Extract	mg/L									
TCLP-Phenolics	Pentachlorophenol in TCLP Extract	mg/L									
TCLP-Phenolics	Phenol in TCLP Extract	mg/L									
TCLP-SVOCs	Aniline in TCLP Extract	mg/L									

Table A-2. Compilation of Sediment Results from the On-Site Drainage Ditch
Southern Wood Piedmont - Former Gulf, NC Facility

		Sample ID	SW-024-SL	SW-024-SL (NCDENR)	SW-053-SD	SW-054-SD	SW-055-SD	SW-056-SD	SW-057-SD	SW-058-SD	SW-059-SD	SW-060-SD
		Station ID	SW-024-SL	SW-024-SL	SW-053-SD	SW-054-SD	SW-055-SD	SW-056-SD	SW-057-SD	SW-058-SD	SW-059-SD	SW-060-SD
		Date Collected	11/14/1995	11/14/1995	7/15/2002 7/19/2006 [1]	7/16/2002	7/17/2002	7/16/2002	7/16/2002	7/16/2002	7/19/2006	7/16/2002
		Waterbody	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch
		Location	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream
		Depth Interval	0 - 6"	0 - 6"	0 - 2"	0 - 2"	0 - 2"	0 - 3"	0 - 3"	0 - 3"	0 - 3"	0 - 3"
ChemClass	Analyte Name	Conc Unit										
VOCs	1,1,1-Trichloroethane	mg/Kg dw		0.013 U								
VOCs	1,1,2,2-Tetrachloroethane	mg/Kg dw		0.013 U								
VOCs	1,1,2-Trichloroethane	mg/Kg dw		0.013 U								
VOCs	1,1-Dichloroethane	mg/Kg dw		0.013 U								
VOCs	1,1-Dichloroethene	mg/Kg dw		0.013 U								
VOCs	1,2,4-Trichlorobenzene	mg/Kg dw		0.42 U								
VOCs	1,2-Dichlorobenzene	mg/Kg dw		0.42 U								
VOCs	1,2-Dichloroethane	mg/Kg dw		0.013 U								
VOCs	1,2-Dichloroethene (total)	mg/Kg dw		0.013 U								
VOCs	1,2-Dichloropropane	mg/Kg dw		0.013 U								
VOCs	1,3-Dichlorobenzene	mg/Kg dw		0.42 U								
VOCs	1,4-Dichlorobenzene	mg/Kg dw		0.42 U								
VOCs	2-Butanone	mg/Kg dw	0.025 U	0.013 U								
VOCs	4-Bromophenyl phenyl ether	mg/Kg dw		0.42 U								
VOCs	Acetone	mg/Kg dw		0.013 U								
VOCs	Benzene	mg/Kg dw	0.005 U	0.013 U								
VOCs	Bis(2-chloroethoxy) methane	mg/Kg dw		0.42 U								
VOCs	Bis(2-Chloroethyl) ether	mg/Kg dw		0.42 U								
VOCs	Bis(2-Chloroisopropyl) ether	mg/Kg dw		0.42 U								
VOCs	Bromodichloromethane	mg/Kg dw		0.013 U								
VOCs	Bromoform	mg/Kg dw		0.013 U								
VOCs	Bromomethane	mg/Kg dw		0.013 UR								
VOCs	Carbon disulfide	mg/Kg dw		0.013 U								
VOCs	Carbon tetrachloride	mg/Kg dw		0.013 U								
VOCs	Chlorobenzene	mg/Kg dw		0.013 U								
VOCs	Chloroethane	mg/Kg dw		0.013 U								
VOCs	Chloroform	mg/Kg dw		0.013 U								
VOCs	Chloromethane	mg/Kg dw		0.013 U								
VOCs	cis-1,3-Dichloropropene	mg/Kg dw		0.013 U								
VOCs	Dibromochloromethane	mg/Kg dw		0.013 U								
VOCs	Ethylbenzene	mg/Kg dw	0.005 U	0.013 U								
VOCs	Methyl butyl ketone	mg/Kg dw		0.013 U								
VOCs	Methyl isobutyl ketone	mg/Kg dw		0.013 U								
VOCs	Methylene chloride	mg/Kg dw	0.005 U	0.013 U								
VOCs	m-Xylene	mg/Kg dw										
VOCs	o-Xylene	mg/Kg dw										
VOCs	p-Xylene	mg/Kg dw										
VOCs	Styrene	mg/Kg dw		0.013 U								
VOCs	Tetrachloroethene	mg/Kg dw		0.013 U								
VOCs	Toluene	mg/Kg dw	0.057	0.013 U								
VOCs	trans-1,3-Dichloropropene	mg/Kg dw		0.013 U								
VOCs	Trichloroethene	mg/Kg dw		0.013 U								
VOCs	Vinyl chloride	mg/Kg dw		0.013 U								
VOCs	Xylenes (total)	mg/Kg dw	0.005 U	0.013 U								
SVOCs	2,4-Dinitrotoluene	mg/Kg dw		0.42 U								
SVOCs	2,6-Dinitrotoluene	mg/Kg dw		0.42 U								
SVOCs	2-Chloronaphthalene	mg/Kg dw		0.42 U								
SVOCs	2-Methylphenol	mg/Kg dw	0.01 U	0.42 U	0.39 U	0.5 U	0.49 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
SVOCs	2-Nitroaniline	mg/Kg dw		1 U								
SVOCs	3,3'-Dichlorobenzidine	mg/Kg dw		0.42 U								
SVOCs	3-Nitroaniline	mg/Kg dw		1 U								
SVOCs	4-Chloroaniline	mg/Kg dw		0.42 U								
SVOCs	4-Chlorophenyl Phenyl Ether	mg/Kg dw		0.42 U								
SVOCs	4-Nitroaniline	mg/Kg dw		1 U								
SVOCs	Aniline	mg/Kg dw	0.05 U		0.39 U	0.5 U	0.49 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
SVOCs	Biphenyl	mg/Kg dw										
SVOCs	Bis(2-ethylhexyl) phthalate	mg/Kg dw		0.42 U								
SVOCs	Butyl benzyl phthalate	mg/Kg dw		0.42 U								
SVOCs	Diethylphthalate	mg/Kg dw		0.42 U								
SVOCs	Dimethylphthalate	mg/Kg dw		0.42 U								

Table A-2. Compilation of Sediment Results from the On-Site Drainage Ditch
Southern Wood Piedmont - Former Gulf, NC Facility

		Sample ID	SW-024-SL	SW-024-SL (NCDENR)	SW-053-SD	SW-054-SD	SW-055-SD	SW-056-SD	SW-057-SD	SW-058-SD	SW-059-SD	SW-060-SD
		Station ID	SW-024-SL	SW-024-SL	SW-053-SD	SW-054-SD	SW-055-SD	SW-056-SD	SW-057-SD	SW-058-SD	SW-059-SD	SW-060-SD
		Date Collected	11/14/1995	11/14/1995	7/15/2002 7/19/2006 [1]	7/15/2002	7/17/2002	7/16/2002	7/16/2002	7/15/2002	7/19/2006	7/16/2002
		Waterbody	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage DRch
		Location	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream
		Depth Interval	0 - 6"	0 - 6"	0 - 2"	0 - 2"	0 - 2"	0 - 3"	0 - 3"	0 - 3"	0 - 3"	0 - 3"
ChemClass	Analyte Name	Conc Unit										
SVOCs	Di-n-butylphthalate	mg/Kg dw		0.42 U								
SVOCs	Di-n-octylphthalate	mg/Kg dw		0.42 U								
SVOCs	Hexachlorobenzene	mg/Kg dw		0.42 UJ								
SVOCs	Hexachlorobutadiene	mg/Kg dw		0.42 U								
SVOCs	Hexachlorocyclopentadiene	mg/Kg dw		0.42 U								
SVOCs	Hexachloroethane	mg/Kg dw		0.42 U								
SVOCs	Isophorone	mg/Kg dw		0.42 U	0.39 U	0.5 U	0.49 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
SVOCs	Nitrobenzene	mg/Kg dw		0.42 U								
SVOCs	N-nitrosodi-n-propylamine	mg/Kg dw		0.42 U								
SVOCs	N-nitrosodiphenylamine	mg/Kg dw		0.42 U								
Phenolics	2,3,4,6-Tetrachlorophenol	mg/Kg dw	0.05 U		0.39 U	0.5 U	0.49 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
Phenolics	2,4,5-Trichlorophenol	mg/Kg dw		1 U								
Phenolics	2,4,6-Trichlorophenol	mg/Kg dw	0.01 U	0.42 U	0.39 U	0.5 U	0.49 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
Phenolics	2,4-Dichlorophenol	mg/Kg dw		0.42 U								
Phenolics	2,4-Dimethylphenol	mg/Kg dw	0.01 U	0.42 U	0.39 U	0.5 U	0.49 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
Phenolics	2,4-Dinitrophenol	mg/Kg dw		1 U								
Phenolics	2-Chlorophenol	mg/Kg dw	0.01 U	0.42 U	0.39 U	0.5 U	0.49 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
Phenolics	2-Methyl-4,6-dinitrophenol	mg/Kg dw		1 U								
Phenolics	2-Nitrophenol	mg/Kg dw		0.42 U								
Phenolics	3&4-Methylphenol	mg/Kg dw	0.01 U	0.42 U								
Phenolics	4-Chloro-3-methylphenol	mg/Kg dw	0.01 U	0.42 U	ND	0.5 U	0.49 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
Phenolics	4-Methylphenol	mg/Kg dw			0.39 U			0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
Phenolics	4-Nitrophenol	mg/Kg dw		1 U								
Phenolics	Pentachlorophenol	mg/Kg dw	0.05 U	0.25 J	0.39 U	0.5 U	0.49 U	1.7 U	1.7 U	1.7 U	0.76 J	1.7 U
Phenolics	Phenol	mg/Kg dw	0.01 U	0.42 U	0.065J	0.071J	0.49 U	0.12 J	0.33 U	0.33 U	0.33 U	0.33 U
PAHs	1-Methylnaphthalene	mg/Kg dw										
PAHs	2-Methylnaphthalene	mg/Kg dw	0.01 U	0.42 U	0.39 U	0.5 U	0.49 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
PAHs	Acenaphthene	mg/Kg dw	0.01 U	0.42 UJ	0.39 U	0.5 U	0.49 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
PAHs	Acenaphthylene	mg/Kg dw		0.42 U	0.39 U	0.5 U	0.49 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
PAHs	Anthracene	mg/Kg dw	0.01 U	0.14 J	0.086J	0.64	0.49 U	0.33 U	0.33 U	0.33 U	0.12 J	0.33 U
PAHs	Benzo(a)anthracene	mg/Kg dw	0.01 U	0.17 J	0.17J	0.045J	0.49 U	0.014 J	0.33 U	0.33 U	0.26 J	0.14 J
PAHs	Benzo(a)pyrene	mg/Kg dw	0.01 U	0.35 J	0.14J	0.067J	0.49 U	0.33 U	0.33 U	0.33 U	0.41	0.17 J
PAHs	Benzo(b&k)fluoranthene	mg/Kg dw		0.93				0.056 J	0.073 J	0.33 U	1.7	0.66
PAHs	Benzo(b)fluoranthene	mg/Kg dw	0.01 U		0.23J	0.5 U	0.19J	0.03 J	0.042 J	0.33 U	1	0.37
PAHs	Benzo(g,h,i)perylene	mg/Kg dw		0.17 J	0.098J	0.076J	0.092J	0.032 J	0.034 J	0.33 U	0.36 J	0.33 U
PAHs	Benzo(k)fluoranthene	mg/Kg dw	0.01 U		0.19J	0.18J	0.12J	0.027 J	0.042 J	0.33 U	0.65	0.3 J
PAHs	Carbazole	mg/Kg dw	0.01 U	0.42 U	0.39 U	0.5 U	0.49 U	0.33 U	0.33 U	0.33 U	0.044 J	0.33 U
PAHs	Chrysene	mg/Kg dw	0.01 U	0.32 J	0.24J	0.092J	0.49 U	0.027 J	0.33 U	0.33 U	0.79	0.23 J
PAHs	Dibenzo(a,h)anthracene	mg/Kg dw	0.01 U	0.076 J	0.39 U	0.5 U	0.49 U	0.33 U	0.33 U	0.33 U	0.15 J	0.33 U
PAHs	Dibenzofuran	mg/Kg dw		0.42 U	0.39 U	0.5 U	0.49 U	0.33 U	0.026 J	0.33 U	0.33 U	0.33 U
PAHs	Fluoranthene	mg/Kg dw	0.01 U	0.21 J	0.38J	0.5 U	0.49 U	0.33 U	0.33 U	0.33 U	0.36 J	0.14 J
PAHs	Fluorene	mg/Kg dw	0.01 U	0.42 U	0.39 U	0.5 U	0.49 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
PAHs	Indeno(1,2,3-cd)pyrene	mg/Kg dw	0.01 U	0.29 J	0.093J	0.5 U	0.49 U	0.33 U	0.33 U	0.33 U	0.39	0.11 J
PAHs	Naphthalene	mg/Kg dw	0.01 U	0.42 U	0.39 U	0.5 U	0.49 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
PAHs	Phenanthrene	mg/Kg dw	0.01 U	0.054	0.034J	0.5 U	0.49 U	0.33 U	0.33 U	0.33 U	0.1 J	0.021 J
PAHs	Pyrene	mg/Kg dw		0.2 J	0.34J	0.08J	0.097J	0.33 U	0.068 J	0.33 U	0.69	0.2 J
PCDD/Fs	1,2,3,4,6,7,8-HpCDD	ng/Kg dw		5800	11200	6220			2690		33000	
PCDD/Fs	1,2,3,4,6,7,8-HpCDF	ng/Kg dw		680	1220	750			328		3600	
PCDD/Fs	1,2,3,4,7,8,9-HpCDF	ng/Kg dw		55	91	58.1			26.8		276	
PCDD/Fs	1,2,3,4,7,8-HxCDD	ng/Kg dw		17	24.1	18.5			7.03		117	
PCDD/Fs	1,2,3,4,7,8-HxCDF	ng/Kg dw		200 U	44.8	26.1			12.1		123	
PCDD/Fs	1,2,3,6,7,8-HxCDD	ng/Kg dw		120	228	138			60		634	
PCDD/Fs	1,2,3,6,7,8-HxCDF	ng/Kg dw		14 U	10.8	7.07			5 U		47.2	
PCDD/Fs	1,2,3,7,8,9-HxCDD	ng/Kg dw		60	45.9	33.9			13.3		207	
PCDD/Fs	1,2,3,7,8,9-HxCDF	ng/Kg dw		14 U	26.9	17.8			5 U		19.2	
PCDD/Fs	1,2,3,7,8-PeCDD	ng/Kg dw		4 J	5 U	5 U			5 U		32.7	
PCDD/Fs	1,2,3,7,8-PeCDF	ng/Kg dw		14 U	5 U	5 U			5 U		5 U	
PCDD/Fs	2,3,4,6,7,8-HxCDF	ng/Kg dw		10	5 U	5 U			7.32		100	
PCDD/Fs	2,3,4,7,8-PeCDF	ng/Kg dw		14 U	8.58	5 U			5 U		35.9	
PCDD/Fs	2,3,7,8-TeCDD	ng/Kg dw		5.6 U	1 U	1 U			1 U		3.35	

Table A-2. Compilation of Sediment Results from the On-Site Drainage Ditch
Southern Wood Piedmont - Former Gulf, NC Facility

		Sample ID	SW-024-SL	SW-024-SL (NCDENR)	SW-053-SD	SW-054-SD	SW-055-SD	SW-056-SD	SW-057-SD	SW-058-SD	SW-059-SD	SW-060-SD
		Station ID	SW-024-SL	SW-024-SL	SW-053-SD	SW-054-SD	SW-055-SD	SW-056-SD	SW-057-SD	SW-058-SD	SW-059-SD	SW-060-SD
		Date Collected	11/14/1995	11/14/1995	7/15/2002 7/19/2006 [1]	7/15/2002	7/17/2002	7/16/2002	7/16/2002	7/18/2002	7/19/2006	7/18/2002
		Waterbody	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch
		Location	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream
		Depth Interval	0 - 6"	0 - 6"	0 - 2"	0 - 2"	0 - 2"	0 - 3"	0 - 3"	0 - 3"	0 - 3"	0 - 3"
ChemClass	Analyte Name	Conc Unit										
PCDD/Fs	2,3,7,8-TeCDF	ng/Kg dw		5.6 U	1 U	1 U			1 U		1 U	
PCDD/Fs	OCDD	ng/Kg dw		63000 J	82500	54700E			33400		138000	
PCDD/Fs	OCDF	ng/Kg dw		3400	4830	3320			1620		13400	
PCDD/F homologs	TeCDDs (total)	ng/Kg dw		2 J					1 U		92	
PCDD/F homologs	TeCDFs (total)	ng/Kg dw		3 J					2.56		78.8	
PCDD/F homologs	PeCDDs (total)	ng/Kg dw		22 J					5 U		391	
PCDD/F homologs	PeCDFs (total)	ng/Kg dw		43 J					18.8		428	
PCDD/F homologs	HxCDD (total)	ng/Kg dw		900 J					382		4590	
PCDD/F homologs	HxCDF (total)	ng/Kg dw		580 J					310		3350	
PCDD/F homologs	HpCDD (total)	ng/Kg dw		16000 J					7360		79700	
PCDD/F homologs	HpCDF (total)	ng/Kg dw		860 J					1650		19200	
Dioxin-TEQ	Dioxin-TEQ(mammal) - Zero DL	ng/Kg dw	NC	109.97	191.9	111.8		NC	50.93	NC	585.74	NC
Dioxin-TEQ	Dioxin-TEQ(mammal) - Half DL	ng/Kg dw	NC	126.76	195.3	115.9		NC	55.30	NC	585.87	NC
Dioxin-TEQ	Dioxin-TEQ(avian)-Zero DL	ng/Kg dw	NC	89.54	132.2	80.1		NC	44.02	NC	344.88	NC
Dioxin-TEQ	Dioxin-TEQ(avian)-Half DL	ng/Kg dw	NC	114.24	136.2	86.6		NC	50.77	NC	345.63	NC
Metals	Aluminum	mg/Kg dw		13000								
Metals	Antimony	mg/Kg dw		4 UJ								
Metals	Arsenic	mg/Kg dw		3.9								
Metals	Barium	mg/Kg dw		150								
Metals	Beryllium	mg/Kg dw		0.9 J								
Metals	Cadmium	mg/Kg dw		0.29 U								
Metals	Calcium	mg/Kg dw		1400								
Metals	Chromium	mg/Kg dw		19								
Metals	Cobalt	mg/Kg dw		10 U								
Metals	Copper	mg/Kg dw		28								
Metals	Iron	mg/Kg dw		25000								
Metals	Lead	mg/Kg dw		11								
Metals	Magnesium	mg/Kg dw		3200								
Metals	Manganese	mg/Kg dw		290								
Metals	Mercury	mg/Kg dw		0.06 U								
Metals	Nickel	mg/Kg dw		14								
Metals	Potassium	mg/Kg dw		360								
Metals	Selenium	mg/Kg dw		0.51 U								
Metals	Silver	mg/Kg dw		0.79 U								
Metals	Sodium	mg/Kg dw		160 U								
Metals	Thallium	mg/Kg dw		0.53 U								
Metals	Tin	mg/Kg dw										
Metals	Vanadium	mg/Kg dw		41								
Metals	Zinc	mg/Kg dw		30 UJ								
General Parameters	Percent Clay	%									15.4	
General Parameters	Percent Gravel	%									0 U	
General Parameters	Percent Sand	%									15	
General Parameters	Percent Silt	%									69.6	
General Parameters	Total Organic Carbon	mg/Kg dw									9040	
General Parameters	Total Solids	mg/Kg dw										
General Parameters	Percent Moisture (metals)	%		23								
General Parameters	Percent Moisture (PCDD/F)	%		21								
General Parameters	Percent Moisture (SVOC)	%		21								
General Parameters	Percent Moisture (SVOCs)	%										
General Parameters	Percent Moisture (VOCs)	%		21								
TCLP-PAHs	Acenaphthene in TCLP Extract	mg/L									0.009 U	
TCLP-PAHs	Acenaphthylene in TCLP Extract	mg/L									0.009 U	
TCLP-PAHs	Anthracene in TCLP Extract	mg/L									0.008 U	
TCLP-PAHs	Benzo(a)anthracene in TCLP Extract	mg/L									0.0065 U	
TCLP-PAHs	Benzo(a)pyrene in TCLP Extract	mg/L									0.0075 U	
TCLP-PAHs	Benzo(b)fluoranthene in TCLP Extract	mg/L									0.008 U	
TCLP-PAHs	Benzo(g,h,i)perylene in TCLP Extract	mg/L									0.012 U	
TCLP-PAHs	Benzo(k)fluoranthene in TCLP Extract	mg/L									0.006 U	
TCLP-PAHs	Carbazole in TCLP Extract	mg/L									0.0085 U	
TCLP-PAHs	Chrysene in TCLP Extract	mg/L									0.0044 U	

Table A-2. Compilation of Sediment Results from the On-Site Drainage Ditch
Southern Wood Piedmont - Former Gulf, NC Facility

		Sample ID	SW-024-SL	SW-024-SL (NCDENR)	SW-053-SD	SW-054-SD	SW-055-SD	SW-056-SD	SW-057-SD	SW-058-SD	SW-059-SD	SW-060-SD
		Station ID	SW-024-SL	SW-024-SL	SW-053-SD	SW-054-SD	SW-055-SD	SW-056-SD	SW-057-SD	SW-058-SD	SW-059-SD	SW-060-SD
		Date Collected	11/14/1995	11/14/1995	7/15/2002 7/19/2006 [1]	7/16/2002	7/17/2002	7/16/2002	7/15/2002	7/18/2002	7/19/2006	7/18/2002
		Waterbody	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch	Drainage Ditch
		Location	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream
		Depth Interval	0 - 6"	0 - 6"	0 - 2"	0 - 2"	0 - 2"	0 - 3"	0 - 3"	0 - 3"	0 - 3"	0 - 3"
ChemClass	Analyte Name	Conc Unit										
TCLP-PAHs	Dibenzo(a,h)anthracene in TCLP Extract	mg/L									0.014 U	
TCLP-PAHs	Dibenzofuran in TCLP Extract	mg/L									0.0075 U	
TCLP-PAHs	Dimethyl Naphthalene in TCLP Extract	mg/L									0.025 U	
TCLP-PAHs	Fluoranthene in TCLP Extract	mg/L									0.01 U	
TCLP-PAHs	Fluorene in TCLP Extract	mg/L									0.0085 U	
TCLP-PAHs	Indeno(1,2,3-cd)pyrene in TCLP Extract	mg/L									0.016 U	
TCLP-PAHs	Isophorone in TCLP Extract	mg/L									0.0095 U	
TCLP-PAHs	Naphthalene in TCLP Extract	mg/L									0.0095 U	
TCLP-PAHs	Phenanthrene in TCLP Extract	mg/L									0.0075 U	
TCLP-PAHs	Pyrene in TCLP Extract	mg/L									0.006 U	
TCLP-Phenolics	2,3,4,6-Tetrachlorophenol in TCLP Extract	mg/L									0.0065 U	
TCLP-Phenolics	2,4,5-Trichlorophenol in TCLP Extract	mg/L									0.0075 U	
TCLP-Phenolics	2,4-Dimethylphenol in TCLP Extract	mg/L									0.01 U	
TCLP-Phenolics	2-Chlorophenol in TCLP Extract	mg/L									0.0075 U	
TCLP-Phenolics	o-Cresol in TCLP Extract	mg/L									0.0075 U	
TCLP-Phenolics	p-chloro-m-cresol in TCLP Extract	mg/L									0.0085 U	
TCLP-Phenolics	Pentachlorophenol in TCLP Extract	mg/L									0.01 U	
TCLP-Phenolics	Phenol in TCLP Extract	mg/L									0.0065 U	
TCLP-SVOCs	Aniline in TCLP Extract	mg/L									0.008 U	

Table A-2. Compilation of Sediment Results from the On-Site Drainage Ditch
Southern Wood Piedmont - Former Gulf, NC Facility

		Sample ID	SW-158-SD	SWP-003
		Station ID	SW-158-SD	SWP-003
		Date Collected	7/18/2002	9/21/1983
		Waterbody	Drainage Ditch	Drainage Ditch
		Location	Downstream	Downstream
		Depth Interval	0 - 3"	Surface
ChemClass	**Analyte Name**	**Conc Unit**		
VOCs	1,1,1-Trichloroethane	mg/Kg dw		
VOCs	1,1,2,2-Tetrachloroethane	mg/Kg dw		
VOCs	1,1,2-Trichloroethane	mg/Kg dw		
VOCs	1,1-Dichloroethane	mg/Kg dw		
VOCs	1,1-Dichloroethene	mg/Kg dw		
VOCs	1,2,4-Trichlorobenzene	mg/Kg dw		
VOCs	1,2-Dichlorobenzene	mg/Kg dw		
VOCs	1,2-Dichloroethane	mg/Kg dw		
VOCs	1,2-Dichloroethene (total)	mg/Kg dw		
VOCs	1,2-Dichloropropane	mg/Kg dw		
VOCs	1,3-Dichlorobenzene	mg/Kg dw		
VOCs	1,4-Dichlorobenzene	mg/Kg dw		
VOCs	2-Butanone	mg/Kg dw		
VOCs	4-Bromophenyl phenyl ether	mg/Kg dw		
VOCs	Acetone	mg/Kg dw		
VOCs	Benzene	mg/Kg dw		
VOCs	Bis(2-chloroethoxy) methane	mg/Kg dw		
VOCs	Bis(2-Chloroethyl) ether	mg/Kg dw		
VOCs	Bis(2-Chloroisopropyl) ether	mg/Kg dw		
VOCs	Bromodichloromethane	mg/Kg dw		
VOCs	Bromoform	mg/Kg dw		
VOCs	Bromomethane	mg/Kg dw		
VOCs	Carbon disulfide	mg/Kg dw		
VOCs	Carbon tetrachloride	mg/Kg dw		
VOCs	Chlorobenzene	mg/Kg dw		
VOCs	Chloroethane	mg/Kg dw		
VOCs	Chloroform	mg/Kg dw		
VOCs	Chloromethane	mg/Kg dw		
VOCs	cis-1,3-Dichloropropene	mg/Kg dw		
VOCs	Dibromochloromethane	mg/Kg dw		
VOCs	Ethylbenzene	mg/Kg dw		
VOCs	Methyl butyl ketone	mg/Kg dw		
VOCs	Methyl isobutyl ketone	mg/Kg dw		
VOCs	Methylene chloride	mg/Kg dw		
VOCs	m-Xylene	mg/Kg dw		
VOCs	o-Xylene	mg/Kg dw		
VOCs	p-Xylene	mg/Kg dw		
VOCs	Styrene	mg/Kg dw		
VOCs	Tetrachloroethene	mg/Kg dw		
VOCs	Toluene	mg/Kg dw		
VOCs	trans-1,3-Dichloropropene	mg/Kg dw		
VOCs	Trichloroethene	mg/Kg dw		
VOCs	Vinyl chloride	mg/Kg dw		
VOCs	Xylenes (total)	mg/Kg dw		
SVOCs	2,4-Dinitrotoluene	mg/Kg dw		
SVOCs	2,6-Dinitrotoluene	mg/Kg dw		
SVOCs	2-Chloronaphthalene	mg/Kg dw		
SVOCs	2-Methylphenol	mg/Kg dw	0.33 U	2 U
SVOCs	2-Nitroaniline	mg/Kg dw		
SVOCs	3,3'-Dichlorobenzidine	mg/Kg dw		
SVOCs	3-Nitroaniline	mg/Kg dw		
SVOCs	4-Chloroaniline	mg/Kg dw		
SVOCs	4-Chlorophenyl Phenyl Ether	mg/Kg dw		
SVOCs	4-Nitroaniline	mg/Kg dw		
SVOCs	Aniline	mg/Kg dw	0.33 U	2 U
SVOCs	Biphenyl	mg/Kg dw		
SVOCs	Bis(2-ethylhexyl) phthalate	mg/Kg dw		
SVOCs	Butyl benzyl phthalate	mg/Kg dw		
SVOCs	Diethylphthalate	mg/Kg dw		
SVOCs	Dimethylphthalate	mg/Kg dw		

Table A-2. Compilation of Sediment Results from the On-Site Drainage Ditch
Southern Wood Piedmont - Former Gulf, NC Facility

		Sample ID	SW-158-SD	SWP-003
		Station ID	SW-158-SD	SWP-003
		Date Collected	7/18/2002	9/21/1983
		Waterbody	Drainage Ditch	Drainage Ditch
		Location	Downstream	Downstream
		Depth Interval	0 - 3"	Surface
ChemClass	Analyte Name	Conc Unit		
SVOCs	Di-n-butylphthalate	mg/Kg dw		
SVOCs	Di-n-octylphthalate	mg/Kg dw		
SVOCs	Hexachlorobenzene	mg/Kg dw		
SVOCs	Hexachlorobutadiene	mg/Kg dw		
SVOCs	Hexachlorocyclopentadiene	mg/Kg dw		
SVOCs	Hexachloroethane	mg/Kg dw		
SVOCs	Isophorone	mg/Kg dw	0.33 U	2 U
SVOCs	Nitrobenzene	mg/Kg dw		
SVOCs	N-nitrosodi-n-propylamine	mg/Kg dw		
SVOCs	N-nitrosodiphenylamine	mg/Kg dw		
Phenolics	2,3,4,6-Tetrachlorophenol	mg/Kg dw	0.33 U	
Phenolics	2,4,5-Trichlorophenol	mg/Kg dw		
Phenolics	2,4,6-Trichlorophenol	mg/Kg dw	0.33 U	2 U
Phenolics	2,4-Dichlorophenol	mg/Kg dw		
Phenolics	2,4-Dimethylphenol	mg/Kg dw	0.33 U	2 U
Phenolics	2,4-Dinitrophenol	mg/Kg dw		
Phenolics	2-Chlorophenol	mg/Kg dw	0.33 U	2 U
Phenolics	2-Methyl-4,6-dinitrophenol	mg/Kg dw		
Phenolics	2-Nitrophenol	mg/Kg dw		
Phenolics	3&4-Methylphenol	mg/Kg dw		2 U
Phenolics	4-Chloro-3-methylphenol	mg/Kg dw	0.33 U	2 U
Phenolics	4-Methylphenol	mg/Kg dw	0.33 U	
Phenolics	4-Nitrophenol	mg/Kg dw		
Phenolics	Pentachlorophenol	mg/Kg dw	1.7 U	11
Phenolics	Phenol	mg/Kg dw	0.33 U	2 U
PAHs	1-Methylnaphthalene	mg/Kg dw		
PAHs	2-Methylnaphthalene	mg/Kg dw	0.33 U	2 U
PAHs	Acenaphthene	mg/Kg dw	0.33 U	2 U
PAHs	Acenaphthylene	mg/Kg dw	0.33 U	0.5 J
PAHs	Anthracene	mg/Kg dw	0.33 U	8.3
PAHs	Benzo(a)anthracene	mg/Kg dw	0.33 U	3.9
PAHs	Benzo(a)pyrene	mg/Kg dw	0.33 U	3.2
PAHs	Benzo(b&k)fluoranthene	mg/Kg dw	0.33 U	
PAHs	Benzo(b)fluoranthene	mg/Kg dw	0.33 U	7.9
PAHs	Benzo(g,h,i)perylene	mg/Kg dw	0.33 U	2 U
PAHs	Benzo(k)fluoranthene	mg/Kg dw	0.33 U	
PAHs	Carbazole	mg/Kg dw	0.33 U	
PAHs	Chrysene	mg/Kg dw	0.33 U	10
PAHs	Dibenzo(a,h)anthracene	mg/Kg dw	0.33 U	2 U
PAHs	Dibenzofuran	mg/Kg dw	0.33 U	2 U
PAHs	Fluoranthene	mg/Kg dw	0.33 U	16
PAHs	Fluorene	mg/Kg dw	0.33 U	1.1 J
PAHs	Indeno(1,2,3-cd)pyrene	mg/Kg dw	0.33 U	2 U
PAHs	Naphthalene	mg/Kg dw	0.33 U	2 U
PAHs	Phenanthrene	mg/Kg dw	0.33 U	2 J
PAHs	Pyrene	mg/Kg dw	0.33 U	12
PCDD/Fs	1,2,3,4,6,7,8-HpCDD	ng/Kg dw		
PCDD/Fs	1,2,3,4,6,7,8-HpCDF	ng/Kg dw		
PCDD/Fs	1,2,3,4,7,8,9-HpCDF	ng/Kg dw		
PCDD/Fs	1,2,3,4,7,8-HxCDD	ng/Kg dw		
PCDD/Fs	1,2,3,4,7,8-HxCDF	ng/Kg dw		
PCDD/Fs	1,2,3,6,7,8-HxCDD	ng/Kg dw		
PCDD/Fs	1,2,3,6,7,8-HxCDF	ng/Kg dw		
PCDD/Fs	1,2,3,7,8,9-HxCDD	ng/Kg dw		
PCDD/Fs	1,2,3,7,8,9-HxCDF	ng/Kg dw		
PCDD/Fs	1,2,3,7,8-PeCDD	ng/Kg dw		
PCDD/Fs	1,2,3,7,8-PeCDF	ng/Kg dw		
PCDD/Fs	2,3,4,6,7,8-HxCDF	ng/Kg dw		
PCDD/Fs	2,3,4,7,8-PeCDF	ng/Kg dw		
PCDD/Fs	2,3,7,8-TeCDD	ng/Kg dw		

Table A-2. Compilation of Sediment Results from the On-Site Drainage Ditch
Southern Wood Piedmont - Former Gulf, NC Facility

		Sample ID	SW-158-SD	SWP-003
		Station ID	SW-158-SD	SWP-003
		Date Collected	7/18/2002	9/21/1983
		Waterbody	Drainage Ditch	Drainage Ditch
		Location	Downstream	Downstream
		Depth Interval	0 - 3"	Surface
ChemClass	Analyte Name	Conc Unit		
PCDD/Fs	2,3,7,8-TeCDF	ng/Kg dw		
PCDD/Fs	OCDD	ng/Kg dw		
PCDD/Fs	OCDF	ng/Kg dw		
PCDD/F homologs	TeCDDs (total)	ng/Kg dw		
PCDD/F homologs	TeCDFs (total)	ng/Kg dw		
PCDD/F homologs	PeCDDs (total)	ng/Kg dw		
PCDD/F homologs	PeCDFs (total)	ng/Kg dw		
PCDD/F homologs	HxCDD (total)	ng/Kg dw		
PCDD/F homologs	HxCDF (total)	ng/Kg dw		
PCDD/F homologs	HpCDD (total)	ng/Kg dw		
PCDD/F homologs	HpCDF (total)	ng/Kg dw		
Dioxin-TEQ	Dioxin-TEQ(mammal) - Zero DL	ng/Kg dw	NC	NC
Dioxin-TEQ	Dioxin-TEQ(mammal) - Half DL	ng/Kg dw	NC	NC
Dioxin-TEQ	Dioxin-TEQ(avian)-Zero DL	ng/Kg dw	NC	NC
Dioxin-TEQ	Dioxin-TEQ(avian)-Half DL	ng/Kg dw	NC	NC
Metals	Aluminum	mg/Kg dw		8800
Metals	Antimony	mg/Kg dw		1 U
Metals	Arsenic	mg/Kg dw		6.6
Metals	Barium	mg/Kg dw		93
Metals	Beryllium	mg/Kg dw		0.32
Metals	Cadmium	mg/Kg dw		0.05 U
Metals	Calcium	mg/Kg dw		
Metals	Chromium	mg/Kg dw		26
Metals	Cobalt	mg/Kg dw		12
Metals	Copper	mg/Kg dw		18
Metals	Iron	mg/Kg dw		20000
Metals	Lead	mg/Kg dw		20
Metals	Magnesium	mg/Kg dw		
Metals	Manganese	mg/Kg dw		270
Metals	Mercury	mg/Kg dw		
Metals	Nickel	mg/Kg dw		20
Metals	Potassium	mg/Kg dw		
Metals	Selenium	mg/Kg dw		1 U
Metals	Silver	mg/Kg dw		2.9
Metals	Sodium	mg/Kg dw		
Metals	Thallium	mg/Kg dw		0.5 U
Metals	Tin	mg/Kg dw		13 X
Metals	Vanadium	mg/Kg dw		25
Metals	Zinc	mg/Kg dw		25
General Parameters	Percent Clay	%		
General Parameters	Percent Gravel	%		
General Parameters	Percent Sand	%		
General Parameters	Percent Silt	%		
General Parameters	Total Organic Carbon	mg/Kg dw		
General Parameters	Total Solids	mg/Kg dw		
General Parameters	Percent Moisture (metals)	%		
General Parameters	Percent Moisture (PCDD/F)	%		
General Parameters	Percent Moisture (SVOC)	%		
General Parameters	Percent Moisture (SVOCs)	%		26
General Parameters	Percent Moisture (VOCs)	%		
TCLP-PAHs	Acenaphthene in TCLP Extract	mg/L		
TCLP-PAHs	Acenaphthylene in TCLP Extract	mg/L		
TCLP-PAHs	Anthracene in TCLP Extract	mg/L		
TCLP-PAHs	Benzo(a)anthracene in TCLP Extract	mg/L		
TCLP-PAHs	Benzo(a)pyrene in TCLP Extract	mg/L		
TCLP-PAHs	Benzo(b)fluoranthene in TCLP Extract	mg/L		
TCLP-PAHs	Benzo(g,h,i)perylene in TCLP Extract	mg/L		
TCLP-PAHs	Benzo(k)fluoranthene in TCLP Extract	mg/L		
TCLP-PAHs	Carbazole in TCLP Extract	mg/L		
TCLP-PAHs	Chrysene in TCLP Extract	mg/L		

Table A-2. Compilation of Sediment Results from the On-Site Drainage Ditch
Southern Wood Piedmont - Former Gulf, NC Facility

		Sample ID	SW-158-SD	SWP-003
		Station ID	SW-158-SD	SWP-003
		Date Collected	7/18/2002	9/21/1983
		Waterbody	Drainage Ditch	Drainage Ditch
		Location	Downstream	Downstream
		Depth Interval	0 - 3"	Surface
ChemClass	*Analyte Name*	Conc Unit		
TCLP-PAHs	Dibenzo(a,h)anthracene in TCLP Extract	mg/L		
TCLP-PAHs	Dibenzofuran in TCLP Extract	mg/L		
TCLP-PAHs	Dimethyl Naphthalene in TCLP Extract	mg/L		
TCLP-PAHs	Fluoranthene in TCLP Extract	mg/L		
TCLP-PAHs	Fluorene in TCLP Extract	mg/L		
TCLP-PAHs	Indeno(1,2,3-cd)pyrene in TCLP Extract	mg/L		
TCLP-PAHs	Isophorone in TCLP Extract	mg/L		
TCLP-PAHs	Naphthalene in TCLP Extract	mg/L		
TCLP-PAHs	Phenanthrene in TCLP Extract	mg/L		
TCLP-PAHs	Pyrene in TCLP Extract	mg/L		
TCLP-Phenolics	2,3,4,6-Tetrachlorophenol in TCLP Extract	mg/L		
TCLP-Phenolics	2,4,5-Trichlorophenol in TCLP Extract	mg/L		
TCLP-Phenolics	2,4-Dimethylphenol in TCLP Extract	mg/L		
TCLP-Phenolics	2-Chlorophenol in TCLP Extract	mg/L		
TCLP-Phenolics	o-Cresol in TCLP Extract	mg/L		
TCLP-Phenolics	p-chloro-m-cresol in TCLP Extract	mg/L		
TCLP-Phenolics	Pentachlorophenol in TCLP Extract	mg/L		
TCLP-Phenolics	Phenol in TCLP Extract	mg/L		
TCLP-SVOCs	Aniline in TCLP Extract	mg/L		

Table A-2. Compilation of Sediment Results from the On-Site Drainage Ditch
Table Footnotes
Southern Wood Piedmont - Former Gulf, NC Facility

Notes:
Data compiled from databases from multiple sources. Missing values indicate chemical not analyzed or not reported by original data source.
Qualifiers: U = Not detected; UJ = Not detected at estimated concentration shown; J = estimated concentration; UR = Not detected and rejected (unusable result).
NA: Not available
NC: Not collected
The "TEQ (I-TEF)" values shown are from the historical datasets. The TEQ value was updated to reflect the latest TEF values for all sample calculations in the current assessment.
The TCLP results were reported for completeness, but were not used directly in the risk assessments.
[1] Date shown is for the collection of TOC and grain size only

Table A-3. Compilation of Sediment Results from the Cedar Creek
Southern Wood Piedmont - Gulf, North Carolina Facility

		Sample ID	SW-025-SD	SW-025-SD (NCDENR)	SW-026-SD	SW-026-SD (NCDENR)	SW-027-SD (NCDENR)	SW-028-SD (NCDENR)	SW-038-SD (NCDENR)	SW-039-SD	SW-039-SD (NCDENR)	SW-040-SD	SW-040-SD (NCDENR)	SW-041-SD
		Station ID		SW-025-SD		SW-026-SD	SW-027-SD	SW-028-SD	SW-038-SD		SW-039-SD		SW-040-SD	
		Date Collected	11/13/1995	11/13/1995	11/13/1995	11/13/1995	11/13/1995	11/13/1995	11/8/1995	11/8/1995	11/8/1995	11/8/1995	11/8/1995	11/8/1995
		Waterbody	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek
		Location	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background
		Depth Interval	0 - 12"	0 - 12"	0 - 12"	0 - 12"	0 - 12"	0 - 12"		0 - 4"	0 - 4"	0 - 4"	0 - 4"	0 - 4"
ChemClass	Analyte Name	Conc Unit												
VOCs	1,1,1-Trichloroethane	mg/Kg dw		0.013 U		0.012 U	0.016 U							
VOCs	1,1,2,2-Tetrachloroethane	mg/Kg dw		0.013 U		0.012 U	0.016 U							
VOCs	1,1,2-Trichloroethane	mg/Kg dw		0.013 U		0.012 U	0.016 U							
VOCs	1,1-Dichloroethane	mg/Kg dw		0.013 U		0.012 U	0.016 U							
VOCs	1,1-Dichloroethene	mg/Kg dw		0.013 U		0.012 U	0.016 U							
VOCs	1,2,4-Trichlorobenzene	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
VOCs	1,2-Dichlorobenzene	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
VOCs	1,2-Dichloroethene	mg/Kg dw		0.013 U		0.012 U	0.016 U							
VOCs	1,2-Dichloroethene (total)	mg/Kg dw		0.013 U		0.012 U	0.016 U							
VOCs	1,2-Dichloropropane	mg/Kg dw		0.013 U		0.012 U	0.016 U							
VOCs	1,3-Dichlorobenzene	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
VOCs	1,4-Dichlorobenzene	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
VOCs	2-Butanone	mg/Kg dw	0.025 U	0.013 U	0.025 U	0.012 U	0.016 U							
VOCs	4-Bromophenyl phenyl ether	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
VOCs	Acetone	mg/Kg dw		0.013 U		0.012 U	0.016 U							
VOCs	Benzene	mg/Kg dw	0.005 U	0.013 U	0.005 U	0.012 U	0.016 U							
VOCs	bis(2-Chloro-1-methylethyl) ether	mg/Kg dw								0.33 U		0.33 U		0.33 U
VOCs	Bis(2-chloroethoxy) methane	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
VOCs	Bis(2-Chloroethyl) ether	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
VOCs	Bis(2-Chloroisopropyl) ether	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U				0.41 U	
VOCs	Bromodichloromethane	mg/Kg dw		0.013 U		0.012 U	0.016 U							
VOCs	Bromoform	mg/Kg dw		0.013 U		0.012 U	0.016 U							
VOCs	Bromomethane	mg/Kg dw		0.013 UR		0.012 UR	0.016 UR							
VOCs	Carbon disulfide	mg/Kg dw		0.013 U		0.012 U	0.016 U							
VOCs	Carbon tetrachloride	mg/Kg dw		0.013 U		0.012 U	0.016 U							
VOCs	Chlorobenzene	mg/Kg dw		0.013 U		0.012 U	0.016 U							
VOCs	Chloroethane	mg/Kg dw		0.013 U		0.012 U	0.016 U							
VOCs	Chloroform	mg/Kg dw		0.013 U		0.012 U	0.016 U							
VOCs	Chloromethane	mg/Kg dw		0.013 U		0.012 U	0.016 U							
VOCs	cis-1,3-Dichloropropene	mg/Kg dw		0.013 U		0.012 U	0.016 U							
VOCs	Dibromochloromethane	mg/Kg dw		0.013 U		0.012 U	0.016 U							
VOCs	Ethylbenzene	mg/Kg dw	0.005 U	0.013 U	0.005 U	0.012 U	0.016 U							
VOCs	Methyl butyl ketone	mg/Kg dw		0.013 U		0.012 U	0.016 U							
VOCs	Methyl isobutyl ketone	mg/Kg dw		0.013 U		0.012 U	0.016 U							
VOCs	Methylene chloride	mg/Kg dw	0.005 U	0.013 U	0.005 U	0.012 U	0.016 U							
VOCs	m-Xylene	mg/Kg dw												
VOCs	o-Xylene	mg/Kg dw												
VOCs	p-Xylene	mg/Kg dw												
VOCs	Styrene	mg/Kg dw		0.013 U		0.012 U	0.016 U							
VOCs	Tetrachloroethene	mg/Kg dw		0.013 U		0.012 U	0.016 U							
VOCs	Toluene	mg/Kg dw	0.005 U	0.013 U	0.084	0.012 U	0.016 U							
VOCs	trans-1,3-Dichloropropene	mg/Kg dw		0.013 U		0.012 U	0.016 U							
VOCs	Trichloroethene	mg/Kg dw		0.013 U		0.012 U	0.016 U							
VOCs	Vinyl chloride	mg/Kg dw		0.013 U		0.012 U	0.016 U							
VOCs	Xylenes (total)	mg/Kg dw	0.005 U	0.013 U	0.005 U	0.012 U	0.016 U							
SVOCs	2,4-Dinitrotoluene	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
SVOCs	2,6-Dinitrotoluene	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
SVOCs	2-Chloronaphthalene	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
SVOCs	2-Methylphenol	mg/Kg dw	0.33 U	0.42 U	0.33 U	0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
SVOCs	2-Nitroaniline	mg/Kg dw		1 U		0.99 U	1.3 U	1 U	0.9 U	1.7 U		1.7 U	1 U	1.7 U
SVOCs	3,3'-Dichlorobenzidine	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 UR	0.66 U		0.66 U	0.41 U	0.66 U
SVOCs	3-Nitroaniline	mg/Kg dw		1 U		0.99 U	1.3 U	1 U	0.9 U	1.7 U		1.7 U	1 U	1.7 U
SVOCs	4-Chloroaniline	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U				0.41 U	
SVOCs	4-Chlorophenyl Phenyl Ether	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
SVOCs	4-Nitroaniline	mg/Kg dw		1 U		0.99 U	1.3 U	1 U	0.9 U	1.7 U		1.7 U	1 U	1.7 U
SVOCs	Aniline	mg/Kg dw	0.33 U		0.33 U									
SVOCs	Benzidine	mg/Kg dw								2.7 U		2.7 U		2.7 U
SVOCs	Benzoic acid	mg/Kg dw								1.7 U		1.7 U		1.7 U
SVOCs	Benzyl alcohol	mg/Kg dw								0.33 U		0.33 U		0.33 U
SVOCs	Biphenyl	mg/Kg dw												
SVOCs	Bis(2-ethylhexyl) phthalate	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
SVOCs	Butyl benzyl phthalate	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
SVOCs	Diethylphthalate	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
SVOCs	Dimethylphthalate	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
SVOCs	Di-n-butylphthalate	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
SVOCs	Di-n-octylphthalate	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
SVOCs	Hexachlorobenzene	mg/Kg dw		0.42 UJ		0.39 UJ	0.51 UJ	0.41 UJ	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
SVOCs	Hexachlorobutadiene	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
SVOCs	Hexachlorocyclopentadiene	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
SVOCs	Hexachloroethane	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
SVOCs	Isophorone	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
SVOCs	Nitrobenzene	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
SVOCs	N-Nitrosodimethylamine	mg/Kg dw								0.33 U		0.33 U		0.33 U

Table A-3. Compilation of Sediment Results from the Cedar Creek
Southern Wood Piedmont - Gulf, North Carolina Facility

		Sample ID	SW-025-SD	SW-025-SD (NCDENR)	SW-026-SD	SW-026-SD (NCDENR)	SW-027-SD (NCDENR)	SW-028-SD (NCDENR)	SW-038-SD (NCDENR)	SW-039-SD	SW-039-SD (NCDENR)	SW-040-SD	SW-040-SD (NCDENR)	SW-041-SD
		Station ID		SW-025-SD		SW-026-SD	SW-027-SD	SW-028-SD	SW-038-SD		SW-039-SD		SW-040-SD	
		Date Collected	11/13/1995	11/13/1995	11/13/1995	11/13/1995	11/13/1995	11/13/1995	11/8/1995	11/8/1995	11/8/1995	11/8/1995	11/8/1995	11/8/1995
		Waterbody	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek
		Location	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background
		Depth Interval	0 - 12"	0 - 12"	0 - 12"	0 - 12"	0 - 12"	0 - 12"		0 - 4"	0 - 4"	0 - 4"	0 - 4"	0 - 4"
ChemClass	Analyte Name	Conc Unit												
SVOCs	N-nitrosodi-n-propylamine	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
SVOCs	N-nitrosodiphenylamine	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
SVOCs	p-Chloroaniline	mg/Kg dw								0.66 U		0.66 U		0.66 U
Phenolics	2,3,4,6-Tetrachlorophenol	mg/Kg dw	1.7 U		1.7 U									
Phenolics	2,4,5-Trichlorophenol	mg/Kg dw		1 U		0.99 U	1.3 U	1 U	0.9 U	0.33 U		0.33 U	1 U	0.33 U
Phenolics	2,4,6-Trichlorophenol	mg/Kg dw	0.33 U	0.42 U	0.33 U	0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
Phenolics	2,4-Dichlorophenol	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
Phenolics	2,4-Dimethylphenol	mg/Kg dw	0.33 U	0.42 U	0.33 U	0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
Phenolics	2,4-Dinitrophenol	mg/Kg dw		1 U		0.99 U	1.3 U	1 U	0.9 U	1.7 U		1.7 U	1 U	1.7 U
Phenolics	2-Chlorophenol	mg/Kg dw	0.33 U	0.42 U	0.33 U	0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
Phenolics	2-Methyl-4,6-dinitrophenol	mg/Kg dw		1 U		0.99 U	1.3 U	1 U	0.9 U				1 U	
Phenolics	2-Nitrophenol	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
Phenolics	3&4-Methylphenol	mg/Kg dw	0.33 U	0.42 U	0.33 U	0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
Phenolics	4,6-Dinitro-2-methylphenol	mg/Kg dw								1.7 U		1.7 U		1.7 U
Phenolics	4-Chloro-3-methylphenol	mg/Kg dw	0.33 U	0.42 U	0.33 U	0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
Phenolics	4-Methylphenol	mg/Kg dw												
Phenolics	4-Nitrophenol	mg/Kg dw		1 U		0.99 U	1.3 U	1 U	0.9 U	1.7 U		1.7 U	1 U	1.7 U
Phenolics	Pentachlorophenol	mg/Kg dw	1.7 U	1 U	1.7 U	0.99 U	1.3 U	1 U	0.9 U	1.7 U		1.7 U	1 U	1.7 U
Phenolics	Phenol	mg/Kg dw	0.33 U	0.42 U	0.33 U	0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
PAHs	1-Methylnaphthalene	mg/Kg dw												
PAHs	2-Methylnaphthalene	mg/Kg dw	0.33 U	0.42 U	0.33 U	0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
PAHs	Acenaphthene	mg/Kg dw	0.33 U	0.42 UJ	0.33 U	0.39 UJ	0.51 UJ	0.41 UJ	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
PAHs	Acenaphthylene	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
PAHs	Anthracene	mg/Kg dw	0.33 U	0.42 U	0.33 U	0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
PAHs	Benzo(a)anthracene	mg/Kg dw	0.33 U	0.42 U	0.33 U	0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
PAHs	Benzo(a)pyrene	mg/Kg dw	0.33 U	0.42 U	0.33 U	0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
PAHs	Benzo(b&k)fluoranthene	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U				0.41 U	
PAHs	Benzo(b)fluoranthene	mg/Kg dw	0.33 U		0.33 U					0.33 U		0.33 U		0.33 U
PAHs	Benzo(g,h,i)perylene	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
PAHs	Benzo(k)fluoranthene	mg/Kg dw	0.33 U		0.33 U					0.33 U		0.33 U		0.33 U
PAHs	Carbazole	mg/Kg dw	0.33 U	0.42 U	0.33 U	0.39 U	0.51 U	0.41 U	0.36 U				0.41 U	
PAHs	Chrysene	mg/Kg dw	0.33 U	0.42 U	0.33 U	0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
PAHs	Dibenzo(a,h)anthracene	mg/Kg dw	0.33 U	0.42 U	0.33 U	0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
PAHs	Dibenzo(a,h)pyrene	mg/Kg dw												
PAHs	Dibenzofuran	mg/Kg dw		0.42 U		0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
PAHs	Fluoranthene	mg/Kg dw	0.33 U	0.42 U	0.33 U	0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
PAHs	Fluorene	mg/Kg dw	0.33 U	0.42 U	0.33 U	0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
PAHs	Indeno(1,2,3-cd)pyrene	mg/Kg dw	0.33 U	0.42 U	0.33 U	0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
PAHs	Naphthalene	mg/Kg dw	0.33 U	0.42 U	0.33 U	0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
PAHs	Phenanthrene	mg/Kg dw	0.33 U	0.42 U	0.33 U	0.39 U	0.51 U	0.41 U	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
PAHs	Pyrene	mg/Kg dw		0.42 UJ		0.39 UJ	0.51 UJ	0.41 UJ	0.36 U	0.33 U		0.33 U	0.41 U	0.33 U
PCDD/Fs	1,2,3,4,6,7,8-HpCDD	ng/Kg dw		30 U				12 U		3.5	9 U	5.9	5 U	3.8
PCDD/Fs	1,2,3,4,6,7,8-HpCDF	ng/Kg dw		13				12 U		0.1 U	5 U	0.26	5 U	0.1 U
PCDD/Fs	1,2,3,4,7,8,9-HpCDF	ng/Kg dw		12 U				12 U		0.2 U	5 U	0.1 U	5 U	0.2 U
PCDD/Fs	1,2,3,4,7,8-HxCDD	ng/Kg dw		12 U				12 U		0.07 U	5 U	0.08 U	5 U	0.08 U
PCDD/Fs	1,2,3,4,7,8-HxCDF	ng/Kg dw		12 U				12 U		0.06 U	5 U	0.12	5 U	0.06 U
PCDD/Fs	1,2,3,6,7,8-HxCDD	ng/Kg dw		12 U				12 U		0.07 U	5 U	0.07 U	5 U	0.07 U
PCDD/Fs	1,2,3,6,7,8-HxCDF	ng/Kg dw		12 U				12 U		0.05 U	5 U	0.05 U	5 U	0.05 U
PCDD/Fs	1,2,3,7,8,9-HxCDD	ng/Kg dw		12 U				12 U		0.07 U	5 U	0.21 EMPC	5 U	0.08 U
PCDD/Fs	1,2,3,7,8,9-HxCDF	ng/Kg dw		12 U				12 U		0.07 U	5 U	0.07 U	5 U	0.07 U
PCDD/Fs	1,2,3,7,8-PeCDD	ng/Kg dw		12 U				12 U			5 U		5 U	
PCDD/Fs	1,2,3,7,8-PeCDF	ng/Kg dw		12 U				12 U		0.08 U	5 R	0.09 U	5 R	0.1 U
PCDD/Fs	2,3,4,6,7,8-HxCDF	ng/Kg dw		12 U				12 U		0.06 U	5 U	0.06 U	5 U	0.06 U
PCDD/Fs	2,3,4,7,8-PeCDF	ng/Kg dw		12 U				12 U		0.07 U	5 U	0.06 U	5 U	0.08 U
PCDD/Fs	2,3,7,8-TeCDD	ng/Kg dw		5 U				5 U		0.13 EMPC	2 U	0.06 U	2 U	0.08 U
PCDD/Fs	2,3,7,8-TeCDF	ng/Kg dw		5 U				5 U		0.29	2 U	0.27	2 U	0.25
PCDD/Fs	OCDD	ng/Kg dw		810				140 U		301	520	406	410	258
PCDD/Fs	OCDF	ng/Kg dw		25 U				25 U		0.3 U	10 U	0.3 U	10 U	0.4 U
PCDD/F homologs	TeCDDs (total)	ng/Kg dw		5 UJ				5 UJ		0.13 EMPC	2 UJ	0.09 EMPC	2 UJ	0.08 EMPC
PCDD/F homologs	TeCDFs (total)	ng/Kg dw		5 UJ				5 UJ		0.29	0.4 J	0.27	0.27 J	0.25
PCDD/F homologs	PeCDDs (total)	ng/Kg dw		12 UJ				12 UJ		0.08 U	5 UJ	0.09 U	5 UJ	0.1 U
PCDD/F homologs	PeCDFs (total)	ng/Kg dw		12 UJ				12 UJ		0	1.4 U	0.48 EMPC	5 UJ	0.23 EMPC
PCDD/F homologs	HxCDD (total)	ng/Kg dw		22 J				12 UJ		0.59	6 U	1.5	5 U	0.4
PCDD/F homologs	HxCDF (total)	ng/Kg dw		27 J				12 UJ		0	5 UJ	0.31	5 UJ	0.08 U
PCDD/F homologs	HpCDD (total)	ng/Kg dw		70 UJ				20 UJ		8.9	20 U	14	14 UJ	9.8
PCDD/F homologs	HpCDF (total)	ng/Kg dw		16 J				12 UJ		0	5 UJ	0.56	5 UJ	0.2 U
Dioxin-TEQ	Dioxin-TEQ(mammal) - Zero DL	ng/Kg dw	NC	0.37	NC	NC	NC	0.00	NC	0.28	0.16	0.24	0.12	0.14
Dioxin-TEQ	Dioxin-TEQ(mammal) - Half DL	ng/Kg dw	NC	15.52	NC	NC	NC	15.13	NC	0.32	6.35	0.30	6.30	0.22
Dioxin-TEQ	Dioxin-TEQ(avian)-Zero DL	ng/Kg dw	NC	0.94	NC	NC	NC	0.00	NC	0.72	0.52	0.72	0.41	0.51
Dioxin-TEQ	Dioxin-TEQ(avian)-Half DL	ng/Kg dw	NC	21.98	NC	NC	NC	21.16	NC	0.79	8.98	0.80	8.86	0.62
Metals	Aluminum	mg/Kg dw		4500		9700	4100	1900						
Metals	Antimony	mg/Kg dw		3 UR		2.8 UR	2.7 UR	3 UR						
Metals	Arsenic	mg/Kg dw		2.6 J		2 U	3 U	3.3						

Table A-3. Compilation of Sediment Results from the Cedar Creek
Southern Wood Piedmont - Gulf, North Carolina Facility

		Sample ID	SW-025-SD	SW-025-SD (NCDENR)	SW-026-SD	SW-026-SD (NCDENR)	SW-027-SD (NCDENR)	SW-028-SD (NCDENR)	SW-036-SD (NCDENR)	SW-039-SD	SW-039-SD (NCDENR)	SW-040-SD	SW-040-SD (NCDENR)	SW-041-SD
		Station ID		SW-025-SD		SW-026-SD	SW-027-SD	SW-028-SD	SW-036-SD		SW-039-SD		SW-040-SD	
		Date Collected	11/13/1995	11/13/1995	11/13/1995	11/13/1995	11/13/1995	11/13/1995	11/8/1995	11/8/1995	11/8/1995	11/8/1995	11/8/1995	11/8/1995
		Waterbody	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek
		Location	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background	Background
		Depth Interval	0 - 12"	0 - 12"	0 - 12"	0 - 12"	0 - 12"	0 - 12"		0 - 4"	0 - 4"	0 - 4"	0 - 4"	0 - 4"
ChemClass	Analyte Name	Conc Unit												
Metals	Barium	mg/Kg dw		35		70	37	14						
Metals	Beryllium	mg/Kg dw		1 U		0.65 J	0.24 J	1 U						
Metals	Cadmium	mg/Kg dw		0.29 U		0.28 U	0.26 U	0.3 U						
Metals	Calcium	mg/Kg dw		480		550	530	250						
Metals	Chromium	mg/Kg dw		11		15	9.8	9.7						
Metals	Cobalt	mg/Kg dw		6 U		6 U	6 U	4 U						
Metals	Copper	mg/Kg dw		6 U		6 U	7 U	3 U						
Metals	Iron	mg/Kg dw		11000		13000	9000	13000						
Metals	Lead	mg/Kg dw		6.2 J		7.4 J	6.3 J	4.9 J						
Metals	Magnesium	mg/Kg dw		790		1500	710	250						
Metals	Manganese	mg/Kg dw		240 J		200 J	190 J	160 J						
Metals	Mercury	mg/Kg dw		0.06 U		0.06 U	0.06 U	0.06 U						
Metals	Nickel	mg/Kg dw		4 U		6 U	4 U	3 U						
Metals	Potassium	mg/Kg dw		140		200	130	46 J						
Metals	Selenium	mg/Kg dw		0.52 U		1 U	0.46 U	0.53 U						
Metals	Silver	mg/Kg dw		0.81 U		0.77 U	0.73 U	0.83 U						
Metals	Sodium	mg/Kg dw		70 U		80 U	40 U	20 U						
Metals	Thallium	mg/Kg dw		0.54 U		0.51 U	0.48 U	0.55 U						
Metals	Tin	mg/Kg dw												
Metals	Vanadium	mg/Kg dw		26		30	20	19						
Metals	Zinc	mg/Kg dw		30 UJ		30 UJ	30 UJ	20 UJ						
General Parameters	Percent Clay	%												
General Parameters	Percent Gravel	%												
General Parameters	Percent Sand	%												
General Parameters	Percent Silt	%												
General Parameters	Total Organic Carbon	mg/Kg dw												
General Parameters	Total Solids	%												
General Parameters	Percent Moisture (metals)	%		22		20	17	26						
General Parameters	Percent Moisture (PCDD/F)	%		15				13			17		12	
General Parameters	Percent Moisture (SVOC)	%							8				19	
General Parameters	Percent Moisture (SVOCs)	%		21		21	37	20						
General Parameters	Percent Moisture (VOCs)	%		21		18	37							
TCLP-PAHs	Acenaphthene in TCLP Extract	mg/L												
TCLP-PAHs	Acenaphthylene in TCLP Extract	mg/L												
TCLP-PAHs	Anthracene in TCLP Extract	mg/L												
TCLP-PAHs	Benzo(a)anthracene in TCLP Extract	mg/L												
TCLP-PAHs	Benzo(a)pyrene in TCLP Extract	mg/L												
TCLP-PAHs	Benzo(b)fluoranthene in TCLP Extract	mg/L												
TCLP-PAHs	Benzo(g,h,i)perylene in TCLP Extract	mg/L												
TCLP-PAHs	Benzo(k)fluoranthene in TCLP Extract	mg/L												
TCLP-PAHs	Carbazole in TCLP Extract	mg/L												
TCLP-PAHs	Chrysene in TCLP Extract	mg/L												
TCLP-PAHs	Dibenzo(a,h)anthracene in TCLP Extract	mg/L												
TCLP-PAHs	Dibenzofuran in TCLP Extract	mg/L												
TCLP-PAHs	Dimethyl Naphthalene in TCLP Extract	mg/L												
TCLP-PAHs	Fluoranthene in TCLP Extract	mg/L												
TCLP-PAHs	Fluorene in TCLP Extract	mg/L												
TCLP-PAHs	Indeno(1,2,3-cd)pyrene in TCLP Extract	mg/L												
TCLP-PAHs	Isophorone in TCLP Extract	mg/L												
TCLP-PAHs	Naphthalene in TCLP Extract	mg/L												
TCLP-PAHs	Phenanthrene in TCLP Extract	mg/L												
TCLP-PAHs	Pyrene in TCLP Extract	mg/L												
TCLP-Phenolics	Extract	mg/L												
TCLP-Phenolics	2,4,5-Trichlorophenol in TCLP Extract	mg/L												
TCLP-Phenolics	2,4-Dimethylphenol in TCLP Extract	mg/L												
TCLP-Phenolics	2-Chlorophenol in TCLP Extract	mg/L												
TCLP-Phenolics	2-Methylphenol in TCLP Extract	mg/L												
TCLP-Phenolics	Extract	mg/L												
TCLP-Phenolics	Pentachlorophenol in TCLP Extract	mg/L												
TCLP-Phenolics	Phenol in TCLP Extract	mg/L												
TCLP-SVOCs	Aniline in TCLP Extract	mg/L												

Table A-3. Compilation of Sediment Results from the Cedar Creek
Southern Wood Piedmont - Gulf, North Carolina Facility

		Sample ID	SW-041-SD (NCDENR)	SW-043-SD	SW-042-SD (NCDENR)	SWP-009	5748	5750	5751	5871	SW-029-SD	SW-029-SD (NCDENR)	SW-030-SD	SW-030-SD (NCDENR)	SW-031-SD (NCDENR)
		Station ID	SW-041-SD		SW-042-SD	SWP-009						SW-029-SD		SW-030-SD	SW-031-SD
		Date Collected	11/9/1996	11/9/1996	11/9/1996	9/21/1983	5/3/1990	5/3/1990	5/3/1990	6/13/1990	11/13/1996	11/13/1996	11/13/1996	11/13/1996	11/13/1996
		Waterbody	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek
		Location	Background	Background	Background	Background	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream
		Depth Interval	0 - 4"	0 - 4"	0 - 4"	Surface	NA	NA	NA	NA	0 - 12"	0 - 12"	0 - 12"	0 - 12"	0 - 12"
ChemClass	Analyte Name	Conc Unit													
VOCs	1,1,1-Trichloroethane	mg/Kg dw										0.013 U		0.015 U	0.014 U
VOCs	1,1,2,2-Tetrachloroethane	mg/Kg dw										0.013 U		0.015 U	0.014 U
VOCs	1,1,2-Trichloroethane	mg/Kg dw										0.013 U		0.015 U	0.014 U
VOCs	1,1-Dichloroethane	mg/Kg dw										0.013 U		0.015 U	0.014 U
VOCs	1,1-Dichloroethene	mg/Kg dw										0.013 U		0.015 U	0.014 U
VOCs	1,2,4-Trichlorobenzene	mg/Kg dw	0.35 U	0.33 U	0.38 U							0.43 U		0.99 U	0.46 U
VOCs	1,2-Dichlorobenzene	mg/Kg dw	0.35 U	0.33 U	0.38 U							0.43 U		0.99 U	0.46 U
VOCs	1,2-Dichloroethane	mg/Kg dw										0.013 U		0.015 U	0.014 U
VOCs	1,2-Dichloroethene (total)	mg/Kg dw										0.013 U		0.015 U	0.014 U
VOCs	1,2-Dichloropropane	mg/Kg dw										0.013 U		0.015 U	0.014 U
VOCs	1,3-Dichlorobenzene	mg/Kg dw	0.35 U	0.33 U	0.38 U							0.43 U		0.99 U	0.46 U
VOCs	1,4-Dichlorobenzene	mg/Kg dw	0.35 U	0.33 U	0.38 U							0.43 U		0.99 U	0.46 U
VOCs	2-Butanone	mg/Kg dw					0.05 U	0.05 U	0.05 U	0.05 U	0.025 U	0.013 U	0.025 U	0.015 U	0.014 U
VOCs	4-Bromophenyl phenyl ether	mg/Kg dw	0.35 U	0.33 U	0.38 U							0.43 U		0.99 U	0.46 U
VOCs	Acetone	mg/Kg dw										0.013 U		0.015 U	0.014 U
VOCs	Benzene	mg/Kg dw					0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.013 U	0.005 U	0.015 U	0.014 U
VOCs	bis(2-Chloro-1-methylethyl) ether	mg/Kg dw		0.33 U											
VOCs	Bis(2-chloroethoxy) methane	mg/Kg dw	0.35 U	0.33 U	0.38 U							0.43 U		0.99 U	0.46 U
VOCs	Bis(2-Chloroethyl) ether	mg/Kg dw	0.35 U	0.33 U	0.38 U							0.43 U		0.99 U	0.46 U
VOCs	Bis(2-Chloroisopropyl) ether	mg/Kg dw	0.35 U		0.38 U							0.43 U		0.99 U	0.46 U
VOCs	Bromodichloromethane	mg/Kg dw										0.013 U		0.015 U	0.014 U
VOCs	Bromoform	mg/Kg dw										0.013 U		0.015 U	0.014 U
VOCs	Bromomethane	mg/Kg dw										0.013 UR		0.015 UR	0.014 UR
VOCs	Carbon disulfide	mg/Kg dw										0.013 U		0.015 U	0.014 U
VOCs	Carbon tetrachloride	mg/Kg dw										0.013 U		0.015 U	0.014 U
VOCs	Chlorobenzene	mg/Kg dw										0.013 U		0.015 U	0.014 U
VOCs	Chloroethane	mg/Kg dw										0.013 U		0.015 U	0.014 U
VOCs	Chloroform	mg/Kg dw										0.013 U		0.015 U	0.014 U
VOCs	Chloromethane	mg/Kg dw										0.013 U		0.015 U	0.014 U
VOCs	cis-1,3-Dichloropropene	mg/Kg dw										0.013 U		0.015 U	0.014 U
VOCs	Dibromochloromethane	mg/Kg dw										0.013 U		0.015 U	0.014 U
VOCs	Ethylbenzene	mg/Kg dw					0.005 U	0.1	0.005 U	0.005 U	0.005 U	0.013 U	0.005 U	0.015 U	0.014 U
VOCs	Methyl butyl ketone	mg/Kg dw										0.013 U		0.015 U	0.014 U
VOCs	Methyl isobutyl ketone	mg/Kg dw										0.013 U		0.015 U	0.014 U
VOCs	Methylene chloride	mg/Kg dw					5 U	5 U	5 U	0.005 U	0.005 U	0.013 U	0.005 U	0.015 U	0.02 U
VOCs	m-Xylene	mg/Kg dw					0.05 U	0.16	0.05 U						
VOCs	o-Xylene	mg/Kg dw					0.05 U	0.15	0.05 U						
VOCs	p-Xylene	mg/Kg dw					0.005 U	0.005 U	0.005 U						
VOCs	Styrene	mg/Kg dw										0.013 U		0.015 U	0.014 U
VOCs	Tetrachloroethene	mg/Kg dw										0.013 U		0.015 U	0.014 U
VOCs	Toluene	mg/Kg dw					0.005 U	0.0086	0.005 U	0.005 U	0.066	0.013 U	0.018	0.015 U	0.014 U
VOCs	trans-1,3-Dichloropropene	mg/Kg dw										0.013 U		0.015 U	0.014 U
VOCs	Trichloroethene	mg/Kg dw										0.013 U		0.015 U	0.014 U
VOCs	Vinyl chloride	mg/Kg dw										0.013 U		0.015 U	0.014 U
VOCs	Xylenes (total)	mg/Kg dw					0.005 U	0.34	0.005 U	0.005 U	0.0077	0.002 J	0.005 U	0.015 U	0.014 U
SVOCs	2,4-Dinitrotoluene	mg/Kg dw	0.35 U	0.33 U	0.38 U							0.43 U		0.99 U	0.46 U
SVOCs	2,6-Dinitrotoluene	mg/Kg dw	0.35 U	0.33 U	0.38 U							0.43 U		0.99 U	0.46 U
SVOCs	2-Chloronaphthalene	mg/Kg dw	0.35 U	0.33 U	0.38 U							0.43 U		0.99 U	0.46 U
SVOCs	2-Methylphenol	mg/Kg dw	0.35 U	0.33 U	0.38 U	2 U	0.41 U	0.41 U	0.41 U	0.33 U	0.33 U	0.43 U	0.33 U	0.99 U	0.46 U
SVOCs	2-Nitroaniline	mg/Kg dw	0.89 U	1.7 U	0.96 U							1.1 U		2.5 U	1.2 U
SVOCs	3,3'-Dichlorobenzidine	mg/Kg dw	0.35 U	0.66 U	0.38 U							0.43 U		0.99 U	0.46 U
SVOCs	3-Nitroaniline	mg/Kg dw	0.89 U	1.7 U	0.96 U							1.1 U		2.5 U	1.2 U
SVOCs	4-Chloroaniline	mg/Kg dw	0.35 U		0.38 U							0.43 U		0.99 U	0.46 U
SVOCs	4-Chlorophenyl Phenyl Ether	mg/Kg dw	0.35 U	0.33 U	0.38 U							0.43 U		0.99 U	0.46 U
SVOCs	4-Nitroaniline	mg/Kg dw	0.89 U	1.7 U	0.96 U							1.1 U		2.5 U	1.2 U
SVOCs	Aniline	mg/Kg dw					0.41 U	0.41 U	0.41 U	0.33 U	0.33 U		0.33 U		
SVOCs	Benzidine	mg/Kg dw		2.7 U											
SVOCs	Benzoic acid	mg/Kg dw		1.7 U											
SVOCs	Benzyl alcohol	mg/Kg dw		0.33 U											
SVOCs	Biphenyl	mg/Kg dw													
SVOCs	Bis(2-ethylhexyl) phthalate	mg/Kg dw	0.35 U	0.33 U	0.38 U							0.43 U		0.99 U	0.46 U
SVOCs	Butyl benzyl phthalate	mg/Kg dw	0.35 U	0.33 U	0.38 U							0.43 U		0.99 U	0.46 U
SVOCs	Diethylphthalate	mg/Kg dw	0.35 U	0.33 U	0.38 U							0.43 U		0.99 U	0.46 U
SVOCs	Dimethylphthalate	mg/Kg dw	0.35 U	0.33 U	0.38 U							0.43 U		0.99 U	0.46 U
SVOCs	Di-n-butylphthalate	mg/Kg dw	0.35 U	0.33 U	0.38 U							0.43 U		0.99 U	0.46 U
SVOCs	Di-n-octylphthalate	mg/Kg dw	0.35 U	0.33 U	0.38 U							0.43 U		0.99 U	0.46 U
SVOCs	Hexachlorobenzene	mg/Kg dw	0.35 U	0.33 U	0.38 U							0.43 UJ		0.99 UJ	0.46 UJ
SVOCs	Hexachlorobutadiene	mg/Kg dw	0.35 U	0.33 U	0.38 U							0.43 U		0.99 U	0.46 U
SVOCs	Hexachlorocyclopentadiene	mg/Kg dw	0.35 U	0.33 U	0.38 U							0.43 U		0.99 U	0.46 U
SVOCs	Hexachloroethane	mg/Kg dw	0.35 U	0.33 U	0.38 U							0.43 U		0.99 U	0.46 U
SVOCs	Isophorone	mg/Kg dw	0.35 U	0.33 U	0.38 U							0.43 U		0.99 U	0.46 U
SVOCs	Nitrobenzene	mg/Kg dw	0.35 U	0.33 U	0.38 U							0.43 U		0.99 U	0.46 U
SVOCs	N-Nitrosodimethylamine	mg/Kg dw		0.33 U											

Table A-3. Compilation of Sediment Results from the Cedar Creek
Southern Wood Piedmont - Gulf, North Carolina Facility

		Sample ID	SW-041-SD (NCDENR)	SW-043-SD	SW-042-SD (NCDENR)	SWP-009	8748	8750	8751	8871	SW-029-SD	SW-029-SD (NCDENR)	SW-030-SD	SW-030-SD (NCDENR)	SW-031-SD (NCDENR)
		Station ID	SW-041-SD		SW-042-SD	SWP-009						SW-029-SD		SW-030-SD	SW-031-SD
		Date Collected	11/9/1996	11/9/1996	11/9/1996	9/21/1983	5/3/1990	5/3/1990	5/3/1990	6/13/1990	11/13/1995	11/13/1995	11/13/1995	11/13/1995	11/13/1995
		Waterbody	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek
		Location	Background	Background	Background	Background	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream
		Depth Interval	0 - 4"	0 - 4"	0 - 4"	Surface	NA	NA	NA	NA	0 - 12"	0 - 12"	0 - 12"	0 - 12"	0 - 12"
ChemClass	Analyte Name	Core Unit													
SVOCs	N-nitrosodi-n-propylamine	mg/Kg dw	0.35 U	0.33 U	0.38 U							0.43 U		0.99 U	0.46 U
SVOCs	N-nitrosodiphenylamine	mg/Kg dw	0.35 U	0.33 U	0.38 U							0.43 U		0.99 U	0.46 U
SVOCs	p-Chloroaniline	mg/Kg dw		0.66 U											
Phenolics	2,3,4,6-Tetrachlorophenol	mg/Kg dw					0.33 U	0.33 U	0.33 U	0.33 U	1.7 U		1.7 U		
Phenolics	2,4,5-Trichlorophenol	mg/Kg dw	0.89 U	0.33 U	0.96 U							1.1 U		2.5 U	1.2 U
Phenolics	2,4,6-Trichlorophenol	mg/Kg dw	0.35 U	0.33 U	0.38 U	2 U	0.41 U	0.41 U	0.41 U	0.33 U	0.33 U	0.43 U	0.33 U	0.99 U	0.46 U
Phenolics	2,4-Dichlorophenol	mg/Kg dw	0.35 U	0.33 U	0.38 U							0.43 U		0.99 U	0.46 U
Phenolics	2,4-Dimethylphenol	mg/Kg dw	0.35 U	0.33 U	0.38 U	2 U	0.41 U	0.41 U	0.41 U	0.33 U	0.33 U	0.43 U	0.33 U	0.99 U	0.46 U
Phenolics	2,4-Dinitrophenol	mg/Kg dw	0.89 U	1.7 U	0.96 U							1.1 U		2.5 U	1.2 U
Phenolics	2-Chlorophenol	mg/Kg dw	0.35 U	0.33 U	0.38 U	2 U	0.41 U	0.41 U	0.41 U	0.33 U	0.33 U	0.43 U	0.33 U	0.99 U	0.46 U
Phenolics	2-Methyl-4,6-dinitrophenol	mg/Kg dw	0.89 U		0.96 U							1.1 U		2.5 U	1.2 U
Phenolics	2-Nitrophenol	mg/Kg dw	0.35 U	0.33 U	0.38 U							0.43 U		0.99 U	0.46 U
Phenolics	3&4-Methylphenol	mg/Kg dw	0.35 U	0.33 U	0.38 U	2 U	0.41 U	0.41 U	0.41 U	0.33 U	0.33 U	0.43 U	0.33 U	0.99 U	0.46 U
Phenolics	4,6-Dinitro-2-methylphenol	mg/Kg dw		1.7 U											
Phenolics	4-Chloro-3-methylphenol	mg/Kg dw	0.35 U	0.33 U	0.38 U	2 U	0.83 U	0.83 U	0.83 U	0.33 U	0.33 U	0.43 U	0.33 U	0.99 U	0.46 U
Phenolics	4-Methylphenol	mg/Kg dw													
Phenolics	4-Nitrophenol	mg/Kg dw	0.89 U	1.7 U	0.96 U							1.1 U		2.5 U	1.2 U
Phenolics	Pentachlorophenol	mg/Kg dw	0.89 U	1.7 U	0.96 U	2 U	2.1 U	2.1 U	2.1 U	1.7 U	1.7 U	110 J	1.7 U	0.74 J	1.2 U
Phenolics	Phenol	mg/Kg dw	0.35 U	0.33 U	0.38 U	2 U	0.41 U	0.41 U	0.41 U	0.33 U	0.33 U	0.43 U	0.33 U	0.99 U	0.46 U
PAHs	1-Methylnaphthalene	mg/Kg dw													
PAHs	2-Methylnaphthalene	mg/Kg dw	0.35 U	0.33 U	0.38 U	2 U	0.33 U	0.33 U	0.33 U	0.33 U	25	250	0.33 U	0.99 U	0.46 U
PAHs	Acenaphthene	mg/Kg dw	0.35 U	0.33 U	0.38 U	2 U	0.41 U	5.8	0.41 U	1.5	39	180 J	0.33 U	0.22 J	0.46 UJ
PAHs	Acenaphthylene	mg/Kg dw	0.35 U	0.33 U	0.38 U	1.2 J						0.43 U		0.99 U	0.46 U
PAHs	Anthracene	mg/Kg dw	0.35 U	0.33 U	0.38 U	0.0038	0.41 U	0.41 U	0.41 U	2.1	15	9.2 J	1.9	1.1	0.46 U
PAHs	Benzo(a)anthracene	mg/Kg dw	0.35 U	0.33 U	0.38 U	0.0057	0.41 U	0.41 U	0.41 U	1.9	6.6	6.5 J	3.4	2	0.049 J
PAHs	Benzo(a)pyrene	mg/Kg dw	0.35 U	0.33 U	0.38 U	0.0091	0.41 U	0.41 U	0.41 U	0.86	0.33 U	1.2	1.4	1.8	0.46 U
PAHs	Benzo(b&k)fluoranthene	mg/Kg dw	0.35 U		0.38 U		0.82 U	0.82 U	0.82 U	3.1		4.2 J		5.3	0.08 J
PAHs	Benzo(b)fluoranthene	mg/Kg dw		0.33 U		0.013					4.6		3.4		
PAHs	Benzo(g,h,i)perylene	mg/Kg dw	0.35 U	0.33 U	0.38 U	0.003						0.089 J		0.5 J	0.46 U
PAHs	Benzo(k)fluoranthene	mg/Kg dw		0.33 U							0.33 U		1.1		
PAHs	Carbazole	mg/Kg dw	0.35 U		0.38 U		0.41 U	0.41 U	0.41 U	0.33 U	5.8	12 J	0.33 U	0.18 J	0.46 U
PAHs	Chrysene	mg/Kg dw	0.35 U	0.33 U	0.38 U	0.019	0.41 U	0.41 U	0.41 U	2.5	8.8	4.6 J	3.9	3.5	0.064 J
PAHs	Dibenzo(a,h)anthracene	mg/Kg dw	0.35 U	0.33 U	0.38 U	2 U	0.41 U	0.41 U	0.41 U	0.33 U	0.33 U	0.43 U	0.33 U	0.28 J	0.46 U
PAHs	Dibenzo(a,h)pyrene	mg/Kg dw													
PAHs	Dibenzofuran	mg/Kg dw	0.35 U	0.33 U	0.38 U	2 U						150		0.2 J	0.2 J
PAHs	Fluoranthene	mg/Kg dw	0.35 U	0.33 U	0.38 U	0.014	0.41 U	12	0.41 U	7.5	44	59	11	3.5	0.2 J
PAHs	Fluorene	mg/Kg dw	0.35 U	0.33 U	0.38 U	0.34 J	0.33 U	7.1	0.33 U	1.9	38	110	0.33 U	0.38 J	0.46 U
PAHs	Indeno(1,2,3-cd)pyrene	mg/Kg dw	0.35 U	0.33 U	0.38 U	0.0044	0.41 U	0.41 U	0.41 U	0.33 U	0.33 U	0.16 J	0.33 U	0.99 J	0.46 U
PAHs	Naphthalene	mg/Kg dw	0.35 U	0.33 U	0.38 U	2 U	0.41 U	0.41 U	0.41 U	0.33 U	12	53	0.33 U	0.99 U	0.46 U
PAHs	Phenanthrene	mg/Kg dw	0.35 U	0.33 U	0.38 U	0.0025	0.41 U	17	0.41 U	5.2	67	200	3.6	0.9 J	0.24 J
PAHs	Pyrene	mg/Kg dw	0.35 U	0.33 U	0.38 U	0.013						10 J		3.2 J	0.16 J
PCDD/Fs	1,2,3,4,6,7,8-HpCDD	ng/Kg dw	7 U	1.6	3.2 U							18000			130
PCDD/Fs	1,2,3,4,6,7,8-HpCDF	ng/Kg dw	4.5 U	0.14 EMPC	3.2 U							4300			10 J
PCDD/Fs	1,2,3,4,7,8,9-HpCDF	ng/Kg dw	4.5 U	0.1 U	3.2 U							170			12 U
PCDD/Fs	1,2,3,4,7,8-HxCDD	ng/Kg dw	4.5 U	0.05 U	3.2 U							23			12 U
PCDD/Fs	1,2,3,4,7,8-HxCDF	ng/Kg dw	4.5 U	0.04 U	3.2 U							610 U			12 U
PCDD/Fs	1,2,3,6,7,8-HxCDD	ng/Kg dw	4.5 U	0.05 U	3.2 U							470			3 J
PCDD/Fs	1,2,3,6,7,8-HxCDF	ng/Kg dw	4.5 U	0.04 U	3.2 U							9 J			12 U
PCDD/Fs	1,2,3,7,8,9-HxCDD	ng/Kg dw	4.5 U	0.05 U	3.2 U							100			2 J
PCDD/Fs	1,2,3,7,8,9-HxCDF	ng/Kg dw	4.5 U	0.05 U	3.2 U							14 U			12 U
PCDD/Fs	1,2,3,7,8-PeCDD	ng/Kg dw	4.5 U		3.2 U							4 J			12 U
PCDD/Fs	1,2,3,7,8-PeCDF	ng/Kg dw	4.5 R	0.07 U	3.2 R							14 U			12 U
PCDD/Fs	2,3,4,6,7,8-HxCDF	ng/Kg dw	4.5 U	0.04 U	3.2 U							14 U			12 U
PCDD/Fs	2,3,4,7,8-PeCDF	ng/Kg dw	4.5 U	0.06 U	3.2 U							4 J			12 U
PCDD/Fs	2,3,7,8-TeCDD	ng/Kg dw	1.8 U	0.06 U	1.3 U							8 U			5 U
PCDD/Fs	2,3,7,8-TeCDF	ng/Kg dw	1.8 U	0.18 EMPC	3.2 U							8 U			5 U
PCDD/Fs	OCDD	ng/Kg dw	560	115	170							220000 J			2000
PCDD/Fs	OCDF	ng/Kg dw	10 U	0.1 U	6.5 U							20000			63
PCDD/F homologs	TeCDDs (total)	ng/Kg dw	1.8 UJ	0.14 EMPC	1.3 UJ							24 J			5 UJ
PCDD/F homologs	TeCDFs (total)	ng/Kg dw	0.7 J	0.41 EMPC	3.2 UJ							6.5 J			5 UJ
PCDD/F homologs	PeCDDs (total)	ng/Kg dw	4.5 UJ	0.07 U	3.2 UJ							40 J			1.3 J
PCDD/F homologs	PeCDFs (total)	ng/Kg dw	4.5 UJ	0.06 U	3.2 UJ							120 J			1.5 J
PCDD/F homologs	HxCDD (total)	ng/Kg dw	4.5 UJ	0.24	3.2 UJ							4100 J			28 J
PCDD/F homologs	HxCDF (total)	ng/Kg dw	4.5 UJ	0.04 U	3.2 UJ							3300 J			12 J
PCDD/F homologs	HpCDD (total)	ng/Kg dw	17 UJ	4	7 UJ							72000 J			340 J
PCDD/F homologs	HpCDF (total)	ng/Kg dw	4.5 UJ	0.14 EMPC	3.2 UJ							5200 J			13 J
Dioxin-TEQ	Dioxin-TEQ(mammal) - Zero DL	ng/Kg dw	0.17	0.07	0.05	NC	NC	NC	NC	NC	NC	362.10	NC	NC	2.52
Dioxin-TEQ	Dioxin-TEQ(mammal) - Half DL	ng/Kg dw	5.74	0.13	4.11	NC	NC	NC	NC	NC	NC	397.51	NC	NC	16.31
Dioxin-TEQ	Dioxin-TEQ(avian)-Zero DL	ng/Kg dw	0.56	0.30	0.17	NC	NC	NC	NC	NC	NC	309.45	NC	NC	2.47
Dioxin-TEQ	Dioxin-TEQ(avian)-Half DL	ng/Kg dw	8.17	0.38	6.55	NC	NC	NC	NC	NC	NC	348.05	NC	NC	22.83
Metals	Aluminum	mg/Kg dw				3200						10000		12000	3900
Metals	Antimony	mg/Kg dw				1 U						3.2 UR		5 UJ	5 UJ
Metals	Arsenic	mg/Kg dw				2.1						2 U		9.9	6.2

Table A-3. Compilation of Sediment Results from the Cedar Creek
Southern Wood Piedmont - Gulf, North Carolina Facility

		Sample ID	SW-041-SD (NCDENR)	SW-042-SD	SW-042-SD (NCDENR)	SWP-009	8748	8750	8751	8871	SW-029-SD	SW-029-SD (NCDENR)	SW-030-SD	SW-030-SD (NCDENR)	SW-031-SD (NCDENR)
		Station ID	SW-041-SD		SW-042-SD	SWP-009						SW-029-SD		SW-030-SD	SW-031-SD
		Date Collected	11/9/1996	11/9/1996	11/9/1996	9/21/1983	5/3/1990	5/3/1990	5/3/1990	8/13/1990	11/13/1995	11/13/1995	11/13/1995	11/13/1995	11/13/1995
		Waterbody	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek
		Location	Background	Background	Background	Background	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream
		Depth Interval	0 - 4"	0 - 4"	0 - 4"	Surface	NA	NA	NA	NA	0 - 12"	0 - 12"	0 - 12"	0 - 12"	0 - 12"
ChemClass	Analyte Name	Conc Unit													
Metals	Barium	mg/Kg dw				29						110		100	34
Metals	Beryllium	mg/Kg dw				0.25 U						1 U		1.1 J	1
Metals	Cadmium	mg/Kg dw				0.05 U						0.32 U		0.3 U	0.36 U
Metals	Calcium	mg/Kg dw										820		1300	360
Metals	Chromium	mg/Kg dw				4.6						15		32	27
Metals	Cobalt	mg/Kg dw				5.4						20 U		18	5 U
Metals	Copper	mg/Kg dw				3.9						20 U		20	20 U
Metals	Iron	mg/Kg dw				9500						15000		37000	19000
Metals	Lead	mg/Kg dw				8.9						7 J		11 J	6.2 J
Metals	Magnesium	mg/Kg dw										2000		2600	390
Metals	Manganese	mg/Kg dw				260						360 J		570 J	130 J
Metals	Mercury	mg/Kg dw										0.06 U		0.06 U	0.08 U
Metals	Nickel	mg/Kg dw				2.3						15 U		36	3 U
Metals	Potassium	mg/Kg dw										240 J		310	70 J
Metals	Selenium	mg/Kg dw				1 U						1 U		1 U	0.83 U
Metals	Silver	mg/Kg dw				1.4						0.87 U		1 U	0.99 U
Metals	Sodium	mg/Kg dw										160 U		110 U	40 U
Metals	Thallium	mg/Kg dw				0.5 U						0.58 U		0.54 U	0.66 U
Metals	Tin	mg/Kg dw				3.3 X									
Metals	Vanadium	mg/Kg dw				12						27		51	28
Metals	Zinc	mg/Kg dw				13						30 UJ		40 UJ	30 UJ
General Parameters	Percent Clay	%													
General Parameters	Percent Gravel	%													
General Parameters	Percent Sand	%													
General Parameters	Percent Silt	%													
General Parameters	Total Organic Carbon	mg/Kg dw													
General Parameters	Total Solids	%					84	67	89						
General Parameters	Percent Moisture (metals)	%				0						25		24	38
General Parameters	Percent Moisture (PCDD/F)	%			18							24			15
General Parameters	Percent Moisture (SVOC)	%	7		14										
General Parameters	Percent Moisture (SVOCs)	%				11						23		34	29
General Parameters	Percent Moisture (VOCs)	%										23		34	29
TCLP-PAHs	Acenaphthene in TCLP Extract	mg/L									0.009 U				
TCLP-PAHs	Acenaphthylene in TCLP Extract	mg/L									0.009 U				
TCLP-PAHs	Anthracene in TCLP Extract	mg/L									0.008 U				
TCLP-PAHs	Benzo(a)anthracene in TCLP Extract	mg/L									0.0065 U				
TCLP-PAHs	Benzo(a)pyrene in TCLP Extract	mg/L									0.0075 U				
TCLP-PAHs	Benzo(b)fluoranthene in TCLP Extract	mg/L									0.008 U				
TCLP-PAHs	Benzo(g,h,i)perylene in TCLP Extract	mg/L									0.012 U				
TCLP-PAHs	Benzo(k)fluoranthene in TCLP Extract	mg/L									0.008 U				
TCLP-PAHs	Carbazole in TCLP Extract	mg/L									0.0085 U				
TCLP-PAHs	Chrysene in TCLP Extract	mg/L									0.0044 U				
TCLP-PAHs	Dibenzo(a,h)anthracene in TCLP Extract	mg/L									0.014 U				
TCLP-PAHs	Dibenzofuran in TCLP Extract	mg/L									0.0075 U				
TCLP-PAHs	Dimethyl Naphthalene in TCLP Extract	mg/L									0.025 U				
TCLP-PAHs	Fluoranthene in TCLP Extract	mg/L									0.01 U				
TCLP-PAHs	Fluorene in TCLP Extract	mg/L									0.0065 U				
TCLP-PAHs	Indeno(1,2,3-cd)pyrene in TCLP Extract	mg/L									0.016 U				
TCLP-PAHs	Isophorone in TCLP Extract	mg/L									0.0095 U				
TCLP-PAHs	Naphthalene in TCLP Extract	mg/L									0.0095 U				
TCLP-PAHs	Phenanthrene in TCLP Extract	mg/L									0.0075 U				
TCLP-PAHs	Pyrene in TCLP Extract	mg/L									0.008 U				
TCLP-Phenolics	Extract	mg/L									0.0065 U				
TCLP-Phenolics	2,4,5-Trichlorophenol in TCLP Extract	mg/L									0.0075 U				
TCLP-Phenolics	2,4-Dimethylphenol in TCLP Extract	mg/L									0.01 U				
TCLP-Phenolics	2-Chlorophenol in TCLP Extract	mg/L									0.0075 U				
TCLP-Phenolics	2-Methylphenol in TCLP Extract	mg/L									0.0075 U				
TCLP-Phenolics	Extract	mg/L									0.0065 U				
TCLP-Phenolics	Pentachlorophenol in TCLP Extract	mg/L									0.01 U				
TCLP-Phenolics	Phenol in TCLP Extract	mg/L									0.0065 U				
TCLP-SVOCs	Aniline in TCLP Extract	mg/L									0.008 U				

Table A-3. Compilation of Sediment Results from the Cedar Creek
Southern Wood Piedmont - Gulf, North Carolina Facility

		Sample ID	SW-032-SD	SW-032-SD (NCDENR)	SW-033-SD (NCDENR)	SW-034-SD (NCDENR)	SW-043-SD	SW-043-SD (NCDENR)	SW-044-SD	SW-044-SD (NCDENR)	SW-045-SD	SW-045-SD (NCDENR)	SW-046-SD	SW-046-SD (NCDENR)
		Station ID	SW-032-SD	SW-032-SD	SW-033-SD	SW-034-SD		SW-043-SD		SW-044-SD	SW-045-SD	SW-045-SD	SW-046-SD	SW-046-SD
		Date Collected	7/19/2006	11/14/1995	11/13/1995	11/13/1995	11/8/1995	11/8/1995	11/8/1995	11/8/1995	7/19/2006	11/8/1995	7/19/2006	11/8/1995
		Waterbody	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek
		Location	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream
		Depth Interval	0 - 3"	0 - 12"	0 - 12"	0 - 12"	0 - 4"	0 - 4"	0 - 4"	0 - 4"	0 - 4"	0 - 4"	0 - 2"	0 - 2"
ChemClass	Analyte Name	Conc Unit												
VOCs	1,1,1-Trichloroethane	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	1,1,2,2-Tetrachloroethane	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	1,1,2-Trichloroethane	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	1,1-Dichloroethane	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	1,1-Dichloroethene	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	1,2,4-Trichlorobenzene	mg/Kg dw		0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
VOCs	1,2-Dichlorobenzene	mg/Kg dw		0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
VOCs	1,2-Dichloroethane	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	1,2-Dichloroethene (total)	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	1,2-Dichloropropane	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	1,3-Dichlorobenzene	mg/Kg dw		0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
VOCs	1,4-Dichlorobenzene	mg/Kg dw		0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
VOCs	2-Butanone	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	4-Bromophenyl phenyl ether	mg/Kg dw		0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
VOCs	Acetone	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	Benzene	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	bis(2-Chloro-1-methylethyl) ether	mg/Kg dw					0.33 U		0.33 U		0.33 U		0.33 U	
VOCs	Bis(2-chloroethoxy) methane	mg/Kg dw		0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
VOCs	Bis(2-Chloroethyl) ether	mg/Kg dw		0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
VOCs	Bis(2-Chloroisopropyl) ether	mg/Kg dw		0.54 U	0.47 U	0.52 U		0.35 U		0.38 U		0.42 U		0.7 U
VOCs	Bromodichloromethane	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	Bromoform	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	Bromomethane	mg/Kg dw		0.016 UR	0.014 UR	0.016 UR								
VOCs	Carbon disulfide	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	Carbon tetrachloride	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	Chlorobenzene	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	Chloroethane	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	Chloroform	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	Chloromethane	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	cis-1,3-Dichloropropene	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	Dibromochloromethane	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	Ethylbenzene	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	Methyl butyl ketone	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	Methyl isobutyl ketone	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	Methylene chloride	mg/Kg dw		0.016 U	0.014 U	0.03 U								
VOCs	m-Xylene	mg/Kg dw												
VOCs	o-Xylene	mg/Kg dw												
VOCs	p-Xylene	mg/Kg dw												
VOCs	Styrene	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	Tetrachloroethene	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	Toluene	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	trans-1,3-Dichloropropene	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	Trichloroethene	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	Vinyl chloride	mg/Kg dw		0.016 U	0.014 U	0.016 U								
VOCs	Xylenes (total)	mg/Kg dw		0.016 U	0.014 U	0.016 U								
SVOCs	2,4-Dinitrotoluene	mg/Kg dw		0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
SVOCs	2,6-Dinitrotoluene	mg/Kg dw		0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
SVOCs	2-Chloronaphthalene	mg/Kg dw		0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
SVOCs	2-Methylphenol	mg/Kg dw	150 U	0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
SVOCs	2-Nitroaniline	mg/Kg dw		1.4 U	1.2 U	1.2 U	1.7 U	0.89 U	1.7 U	0.94 U	1.7 U	1.1 U	1.7 U	1.8 U
SVOCs	3,3'-Dichlorobenzidine	mg/Kg dw		0.54 U	0.47 U	0.52 U	0.66 U	0.35 U	0.66 U	0.38 U	0.66 U	0.42 U	0.66 U	0.7 UR
SVOCs	3-Nitroaniline	mg/Kg dw		1.4 U	1.2 U	1.3 U	1.7 U	0.89 U	1.7 U	0.94 U	1.7 U	1.1 U	1.7 U	1.8 U
SVOCs	4-Chloroaniline	mg/Kg dw		0.54 U	0.47 U	0.52 U		0.35 U		0.38 U		0.42 U		0.7 U
SVOCs	4-Chlorophenyl Phenyl Ether	mg/Kg dw		0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
SVOCs	4-Nitroaniline	mg/Kg dw		1.4 U	1.2 U	1.3 U	1.7 U	0.89 U	1.7 U	0.94 U	1.7 U	1.1 U	1.7 U	1.8 U
SVOCs	Aniline	mg/Kg dw	0.69 U											
SVOCs	Benzidine	mg/Kg dw					2.7 U		2.7 U		2.7 U		2.7 U	
SVOCs	Benzoic acid	mg/Kg dw					1.7 U		1.7 U		1.7 U		1.7 U	
SVOCs	Benzyl alcohol	mg/Kg dw					0.33 U		0.33 U		0.33 U		0.33 U	
SVOCs	Biphenyl	mg/Kg dw												
SVOCs	Bis(2-ethylhexyl) phthalate	mg/Kg dw		0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
SVOCs	Butyl benzyl phthalate	mg/Kg dw		0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
SVOCs	Diethylphthalate	mg/Kg dw		0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
SVOCs	Dimethylphthalate	mg/Kg dw		0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
SVOCs	Di-n-butylphthalate	mg/Kg dw		0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
SVOCs	Di-n-octylphthalate	mg/Kg dw		0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
SVOCs	Hexachlorobenzene	mg/Kg dw		0.54 UJ	0.47 UJ	0.52 UJ	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
SVOCs	Hexachlorobutadiene	mg/Kg dw		0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
SVOCs	Hexachlorocyclopentadiene	mg/Kg dw		0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
SVOCs	Hexachloroethane	mg/Kg dw		0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
SVOCs	Isophorone	mg/Kg dw	0.054 U	0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
SVOCs	Nitrobenzene	mg/Kg dw		0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
SVOCs	N-Nitrosodimethylamine	mg/Kg dw					0.33 U		0.33 U		0.33 U		0.33 U	

Table A-3. Compilation of Sediment Results from the Cedar Creek
Southern Wood Piedmont - Gulf, North Carolina Facility

		Sample ID	SW-032-SD	SW-032-SD (NCDENR)	SW-033-SD (NCDENR)	SW-034-SD (NCDENR)	SW-043-SD	SW-043-SD (NCDENR)	SW-044-SD	SW-044-SD (NCDENR)	SW-045-SD	SW-045-SD (NCDENR)	SW-046-SD	SW-046-SD (NCDENR)
		Station ID	SW-032-SD	SW-032-SD	SW-033-SD	SW-034-SD		SW-043-SD		SW-044-SD	SW-045-SD	SW-045-SD	SW-046-SD	SW-046-SD
		Date Collected	7/18/2000	11/14/1995	11/13/1995	11/13/1995	11/9/1995	11/9/1995	11/9/1995	11/9/1995	7/19/2000	11/9/1995	7/19/2000	11/9/1995
		Waterbody	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek
		Location	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream
		Depth Interval	0 - 3"	0 - 12"	0 - 12"	0 - 12"	0 - 4"	0 - 4"	0 - 4"	0 - 4"	0 - 4"	0 - 4"	0 - 2"	0 - 2"
ChemClass	Analyte Name	Conc Unit												
SVOCs	N-nitrosodi-n-propylamine	mg/Kg dw		0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
SVOCs	N-nitrosodiphenylamine	mg/Kg dw		0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
SVOCs	p-Chloroaniline	mg/Kg dw					0.66 U		0.66 U		0.66 U		0.66 U	
Phenolics	2,3,4,6-Tetrachlorophenol	mg/Kg dw	0.69 U											
Phenolics	2,4,5-Trichlorophenol	mg/Kg dw		1.4 U	1.2 U	1.3 U	0.33 U	0.89 U	0.33 U	0.94 U	0.33 U	1.1 U	0.33 U	1.8 U
Phenolics	2,4,6-Trichlorophenol	mg/Kg dw	0.69 U	0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
Phenolics	2,4-Dichlorophenol	mg/Kg dw		0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
Phenolics	2,4-Dimethylphenol	mg/Kg dw	0.69 U	0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
Phenolics	2,4-Dinitrophenol	mg/Kg dw		1.4 U	1.2 U	1.3 U	1.7 U	0.89 U	1.7 U	0.94 U	1.7 U	1.1 U	1.7 U	1.8 U
Phenolics	2-Chlorophenol	mg/Kg dw	0.69 U	0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
Phenolics	2-Methyl-4,6-dinitrophenol	mg/Kg dw		1.4 U	1.2 U	1.3 U		0.89 U		0.94 U		1.1 U		1.8 U
Phenolics	2-Nitrophenol	mg/Kg dw		0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
Phenolics	3&4-Methylphenol	mg/Kg dw		0.052 J	0.06 J	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
Phenolics	4,6-Dinitro-2-methylphenol	mg/Kg dw					1.7 U		1.7 U		1.7 U		1.7 U	
Phenolics	4-Chloro-3-methylphenol	mg/Kg dw	0.69 U	0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
Phenolics	4-Methylphenol	mg/Kg dw												
Phenolics	4-Nitrophenol	mg/Kg dw		1.4 U	1.2 U	1.3 U	1.7 U	0.89 U	1.7 U	0.94 U	1.7 U	1.1 U	1.7 U	1.8 U
Phenolics	Pentachlorophenol	mg/Kg dw	3.5 U	0.3 J	1.2 U	1.3 U	1.7 U	0.89 U	1.7 U	0.94 U	1.7 U	0.31 J	1.7 U	1.8 U
Phenolics	Phenol	mg/Kg dw	0.69 U	0.54 U	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.42 U	0.33 U	0.7 U
PAHs	1-Methylnaphthalene	mg/Kg dw												
PAHs	2-Methylnaphthalene	mg/Kg dw	0.69 U	0.064 J	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.15 J	0.33 U	0.61	0.33 U	0.7 U
PAHs	Acenaphthene	mg/Kg dw	0.69 U	0.065 J	0.47 UJ	0.52 UJ	0.33 U	0.35 U	3.1	1.8	0.33 U	0.42 U	0.33 U	0.7 U
PAHs	Acenaphthylene	mg/Kg dw	150 U	0.074 J	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.38 U	0.33 U	0.083 J	0.33 U	0.7 U
PAHs	Anthracene	mg/Kg dw	0.69 U	0.39 J	0.47 U	0.52 U	0.33 U	0.35 U	4.2	1.5	6.9	18	0.33 U	0.7 U
PAHs	Benzo(a)anthracene	mg/Kg dw	0.69 U	0.28 J	0.47 U	0.52 U	0.33 U	0.35 U	3.1	1.3	3	1.1	0.33 U	0.7 U
PAHs	Benzo(a)pyrene	mg/Kg dw	0.69 U	0.53 J	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.51	1.7	0.82	0.33 U	0.7 U
PAHs	Benzo(b&k)fluoranthene	mg/Kg dw		1.9	0.47 U	0.12 J		0.35 U		1.3		2.9		0.7 U
PAHs	Benzo(b)fluoranthene	mg/Kg dw	130 U				0.33 U		2.2		4.5		0.33 U	
PAHs	Benzo(g,h,i)perylene	mg/Kg dw	0.048 U	0.27 J	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.16 J	0.33 U	0.46	0.33 U	0.7 U
PAHs	Benzo(k)fluoranthene	mg/Kg dw	130 U				0.33 U		0.33 U		2.2		0.33 U	
PAHs	Carbazole	mg/Kg dw	0.69 U	0.1 J	0.47 U	0.52 U		0.35 U		0.086 J		3.3 J		0.7 U
PAHs	Chrysene	mg/Kg dw	0.69 U	0.64	0.47 U	0.52 U	0.33 U	0.35 U	3.7	1.5	5.3	1.9	0.33 U	0.7 U
PAHs	Dibenzo(a,h)anthracene	mg/Kg dw		0.11 J	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.094 J	0.33 U	0.23 J	0.33 U	0.7 U
PAHs	Dibenzo(a,h)pyrene	mg/Kg dw	0.69 U											
PAHs	Dibenzofuran	mg/Kg dw	0.071 U	0.066 J	0.47 U	0.52 U	0.33 U	0.35 U	2.1	1.1	0.33 U	0.64	0.33 U	0.7 U
PAHs	Fluoranthene	mg/Kg dw	0.69 U	0.23 J	0.47 U	0.52 U	0.33 U	0.35 U	19	7.1	6.4	1.1	0.33 U	0.7 U
PAHs	Fluorene	mg/Kg dw	0.69 U	0.06 J	0.47 U	0.52 U	0.33 U	0.35 U	4.6	2.4	0.33 U	1.6	0.33 U	0.7 U
PAHs	Indeno(1,2,3-cd)pyrene	mg/Kg dw	0.69 U	0.54 J	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.19 J	0.33 U	0.63	0.33 U	0.7 U
PAHs	Naphthalene	mg/Kg dw	0.69 U	0.12 J	0.47 U	0.52 U	0.33 U	0.35 U	0.33 U	0.079 J	0.33 U	0.26 J	0.33 U	0.7 U
PAHs	Phenanthrene	mg/Kg dw	0.69 U	0.23 J	0.47 U	0.52 U	0.33 U	0.35 U	18	6.4	0.96	3.9 J	0.33 U	0.7 U
PAHs	Pyrene	mg/Kg dw	150 U	0.23 J	0.47 UJ	0.52 UJ	0.33 U	0.35 U	14	4.2	5.2	1	0.33 U	0.7 U
PCDD/Fs	1,2,3,4,6,7,8-HpCDD	ng/Kg dw		30000	53		82.6	120	30060	26000	34840	17000	192	180
PCDD/Fs	1,2,3,4,6,7,8-HpCDF	ng/Kg dw		4800	29		13.8	12	5080	3400	5450	2700	22.9	17
PCDD/Fs	1,2,3,4,7,8,9-HpCDF	ng/Kg dw		390	16 U		1.1	4.3 U	514	190	573	240	1.5	1.3 J
PCDD/Fs	1,2,3,4,7,8-HxCDD	ng/Kg dw		62	16 U		0.4	4.3 U	29.1	16	78.9	50	0.86 EMPC	0.87 J
PCDD/Fs	1,2,3,4,7,8-HxCDF	ng/Kg dw		1200 U	16 U		0.42	4.3 U	122	73 J	147	89 J	1.2	5 U
PCDD/Fs	1,2,3,6,7,8-HxCDD	ng/Kg dw		790	1.4 J		1.7	2.6 J	529	490	680	530	4.3	3.8 J
PCDD/Fs	1,2,3,6,7,8-HxCDF	ng/Kg dw		17 U	16 U		0.17 EMPC	4.3 U	38.6 EMPC	12	51.4	25	0.3 U	5 U
PCDD/Fs	1,2,3,7,8,9-HxCDD	ng/Kg dw		210	2.2 J		1	1.3 J	133	63	238	140	6.1	2 J
PCDD/Fs	1,2,3,7,8,9-HxCDF	ng/Kg dw		17 U	16 U		0.03 U	4.3 U	15.1 U	6.3 U	27.6	4.5 U	0.3 U	5 U
PCDD/Fs	1,2,3,7,8-PeCDD	ng/Kg dw		7 J	16 U			4.3 U		2.4 J		10		5 U
PCDD/Fs	1,2,3,7,8-PeCDF	ng/Kg dw		17 U	16 U		0.16 EMPC	4.3 R	20.4 U	1 J	20.4 U	2.1 J	0.3 U	5 R
PCDD/Fs	2,3,4,6,7,8-HxCDF	ng/Kg dw		38 U	16 U		0.32 EMPC	4.3 U	88.4	7.9	136	17	0.68 EMPC	5 U
PCDD/Fs	2,3,4,7,8-PeCDF	ng/Kg dw		6.2 J	4.4 J		0.05 U	4.3 U	14.7 U	3.9 J	15.7 U	7.2	0.3 U	5 U
PCDD/Fs	2,3,7,8-TeCDD	ng/Kg dw		6.7 U	6.3 U		0.13	1.7 U	19.9 U	0.22 J	20.9 U	0.95 J	0.03 U	2 U
PCDD/Fs	2,3,7,8-TeCDF	ng/Kg dw		6.7 U	6.3 U		0.28	1.7 U	15.1 U	0.27 J	16.1 U	0.59 J	0.4 U	2 U
PCDD/Fs	OCDD	ng/Kg dw		360000 J	1400 J		2280	2700 J	300700	37000	325020	170000 J	5800	8200
PCDD/Fs	OCDF	ng/Kg dw		31000	32 U		41.7	82 J	19390	28000	22060	12000 J	67.8	97
PCDD/F homologs	TeCDDs (total)	ng/Kg dw		11 J	0.7 J		0.13	1.7 UJ	19.9 U	6.1 J	20.9 U	25 J	0.88 EMPC	2 UJ
PCDD/F homologs	TeCDFs (total)	ng/Kg dw		22 J	1.8 J		0.28	0.12 J	15.1 U	9.9 J	16.1 U	55 J	2.6 EMPC	1.6 J
PCDD/F homologs	PeCDDs (total)	ng/Kg dw		79 J	16 UJ		0.32	4.3 UJ	20.4 U	45 J	92	140 J	6.2 EMPC	1.8 J
PCDD/F homologs	PeCDFs (total)	ng/Kg dw		200 J	200 J		0.62	4.3 UJ	107 EMPC	54 J	243	210 J	1.9	1.3 J
PCDD/F homologs	HxCDD (total)	ng/Kg dw		5200 J	14 J		12.5	17 J	3030	2400 J	3900	3200 J	43.2	30 J
PCDD/F homologs	HxCDF (total)	ng/Kg dw		4400 J	12 J		9.1	10 J	3820	580 J	4450	3000 J	14.1	15 J
PCDD/F homologs	HpCDD (total)	ng/Kg dw		79000 J	130 J		213	300 J	76850	65000 J	86060	45000 J	519	480 J
PCDD/F homologs	HpCDF (total)	ng/Kg dw		6100 J	34 J		48.7	52 J	25530	1400 J	27590	13000 J	67	74 J
Dioxin-TEQ	Dioxin-TEQ(mammal) - Zero DL	ng/Kg dw	NC	594.26	2.92	NC	2.24	2.54	546.58	387.44	648.64	352.33	5.24	5.14
Dioxin-TEQ	Dioxin-TEQ(mammal) - Half DL	ng/Kg dw	NC	651.80	18.71	NC	2.25	7.37	560.76	387.75	662.78	352.56	5.35	10.49
Dioxin-TEQ	Dioxin-TEQ(avian)-Zero DL	ng/Kg dw	NC	490.20	6.38	NC	3.17	3.10	433.58	131.88	493.04	271.45	7.13	8.85
Dioxin-TEQ	Dioxin-TEQ(avian)-Half DL	ng/Kg dw	NC	561.35	25.16	NC	3.20	10.09	460.91	132.20	521.16	271.68	7.54	16.85
Metals	Aluminum	mg/Kg dw		8400	8600	13000								
Metals	Antimony	mg/Kg dw		4 UJ	3.3 UR	3.3 UR								
Metals	Arsenic	mg/Kg dw		2 U	1 U	2.9								

Table A-3. Compilation of Sediment Results from the Cedar Creek
Southern Wood Piedmont - Gulf, North Carolina Facility

		Sample ID	SW-032-SD	SW-032-SD (NCDENR)	SW-033-SD (NCDENR)	SW-034-SD (NCDENR)	SW-043-SD	SW-043-SD (NCDENR)	SW-044-SD	SW-044-SD (NCDENR)	SW-045-SD	SW-045-SD (NCDENR)	SW-046-SD	SW-046-SD (NCDENR)
		Station ID	SW-032-SD	SW-032-SD	SW-033-SD	SW-034-SD		SW-043-SD		SW-044-SD	SW-045-SD	SW-045-SD	SW-046-SD	SW-046-SD
		Date Collected	7/18/2000	11/14/1995	11/13/1995	11/13/1995	11/9/1995	11/9/1995	11/9/1995	11/9/1995	7/19/2000	11/9/1995	7/19/2000	11/9/1995
		Waterbody	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek
		Location	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream
		Depth Interval	0 - 3"	0 - 12"	0 - 12"	0 - 12"	0 - 4"	0 - 4"	0 - 4"	0 - 4"	0 - 4"	0 - 4"	0 - 2"	0 - 2"
ChemClass	Analyte Name	Conc Unit												
Metals	Barium	mg/Kg dw		95	76	140								
Metals	Beryllium	mg/Kg dw		0.69 J	1 U	0.79 J								
Metals	Cadmium	mg/Kg dw		0.34 U	0.32 U	0.33 U								
Metals	Calcium	mg/Kg dw		670	560	920								
Metals	Chromium	mg/Kg dw		12	8.5	14								
Metals	Cobalt	mg/Kg dw		20 U	4 U	20 U								
Metals	Copper	mg/Kg dw		20 U	20 U	25								
Metals	Iron	mg/Kg dw		9800	4000	18000								
Metals	Lead	mg/Kg dw		13	12 J	9.6								
Metals	Magnesium	mg/Kg dw		1500	680	1700								
Metals	Manganese	mg/Kg dw		460 J	92 J	660								
Metals	Mercury	mg/Kg dw		0.07 U	0.07 U	0.2 U								
Metals	Nickel	mg/Kg dw		9 U	4 U	9 U								
Metals	Potassium	mg/Kg dw		310	330	380								
Metals	Selenium	mg/Kg dw		0.6 U	0.57 U	1 U								
Metals	Silver	mg/Kg dw		0.94 U	0.69 U	0.9 U								
Metals	Sodium	mg/Kg dw		70 U	80 U	70 U								
Metals	Thallium	mg/Kg dw		0.63 U	0.6 U	0.6 U								
Metals	Tin	mg/Kg dw												
Metals	Vanadium	mg/Kg dw		24	14	42								
Metals	Zinc	mg/Kg dw		40 UJ	40 UJ	40 UJ								
General Parameters	Percent Clay	%	12.7								3.5		0.9	
General Parameters	Percent Gravel	%	22								29.1		0 U	
General Parameters	Percent Sand	%	43.8								51.5		89.9	
General Parameters	Percent Silt	%	21.6								15.9		9.2	
General Parameters	Total Organic Carbon	mg/Kg dw	24900								3740		4530	
General Parameters	Total Solids	%												
General Parameters	Percent Moisture (metals)	%		33	40	30								
General Parameters	Percent Moisture (PCDD/F)	%		35	30					19		22		49
General Parameters	Percent Moisture (SVOC)	%						7		12		22		53
General Parameters	Percent Moisture (SVOCs)	%		39	31	36								
General Parameters	Percent Moisture (VOCs)	%		39	31	36								
TCLP-PAHs	Acenaphthene in TCLP Extract	mg/L												
TCLP-PAHs	Acenaphthylene in TCLP Extract	mg/L												
TCLP-PAHs	Anthracene in TCLP Extract	mg/L												
TCLP-PAHs	Benzo(a)anthracene in TCLP Extract	mg/L												
TCLP-PAHs	Benzo(a)pyrene in TCLP Extract	mg/L												
TCLP-PAHs	Benzo(b)fluoranthene in TCLP Extract	mg/L												
TCLP-PAHs	Benzo(g,h,i)perylene in TCLP Extract	mg/L												
TCLP-PAHs	Benzo(k)fluoranthene in TCLP Extract	mg/L												
TCLP-PAHs	Carbazole in TCLP Extract	mg/L												
TCLP-PAHs	Chrysene in TCLP Extract	mg/L												
TCLP-PAHs	Dibenzo(a,h)anthracene in TCLP Extract	mg/L												
TCLP-PAHs	Dibenzofuran in TCLP Extract	mg/L												
TCLP-PAHs	Dimethyl Naphthalene in TCLP Extract	mg/L												
TCLP-PAHs	Fluoranthene in TCLP Extract	mg/L												
TCLP-PAHs	Fluorene in TCLP Extract	mg/L												
TCLP-PAHs	Indeno(1,2,3-cd)pyrene in TCLP Extract	mg/L												
TCLP-PAHs	Isophorone in TCLP Extract	mg/L												
TCLP-PAHs	Naphthalene in TCLP Extract	mg/L												
TCLP-PAHs	Phenanthrene in TCLP Extract	mg/L												
TCLP-PAHs	Pyrene in TCLP Extract	mg/L												
TCLP-Phenolics	Extract	mg/L												
TCLP-Phenolics	2,4,5-Trichlorophenol in TCLP Extract	mg/L												
TCLP-Phenolics	2,4-Dimethylphenol in TCLP Extract	mg/L												
TCLP-Phenolics	2-Chlorophenol in TCLP Extract	mg/L												
TCLP-Phenolics	2-Methylphenol in TCLP Extract	mg/L												
TCLP-Phenolics	Extract	mg/L												
TCLP-Phenolics	Pentachlorophenol in TCLP Extract	mg/L												
TCLP-Phenolics	Phenol in TCLP Extract	mg/L												
TCLP-SVOCs	Aniline in TCLP Extract	mg/L												

Table A-3. Compilation of Sediment Results from the Cedar Creek
Southern Wood Piedmont - Gulf, North Carolina Facility

		Sample ID	SW-047-SD	SW-047-SD (NCDENR)	SW-048-SD	SW-048-SD (NCDENR)	SW-049-SD	SW-049-SD (NCDENR)	SW-050-SD	SW-050-SD (NCDENR)	SW-051-SD	SW-051-SD (NCDENR)	SW-052-SD	SW-052-SD (NCDENR)
		Station ID	SW-047-SD	SW-047-SD	SW-048-SD	SW-048-SD	SW-049-SD	SW-049-SD	SW-050-SD	SW-050-SD	SW-051-SD	SW-051-SD	SW-052-SD	SW-052-SD
		Date Collected	7/18/2006	11/8/1998	7/18/2006	11/8/1998	7/18/2006	11/8/1998	7/18/2006	11/8/1998	7/18/2006	11/8/1998	7/18/2006	11/8/1998
		Waterbody	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek
		Location	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream
		Depth Interval	0 - 2"	0 - 2"	0 - 2"	0 - 2"	0 - 2"	0 - 2"	0 - 2"	0 - 2"	0 - 2"	0 - 2"	0 - 2"	0 - 2"
ChemClass	Analyte Name	Conc Unit												
VOCs	1,1,1-Trichloroethane	mg/Kg dw												
VOCs	1,1,2,2-Tetrachloroethane	mg/Kg dw												
VOCs	1,1,2-Trichloroethane	mg/Kg dw												
VOCs	1,1-Dichloroethane	mg/Kg dw												
VOCs	1,1-Dichloroethene	mg/Kg dw												
VOCs	1,2,4-Trichlorobenzene	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
VOCs	1,2-Dichlorobenzene	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
VOCs	1,2-Dichloroethane	mg/Kg dw												
VOCs	1,2-Dichloroethene (total)	mg/Kg dw												
VOCs	1,2-Dichloropropane	mg/Kg dw												
VOCs	1,3-Dichlorobenzene	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
VOCs	1,4-Dichlorobenzene	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
VOCs	2-Butanone	mg/Kg dw												
VOCs	4-Bromophenyl phenyl ether	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
VOCs	Acetone	mg/Kg dw												
VOCs	Benzene	mg/Kg dw												
VOCs	bis(2-Chloro-1-methylethyl) ether	mg/Kg dw	0.33 U		0.33 U		0.33 U		0.33 U		0.33 U		0.33 U	
VOCs	Bis(2-chloroethoxy) methane	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
VOCs	Bis(2-Chloroethyl) ether	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
VOCs	Bis(2-Chloroisopropyl) ether	mg/Kg dw		0.39 U		0.42 UJ		0.36 U		0.44 U		0.41 U		0.43 U
VOCs	Bromodichloromethane	mg/Kg dw												
VOCs	Bromoform	mg/Kg dw												
VOCs	Bromomethane	mg/Kg dw												
VOCs	Carbon disulfide	mg/Kg dw												
VOCs	Carbon tetrachloride	mg/Kg dw												
VOCs	Chlorobenzene	mg/Kg dw												
VOCs	Chloroethane	mg/Kg dw												
VOCs	Chloroform	mg/Kg dw												
VOCs	Chloromethane	mg/Kg dw												
VOCs	cis-1,3-Dichloropropene	mg/Kg dw												
VOCs	Dibromochloromethane	mg/Kg dw												
VOCs	Ethylbenzene	mg/Kg dw												
VOCs	Methyl butyl ketone	mg/Kg dw												
VOCs	Methyl isobutyl ketone	mg/Kg dw												
VOCs	Methylene chloride	mg/Kg dw												
VOCs	m-Xylene	mg/Kg dw												
VOCs	o-Xylene	mg/Kg dw												
VOCs	p-Xylene	mg/Kg dw												
VOCs	Styrene	mg/Kg dw												
VOCs	Tetrachloroethene	mg/Kg dw												
VOCs	Toluene	mg/Kg dw												
VOCs	trans-1,3-Dichloropropene	mg/Kg dw												
VOCs	Trichloroethene	mg/Kg dw												
VOCs	Vinyl chloride	mg/Kg dw												
VOCs	Xylenes (total)	mg/Kg dw												
SVOCs	2,4-Dinitrotoluene	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
SVOCs	2,6-Dinitrotoluene	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
SVOCs	2-Chloronaphthalene	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
SVOCs	2-Methylphenol	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
SVOCs	2-Nitroaniline	mg/Kg dw	1.7 U	0.99 U	1.7 U	1.1 UJ	1.7 U	0.9 U	1.7 U	1.1 U	1.7 U	1 U	1.7 U	1.1 U
SVOCs	3,3'-Dichlorobenzidine	mg/Kg dw	0.66 U	0.39 U	0.66 U	0.42 UJ	0.66 U	0.36 U	0.66 U	0.44 U	0.66 U	0.41 U	0.66 U	0.43 U
SVOCs	3-Nitroaniline	mg/Kg dw	1.7 U	0.99 U	1.7 U	1.1 UJ	1.7 U	0.9 U	1.7 U	1.1 U	1.7 U	1 U	1.7 U	1.1 U
SVOCs	4-Chloroaniline	mg/Kg dw		0.39 U		0.42 UJ		0.36 U		0.44 U		0.41 U		0.43 U
SVOCs	4-Chlorophenyl Phenyl Ether	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
SVOCs	4-Nitroaniline	mg/Kg dw	1.7 U	0.99 U	1.7 U	1.1 UJ	1.7 U	0.9 U	1.7 U	1.1 U	1.7 U	1 U	1.7 U	1.1 U
SVOCs	Aniline	mg/Kg dw												
SVOCs	Benzidine	mg/Kg dw	2.7 U		2.7 U		2.7 U		2.7 U		2.7 U		2.7 U	
SVOCs	Benzoic acid	mg/Kg dw	1.7 U		1.7 U		1.7 U		1.7 U		1.7 U		1.7 U	
SVOCs	Benzyl alcohol	mg/Kg dw	0.33 U		0.33 U		0.33 U		0.33 U		0.33 U		0.33 U	
SVOCs	Biphenyl	mg/Kg dw												
SVOCs	Bis(2-ethylhexyl) phthalate	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
SVOCs	Butyl benzyl phthalate	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
SVOCs	Diethylphthalate	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
SVOCs	Dimethylphthalate	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
SVOCs	Di-n-butylphthalate	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
SVOCs	Di-n-octylphthalate	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
SVOCs	Hexachlorobenzene	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
SVOCs	Hexachlorobutadiene	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
SVOCs	Hexachlorocyclopentadiene	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
SVOCs	Hexachloroethane	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
SVOCs	Isophorone	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
SVOCs	Nitrobenzene	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
SVOCs	N-Nitrosodimethylamine	mg/Kg dw	0.33 U		0.33 U		0.33 U		0.33 U		0.33 U		0.33 U	

Table A-3. Compilation of Sediment Results from the Cedar Creek
Southern Wood Piedmont - Gulf, North Carolina Facility

		Sample ID	SW-047-SD	SW-047-SD (NCDENR)	SW-048-SD	SW-048-SD (NCDENR)	SW-049-SD	SW-049-SD (NCDENR)	SW-050-SD	SW-050-SD (NCDENR)	SW-051-SD	SW-051-SD (NCDENR)	SW-052-SD	SW-052-SD (NCDENR)
		Station ID	SW-047-SD	SW-047-SD	SW-048-SD	SW-048-SD	SW-049-SD	SW-049-SD	SW-050-SD	SW-050-SD	SW-051-SD	SW-051-SD	SW-052-SD	SW-052-SD
		Date Collected	7/18/2006	11/9/1996	7/18/2006	11/9/1996	7/18/2006	11/9/1996	7/18/2006	11/9/1996	7/18/2006	11/9/1996	7/18/2006	11/9/1996
		Waterbody	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek
		Location	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream
		Depth Interval	0 - 2"	0 - 2"	0 - 2"	0 - 2"	0 - 2"	0 - 2"	0 - 2"	0 - 2"	0 - 2"	0 - 2"	0 - 2"	0 - 2"
ChemClass	Analyte Name	Conc Unit												
SVOCs	N-nitrosodi-n-propylamine	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
SVOCs	N-nitrosodiphenylamine	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
SVOCs	p-Chloroaniline	mg/Kg dw	0.66 U		0.66 U		0.66 U		0.66 U		0.66 U		0.66 U	
Phenolics	2,3,4,6-Tetrachlorophenol	mg/Kg dw												
Phenolics	2,4,5-Trichlorophenol	mg/Kg dw	0.33 U	0.99 U	0.33 U	1.1 UJ	0.33 U	0.9 U	0.33 U	1.1 U	0.33 U	1 U	0.33 U	1.1 U
Phenolics	2,4,6-Trichlorophenol	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
Phenolics	2,4-Dichlorophenol	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
Phenolics	2,4-Dimethylphenol	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
Phenolics	2,4-Dinitrophenol	mg/Kg dw	1.7 U	0.99 U	1.7 U	1.1 UJ	1.7 U	0.9 U	1.7 U	1.1 U	1.7 U	1 U	1.7 U	1.1 U
Phenolics	2-Chlorophenol	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
Phenolics	2-Methyl-4,6-dinitrophenol	mg/Kg dw		0.99 U		1.1 UJ		0.9 U		1.1 U		1 U		1.1 U
Phenolics	2-Nitrophenol	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
Phenolics	3&4-Methylphenol	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
Phenolics	4,6-Dinitro-2-methylphenol	mg/Kg dw	1.7 U		1.7 U		1.7 U		1.7 U		1.7 U		1.7 U	
Phenolics	4-Chloro-3-methylphenol	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
Phenolics	4-Methylphenol	mg/Kg dw												
Phenolics	4-Nitrophenol	mg/Kg dw	1.7 U	0.99 U	1.7 U	1.1 UJ	1.7 U	0.9 U	1.7 U	1.1 U	1.7 U	1 U	1.7 U	1.1 U
Phenolics	Pentachlorophenol	mg/Kg dw	1.7 U	0.99 U	1.7 U	1.1 UJ	1.7 U	0.9 U	1.7 U	1.1 U	1.7 U	1 U	1.7 U	1.1 U
Phenolics	Phenol	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
PAHs	1-Methylnaphthalene	mg/Kg dw												
PAHs	2-Methylnaphthalene	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
PAHs	Acenaphthene	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
PAHs	Acenaphthylene	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
PAHs	Anthracene	mg/Kg dw	0.9	0.89	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
PAHs	Benzo(a)anthracene	mg/Kg dw	0.6	0.3 J	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
PAHs	Benzo(a)pyrene	mg/Kg dw	0.64	0.36 J	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
PAHs	Benzo(b&k)fluoranthene	mg/Kg dw		1.2 J		0.42 UJ		0.36 U		0.44 U		0.41 U		0.43 U
PAHs	Benzo(b)fluoranthene	mg/Kg dw	1.3		0.33 U		0.33 U		0.33 U		0.33 U		0.33 U	
PAHs	Benzo(g,h,i)perylene	mg/Kg dw	0.33 U	0.2 J	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
PAHs	Benzo(k)fluoranthene	mg/Kg dw	0.66		0.33 U		0.33 U		0.33 U		0.33 U		0.33 U	
PAHs	Carbazole	mg/Kg dw		0.096 J		0.42 UJ		0.36 U		0.44 U		0.41 U		0.43 U
PAHs	Chrysene	mg/Kg dw	1	0.54	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
PAHs	Dibenzo(a,h)anthracene	mg/Kg dw	0.33 U	0.12 J	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
PAHs	Dibenzo(a,h)pyrene	mg/Kg dw												
PAHs	Dibenzofuran	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
PAHs	Fluoranthene	mg/Kg dw	0.8	0.32 J	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
PAHs	Fluorene	mg/Kg dw	0.33 U	0.092 J	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
PAHs	Indeno(1,2,3-cd)pyrene	mg/Kg dw	0.33 U	0.24 J	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
PAHs	Naphthalene	mg/Kg dw	0.33 U	0.39 U	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
PAHs	Phenanthrene	mg/Kg dw	0.33 U	0.25 J	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
PAHs	Pyrene	mg/Kg dw	1	0.32 J	0.33 U	0.42 UJ	0.33 U	0.36 U	0.33 U	0.44 U	0.33 U	0.41 U	0.33 U	0.43 U
PCDD/Fs	1,2,3,4,6,7,8-HpCDD	ng/Kg dw	6730	4200	1930	1300	708	680	1610	820	777	720	519	630
PCDD/Fs	1,2,3,4,6,7,8-HpCDF	ng/Kg dw	946	490	273	220	130	130	242	160	120	89	77.4	70
PCDD/Fs	1,2,3,4,7,8,9-HpCDF	ng/Kg dw	65	34	14.3	16	6.6	7.8	17.8	13	6.8	5.5	4.4	4.4 J
PCDD/Fs	1,2,3,4,7,8-HxCDD	ng/Kg dw	13.2	7.8	6.1	5.8	1.3 EMPC	1.8 J	5.3	3.8 J	1.9	17 J	1.6	5 U
PCDD/Fs	1,2,3,4,7,8-HxCDF	ng/Kg dw	32.3	16 J	8	5.4 J	3.3	3 J	7.9	4.8 J	3.5	2.5 J	2.7	5 U
PCDD/Fs	1,2,3,6,7,8-HxCDD	ng/Kg dw	137	83	39.4	37	16.7	21	34.6	29	17.5	1.4	12.4	13
PCDD/Fs	1,2,3,6,7,8-HxCDF	ng/Kg dw	8.4	3.4 J	3.2	2.4 J	1.1 EMPC	5 U	3.1	1.8 J	1.2	0.7 J	0.9 EMPC	5 U
PCDD/Fs	1,2,3,7,8,9-HxCDD	ng/Kg dw	52.2	18	23.4	15	5.1	4.8 J	15.3	10	6.3	4.6	5.1	4.1 J
PCDD/Fs	1,2,3,7,8,9-HxCDF	ng/Kg dw	0.4 U	4.4 U	0.3 U	5 U	0.2 U	5 U	0.61 EMPC	5 U	0 U	4.2 U	0 U	5 U
PCDD/Fs	1,2,3,7,8-PeCDD	ng/Kg dw		1.3 J		1.3 J		5 U		0.93 J		4.2 U		5 J
PCDD/Fs	1,2,3,7,8-PeCDF	ng/Kg dw	1.9 EMPC	0.36 J	2.1	0.4 J	0.2 U	5 R	1.3	0.27 J	0.2 U	4.2 R	0.58	5 R
PCDD/Fs	2,3,4,6,7,8-HxCDF	ng/Kg dw	16.8	2.6 J	6.7	2.2 J	2.2	5 U	7.2	1.4 J	2.9	4.2 U	2.2	5 U
PCDD/Fs	2,3,4,7,8-PeCDF	ng/Kg dw	2 EMPC	1.5 J	0.91 EMPC	5 U	0.1 U	5 U	0.91	5 U	0.38 EMPC	4.2 U	0.44 EMPC	5 U
PCDD/Fs	2,3,7,8-TeCDD	ng/Kg dw	0.3 U	1.7 U	0.4 U	2 U	0.1 U	2 U	0.23	2 U	0.1 U	1.7 U	0.13	2 U
PCDD/Fs	2,3,7,8-TeCDF	ng/Kg dw	0.3 U	1.7 U	0.4 U	0.43 J	0.5	0.15 J	0.72	0.31 J	0.54	0.18 J	0.69	0.4 J
PCDD/Fs	OCDD	ng/Kg dw	66030	57000	24490	15000	7600	6100	17860	8300	8760	12000	8380	6100
PCDD/Fs	OCDF	ng/Kg dw	2590	3800	701	1200	398	900	810	1000	447	570	293	430
PCDD/F homologs	TeCDDs (total)	ng/Kg dw	1.6 EMPC	2.7 UJ	0.74 EMPC	2 UJ	0.17	2 UJ	3.1	3.6 UJ	0.82	1.9 UJ	2.5	2 UJ
PCDD/F homologs	TeCDFs (total)	ng/Kg dw	4	9.2 J	1.9 EMPC	7.4 J	1	1.6 J	4.7	3.8 J	2.4	1.9 J	6	5.3 J
PCDD/F homologs	PeCDDs (total)	ng/Kg dw	9.9	20 J	6	8.4 J	3.6 EMPC	4.6 J	17.3	9.4 J	3.8	5.6 J	6.4	4 J
PCDD/F homologs	PeCDFs (total)	ng/Kg dw	46.3	43 J	20.3	22 J	5.6	7.2 J	25.4	15 J	9.3	7.2 J	9.8	8.4 J
PCDD/F homologs	HxCDD (total)	ng/Kg dw	951	420 J	267	230 J	112	120 J	270	190 J	118	85 J	94	85 J
PCDD/F homologs	HxCDF (total)	ng/Kg dw	834	430 J	191	190 J	99.3	110 J	204	150 J	98.6	78 J	73.5	60 J
PCDD/F homologs	HpCDD (total)	ng/Kg dw	21260	11000 J	5030	3000 J	1740	1700 J	4330	2000 J	2030	720 J	1400	1600 J
PCDD/F homologs	HpCDF (total)	ng/Kg dw	4010	520 J	902	1000 J	530	690 J	957	780 J	515	400 J	312	360 J
Dioxin-TEQ	Dioxin-TEQ(mammal) - Zero DL	ng/Kg dw	124.54	80.32	38.75	28.36	13.67	13.35	32.31	18.77	15.30	14.55	11.45	15.75
Dioxin-TEQ	Dioxin-TEQ(mammal) - Half DL	ng/Kg dw	124.73	81.48	38.99	30.36	13.94	18.35	32.31	20.77	15.35	16.55	11.45	18.75
Dioxin-TEQ	Dioxin-TEQ(avian)-Zero DL	ng/Kg dw	98.22	74.88	35.31	23.71	11.62	9.48	28.18	14.50	13.43	15.55	12.36	13.46
Dioxin-TEQ	Dioxin-TEQ(avian)-Half DL	ng/Kg dw	98.55	76.80	35.74	27.46	11.74	16.23	28.18	16.25	13.50	21.02	12.36	18.08
Metals	Aluminum	mg/Kg dw												
Metals	Antimony	mg/Kg dw												
Metals	Arsenic	mg/Kg dw												

Table A-3. Compilation of Sediment Results from the Cedar Creek
Southern Wood Piedmont - Gulf, North Carolina Facility

		Sample ID	SW-047-SD	SW-047-SD (NCDENR)	SW-048-SD	SW-048-SD (NCDENR)	SW-049-SD	SW-049-SD (NCDENR)	SW-050-SD	SW-050-SD (NCDENR)	SW-051-SD	SW-051-SD (NCDENR)	SW-052-SD	SW-052-SD (NCDENR)
		Station ID	SW-047-SD	SW-047-SD	SW-048-SD	SW-048-SD	SW-049-SD	SW-049-SD	SW-050-SD	SW-050-SD	SW-051-SD	SW-051-SD	SW-052-SD	SW-052-SD
		Date Collected	7/18/2006	11/8/1996	7/18/2006	11/8/1996	7/18/2006	11/8/1996	7/18/2006	11/8/1996	7/18/2006	11/8/1996	7/18/2006	11/8/1996
		Waterbody	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek
		Location	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream
		Depth Interval	0 - 2"	0 - 2"	0 - 2"	0 - 2"	0 - 2"	0 - 2"	0 - 2"	0 - 2"	0 - 2"	0 - 2"	0 - 2"	0 - 2"
ChemClass	Analyte Name	Conc Unit												
Metals	Barium	mg/Kg dw												
Metals	Beryllium	mg/Kg dw												
Metals	Cadmium	mg/Kg dw												
Metals	Calcium	mg/Kg dw												
Metals	Chromium	mg/Kg dw												
Metals	Cobalt	mg/Kg dw												
Metals	Copper	mg/Kg dw												
Metals	Iron	mg/Kg dw												
Metals	Lead	mg/Kg dw												
Metals	Magnesium	mg/Kg dw												
Metals	Manganese	mg/Kg dw												
Metals	Mercury	mg/Kg dw												
Metals	Nickel	mg/Kg dw												
Metals	Potassium	mg/Kg dw												
Metals	Selenium	mg/Kg dw												
Metals	Silver	mg/Kg dw												
Metals	Sodium	mg/Kg dw												
Metals	Thallium	mg/Kg dw												
Metals	Tin	mg/Kg dw												
Metals	Vanadium	mg/Kg dw												
Metals	Zinc	mg/Kg dw												
General Parameters	Percent Clay	%	0.8		6.2		0.8		18.8		38		21.5	
General Parameters	Percent Gravel	%	8.1		38		16.1		0 U		0 U		0 U	
General Parameters	Percent Sand	%	83.7		47.1		81		47.6		3.9		12	
General Parameters	Percent Silt	%	7.4		8.7		2.1		38.1		58.1		66.5	
General Parameters	Total Organic Carbon	mg/Kg dw	1830		16100		523		44200		7450		7220	
General Parameters	Total Solids	%												
General Parameters	Percent Moisture (metals)	%												
General Parameters	Percent Moisture (PCDD/F)	%		25		36		25		44		33		40
General Parameters	Percent Moisture (SVOC)	%		16		22		8		25		20		23
General Parameters	Percent Moisture (SVOCs)	%												
General Parameters	Percent Moisture (VOCs)	%												
TCLP-PAHs	Acenaphthene in TCLP Extract	mg/L												
TCLP-PAHs	Acenaphthylene in TCLP Extract	mg/L												
TCLP-PAHs	Anthracene in TCLP Extract	mg/L												
TCLP-PAHs	Benzo(a)anthracene in TCLP Extract	mg/L												
TCLP-PAHs	Benzo(a)pyrene in TCLP Extract	mg/L												
TCLP-PAHs	Benzo(b)fluoranthene in TCLP Extract	mg/L												
TCLP-PAHs	Benzo(g,h,i)perylene in TCLP Extract	mg/L												
TCLP-PAHs	Benzo(k)fluoranthene in TCLP Extract	mg/L												
TCLP-PAHs	Carbazole in TCLP Extract	mg/L												
TCLP-PAHs	Chrysene in TCLP Extract	mg/L												
TCLP-PAHs	Dibenzo(a,h)anthracene in TCLP Extract	mg/L												
TCLP-PAHs	Dibenzofuran in TCLP Extract	mg/L												
TCLP-PAHs	Dimethyl Naphthalene in TCLP Extract	mg/L												
TCLP-PAHs	Fluoranthene in TCLP Extract	mg/L												
TCLP-PAHs	Fluorene in TCLP Extract	mg/L												
TCLP-PAHs	Indeno(1,2,3-cd)pyrene in TCLP Extract	mg/L												
TCLP-PAHs	Isophorone in TCLP Extract	mg/L												
TCLP-PAHs	Naphthalene in TCLP Extract	mg/L												
TCLP-PAHs	Phenanthrene in TCLP Extract	mg/L												
TCLP-PAHs	Pyrene in TCLP Extract	mg/L												
TCLP-Phenolics	Extract	mg/L												
TCLP-Phenolics	2,4,5-Trichlorophenol in TCLP Extract	mg/L												
TCLP-Phenolics	2,4-Dimethylphenol in TCLP Extract	mg/L												
TCLP-Phenolics	2-Chlorophenol in TCLP Extract	mg/L												
TCLP-Phenolics	2-Methylphenol in TCLP Extract	mg/L												
TCLP-Phenolics	Extract	mg/L												
TCLP-Phenolics	Pentachlorophenol in TCLP Extract	mg/L												
TCLP-Phenolics	Phenol in TCLP Extract	mg/L												
TCLP-SVOCs	Aniline in TCLP Extract	mg/L												

Table A-3. Compilation of Sediment Results from the Cedar Creek
Southern Wood Piedmont - Gulf, North Carolina Facility

		Sample ID	SW-053-SD	SW-054-SD	SW-055-SD	SW-061-SD	SW-062-SD	SW-063-SD	SW-064-SD	SW-065-SD	SW-066-SD	SW-067-SD	SW-068-SD	SW-129-SD (NCDENR)	SW-143-SD	SW-143-SD (NCDENR)	SW-152-SD
		Station ID	SW-053-SD	SW-054-SD	SW-055-SD				SW-064-SD		SW-066-SD	SW-067-SD		SW-129-SD Dup		SW-143-SD Dup	
		Date Collected	4/7/1999	4/7/1999	4/7/1999	7/17/2002	7/17/2002	7/17/2002	7/19/2006	7/17/2002	7/19/2006	7/19/2006	7/19/2002	11/13/1995	11/8/1999	11/8/1999	11/8/1999
		Waterbody	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek
		Location	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream
		Depth Interval	0 - 2"	0 - 2"	0 - 2"	0 - 3"	0 - 3"	0 - 3"	0 - 3"	0 - 3"	0 - 3"	0 - 3"	0 - 3"	0 - 12"	0 - 4"	0 - 4"	0 - 2"
ChemClass	Analyte Name	Conc Unit															
VOCs	1,1,1-Trichloroethane	mg/Kg dw												0.013 U			
VOCs	1,1,2,2-Tetrachloroethane	mg/Kg dw												0.013 U			
VOCs	1,1,2-Trichloroethane	mg/Kg dw												0.013 U			
VOCs	1,1-Dichloroethane	mg/Kg dw												0.013 U			
VOCs	1,1-Dichloroethene	mg/Kg dw												0.013 U			
VOCs	1,2,4-Trichlorobenzene	mg/Kg dw												0.41 U	0.33 U	0.39 U	0.33 U
VOCs	1,2-Dichlorobenzene	mg/Kg dw												0.41 U	0.33 U	0.39 U	0.33 U
VOCs	1,2-Dichloroethane	mg/Kg dw												0.013 U			
VOCs	1,2-Dichloroethene (total)	mg/Kg dw												0.013 U			
VOCs	1,2-Dichloropropane	mg/Kg dw												0.013 U			
VOCs	1,3-Dichlorobenzene	mg/Kg dw												0.41 U	0.33 U	0.39 U	0.33 U
VOCs	1,4-Dichlorobenzene	mg/Kg dw												0.41 U	0.33 U	0.39 U	0.33 U
VOCs	2-Butanone	mg/Kg dw												0.013 U			
VOCs	4-Bromophenyl phenyl ether	mg/Kg dw												0.41 U	0.33 U	0.39 U	0.33 U
VOCs	Acetone	mg/Kg dw												0.013 U			
VOCs	Benzene	mg/Kg dw												0.013 U			
VOCs	bis(2-Chloro-1-methylethyl) ether	mg/Kg dw													0.33 U		0.33 U
VOCs	Bis(2-chloroethoxy) methane	mg/Kg dw												0.41 U	0.33 U	0.39 U	0.33 U
VOCs	Bis(2-Chloroethyl) ether	mg/Kg dw												0.41 U	0.33 U	0.39 U	0.33 U
VOCs	Bis(2-Chloroisopropyl) ether	mg/Kg dw												0.41 U		0.39 U	
VOCs	Bromodichloromethane	mg/Kg dw												0.013 U			
VOCs	Bromoform	mg/Kg dw												0.013 U			
VOCs	Bromomethane	mg/Kg dw												0.013 UR			
VOCs	Carbon disulfide	mg/Kg dw												0.013 U			
VOCs	Carbon tetrachloride	mg/Kg dw												0.013 U			
VOCs	Chlorobenzene	mg/Kg dw												0.013 U			
VOCs	Chloroethane	mg/Kg dw												0.013 U			
VOCs	Chloroform	mg/Kg dw												0.013 U			
VOCs	Chloromethane	mg/Kg dw												0.013 U			
VOCs	cis-1,3-Dichloropropene	mg/Kg dw												0.013 U			
VOCs	Dibromochloromethane	mg/Kg dw												0.013 U			
VOCs	Ethylbenzene	mg/Kg dw												0.013 U			
VOCs	Methyl butyl ketone	mg/Kg dw												0.013 U			
VOCs	Methyl isobutyl ketone	mg/Kg dw												0.013 U			
VOCs	Methylene chloride	mg/Kg dw												0.02 U			
VOCs	m-Xylene	mg/Kg dw															
VOCs	o-Xylene	mg/Kg dw															
VOCs	p-Xylene	mg/Kg dw															
VOCs	Styrene	mg/Kg dw												0.013 U			
VOCs	Tetrachloroethene	mg/Kg dw												0.013 U			
VOCs	Toluene	mg/Kg dw												0.013 U			
VOCs	trans-1,3-Dichloropropene	mg/Kg dw												0.013 U			
VOCs	Trichloroethene	mg/Kg dw												0.013 U			
VOCs	Vinyl chloride	mg/Kg dw												0.013 U			
VOCs	Xylenes (total)	mg/Kg dw												0.013 U			
SVOCs	2,4-Dinitrotoluene	mg/Kg dw												0.41 U	0.33 U	0.39 U	0.33 U
SVOCs	2,6-Dinitrotoluene	mg/Kg dw												0.41 U	0.33 U	0.39 U	0.33 U
SVOCs	2-Chloronaphthalene	mg/Kg dw												0.41 U	0.33 U	0.39 U	0.33 U
SVOCs	2-Methylphenol	mg/Kg dw				0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	91 U	160 U		0.41 U	0.33 U	0.39 U	0.33 U
SVOCs	2-Nitroaniline	mg/Kg dw												1 U	1.7 U	0.99 U	1.7 U
SVOCs	3,3'-Dichlorobenzidine	mg/Kg dw												0.41 U	0.66 U	0.39 U	0.66 U
SVOCs	3-Nitroaniline	mg/Kg dw												10 U	1.7 U	0.99 U	1.7 U
SVOCs	4-Chloroaniline	mg/Kg dw												0.41 U		0.39 U	
SVOCs	4-Chlorophenyl Phenyl Ether	mg/Kg dw												0.41 U	0.33 U	0.39 U	0.33 U
SVOCs	4-Nitroaniline	mg/Kg dw												1 U	1.7 U	0.99 U	1.7 U
SVOCs	Aniline	mg/Kg dw				0.034 J	0.33 U	0.33 U	0.33 U	0.33 U	0.41 U	0.7 U					
SVOCs	Benzidine	mg/Kg dw													2.7 U		2.7 U
SVOCs	Benzoic acid	mg/Kg dw													1.7 U		1.7 U
SVOCs	Benzyl alcohol	mg/Kg dw													0.33 U		0.33 U
SVOCs	Biphenyl	mg/Kg dw															
SVOCs	Bis(2-ethylhexyl) phthalate	mg/Kg dw												0.41 U	0.33 U	0.39 U	0.33 U
SVOCs	Butyl benzyl phthalate	mg/Kg dw												0.41 U	0.33 U	0.39 U	0.33 U
SVOCs	Diethylphthalate	mg/Kg dw												0.41 U	0.33 U	0.39 U	0.33 U
SVOCs	Dimethylphthalate	mg/Kg dw												0.41 U	0.33 U	0.39 U	0.33 U
SVOCs	Di-n-butylphthalate	mg/Kg dw												0.41 U	0.33 U	0.39 U	0.33 U
SVOCs	Di-n-octylphthalate	mg/Kg dw												0.41 U	0.33 U	0.39 U	0.33 U
SVOCs	Hexachlorobenzene	mg/Kg dw												0.41 U	0.33 U	0.39 U	0.33 U
SVOCs	Hexachlorobutadiene	mg/Kg dw												0.41 U	0.33 U	0.39 U	0.33 U
SVOCs	Hexachlorocyclopentadiene	mg/Kg dw												0.41 U	0.33 U	0.39 U	0.33 U
SVOCs	Hexachloroethane	mg/Kg dw												0.41 U	0.33 U	0.39 U	0.33 U
SVOCs	Isophorone	mg/Kg dw				0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.032 U	0.055 U		0.41 U	0.33 U	0.39 U	0.33 U
SVOCs	Nitrobenzene	mg/Kg dw												0.41 U	0.33 U	0.39 U	0.33 U
SVOCs	N-Nitrosodimethylamine	mg/Kg dw													0.33 U		0.33 U

Table A-3. Compilation of Sediment Results from the Cedar Creek
Southern Wood Piedmont - Gulf, North Carolina Facility

		Sample ID	SW-053-SD	SW-054-SD	SW-055-SD	SW-061-SD	SW-062-SD	SW-063-SD	SW-064-SD	SW-065-SD	SW-066-SD	SW-067-SD	SW-068-SD	SW-129-SD (NCDENR)	SW-143-SD	SW-143-SD (NCDENR)	SW-152-SD
		Station ID	SW-053-SD	SW-054-SD	SW-055-SD		-		SW-064-SD		SW-066-SD	SW-067-SD		SW-029-SD Dup		SW-043-SD Dup	
		Date Collected	4/7/1998	4/7/1998	4/7/1998	7/17/2002	7/17/2002	7/17/2002	7/19/2006	7/17/2002	7/19/2006	7/19/2006	7/18/2002	11/13/1995	11/8/1995	11/8/1995	11/9/1995
		Waterbody	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek
		Location	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream
		Depth Interval	0 - 2"	0 - 2"	0 - 2"	0 - 3"	0 - 3"	0 - 3"	0 - 3"	0 - 3"	0 - 3"	0 - 3"	0 - 3"	0 - 12"	0 - 4"	0 - 4"	0 - 2"
ChemClass	Analyte Name	Conc Unit															
SVOCs	N-nitrosodi-n-propylamine	mg/Kg dw												0.41 U	0.33 U	0.39 U	0.33 U
SVOCs	N-nitrosodiphenylamine	mg/Kg dw												0.41 U	0.33 U	0.39 U	0.33 U
SVOCs	p-Chloroaniline	mg/Kg dw													0.66 U		0.66 U
Phenolics	2,3,4,6-Tetrachlorophenol	mg/Kg dw				0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.41 U	0.7 U					
Phenolics	2,4,5-Trichlorophenol	mg/Kg dw												1 U	0.33 U	0.99 U	0.33 U
Phenolics	2,4,6-Trichlorophenol	mg/Kg dw				0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.41 U	0.7 U		0.41 U	0.33 U	0.39 U	0.33 U
Phenolics	2,4-Dichlorophenol	mg/Kg dw												0.41 U	0.33 U	0.39 U	0.33 U
Phenolics	2,4-Dimethylphenol	mg/Kg dw				0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.41 U	0.7 U		0.41 U	0.33 U	0.39 U	0.33 U
Phenolics	2,4-Dinitrophenol	mg/Kg dw												1 U	1.7 U	0.99 U	1.7 U
Phenolics	2-Chlorophenol	mg/Kg dw				0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.41 U	0.7 U		0.41 U	0.33 U	0.39 U	0.33 U
Phenolics	2-Methyl-4,6-dinitrophenol	mg/Kg dw												1 U		0.99 U	
Phenolics	2-Nitrophenol	mg/Kg dw												0.41 U	0.33 U	0.39 U	0.33 U
Phenolics	3&4-Methylphenol	mg/Kg dw												0.41 U	0.33 U	0.39 U	0.33 U
Phenolics	4,6-Dinitro-2-methylphenol	mg/Kg dw													1.7 U		1.7 U
Phenolics	4-Chloro-3-methylphenol	mg/Kg dw				0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.41 U	0.7 U		0.41 U	0.33 U	0.39 U	0.33 U
Phenolics	4-Methylphenol	mg/Kg dw				0.33 U	0.33 U	0.33 U	0.33 U	0.33 U							
Phenolics	4-Nitrophenol	mg/Kg dw												1 U	1.7 U	0.99 U	1.7 U
Phenolics	Pentachlorophenol	mg/Kg dw				1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	2.1 U	3.6 U		1.2	1.7 U	0.99 U	1.7 U
Phenolics	Phenol	mg/Kg dw				0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.41 U	0.7 U		0.41 U	0.33 U	0.39 U	0.33 U
PAHs	1-Methylnaphthalene	mg/Kg dw															
PAHs	2-Methylnaphthalene	mg/Kg dw				0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.41 U	0.7 U		42	0.33 U	0.39 U	0.33 U
PAHs	Acenaphthene	mg/Kg dw				0.33 U	0.051 J	0.075 J	0.33 U	0.33 U	0.13 J	0.7 U		37 J	0.33 U	0.39 U	0.33 U
PAHs	Acenaphthylene	mg/Kg dw				0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	90 U	150 U		0.41 U	0.33 U	0.39 U	0.33 U
PAHs	Anthracene	mg/Kg dw				0.31 J	0.063 J	0.16 J	0.58 J	0.062 J	0.41 U	0.7 U		2.8	0.33 U	0.39 U	0.33 U
PAHs	Benzo(a)anthracene	mg/Kg dw				0.4 J	0.059 J	0.2 J	0.26 J	0.058 J	0.41 U	0.7 U		2.3	0.33 U	0.39 U	0.33 U
PAHs	Benzo(a)pyrene	mg/Kg dw				0.43 J	0.075 J	0.17 J	0.19 J	0.064 J	0.41 U	0.12 J		0.83	0.33 U	0.39 U	0.33 U
PAHs	Benzo(b&k)fluoranthene	mg/Kg dw				1.3	0.033 J	0.54	0.72 J	0.18 J				2.5		0.39 U	
PAHs	Benzo(b)fluoranthene	mg/Kg dw				0.72	0.33 U	0.25 J	0.72 J	0.33 U	78 U	130 U			0.33 U		0.33 U
PAHs	Benzo(g,h,i)perylene	mg/Kg dw				0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.029 U	0.049 U		0.13 J	0.33 U	0.39 U	0.33 U
PAHs	Benzo(k)fluoranthene	mg/Kg dw				0.63	0.33 U	0.28 J	0.33 U	0.33 U	80 U	140 U			0.33 U		0.33 U
PAHs	Carbazole	mg/Kg dw				0.05 J	0.33 U	0.33 U	0.33 U	0.33 U	0.41 U	0.7 U		5.4 J		0.39 U	
PAHs	Chrysene	mg/Kg dw				0.7	0.07 J	0.28 J	0.52 J	0.13 J	0.41 U	0.12 J		2	0.33 U	0.39 U	0.33 U
PAHs	Dibenzo(a,h)anthracene	mg/Kg dw				0.073 J	0.33 U	0.33 U	0.33 U	0.33 U				0.057 J	0.33 U	0.39 U	0.33 U
PAHs	Dibenzo(a,h)pyrene	mg/Kg dw									0.41 U	0.7 U					
PAHs	Dibenzofuran	mg/Kg dw				0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.042 U	0.072 U		32	0.33 U	0.39 U	0.33 U
PAHs	Fluoranthene	mg/Kg dw				0.48	0.39 J	0.22 J	0.72 J	0.33 U	0.12 J	0.086 J		18	0.33 U	0.39 U	0.33 U
PAHs	Fluorene	mg/Kg dw				0.054 J	0.065 J	0.082 J	0.09 J	0.33 U	0.14 J	0.7 U		31	0.33 U	0.39 U	0.33 U
PAHs	Indeno(1,2,3-cd)pyrene	mg/Kg dw				0.21 J	0.33 U	0.33 U	0.33 U	0.33 U	0.41 U	0.058 J		0.21 J	0.33 U	0.39 U	0.33 U
PAHs	Naphthalene	mg/Kg dw				0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.41 U	0.7 U		12	0.33 U	0.39 U	0.33 U
PAHs	Phenanthrene	mg/Kg dw				0.19 J	0.2 J	0.11 J	0.19 J	0.33 U	0.13 J	0.7 U		47	0.33 U	0.39 U	0.33 U
PAHs	Pyrene	mg/Kg dw				0.6	0.3 J	0.31 J	0.8	0.33 U	91 U	160 U		15 J	0.33 U	0.39 U	0.33 U
PCDD/Fs	1,2,3,4,6,7,8-HpCDD	ng/Kg dw	104	161	3420				9560		1250	1020	79	38000 J	76.5	100	489
PCDD/Fs	1,2,3,4,6,7,8-HpCDF	ng/Kg dw	293	13.4	395				1010		167	133	9.29	6800	12.8	11	72.3
PCDD/Fs	1,2,3,4,7,8,9-HpCDF	ng/Kg dw	2.8	1.6	40.3				61.9		9.02	9.3	5 U	310	0.85	5 U	4.9
PCDD/Fs	1,2,3,4,7,8-HxCDD	ng/Kg dw	1.3	1.1	21.3				19.3		5 U	5 U	5 U	43	0.38 EMPC	5 U	2.2
PCDD/Fs	1,2,3,4,7,8-HxCDF	ng/Kg dw	3.7	0.87	16.6				33.7		5 U	5 U	5 U	1200 U	0.55	5 U	2.6
PCDD/Fs	1,2,3,6,7,8-HxCDD	ng/Kg dw	4.1	3	75				174		30.6	24.9	5 U	820	1.6	2.1 J	11.6
PCDD/Fs	1,2,3,6,7,8-HxCDF	ng/Kg dw	2.3	0.63	8				11		5 U	5 U	5 U	31 J	0.22 EMPC	5 U	1.3
PCDD/Fs	1,2,3,7,8,9-HxCDD	ng/Kg dw	4.5	4.4	56.2				40.6		5.76	5 U	5 U	130	0.76 EMPC	1.1 J	5.1
PCDD/Fs	1,2,3,7,8,9-HxCDF	ng/Kg dw	4.3	0.85	20.2				5 U		5 U	5 U	5 U	14 U	0.2 U	5 U	0.8 U
PCDD/Fs	1,2,3,7,8-PeCDD	ng/Kg dw	0.7	0.74	4.4									5.1 J		5 U	
PCDD/Fs	1,2,3,7,8-PeCDF	ng/Kg dw	0.84	0.41	1.5				5 U		5 U	5 U	5 U	14 U	0.2 U	5 R	0.76 EMPC
PCDD/Fs	2,3,4,6,7,8-HxCDF	ng/Kg dw	0.72	0.51	0.3				25.3		5 U	5 U	5 U	14 U	0.46	5 U	2
PCDD/Fs	2,3,4,7,8-PeCDF	ng/Kg dw	1.2	0.36	2.6				17.5		5 U	5 U	5 U	9.1 J	0.2 U	5 U	0.4 U
PCDD/Fs	2,3,7,8-TeCDD	ng/Kg dw	0.2	0.2	0.62				1 U		1 U	1 U	1 U	6 U	0.1 U	2 U	0.3 U
PCDD/Fs	2,3,7,8-TeCDF	ng/Kg dw	0.85	0.37	1				1 U		1 U	1 U	1 U	6 U	0.21	2 U	1.2
PCDD/Fs	OCDD	ng/Kg dw	2780	6210	27500				75700		13800 E	11600 E	2530	340000 J	1550	3800	9220
PCDD/Fs	OCDF	ng/Kg dw	115	42.4	1450				4490		766	629	25.4	37000	33.3	70	295
PCDD/F homologs	TeCDDs (total)	ng/Kg dw							11.4		1 U	1 U	1 U	17 J	0.1 U	2 UJ	2.2
PCDD/F homologs	TeCDFs (total)	ng/Kg dw							43.4		1.7	1 U	1 U	11 J	0.21 EMPC	2 UJ	7.3
PCDD/F homologs	PeCDDs (total)	ng/Kg dw							32.4		5 U	5 U	5 U	36 J	0.2 U	5 UJ	3.6
PCDD/F homologs	PeCDFs (total)	ng/Kg dw							236		20.9	8.72	5 U	190 J	0.53 EMPC	5 UJ	14.3
PCDD/F homologs	HxCDD (total)	ng/Kg dw							1220		205	160	17.2	5400 J	10.5	14 J	97.5
PCDD/F homologs	HxCDF (total)	ng/Kg dw							858		155	113	5 U	5000 J	10.2	8.4 J	67.9
PCDD/F homologs	HpCDD (total)	ng/Kg dw							26300		3320	2820	215	120000 J	205	240 J	1260
PCDD/F homologs	HpCDF (total)	ng/Kg dw							5470		802	634	28.6	8200 J	49.1	46 J	272
Dioxin-TEQ	Dioxin-TEQ(mammal) - Zero DL	ng/Kg dw	8.3	5.9	73.1	NC	NC	NC	166.02	NC	22.27	17.78	1.65	654.43	1.79	2.59	11.16
Dioxin-TEQ	Dioxin-TEQ(mammal) - Half DL	ng/Kg dw	8.3	5.9	73.1	NC	NC	NC	166.97	NC	24.97	20.73	4.87	719.34	1.89	8.22	11.42
Dioxin-TEQ	Dioxin-TEQ(avian)-Zero DL	ng/Kg dw	10.5	9.0	56.3	NC	NC	NC	127.69	NC	17.77	14.35	2.70	491.45	2.21	4.15	13.11
Dioxin-TEQ	Dioxin-TEQ(avian)-Half DL	ng/Kg dw	10.5	9.0	56.3	NC	NC	NC	129.44	NC	22.69	19.73	8.13	559.55	2.39	12.30	13.52
Metals	Aluminum	mg/Kg dw												12000			
Metals	Antimony	mg/Kg dw												3.2 UR			
Metals	Arsenic	mg/Kg dw												4 J			

Table A-3. Compilation of Sediment Results from the Cedar Creek
Southern Wood Piedmont - Gulf, North Carolina Facility

		Sample ID	SW-053-SD	SW-054-SD	SW-055-SD	SW-061-SD	SW-062-SD	SW-063-SD	SW-064-SD	SW-065-SD	SW-066-SD	SW-067-SD	SW-068-SD	SW-129-SD (NCDENR)	SW-143-SD	SW-143-SD (NCDENR)	SW-152-SD
		Station ID	SW-053-SD	SW-054-SD	SW-055-SD				SW-064-SD		SW-066-SD	SW-067-SD		SW-029-SD Dup		SW-043-SD Dup	
		Date Collected	4/7/1999	4/7/1999	4/7/1999	7/17/2002	7/17/2002	7/17/2002	7/19/2006	7/17/2002	7/19/2006	7/19/2006	7/18/2002	11/18/1998	11/8/1998	11/8/1998	11/9/1998
		Waterbody	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek	Cedar Creek
		Location	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream	Downstream
		Depth Interval	0 - 2"	0 - 2"	0 - 2"	0 - 3"	0 - 3"	0 - 3"	0 - 3"	0 - 3"	0 - 3"	0 - 3"	0 - 3"	0 - 12"	0 - 4"	0 - 4"	0 - 2"
ChemClass	Analyte Name	Conv Unit															
Metals	Barium	mg/Kg dw												160			
Metals	Beryllium	mg/Kg dw												0.99 J			
Metals	Cadmium	mg/Kg dw												0.32 U			
Metals	Calcium	mg/Kg dw												2100			
Metals	Chromium	mg/Kg dw												28			
Metals	Cobalt	mg/Kg dw												27			
Metals	Copper	mg/Kg dw												26			
Metals	Iron	mg/Kg dw												26000			
Metals	Lead	mg/Kg dw												9.2 J			
Metals	Magnesium	mg/Kg dw												4000			
Metals	Manganese	mg/Kg dw												900 J			
Metals	Mercury	mg/Kg dw												0.06 U			
Metals	Nickel	mg/Kg dw												37			
Metals	Potassium	mg/Kg dw												310			
Metals	Selenium	mg/Kg dw												1 U			
Metals	Silver	mg/Kg dw												0.87 U			
Metals	Sodium	mg/Kg dw												190 U			
Metals	Thallium	mg/Kg dw												0.58 U			
Metals	Tin	mg/Kg dw															
Metals	Vanadium	mg/Kg dw												46			
Metals	Zinc	mg/Kg dw												40 UJ			
General Parameters	Percent Clay	%							9.3		3.5	11.5					
General Parameters	Percent Gravel	%							0 U		0 U	2.8					
General Parameters	Percent Sand	%							46.9		77.5	83					
General Parameters	Percent Silt	%							43.8		19	2.7					
General Parameters	Total Organic Carbon	mg/Kg dw							20400		5900	917					
General Parameters	Total Solids	%															
General Parameters	Percent Moisture (metals)	%												25			
General Parameters	Percent Moisture (PCDD/F)	%												26		19	
General Parameters	Percent Moisture (SVOC)	%														16	
General Parameters	Percent Moisture (SVOCs)	%												21			
General Parameters	Percent Moisture (VOCs)	%												21			
TCLP-PAHs	Acenaphthene in TCLP Extract	mg/L							0.009 U		0.009 U						
TCLP-PAHs	Acenaphthylene in TCLP Extract	mg/L							0.009 U		0.009 U						
TCLP-PAHs	Anthracene in TCLP Extract	mg/L							0.008 U		0.008 U						
TCLP-PAHs	Benzo(a)anthracene in TCLP Extract	mg/L							0.0065 U		0.0065 U						
TCLP-PAHs	Benzo(a)pyrene in TCLP Extract	mg/L							0.0075 U		0.0075 U						
TCLP-PAHs	Benzo(b)fluoranthene in TCLP Extract	mg/L							0.008 U		0.008 U						
TCLP-PAHs	Benzo(g,h,i)perylene in TCLP Extract	mg/L							0.012 U		0.012 U						
TCLP-PAHs	Benzo(k)fluoranthene in TCLP Extract	mg/L							0.008 U		0.008 U						
TCLP-PAHs	Carbazole in TCLP Extract	mg/L							0.0085 U		0.0085 U						
TCLP-PAHs	Chrysene in TCLP Extract	mg/L							0.0044 U		0.0044 U						
TCLP-PAHs	Dibenzo(a,h)anthracene in TCLP Extract	mg/L							0.014 U		0.014 U						
TCLP-PAHs	Dibenzofuran in TCLP Extract	mg/L							0.0075 U		0.0075 U						
TCLP-PAHs	Dimethyl Naphthalene in TCLP Extract	mg/L							0.025 U		0.025 U						
TCLP-PAHs	Fluoranthene in TCLP Extract	mg/L							0.01 U		0.01 U						
TCLP-PAHs	Fluorene in TCLP Extract	mg/L							0.0065 U		0.0065 U						
TCLP-PAHs	Indeno(1,2,3-cd)pyrene in TCLP Extract	mg/L							0.018 U		0.018 U						
TCLP-PAHs	Isophorone in TCLP Extract	mg/L							0.0095 U		0.0095 U						
TCLP-PAHs	Naphthalene in TCLP Extract	mg/L							0.0095 U		0.0095 U						
TCLP-PAHs	Phenanthrene in TCLP Extract	mg/L							0.0075 U		0.0075 U						
TCLP-PAHs	Pyrene in TCLP Extract	mg/L							0.006 U		0.006 U						
TCLP-Phenolics	Extract	mg/L							0.0065 U		0.0065 U						
TCLP-Phenolics	2,4,5-Trichlorophenol in TCLP Extract	mg/L							0.0075 U		0.0075 U						
TCLP-Phenolics	2,4-Dimethylphenol in TCLP Extract	mg/L							0.01 U		0.01 U						
TCLP-Phenolics	2-Chlorophenol in TCLP Extract	mg/L							0.0075 U		0.0075 U						
TCLP-Phenolics	2-Methylphenol in TCLP Extract	mg/L							0.0075 U		0.0075 U						
TCLP-Phenolics	Extract	mg/L							0.0085 U		0.0085 U						
TCLP-Phenolics	Pentachlorophenol in TCLP Extract	mg/L							0.01 U		0.01 U						
TCLP-Phenolics	Phenol in TCLP Extract	mg/L							0.0065 U		0.0065 U						
TCLP-SVOCs	Aniline in TCLP Extract	mg/L							0.008 U		0.008 U						

Table A-3. Compilation of Sediment Results from Cedar Creek
Table Footnotes
Southern Wood Piedmont - Gulf, North Carolina Facility

Notes:
Data compiled from databases from multiple sources. Missing values indicate chemical not analyzed or not reported by original data source.
Qualifiers: U = Not detected; UJ = Not detected at estimated concentration shown; J = estimated concentration; UR = Not detected and rejected (unusable result).
NA: Not available
NC: Not collected
The TCLP results were reported for completeness, but were not used directly in the risk assessments.
[1] Date shown is for the collection of TOC and grain size only.

Table A-4. Acronym List for PAHs
Southern Wood Piedmont - Gulf, North Carolina Facility

Analyte Name	Acronym Code [b]
2-Methylnaphthalene	2MeNap
Acenaphthene	Acenap1
Acenaphthylene	Acenap2
Anthracene	Anth
Benzo(a)anthracene	BaA
Benzo(a)pyrene	BaP
Total Benzofluoranthenes [a]	BF
Benzo(g,h,i)perylene	Bpery
Carbazole	Carb
Chrysene	Chry
Dibenzo(a,h)anthracene	DbAnth
Dibenzofuran	DBf
Fluoranthene	Flouran
Fluorene	Fluor
Indeno(1,2,3-cd)pyrene	IPyr
Naphthalene	Nap
Phenanthrene	Phe
Pyrene	Pyr

Notes:
[a] Total benzofluoranthenes represented the benzo(b&k)fluoranthene results, or the combined value for the two individual benzofluoranthene isomers. See text for discussion.
[b] The acronym code is used as a descriptor for discussions in the text and in the figures.

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Appendix B
Summary of Toxicological Studies for the Refined List of COPECs

Appendix B
Derivation of Preliminary Toxicity Reference Values

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Table B-3 Data Sources Used to Develop Avian Toxicity Reference Values, Southern Wood Piedmont Facility - Gulf, North Carolina

Appendix B
Derivation of Toxicity Reference Values

B.1 Introduction

This appendix includes a summary of the key toxicological studies that could be used to derive toxicity reference values (TRVs) for the refined list of COPECs if it is determined that evaluation of the drainage ditch and Cedar Creek proceed to subsequent steps in the ERAGS process. To simplify the presentation of this information, a tabular format was used.

When supported by the evaluated studies, both TRV_{NOAEL} and TRV_{LOAEL} values are derived. For some studies, LOAEL values could not be derived since no toxicity was evident at any of the exposure concentrations. Tables B-1 (for mammalian receptors) and Table B-3 (for avian receptors) summarize the key studies used to derive the NOAEL values (and LOAEL values, when available) in the original testing concentration units (e.g., as dietary concentrations), and the recommended TRV_{NOAEL} and TRV_{LOAEL} values. The equivalent TRV units (mg/Kg-day) are calculated using the standard dosing calculations (Sample et al., 1996) shown below:

$$TRV = [Food_{NOAEL} \text{ (or } Food_{LOAEL}) \times IR_{food} \times CF]/BW$$

where, $Food_{NOAEL}$ (or $Food_{LOAEL}$) is the NOAEL (or LOAEL) concentration in the food (or the dose), IR_{food} is the daily food ingestion rate (g_{food}/day), CF is the mass conversion factor (0.001 Kg/g) and BW is the body weight (in Kg).

For avian receptors, no adjustment for body weight differences between the test organism and receptor is used (Sample et al., 1996). For mammalian receptors, body weight scaling of the receptor relative to the test organism is used to calculate the appropriate TRV values for the evaluated receptors. A body weight scaling factor was applied (Sample et al., 1996; Farrell-Gray and Gotelli, 2005) using the following equation:

$$NOAEL_{rec} = NOAEL_t \times \left(\frac{BW_t}{BW_{rec}}\right)^{0.25}$$

where,

$NOAEL_{rec}$ = NOAEL for the receptor
$NOAEL_t$ = NOAEL for the test organism
BW_t = Body weight of test organism

BW_{rec} = Body weight of receptor

The NOAEL terms in the equation above are replaced with the LOAEL values when the latter is adjusted for body weight scaling.

As discussed in the BERA, there were several sources of information used for developing TRVs. These included literature sources (e.g., Schafer et al., 1983), agency data sources, such as the *Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (USEPA, 1999) and the Ecological Soil Screening Level (EcoSSL) documents (e.g., USEPA, 2005a), related data sources, such as compilations prepared by Oak Ridge National Laboratory (ORNL; Sample et al., 1996), and other sources. For the avian and mammalian TRVs, precedence was given towards NOAEL and LOAEL values generated to support the EcoSSLs. The EPA EcoSSL documents (USEPA, 2006 and 2007) include a detailed compilation of NOAEL and LOAEL values for both metals identified as COPCs for this project for both mammalian and avian receptors. When multiple NOAEL or LOAEL values were reported for growth, reproductive effects, or survivability, the geometric mean of these values were used as the TRV values, consistent with the approach used to derive the EcoSSLs. The numbers of studies used to generate the TRV_{NOAEL} and TRV_{LOAEL} values are shown in Table B-1 for mammals and Table B-3 for avian receptors.

The subsequent sections discuss the derivation of some of the TRV values used in this BERA.

B.2 Mammalian TRVs

Table B-1 compiles the literature sources used to derive the mammalian TRVs. TRVs derived by Sample et al (1996) were used for the semivolatile organics. TRVs derived by Sample et al. (1996) were used for assessing dioxin-TEQs in the avian receptors. For the two metal COPCs, the two principal data sources where the EcoSSL documents and Sample et al. (1996). Table B-2 shows the calculated TRVs where body weight scaling was performed. The derivation of TRV values for the PAHs are discussed further below.

B.2.1 Mammalian TRVs for PAHs

The TRV for benzo(a)pyrene from Sample et al. (1996) was used as a surrogate for all of the H-PAHs, consistent with the recommendations of USACHHPM (2006). For the L-PAHs, the TRV for naphthalene was used as a surrogate. The naphthalene TRV was from the Navarro et al. (1991) study recommended by USEPA (2002).

B.3 Avian TRVs

Table B-3 compiles the literature sources used to derive the avian TRVs. TRVs derived by Sample et al. (1996) were used for the dioxin-TEQs in the avian receptors. For the metals, the two principal data sources where the EcoSSL documents and Sample et al. (1996).
The semivolatile organic COPCs included pentachlorophenol and the PAHs. The derivation of avian TRVs for the PAHs is discussed in Section B.3.1.

B.3.1 Avian TRVs for PAHs

There were several studies available to develop avian TRVs for the PAHs. These fell into three categories:

- TRVs based on an egg yolk injection study (Brünstrom et al., 1991);
- TRVs based on an intramuscular injection studies (Revis et al., 1984; Hough et al., 1993); and
- TRVs based on an oral exposure study (Schafer et al., 1983).

Brunström et al. (1991) evaluated the embryotoxicity of PAHs based on egg yolk injection studies using 18 individual PAHs, and a mixture of these 18 PAHs. Four bird species (chicken, turkey, domestic duck, and eider duck) were evaluated using the PAH mixture and one species (chicken) was evaluated using the individual PAHs. The PAH mixture was tested at two concentrations (0.2 and 2 mg/Kg egg) and the individual PAHs were evaluated using one test concentration (2 mg/Kg egg), except for benzo(k)fluoranthene (evaluated at 0.2 and 0.05 mg/Kg egg) and indeno(1,2,3-cd)pyrene (evaluated at 0.5 mg/Kg egg). Development was monitored every 2 to 3 days, and any eggs that contained dead embryos were opened and evaluated for gross abnormalities. The total study duration was 18 days for the chicken and 24 days for the other species. Using the PCB mixture, the LOAEL was 0.2 mg/Kg egg across all four species. Many of the individual PAHs exhibited low or limited (similar to controls) toxicity at 2 mg/Kg egg. For benzo(k)fluoranthene the LOAEL was 0.2 mg/Kg egg, and for indeno(1,2,3-cd)pyrene the LOAEL was 0.5 mg/Kg egg.

A key uncertainty in the application of this study to derive an ingested-based TRV is the amount of PAH transfer from the female to the egg. The focus of maternal transfer studies have been on bioaccumulative compounds, such as PCBs and PCDD/Fs (e.g., Bargar et al., 2001). Since PAHs, can be degraded by birds (e.g., Malcolm and Shore, 1993), the amount of maternal transfer to the egg may be lower than reported for bioaccumulative compounds. To attempt to account for this issue USEPA (1999) applied an uncertainty factor of 100 to derive the TRV_{NOAEL} based on the Brunström et al. (1991) study. The TRV_{LOAEL} values were assumed to be 10 times the TRV_{NOAEL} values. Because of the conservative nature of the exposure, the TRVs derived

from the Brunström et al. (1991) study is typically used for screening assessments (e.g., USEPA, 1999).

Revis et al. (1984) evaluated the formation of atherosclerotic lesions in the abdominal aorta in 3 month old White Carneau pigeons. The formation of atherosclerotic lesions in birds following exposure to PAHs was reported in earlier studies (e.g., Albert et al., 1977). Male birds were given weekly intramuscular injections over a 6 month period to corn oil or corn oil with PAH concentrations equivalent to 0.1, 10 or 100 mg/Kg body weight (mg/Kg_{bw}). The evaluated chemicals included benzo(a)pyrene, benzo(e)pyrene, 3-methylcholanthrene, 7,12-dimethylbenz[a,h]anthracene, and 2,4,6-trichlorophenol. Several endpoints were evaluated, and although there were no significant changes in key cardiovascular status (e.g., hear rate, blood pressure) for any of the test chemicals and exposure concentrations, there was a statistically significant increase in plaque formation at the lowest test dose (0.1 mg/Kg_{bw}). This endpoint was not relevant to growth or reproductive effects, and was therefore not appropriate to derive a TRV.

The later study by Hough et al. (1993) evaluated atherosclerosis, hepatic biomarkers, and reproductive effects of two PAHs [benzo(a)pyrene and benzo(e)pyrene) in two stains of pigeons (White Carneau and show racer). Male and female birds were given weekly intramuscular injections over a 5 month period to corn oil or corn oil with PAH concentrations equivalent to 10 mg/Kg body weight (mg/Kg_{bw}). Several endpoints were evaluated, and reproductive effects (cessation of egglaying and gross deleterious ovarian changes) were noted in the exposed female birds. The weekly dose equates to a daily dose of 1.43 mg/kg-day as a TRV_{LOAEL}. Applying a factor of 10 for the LOAEL to NOAEL uncertainty factor yields a TRV_{NOAEL} of 0.143 mg/kg-day. These values were also used for the other evaluated PAHs.

Schafer et al. (1983) reported the LD_{50} values for numerous chemicals, including several of the PAHs, on red-winged blackbirds and European starlings. These were developed using standard acute toxicity methods (for the period), with exposure by oral gavage or oral intubation. These values are converted to TRV_{NOAEL} values by dividing by 1000. This is conservative since the *Standard Practice for Wildlife Toxicity Reference Values* (USACHPPM, 2000) recommends the use of a total uncertainty factor of 100 to adjust LD_{50} values to chronic NOAEL equivalent values. Chemical specific LD_{50} values were available for seven PAHs (Table E-1). The remaining PAHs used surrogates [acenaphthene, benzo(a)pyrene, or benzo(k)fluoranthene] although all of the TRV_{NOAEL} values were on the order of 0.1 mg/Kg_{bw}-day. The TRV_{LOAEL} values were assumed to be 10 times the TRV_{NOAEL} values.

The route of administration (i.e., exposure) is important since avian species are known to rapidly metabolize PAHs (Näf et al., 1992; Malcolm and Shore, 2003). Therefore, it is more appropriate to utilize studies based on oral exposure to chemicals of interest for the derivation of TRVs used in the risk characterization. Therefore, the TRVs derived from the Schafer et al. (1983) study

were used for the quantitative risk assessment. The alternate TRVs will be assessed as part of the uncertainty assessment.

B.4 References

Albert, R.E., M. Vanderlaan, F.J. Burns, and M. Nishizumi. 1977. Effect of carcinogens on chicken atherosclerosis. *Cancer Research*. 37: 2232-2235.

Anderson, D. W., R. W. Risebrough, L. A. Woods, Jr., L. R. DeWeese, and W. G. Edgecomb. 1975. Brown pelicans: improved reproduction off the southern California coast. *Science*. 190: 806-808. [As cited by Sample et al, 1996]

Aughey, E., L. Grant, B.L. Furman and W.F. Dryden. 1977. The effects of oral zinc supplementation in the mouse. *Journal of Comparative Pathology*. 87:1-14. [As cited by USEPA, 2002]

Bargar, T.A., G.I. Scott, and G.P. Cobb. 2001. Maternal transfer of contaminants: case study of the excretion of three polychlorinated biphenyl congeners and technical-grade endosulfan into eggs by white leghorn chickens (*Gallus domesticus*). *Environmental Toxicology and Chemistry*. 20(1): 61-67.

Beard, A.P. and N.C. Rawlings. 1998. Reproductive effects in mink (*Mustela vison*) exposed to pesticides lindane, carbofuran and pentachlorophenol in a multigeneration study. *Journal of Reproduction and Fertility*. 113(1): 95-104.

Brunström, B., D. Broman, and C Näf. 1991. Toxicity and EROD-inducing potency of 24 polycyclic aromatic hydrocarbons (PAHs) in chick embryos. *Archives of Toxicology*. 65: 485-489.

Cain, B.W. and E.A. Pafford. 1981. Effects of dietary nickel on survival and growth of mallard ducklings. *Archives of Environmental Contamination and Toxicology*. 10: 737-745.

California Department of Toxic Substances Control (CDTSC). 2000. Use of Navy/U.S. Environmental Protection Agency (USEPA) Region 9 Biological Technical Assistance Group (BTAG) Toxicity Reference Values (TRVs) for Ecological Risk Assessment. Human and Ecological Risk Division (HERD) Ecological Risk Assessment (ERA) Note Number 4. 8 December.

Farrell-Gray, C.C. and N.J. Gotelli. 2005. Allometric exponents support a 3/4-power scaling factor. *Ecology*. 86(8): 2083-2087.

Hill, E.F., and M.B. Camardese. 1986. *Lethal Dietary Toxicities of Environmental Contaminants and Pesticides to Coturnix.* Fish and Wildlife Service. Technical Report 2. [As cited by USEPA, 1999]

Hough, J.L., M.B. Baird, G.T. Sfeir, C.S. Pacini, D. Darrow, and C. Wheelock. 1993. Benzo[a]pyrene enhances atherosclerosis in White Carneau and show racer pigeons. *Arteriosclerosis, Thrombosis, and Vascular Biology.* 13: 1721–1727

Isensee, A.R. and G.E. Jones. 1975. Distribution of 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) in aquatic model ecosystem. *Environmental Science and Technology.* 9(7): 668-672.

Malcolm, H.M. and R.F Shore. 2003. *Effects of PAHs on Terrestrial and Freshwater Birds, Mammals, and Amphibians*, p. 225-241, *in*, P.E.T. Douben [ed], PAHs: An Ecotoxicological Perspective. John Wiley & Sons. West Sussex, England. 392p.

Näf, C., D. Broman and B. Brunström. 1992. Distribution and metabolism of polycyclic aromatic hydrocarbons (PAHs) injected into eggs of chicken (*Gallus domesticus*) and common eider duck (*Somateria mollissima*). *Environmental Toxicology and Chemistry.* 11: 1653-1660.

National Academies of Science (NAS). 1980. Mineral Tolerance of Domestic Animals. Board on Agriculture.
[http://darwin.nap.edu/books/0309030226/html/R1.html]

National Research Council of Canada (NRCC). 1975. *Chlordane: Its Effects on Ecosystems and its Chemistry.* National Research Council Canada. Publication NRCC 14094. 189 pp. [As cited by Eisler, 1990]

Navarro et al., 1991. Developmental toxicity evaluation of naphthalene (CAS NO. 91-20-3) administered by gavage to Sprague-Dawley (CD) rats on gestation days 6 through 15. Chemistry and Life Sciences, Research Triangle Institute (RTI). Research Triangle Park, NC. RTI Master Protocol Number: RTI-376. December 5. [Also presented as conference abstract as "Navarro, H.A., C.J. Price, M.C. Marr, C.B. Myers, J.J, Heindel, and B.A. Schwertz. 1992. Developmental toxicity evaluation of naphthalene in rats. *Teratology.* 45: 475"]

Nosek J.A., S.R. Craven, J.R. Sullivan, S.S. Hurley, and R.E. Peterson. 1992. Toxicity and reproductive effects of 2,3,7,8-tetrachlorodibenzo-p-dioxin in ring-necked pheasant hens. *Journal of Toxicology and Environmental Health.* 35:187-198. [As cited by Sample et al, 1996]

Revis, N.W., R. Bull, D. Laurie, and C.A. Schiller. The effectiveness of chemical carcinogens to induce atherosclerosis in the White Carneau pigeon. *Toxicology.* 32: 215-227.

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. *Toxicological Benchmarks for Wildlife: 1996 Revision.* ES/ER/TM-86/R3. Oak Ridge National Laboratory. June.

Schaefer Jr., E.W. 1972. The acute oral toxicity of 369 pesticidal, pharmaceutical and other chemicals to wild birds. *Toxicology and Applied Pharmacology.* 21: 315-330.

Schafer Jr., E.W., W.A. Bowles Jr, and J. Hurlbut. 1983. The acute oral toxicity, repellency, and hazard potential of 998 chemicals to one or more species of wild and domestic birds. *Archives of Environmental Contamination and Toxicology.* 12: 355-382.

Schroeder, H.A. and M. Mitchener. 1971. Toxic effects of trace elements on the reproduction of mice and rats. *Archives of Environmental Health.* 23:102-106.

US Army Center for Health Promotion and Preventive Medicine (USACHPPM). 2000. *Standard Practice for Wildlife Reference Values Technical Guide No. 254.* U.S. Army Center for Health Promotion and Preventive Medicine. Aberdeen Proving Ground, Maryland, October. [http://chppm-www.apgea.army.mil/documents/TG/TECHGUID/TG254.pdf]

US Army Center for Health Promotion and Preventive Medicine (USACHPPM). 2005. *Wildlife Toxicity Assessment for Aldrin.* December. [http://chppm-www.apgea.army.mil/erawg/tox/Aldrin(final06).pdf]

US Army Center for Health Promotion and Preventive Medicine (USACHPPM). 2006. *Wildlife Toxicity Assessment for Phenanthrene.* Document No. 39-EJ1138-01K, Aberdeen Proving Ground, Maryland, January.
URL: http://chppm-www.apgea.army.mil/erawg/tox/phenanthrene.pdf]

USEPA. 1999. *Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. Appendix E: Toxicity Reference Values.* Office of Solid Waste and Emergency Response. EPA530-D-99-001A. August.

USEPA. 2002. *USEPA Region 9 Biological Technical Assistance Group (BTAG) Recommended Toxicity Reference Values for Mammals and Birds.* Revision Date 11/21/2002. [http: www.dtsc.ca.gov/AssessingRisk/upload/Eco_Btag-mammal-bird-TRV-table.pdf]

USEPA. 2006. *Ecological Soil Screening Levels for Silver.* OSWER Directive 9285.7-77. Interim Final. September.
[http://www.epa.gov/ecotox/ecossl/pdf/eco-ssl_silver.pdf]

USEPA. 2007. *Ecological Soil Screening Levels for Nickel*. OSWER Directive 9285.7-76. Interim Final. March.
[http://www.epa.gov/ecotox/ecossl/pdf/eco-ssl_silver.pdf]

Table B-1. Data Sources Used to Develop Mammalian Toxicity Reference Values
Southern Wood Piedmont Facility - Gulf, North Carolina

Chemical	Chemical Form	Test Organism	Study Duration	Endpoints	Exposure Route	Dosage	Reported Toxicity Value(s)	Test Species NOAEL	Test Species LOAEL	Selected TRV_{NOAEL} (mg/kg-day)	Selected TRV_{LOAEL} (mg/kg-day)	Value Used for ERA	Source/Comments
Semivolatile Organics													
2-methylnaphthalene	Napththalane as surrogate	Rat		Developmental			NOAEL, LOAEL	NR	NR	5.0E+01	1.5E+02	✓	Navarro et al. (1991), as cited by USEPA (2002).
Acenaphthene	Napththalane as surrogate	Rat		Developmental			NOAEL, LOAEL	NR	NR	5.0E+01	1.5E+02	✓	Navarro et al. (1991), as cited by USEPA (2002).
Acenaphthylene	Napththalane as surrogate	Rat		Developmental			NOAEL, LOAEL	NR	NR	5.0E+01	1.5E+02	✓	Navarro et al. (1991), as cited by USEPA (2002).
Anthracene	Napththalane as surrogate	Rat		Developmental			NOAEL, LOAEL	NR	NR	5.0E+01	1.5E+02	✓	Navarro et al. (1991), as cited by USEPA (2002).
Benzo(a)anthracene	BaP as surrogate	Mouse	Days 7-16 of gestation	Repro	Oral intubation	Three dose levels: 10, 40, and 160 mg/kg-d	LOAEL	NA	10 mg/Kg-d	1.0E+00	1.0E+01	✓	Mackenzie and Angevine (1981), as cited by Sample et al (1996). Used Benzo(a)pyrene as surrogate. Sample et al (1996) assumed TRV_{NOAEL} was 1/10 TRV_{LOAEL}.
Benzo(a)pyrene	NA	Mouse	Days 7-16 of gestation	Repro	Oral intubation	Three dose levels: 10, 40, and 160 mg/kg-d	LOAEL	NA	10 mg/Kg-d	1.0E+00	1.0E+01	✓	Mackenzie and Angevine (1981), as cited by Sample et al (1996). Sample et al (1996) assumed TRV_{NOAEL} was 1/10 TRV_{LOAEL}.
Benzo(b)fluoranthene	BaP as surrogate	Mouse	Days 7-16 of gestation	Repro	Oral intubation	Three dose levels: 10, 40, and 160 mg/kg-d	LOAEL	NA	10 mg/Kg-d	1.0E+00	1.0E+01	✓	Mackenzie and Angevine (1981), as cited by Sample et al (1996). Used Benzo(a)pyrene as surrogate. Sample et al (1996) assumed TRV_{NOAEL} was 1/10 TRV_{LOAEL}.
Benzo(g,h,i)perylene	BaP as surrogate	Mouse	Days 7-16 of gestation	Repro	Oral intubation	Three dose levels: 10, 40, and 160 mg/kg-d	LOAEL	NA	10 mg/Kg-d	1.0E+00	1.0E+01	✓	Mackenzie and Angevine (1981), as cited by Sample et al (1996). Used Benzo(a)pyrene as surrogate. Sample et al (1996) assumed TRV_{NOAEL} was 1/10 TRV_{LOAEL}.
Benzo(k)fluoranthene	BaP as surrogate	Mouse	Days 7-16 of gestation	Repro	Oral intubation	Three dose levels: 10, 40, and 160 mg/kg-d	LOAEL	NA	10 mg/Kg-d	1.0E+00	1.0E+01	✓	Mackenzie and Angevine (1981), as cited by Sample et al (1996). Used Benzo(a)pyrene as surrogate. Sample et al (1996) assumed TRV_{NOAEL} was 1/10 TRV_{LOAEL}.
Carbazole	Napththalane as surrogate	Rat		Developmental			NOAEL, LOAEL	NR	NR	5.0E+01	1.5E+02	✓	Navarro et al. (1991), as cited by USEPA (2002).
Chrysene	BaP as surrogate	Mouse	Days 7-16 of gestation	Repro	Oral intubation	Three dose levels: 10, 40, and 160 mg/kg-d	LOAEL	NA	10 mg/Kg-d	1.0E+00	1.0E+01	✓	Mackenzie and Angevine (1981), as cited by Sample et al (1996). Used Benzo(a)pyrene as surrogate. Sample et al (1996) assumed TRV_{NOAEL} was 1/10 TRV_{LOAEL}.
Dibenzo(a,h)anthracene	BaP as surrogate	Mouse	Days 7-16 of gestation	Repro	Oral intubation	Three dose levels: 10, 40, and 160 mg/kg-d	LOAEL	NA	10 mg/Kg-d	1.0E+00	1.0E+01	✓	Mackenzie and Angevine (1981), as cited by Sample et al (1996). Used Benzo(a)pyrene as surrogate. Sample et al (1996) assumed TRV_{NOAEL} was 1/10 TRV_{LOAEL}.
Dibenzofuran	Napththalane as surrogate	Rat		Developmental			NOAEL, LOAEL	NR	NR	5.0E+01	1.5E+02	✓	Navarro et al. (1991), as cited by USEPA (2002).
Fluoranthene	BaP as surrogate	Mouse	Days 7-16 of gestation	Repro	Oral intubation	Three dose levels: 10, 40, and 160 mg/kg-d	LOAEL	NA	10 mg/Kg-d	1.0E+00	1.0E+01	✓	Mackenzie and Angevine (1981), as cited by Sample et al (1996). Used Benzo(a)pyrene as surrogate. Sample et al (1996) assumed TRV_{NOAEL} was 1/10 TRV_{LOAEL}.
Fluoranthene	BaP as surrogate	Mouse	Days 7-16 of gestation	Repro	Oral intubation	Three dose levels: 10, 40, and 160 mg/kg-d	LOAEL	NA	10 mg/Kg-d	1.0E+00	1.0E+01	✓	Mackenzie and Angevine (1981), as cited by Sample et al (1996). Used Benzo(a)pyrene as surrogate. Sample et al (1996) assumed TRV_{NOAEL} was 1/10 TRV_{LOAEL}.
Fluorene	Napththalane as surrogate	Rat		Developmental			NOAEL, LOAEL	NR	NR	5.0E+01	1.5E+02	✓	Navarro et al. (1991), as cited by USEPA (2002).
Indeno(1,2,3-cd)pyrene	BaP as surrogate	Mouse	Days 7-16 of gestation	Repro	Oral intubation	Three dose levels: 10, 40, and 160 mg/kg-d	LOAEL	NA	10 mg/Kg-d	1.0E+00	1.0E+01	✓	Mackenzie and Angevine (1981), as cited by Sample et al (1996). Used Benzo(a)pyrene as surrogate. Sample et al (1996) assumed TRV_{NOAEL} was 1/10 TRV_{LOAEL}.
Naphthalene	NA	Rat		Developmental			NOAEL, LOAEL	NR	NR	5.0E+01	1.5E+02	✓	Navarro et al. (1991), as cited by USEPA (2002).

Table B-1. Data Sources Used to Develop Mammalian Toxicity Reference Values
Southern Wood Piedmont Facility - Gulf, North Carolina

Chemical	Chemical Form	Test Organism	Study Duration	Endpoints	Exposure Route	Dosage	Reported Toxicity Value(s)	Test Species NOAEL	Test Species LOAEL	Selected TRV_{NOAEL} (mg/kg-day)	Selected TRV_{LOAEL} (mg/kg-day)	Value Used for ERA	Source/Comments
Pentachlorophenol	NA	Rat	77+ days	Repro	Oral in diet	Two dose levels: 3 and 30 ppm in diet	NOAEL	3 ppm	30 ppm	2.40E-01	2.40E+00	—	Schwetz et al. (1978), as cited by Sample et al (1996).
Pentachlorophenol	NA	Mink, sheep, rat, mouse	Varied; 4 days to 8 months	Growth, Reproduction	Oral in diet or gavage	Varied	NOAEL, LOAEL	Varied; 0.08 to 122 mg/Kg-day	Varied; 0.57 to 74 mg/Kg-day	8.40E+00	2.27E+01	✓	Geometric mean of multiple studies used for EcoSSL development (USEPA, 2005x). Endpoint was growth and reproduction.
Pentachlorophenol	NA	Mink	100+ days; 3 gen	Reproduction	Oral in diet	1 mg/Kg-d	NOAEL	1 mg/Kg-d	NA	1.00E+00	NA	✓	Beard and Rawlings (1998). Used this value as TRVNOAEL for mink. Used EcoSSL-derived value for the TRVLOAEL.
Phenanthrene	Napththalane as surrogate	Rat		Develomental			NOAEL, LOAEL	NR	NR	5.0E+01	1.5E+02	✓	Navarro et al. (1991), as cited by USEPA (2002).
Pyrene	BaP as surrogate	Mouse	Days 7-16 of gestation	Repro	Oral intubation	Three dose levels: 10, 40, and 160 mg/kg-d	LOAEL	NA	10 mg/Kg-d	1.0E+00	1.0E+01	✓	Mackenzie and Angevine (1981), as cited by Sample et al (1996). Used Benzo(a)pyrene as surrogate. Sample et al (1996) assumed TRV_{NOAEL} was 1/10 TRV_{LOAEL}.
Total L-PAHs	Napththalane as surrogate	Rat		Develomental			NOAEL, LOAEL	NR	NR	5.0E+01	1.5E+02	✓	Navarro et al. (1991), as cited by USEPA (2002).
Total H-PAHs	BaP as surrogate	Mouse	Days 7-16 of gestation	Repro	Oral intubation	Three dose levels: 10, 40, and 160 mg/kg-d	LOAEL	NA	10 mg/Kg-d	1.0E+00	1.0E+01	✓	Mackenzie and Angevine (1981), as cited by Sample et al (1996). Sample et al (1996) assumed TRV_{NOAEL} was 1/10 TRV_{LOAEL}.
Dioxins/Furans													
Dioxin-$TEQ_{mammalian}$	2,3,7,8-TCDD	Rat	>1 year (3 gen)	Repro	Oral in diet	Three dose levels: 0.001, 0.01, and 0.01 µg/Kg-d;	NOAEL	0.001 µg/Kg-d	NA	1.00E-06	1.00E-05	✓	Murray et al. (1979), as cited by Sample et al (1996). TRV_{LOAEL} assumed to be 10X TRV_{NOAEL}
Metals													
Nickel	Nickel Sulfate Hexahydrate	Rat	>1 y	Reproduction	Oral in diet	Three dose levels: 250, 500, and 1000 ppm Ni	NOAEL, LOAEL	250 ppm	500 ppm	4.00E+01	8.00E+01	✓	Ambrose et al. (1976), as cited by Sample et al. (1996)
Nickel	Nickel Chloride	Rat	~1 year (2 gen)	Reproduction	Oral in water	Three dose levels: 10, 50, and 250 mg Se/L	NOAEL, LOAEL	10 mg/L	50 mg/L	1.33E-01	3.16E+01		Smith et al (1993), as cited by USEPA (2002)
Silver	Silver acetate, silver chloride, or silver nitrate	Rat, Pig	25 days to 16 weeks	Growth, reproduction, survival	Oral in water o dite	Varied	NOAEL, LOAEL	NA	NA	8.36E+01	1.22E+02	✓	USEPA (2006). Value shown is geometric mean of 8 NOAELs and 2 LOAELs for reproduction, growth, and survival across multiple studies.

Notes:
NA: Information not available.
NR: Benchmarks not reported.
The selected TRV_{NOAEL} and TRV_{LOAEL} are based on the test organism. These value are adjusted in Table B-2 for the receptor(s) of interest.

amec

Appendix C
Chemical Fingerprinting Assessment of Sediment PCDD/F congener and PAH Results

APPENDIX C
CHEMICAL FINGERPRINTING ASSESSMENT OF SEDIMENT PCDD/F CONGENER AND PAH RESULTS

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CHEMICAL FINGERPRINTING ASSESSMENT OF SEDIMENT PCDD/F CONGENER AND PAH RESULTS

C.1 INTRODUCTION

In their review of the draft SLERA, NCDENR (2007) requested information concerning the potential contribution of COPECs from the tributaries to Cedar Creek. Section 2.4 of the main text discusses the results of the semi-quantitative assessment that evaluated the local hydrology of the area and compared the chemical concentrations in the sediments (and surface water) in the tributaries relative to those in Cedar Creek. This appendix presents the results from the chemical fingerprinting analysis of sediment PCDD/F congeners and PAH results for the sediments collected from the Drainage Ditch and Cedar Creek near the former SWP facility in Gulf, North Carolina. The primary objective of the fingerprinting assessment is to determine whether the PAH and PCDD/F congener patterns in the Drainage Ditch and Cedar Creek samples are related to the materials historically used at the SWP facility and to determine whether the SWP facility represents the only source of these chemicals to these areas.

The analytical results from the historical sampling events are provided in Appendix A. These samples represented the 0-2" or 0-6" depth intervals, and were collected from depositional areas at each of the sample locations. The statistical tools used for the chemical fingerprinting evaluation included Correlation and Regression Analyses, Principal Components Analysis (PCA) and Cluster Analysis (CA). PCA and CA were performed using the MultiVariate Statistical Package (MVSP v 3.12d; Kovach Computing Services, 2001) while the remaining statistical methods were performed using Minitab (v12.23; Minitab, 1999).

As part of the initial step of the fingerprinting assessment, the relative concentrations of the constituent PAHs or PCDD/F congeners are evaluated for each sampled area. When compared to the total PAH or total PCDD/F concentrations this provides insight for both the spatial distribution and the relative patterns of the constituent congeners. The spatial analysis of these results was discussed in the main section of the ERAGS Step 3 report and will be summarized as appropriate in this appendix. The relative patterns of the constituent PCDD/F congeners are evaluated more rigorously using PCA and CA. A different approach is used to assess the PAH results due to the large temporal and spatial variability of these results.

The focus of the PCA and CA evaluations is on the relative pattern of the PCDD/F congener results. Therefore, the individual PAH or PCDD/F congener results for a given sample were first normalized to the total PAH or PCDD/F concentrations of that sample prior to performing these evaluations. For both the total PCDD/Fs and the PAHs, non-detect results were assessed by setting the values to zero or to half the reporting limit. This was done to assess the potential biases that may affect the interpretation of the statistical analyses when the non-detects are

replaced with values other than zeroes. For example, samples with elevated PCDD/F detection limits may result in a pattern that appears to be similar to another sample with the same PCDD/F congeners detected due to the substitution methods. Half the reporting limit was used since this is a common substitution to address non-detect results in deriving exposure point concentrations in human and ecological risk assessments.

As part of this fingerprinting analysis, a determination of the possible correlations between total PAHs, total PCDD/Fs, their constituent congeners, and pentachlorophenol was performed. This was done to determine any associations related to potential releases from the SWP property, as well as to identify whether select indicator chemical(s), such as total PAH concentrations or Dioxin-TEQ concentrations, could be used as remedial goals for the implementation of any remedial measures.

C.1.1 Data Transformations for PCA and CA Analyses

In addition to normalizing concentration data for the PCA and CA evaluations, an additional transformation is often applied in chemical fingerprinting analyses to remove differences in the variable's ranges of values, as well as to give variables the same "importance" in PCA and CA analyses (Cao et al., 1999). A commonly employed method is the "z-score transformation," which is outlined below:

1. Normalize the concentration data within each sample "k" to its corresponding total PAH or PCDD/F concentrations, yielding a ratio "R", for each individual chemical "j" in each sample (R_{jk}).

2. Calculate the average ($Mean_k$) and standard deviation (SD_k) of the normalized ratios within each "k" sample.

3. The z-score transformation of each congener ratio result (ZR_{jk}) is then calculated as follows for each "k" sample:

$$ZR_{jk} = (R_{jk} - Mean_k)/SD_k$$

4. To confirm the proper calculation of the z scores, the sum of the ZR_{jk} values for each sample is zero, with a standard deviation of 1.

Z-score transformation tends to reduce the scale of the principal component axes, and better defines the clustering of the sample results, when compared to untransformed results. This transform is more commonly applied compared to other transforms (e.g., log ratio transform; Aitchison, 1986) since it is simple to implement and avoids the need for surrogate values for zero (or missing) values.

C.1.2 Principal Components Analysis

PCA, an exploratory statistical data technique, reduces a large set of variables to a smaller set that still contains most of the information (i.e., the variability) from the larger set, facilitating analysis and interpretation (NIST, 2004). Each of these smaller sets, called principal components (PCs), account for a certain percentage of the overall datasets variability. The first PC (PC1) accounts for the largest amount of the variability, with the next largest amount addressed by the second PC (PC2), and so on. Each PC is "orthogonal" (i.e., perpendicular) to the other, so up to three PCs can be plotted on the same graph. When portrayed on a two-dimensional (PC1:PC2) plot or three-dimensional (PC1:PC2:PC3) plot the clusters represent those samples that have similar characteristics (i.e., similar PCDD/F congener patterns within each of the cluster groups).

C.1.3 Cluster Analysis

CA, another exploratory data technique, was also performed using MVSP. CA results are commonly presented as dendrograms, where the vertical lines represent the pairs of individual samples or pairs of individual samples with groups of similar samples, and the lower axis represents the "dissimilarity" between the samples. The length of the horizontal line between pairs shows the similarity of the grouped samples, with longer horizontal lines indicating less similarity. Shorter horizontal lines reflect grouped samples that are more similar.

CA is based on a different algorithm and set of assumptions compared to PCA, but can also be used to identify how well the samples group together.

C.1.4 Analytical Dataset

The same analytical dataset that was presented in the SLERA (AMEC, 2007) was used for the chemical fingerprinting assessment. It was noted during the fingerprinting assessment that the total PAHs, total PCDD/Fs and dioxin-TEQs for some of the samples were double-counted due to combining the results from the same locations that were collected during different sample years. This principally occurred with the following samples that were collected in both 1999 and in 2002: SW-053-SD, SW-054-SD and SW-055-SD.

Further evaluation showed that these same Sample IDs were used to represent different sampling areas (Cedar Creek tributaries or the Drainage Ditch) depending upon the sample year. In 1999, these Sample IDs were used for the PCDD/F analyses of the sediments collected from three Cedar Creek tributaries (Trib-S1, Trib-S2, and Trib-N3). In 2002, these same Sample IDs were used for SVOC and PCDD/F analysis of the Drainage Ditch samples. The data summary tables in Appendix A reflect these sample assignments.

In addition, some of the datasets reported the isomers benzo(b)fluoranthene and benzo(k)fluoranthene as co-eluting pairs, while in others these isomers were reported separately. It is not uncommon for laboratories to report these isomers as co-eluting pairs, and the combined results are often reported as "benzo(b&k)fluoranthene", or a similar descriptor. For this assessment, if the two benzofluoranthene isomer results were reported independently, they were combined as "total benzofluoranthenes" as follows:

- If both isomers were positively detected, the total benzofluoranthene concentration was the sum of the two isomer results;
- If one of these isomers was detected but the other was not detected, the single positive result was used as the total benzofluoranthene concentration.
- If neither of the isomers were detected, the non-detect value for the total benzofluoranthene was the average of the two detection limits.

Figures 2-4 through 2-7 in the main text of the ERAGS Step 3 report, which summarize the spatial distribution of these results, reflect this information. These figures are updates to the comparable figures (Figure 4a, 4b, 5a and 5c) presented in the SLERA (AMEC, 2007).

C.1.5 Fingerprint Signatures

Wood treatment at the former SWP facility used a combination of creosote and pentachlorophenol (PCP). PAHs are present in creosote (WHO, 2004) while PCDD/Fs are present as a contaminant in PCP (USEPA, 1992). This section briefly summarizes the fingerprint signatures of these chemical groups in these products.

PAHs in Creosote

The type of creosote used for wood treatment was typically coal tar creosote, derived from distillation products of coal tar, which are by-products of the carbonization of coal to produce coke or natural gas (ATSDR, 2002). Consequently, creosote is a complex mixture of chemicals. As summarized in WHO (2004), there are six major classes of compounds in creosote: aromatic hydrocarbons (including the PAHs), alkylated PAHs, phenolics, nitrogen-containing heterocyclics (e.g., carbazole), sulfur-containing heterocyclics (e.g., dibenzothiophene); and oxygen-containing heterocyclics (e.g., dibenzofuran). The two principal blends of creosote used for wood preservation (P1/P13 and P2) varied in their PAH content since different distillation temperatures were used to derive these products (Murphy and Brown, 2005). Table C-1 summarizes the relative percentages of the EPA Method 8270 PAHs in the two types of creosote, as reported by Murphy and Brown (2005). These results will be identified as C-P1/P13 and C-P2 in this fingerprinting evaluation. Unfortunately, information concerning whether these more contemporary forms of creosote were used during historic plant operations can not be confirmed.

Several authors have also used the ratios of select PAHs, or combinations of PAHs, as indicators for sources of these chemicals (e.g., Yunker et al., 2002; Lucia et al., 2005). Table C-2 summarizes the PAH ratios reported by these authors for different types of PAH sources, some of which may have contributed PAHs to the evaluated areas. These ratios were examined further as part of the PAH fingerprinting assessment.

PCDD/Fs in Pentachlorophenol

Early work relating PCDD/F patterns to potential sources showed that the PCDD/F content of pentachlorophenol was predominantly OCDD, followed, in decreasing order of relative abundance, by the HpCDD, OCDF and HpCDF homologs (Cull et al., 1984; Hagenmaier et al., 1994). The PCDD/F congener concentrations in pentachlorophenol reported by Cull et al (1984) were limited to the hexa- and higher chlorinated congeners. Hagenmaier and Brunner (1987) reported concentrations for all 17 PCDD/F congeners in pentachlorophenol from two sources. These results, with their respective normalized concentration ratios, are summarized in Table C-3. Review of this table shows that the dominant PCDDs were OCDD and 1,2,3,4,6,7,8-HpCDD, while the dominant PCDFs were OCDF and 1,2,3,4,6,7,8-HpCDF. These results are identified as PCP Std-1 and PCP Std-2 in the PCA and CA analyses.

The PCDD/F congener concentration ratios reported in Hagenmaier and Brunner (1987) were determined from unused pentachlorophenol. The pentachlorophenol that was intermittently released from the SWP facility had undergone the heating and high pressure process used for treating the wood, as well as possible attenuation processes in the settling ponds. Consequently, the spent pentachlorophenol may not have the same PCDD/F congener ratios as the unused form. Therefore, the PCA and CA analyses were performed with and without PCP Std-1 and PCP Std-2. In addition, the PAHs and PCDD/Fs in the Drainage Ditch sediments were evaluated as possible signatures relating to the spent chemical forms derived from facility operations that may have been transported to Cedar Creek sediments.

C.2 POLYCYCLIC AROMATIC HYDROCARBONS IN SEDIMENTS

Figures 4a and 5a in the SLERA (AMEC, 2007) presented the horizontal distribution of PAHs in the drainage ditch sediments and Cedar Creek sediments, respectively. The PAHs were summarized in these figures as low molecular weight PAHs (L-PAHs), high molecular weight PAHs (H-PAHs), and total PAHs. Review of this information suggests some shifting of the patterns of the L- and H-PAHs (and therefore the underlying individual PAHs) with increasing distance from the SWP property, and also between the upgradient (background) and downgradient samples, although these PAHs were also not detected in a number of the downstream samples (see Appendix A, Tables A-2 and A-3 for sediment results).

The PAH results were evaluated two different ways:

1. Setting non-detects to zero values ('Zero-DL'); and,
2. Setting non-detects to half the reported detection limit ('Half-DL').

Two different substitution approaches were used for the non-detect results to determine whether or not the methodology used to address such results would result in any different interpretations of the fingerprinting results.

PAH fingerprinting typically includes the alkylated derivates of the PAHs analyzed following a modification of EPA Method 8270 (e.g., Burns et al., 1997; Costa and Sauer, 2005; Stout et al., 2003). Since these alkylated PAHs were not included as target analytes in the historical sampling events, the fingerprinting assessment of the PAHs is restricted to the non-alkylated PAHs.

Acronyms for the different PAHs were developed to facilitate the fingerprinting discussion regarding these chemicals. This acronym list is provided in Appendix Table A-5.

C.2.1 Field Quality Control Samples for PAHs in Sediments

Prior to performing the chemical fingerprinting assessment a review of the field quality control samples (field duplicates, splits, and related) was performed (Attachment C1). Field duplicates and split samples were obtained from well-mixed homogenates. The key results from this assessment are summarized below, by area.

Drainage Ditch Sediment PAH Samples

- There was one sample-duplicate pair (SW-058-SD and SW-158-SD) collected for PAHs from the Drainage Ditch sediments and neither sample contained any detectable PAHs.

- There were two split samples collected for PAHs from the Drainage Ditch sediments [SW-024-SL and SW-024-SL (NCDENR); and SW-015-SL and SW-015-SL (NCDENR)]. The first set exhibited wide variability in the reported PAH concentrations (SW-024-SL had no detectable PAHs while the split sample contained 2.91 mg/Kg_{dw} of total PAHs). The second set had similar total PAH concentrations but differed in their relative PAH concentrations. Since well mixed samples were split this variability likely reflects differences between the two analytical laboratories. The divergent PAHs results of these samples will preclude a definitive fingerprinting assessment of their relative PAH ratios.

- There were no samples that were co-located spatially and collected on different dates for the PAHs from the Drainage Ditch.

Cedar Creek Sediment PAH Samples

- There were six sets of samples that were collected as sample–duplicate pairs. Four of these datasets had no detectable PAHs in either the original sample or the field duplicates. For the remaining two sets, the relative PAH patterns were similar between the different sample-duplicate pairs.

- There were 12 sets of sediment samples analyzed for PAHs that were split for analysis by SWP and NCDENR. Nine of these datasets had no detectable PAHs in either the original or split samples. For the remaining three sets of samples, when PAHs were detected in both of the split samples their relative patterns were similar. However, some PAHs were detected in one but not both of the split samples; even when total PAH concentrations were similar there were variations in the PAH patterns. This variability may impact the chemical fingerprinting assessment.

- There were four sets of sediment samples analyzed for PAHs that were co-located spatially but which were collected during different sample events (1983, 1990, 1995 and 1998) from Cedar Creek. There were no detectable PAHs in one of these sets of samples. For the remaining sets of samples, there was a large variation in both their total PAH concentrations as well as relative PAH patterns.

Due to the large temporal variability in the PAH results, and poor sample reproducibility for some of the duplicate and split samples, the chemical fingerprinting assessment was limited to an examination of the PAH concentration ratios in select samples and an evaluation of the spatial distributions of the results. Detailed PCA and CA analyses of the PAH results were not performed.

C.2.2 Concentration Ratios of PAHs in Sediments

The concentration ratios assessment was performed separately for the Drainage Ditch and Cedar Creek sediments samples. To avoid any misinterpretation due to the presence of non-detect results, only the subset of ten PAHs was evaluated.

C.2.2.1 Drainage Ditch PAH Concentration Ratios

The analytical results for the PAHs in the Drainage Ditch sediment samples are summarized in Appendix Table A-2. There were 20 samples (plus one field duplicate) collected from the Drainage Ditch in the analytical database. One sample representing background (SW-013-SL) was collected from upgradient of the SWP facility. Of the remaining Drainage Ditch sediment samples, four [8752, SW-058-SD, SW-158-SD, and SW-024-SL] contained no detectable PAHs

and were excluded from this evaluation. The upgradient sample contained a total PAH concentration of 0.28 mg/Kg_{dw}. The remaining samples had total PAH concentrations ranging from non-detect (0.19 mg/Kg_{dw} in lowest positive result) to 3,800 mg/Kg_{dw}. The latter sample (SW-014-SL) was collected on the opposite side of the drip track area railroad tracks (Figure 1-2a).

Figure C-1 compares the concentration profile for the 10 most commonly detected PAHs in the 20 evaluated samples (and the field duplicate) from the Drainage Ditch. Samples are ordered from upstream (top) to downstream (bottom) on these figures. The "a" side of this figure shows the total PAH concentrations (on a log scale) and the "b" side of this figure shows the normalized ratios of the 10 most commonly detected PAHs in the same samples. The relative contributions of the individual PAHs were highly variable across the Drainage Ditch samples. For example, the dominant PAHs in sample SW-014-SL, which had the largest total PAH concentration, were Anth and Phe. In contrast, the upgradient (background sample) contained BF, Chry, Fluoran and Pyr in similar amounts. Review of this figure shows that there were no clear relationships between the relative concentrations of the individual PAHs and the total PAH concentrations in these samples. This may be due, in part, to combining datasets from different sample collection years (1983, 1990, 1995, 1998, 2002, and 2003).

C.2.2.2 Cedar Creek PAH Concentration Ratios

The analytical results for the PAHs in the Cedar Creek sediment samples are summarized in Appendix Table A-3. There were 63 sample results (including six field duplicates) collected from Cedar Creek in the analytical database. Fifteen samples were collected from upgradient of the SWP facility, 10 from three of the downstream creek tributaries, and the remaining from the main downstream channel. Thirty-six samples (fourteen from the upgradient locations, six from the tributaries, and 16 from the main channel) contained no detectable PAHs. The positive results in the remaining samples ranged from 0.12 to 1,050 mg/Kg_{dw}. The latter result was in sample SW-029-SD, which was the initial sample of a sample-duplicate pair collected at the location where the Drainage Ditch connects to Cedar Creek. The duplicate of this pair (SW-129-SD) had a lower total PAH concentration (250 mg/Kg_{dw}) as did the other five historical samples collected from this station.

Figure C-2 compares the concentration profile for the 10 most commonly detected PAHs in all 63 samples from Cedar Creek. Samples that are missing bars represent the non-detect results. Samples are ordered from upstream (top) to downstream (bottom) on these figures. The "a" side of this figure shows the total PAH concentrations (on a log scale) and the "b" side of this figure shows the normalized ratios of the 10 most commonly detected PAHs in the same samples. The dominant PAH in the single upstream sample that had detectable PAHs (SWP-009; total PAH concentration of 1.63 mg/Kg_{dw}) was Fluoran. This sample was located near Oldham Road and may reflect the contribution from road surface runoff. When detected, the

relative PAH concentrations in the remaining samples were variable, with no clear relationship between relative ratios and total PAH concentration. Sample SW-034-SD, collected near State Road 2145, had the lowest positively detected PAH concentration, with total benzofluoranthenes representing the dominant PAH in this sample. The PAH pattern in the tributary sediment samples that had detectable PAHs [samples SW-031-SD and SW-032-SD (NCDENR)] showed a slightly different PAH pattern relative to the main channel PAHs.

One issue that can influence the interpretation of the PAH fingerprinting is the high variability in the total PAH results collected from the same sampling locations. For example, there were eight sample results (including three duplicates) in the analytical database for the sample station near the junction of the Drainage Ditch and Cedar Creek. Table C-4 summarizes the total PAH concentrations in these samples, clearly showing variation in total PAH concentrations over time. The maximum of these results [SW-029-SD (NCDENR); 1,050 mg/Kg] - which was also the maximum of the combined ditch and creek sediment dataset - is suspect since its' corresponding NCDENR field duplicate [SW-129-SD (NCDENR); 250 mg/Kg] had a similar concentration to the split sample collected by SWP (SW-029-SD; 264 mg/Kg). The most recent samples (from 1998) from this location had no detectable PAHs. Therefore, the temporal variation may be due to a combination of sample matrix variability, interlaboratory variability, and/or degradation of PAHs with time.

C.2.3 PAH Isomer Ratios

Different methodologies have been used to attempt to distinguish sources of PAHs, including whether they are of pyrogenic, petrogenic, or biogenic origin (e.g., Wang et al., 1999; Lima et al., 2005). As discussed in Section C.1.5, one approach is to compare the ratios between individual PAHs or combinations of PAHs. Several authors have compiled typical "signature" ratios for select PAH sources (e.g., Yunker et al., 2002, Oros and Ross, 2004, Lima et al., 2005). Stout et al (2004) used the "double-ratio" plots of the ratios of the concentrations of the following PAHs that can be used to identify background sources of these chemicals:

- Fluoran/Pyr versus Anth/Phen; and,
- BaA/Chry versus BeP/BaP.

Benzo(e)pyrene (BeP) was not quantified in any of these samples since it is not part of the target compound list of the analytical method (EPA method 8270) that was used. Therefore, this analysis was restricted to comparisons of the Fluoran/Pyr versus Anth/Phen ratios only. Figures C-3a, C-3b and C-3c show the PAH isomer comparisons for the Drainage Ditch, main stem Cedar Creek, and Cedar Creek tributary sediments, respectively. These are discussed further below.

As an additional comparison, the relative ratios of these isomer pairs can also be calculated from the creosote data provided in Table C-1. The relative ratios of Fluoran/Pyr and Anth/Phen for the two creosote types are summarized in the table below, and will be included in this assessment.

P2 Creosote		P1/P13 Creosote	
Fluoran/Pyr	Anth/Phen	Fluoran/Pyr	Anth/Phen
1.15	0.30	1.17	0.24

Drainage Ditch Sediments

Figure C-3a presents the isomer ratio comparisons for the half-DL and zero-DL substitution schemes for the Drainage Ditch sediments. One or more of the four isomer ratio analytes where either not detected in these samples, or were not quantified, which reduced the number of possible comparisons to perform.

The half-DL substitution ratio comparisons are shown in the "(a)" portion of Figure C-3a. Of the 21 samples with PAH results from the Drainage Ditch, six lacked results for pyrene, so a total of 15 results were available for these comparisons. There was no clear clustering of the background and downstream samples collected from the Drainage Ditch. One of the samples [SW-015-SL (NCDENR)] had a pattern similar to that in the creosote mixtures. This was also the sample with the largest total PAH concentration of any of the Drainage Ditch samples (361 mg/Kg). Table C-5a summarizes the calculated isomer ratios for the Drainage Ditch samples using the Half DL substitution method.

Some of this variability may be due to the detection frequency of the different chemicals, reflected in the "(b)" portion of Figure C-3a, which summarizes the Zero DL substitution ratio comparisons. In this case, 13 of the samples had one or more of the PAHs not detected or not reported, so their ratios could not be calculated. Furthermore, only the downstream results were available for comparisons. Sample SW-015-SL (NCDENR) did not properly plot on this figure but had PAH isomer ratios similar to that observed in the creosote mixtures. Table C-5b summarizes the calculated isomer ratios for the Drainage Ditch samples using the Zero DL substitution method.

Main Stem Cedar Creek Sediments

Figure C-3b presents the isomer ratio comparisons for the half-DL and zero-DL substitution schemes for the Cedar Creek sediments. As with the Drainage Ditch samples, one or more of the four isomer ratio analytes where either not detected in these samples, or were not quantified, which reduced the number of possible comparisons to perform.

The half-DL substitution ratio comparisons are shown in the "(a)" portion of Figure C-3b. There were a total of 55 results available for these comparisons. Of the 13 samples from the background areas, 12 of these had isomer ratios of 1 for both PAH pairs. There were 17 main stem Cedar Creek samples (Table C-5c), shown within the "A" circle on this figure, that had similar PAH isomer ratios to those seen in the background samples. Many of these samples had the same isomer ratios so they do not plot separately on this figure. Four of the samples [SW-129-SD (NCDENR), SW-062-SD, SW-044-SD (NCDENR), and SW-065-SD], shown within the "B" circle on this figure, had isomer ratios for these PAH pairs that were similar to that observed for the two creosote types.

To determine whether this clustering was attributable to the DL replacement method, the "(b)" portion of Figure C-3b summarizes the Zero-DL substitution ratio comparisons. In this case, there were five samples (Table C-5d), shown in the circled area on this figure, that had similar PAH isomer ratios to those seen in the background samples. The larger number of samples that were included in the background circled area in the half-DL substitution scheme were due to the large number of non-detect results for these PAH isomers. Three of these samples [SW-129-SD (NCDENR), SW-062-SD, and SW-044-SD (NCDENR)], shown within the "B" circle on this figure, had isomer ratios for these PAH pairs that were similar to that observed for the two creosote types.

Cedar Creek Tributary Sediments

Figure C-3c presents the isomer ratio comparisons for the half-DL and zero-DL substitution schemes for the Cedar Creek tributary sediments. One or more of the four isomer ratio analytes where either not detected in these samples, or were not quantified, which reduced the number of possible comparisons to perform.

The half-DL substitution ratio comparisons are shown in the "(a)" portion of Figure C-3c. There were a total of 22 results available for these comparisons. Of the 13 samples from the background areas, 12 of these had isomer ratios of 1 for both PAH pairs. Two of the remaining nine samples from the tributaries [SW-031-SD (NCDENR) and SW-055-SD] had at least one of the PAHs detected in the paired PAH groupings. Seven of the tributary samples grouped with the Cedar Creek background samples (these plotted at the same location on this figure) but none were near the two creosote standards.

To determine whether this clustering was attributable to the DL replacement method, the "(b)" portion of Figure C-3c summarizes the Zero-DL substitution ratio comparisons. In this case, only two of the tributary samples [SW-031-SD (NCDENR) and SW-055-SD] and one of the background samples (SWP-009) had at least one positive PAH detected. Sample SW-055-SD was not included in this plot since pyrene was the only PAH of the two PAH pairs that was detected. The tributary sample SW-031-SD (NCDENR) did not plot near either the background

sample or the creosote standards, suggesting a unique source of PAHs to this tributary (Trib-N1).

In summary, the "double-ratio" plots of Fluoran/Pyr versus Anth/Phen suggest clustering of some of the downstream sediments samples within Cedar Creek with background (upstream) sediment samples. Although the number of comparisons was somewhat limited, it suggests that many of the downstream sediments are "background-like" and have not been impacted by historical runoff of PAHs from the SWP facility. A small number of downstream sediment samples in the creek were "creosote-like" in their PAH patterns, but these were either located near the facility or had low total PAH concentrations well below the RSV.

C.3 PCDD/F CONGENERS IN SEDIMENTS

Figures 4b and 5b in the SLERA (AMEC, 2007) presented the horizontal distribution of PCDD/F TEQs in the drainage ditch sediments and Cedar Creek sediments, respectively. Review of this information shows variability in the TEQ values suggesting possible spatial shifts in the relative concentrations of the underlying PCDD/F congeners. These will be examined further using PCA and CA.

Although the TEQ values were presented in the aforementioned figures, the fingerprinting assessment focuses on the individual PCDD/F congener results. As with the PAH evaluation, the ratios of the congener concentrations normalized to the total PCDD/F concentrations were used for the PCA and CA evaluations.

Table C-6 summarizes the frequencies of detection and the ranges of the normalized PCDD/F congeners. The fingerprinting software treated any non-detect results that were substituted with zero values, or where values were missing, as zero values.

Some of the sample stations were collected more than once. To facilitate the presentation of this information, the sample year precedes the sample IDs in the figures and data output for these analyses. For example, sample SW-053-SD, which was collected on 4/7/1999 and on 7/16/2002 (from different locations, see Section C.1.4), was identified as 99SW-053-SD and 02SW-053-SD (respectively) on the PCA and CA figures.

The PCDD/F results were evaluated two different ways:

- Setting non-detects to zero values ('Zero-DL'); and,
- Setting non-detects to half the reported detection limit ('Half-DL').

This was performed to determine whether or not the two different DL substitution schemes would yield differing fingerprinting results. Generally, the greater the detection frequency, the

less the impact is of the different DL substitution schemes on the interpretation of the analytical results.

Tables C-7a and C-7b show the Sum PCDD/F results and Dioxin-TEQ concentrations for the sediments collected from the Drainage Ditch and Cedar Creek, respectively. The fingerprinting assessment focuses on the PCDD/F congener results, but these tables are provided to allow easy referencing to the calculated Dioxin-TEQ results for these samples.

C.3.1 Relative Concentrations of PCDD/Fs in Sediment Samples

This section summarizes the relative concentrations of the PCDD/Fs in the sediments as a first step in the fingerprinting assessment. The sediment results were evaluated by area.

C.3.1.1 Relative Concentrations of Drainage Ditch PCDD/Fs

The analytical results for the PCDD/Fs in the Drainage Ditch sediment samples are summarized in Appendix Table A-2. There were eight samples collected from the Drainage Ditch in the analytical database. All samples contained at least one PCDD/F congener. One Drainage Ditch sample representing background (95SW-013-SL) was collected from upgradient of the SWP facility. This result was compared to the Clinton Crops background soil concentration reported by USEPA (2007)[1] in Table C-8. Although the total PCDD/Fs were greater in the Drainage Ditch sample compared to the Clinton Crops sample, both of these samples were dominated (96 to 98%) by the same congener (OCDD), suggesting that the site-specific background may have been derived from a similar background source(s) as the regional background sample.

Ferrario et al (2000) reported a possible natural, pre-anthropogenic origin of PCDD/Fs in clays. Although many of the sediments collected from this site were clays or clay mixtures, the PCDD/Fs congener pattern of the natural "ball clay", which are dominated by PCDDs with only small amounts of PCDFs[2], were not observed in these samples. Therefore, the PCDD/Fs detected in the background sediment samples likely reflect anthropogenic, long-range air transport, or other (e.g., recent forest fire) sources.

Figure 2-4 showed the spatial distribution of the Dioxin-TEQs based on the mammalian and avian TEFs in these samples. The upgradient sample contained Dioxin-TEQ_{mammal} and Dioxin-TEQ_{avian} concentrations of 13.5 and 19.1 ng/Kg_{dw}, respectively. The remaining samples had

[1] See section 2.2.3 of the main text of the ERAGS Step 3 Report for discussion regarding the USEPA (2007) study.

Dioxin-TEQ_{mammal} values ranging from 51 to 586 ng/Kg_{dw}, and the Dioxin-TEQ_{avian} concentrations ranged from 44 to 345 ng/Kg_{dw}. The maximum Dioxin-TEQ values were calculated in sample 02SW-059-SD.

Figure C-4 compares the concentration profiles for all of the PCDD/F congeners in the samples from the Drainage Ditch. Samples are ordered from upstream (top) to downstream (bottom) on these figures. The "a" side of this figure shows the total PCDD/F concentrations (on a log scale) and the "b" side of this figure shows the normalized ratios of the PCDD/F congeners in the same samples. Review of this figure shows that the dominant congener in all of the Drainage Ditch samples was OCDD, followed by 1,2,3,4,6,7,8-HpCDD and then OCDF. The remaining congeners generally contributed well below 1% to the total PCDD/F concentrations. Of the two PCDD/F congeners with TEF values of 1 (2,3,7,8-TCDD and 1,2,3,7,8-PeCDD), the congener 2,3,7,8-TCDD was detected in the upgradient (background) sample [95SW-013-SL (NCDENR)] and two of the seven remaining Drainage Ditch samples [02SW-059-SD and 02SW-055-SD]. The congener 1,2,3,7,8-PeCDD was also detected in the upgradient (background) sample and five of the remaining seven Drainage Ditch samples.

C.3.1.2 Relative Concentrations of Cedar Creek PCDD/Fs

The analytical results for the PCDD/Fs in the sediments from Cedar Creek, associated tributaries, and the Deep River, are summarized in Appendix Table A-3. There were a total of 45 results from 21 locations in the analytical database, representing samples collected in 1995, 1998, 1999, and 2002. All samples contained at least one PCDD/F congener. The relative concentrations of the PCDD/F samples were examined in (1) the upstream, non-tributary samples, (2) the upstream tributary samples, (3) the Deep River sample, and (4) all creek samples combined.

Upstream, Non-Tributary Samples

There were 10 sample results, representing four locations that corresponded to the upstream (background) non-tributary data (Figure 2-5). There were no detectable PCDD/F congeners in one of these samples (95SW-028-SD). For the remaining nine background samples, the Dioxin-TEQ_{mammal} ranged from 0.05 to 0.37 ng/Kg_{dw}, while the Dioxin-TEQ_{avian} ranged from 0.17 to 0.94 ng/Kg_{dw}. These results are compared to each other and the Clinton Crops background soil concentration reported by USEPA (2007) in Table C-9a. The total PCDD/F concentrations were lower in these upstream non-tributary samples than in the Clinton Crops sample. All of these samples were dominated by OCDD, which represented 98 to 100% of the total PCDD/F concentrations in these samples.

[2] Ferrario et al (2000) reported that the average of the ratios of the sum of the PCDD congeners to the sum of the PCDF congeners in the "ball clay" samples was 957. This was a widely differing pattern than observed in any of the sediments collected for this project.

Upstream, Tributary Samples

There were twelve sample results, representing nine locations, which corresponded to the upstream (background) tributary data (Figure 2-5). PCDD/F congeners were detected in all of these samples. The Dioxin-TEQ_{mammal} ranged from 2.9 to 38.7 ng/Kg_{dw}, while the Dioxin-TEQ_{avian} ranged from 6.4 to 35.3 ng/Kg_{dw}. These results are compared to each other and the Clinton Crops background soil concentration reported by USEPA (2007) in Table C-9b. The total PCDD/F concentrations were greater in these upstream tributary samples than in the Clinton Crops sample. All of these samples were dominated by OCDD, although the percent contribution to the total PCDD/F concentrations, which was lower than observed in the Drainage Ditch samples, ranged from 80 to 96% of the total PCDD/F concentrations in these samples.

Cedar Creek, Cedar Creek Tributary and Deep River Samples

Figure C-5 compares the concentration profiles for all of the PCDD/F congeners in the sediment samples from Cedar Creek, its associated tributaries, and the Deep River. Samples are ordered from upstream (top) to downstream (bottom) on these figures. The "a" side of this figure shows the total PCDD/F concentrations (on a log scale) and the "b" side of this figure shows the normalized ratios of the PCDD/F congeners in the same samples. Review of this figure shows that the dominant congener in all of the Cedar Creek samples was OCDD, followed by 1,2,3,4,6,7,8-HpCDD and then OCDF. The remaining congeners generally contributed well below 1% to the total PCDD/F concentrations. The samples collected from the downstream locations (relative to the upstream background locations) generally showed lower relative OCDD concentrations with a greater contribution of 1,2,3,4,6,7-HpCDD and OCDF.

Deep River Sample

There was one sample (02SW-068-SD) collected from the Deep River for PCDD/Fs[3] in 2002. The Dioxin-TEQ_{mammal} and Dioxin-TEQ_{avian} concentrations were 1.6 and 2.7 ng/Kg_{dw}, respectively. The result is compared to the Clinton Crops background soil concentration reported by USEPA (2007) in Table C-9c. Although the total PCDD/F concentration was higher in the Deep River sample than in the Clinton Crops sample, fewer congeners were detected in the river sediment sample compared to the NC soil background sample (EPA, 2007). Of those congeners that were detected, the congener pattern was similar to the Clinton Crops sample. Both showed dominance by OCDD (96% and 98% of the total PCDD/F concentration in the river sample and NC background sample, respectively).

[3] This sample was collected and analyzed only for PCDD/Fs.

Variation in Cedar Creek Sediment PCDD/F Field Duplicate Results

There were six sets of samples that were collected in duplicate. These included samples that were collected by SWP and by NCDENR. The results from these comparisons are evaluated in Attachment C1. There was reasonably good agreement between the sample and field duplicate pairs with the exception of some of the individual PCDD/F congeners. There was no consistency in the specific congeners that were divergent in some of the samples.

Variation in Cedar Creek Sediment PCDD/F Split Sample Results

There were 13 sets of samples from Cedar Creek that were collected as split samples between SWP and NCDENR. Several of these were also included as sample-duplicate pairs. There was some variation in the concentrations between the reported results in the split samples between SWP and NCDENR. Of these comparisons, the most significant variation was observed with sample SW-044-SD/SW-044-SD (NCDENR). These are likely due to inter-laboratory variation, and possibly also sample non-homogeneity.

Temporal Variation in Cedar Creek Sediment PCDD/F Concentrations

There were three groups of sediment samples co-located spatially but which were collected during different sample events from Cedar Creek. These results are evaluated in Attachment C1. The temporal variation was most significant for samples collected from the site at the juncture of the Drainage Ditch and Cedar Creek [95SW-029-SD, 95SW-129-SD, 98SW-043-SD, 98SW-143-SD, 98SW-043-SD (NCDENR) and 98SW-143-SD (NCDENR)]. These also exhibited the most dramatic change in total PCDD/F concentrations over time. These variations will likely impact the fingerprinting analysis, since the individual congener results also varied in these samples. Consequently, the individual results were evaluated separately for the assessment of the Cedar Creek samples.

C.3.2 Principal Components Analysis

The PCA analyses of the PCDD/F results were performed for the drainage ditch and Cedar Creek separately and then also combined.

C.3.2.1 Drainage Ditch Sediments

Figure C-6a presents the PCA plot for the PCDD/Fs in Drainage Ditch sediments (setting non-detect results to zero) plus the two PCP standards from Hagenmaier and Brunner (1987). When non-detects were set to zero, PC1 defined 83.6% of the variability of the dataset. Adding PC2 increased this value to 99.8%. Therefore, nearly all of the variability in the data was captured in the PC1:PC2 plot. Review of this figure shows that the PCDD/F congener patterns

in the two PCP standards were similar but distinct from that observed in the sediment samples. Although this would suggest that PCP was not the source of the PCDD/Fs in the Drainage Ditch sediments; the fact that the source patterns for the PCP used in this assessment are based on unused PCP should be considered. The PCP that was intermittently released from the SWP facility represented waste PCP from the settling basins that had undergone heating and the high pressure process used for treating the wood. Therefore, even if the presence of PCDD/Fs in sediments is related to site activities, it is not unexpected that the PCDD/F patterns in the sediments would differ from that present in unused PCP. Unfortunately, data representing potential source patterns for processed PCP is unavailable.

Figure C-6b presents the PCA plot for the PCDD/Fs in Drainage Ditch sediments, less the two PCP standards, setting non-detect results to zero. When non-detects were set to zero, PC1 defined 98.6% of the variability of the dataset. Adding PC2 increased this value to 99.9%. Therefore, nearly all of the variability in the data was captured in the PC1:PC2 plot. Review of Figure C-6b shows that none of the downstream samples had similar PCDD/F congener patterns to the upstream background sample (95SW-013-SL). Most of the downstream samples grouped together, except for sample 02SW-059-SD. The latter was collected near the former settling ponds and was the sample with the highest Dioxin-TEQ concentrations from the Drainage Ditch (Figure 2-4).

Figure C-6c presents the PCA plot for the PCDD/Fs in Drainage Ditch sediments setting non-detect results to half the reporting limit. When non-detects were set to half-DLs, PC1 and PC2 defined 98.6% and 99.9% of the variability of the dataset, respectively (the same as was observed for the zero-DL substitution scheme). The PCA plot using the half-DL substitution scheme was identical to that using the zero-DL scheme (Figure C-6b). This likely occurred since there were only a small number of non-detect PCDD/F congeners in these samples.

C.3.2.2 Cedar Creek Sediments

Forty-six of the 47 sediment samples from Cedar Creek were evaluated for PCDD/F fingerprinting. Sample 95SW-028-SD (NCDENR), one of the 10 sample results available from the upstream (background) stations, was excluded from this analysis since it contained no detectable PCDD/F congeners.

All Cedar Creek Samples

Figure C-7a presents the PCA plot for the PCDD/Fs in Cedar Creek sediments, setting non-detect results to zero. When non-detects were set to zero, PC1 defined 94.5% of the variability of the dataset. Adding PC2 increased this value to 97.1%. Therefore, nearly all of the variability in the data was captured in the PC1:PC2 plot. This plot is distorted due to the apparent unique pattern in downstream sample 98SW-044-SD (NCDENR), relative to the other samples that

grouped closely together. This sample had the second highest TEQ concentrations (e.g., Dioxin-TEQ_{mammal} of 547 ng/Kg_{dw}) of the samples collected from within Cedar Creek, and was located downstream of the juncture of the Drainage Ditch and Cedar Creek at the SWP property boundary (Figure 1-2b). A split sample was collected from this location by SWP at the same time but had a different number of congeners detected [11 in samples SW-044-SD compared to 16 in sample SW-044-SD (NCDENR)] and different congener patterns (Attachment C1, Figure C1-6e). Review of the congener-specific inputs to the PCA (data not shown) indicated that the normalized ratios for 1,2,3,4,6,7,8-HpCDD and OCDF were the dominant features in sample 98SW-044-SD (NCDENR), while lower relative ratios for these congeners were calculated for the other sediment samples.

To facilitate the evaluation of the remaining data, sample 98SW-044-SD (NCDENR) was removed from the dataset and the PCA was repeated. Despite excluding this sample, the new plot, shown in Figure C-7b, is still highly complex. When non-detects were set to zero, PC1 defined 81.1% of the variability of the dataset. Adding PC2 increased this value to 92.5%. Therefore, nearly all of the variability in the data was captured in the PC1:PC2 plot. The PC1 and PC2 scales (-0.05 to +0.06) were fairly narrow. The grouping of the samples on this plot shows the following:

- The PCDD/F patterns in the background samples were distinct relative to the main stem downstream samples.

- The river sample (02SW-068-SD), five of the tributary samples [95SW-031-SD, 95SW-033-SD (NCDENR), 99SW-054-SD, 98SW-046-SD (NCDENR), and 98SW-046-SD] and seven downstream samples [98SW-043-SD, 98SW-143-SD, 98SW-043-SD (NCDENR) and 98SW-143-SD (NCDENR), 98-SW-051-SD (NCDENR), 98SW-052-SD and 98SW-152-SD] were grouped near the background samples, suggesting similar PCDD/F congener patterns. See Figure 1-2b for these sampling locations.

- The remaining tributary samples and downstream samples have unique patterns relative to the site-specific background samples. This suggests the potential for attenuation processes, analytical differences, or unique sources relative to the Site releases.

- There were three samples that were more divergent from the remaining samples on this plot: 99SW-053-SD, 98SW-152-SD (NCDENR) and 98SW-049-SD (NCDENR). Sample 99SW-053-SD was the most upstream station collected from Trib-S2. Sample 98SW-152-SD (NCDENR) was a field duplicate of sample 98SW-052-SD (NCDENR) and was the most downstream station on Cedar Creek prior to the juncture with the Deep River. Sample 98SW-049-SD (NCDENR) was also a downstream station collected between Trib-N3 and Trib-S2.

Comparison of Cedar Creek Background and Tributary Samples, and Deep River Sample

Figure C-7c presents the PCA plot for the PCDD/Fs in Cedar Creek background, tributary, and Deep River sediments, setting non-detect results to zero. The tributary samples were identified by their locations in this plot. When non-detects were set to zero, PC1 defined 93.2% of the variability of the dataset and adding PC2 increased this to 99.0%. The PC1 and PC2 scales (from -0.05 to +0.08) were fairly narrow, as was observed with the other comparisons made with the Cedar Creek samples. The grouping of the samples on this plot shows the following:

- The PCDD/F congener pattern in the Deep River sample (SW-068-SD) differed from that of the Cedar Creek background samples and tributaries ("A" area on figure).

- The PCDD/F congener patterns in most of the remaining samples fell within an area that was bounded by the background samples ("B" area on figure). Within this oval there were subgroupings of these samples. For example, three of the upstream (background) samples grouped closely together [98SW-039-SD (NCDENR), 98SW-040-SD (NCDENR), and 98SW-041-SD (NCDENR)]. The split samples from these locations collected by SWP where less clustered and were located on a different portion of this plot. This variation is likely due to interlaboratory variation of the PCDD/F results.

- Sample 98SW-050-SD (NCDENR) collected from Trib-S2 was similar to but just outside of the range of results considered background-like. However, it should still be considered comparable to background since this sample had a large number of non-detectable PCDD/F congeners.

C.3.2.3 Combined Drainage Ditch and Cedar Creek Sediments

Due to its proximity to the SWP facility, the PCDD/F patterns of the Drainage Ditch sediments can be representative of the possible loadings to Cedar Creek from the site. Therefore, the PCA was repeated using the combined ditch and creek datasets, with and without creek sample 98SW-044-SD (NCDENR), as discussed previously.

Drainage Ditch and Cedar Creek Tributaries

First, the PCA comparing the PCDD/F patterns in the Drainage Ditch sediments to those in the Cedar Creek tributaries was performed to determine whether or not these patterns were similar as to suggest that the SWP facility represents the only source of PCDD/Fs to these areas. Figure C-8a shows the PCA plot for this comparison. PC1 defined 76.3% of the variability of the dataset and adding PC2 increased this value to 90.1%. The PC1 and PC2 scales (-0.09 to 0.16) were fairly narrow. The groupings of the samples on this plot show the following:

- Four of the tributary samples [99SW-054-SD from Trib-N3, 98SW-046-SD and 98SW-046-SD (NCDENR) from Trib-N1, and 95SW-033-SD (NCDENR) from Trib-S2] closely grouped with the background sample from the Drainage Ditch, indicating no contribution of the downstream portion of the drainage ditch on their PCDD/F congener patterns.

- All of the Drainage Ditch downstream samples fell closely along the PC1 axis. Tributary samples that fell outside of the line [99SW-053-SD and 98SW-050-SD (NCDENR) from Trib-S2 and 95SW-032-SD (NCDENR) and 98SW-048-SD (NCDENR) from Trib-N3] likely do not reflect locations that were impacted by the drainage ditch.

  These four tributary samples appear to be outliers relative to the other evaluated samples. The Dioxin-TEQ concentrations (ng/Kg_{dw}) in these four samples were greater than Cedar Creek upstream samples (Table C-7b) as summarized in the table below[4]:

Item	Area	Dioxin-TEQ_{mammal}	Dioxin-TEQ_{avian}
CC Upstream (Range)	Site Background	0.05 to 0.37	0.17 to 0.94
95SW-032-SD	Trib-N3	584	490
98SW-048-SD (NCDENR)	Trib-N3	28	24
99SW-053-SD	Trib-S2	8.15	10.42
98SW-050-SD (NCDENR)	Trib-S2	18.77	14.50

  This may indicate inputs from sources other than the Drainage Ditch to tributary Trib-S2 and Trib-N3.

Drainage Ditch and Main Stem Cedar Creek

The initial PCA comparison of the Drainage Ditch and Cedar Creek samples included creek sample 98SW-044-SD (NCDENR), which skewed the PCA plot (results not shown). Therefore this sample was excluded for further evaluation of these results. Figure C-8b presents the PCA plot for the PCDD/Fs in the Drainage Ditch and Cedar Creek samples (less the aforementioned sample) setting non-detect results to zero. PC1 defined 89.2% of the variability of the dataset and adding PC2 increased this value to 99.5%.

- The "Group A" circle represented those samples that were "background-like" for this comparison. This included the upstream samples from both the Drainage Ditch (95-SW-013-SL) and Cedar Creek [95SW-025-SD, 98SW-039-SD, 98-039-SD (NCDENR), 98-SW-040-SD, SW-040-SD (NCDENR), SW-041-SD, SW-041-SD (NCDENR), 95-SW-028-SD, 98SW-042-SD, 98SW-042-SD (NCDENR)], the river sample (02SW-068-SD),

[4] The TEQ values shown are based on the zero-DL substitution scheme. The half-DL substitution scheme results were slightly higher and are shown in Table C-7b.

and seven of the downstream samples [98SW-143-SD, 98SW-143-SD (NCDENR), 98SW-043-SD, 98SW-043-SD (NCDENR), 98SW-051-SD (NCDENR), 98SW-052-SD, and 98SW-152-SD] collected from Cedar Creek.

- Review of this figure shows that six of the downstream sediment samples [02SW-066-SD, 02SW-067-SD, 02SW-167-SD, 98SW-049-SD, 98SW-051-SD, and 02SW-064-SD] fell along an axis on an angle (denoted as a dashed green line on this figure) from the PC1 axis that bounds the Drainage Ditch samples. The "Group B" oval incorporates these samples, as well as several other nearby samples on this portion of the plot. This implies that these samples have similar PCDD/F congener patterns to the Drainage Ditch samples.

- The remaining samples did not group with either the background samples or the Drainage Ditch samples. There were two samples that diverged widely from the other samples on this plot: 98SW-152-SD (NCDENR) and 98SW-049-SD (NCDENR). Both of these samples were located near the downstream portion of Cedar Creek prior to the junction with the Deep River (Figure 2-5), and may indicate other potential sources of PCDD/Fs in this area.

C.3.3 Cluster Analysis

The CA analyses of the PCDD/F results were performed for the drainage ditch and Cedar Creek separately and then also combined, as was done with the PCA. The CA figures (dendrograms) show the Sample IDs with the prefix of the sample year and also a suffix that identifies the sampling area.

C.3.3.1 Drainage Ditch Samples

Figure C-9 shows the cluster analysis dendrogram of the PCDD/Fs in the Drainage Ditch setting non-detect results to zero. Based on the CA, the PCDD/F congener pattern was most similar between samples 95SW-015-SL and 95SW-024-SL, which in turn showed better clustering with sample 02SW-057-SD relative to the grouping of samples 02SW-053-SD and 02-SW-054-SD. As was noted in the PCA analysis, sample 02SW-059-SD showed the largest dissimilarity to the other Drainage Ditch samples. Comparable results were achieved when the half-DL substitution scheme was used (figure not shown). The CA results are generally consistent with the PCA results. The variability in the PCDD/F results with respect to the sample locations (Figure 2-4) may reflect different release events from the former settling ponds during facility operations.

C.3.3.2 Cedar Creek Sediments

Figure C-10a shows the cluster analysis dendrogram of the PCDD/Fs in all of the Cedar Creek sediments setting non-detect results to zero. This figure includes sample SW-044-SD (NCDENR) which, as seen with the PCA analysis, had a different congener pattern than was observed in the remaining samples. The dendrogram was complex and shows a number of smaller groupings of the samples. The key results are summarized below:

- The background samples grouped closely together, falling into two main sub-groups approximated by whether the samples were analyzed by SWP or by NCDENR. This may reflect inter-laboratory variation since most of these samples were collected the same year (1998).

- The individual tributary samples did not always group closely with either other samples from the same tributaries or with nearby samples from the main channel of Cedar Creek. This is examined more closely below.

Comparison of Background (Upstream) Samples, Tributary Samples, and River Sample

Figure C-10b shows the cluster analysis dendrogram of the PCDD/Fs in the background (upstream) Cedar Creek sediments, tributary samples, and river sample, setting non-detect results to zero. The dendrogram is complex and shows a number of smaller groupings of the samples. There was no clear grouping of these samples either by tributary or by background location. This did not appear to be related to either sampling year or whether the samples were collected by SWP or NCDENR.

C.4 CORRELATION ANALYSES OF PCDD/FS, PAHS, AND PENTACHLOROPHENOL

Correlation analyses between the PCDD/Fs, PAHs, and pentachlorophenol were also performed using the observed concentration results. The concentration data were more appropriate to use than the normalized ratio data for these comparisons since the objective was to determine whether or not there were trends in concentrations between these chemicals. For example, a positive correlation between the total PAHs and PCDD/F congeners may indicate an association with the original release events. In addition, this information could be used to identify "indicator chemicals" that may assist in the remedial alternatives evaluation. Correlation analyses were performed separately for the drainage ditch and Cedar Creek using the untransformed and log-transformed sediment results.

C.4.1 Drainage Ditch Comparisons

There were seven samples collected from the drainage ditch [SW-013-SL (NCDENR), SW-015-SL (NCDENR), SW-024-SL (NCDENR), SW-053-SD (2002), SW-054-SD (2002), SW-057-SD, and SW-059-SD] that had both PCDD/F and PAH results available in the database. Table C-10a summarizes the results of the comparisons between the total PAH and total PCDD/F results. Review of this table shows that there were no significant correlations between the total PAH and total PCDD/F results using either the zero- or half-DL substitution schemes and with or without log transformation for the samples collected from the Drainage Ditch.

A comparison was also made between the individual PCDD/F congeners and total PAHs in the Drainage Ditch sediments. Only the samples that had positive total PAH results were evaluated in this comparison. Table C-10b summarizes the results of these comparisons using the half-DL substitution scheme and shows that there were no significant correlations (r-values less than one, p-values greater than 0.05) for all log-transformed comparisons and all untransformed comparisons. Table C-10c summarizes the results using the Zero-DL substitution scheme. Review of this table also shows that there were no significant correlations between the individual PCDD/F results and the total PAHs, with or without log-transformation.

PCDD/F and pentachlorophenol results were available for five of the sediment samples collected from the Drainage Ditch. Pentachlorophenol was detected in only two of these samples (samples SW-024-SL and SW-059-SD)[5]. Therefore, a correlation analysis between these two parameters was not performed due to the limited positive results in this dataset.

C.4.2 Cedar Creek Comparisons

There were 16 results from samples collected from Cedar Creek (or tributaries) that had both PCDD/F and positive PAH results available in the database. Table C-10a also summarizes the results of the comparisons between the total PAH and total PCDD/F results for the Cedar Creek sediment samples. Review of this table shows that there were no significant correlations between the total PAH and total PCDD/F results using either the zero- or half-DL substitution schemes when the data were not log-transformed. When log-transformed, only the zero-DL substitution scheme resulted in a significant positive correlation between total PAHs and total PCDD/Fs ($r = 0.761$; $p = 0.0006$); none of the remaining untransformed or log-transformed results or substitution schemes yielded significant correlations (Table C-10a). Despite the significant correlation using the log-transformation and zero-DL substitution schemes, there was a large amount of variability in the data, with 58% of the variability captured by the regression line (Figure C-11). Furthermore, this correlation was based on a subset of the PAH results

[5] The pentachlorophenol concentrations in samples 95SW-024-SL and 02SW-059-SD were 0.25 and 0.76 mg/Kg_{dw}, respectively.

(those with positive PAHs). Since there were a number of samples where PCDD/Fs were detected but PAHs were not detected the regression would not be a suitable predictive tool for estimating total PCDD/Fs.

A comparison was also made between the individual PCDD/F congeners and total PAHs in the Cedar Creek sediments. Table C-11a summarizes the half-DL substitution scheme results of these comparisons and shows that there were no significant correlations (all r-values less than one and all p-values greater than 0.05) for all log-transformed comparisons and all untransformed comparisons. Table C-11b summarizes the zero-DL substitution scheme for the same 16 samples. Review of this table shows that when the untransformed results were compared there were no significant correlations. However, when the log-transformed results were used, 10 of the 17 PCDD/F congeners showed positive correlations with the log of the total PAH concentrations. Figure C-12 is an example of one of the regressions. In this case, it compared the log-transformed 1234678-HpCDD results to the total PAH results. As noted with the comparisons shown in Figure C-11, although the correlation was significant the regression represented about 51% of the variability in the datasets.

In summary, there was no significant correlation between the untransformed and log-transformed total PAH and total PCDD/F concentrations, or between the untransformed and log-transformed total PAH and the individual PCDD/F congeners, in sediments collected from the Drainage Ditch. For Cedar Creek, both the untransformed data, and the log-transformed Half-DL substitution scheme showed that there were no correlations between these parameters in the Cedar Creek samples. When the Cedar Creek data were log-transformed the Zero-DL substitution scheme for the total PCDD/F results, and results for some of the individual congeners, correlated with Total PAHs. Although the correlation between the log-transformed total PCDD/Fs and total PAHs was statistically significant using the Zero-DL substitution scheme, the regression represented only a portion (e.g., 58% for the total PCDD/Fs and total PAHs) of the variability of the datasets. In addition, since a subset of the results (i.e., those where both PCDD/Fs and PAHs were detected) was used, these regressions would not be a suitable tool for predicting PCDD/F concentrations based on PAH concentrations. Finally, due to the limited detection frequency of pentachlorophenol in the sediment samples, a correlation analysis was not performed using this chemical.

C.5 FINGERPRINTING UNCERTAINTY EVALUATION

This section discusses the uncertainties related to the fingerprinting assessment, focusing on the following:

- Combining multiple datasets;
- Non-detect substitution methods; and
- Use of alternate summary metrics.

These are briefly discussed below.

C.5.1 Combining Multiple Datasets

Multiple datasets representing the samples collected from 1983 through 2003 were combined for this evaluation. Although this increases the number of samples for statistical analysis, using data spanning 20 years often introduces large variability in the analytical results from the same locations, particularly for the PAH evaluations, since PAH concentrations can be expected to degrade significantly over this time period under most environmental conditions. For example, the sampling location near the juncture of the Drainage Ditch and Cedar Creek had the largest total PAH concentration in the sample collected in 1995 (1,050 mg/Kg in SW-029-SD) but two follow-up samples collected from this same location in 1998 (SW-043-SD, SW-043-SD (NCDENR) and their corresponding duplicates) showed no detectable PAHs. This variability complicates both the spatial interpretation of the results and chemical fingerprinting, which is why the PAH evaluation focused on comparisons of isomer ratios. Less variability was observed with the PCDD/F results, which is consistent with their more recalcitrant nature compared to the PAHs.

C.5.2 Non-Detect Substitution Methods

The PCA and CA assessments used two different non-detect substitution schemes – replacing the non-detect results with either zeros or with half the reported detection limits. These two approaches were used since they are consistent with the summary methods used in the SLERA (AMEC, 2007). As was seen in the fingerprinting analysis, the different substitution schemes did not significantly change most of the PCA or CA results. However, the different substitution schemes did yield some differences in the correlation analyses, specifically between total PAHs and some of the PCDD/F congeners using the half-DL substitution scheme. Alternate non-detect substitution schemes are available, such as those included as part of the UNCENSOR program (Newman and Dixon, 1990) but the evaluation of these schemes was not examined further for this fingerprinting assessment.

C.5.3 Use of Alternate Summary Metrics

The PCDD/F data were normalized to the total PCDD/F concentrations (respectively) for the PCA and CA evaluation. This was done in order to best represent the relative concentrations of the constituent congeners. Use of the toxicity metric –PCDD/F TEQs – was also considered for these evaluations, but were not determined to be relevant. TEQs are derived from the toxicity equivalence factors (TEFs). As their name implies, TEFs are toxicity based and do not reflect the potential environmental attenuation pathways or chemical interactions that the constituent chemicals may undergo upon release to the environment. Potential toxicity is not the same as

the chemical's environmental fate. Therefore, when the focus is on fingerprinting the chemical distribution in the environment, it is more relevant to assess the normalized ratios based on the total chemical concentrations.

C.6 SYNOPSIS OF FINGERPRINTING EVALUATION

The following is a synopsis of the chemical fingerprinting evaluation of PCDD/Fs, PAHs and pentachlorophenol in sediments collected from the Drainage Ditch and Cedar Creek.

1. Published PAH patterns in creosote and PCDD/Fs in pentachlorophenol were used for the initial comparisons to the sample results. However, since these materials had undergone the heating and high pressure process used for treating the wood, as well as possible attenuation processes in the settling ponds, the "spent" chemical patterns may differ from their unused forms. Therefore, the PAHs and PCDD/Fs in the Drainage Ditch sediments were evaluated as possible signatures relating to the spent chemical forms derived from facility operations that may have been transported to Cedar Creek sediments.

2. The evaluation of the field QC samples, which included comparisons of split samples, field duplicates, and samples collected from the same locations but on different dates, was performed prior to the fingerprinting assessment. There was a significant decline in total PAH concentrations with time for the samples collected from the same location. Since all of the results were used, the fingerprinting assessment may not yield currently representative conditions for the site. This may have been due to sample homogeneity issues, biodegradation of PAHs with time, or inter-laboratory variation. The variability in the PAH results complicate the chemical fingerprinting assessment to the point that no conclusions could be drawn using PCA and CA techniques. An alternate fingerprinting evaluation technique based on the comparison of select individual PAH isomer ratios were utilized to evaluate potential sources for the PAHs.

   There were less temporal changes in the PCDD/F results, although variability in the results between the split samples was observed in some cases that can impact the chemical fingerprinting. The split samples were evaluated independently for the PCA and CA analyses.

3. One sediment sample [SW-015-SL (NCDENR)] collected from the Drainage Ditch showed an approximate match to the creosote PAH pattern based on comparison of PAH isomer ratios. This sample is located near the railroad tracks at the southeastern corner of the Drainage Ditch which represented the first area where runoff would leave the former on-site settling ponds. This sample also had the third highest relative total PAH concentration (362 mg/Kg) of the Drainage Ditch samples. The remaining samples

had different PAH patterns, which also differed from the upstream (background) sample. This may be due to biodegradation of the PAHs with time.

4. One main stem Cedar Creek sediment sample [95SW-129-SD (NCDENR)] from the juncture of the ditch and creek and one sediment sample [98SW-044-SD (NCDENR)] from the property boundary exceeded the RSV and had similar PAH patterns to the two creosote standards. One of these samples [95SW-029-SD (NCDENR)] had the highest total PAH concentration of the collected data (1,050 mg/Kg). Two downstream off-site main stem Cedar Creek sediment samples (02SW-061-SD and 02SW-065-SD) also had similar PAH patterns to the two creosote standards, but both contained only trace levels of PAHs that did not exceed the RSV.

   None of the sediment samples collected from the Cedar Creek tributaries exhibited a creosote-like PAH pattern based on PAH isomer ratio comparisons.

5. PAHs were intermittently detected in the remaining Cedar Creek samples, both spatially and temporally. When detected, the PAH patterns reflected a combination of biodegraded PAHs that may have been originally released from the site, or contributions from other sources at these locations.

   The plot of the ratios of Fluoran/Pyr versus Anth/Phen suggest clustering of some of the downstream sediments samples within Cedar Creek with background (upstream) sediment samples. Although the number of comparisons was somewhat limited, it suggests that a number of the downstream sediments were "background-like" and have not been impacted by historical runoff of PAHs from the SWP facility.

6. The comparison of the PCDD/F congener patterns in the two PCP standards to those from the Drainage Ditch sediment samples showed that the sediments had a different congener pattern relative to that reported for PCP. Although this would suggest that PCP was not the source of the PCDD/Fs in the Drainage Ditch sediments, the fact that the source patterns for the PCP used in this assessment are based on unused PCP should be considered and evaluated. The PCP that was intermittently released from the SWP facility represented waste PCP from the settling basins that had undergone heating and the high pressure process used for treating the wood. Therefore, even if the presence of PCDD/Fs in sediments is related to site activities, it is not unexpected that the PCDD/F patterns in the sediments would differ from that present in unused PCP. Since data representing potential source patterns for processed PCP is unavailable the patterns in the Drainage Ditch sediments, which are most proximal to the original site releases, were used to determine whether downstream Cedar Creek sediments were impacted by site releases.

7. The PCDD/F pattern in the upstream Drainage Ditch sediment had a different pattern than observed in the downstream Drainage Ditch sediment samples. The latter grouped together, except for sample SW-059-SD collected in 2002. This sample was collected near the former settling ponds and had the highest Dioxin-TEQ concentrations from the Drainage Ditch. The normalized ratios for 1,2,3,4,6,7,8-HpCDD and (to a lesser extent) OCDF were the dominant features in this sample, while lower ratios for these congeners were calculated for the other sediment samples.

8. The PCA and CA evaluation of the PCDD/F congener results from the Drainage Ditch showed variations in the sample groupings that were not directly related to their spatial locations. The variability in these results may reflect different release events from the former settling ponds during facility operations. This is consistent with the variability in the Dioxin-TEQ concentration gradient along the Drainage Ditch.

9. Due to the large dataset, the PCDD/F results for the Cedar Creek samples were evaluated several different ways. The initial PCA plot was distorted due to the apparent unique congener pattern in downstream sample SW-044-SD (NCDENR), relative to the other samples (including background and tributaries). This sample had the second highest TEQ concentrations (e.g., Dioxin-TEQ_{mammal} of 547 ng/Kg_{dw}) of the samples collected from within Cedar Creek, and was located downstream of the juncture of the Drainage Ditch and Cedar Creek at the site property boundary. As with the Drainage Ditch sample that had a unique PCDD/F pattern relative to the other sediments, the normalized ratios for 1,2,3,4,6,7,8-HpCDD and OCDF were the dominant features in sample SW-044-SD (NCDENR). To facilitate the evaluation of the Cedar Creek data, sample SW-044-SD (NCDENR) was removed and the PCA was repeated.

10. The PCDD/F patterns in the Cedar Creek background samples were similar to the Deep River samples and several of the tributary samples, but these were distinct from the main stem downstream samples.

11. Due to its proximity to the SWP facility, the Drainage Ditch can represent the PCDD/F pattern that would be representative of the possible loadings to Cedar Creek from the site. First, the PCDD/F patterns in the Drainage Ditch sediments were compared to those in the Cedar Creek tributaries. Four of the tributary samples [99SW-054-SD from Trib-N3, SW-046-SD and SW-046-SD (NCDENR) from Trib-N1, and SW-033-SD (NCDENR) from Trib-S2] closely grouped with the background sample from the Drainage Ditch, indicating no contribution of the downstream portion of the drainage ditch on their PCDD/F congener patterns. Two tributary samples [99SW-053-SD and SW-050-SD (NCDENR)], both from Trib-S2, appear to be outliers relative to the other evaluated samples. This suggests inputs from sources other than the Drainage Ditch to tributary Trib-S2.

12. A comparison of the PCDD/F patterns in the Drainage Ditch samples and main stem Cedar Creek samples was also performed. The upstream samples from the Drainage Ditch and Cedar Creek, the river sample, and two of the downstream samples [98SW-143-SD (NCDENR) and 98SW-043-SD; "Group A" samples in Figure C-12b] collected from Cedar Creek grouped closely together suggesting no input to these sample locations from the site. Six of the downstream sediment samples [SW-066-SD, SW-067-SD, SW-167-SD, SW-049-SD, SW-051-SD, and SW-064-SD] plotted within the patterns observed for the downstream Drainage Ditch samples. The remaining samples did not group with either the background samples or the Drainage Ditch samples. Two samples that diverged widely from the other samples on this plot [SW-152-SD (NCDENR) and 98SW-049-SD (NCDENR)]. Both of these samples were located near the downstream portion of Cedar Creek prior to the junction with the Deep River, and may indicate other potential sources of PCDD/Fs in this area.

    The parallel analyses using the same datasets and sample comparisons using Cluster Analyses confirmed the results from the PCA analysis.

13. There was no correlation between the sediment pentachlorophenol and PCDD/F congener concentrations in the Drainage Ditch or in Cedar Creek. This may be due to the degradation potential of pentachlorophenol compared to the more recalcitrant PCDD/F congeners. Similarly, there was no correlation between the sediment individual PAH and PCDD/F congener concentrations in the Drainage Ditch or in Cedar Creek. This may be due to the degradation potential of PAHs compared to the more recalcitrant PCDD/F congeners.

14. There was no significant correlation between the untransformed and log-transformed total PAH and total PCDD/F concentrations, or between the untransformed and log-transformed total PAH and the individual PCDD/F congeners, in sediments collected from the Drainage Ditch.

15. There was no significant correlation between the untransformed and log-transformed total PAH and total PCDD/F concentrations observed with the Cedar Creek samples, except when using the log-transformed and Zero-DL substitution scheme. Although the correlation between the log-transformed total PCDD/Fs and total PAHs was statistically significant, the regression represented only a portion (e.g., 58% for the total PCDD/Fs and total PAHs) of the variability of the datasets. In addition, since a subset of the results (i.e., those were both PCDD/Fs and PAHs were detected) was used, these regressions would not be a suitable tool for predicted PCDD/F concentrations based on PAH concentrations.

16. Since there was no correlation between the sediment pentachlorophenol, PAH, or PCDD/F congener concentrations in the Drainage Ditch or in Cedar Creek, neither the pentachlorophenol nor the PAH concentrations in the sediments can be used as indicators of the PCDD/F concentrations as part of any future remedial measure development.

The primary objective of the fingerprinting assessment was to determine whether the PAH and PCDD/F congener patterns in the Drainage Ditch and Cedar Creek samples are related to the materials historically used at the SWP facility and to determine whether the SWP facility represents the only source of these chemicals to these areas. The PAH results were variable, both in time and space, which complicated the interpretation of these results. Only a small number of the sediment samples located along the Drainage Ditch (SW-014-SL and SW-015-SL) and one sample at the juncture with Cedar Creek [SW-129-SD (NCDENR)] had a PAH fingerprint similar to that for creosote based on the comparison of the isomer ratios of select PAHs (Table C-5d). Biodegraded PAHs from the site and other potential sources, such as runoff from vehicles (on- and off-road) may be contributing to the sporadic detections of PAHs found within the Cedar Creek main channel and its associated tributaries downgradient of the site. The PCDD/F results showed less variability with time but the chemical fingerprinting was affected by inter-laboratory variation of the samples split between SWP and NCDENR. The PCDD/F patterns in the Cedar Creek sediments did not match those reported for unused PCP, but there appeared to be some similarity in the PCDD/F patterns of the downstream creek sediments and the downstream ditch sediments. The most significant of these areas is near the juncture of the ditch and creek. Several of the downstream creek samples [SW-066-SD, SW-067-SD, SW-167-SD, SW-049-SD, SW-051-SD, and SW-064-SD] also have similar fingerprints to those in the ditch sediments, although at lower TEQ concentrations (Tables C-9a and C-9b). Although PCDD/F congeners were detected in some of the creek tributary samples, the patterns for most of these differ from that observed in the ditch suggesting potential other sources in these areas.

C.7 REFERENCES

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. *Toxicological Profile For Wood Creosote, Coal Tar Creosote, Coal Tar, Coal Tar Pitch, and Coal Tar Pitch Volatiles.* U.S. Department of Health and Human Services. September. 354p.
[URL: http://www.atsdr.cdc.gov/toxprofiles/tp85.pdf]

Aitchison, J. 1986. The Statistical Analysis of Compositional Data. Chapman & Hall, New York. 416p.

AMEC. 2007. *Screening-Level Ecological Risk Assessment of the Drainage Ditch and Cedar Creek Near the Southern Wood Piedmont Facility in Gulf, North Carolina – Revision 1.* 15 June.

Burns, W.A., P.J. Mankiewicz, A.E. Bence, D.S. Page, and K.R. Parker. 1997. A principal-component and least-squares method for allocating polycyclic aromatic hydrocarbons to multiple sources. *Environmental Toxicology and Chemistry.* 16(6): 1119-1131.

Cao, Y., D.D. Williams and N.E. Williams. 1999. Data transformation and standardization in the multivariate analysis of river water quality. *Ecological Applications.* 9(2): 669-677.

Costa, H.J. and T.C. Sauer Jr. 2005. Forensic Approaches and Considerations in Identifying PAH Background. *Environmental Forensics.* 6(1): 9-16

Cull, M.R., A.J. Dobbs, M. Goudot, and N. Schultz. 1984. Polychlorodibenzo-p-dioxins and dibenzofurans in technical pentachlorophenol - Results of a collaborative analytical exercise. *Chemosphere.* 13(10): 1157-1165.

Ferrario, J.B., C.J. Byrne, and D.H. Cleverly. 2000. 2,3,7,8-Dibenzo-p-dioxins in mined clay products from the United States: Evidence of possible natural origin. *Environmental Science and Technology.* 34: 4524-4532.

Hagenmaier, H. and H. Brunner. 1987. Isomerspecific analysis of pentachlorophenol and sodium pentachlorphenate for 2,3,7,8-substituted PCDD and PCDF at sub-ppb levels. *Chemosphere.* 16(8-9): 1759-1764.

Hagenmaier, H., C. Lindig, and J. She. 1994. Correlation of environmental occurrence of polychlorinated dibenzo-p-dioxins and dibenzofurans with possible sources. *Chemosphere.* 29(9-11): 2163-2174.

Kovach Computing Services. 2001. MultiVariate Statistical Package (MVSP), version 3.12d.

Kucera, M. and B.A. Malmgren. 1998. Log-ratio transformation of compositional data – a resolution of the constant sum constraint. *Marine Micropaleontology.* 34: 117-120.

Lima, A.L.C., J.W. Farrington, and C.M Reddy. 2005. Combustion-derived polycyclic aromatic hydrocarbons in the environment – A review. *Environmental Forensics.* 6: 109-131.

Minitab, Inc. 1999. Minitab Release 12.23. [URL: http://www.minitab.com]

Murphy, B.L. and J. Brown. 2005. Environmental forensics aspects of PAHs from wood treatment with creosote compounds. *Environmental Forensics.* 6: 151-159.

Newman, M.C. and P.M. Dixon. 1990. UNCENSOR: A program to estimate means and standard deviations for data sets with below detection limit observations. *American Environmental Laboratory*. 4: 26-30.
[http://www.vims.edu/env/research/software/vims_software.html]

NIST, 2004. NIST/SEMATECH e-Handbook of Statistical Methods.
[URL: http://www.itl.nist.gov/div898/handbook/]

North Carolina Department of Environment and Natural Resources (NCDENR). 2007. Evaluation of the SLERA, Southern Wood Piedmont, Gulf, Chatham County. Letter from Keith Snavely (NCDENR) to William Arrants (SWP), dated 28 March 2007.

Oros, D.R. and J.R.M Ross. 2004. Polycyclic aromatic hydrocarbons in San Francisco estuary sediments. *Marine Chemistry*. 86: 169-184.

Stout, S.A., J.M Leather, and W.E. Corl III. 2003. *A User's Guide for Determining the Sources of Contaminants in Sediments A Demonstration Study: Sources of PAH in Sediments in the Vicinity of the Norfolk Naval Shipyard, Elizabeth River, Norfolk, Virginia*. Technical Report No. 1907. September. 97p.

Stout, S.A., A.D. Uhler and S.D. Emsbo-Mattingly. 2004. Comparative evaluation of background anthropogenic hydrocarbons in surficial sediments from nine urban waterways. *Environmental Science and Technology*. 38(11): 2987-2994.

USEPA. 1992. *Contaminants and Remedial Options at Wood Preserving Sites*. Office of Research and Development. EPA-600/R-92/182. October.
[http://www.p2pays.org/ref/19/18352.pdf]

World Health Organization (WHO). 2004. *Coal Tar Creosote*. Concise International Chemical Assessment Document 62.
[http://www.who.int/ipcs/publications/cicad/en/CICAD62.pdf]

Yunker, M.B., R.W. Macdonald, R. Vingarzan, R.H. Mitchell, D. Goyette, S. Sylvestre. 2002. PAHs in the Fraser River basin: a critical appraisal of PAH ratios as indicators of PAH source and composition. *Organic Geochemistry*. 33: 489-515.

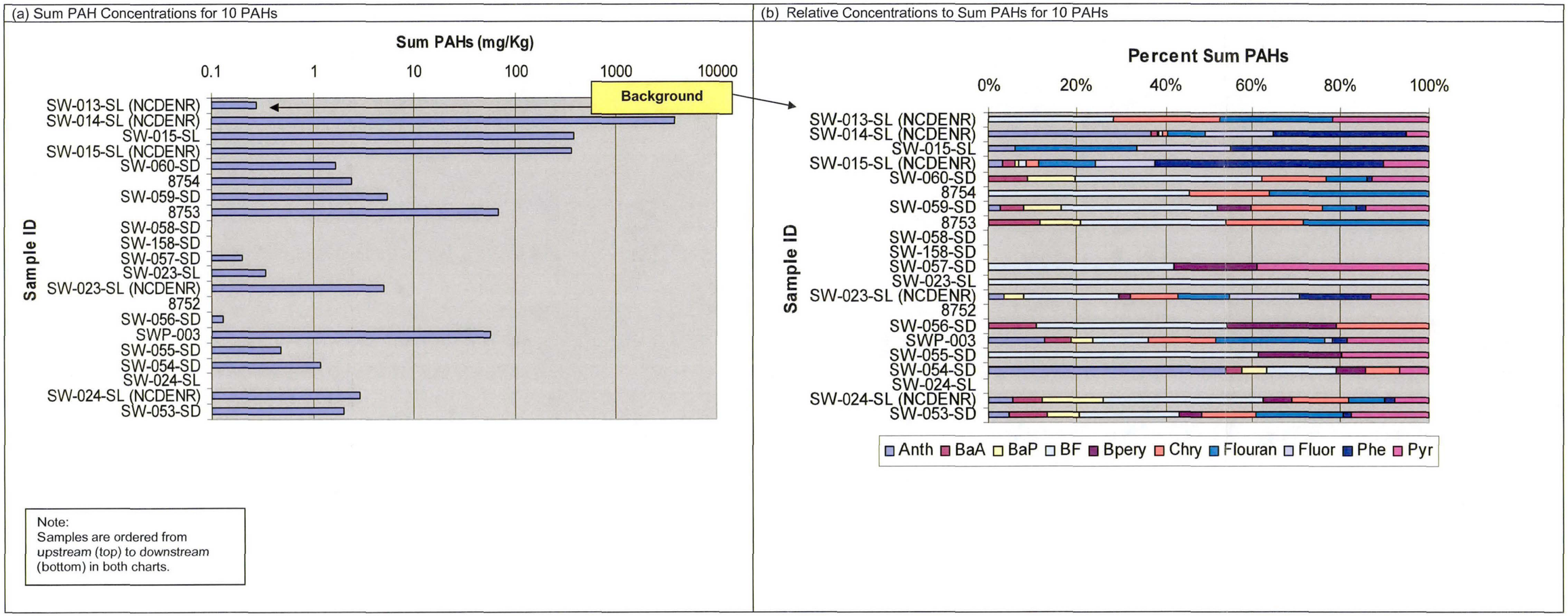

Figure C-1. Comparison of Relative Concentrations for a Subset of PAHs in the Drainage Ditch Sediments with Positive PAH Results

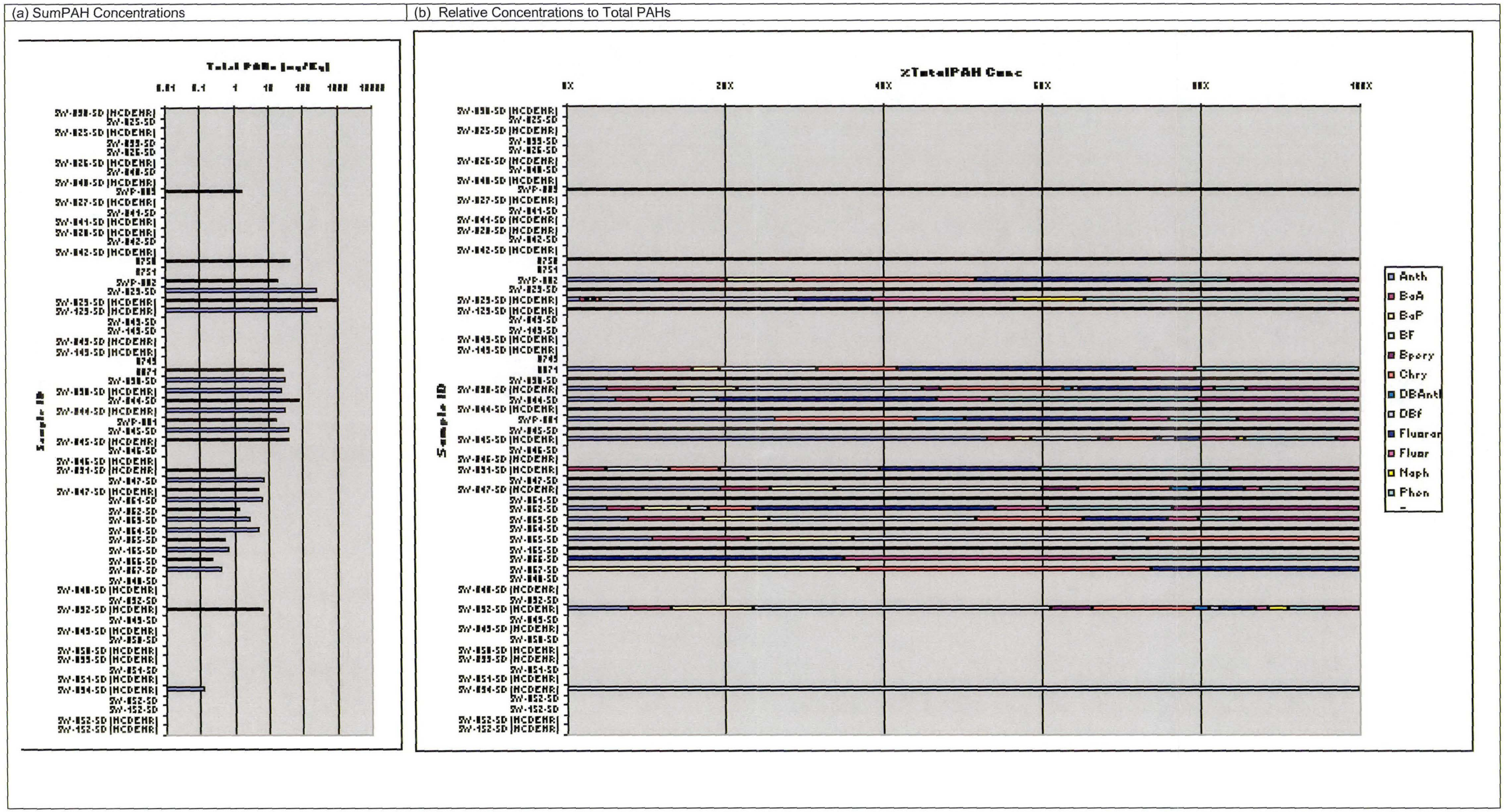

Figure C-2. Comparison of Relative Concentrations of Subset of PAHs in Cedar Creek Sediments.

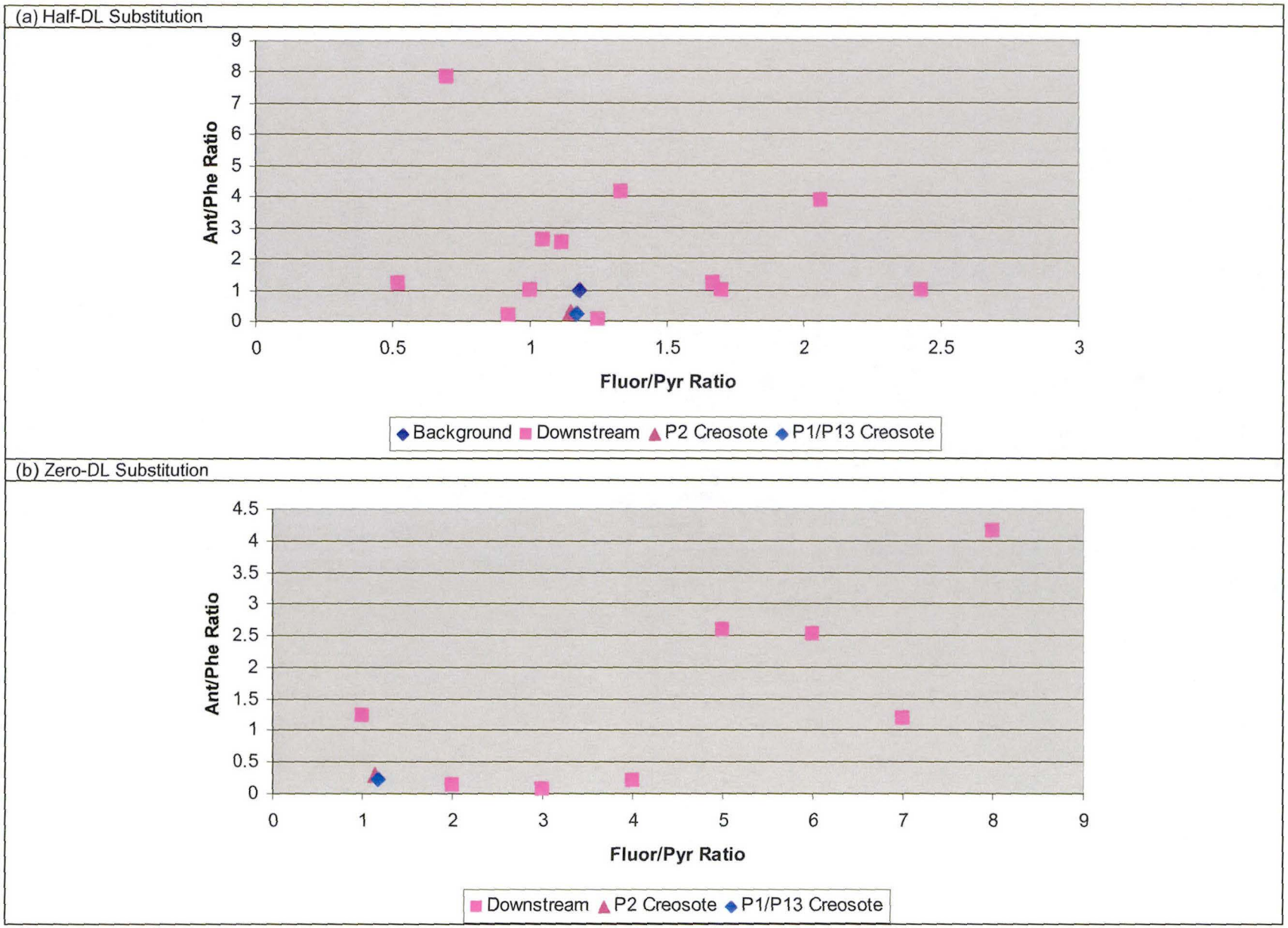

Figure C-3a. Comparison of the Fluoranthene/Pyrene Versus Anthracene/Phenanthrene PAH Ratios in Sediments from the Drainage Ditch using a Zero-DL Substitution Scheme

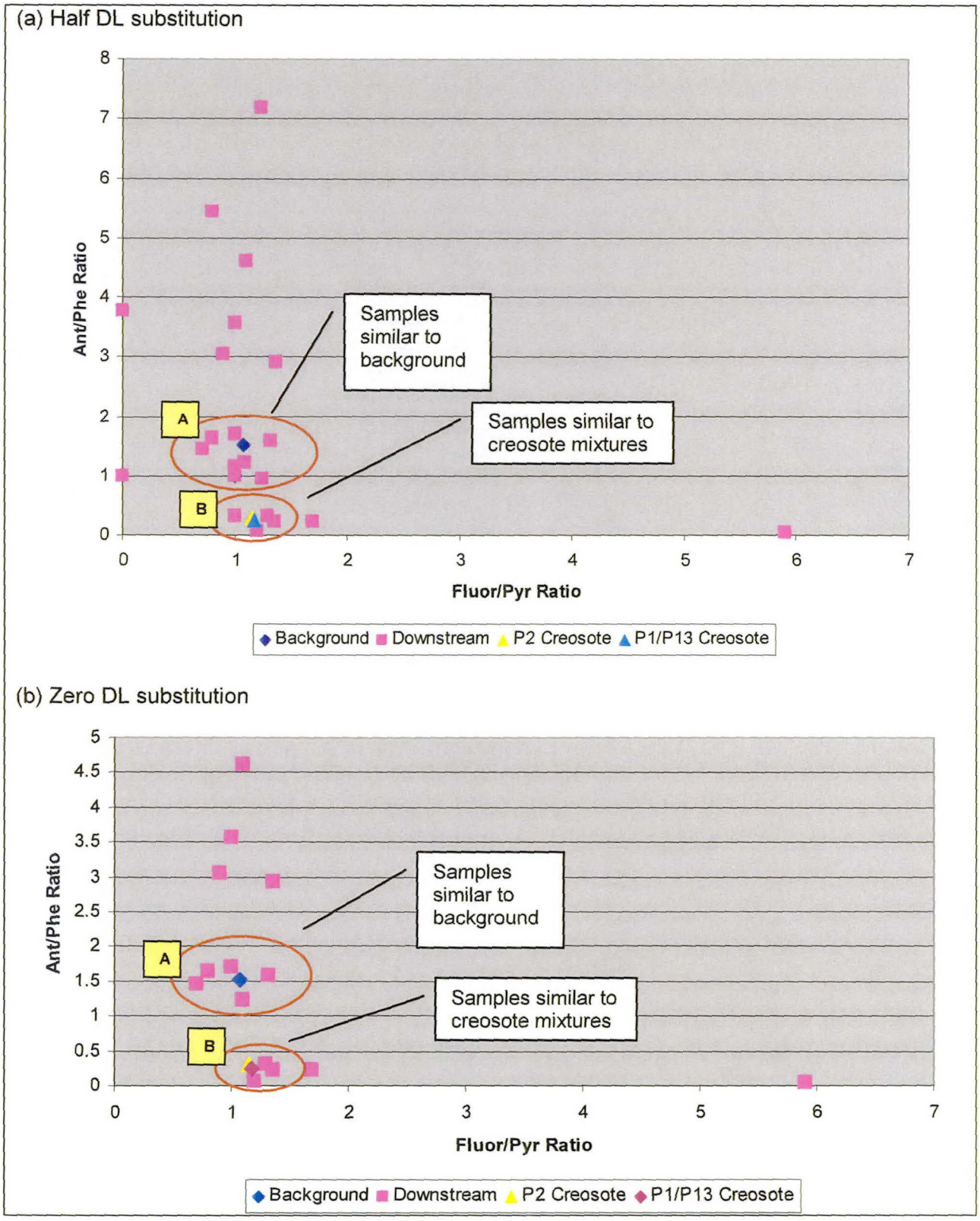

Figure C-3b. Comparison of the Fluoranthene/Pyrene Versus Anthracene/Phenanthrene PAH Ratios in Sediments from Cedar Creek

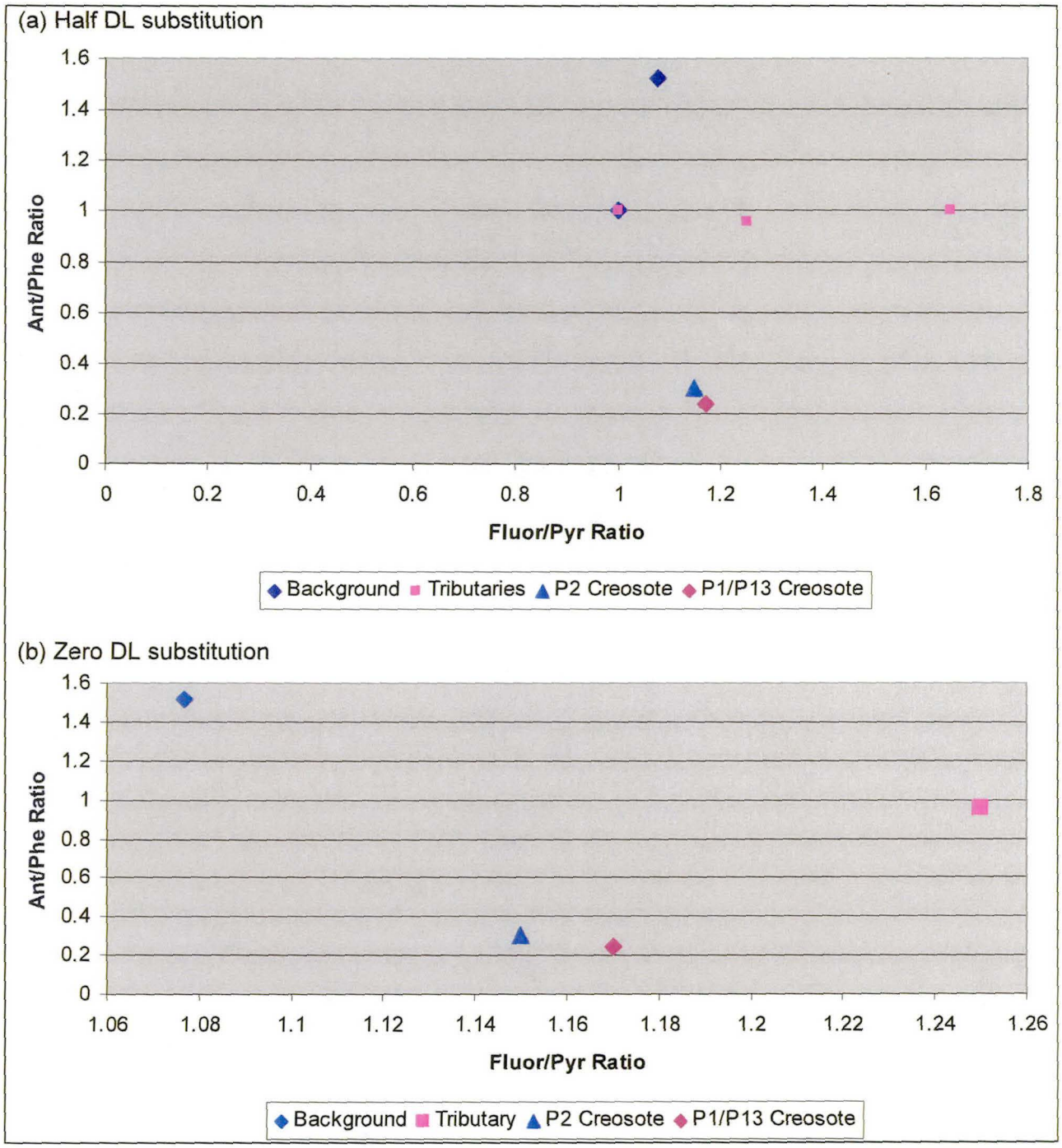

Figure C-3c. Comparison of the Fluoranthene/Pyrene Versus Anthracene/Phenanthrene PAH Ratios in Sediments from Cedar Creek Tributaries

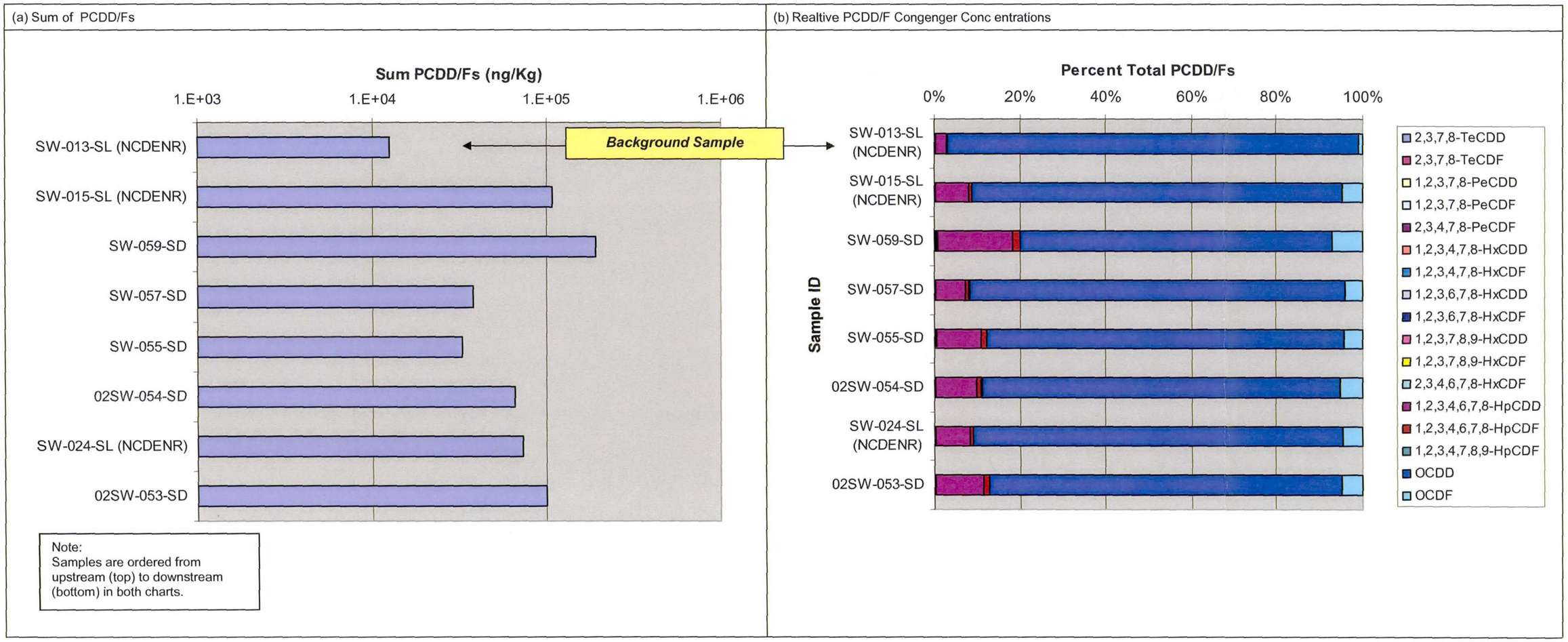

Figure C-4. Relative Concentration Ratios of PCDD/F Congeners in Drainage Ditch Sediments

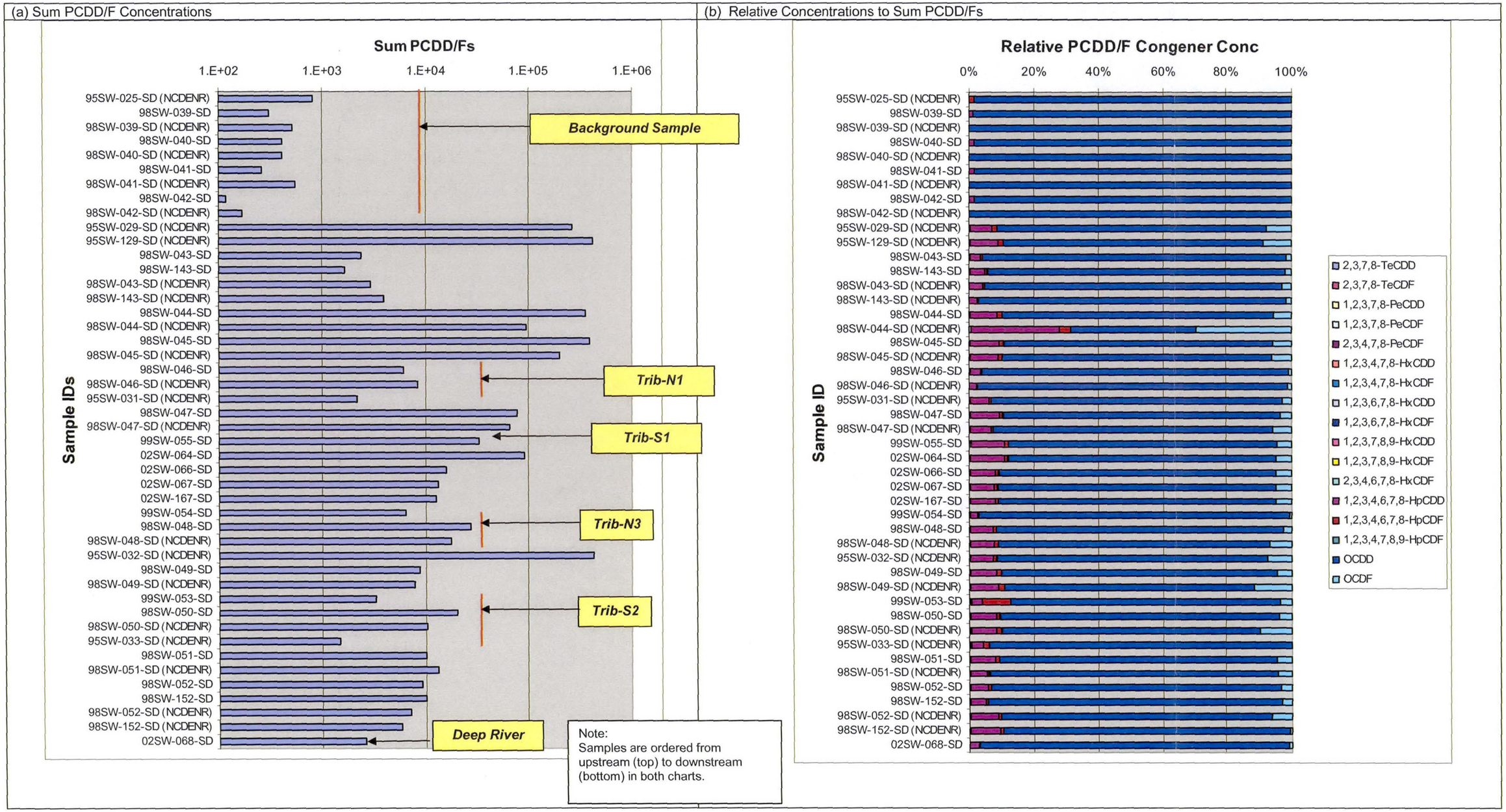

Figure C-5. Comparison of Relative Concentrations of PCDD/F Congeners in Cedar Creek Sediments.

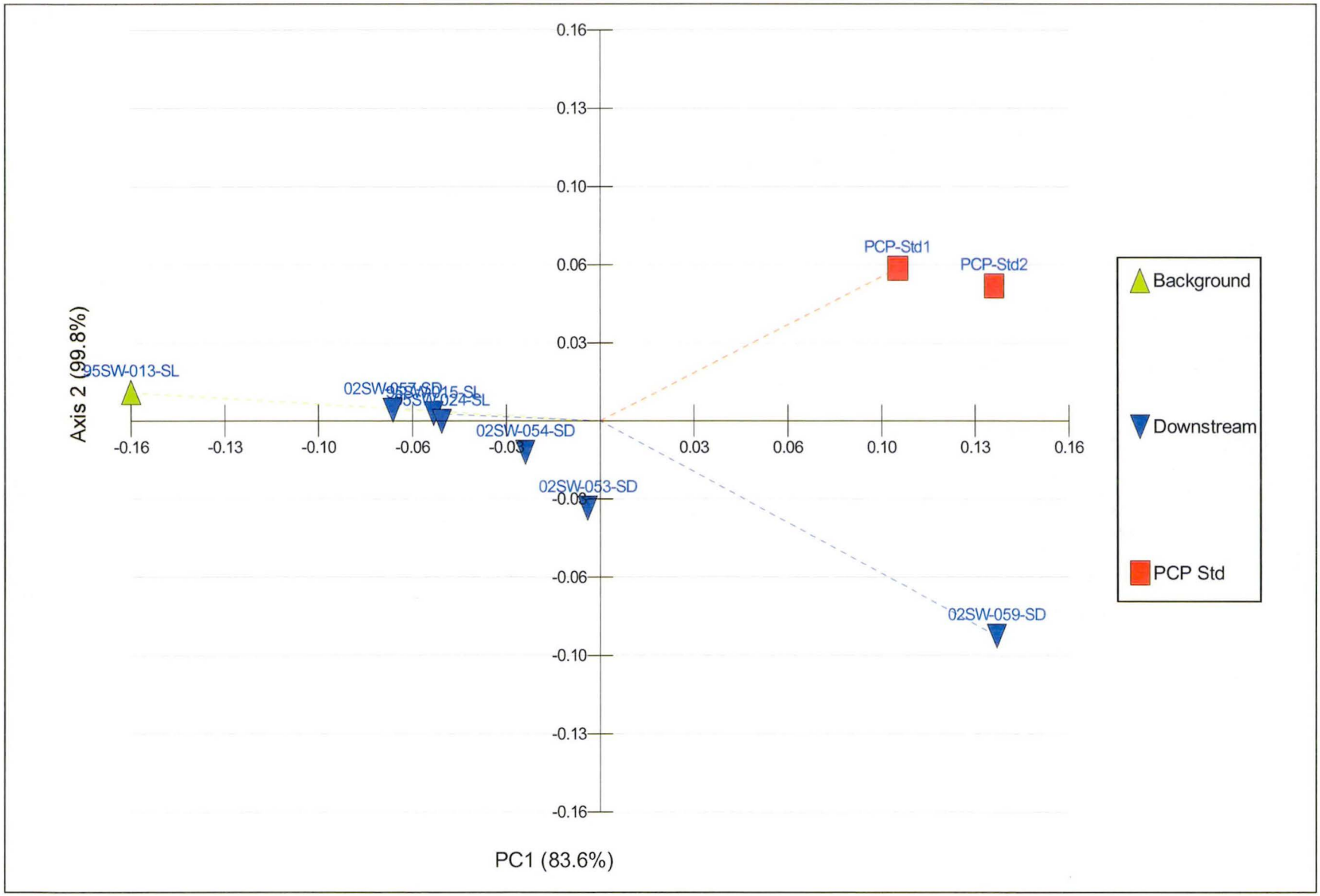

Figure C-6a. PCA Plot of PCDD/F Congeners in Sediments Collected from the Drainage Ditch and Comparison to PCP Standards, Setting Non-Detects to Zero Values.

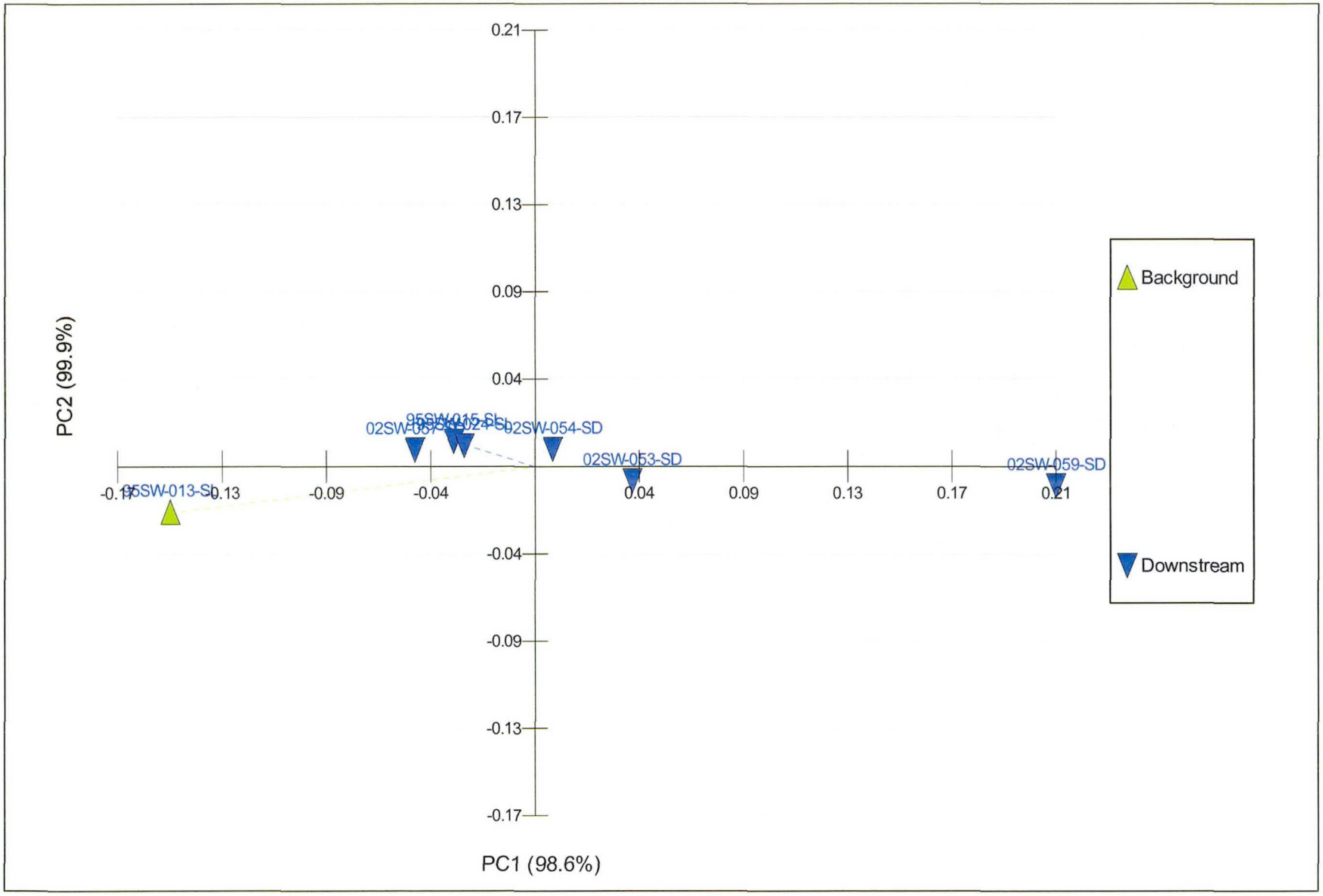

Figure C-6b. PCA Plot of PCDD/F Congeners in Sediments Collected from the Drainage Ditch Setting Non-Detects to Zero Values.

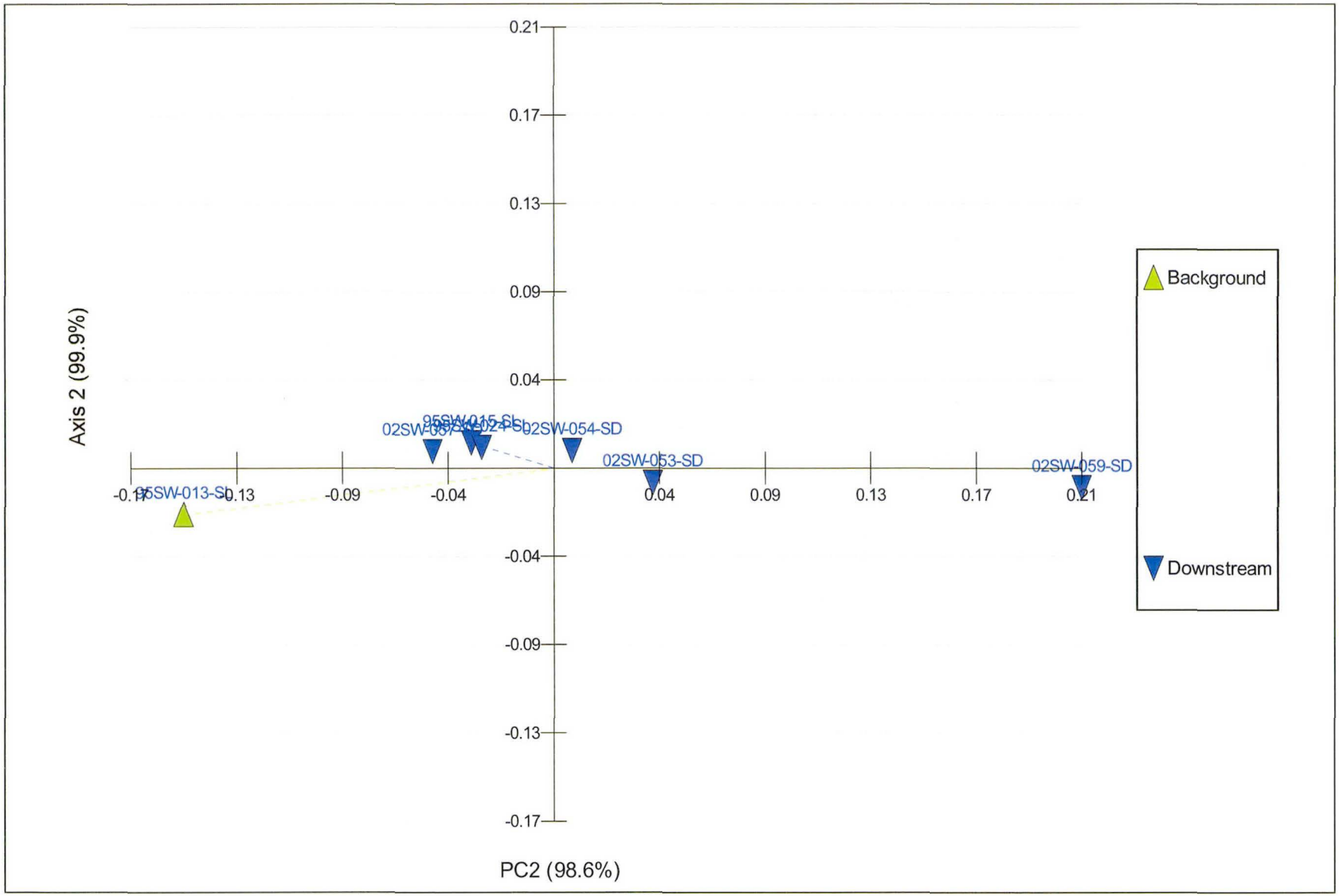

Figure C-6c. PCA Plot of PCDD/F Congeners in Sediments Collected from the Drainage Ditch Setting Non-Detects to Half DLs.

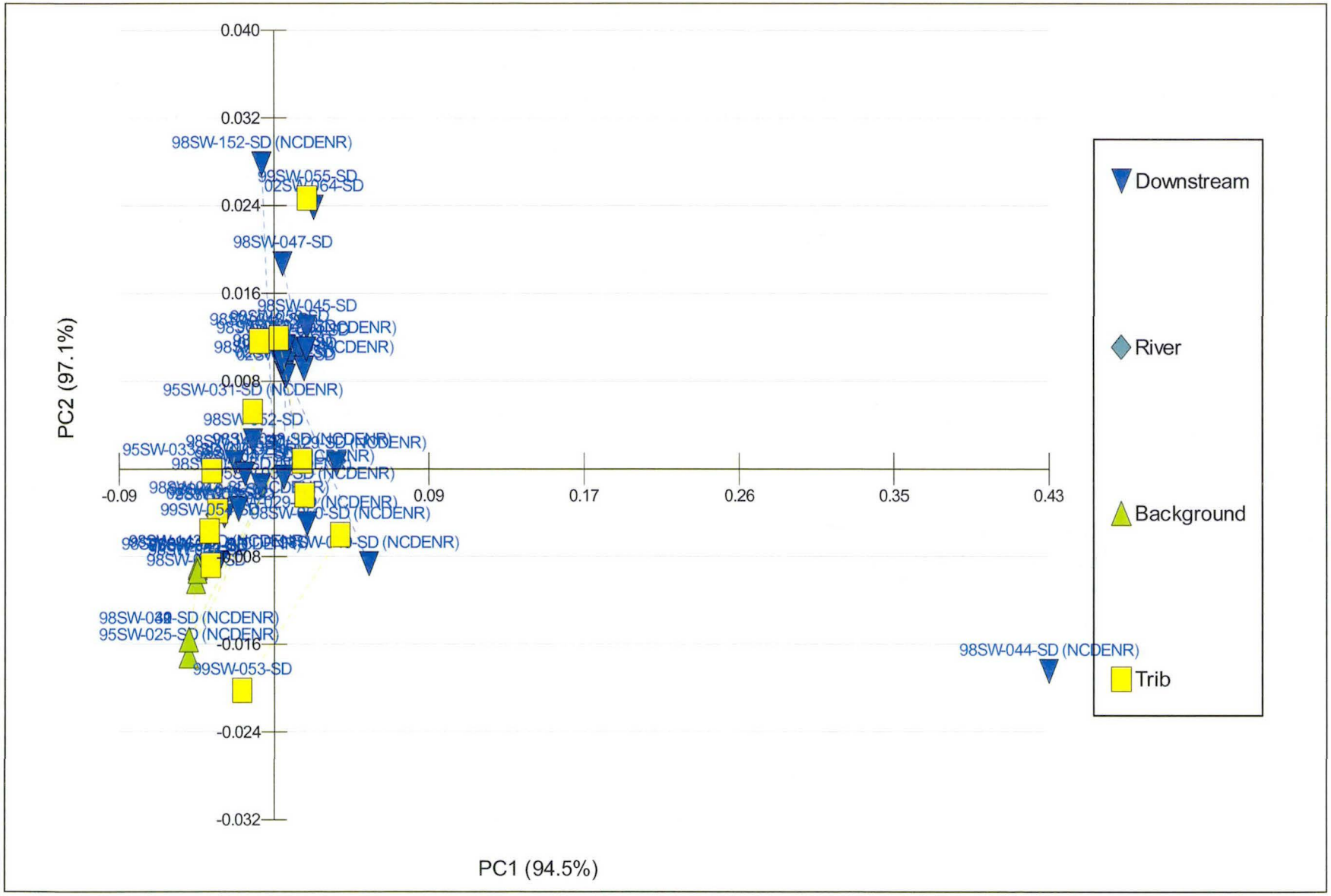

Figure C-7a. PCA Plot of PCDD/F Congeners in Sediments Collected from Cedar Creek Setting Non-Detects to Zero Values.

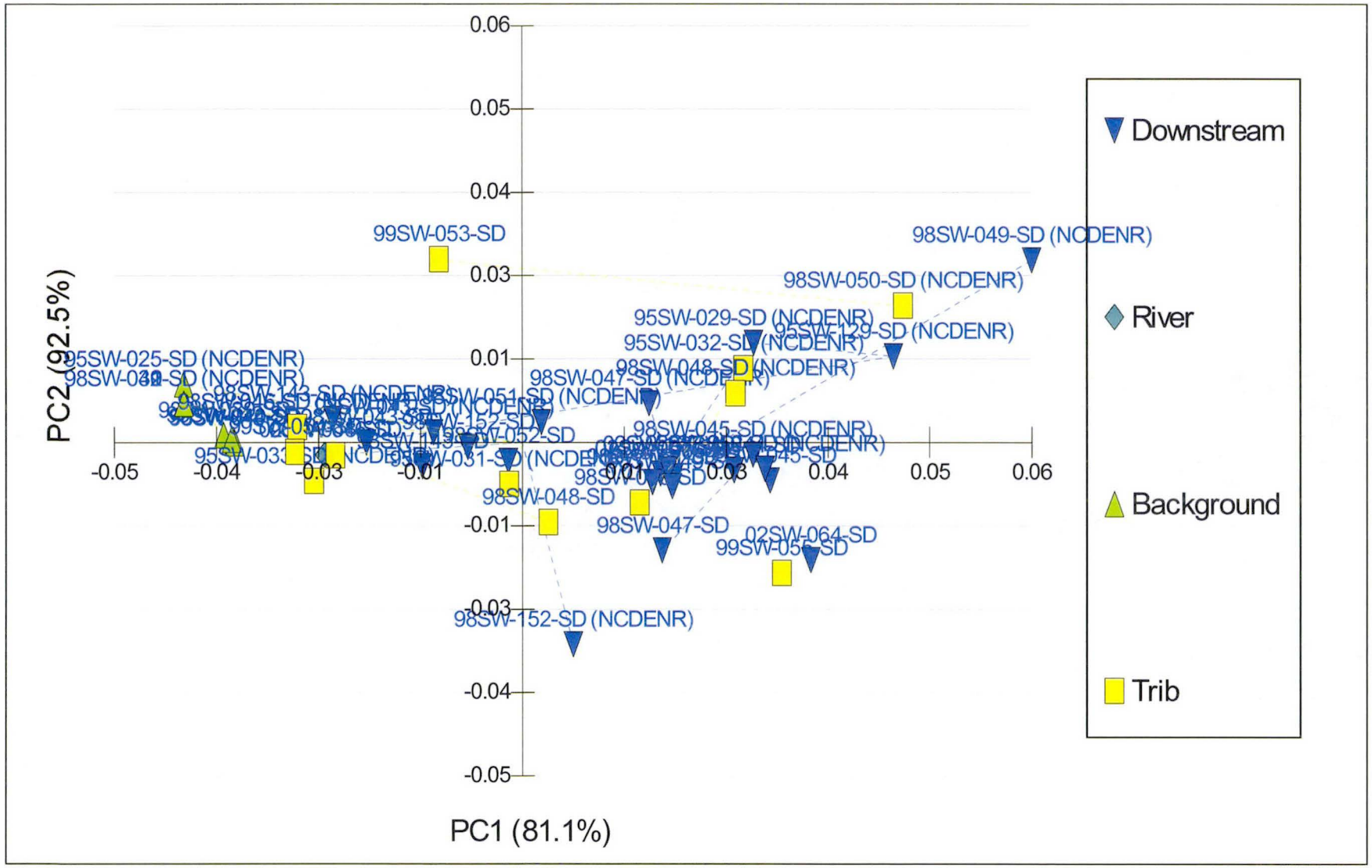

Figure C-7b. PCA Plot of PCDD/F Congeners in Sediments Collected from Cedar Creek Less Sample SW-044-SD (NCDENR) and Setting Non-Detects to Zero Values.

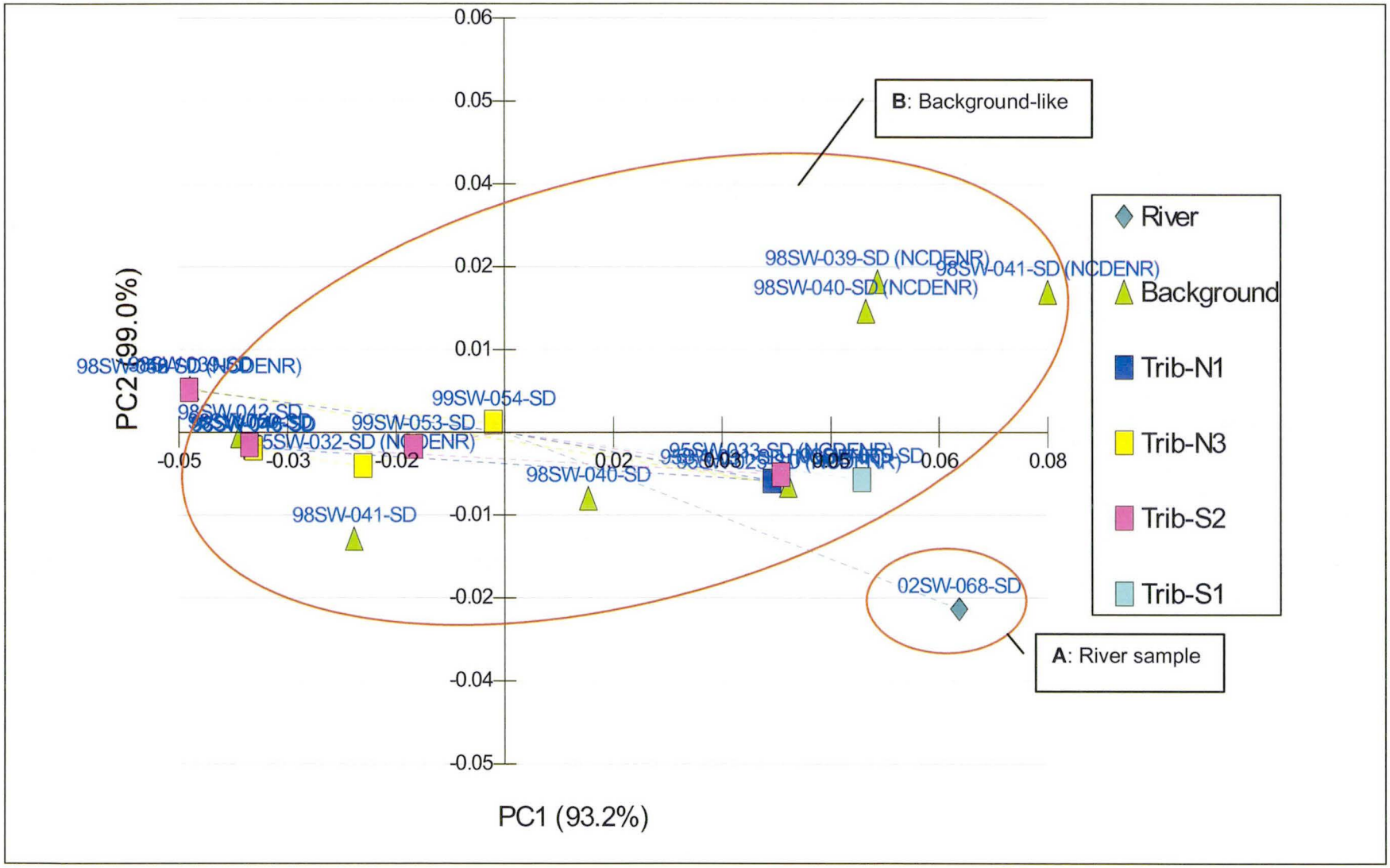

Figure C-7c. PCA Plot of PCDD/F Congeners in Sediments Collected from Cedar Creek Background and Tributaries, and the Deep River, Setting Non-Detects to Zero Values.

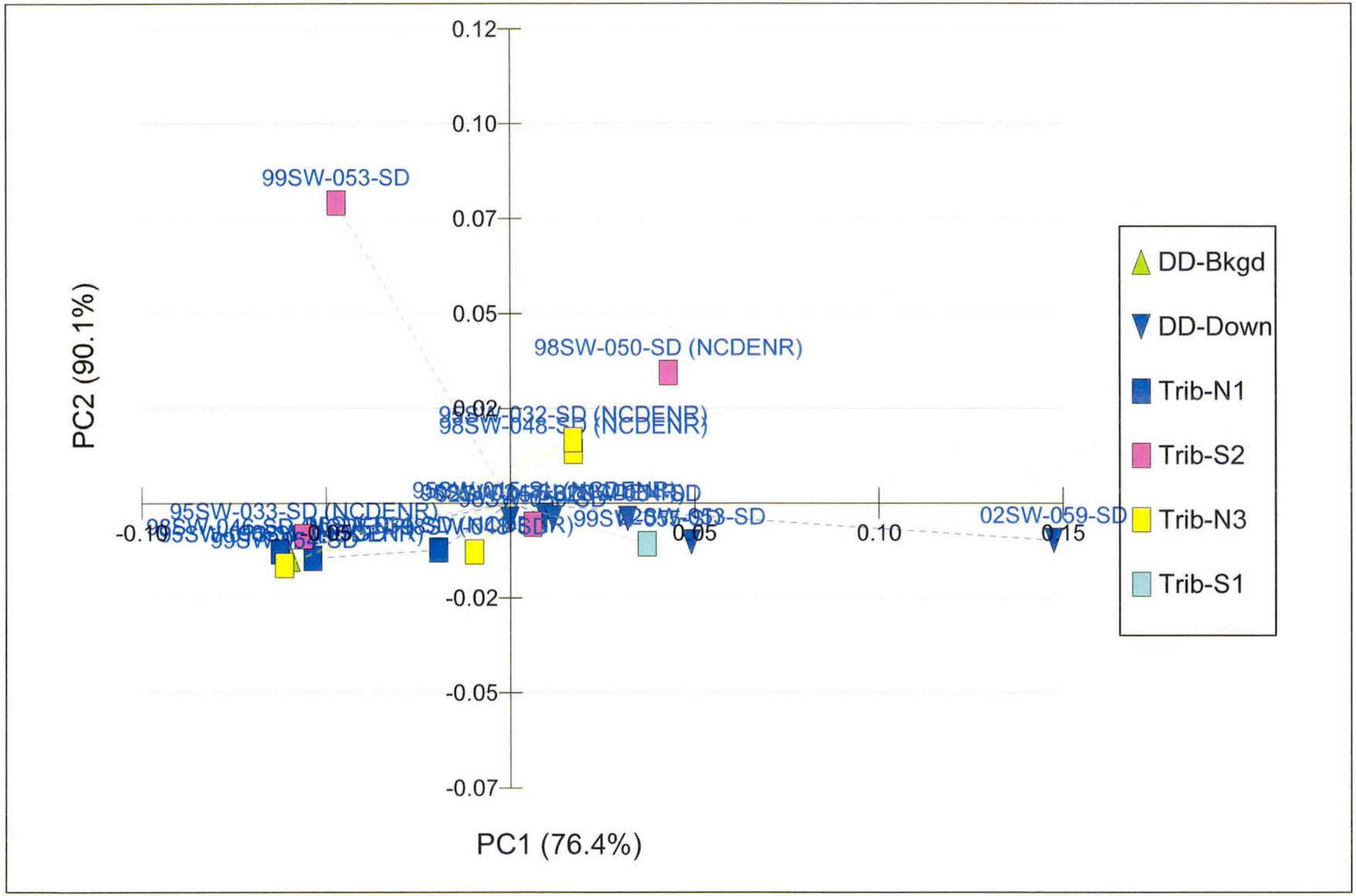

Figure C-8a. PCA Plot of PCDD/F Congeners in Sediments Collected from the Drainage Ditch and those from the Cedar Creek Tributaries, Setting Non-Detects to Zero Values.

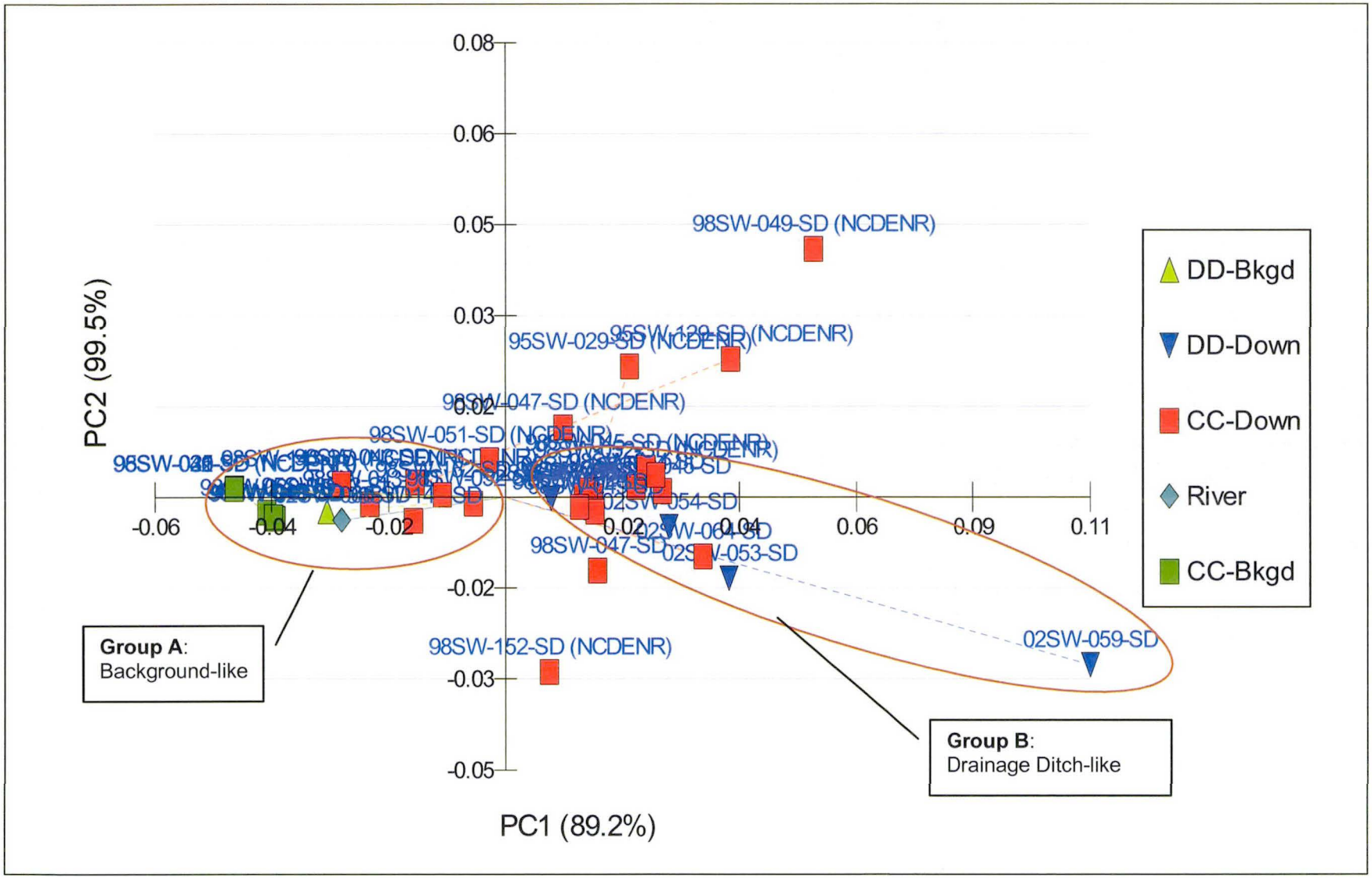

Figure C-8b. PCA Plot of PCDD/F Congeners in Sediments Collected from the Drainage Ditch and Main Stem of Cedar Creek [Less Sample SW-044-SD (NCDENR)] and Setting Non-Detects to Zero Values.

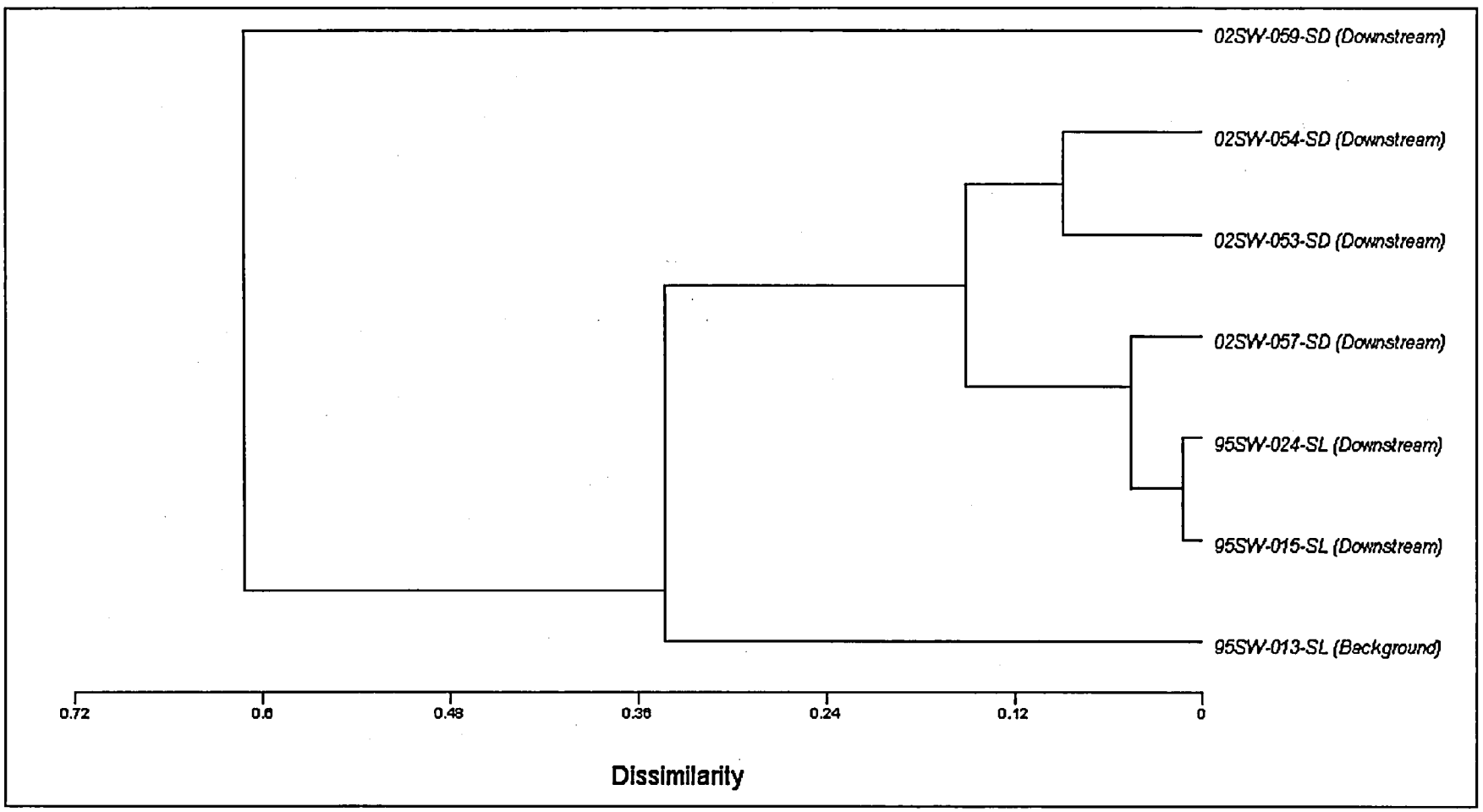

Figure C-9. CA Dendrogram of PCDD/F Congeners in Sediments Collected from the Drainage Ditch Setting Non-Detects to Zero Values.

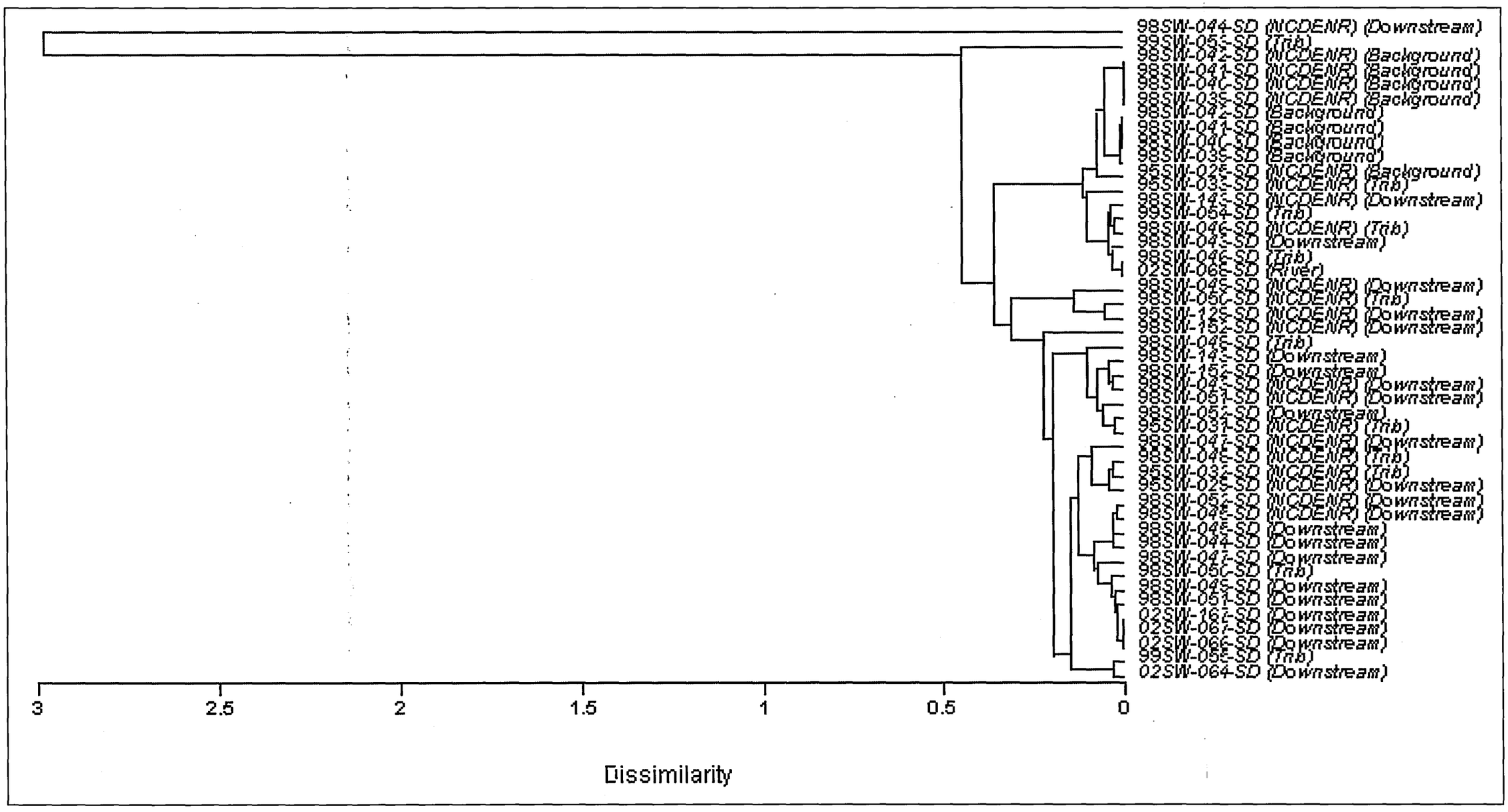

Figure C-10a. CA Dendrogram of PCDD/F Congeners in Sediments Collected from the Cedar Creek Setting Non-Detects to Zero Values.

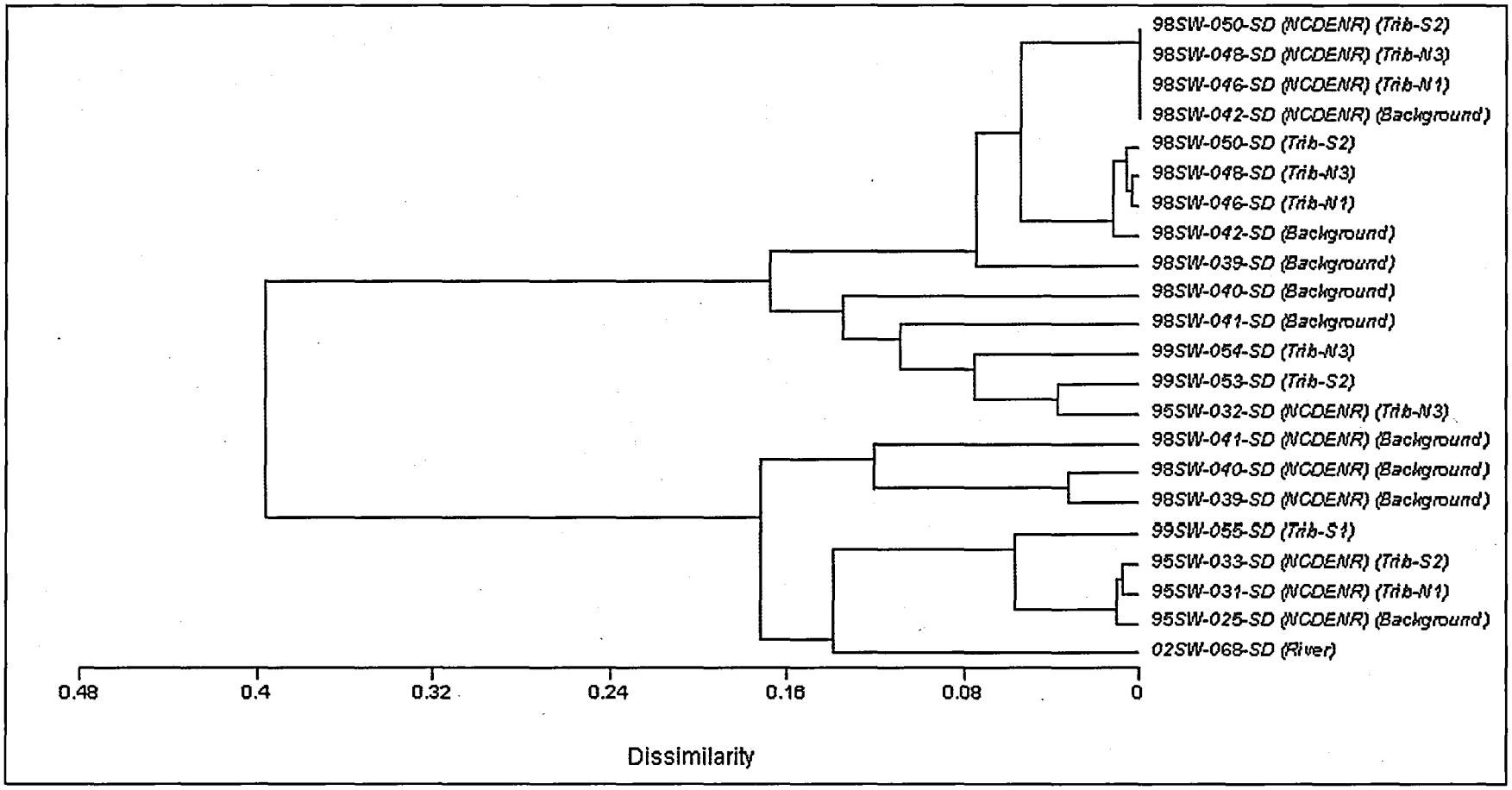

Figure C-10b. CA Dendrogram of PCDD/F Congeners in Sediments Collected from the Cedar Creek Background (Upstream) Locations, Tributaries and River, Setting Non-Detects to Zero Values.

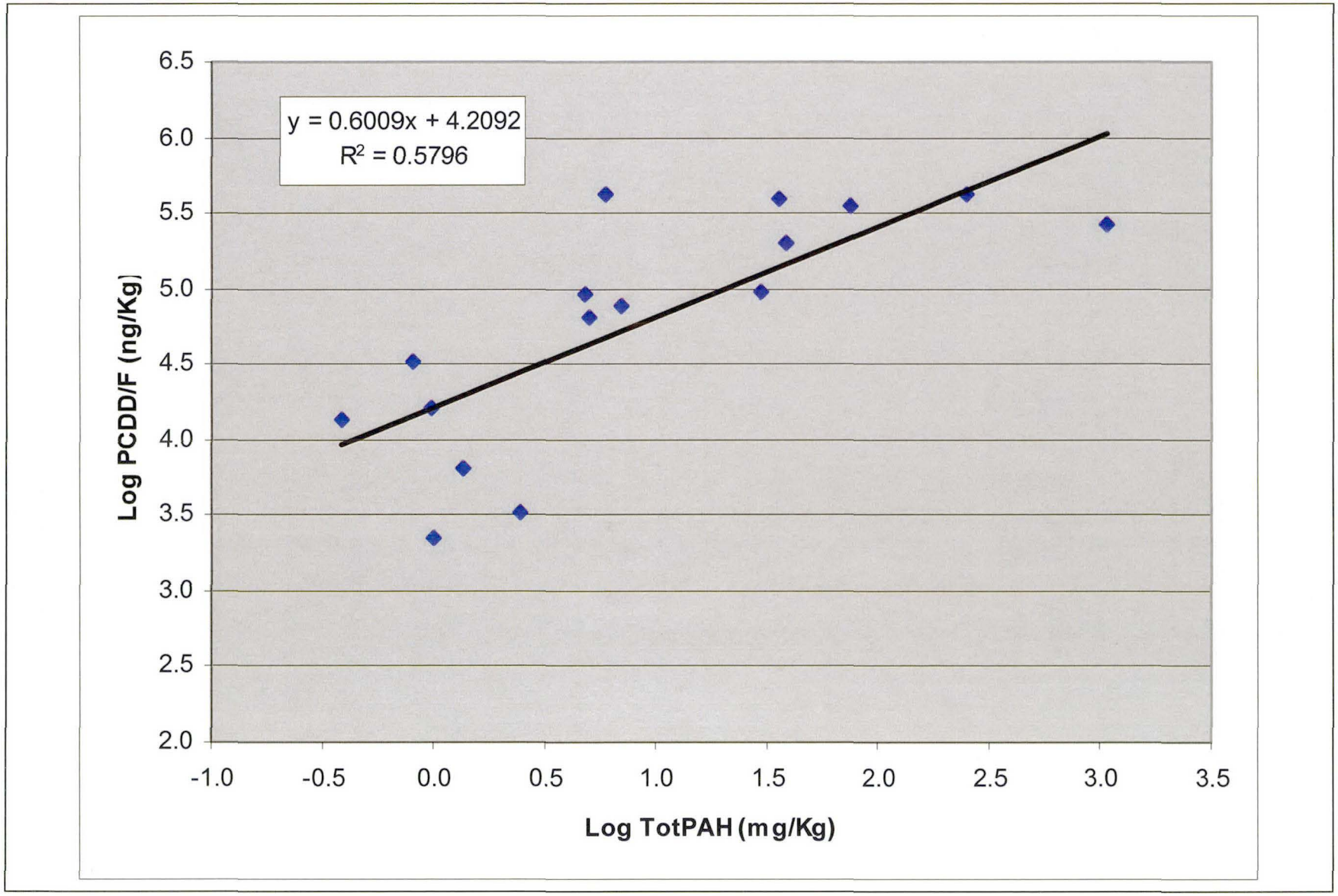

Figure C-11. Comparison of Total PCDD/Fs (ng/Kg) and Total PAHs (mg/Kg) in a Subset of the Cedar Creek Sediment Samples.

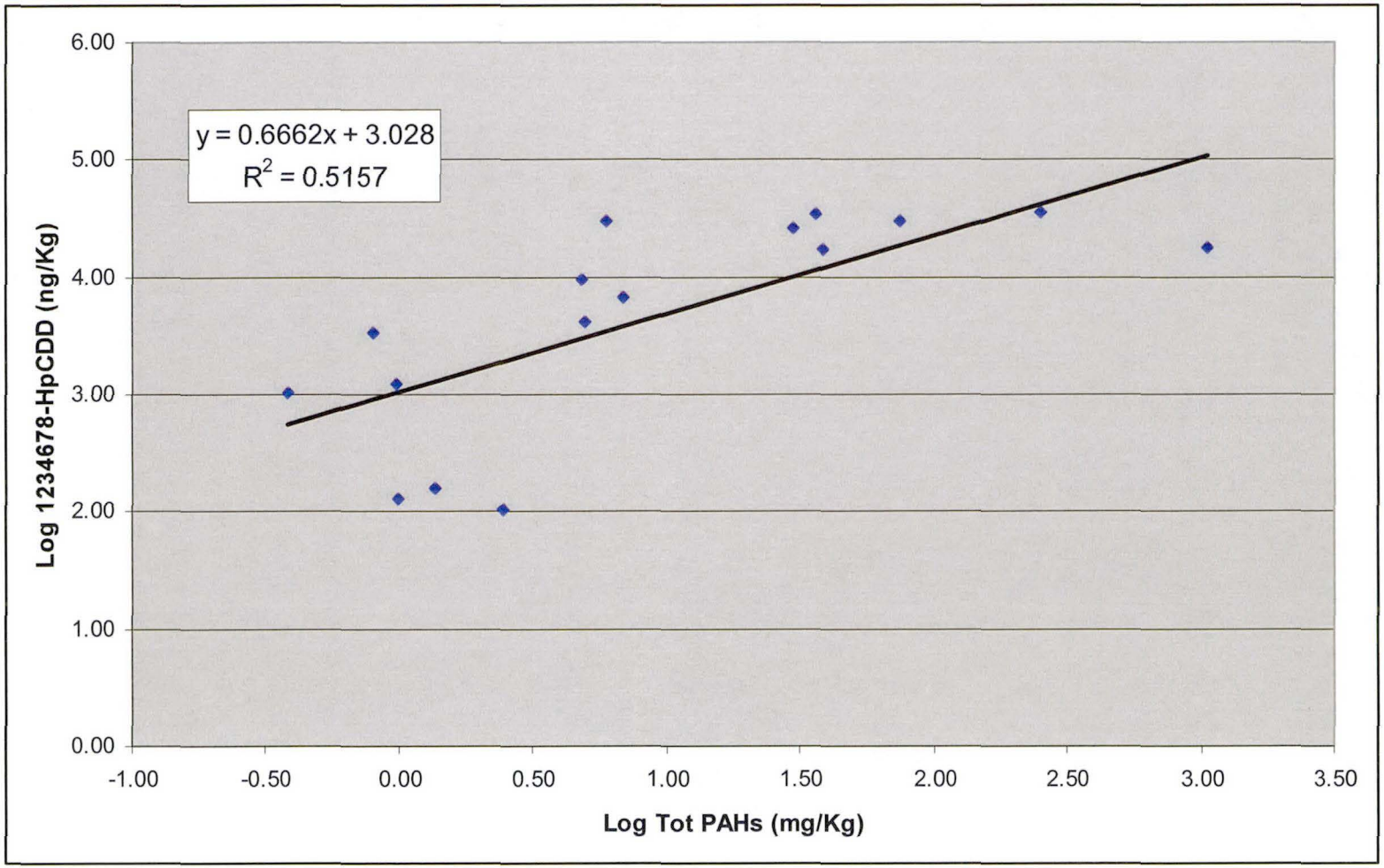

Figure C-12. Comparison of Log Transformed 1234678-HpCDD (ng/Kg) and Total PAHs (mg/Kg) in a Subset of the Cedar Creek Sediment Samples.

Table C-1. PAH Content of Creosote
Southern Wood Piedmont - Gulf, North Carolina

Parameters	Number of Rings	Percent Total Mass	
		P2 Creosote	P1/P13 Creosote
2-Methylnaphthalene	2	0.028	0.036
Acenaphthene	3	0.044	0.077
Acenaphthylene		NR	NR
Anthracene	3	0.029	0.031
Benzo(a)anthracene	4	0.002	0.004
Benzo(a)pyrene	5	NR	0.004
Benzo(b)fluoranthene	5	0.005	0.008
Benzo(k)fluoranthene		NR	NR
Benzo(g,h,i)perylene	6	0.001	<0.001
Carbazole	3	0.014	0.017
Chrysene	4	0.001	0.014
Dibenzo(a,h)anthracene		NR	NR
Dibenzofuran	3	0.023	0.043
Fluoranthene	4	0.046	0.055
Fluorene	3	0.040	0.060
Indeno(1,2,3-cd)pyrene		NR	NR
Naphthalene	2	0.173	0.062
Phenanthrene	3	0.096	0.128
Pyrene	4	0.040	0.047

Notes:
Data from Murphy and Brown (2005). Only the PAHs that were included as part of the Method 8270 analyses are shown in this table.
NR = Not reported.

Table C-2. Summary of PAH Isomer Ratios for Select Petroleum, Single-Source Combustion and Environmental Samples
Southern Wood Piedmont - Gulf, North Carolina

SOURCE	An/178[a]	Fl/Fl+Py[a]	BaA/228[a]	IP/IP+Bghi[a]	Phen[b]	Phen[b]	Fla[b]	BaA[b]	Chry[b]	BbF[b]	BaP[b]	IP[b]
Petroleum												
Kerosene	0.04	0.46	0.35	0.48								
Diesel oil	0.09±0.05	0.26±0.16	0.35±0.24	0.40±0.18								
	(0.03-0.17)	(0.01-0.47)	(0.12-0.71)	(0.25-0.65)								
Lubricating oil	-	0.29	0.1	0.12								
		(0.17-0.30)	(0.11-0.12)	(0.00-0.13)								
Coal	0.2±0.13	-	-	-		3	1.4	1	1.11±0.06	3.70±0.17	1.19	1.09±0.03
	(0.00-0.41)											
Asphalt	-	-	0.5	0.52-0.54								
Combustion												
Lignite and brown coal	0.08	0.72	0.44	0.57								
	(0.00-0.16)	(0.59-0.85)	(0.39-0.49)									
Bituminous coal	0.33	0.53±0.05	0.34	0.48								
	(0.31-0.36)	(0.48-0.58)	(0.18-0.50)	(0.35-0.62)								
Coal tar	0.18	0.58	0.54	0.53								
Wood soot	0.26	0.5	0.43-0.49	0.55-0.55								
Wood	0.19±0.04	0.51±0.06	0.46±.06	0.64±0.07		3	1	0.93	0.79±0.13	0.92±0.16	2.27	0.28±0.05
	(0.14-0.29)	(0.41-0.67)	(0.30-0.54)	(0.49-0.77)								
Grasses	0.17±0.04	0.58±0.04	0.46±0.02	0.58±0.1								
	(0.13-0.23)	(0.53-0.63)	(0.44-0.49)	(0.52-0.69)								
Gasoline	0.11	0.44	0.33-0.38	0.09-0.22		>10						
Kerosene	0.14±0.02	0.50	0.37	0.37								
	(0.12-0.16)	(0.50-0.50)	(0.30-0.44)									
Diesel	0.11±0.05	0.39±0.11	0.38±0.11	0.35±0.10								
	(0.01-0.27)	(0.2-0.58)	(0.18-0.69)	(0.19-0.5)								
No. 2 Fuel Oil	0.06	0.51	0.17	-								
		(0.47±0.55)	(0.12-0.22)									
Crude oil	0.22	0.44±0.02	0.49±0.01	0.47±0.01								
	(0.22-0.22	(0.42-0.46)	(0.47-0.50)	(0.46-0.48)								
Environmental Samples												
Bush Fire	-	0.61	0.23	0.70								
Road dust	0.18	0.42	0.13	0.51								
Lubricating oil, re-refined	-	0.74	-	0.36								
Used engine oil, gasoline passenger car	0.22	0.3	0.5	0.18								
Used engine oil, diesel car, truck and bus	-	0.37	-	0.29								
Creosote treated wood piling	0.20±0.05	0.62±0.01	0.50±0.03	0.64±0.04								
	(0.16-0.26)	(0.61-0.64)	(0.46-0.53)	(0.59-0.68)								
Automobiles							0.6	0.28	0.52±0.06	0.26±0.19	0.07	0.33±0.06

Notes:
Means ± standard deviations, and/or ranges (in parenthesis) of PAH isomer ratios of sources (Yunker et al., 2002).
a. Yunker et al. (2002)
b. Lucia et al. (2005)
Acronym summary: An/178 =Athracene/Sum[Anthracene Plus Phenanthrene]; Fl/Fl+Py = Fluoranthene/Sum(Fluoranthene plus Pyrene); BaA/228=Benzo(a)anthracene/Sum[Benzo(a)anthracene plus Chrysene: IP/IP+Bgh = Indeno(123-cd)pyrene/Sum[Indeno(123-cd)pyrene plus Benzo(ghi)perylene]

Table C-3. PCDD/F Concentrations and Normalized Ratios in Pentachlorophenol Southern Wood Piedmont - Gulf, North Carolina

	Congener Concentrations (mg/Kg)		Congener Normalized Ratios	
Parameters	**Vendor 1**	**Vendor 2**	**Vendor 1**	**Vendor 2**
1,2,3,4,6,7,8-HpCDD	112	138	1.15E-01	1.27E-01
1,2,3,4,6,7,8-HpCDF	11.28	19.94	1.16E-02	1.83E-02
1,2,3,4,7,8,9-HpCDF	0.637	0.98	6.53E-04	9.01E-04
1,2,3,4,7,8-HxCDD	ND (<0.001)	ND (<0.001)	0.0	0.0
1,2,3,4,7,8-HxCDF	0.125	0.163	1.28E-04	1.50E-04
1,2,3,6,7,8-HxCDD	0.0831	1.48	8.52E-05	1.36E-03
1,2,3,6,7,8-HxCDF	ND (<0.001)	ND (<0.001)	0.0	0.0
1,2,3,7,8,9-HxCDD	0.028	0.053	2.87E-05	4.87E-05
1,2,3,7,8,9-HxCDF	0.032	0.146	3.28E-05	1.34E-04
1,2,3,7,8-PeCDD	0.001	0.002	1.03E-06	1.84E-06
1,2,3,7,8-PeCDF	0.005	0.002	5.13E-06	1.84E-06
2,3,4,6,7,8-HxCDF	ND (<0.001)	ND (<0.001)	0.0	0.0
2,3,4,7,8-PeCDF	0.0015	0.0009	1.54E-06	8.27E-07
2,3,7,8-TeCDD	ND (<0.00003)	ND (<0.00005)	0.0	0.0
2,3,7,8-TeCDF	ND (<0.0001)	ND (<0.0001)	0.0	0.0
OCDD	733	790	7.52E-01	7.26E-01
OCDF	118	137	1.21E-01	1.26E-01
Sum PCDD/Fs	975	1,088		

Notes:
Data from Hagenmaier and Brunner (1987).
Concentrations represent mass of PCDD/F congeners in unused pentachlorophenol.
The normalized ratios were calculated by dividing the individual congener results by the Sum PCDD/Fs.
Vendor 1 and Vendor 2 refer to Witophen and Rhone-Polenc, respectively. These were the suppliers of the pentachlorphenol used in Hagenmaier and Brunner (1987).
ND = Not detected. Detection limits shown in parentheses.

Table C-4. Comparison of Total PAHs in Samples Collected from the Same Location Near the Junction of Cedar Creek and the Drainage Ditch at Different Times
Southern Wood Piedmont - Gulf, North Carolina

Sample ID	Year Collected	Total PAHs (mg/Kg_{dw})	Comment
SWP-002	1983	18.8	
8750	1990	41.9	
SW-029-SD	1995	264	Split of NCDENR sample
SW-029-SD (NCDENR)	1995	1,050	
SW-129-SD (NCDENR)	1995	250	Field Duplicate
SW-043-SD	1998	ND	Split of NCDENR Sample
SW-143-SD	1998	ND	Split of NCDENR sample Field Duplicate
SW-043-SD (NCDENR)	1998	ND	
SW-143-SD (NCDENR)	1998	ND	Field Duplicate

Notes:
All samples were collected from the same location, but on different sampling dates.
ND: Not detected. The detection limits ranged from 0.33 to 0.39 mg/Kg_{dw} in these samples.

Table C-5a. Isomer Ratios of Fluoranthene:Pyrene and Anthracene:Phenanthrene in Drainage Ditch Sediments Using Half-DL Substitution for Non-Detect Results
Southern Wood Piedmont - Gulf, North Carolina

Location	Sample ID	Fluor/Pyr Ratio	Ant/Phe Ratio	Pattern
Background	SW-013-SL (NCDENR)	1.18	1.00	Background
Downstream	SW-014-SL (NCDENR)	1.67	1.23	Unknown
Downstream	SW-015-SL (NCDENR)	1.25	0.06	Creosote-like (?)
Downstream	SW-060-SD	0.70	7.86	Unknown
Downstream	SW-059-SD	0.52	1.20	Unknown
Downstream	SW-058-SD	1.00	1.00	Unknown
Downstream	SW-158-SD	1.00	1.00	Unknown
Downstream	SW-057-SD	2.43	1.00	Unknown
Downstream	SW-023-SL (NCDENR)	0.92	0.21	Unknown
Downstream	SW-056-SD	1.00	1.00	Unknown
Downstream	SW-055-SD	1.70	1.00	Unknown
Downstream	SWP-003	1.33	4.15	Unknown
Downstream	SW-054-SD	2.06	3.88	Unknown
Downstream	SW-024-SL (NCDENR)	1.05	2.59	Unknown
Downstream	SW-053-SD	1.12	2.53	Unknown
	P2 Creosote	1.15	0.30	
	P1/P13 Creosote	1.17	0.24	
	Mean Downstream	1.26	2.05	
	Range Downstream	0.52 to 2.43	0.06 to 7.86	

Note:
NC: Not calculated due to one or both analytes not reported in the sample.
The "background-like" samples were those that had similar isomer ratios to the background samples.
The "creosote-like" samples were those that had similar isomer ratios to the two creosote standards.

Table C-5b. Isomer Ratios of Fluoranthene:Pyrene and Anthracene:Phenanthrene in Drainage Ditch Sediments Using Zero-DL Substitution for Non-Detect Results Southern Wood Piedmont - Gulf, North Carolina

Location	Sample ID	Fluor/Pyr	Ant/Phe	Pattern
Downstream	SW-014-SL (NCDENR)	1.67	1.23	Unknown
Downstream	SW-015-SL	--	0.14	Unknown
Downstream	SW-015-SL (NCDENR)	1.25	0.06	Unknown
Downstream	SW-059-SD	0.52	1.20	Unknown
Downstream	SW-023-SL (NCDENR)	0.92	0.21	Creosote-like?
Downstream	SWP-003	1.33	4.15	Unknown
Downstream	SW-024-SL (NCDENR)	1.05	2.59	Unknown
Downstream	SW-053-SD	1.12	2.53	Unknown
	P2 Creosote	1.15	0.30	
	P1/P13 Creosote	1.17	0.24	
	Mean Downstream	1.12	1.51	
	Range Downstream	0.52 to 1.67	0.06 to 4.15	

Note:
Since a zero DL substitution scheme was used, the number of samples is reduced in this compilation since the four PAHs were not always detected concurrently in the same samples.
The "background-like" samples were those that had similar isomer ratios to the background samples.
The "creosote-like" samples were those that had similar isomer ratios to the two creosote standards. See text for discussion.
A "—" indicates that the calculation was not performed since one or both of the PAHs were not detected in this sample.

Table C-5c. Isomer Ratios of Fluoranthene:Pyrene and Anthracene:Phenanthrene in Cedar Creek Sediments Using Half-DL Substitution for Non-Detect Results
Southern Wood Piedmont - Gulf, North Carolina

Location	Sample ID	Fluor/Pyr Ratio	Ant/Phe Ratio	Pattern
Background	SW-040-SD (NCDENR)	NC	1.00	Background
Background	SW-041-SD	1.00	1.00	Background
Background	SW-025-SD (NCDENR)	1.00	1.00	Background
Background	SW-041-SD (NCDENR)	1.00	1.00	Background
Background	SW-027-SD (NCDENR)	1.00	1.00	Background
Background	SW-039-SD	1.00	1.00	Background
Background	SW-038-SD (NCDENR)	1.00	1.00	Background
Background	SW-042-SD (NCDENR)	1.00	1.00	Background
Background	SW-040-SD	1.00	1.00	Background
Background	SW-026-SD (NCDENR)	1.00	1.00	Background
Background	SW-028-SD (NCDENR)	1.00	1.00	Background
Background	SW-042-SD	1.00	1.00	Background
Background	SWP-009	1.08	1.52	Background
Downstream (main-stem)	SWP-002	1.32	1.57	Background-like
Downstream (main-stem)	SW-029-SD (NCDENR)	5.90	0.05	Unknown
Downstream (main-stem)	SW-129-SD (NCDENR)	1.20	0.06	Creosote-like
Downstream (main-stem)	SW-043-SD (NCDENR)	1.00	1.00	Background-like
Downstream (main-stem)	SW-043-SD	1.00	1.00	Background-like
Downstream (main-stem)	SW-143-SD (NCDENR)	1.00	1.00	Background-like
Downstream (main-stem)	SW-143-SD	1.00	1.00	Background-like
Downstream (main-stem)	SW-030-SD (NCDENR)	1.09	1.22	Background-like
Downstream (main-stem)	SW-044-SD (NCDENR)	1.69	0.23	Creosote-like
Downstream (main-stem)	SW-044-SD	1.36	0.23	Unknown
Downstream (main-stem)	SWP-001	1.36	2.92	Unknown
Downstream (main-stem)	SW-045-SD	1.23	7.19	Unknown
Downstream (main-stem)	SW-045-SD (NCDENR)	1.10	4.62	Unknown
Trib-N2	SW-046-SD	1.00	1.00	Background-like
Trib-N2	SW-046-SD (NCDENR)	1.00	1.00	Background-like
Trib-N1	SW-031-SD (NCDENR)	1.25	0.96	Background-like
Downstream (main-stem)	SW-047-SD	0.80	5.45	Unknown
Downstream (main-stem)	SW-047-SD (NCDENR)	1.00	3.56	Unknown
Downstream (main-stem)	SW-061-SD	0.80	1.63	Background-like
Downstream (main-stem)	SW-062-SD	1.30	0.32	Creosote-like
Downstream (main-stem)	SW-063-SD	0.71	1.45	Unknown
Downstream (main-stem)	SW-064-SD	0.90	3.05	Unknown
Downstream (main-stem)	SW-065-SD	1.00	0.32	Creosote-like
Downstream (main-stem)	SW-165-SD	1.00	1.15	Background-like
Downstream (main-stem)	SW-066-SD	0.0014	3.77	Unknown
Downstream (main-stem)	SW-067-SD	0.0011	1.00	Unknown
Trib-N3	SW-048-SD	1.00	1.00	Background-like
Trib-N3	SW-048-SD (NCDENR)	1.00	1.00	Background-like
Trib-N3	SW-032-SD	0.00	1.00	Unknown
Trib-N3	SW-032-SD (NCDENR)	1.00	1.70	Background-like
Downstream (main-stem)	SW-049-SD	1.00	1.00	Background-like
Downstream (main-stem)	SW-049-SD (NCDENR)	1.00	1.00	Background-like

Table C-5c. Isomer Ratios of Fluoranthene:Pyrene and Anthracene:Phenanthrene in Cedar Creek Sediments Using Half-DL Substitution for Non-Detect Results
Southern Wood Piedmont - Gulf, North Carolina

Location	Sample ID	Fluor/Pyr Ratio	Ant/Phe Ratio	Pattern
Trib-S2	SW-050-SD	1.00	1.00	Background-like
Trib-S2	SW-050-SD (NCDENR)	1.00	1.00	Background-like
Trib-S2	SW-033-SD (NCDENR)	1.00	1.00	Background-like
Downstream (main-stem)	SW-051-SD	1.00	1.00	Background-like
Downstream (main-stem)	SW-051-SD (NCDENR)	1.00	1.00	Background-like
Downstream (main-stem)	SW-034-SD (NCDENR)	1.00	1.00	Background-like
Downstream (main-stem)	SW-052-SD	1.00	1.00	Background-like
Downstream (main-stem)	SW-052-SD (NCDENR)	1.00	1.00	Background-like
Downstream (main-stem)	SW-152-SD	1.00	1.00	Background-like
Downstream (main-stem)	SW-152-SD (NCDENR)	1.00	1.00	Background-like
	P2 Creosote	1.15	0.30	
	P1/P13 Creosote	1.17	0.24	
	Mean Downstream and Tribs	1.10	1.51	
	Range Downstream and Tribs	0.0011 to 5.90	0.0460 to 7.19	

Note:
Data were sorted from upstream to downstream location.
Since a zero DL substitution scheme was used, the number of samples is reduced in this compilation since the four PAHs were not always detected concurrently in the same samples.
The "background-like" samples were those that had similar isomer ratios to the background samples.
The "creosote-like" samples were those that had similar isomer ratios to the two creosote standards.

Table C-5d. Isomer Ratios of Fluoranthene:Pyrene and Anthracene:Phenanthrene in Cedar Creek Sediments Using Zero-DL Substitution for Non-Detect Results
Southern Wood Piedmont - Gulf, North Carolina

Location	Sample ID	Fluor/Pyr Ratio	Ant/Phe Ratio	Pattern
Background	SWP-009	1.08	1.52	Background
Downstream	SW-129-SD (NCDENR)	1.20	0.06	Creosote-like
Downstream	SW-029-SD (NCDENR)	5.90	0.05	Unknown
Downstream	SWP-001	1.36	2.92	Unknown
Downstream	SW-030-SD (NCDENR)	1.09	1.22	Background-like
Downstream	SW-044-SD (NCDENR)	1.69	0.23	Creosote-like
Downstream	SW-044-SD	1.36	0.23	Unknown
Downstream	SWP-002	1.32	1.57	Background-like
Downstream	SW-045-SD (NCDENR)	1.10	4.62	Unknown
Downstream	SW-047-SD (NCDENR)	1.00	3.56	Unknown
Downstream	SW-061-SD	0.80	1.63	Background-like
Downstream	SW-062-SD	1.30	0.32	Creosote-like
Downstream	SW-063-SD	0.71	1.45	Unknown
Downstream	SW-064-SD	0.90	3.05	Unknown
Trib-N3	SW-032-SD (NCDENR)	1.00	1.70	Background-like
	Mean Downstream	1.52	1.61	
	Range Downstream	0.71 to 5.90	0.05 to 4.62	

Note:
Data were sorted from upstream to downstream location.
Since a zero DL substitution scheme was used, the number of samples is reduced in this compilation since the four PAHs were not always detected concurrently in the same samples.
The "background-like" samples were those that had similar isomer ratios to the background samples.
The "creosote-like" samples were those that had similar isomer ratios to the two creosote standards.

Table C-6. Summary of Normalized Ratios of PCDD/F Congeners Across All Samples using Different Non-Detect Surrogate Values
Southern Wood Piedmont - Gulf, North Carolina

	Drainage Ditch Sediments					Cedar Creek Sediments				
		NDs as Zero		NDs as Half DLs			NDs as Zero		NDs as Half DLs	
PCDD/F Congeners	Freq Det	Min	Max	Min	Max	Freq Det	Min	Max	Min	Max
1,2,3,4,6,7,8-HpCDD	100%	2.50E-02	1.74E-01	2.50E-02	1.74E-01	86%	0	2.73E-01	5.88E-03	2.73E-01
1,2,3,4,6,7,8-HpCDF	100%	2.08E-03	8.83E-02	2.08E-03	8.83E-02	84%	0	3.57E-02	1.64E-04	3.57E-02
1,2,3,4,7,8,9-HpCDF	100%	1.52E-04	1.46E-03	1.52E-04	1.46E-03	66%	0	1.99E-03	1.21E-04	8.22E-03
1,2,3,4,7,8-HxCDD	100%	1.71E-04	6.45E-04	1.71E-04	6.45E-04	55%	0	1.27E-03	8.16E-05	8.22E-03
1,2,3,4,7,8-HxCDF	70%	0	1.11E-03	1.35E-04	1.36E-03	48%	0	7.66E-04	9.82E-05	8.22E-03
1,2,3,6,7,8-HxCDD	100%	4.66E-04	3.34E-03	4.66E-04	3.34E-03	75%	0	5.14E-03	8.47E-05	8.22E-03
1,2,3,6,7,8-HxCDF	70%	0	6.93E-04	6.55E-05	6.93E-04	45%	0	1.74E-04	1.99E-05	8.22E-03
1,2,3,7,8,9-HxCDD	100%	3.48E-04	1.70E-03	3.48E-04	1.70E-03	75%	0	1.48E-03	1.15E-04	8.22E-03
1,2,3,7,8,9-HxCDF	30%	0	2.17E-04	4.54E-06	5.98E-04	5%	0	7.09E-05	0	8.22E-03
1,2,3,7,8-PeCDD	67%	0	2.11E-04	0	2.11E-04	39%	0	6.89E-04	0	8.22E-03
1,2,3,7,8-PeCDF	46%	0	2.11E-04	1.32E-05	5.98E-04	22%	0	2.61E-05	0	6.51E-03
2,3,4,6,7,8-HxCDF	90%	0	1.30E-03	8.44E-05	1.30E-03	41%	0	3.49E-04	1.66E-05	8.22E-03
2,3,4,7,8-PeCDF	60%	0	3.62E-04	3.83E-05	3.62E-04	30%	0	2.95E-03	5.64E-06	8.22E-03
2,3,7,8-TeCDD	30%	0	4.80E-05	4.99E-06	4.79E-05	14%	0	4.26E-04	1.96E-06	3.34E-03
2,3,7,8-TeCDF	30%	0	2.56E-04	2.64E-06	2.56E-04	43%	0	1.54E-03	1.96E-06	8.22E-03
OCDD	100%	7.28E-01	9.64E-01	7.28E-01	9.64E-01	98%	0	1.00E+00	3.88E-01	9.85E-01
OCDF	100%	6.58E-03	7.07E-02	6.58E-03	7.07E-02	75%	0	2.94E-01	3.63E-04	2.94E-01

Notes:
One sample [SW-028-SD (NCDENR)] collected from Cedar Creek was excluded from this analysis since it contained no detectable PCDD/Fs.
The Cedar Creek samples include those present in the tributaries and also the single sample from the Deep River.

Table C-7a. Summary of Drainage Ditch Sediment Sum PCDD/Fs and Dioxin-TEQ Calculations
Southern Wood Piedmont - Gulf, North Carolina

Sample	Area	Sum PCDD/Fs		Dioxin-TEQ$_{mammal}$		Dioxin-TEQ$_{avian}$	
		Zero DL	Half DL	Zero DL	Half DL	Zero DL	Half DL
95SW-013-SL (NCDENR)	Background	12,507	12,533	13.5	15.5	19.1	24.3
95SW-015-SL (NCDENR)	Downstream	106,535	106,692	157	177	131	161
95SW-024-SL (NCDENR)	Downstream	73,146	73,280	110	127	89.5	114
02SW-053-SD	Downstream	100,230	100,239	192	195	132	136
02SW-054-SD	Downstream	65,289	65,300	112	116	80.1	86.6
02SW-057-SD	Downstream	38,165	38,178	50.9	55.3	44.0	50.8
02SW-059-SD	Downstream	189,595	189,598	586	586	345	346

Notes:
All concentration units are in ng/Kg$_{dw}$.
The sample year is the two digit number that precedes the Sample ID.
See Figure 2-4 for actual sample locations.

Table C-7b. Summary of Cedar Creek Sediment Sum PCDD/Fs and Dioxin-TEQ Calculations
Southern Wood Piedmont - Gulf, North Carolina

Sample	Area	Sum PCDD/Fs		Dioxin-TEQ$_{mammal}$		Dioxin-TEQ$_{avian}$	
		Zero DL	Half DL	Zero DL	Half DL	Zero DL	Half DL
95SW-025-SD (NCDENR)	Background	823	922	0.37	15.52	0.94	21.98
98SW-039-SD	Background	305	306	0.28	0.32	0.72	0.79
98SW-039-SD (NCDENR)	Background	520	559	0.16	6.35	0.52	8.98
98SW-040-SD	Background	413	413	0.24	0.30	0.72	0.80
98SW-040-SD (NCDENR)	Background	410	448	0.12	6.30	0.41	8.86
98SW-041-SD	Background	262	263	0.14	0.22	0.51	0.62
98SW-041-SD (NCDENR)	Background	560	595	0.17	5.74	0.56	8.17
95SW-028-SD (NCDENR)	Background	ND	ND	ND	ND	ND	ND
98SW-042-SD	Background	117	117	0.07	0.13	0.30	0.38
98SW-042-SD (NCDENR)	Background	170	195	0.05	4.11	0.17	6.55
95SW-029-SD (NCDENR)	Downstream	263,080	263,412	362	398	309	348
95SW-129-SD (NCDENR)	Downstream	421,148	421,775	654	719	491	560
98SW-043-SD	Downstream	2,424	2,424	2.24	2.25	3.17	3.20
98SW-143-SD	Downstream	1,678	1,678	1.79	1.89	2.21	2.39
98SW-043-SD (NCDENR)	Downstream	2,918	2,937	2.54	7.37	3.10	10.09
98SW-143-SD (NCDENR)	Downstream	3,984	4,006	2.59	8.22	4.15	12.30
98SW-044-SD	Downstream	356,684	356,734	547	561	434	461
98SW-044-SD (NCDENR)	Downstream	95,280	95,283	387	388	132	132
98SW-045-SD	Downstream	389,302	389,346	649	663	493	521
98SW-045-SD (NCDENR)	Downstream	202,812	202,814	352	353	271	272
98SW-046-SD	Trib-N1	6,097	6,098	5.24	5.35	7.13	7.54
98SW-046-SD (NCDENR)	Trib-N1	8,502	8,519	5.14	10.49	8.85	16.85
95SW-031-SD (NCDENR)	Trib-N1	2,208	2,267	2.52	16.31	2.47	22.83
98SW-047-SD	Downstream	76,615	76,615	125	125	98	99
98SW-047-SD (NCDENR)	Downstream	65,658	65,662	80.3	81.5	74.9	76.8
99SW-055-SD	Trib-S1	33,013	33,013	68.8	68.9	52.3	52.4
02SW-064-SD	Downstream	91,143	91,152	166	167	128	129
02SW-066-SD	Downstream	16,028	16,049	22.3	25.0	17.8	22.9
02SW-067-SD	Downstream	13,416	13,440	17.8	20.7	14.4	19.7
02SW-167-SD	Downstream	12,761	12,782	17.5	20.2	14.2	19.4
99SW-054-SD	Trib-N3	6,442	6,442	5.68	5.78	8.88	8.98
98SW-048-SD	Trib-N3	27,498	27,499	38.7	39.0	35.3	35.7
98SW-048-SD (NCDENR)	Trib-N3	17,806	17,812	28.4	30.4	23.7	27.5
95SW-032-SD (NCDENR)	Trib-N3	427,265	427,916	584	652	490	561
98SW-049-SD	Downstream	8,873	8,873	13.87	13.94	11.62	11.74
98SW-049-SD (NCDENR)	Downstream	7,849	7,862	13.35	18.35	9.48	16.23
99SW-053-SD	Trib-S2	3,320	3,320	8.15	8.25	10.42	10.52
98SW-050-SD	Trib-S2	20,617	20,617	32.31	32.31	28.18	28.18
98SW-050-SD (NCDENR)	Trib-S2	10,345	10,351	18.77	20.77	14.50	18.25
95SW-033-SD (NCDENR)	Trib-S2	1,490	1,576	2.92	18.71	6.38	25.16
98SW-051-SD	Downstream	10,145	10,145	15.30	15.35	13.43	13.50
98SW-051-SD (NCDENR)	Downstream	13,411	13,420	14.55	18.55	15.55	21.02
98SW-052-SD	Downstream	9,301	9,301	11.45	11.45	12.36	12.36
98SW-152-SD	Downstream	10,108	10,109	11.16	11.42	13.11	13.52
98SW-052-SD (NCDENR)	Downstream	7,257	7,273	15.75	18.75	13.46	18.08
98SW-152-SD (NCDENR)	Downstream	5,870	5,888	9.18	14.68	7.23	14.36
02SW-068-SD	River	2,644	2,672	1.65	4.87	2.70	8.13

Notes:
All concentration units are in ng/Kg$_{dw}$.
Samples are ordered from upstream to downstream location.
The sample year is the two digit number that precedes the Sample ID.
See Figure 2-4 for actual sample locations.
ND: Not detected

Table C-8. Comparison of Absolute and Relative PCDD/F Congener Concentrations from North Carolina Background and Site-Specific Background Sediment from the Drainage Ditch
Southern Wood Piedmont - Gulf, North Carolina

	Absolute Concentrations				Relative Concentrations	
	Clinton Crop Stn (USEPA, 2007)		SW-013-SL		Clinton	
Congener	Result	Qual	Result	Qual	Crop Stn	SW-013-SL
2378-TCDD	0.03		0.6	J	2.27E-05	4.80E-05
12378-PeCDD	0.13	J	2.3	J	9.85E-05	1.84E-04
123478-HcCDD	0.26		3.7	J	1.97E-04	2.96E-04
123678-HxCDD	0.39		7.9	J	2.95E-04	6.32E-04
123789-HxCDD	0.72		9.1	J	5.45E-04	7.28E-04
1234678-HpCDD	17.4		320		1.32E-02	2.56E-02
OCDD	1,299		12,000	J	9.84E-01	9.59E-01
2378-TCDF	0.14		6	U	1.06E-04	0
12378-PeCDF	0.06	J	15	U	4.55E-05	0
23478-PeCDF	0.07	J	1.4	J	5.30E-05	1.12E-04
123478-HxCDF	0.14	J	15	U	1.06E-04	0
123678-HxCDF	0.04	J	2.5	J	3.03E-05	2.00E-04
123789-HxCDF	0.17	U	15	U	0	0
234678-HxCDF	0.07	J	6.9	J	5.30E-05	5.52E-04
1234678-HpCDF	0.74		31		5.61E-04	2.48E-03
1234789-HpCDF	0.17	U	1.9	J	0	1.52E-04
OCDF	1.33		120		1.01E-03	9.59E-03
Sum PCDD/Fs	1,320		12,507			

Notes:
Clinton Crops PCDD/F data from USEPA (2007). The Dioxin-TEQ calculation for this sample is shown in Table 2-4.
Sample SW-013-SL is the single upstream (background) sample collected from the Drainage Ditch.
Concentration units are in ng/Kg_{dw}.
Sum PCDD/Fs were calculated setting non-detect results to zero.
Qual descriptions: U = not detected at concentration shown; J = estimated value
Relative concentrations are the normalized ratios to the Sum PCDD/Fs.

Table C-9a. Comparison of Absolute and Relative PCDD/F Congener Concentrations from North Carolina Background and Site-Specific Non-Tributary Upstream Background Sediment from Cedar Creek Southern Wood Piedmont - Gulf, North Carolina

	Absolute Concentrations																			
	Clinton Crop		SW-025-SD		SW-039-SD		SW-039-SD		SW-040-SD		SW-040-SD		SW-041-SD		SW-041-SD		SW-042-SD		SW-042-SD	
Congener	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
2378-TCDD	0.03		5	U	0.13	EMPC	2	U	0.06	U	2	U	0.08	U	1.8	U	0.06	U	1.3	U
12378-PeCDD	0.13	J	12	U			5	U		NR	5	U		NR	4.5	U			3.2	U
123478-HxCDD	0.26		12	U	0.07	U	5	U	0.08	U	5	U	0.08	U	4.5	U	0.05	U	3.2	U
123678-HxCDD	0.39		12	U	0.07	U	5	U	0.07	U	5	U	0.07	U	4.5	U	0.05	U	3.2	U
123789-HxCDD	0.72		12	U	0.07	U	5	U	0.21	EMPC	5	U	0.08	U	4.5	U	0.05	U	3.2	U
1234678-HpCDD	17.4		30	U	3.5		9	U	5.9		6	U	3.8		7	U	1.6		3.2	U
OCDD	1,299		810		301		520		406		410		258		560		115		170	
2378-TCDF	0.14		5	U	0.29		2	U	0.27		2	U	0.25		1.8	U	0.18	EMPC	3.2	U
12378-PeCDF	0.06	J	12	U	0.06	U		R	0.06	U		NR	0.08	U		NR	0.07	U		
23478-PeCDF	0.07	J	12	U	0.07	U	5	U	0.06	U	5	U	0.08	U	4.5	U	0.06	U	3.2	U
123478-HxCDF	0.14	J	12	U	0.06	U	5	U	0.12		5	U	0.06	U	4.5	U	0.04	U	3.2	U
123678-HxCDF	0.04	J	12	U	0.05	U	5	U	0.05	U	5	U	0.05	U	4.5	U	0.04	U	3.2	U
123789-HxCDF	0.17	U	12	U	0.07	U	5	U	0.07	U	5	U	0.07	U	4.5	U	0.05	U	3.2	U
234678-HxCDF	0.07	J	12	U	0.06	U	5	U	0.06	U	5	U	0.06	U	4.5	U	0.04	U	3.2	U
1234678-HpCDF	0.74		13		0.1	U	5	U	0.26		5	U	0.1	U	4.5	U	0.14	EMPC	3.2	U
1234789-HpCDF	0.17	U	12	U	0.2	U	5	U	0.1	U	5	U	0.2	U	4.5	U	0.1	U	3.2	U
OCDF	1.33		25	U	0.3	U	10	U	0.3	U	10	U	0.4	U	10	U	0.1	U	6.5	U
Sum PCDD/Fs	1,320		823		305		520		413		410		262		560		117		170	

	Relative Concentrations - Normalized to Total PCDD/Fs									
Congener	Clinton Crop Stn	SW-025-SD	SW-039-SD	SW-039-SD (NCDENR)	SW-040-SD	SW-040-SD (NCDENR)	SW-041-SD	SW-041-SD (NCDENR)	SW-042-SD	SW-042-SD (NCDENR)
2378-TCDD	2.3E-05	0	4.3.E-04	0	0	0	0	0	0	0
12378-PeCDD	9.8E-05	0		0	0	0	0	0	0	0
123478-HcCDD	2.0E-04	0	0	0	0	0	0	0	0	0
123678-HxCDD	3.0E-04	0	0	0	0	0	0	0	0	0
123789-HxCDD	5.5E-04	0	0	0	5.1.E-04	0	0.0.E+00	0	0.0.E+00	0
1234678-HpCDD	1.3E-02	0	1.1.E-02	0	1.4.E-02	0	1.5.E-02	0	1.4.E-02	0
OCDD	9.8E-01	9.8E-01	9.9.E-01	1.0.E+00	9.8.E-01	1.0.E+00	9.8.E-01	1.0.E+00	9.8.E-01	1.0.E+00
2378-TCDF	1.1E-04	0	0	0	0	0	0	0	0	0
12378-PeCDF	4.5E-05	0	0	0	0	0	0	0	0	0
23478-PeCDF	5.3E-05	0	0	0	0	0	0	0	0	0
123478-HxCDF	1.1E-04	0	0	0	2.9.E-04	0	0	0	0	0
123678-HxCDF	3.0E-05	0	0	0	0	0	0	0	0	0
123789-HxCDF	0	0	0	0	0	0	0	0	0	0
234678-HxCDF	5.3E-05	0	0	0	0	0	0	0	0	0
1234678-HpCDF	5.6E-04	1.6E-02	0	0	6.3.E-04	0	0	0	1.2.E-03	0
1234789-HpCDF	0	0	0	0	0	0	0	0	0	0
OCDF	1.0E-03	0	0	0	0	0	0	0	0	0

Notes:
Clinton Crops PCDD/F data from USEPA (2007). The Dioxin-TEQ calculation for this sample is shown in Table 2-4.
Samples shown in this table are the non-tributary upstream (background) samples collected from Cedar Creek.
Concentration units are in ng/Kg_{dw}.
Sum PCDD/Fs were calculated setting non-detect results to zero.
Qual descriptions: U = not detected at concentration shown; J = estimated value; EMPC = Estimated maximum possible concentration; NR = not reported.

Table C-9b. Comparison of Absolute and Relative PCDD/F Congener Concentrations from North Carolina Background and Site-Specific Upstream Background Sediment from Cedar Creek Tributaries
Southern Wood Piedmont - Gulf, North Carolina

	Absolute Concentrations																							
	Clinton Crop Stn (USEPA, 2007)		Trib-N1 SW-046-SD		Trib-N1 SW-046-SD (NCDENR)		Trib-N1 SW-031-SD		Trib-S1 99SW-053-SD		Trib-N3 SW-048-SD		Trib-N3 SW-048-SD (NCDENR)		Trib-N3 SW-032-SD		Trib-N3 99SW-054-SD		Trib-S2 SW-050-SD		Trib-S2 SW-050-SD (NCDENR)		Trib-S2 SW-033-SD	
Congener	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
2378-TCDD	0.03		0.03	U	2	U	5	U	0.2	U	0.4	U	2	U	6.7	U	0.2	U	0.23		2	U	6.3	U
12378-PeCDD	0.13	J		NR	5	U	12	U		NR			1.3	J	7	J	0.74				0.93	J	16	U
123478-HxCDD	0.26		0.86	EMPC	0.87	J	12	U	1.3		6.1		5.8		62		1.1		5.3		3.8	J	16	U
123678-HxCDD	0.39		4.3		3.8	J	3	J	4.1		39.4		37		790		3		34.6		29		1.4	J
123789-HxCDD	0.72		6.1		2	J	2	J	4.5		23.4		15		210		4.4		15.3		10		2.2	J
1234678-HpCDD	17.4		192		180		130		104		1,930		1,300		30,000		161		1,610		820		53	
OCDD	1,299		5,800		8,200		2,000		2,780		24,490		15,000		360,000	J	6,210		17,860		8,300		1,400	J
2378-TCDF	0.14		0.4	U	2	U	5	U	0.85		0.4	U	0.43	J	6.7	U	0.37		0.72		0.31	J	6.3	U
12378-PeCDF	0.06	J	0.3	U			12	U	0.7		2.1		0.4	J	17	U	0.41		1.3		0.27	J	16	U
23478-PeCDF	0.07	J	0.3	U	5	U	12	U	1.2		0.91	EMPC	5	U	6.2	J	0.36		0.91		5	U	4.4	J
123478-HxCDF	0.14	J	1.2		5	U	12	U	3.7		8		5.4	J	1,200	U	0.87		7.9		4.8	J	16	U
123678-HxCDF	0.04	J	0.3	U	5	U	12	U	2.3		3.2		2.4	J	17	U	0.63		3.1		1.8	J	16	U
123789-HxCDF	0.17	U	0.3	U	5	U	12	U	0.72		0.3	U	5	U	17	U	0.51		0.51	EMPC	5	U	16	U
234678-HxCDF	0.07	J	0.68	EMPC	5	U	12	U	4.3		6.7		2.2	J	38	U	0.85		7.2		1.4	J	16	U
1234678-HpCDF	0.74		22.9		17		10	J	293		273		220		4,800		13.4		242		160		29	
1234789-HpCDF	0.17	U	1.5		1.3	J	12	U	2.8		14.3		16		390		1.6		17.8		13		16	U
OCDF	1.33		67.8		97		63		115		701		1200		31,000		42.4		810		1,000		32	U
Sum PCDD/Fs	1,320		6,097		8,502		2,208		3,318		27,498		17,806		427,265		6,442		20,617		10,345		1,490	

	Relative Concentrations - Normalized to Total PCDD/Fs											
Congener	Clinton Crop Stn	Trib-N1 SW-046-SD	Trib-N1 SW-046-SD (NCDENR)	Trib-N1 SW-031-SD	Trib-S1 99SW-053-SD	Trib-N3 SW-048-SD	Trib-N3 SW-048-SD (NCDENR)	Trib-N3 SW-032-SD	Trib-N3 99SW-054-SD	Trib-S2 SW-050-SD	Trib-S2 SW-050-SD (NCDENR)	SW-033-SD
2378-TCDD	2.3E-05	0	0	0	0	0	0	0	0	1.1E-05	0	0
12378-PeCDD	9.8E-05	0	0	0	0	0	7.3E-05	1.6E-05	1.1E-04	0	9.0E-05	0
123478-HcCDD	2.0E-04	1.4E-04	1.0.E-04	0	3.9E-04	2.2E-04	3.3E-04	1.5E-04	1.7E-04	2.6E-04	3.7E-04	0
123678-HxCDD	3.0E-04	7.1E-04	4.5.E-04	1.4.E-03	1.2E-03	1.4E-03	2.1E-03	1.8E-03	4.7E-04	1.7E-03	2.8E-03	9.4E-04
123789-HxCDD	5.5E-04	1.0E-03	2.4.E-04	9.1.E-04	1.4E-03	8.5E-04	8.4E-04	4.9E-04	6.8E-04	7.4E-04	9.7E-04	1.5E-03
1234678-HpCDD	1.3E-02	3.1E-02	2.1.E-02	5.9.E-02	3.1E-02	7.0E-02	7.3E-02	7.0E-02	2.5E-02	7.8E-02	7.9E-02	3.6E-02
OCDD	9.8E-01	9.5E-01	9.6.E-01	9.1.E-01	8.4E-01	8.9E-01	8.4E-01	8.4E-01	9.6E-01	8.7E-01	8.0E-01	9.4E-01
2378-TCDF	1.1E-04	0	0	0	2.6E-04	0	2.4E-05	0	5.7E-05	3.5E-05	3.0E-05	0
12378-PeCDF	4.5E-05	0	0	0	2.1E-04	7.6E-05	2.2E-05	0	6.4E-05	6.3E-05	2.6E-05	0
23478-PeCDF	5.3E-05	0	0	0	3.6E-04	3.3E-05	0	1.5E-05	5.6E-05	4.4E-05	0	3.0E-03
123478-HxCDF	1.1E-04	2.0E-04	0	0	1.1E-03	2.9E-04	3.0E-04	0	1.4E-04	3.8E-04	4.6E-04	0
123678-HxCDF	3.0E-05	0	0	0	6.9E-04	1.2E-04	1.3E-04	0	9.8E-05	1.5E-04	1.7E-04	0
123789-HxCDF	0	0	0	0	2.2E-04	0	0	0	7.9E-05	2.5E-05	0	0
234678-HxCDF	5.3E-05	1.1E-04	0	0	1.3E-03	2.4E-04	1.2E-04	0	1.3E-04	3.5E-04	1.4E-04	0
1234678-HpCDF	5.6E-04	3.8E-03	2.0.E-03	4.5.E-03	8.8E-02	9.9E-03	1.2E-02	1.1E-02	2.1E-03	1.2E-02	1.5E-02	1.9E-02
1234789-HpCDF	0	2.5E-04	1.5.E-04	0	8.4E-04	5.2E-04	9.0E-04	9.1E-04	2.5E-04	8.6E-04	1.3E-03	0
OCDF	1.0E-03	1.1E-02	1.1.E-02	2.9.E-02	3.5E-02	2.5E-02	6.7E-02	7.3E-02	6.6E-03	3.9E-02	9.7E-02	0

Notes:
Clinton Crops PCDD/F data from USEPA (2007). The Dioxin-TEQ calculation for this sample is shown in Table 2-4.
Samples shown in this table are the non-tributary upstream (background) samples collected from Cedar Creek.
Concentration units are in ng/Kg$_{dw}$.
Sum PCDD/Fs were calculated setting non-detect results to zero.
Qual descriptions: U = not detected at concentration shown; J = estimated value; EMPC = Estimated maximum possible concentration; NR = not reported.

Table C-9c. Comparison of Absolute and Relative PCDD/F Congener Concentrations from North Carolina Background and Deep River Sediment
Southern Wood Piedmont - Gulf, North Carolina

	Absolute Concentrations (ng/Kg $_{dw}$)			
	Clinton Crop Stn (USEPA, 2007)		Deep River SW-068-SD	
Congener	Result	Qual	Result	Qual
2378-TCDD	0.03		1	U
12378-PeCDD	0.13	J		NR
123478-HxCDD	0.26		5	U
123678-HxCDD	0.39		5	U
123789-HxCDD	0.72		5	U
1234678-HpCDD	17.4		79	
OCDD	1,299		2,530	
2378-TCDF	0.14		1	U
12378-PeCDF	0.06	J	5	U
23478-PeCDF	0.07	J	5	U
123478-HxCDF	0.14	J	5	U
123678-HxCDF	0.04	J	5	U
123789-HxCDF	0.17	U	5	U
234678-HxCDF	0.07	J	5	U
1234678-HpCDF	0.74		9.29	
1234789-HpCDF	0.17	U	5	U
OCDF	1.33		25.4	
Sum PCDD/Fs	1,320		2,644	

	Relative Concentrations - Normalized to Total PCDD/Fs	
Congener	Clinton Crop Stn	Deep River SW-068-SD
2378-TCDD	2.3E-05	0.0
12378-PeCDD	9.8E-05	0.0
123478-HcCDD	2.0E-04	0.0
123678-HxCDD	3.0E-04	0.0
123789-HxCDD	5.5E-04	0.0
1234678-HpCDD	1.3E-02	3.0E-02
OCDD	9.8E-01	9.6E-01
2378-TCDF	1.1E-04	0.0
12378-PeCDF	4.5E-05	0.0
23478-PeCDF	5.3E-05	0.0
123478-HxCDF	1.1E-04	0.0
123678-HxCDF	3.0E-05	0.0
123789-HxCDF	0.0	0.0
234678-HxCDF	5.3E-05	0.0
1234678-HpCDF	5.6E-04	3.5E-03
1234789-HpCDF	0.0	0.0
OCDF	1.0E-03	9.6E-03

Notes:
Clinton Crops PCDD/F data from USEPA (2007). The Dioxin-TEQ calculation for this sample is shown in Table 2-4.
Sum PCDD/Fs were calculated setting non-detect results to zero.
Qual descriptions: U = not detected at concentration shown; J = Estimated value; NR = not reported.

Table C-10a. Comparison of Total PCDD/F and Total PAH Results from the Drainage Ditch and Cedar Creek Sediments
Southern Wood Piedmont - Gulf, North Carolina

Summary Calc	Metric	Drainage Ditch		Cedar Creek	
		No Trans	Log Trans	No Trans	Log Trans
Zero DLs	r-value	0.197	0.653	0.319	**0.761**
	p-value	0.679	0.112	0.229	**0.0006**
Half DLs	r-value	0.189	0.394	0.177	0.39
	p-value	0.684	0.382	0.512	0.134
Evaluated Samples		SW-013-SL (NCDENR), SW-015-SL (NCDENR), SW-024-SL (NCDENR), 02SW-053-SD, 02SW-054-SD, SW-057-SD, SW-059-SD		SW-029-SD (NCDENR), SW-031-SD (NCDENR), SW-032-SD (NCDENR), SW-044-SD (NCDENR), SW-044-SD, SW-045-SD (NCDENR), SW-045-SD, SW-047-SD (NCDENR), 99SW-053-SD, 99SW-054-SD, 99-SW-055-SD, SW-047-SD, SW-064-SD, SW-066-SD, SW-067-SD, SW-129-SD (NCDENR)	

Notes:
r-values closer to one indicate better correlations between total PAHs and total PCDD/Fs.
p-value greater than 0.05 indicate no significant correlation between total PAH and total PCDD/F concentrations. Significant correlations are shown in bold.
The evaluated samples were those where both PAHs and PCDD/Fs were positively detected.

Table C-10b. Correlation Coefficients for the Comparison of Total PAH Results in Sediments to Individual PCDD/F Congeners in Drainage Ditch Sediments Setting Non-Detects to Half-DLs

Chemical	Detection Frequency	Untransformed Data			Log Transformed Data		
		r-Value	p-Value	Conclusion	r-Value	p-Value	Conclusion
1,2,3,4,6,7,8-HpCDD	7/7	-0.05	0.923	No sig correl	0.28	0.540	No sig correl
1,2,3,4,6,7,8-HpCDF	7/7	-0.04	0.939	No sig correl	0.28	0.541	No sig correl
1,2,3,4,7,8,9-HpCDF	7/7	0.04	0.928	No sig correl	0.33	0.473	No sig correl
1,2,3,4,7,8-HxCDD	7/7	-0.01	0.985	No sig correl	0.36	0.427	No sig correl
1,2,3,4,7,8-HxCDF	4/7	0.42	0.345	No sig correl	0.54	0.212	No sig correl
1,2,3,6,7,8-HxCDD	7/7	-0.06	0.903	No sig correl	0.26	0.569	No sig correl
1,2,3,6,7,8-HxCDF	4/7	-0.08	0.865	No sig correl	0.26	0.566	No sig correl
1,2,3,7,8,9-HxCDD	7/7	0.21	0.655	No sig correl	0.51	0.243	No sig correl
1,2,3,7,8,9-HxCDF	1/7	0.15	0.753	No sig correl	0.43	0.334	No sig correl
1,2,3,7,8-PeCDD	4/7	-0.01	0.978	No sig correl	0.39	0.383	No sig correl
1,2,3,7,8-PeCDF	0/7	0.64	0.125	No sig correl	0.54	0.210	No sig correl
2,3,4,6,7,8-HxCDF	6/7	-0.20	0.663	No sig correl	-0.07	0.875	No sig correl
2,3,4,7,8-PeCDF	3/7	-0.01	0.987	No sig correl	0.37	0.412	No sig correl
2,3,7,8-TeCDD	2/7	0.56	0.190	No sig correl	0.65	0.116	No sig correl
2,3,7,8-TeCDF	0/7	0.59	0.163	No sig correl	0.50	0.256	No sig correl
OCDD	7/7	0.27	0.561	No sig correl	0.42	0.346	No sig correl
OCDF	7/7	0.06	0.896	No sig correl	0.32	0.481	No sig correl

Notes:
The detection frequency for the total PAHs was 7/7.
r-values closer to one indicate better correlations between total PAHs and total PCDD/Fs.
p-value greater than 0.05 indicate no significant correlation between total PAH and total PCDD/F concentrations. Values shown in bold represent significant correlations.
The evaluated samples were those where both PAHs and PCDD/Fs were positively detected (see Table C-12a).

Table C-10c. Correlation Coefficients for the Comparison of Total PAH Results in Sediments to Individual PCDD/F Congeners in Cedar Creek Sediments Setting Non-Detects to Zero DLs

Chemical	Detection Frequency	Untransformed Data			Log Transformed Data		
		r-Value	p-Value	Conclusion	r-Value	p-Value	Conclusion
1,2,3,4,6,7,8-HpCDD	7/7	-0.04	0.929	No sig correl	0.55	0.199	No sig correl
1,2,3,4,6,7,8-HpCDF	7/7	-0.03	0.945	No sig correl	0.55	0.202	No sig correl
1,2,3,4,7,8,9-HpCDF	7/7	0.05	0.921	No sig correl	0.58	0.168	No sig correl
1,2,3,4,7,8-HxCDD	7/7	-0.01	0.991	No sig correl	0.61	0.146	No sig correl
1,2,3,4,7,8-HxCDF	4/7	-0.28	0.548	No sig correl	-0.17	0.723	No sig correl
1,2,3,6,7,8-HxCDD	7/7	-0.05	0.910	No sig correl	0.54	0.216	No sig correl
1,2,3,6,7,8-HxCDF	4/7	-0.23	0.613	No sig correl	-0.04	0.938	No sig correl
1,2,3,7,8,9-HxCDD	7/7	0.21	0.649	No sig correl	0.75	0.054	No sig correl
1,2,3,7,8,9-HxCDF	1/7	-0.15	0.746	No sig correl	0.16	0.736	No sig correl
1,2,3,7,8-PeCDD	4/7	0.03	0.947	No sig correl	0.55	0.204	No sig correl
1,2,3,7,8-PeCDF	0/7	NC	—		NC	—	
2,3,4,6,7,8-HxCDF	6/7	-0.29	0.525	No sig correl	-0.39	0.385	No sig correl
2,3,4,7,8-PeCDF	3/7	-0.20	0.664	No sig correl	0.09	0.846	No sig correl
2,3,7,8-TeCDD	2/7	-0.19	0.691	No sig correl	0.29	0.522	No sig correl
2,3,7,8-TeCDF	0/7	NC	—		NC	—	
OCDD	7/7	0.27	0.554	No sig correl	0.68	0.094	No sig correl
OCDF	7/7	0.07	0.890	No sig correl	0.58	0.172	No sig correl

Notes:
The detection frequency for the total PAHs was 7/7.
r-values closer to one indicate better correlations between total PAHs and total PCDD/Fs.
p-value greater than 0.05 indicate no significant correlation between total PAH and total PCDD/F concentrations. Values shown in bold represent significant correlations.
NC: Not calculated. Congener was not detected in any of the samples.
The evaluated samples were those where both PAHs and PCDD/Fs were positively detected (see Table C-12 for listing).

Table C-11a. Correlation Coefficients for the Comparison of Total PAH Results in Sediments to Individual PCDD/F Congeners in Cedar Creek Sediments Setting Non-Detects to Half-DLs

Chemical	Detection Frequency	Untransformed Data			Log Transformed Data		
		r-Value	p-Value	Conclusion	r-Value	p-Value	Conclusion
1,2,3,4,6,7,8-HpCDD	38/44	0.08	0.759	No sig correl	0.40	0.127	No sig correl
1,2,3,4,6,7,8-HpCDF	37/44	0.24	0.365	No sig correl	0.40	0.125	No sig correl
1,2,3,4,7,8,9-HpCDF	29/44	-0.01	0.962	No sig correl	0.34	0.201	No sig correl
1,2,3,4,7,8-HxCDD	24/44	-0.06	0.819	No sig correl	0.17	0.540	No sig correl
1,2,3,4,7,8-HxCDF	21/44	0.27	0.306	No sig correl	0.30	0.264	No sig correl
1,2,3,6,7,8-HxCDD	33/44	0.14	0.601	No sig correl	0.42	0.108	No sig correl
1,2,3,6,7,8-HxCDF	20/44	-0.07	0.787	No sig correl	0.28	0.302	No sig correl
1,2,3,7,8,9-HxCDD	33/44	0.02	0.950	No sig correl	0.19	0.480	No sig correl
1,2,3,7,8,9-HxCDF	2/44	0.07	0.808	No sig correl	0.47	0.069	No sig correl
1,2,3,7,8-PeCDD	9/23	0.08	0.772	No sig correl	0.18	0.509	No sig correl
1,2,3,7,8-PeCDF	11/44	0.33	0.207	No sig correl	0.46	0.074	No sig correl
2,3,4,6,7,8-HxCDF	18/44	-0.17	0.533	No sig correl	0.00	0.987	No sig correl
2,3,4,7,8-PeCDF	13/44	-0.09	0.749	No sig correl	0.27	0.312	No sig correl
2,3,7,8-TeCDD	6/44	0.04	0.895	No sig correl	0.35	0.177	No sig correl
2,3,7,8-TeCDF	19/44	0.07	0.792	No sig correl	0.22	0.405	No sig correl
OCDD	43/44	0.18	0.505	No sig correl	0.39	0.140	No sig correl
OCDF	33/44	0.19	0.478	No sig correl	0.44	0.091	No sig correl

Notes:
The detection frequency for the total PAHs was 16/44.
r-values closer to one indicate better correlations between total PAHs and total PCDD/Fs.
p-value greater than 0.05 indicate no significant correlation between total PAH and total PCDD/F concentrations. Values shown in bold represent significant correlations.
The evaluated samples were those where both PAHs and PCDD/Fs were positively detected (see Table C-12a for listing).

Table C-11b. Correlation Coefficients for the Comparison of Total PAH Results in Sediments to Individual PCDD/F Congeners in Cedar Creek Sediments Setting Non-Detects to Zero DLs

Chemical	Detection Frequency	Untransformed Data			Log Transformed Data		
		r-Value	p-Value	Conclusion	r-Value	p-Value	Conclusion
1,2,3,4,6,7,8-HpCDD	38/44	0.23	0.384	No sig correl	0.72	**0.002**	**Sig correl**
1,2,3,4,6,7,8-HpCDF	37/44	0.39	0.133	No sig correl	0.77	**<0.001**	**Sig correl**
1,2,3,4,7,8,9-HpCDF	29/44	0.12	0.668	No sig correl	0.73	**0.001**	**Sig correl**
1,2,3,4,7,8-HxCDD	24/44	0.09	0.744	No sig correl	0.69	**0.003**	**Sig correl**
1,2,3,4,7,8-HxCDF	21/44	-0.16	0.558	No sig correl	0.25	0.344	No sig correl
1,2,3,6,7,8-HxCDD	33/44	0.29	0.276	No sig correl	0.73	**0.001**	**Sig correl**
1,2,3,6,7,8-HxCDF	20/44	0.07	0.790	No sig correl	0.72	**0.002**	**Sig correl**
1,2,3,7,8,9-HxCDD	33/44	0.17	0.529	No sig correl	0.74	**0.001**	**Sig correl**
1,2,3,7,8,9-HxCDF	2/44	-0.06	0.816	No sig correl	0.22	0.410	No sig correl
1,2,3,7,8-PeCDD	9/23	0.25	0.342	No sig correl	0.59	**0.017**	**Sig correl**
1,2,3,7,8-PeCDF	11/44	-0.18	0.494	No sig correl	0.19	0.489	No sig correl
2,3,4,6,7,8-HxCDF	18/44	-0.12	0.666	No sig correl	0.20	0.448	No sig correl
2,3,4,7,8-PeCDF	13/44	0.10	0.723	No sig correl	0.44	0.087	No sig correl
2,3,7,8-TeCDD	6/44	-0.12	0.656	No sig correl	-0.12	0.662	No sig correl
2,3,7,8-TeCDF	19/44	-0.19	0.471	No sig correl	-0.03	0.913	No sig correl
OCDD	43/44	0.32	0.230	No sig correl	0.75	**0.001**	**Sig correl**
OCDF	33/44	0.33	0.209	No sig correl	0.75	**0.001**	**Sig correl**

Notes:
The detection frequency for the total PAHs was 16/44.
r-values closer to one indicate better correlations between total PAHs and total PCDD/Fs.
p-value greater than 0.05 indicate no significant correlation between total PAH and total PCDD/F concentrations. Values shown in bold represent significant correlations.
The evaluated samples were those where both PAHs and PCDD/Fs were positively detected (see Table C-12a for listing).

Attachment C1
Quality Control Assessment of Analytical Results for Fingerprinting Assessment

Appendix C - Attachment C1
Quality Control Assessment of Analytical Results for Fingerprinting Assessment

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LIST OF FIGURES

Figure	Description
	SW-039-SD (NCDENR)
Figure C1-7b	Comparison of PCDD/F Congener Concentrations in Samples Collected at Different Times from Cedar Creek - Samples SW-028-SD, SW-042-SD and SW-042-SD (NCDENR)
Figure C1-7c	Comparison of PCDD/F Congener Concentrations in Samples Collected at Different Times from Cedar Creek - Samples SW-029-SD, SW-129-SD, SW-043-SD, SW-143-SD, SW-043-SD (NCDENR) and SW-043-SD (NCDENR)

Appendix C - Attachment C1
Quality Control Assessment of Analytical Results for Fingerprinting Assessment

C1.1 Introduction

This attachment summarizes some of the key field quality control (QC) results of the analytical dataset in support of the fingerprinting assessment of the sediment results. Since multiple datasets collected over different years and analyzed by different laboratories were available, the focus of this field QC assessment was the following:

- Evaluation of field duplicates;
- Evaluation of split sample results between SWP and NCDENR; and
- Evaluation of co-located samples that were collected during different sampling events.

The field duplicates were identified as those samples that start with "1" in the Sample ID code (e.g., SW-167-SD is the field duplicate of sample SW-067-SD). The samples that were split with NCDENR are designated with the sample ID followed by "(NCDENR)" for the data reported by the State of North Carolina. Since the fingerprinting assessment evaluated only the PAH and PCDD/F results, these were the focus of this QC assessment.

C1.2 Drainage Ditch Samples

C1.2.1 PAH Results

The analytical results for the PAHs in the Drainage Ditch sediment samples are summarized in Appendix Table A-2. There were 20 samples (plus one field duplicate) collected from the Drainage Ditch in the analytical database. One sample representing background (SW-013-SL) was collected from upgradient of the SWP facility.

Variation in Drainage Ditch Sediment PAH Field Duplicate Results

There was one sample-duplicate pair (SW-058-SD and SW-158-SD) collected for PAHs from the Drainage Ditch. Neither sample contained any detectable PAHs.

Variation in Drainage Ditch Sediment PAH Split Sample Results

There were two split samples in this dataset. The 10 PAHs are plotted and the results compared on Figure C1-1, and the results are summarized below.

- *SW-024-SL and SW-024-SL (NCDENR)*: Sample SW-024-SL contained no detectable PAHs, while sample SW-024-SL (NCDENR) had total PAH concentration of 2.91 mg/Kg_{dw}, with most of the concentration (2.72 mg/Kg_{dw}) represented by the H-PAHs. The predominant PAHs in this sample were BF, BaP and Chry. The inconsistency between these results was not attributable to elevated detection limits, since the reported detection limit in sample SW-024-SL for all of the PAHs was 0.01 mg/Kg_{dw}.

- *SW-015-SL and SW-015-SL (NCDENR)*: Samples SW-015-SL and SW-015-SL (NCDENR) had similar total PAH concentrations (382 and 362 mg/Kg_{dw}, respectively), but had different patterns in their Fluoran and Fluor concentrations, with higher concentrations observed in the SW-015-SL sample. The Phe concentrations were similar between the two split samples.

The results of the split samples suggest wide variability in both the reported PAH concentrations and in the relative PAH concentrations. This variability was likely due to sample non-homogeneity.

Temporal Variation in Drainage Ditch Sediment PAH Concentrations

There were no samples that were co-located spatially but collected at different times for the PAHs from the Drainage Ditch.

In summary, the evaluation of the field QC for the PAH results from the Drainage Ditch samples showed wide variability in the reported results, both as concentrations and in the PAHs that were identified in the split samples. This difference may have been due to sample non-homogeneity between these split samples. A field duplicate was not available to further assess sample matrix issues for the PAHs from the Drainage Ditch.

C.1.2.2 Drainage Ditch PCDD/F Results

The analytical results for the PCDD/Fs in the Drainage Ditch sediment samples are summarized in Appendix Table A-2. There were eight samples collected from the Drainage Ditch in the analytical database. These samples were collected in 1995, 1998, and 2002. All samples contained at least one PCDD/F congener. One sample was collected from upgradient of the SWP facility representing background (SW-013-SL).

Variation in Drainage Ditch Sediment PCDD/F Field Duplicate Results

There were no field duplicate samples collected for the Drainage Ditch samples.

Variation in Drainage Ditch Sediment PCDD/F Split Sample Results

There were no split samples collected for the Drainage Ditch samples.

Temporal Variation in Drainage Ditch Sediment PCDD/F Concentrations

There were no Drainage Ditch sediment samples that were co-located spatially but collected during different sampling events for PCDD/Fs.

C1.3 Cedar Creek Samples

C1.3.1 Cedar Creek PAH Results

The analytical results for the PAHs in the Cedar Creek sediment samples are summarized in Appendix Table A-3. There were 63 sample results (including six field duplicates) collected from Cedar Creek in the analytical database. Fifteen samples were collected from upgradient of the SWP facility, 10 from three of the downstream creek tributaries, and the remaining from the main, downstream channel. Thirty-six samples (fourteen from the upgradient locations, six from the tributaries and 16 from the main channel) contained no detectable PAHs.

Variation in Cedar Creek Sediment PAH Field Duplicate Results

There were six sets of samples that were collected as sample–duplicate pairs. These included samples that were collected by SWP and by NCDENR. The results from these comparisons are summarized below by sample-duplicate pair, and are listed from upstream to downstream locations.

- *SW-029-SD and SW-129-SD*: These samples were collected at the juncture with the drainage ditch in 1995. Both samples had detectable PAHs, although sample SW-029-SD had a greater total PAH concentration (1,050 mg/Kg_{dw}) than the field duplicate SW-129-SD (250 mg/Kg_{dw}). Figure C1-1a, which compares the PAH concentration pattern for the subset of 10 PAHs, shows that the relative PAH patterns were fairly similar.

- *SW-065-SD and SW-165-SD:* These samples were collected from a downstream location in 2002. Both samples had the same five PAHs detected (Figure C1-2b), and sample SW-065-SD had a slightly lower total PAH concentration (0.49 mg/Kg_{dw}) compared to its field duplicate SW-129-SD (0.67 mg/Kg_{dw}). The concentrations were similar between these five PAHs, except for Anth, which was detected at 0.052 and 0.19 mg/Kg_{dw} in samples SW-065-SD and SW-165-SD (respectively).

- *SW-043-SD and SW-143-SD, SW-043-SD (NCDENR) and SW-143-SD (NCDENR), SW-052-SD and SW-152-SD, SW-052-SD (NCDENR) and SW-152-SD (NCDENR)*: These sample-duplicate pairs were all collected from downstream locations. None of them had any detectable PAHs.

Variation in Cedar Creek Sediment PAH Split Sample Results

There were 12 sets of sediment samples analyzed for PAHs that were split for analysis by SWP and NCDENR. These samples, which were collected in 1995 or 1998, are evaluated below.

- *SW-025-SD and SW-025-SD (NCDENR), SW-026-SD and SW-026-SD (NCDENR), SW-040-SD and SW-040-SD (NCDENR), SW-041-SD and SW-041-SD (NCDENR), SW-042-SD and SW-042-SD (NCDENR), SW-046-SD and SW-046-SD (NCDENR), SW-048-SD and SW-048-SD (NCDENR), SW-049-SD and SW-049-SD (NCDENR), and SW-050-SD and SW-050-SD (NCDENR)*: These samples were collected in 1995 or 1998. There were no detectable PAHs in any of these samples.

- *SW-029-SD and SW-029-SD (NCDENR)*: These samples were collected at the juncture with the drainage ditch in 1995. Both samples had PAHs detected, although the NCDENR sample [SW-29-SD (NCDENR) had a greater total PAH concentration (1,050 mg/Kg_{dw}) than the SWP sample (SW-029-SD; 264 mg/Kg_{dw}). Figure C1-3a compares the PAH pattern between these two samples. A larger number of PAHs were reported in sample SW-029-SD (NCDENR) compared to SW-029-SD. However, with the exception of Naph, when the same PAHs were detected in the paired samples the normalized ratios were greater in sample SW-029-SD.

- *SW-044-SD and SW-044-SD (NCDENR)*: These samples were collected from a downstream location in 1998. Both samples had PAHs detected, but the SWP sample (SW-044-SD) had a greater total PAH concentration than the NCDENR sample (74 and 30 mg/Kg_{dw}, respectively). Figure C1-3b compares the PAH pattern between these two samples. A larger number of PAHs were reported in sample SW-044-SD (NCDENR) compared to SW-044-SD. However, when the same PAHs were detected in the paired samples, they were fairly similar.

- *SW-045-SD and SW-045-SD (NCDENR)*: These samples were collected from a downstream location in 1998. These samples had similar total PAH concentrations 36 and 39 mg/Kg_{dw}). Figure C1-3c compares the PAH pattern between these two samples. A larger number of PAHs were reported in sample SW-045-SD (NCDENR) compared to SW-045-SD. Despite similar total PAH concentrations, these two samples were highly variable in their relative PAH concentrations.

In summary, when PAHs were detected in both of the split samples, their relative patterns were similar. When PAHs were detected in one but not both of the split samples, and even when total PAH concentrations were similar between these spits, there were variations in the PAH patterns. This variability may impact the chemical fingerprinting assessment.

Temporal Variation in Cedar Creek Sediment PAH Concentrations

There were four sets of sediment samples analyzed for PAHs that were co-located spatially but were collected during different sample events from Cedar Creek. These are evaluated below and are listed from upstream to downstream locations.

- *SW-025-SD, SW-025-SD (NCDENR) and SW-039-SD*: Samples SW-025-SD and SW-025-SD (NCDENR) were collected in 1995, while the remaining sample (SW-039-SD) was collected in 1998. There were no detectable PAHs in any of these samples.

- *SWP-009, SW-026-SD, SW-026-SD (NCDENR), SW-040-SD and SW-040-SD (NCDENR)*: Sample SWP-009 was collected in 1983, samples SW-026-SD and SW-026-SD (NCDENR) were collected in 1995, and SW-040-SD and SW-040-SD (NCDENR) were collected in 1998. All of these samples, except for SWP-009, contained no detectable PAHs. The total PAH concentration in sample SWP-009 was 1.6 mg/Kg_{dw}). These results suggest a significant decline in PAH concentrations with time.

- *SWP-002, 8750, SW-029-SD, SW-029-SD (NCDENR), SW-129-SD (NCDENR), SW-043-SD, SW-143-SD, SW-043-SD (NCDENR) and SW-143-SD (NCDENR)*: Sample SWP-002 was collected in 1983, sample 8750 was collected in 1990, samples *SW-029-SD, SW-029-SD (NCDENR), SW-129-SD (NCDENR)* were collected in 1995, and samples *SW-043-SD, SW-143-SD, SW-043-SD (NCDENR) and SW-143-SD (NCDENR)* were collected in 1998. These were all located at the juncture of the Drainage Ditch and Cedar Creek. There were no detectable PAHs in the most recent samples [*SW-043-SD, SW-143-SD, SW-043-SD (NCDENR) and SW-143-SD (NCDENR)*]. The total PAH results (as mg/Kg_{dw}) for all of the samples are summarized in the table below.

Sample ID	Year	Total PAHs (mg/Kg$_{dw}$)
SWP-002	1983	18.8
8750	1990	41.9
SW-029-SD	1990	264
SW-029-SD (NCDENR)	1995	1,050
SW-129-SD (NCDENR)	1995	250
SW-043-SD	1998	ND
SW-143-SD	1998	ND
SW-043-SD (NCDENR)	1998	ND
SW-143-SD (NCDENR)	1998	ND

The total PAH results in these samples were highly variable with time. Figure C1-4a compares the individual PAH concentrations. Review of this table shows high variability in the individual PAH results for the samples collected from the same location. The most recent set of samples (collected in 1998) that included both split and duplicated samples, showed no detectable PAHs from this location.

- *SWP-001, 8749, 8871, SW-030-SD, SW-030-SD (NCDENR), SW-044-SD and SW-044-SD (NCDENR)*: Sample SWP-001 was collected in 1983, samples 8749 and 8891 were collected in 1990, samples SW-030-SD and SW-030-SD (NCDENR) were collected in 1995, and samples SW-044-SD and SW-044-SD (NCDENR) were collected in 1998. These were all located at the property line near the juncture of the Drainage Ditch and Cedar Creek. There were no detectable PAHs in sample 8749, but PAHs were detected in the remaining samples. The total PAH results (as mg/Kg$_{dw}$) are summarized below.

Sample ID	Year	Total PAHs (mg/Kg$_{dw}$)
SWP-001	1983	16.5
8749	1990	ND
8871	1990	28.6
SW-030-SD	1995	29.7
SW-030-SD (NCDENR)	1995	24.1
SW-044-SD	1998	74
SW-044-SD (NCDENR)	1998	29.9

The total PAH results were highly variable in these samples with time. Figure C1-4b compares the individual PAH concentrations. Review of this table shows high variability in the individual PAH results for the samples collected from the same location.

In summary, samples that were collected from the same location but during different sample events from Cedar Creek exhibited large variation in both their total PAH concentrations as well as relative PAH patterns. Consequently a detailed fingerprinting assessment of the PAH results using PCA and CA were not performed on any of the sediments samples.

C1.3.2 Cedar Creek PCDD/F Results

The analytical results for the PCDD/Fs in the sediments from Cedar Creek, associated tributaries, and the Deep River, are summarized in Appendix Table A-3. There were a total of 45 results from 21 locations in the analytical database.

Variation in Cedar Creek Sediment PCDD/F Field Duplicate Results

There were six sets of samples that were collected as sample–duplicate pairs. These included samples that were collected by SWP and by NCDENR. The results from these comparisons are summarized below by sample-duplicate pair, and are listed from upstream to downstream locations.

- *SW-029-SD and SW-129-SD*: These samples were collected from a downstream location in 1995. Both samples had the same PCDD/F congeners detected, although the field duplicate SW-129-SD had greater concentrations of the individual congeners compared to the paired sample SW-029-SD (Figure C1-5a).

- *SW-043-SD and SW-143-SD*: These samples were collected from a downstream location in 1998. Both samples had the same PCDD/F congeners detected, except for 2,3,7,8-TCDD, which was detected in sample SW-043-SD, only. The remaining congeners had similar concentrations in this sample-duplicate pair (Figure C1-5b).

- *SW-043-SD (NCDENR) and SW-143-SD (NCDENR)*: These samples were collected from a downstream location in 1998. Both samples had the same six PCDD/F congeners detected. The remaining congeners had similar concentrations in this sample-duplicate pair (Figure C1-5c).

- *SW-067-SD and SW-167-SD*: These samples were collected from a downstream location in 2002. Both samples had the same PCDD/F congeners detected, except for 1,2,3,7,8,9-HxCDD, which was detected in the field duplicate SW-167-SD only. The remaining congeners had similar concentrations in this sample-duplicate pair (Figure C1-5d).

- *SW-052-SD and SW-152-SD*: These samples were collected from a downstream location in 1998. Both samples had the same PCDD/F congeners detected, except for 2,3,7,8-TCDD and 2,3,4,7,8-PeCDF, which were detected in the SW-052-SD only. The remaining congeners had similar concentrations in this sample-duplicate pair (Figure C1-5e).

- *SW-052-SD (NCDENR) and SW-152-SD (NCDENR)*: These samples were collected from a downstream location in 1998. Both samples had the same PCDD/F congeners detected. The remaining congeners had similar concentrations in this sample-duplicate pair, except for OCDF, which was detected at a lower concentration in the field duplicate [SW-152-SD (NCDENR)] compared to the original sample (Figure C1-5f).

In summary, there was reasonably good agreement between the sample and field duplicate pairs with the exception of some of the individual PCDD/F congeners. There was no consistency in the specific congeners that were divergent in some of the samples.

Variation in Cedar Creek Sediment PCDD/F Split Sample Results

There were 13 sets of samples from Cedar Creek that were collected as split samples between SWP and NCDENR. Several of these were also included as sample-duplicate pairs. The results from these comparisons are summarized below by split sample pairs, and are listed from upstream to downstream locations.

- *SW-039-SD and SW-039-SD (NCDENR)*: These samples were collected from an upstream (background) location in 1998. OCDD was the only congener that was detected in both samples, while sample SW-039-SD also had three other congeners (2,3,7,8-TeCDD, 2,3,7,8-TeCDF, and 1,2,3,4,6,7,8-HpCDD) detected (Figure C1-6a). Since sample SW-039-SD included 2,3,7,8-TeCDD, which has a TEF value of one, the Dioxin-TEQ concentrations calculated from these split samples will differ.

- *SW-040-SD and SW-040-SD (NCDENR)*: These samples were collected from an upstream (background) location in 1998. OCDD was the only congener that was detected in both samples, with comparable concentrations reported (Figure C1-6b). Sample SW-040-SD also had five other congeners detected (2,3,7,8-TeCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,7,8,9-HxCDD, 1,2,3,4,6,7,8-HpCDD, and 1,2,3,4,6,7,8-HpCDF), albeit at far lower concentrations than reported for OCDD.

- *SW-041-SD and SW-041-SD (NCDENR)*: These samples were collected from an upstream (background) location in 1998. OCDD was the only congener that was detected in both samples (Figure C1-6c). Somewhat higher concentrations of OCDD were detected in sample SW-041-SD (NCDENR) than in sample SW-041-SD (590 and 258 ng/Kg_{dw}, respectively). Sample SW-041-SD also had two other congeners detected (2,3,7,8-TeCDF and 1,2,3,4,6,7,8-HpCDD).

- *SW-042-SD and SW-042-SD (NCDENR)*: These samples were collected from an upstream (background) location in 1998. OCDD was the only congener that was

detected in both samples (Figure C1-6d). Somewhat higher concentrations of OCDD were detected in sample SW-042-SD (NCDENR) than in sample SW-041-SD (170 and 115 ng/Kg_{dw}, respectively). Sample SW-042-SD also had three other congeners detected (2,3,7,8-TeCDF, 1,2,3,4,6,7,8-HpCDD, and 1,2,3,4,6,7,8-HpCDF).

- *SW-044-SD and SW-044-SD (NCDENR)*: These samples were collected from a downstream location in 1998. These split samples had widely differing PCDD/F results (Figure C1-6e), with 11 congeners detected in SW-044-SD and 16 congeners detected in sample SW-044-SD (NCDENR).

- *SW-045-SD and SW-045-SD (NCDENR)*: These samples were collected from a downstream location in 1998. These split samples had widely differing PCDD/F results (Figure C1-6f), with 12 congeners detected in SW-044-SD and 16 congeners detected in sample SW-044-SD (NCDENR). When the congeners were detected in both samples, the concentrations were generally higher in SW-045-SD.

- *SW-046-SD and SW-046-SD (NCDENR):* These samples were collected from a creek tributary (Trib-N1) in 1998. Ten PCDD/F congeners were detected in SW-046-SD while eight were detected in SW-046-SD (NCDENR). When the same congener was detected in both samples, the concentrations were fairly similar (Figure C1-6g). OCDD was the dominant congener in both samples.

- *SW-047-SD and SW-047-SD (NCDENR)*: These samples were collected from a downstream location in 1998. Twelve PCDD/F congeners were detected in SW-047-SD while 14 were detected in SW-047-SD (NCDENR). As shown in Figure C1-6h, when the same congeners were detected in both samples the higher concentrations were nearly always observed in sample SW-047-SD (the exception was OCDF).

- *SW-048-SD and SW-048-SD (NCDENR)*: These samples were collected from a creek tributary (Trib-N3) in 1998. Twelve PCDD/F congeners were detected in SW-048-SD while 14 were detected in SW-048-SD (NCDENR). As shown in Figure C1-6i when the same congeners were detected in both samples, similar or slightly higher concentrations were reported in sample SW-048-SD (the exception was OCDF).

- *SW-049-SD and SW-049-SD (NCDENR)*: These samples were collected from a downstream location in 1998. Twelve PCDD/F congeners were detected in SW-049-SD, while 10 were detected in SW-049-SD (NCDENR). As shown in Figure C1-6j when the same congeners were detected in both samples, similar or slightly higher concentrations were reported in sample SW-049-SD. The largest difference was observed in the reported concentrations for 2,3,7,8-TCDF (0.5 and 0.15 ng/Kg_{dw}, respectively).

- *SW-051-SD and SW-051-SD (NCDENR)*: These samples were collected from a downstream location in 1998. Thirteen PCDD/F congeners were detected in SW-051-SD while 11 were detected in SW-051-SD (NCDENR). As shown in Figure C1-6k there was variation in the relative concentrations of the different congeners when the same congeners were detected in both samples. The largest difference was observed in the reported concentrations between SW-051-SD and SW-051-SD (NCDENR) for 2,3,7,8-TCDF (0.5 and 0.54 ng/Kg_{dw}, respectively), 1,2,3,4,7,8-HxCDD (1.9 and 17 ng/Kg_{dw}, respectively), and 1,2,3,6,7,8-HxCDD (17.5 and 1.4 ng/Kg_{dw}, respectively).

- *SW-052-SD and SW-052-SD (NCDENR)*: These samples were collected from a downstream location in 1998. Fourteen PCDD/F congeners were detected in SW-052-SD, while nine were detected in SW-052-SD (NCDENR). As shown in Figure C1-6l, when the congeners were detected in both samples the concentrations were fairly consistent. The variability in the congeners that were detected will result in different TEQ calculations and fingerprinting patterns for these two samples.

- *SW-152-SD and SW-152-SD (NCDENR)*: These samples were collected from a downstream location in 1998 and were the field duplicates for samples SW-052-SD and SW-052-SD (NCDENR). Twelve PCDD/F congeners were detected in SW-152-SD while eight were detected in SW-152-SD (NCDENR). As shown in Figure C1-6m, when the congeners were detected in both samples the concentrations were fairly consistent. The largest difference was observed in the reported concentrations between SW-152-SD and SW-152-SD (NCDENR) for 2,3,7,8-TCDF (1.2 and 0.3 ng/Kg_{dw}, respectively), OCDD (9,220 and 5,200 ng/Kg_{dw}, respectively), and OCDF (295 and 43 ng/Kg_{dw}, respectively).

In summary, there was some variation between the reported PCDD/F results in the split samples between SWP and NCDENR. Of these comparisons, the most significant variation was observed with sample SW-044-SD/SW-044-SD (NCDENR). These are likely due to inter-laboratory variation, and possibly also sample non-homogeneity.

Temporal Variation in Cedar Creek Sediment PCDD/F Concentrations

There were three groups of sediment samples co-located spatially but collected during different sample events from Cedar Creek. These are evaluated below and are listed from upstream to downstream locations.

- *SW-025-SD, SW-039-SD and SW-039-SD (NCDENR)*: Sample SW-025-SD was collected in 1995 while the remaining samples were collected in 1998. All samples were

collected from an upstream (background) location on the west side of Oldham Road (Figure 2-4). The Dioxin-TEQ concentrations (ng/Kg_{dw}) in these samples were low, as summarized in the table below (non-detects were set to zero for these calculations).

	Dioxin-TEQ_{mammal}	Dioxin-TEQ_{avian}
SW-025-SD	0.37	0.94
SW-039-SD	0.28	0.72
SW-039-SD (NCDENR)	0.16	0.52

Figure C1-7a compares the normalized congener concentrations in these samples. Only a small number of congeners were detected in these three samples. Two congeners were detected in SW-025-SD (1,2,3,4,6,7,8-HpCDF and OCDD), four in SW-039-SD (2,3,7,8-TeCDD, 2,3,7,8-TeCDF, 1,2,3,4,6,7,8-HpCDD and OCDD) and OCDD was the only congener detected in SW-039-SD (NCDENR). OCDD was the dominant congener in these samples, which was not unexpected since it is the more ubiquitous PCDD/F congener.

- *SW-028-SD, SW-042-SD and SW-042-SD (NCDENR)*: Sample SW-028-SD was collected in 1995 while the remaining samples were collected in 1998. All samples were collected from an upstream (background) location just upstream of the SWP facility property (Figure 2-4). The Dioxin-TEQ concentrations (ng/Kg_{dw}) were not detected in sample SW-028-SD and were low in the remaining samples, as summarized in the table below (non-detects were set to zero for these calculations).

	Dioxin-TEQ_{mammal}	Dioxin-TEQ_{avian}
SW-028-SD	ND	ND
SW-042-SD	0.07	0.30
SW-042-SD (NCDENR)	0.05	0.17

Figure C1-7b compares the normalized congener concentrations in these samples. There were no detectable PCDD/F congeners in samples SW-028-SD. Four congeners were detected in SW-042-SD (1,2,3,4,6,7,8-HpCDF and OCDD), four in SW-039-SD (2,3,7,8-TeCDF, 1,2,3,4,6,7,8-HpCDD, 1,2,3,4,6,7,8-HpCDF, and OCDD) and OCDD was the only congener detected SW-042-SD (NCDENR). OCDD was the dominant congener in these two samples.

- *SW-029-SD, SW-129-SD, SW-043-SD, SW-143-SD, SW-043-SD (NCDENR) and SW-043-SD (NCDENR):* Sample SW-029-SD and its field duplicate SW-129-SD were collected in 1995, while the remaining samples were collected in 1998. All samples were collected from a point on the property near the juncture of the Drainage Ditch and Cedar Creek (Figure 2-4). The Dioxin-TEQ concentrations (ng/Kg_{dw}) in these samples

were low, as summarized in the table below (non-detects were set to zero for these calculations).

	Dioxin-TEQ$_{mammal}$	Dioxin-TEQ$_{avian}$
SW-029-SD	362	654
SW-129-SD	301	491
SW-043-SD	2.23	1.79
SW-143-SD	3.17	2.21
SW-043-SD (NCDENR)	2.54	2.59
SW-143-SD (NCDENR)	3.10	4.15

There was a significant decline in concentrations between the 1995 samples (SW-029-SD and SW-129-SD) and the remaining samples collected in 1998.

Figure C1-7c compares the normalized congener concentrations in these samples. The 1995 and 1998 results were widely divergent in their relative congener patterns. The number of congener detections also varied between the sample years. OCDD was the dominant congener in these two samples.

In summary, the temporal variation was most significant for samples collected from the point on the property near the juncture of the Drainage Ditch and Cedar Creek [SW-029-SD, SW-129-SD, SW-043-SD, SW-143-SD, SW-043-SD (NCDENR) and SW-043-SD (NCDENR)]. These also exhibited the most dramatic change in total PCDD/F concentrations with time. This variation will likely impact the fingerprinting analysis for the Cedar Creek samples.

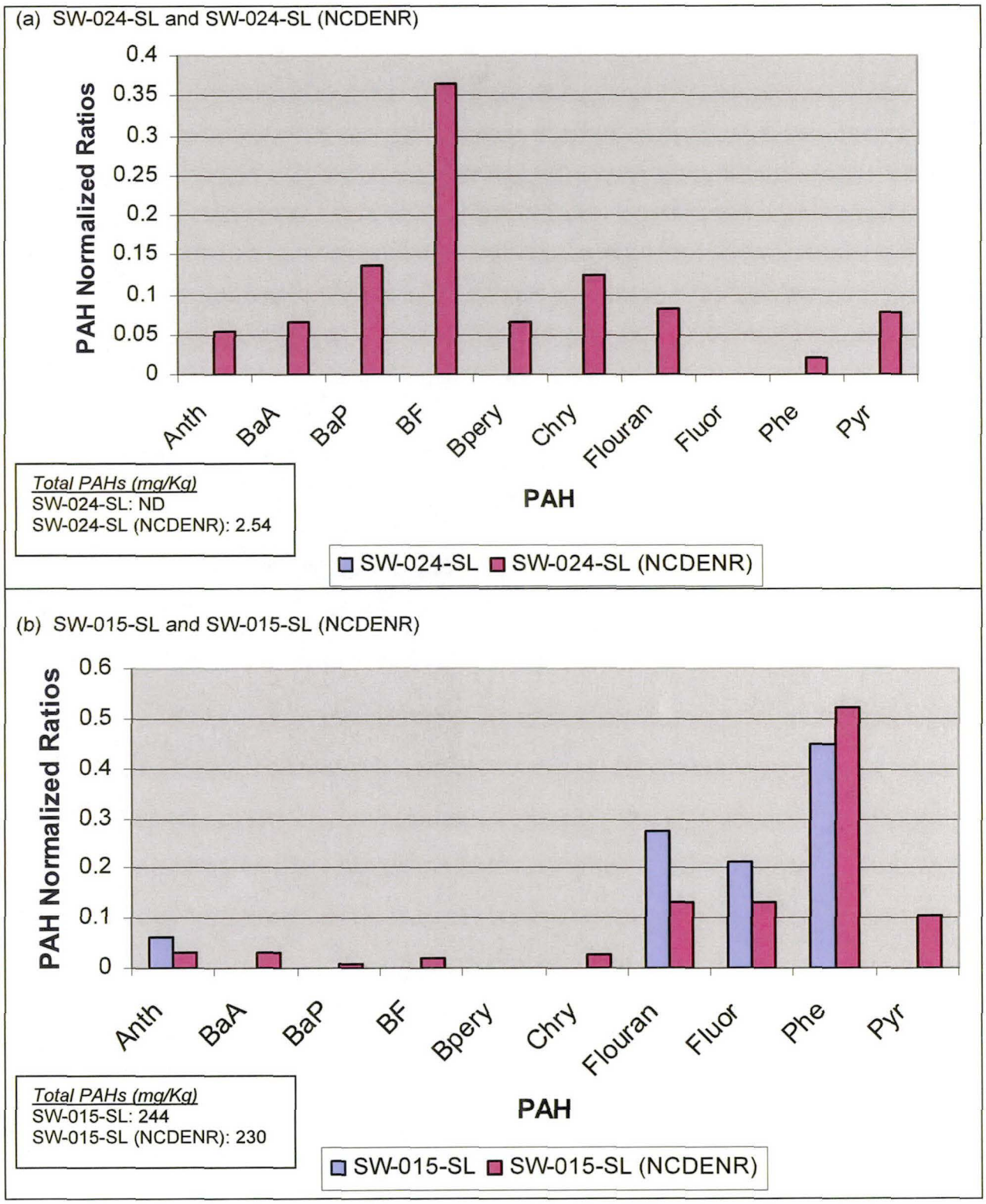

Figure C1-1. Comparison of Relative PAH Patterns in Split Sediment Samples Collected from the Drainage Ditch

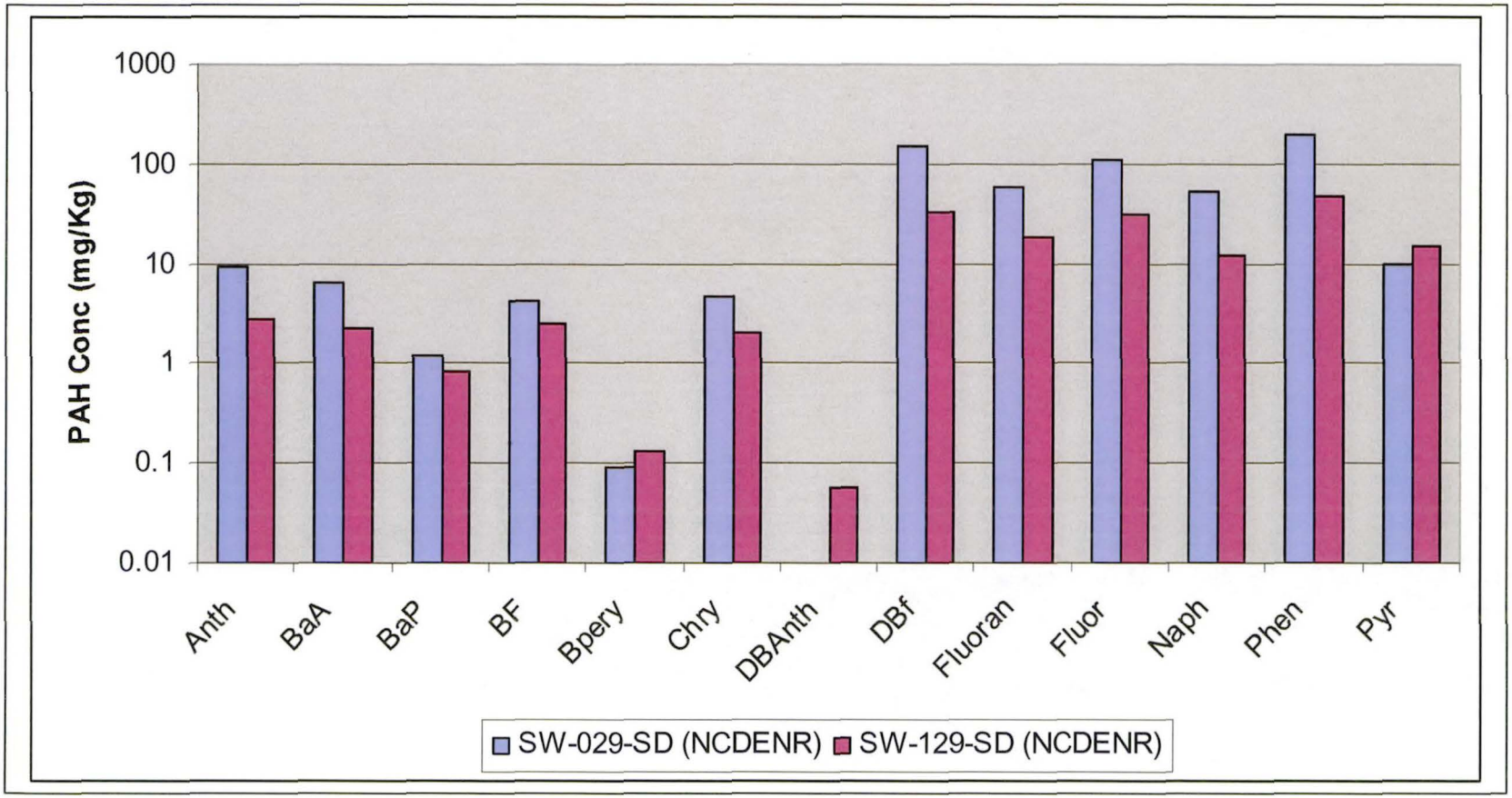

Figure C1-2a. Comparison of PAH Concentrations in Samples Collected as Field Duplicates from Cedar Creek - Samples SW-029-SD and SW-129-SD

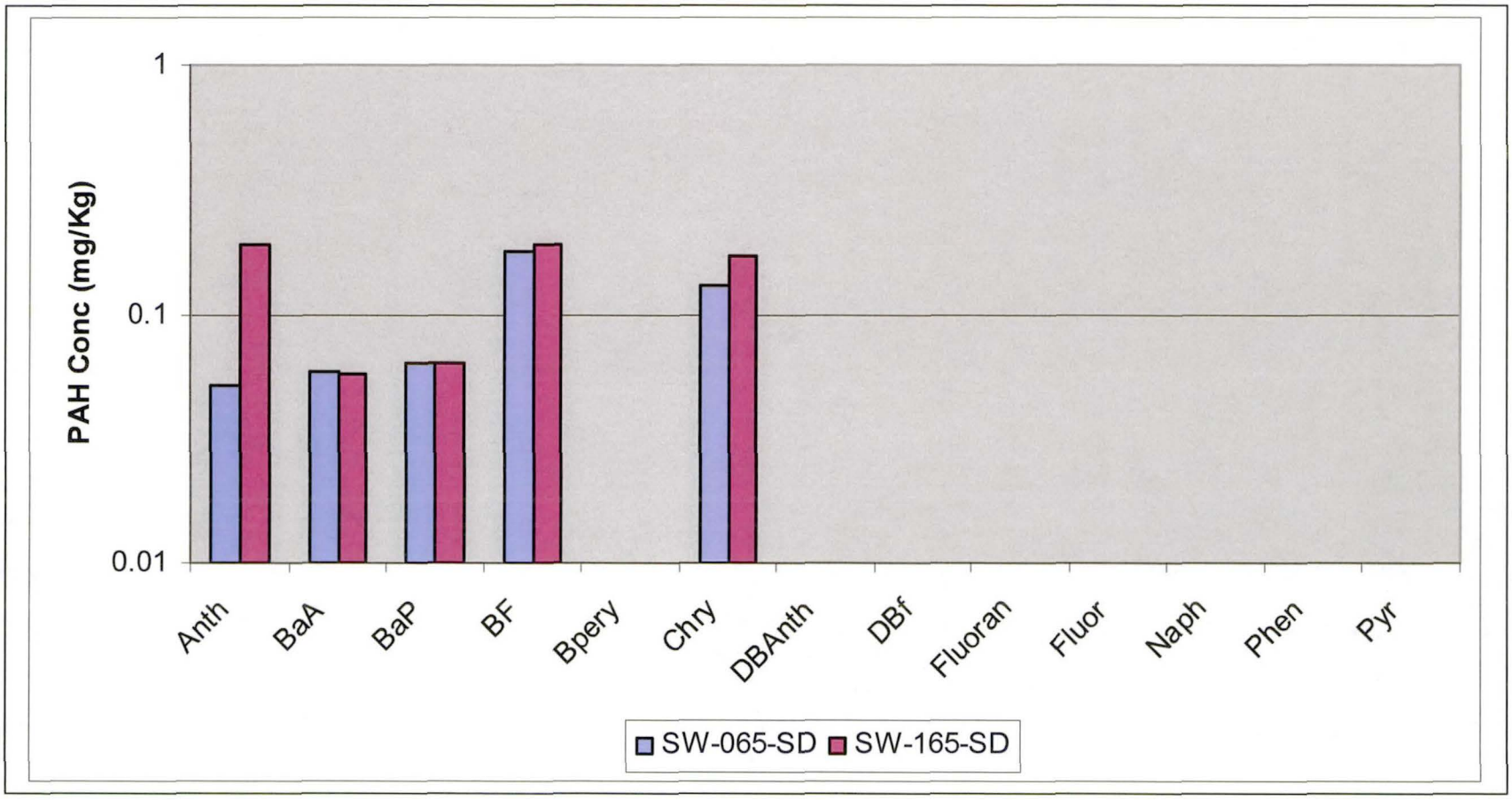

Figure C1-2b. Comparison of PAH Concentrations in Samples Collected as Field Duplicates from Cedar Creek - Samples SW-065-SD and SW-165-SD

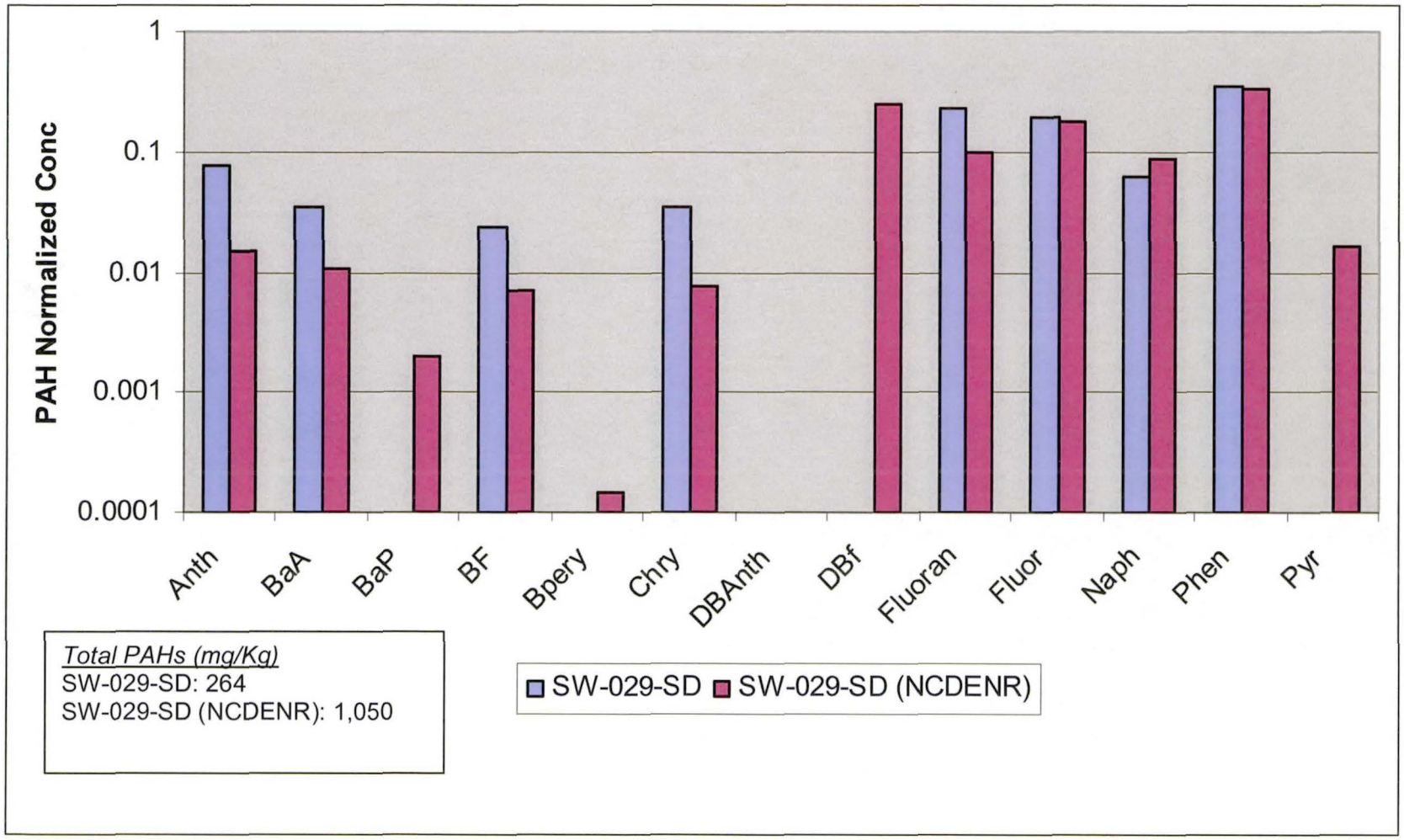

Figure C1-3a. Comparison of PAH Concentrations in Split Samples Collected Cedar Creek – Samples SW-029-SD/SW-029-SD (NCDENR).

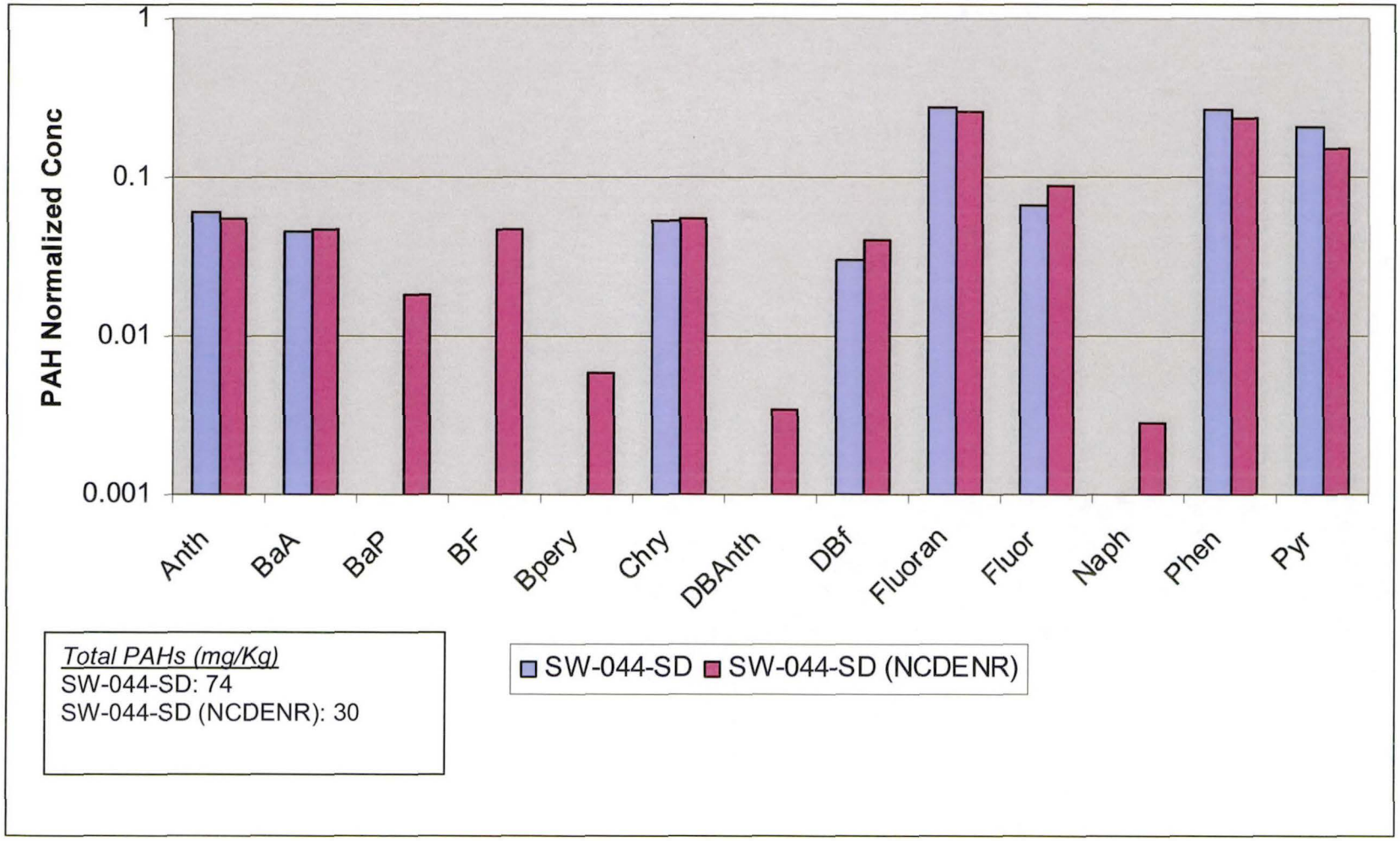

Figure C1-3b. Comparison of PAH Concentrations in Split Samples Collected Cedar Creek – Samples SW-044-SD/SW-044-SD (NCDENR).

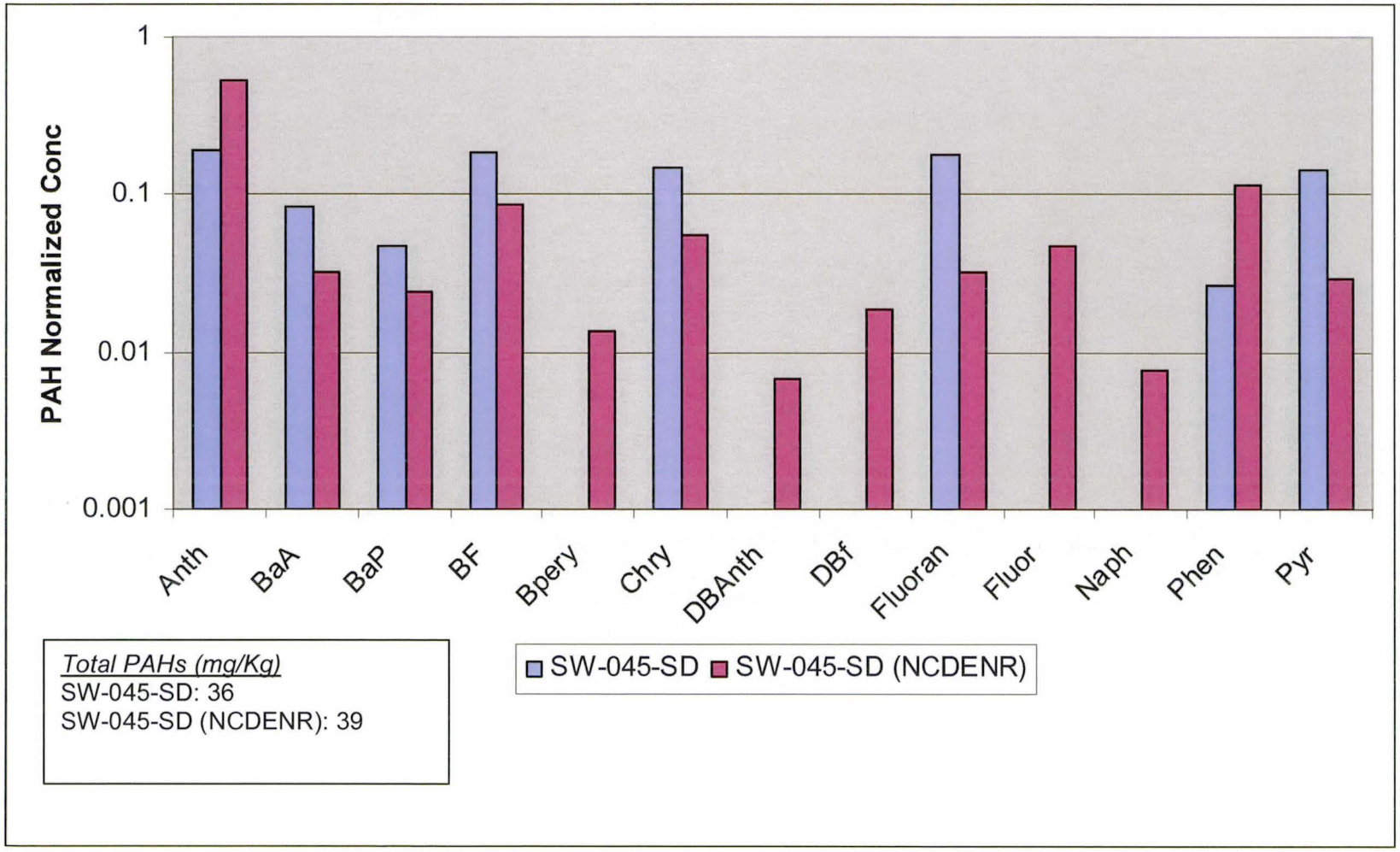

Figure C1-3c. Comparison of PAH Concentrations in Split Samples Collected Cedar Creek – Samples SW-045-SD/SW-045-SD (NCDENR).

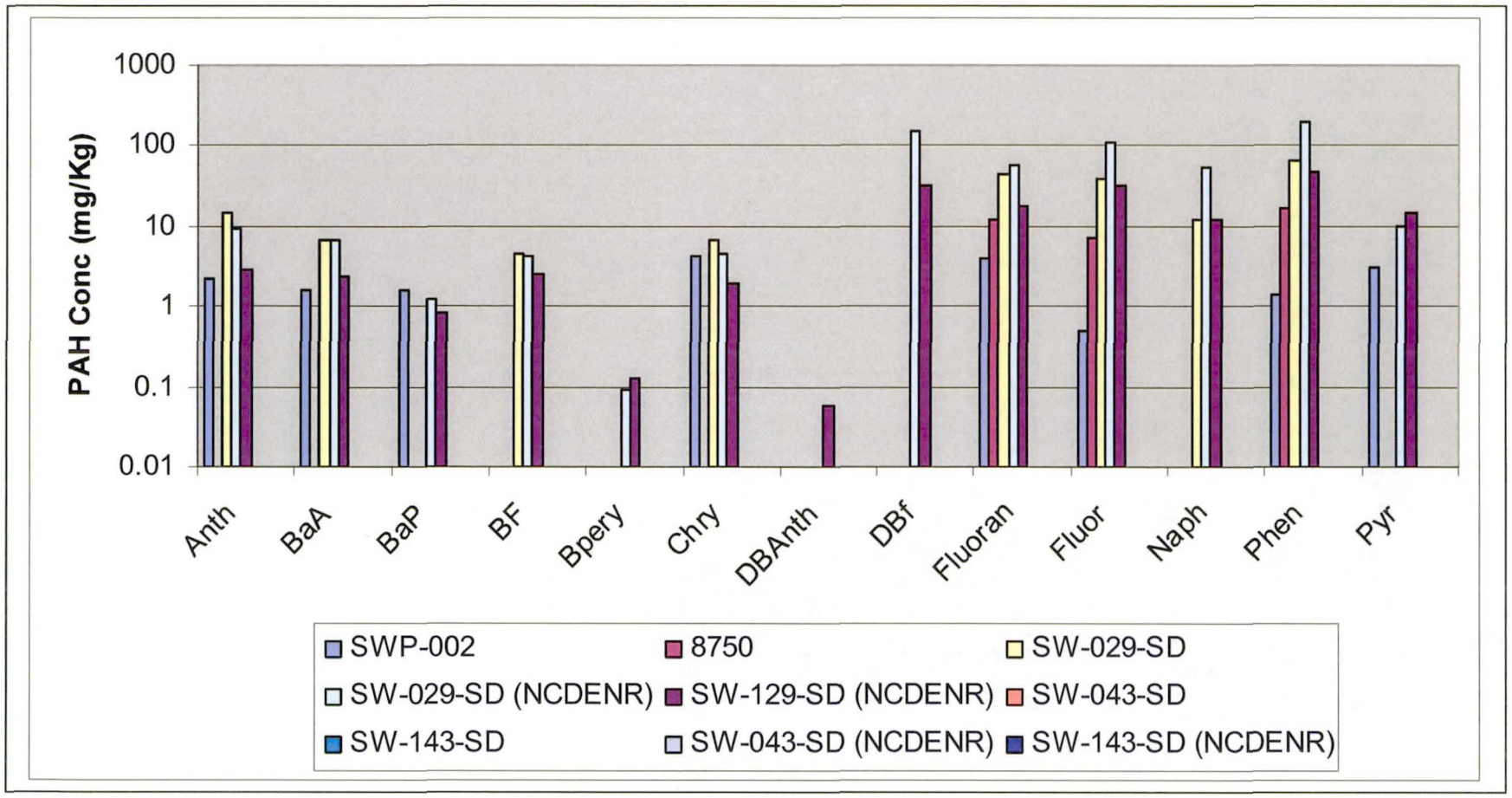

Figure C1-4a. Comparison of PAH Concentrations in Samples Collected from the Same Locations on Different Dates from Cedar Creek – Samples SWP-002, 8750, SW-029-SD, SW-029-SD (NCDENR), SW-129-SD (NCDENR), SW-043-SD, SW-143-SD, SW-043-SD (NCDENR), and SW-143-SD (NCDENR)

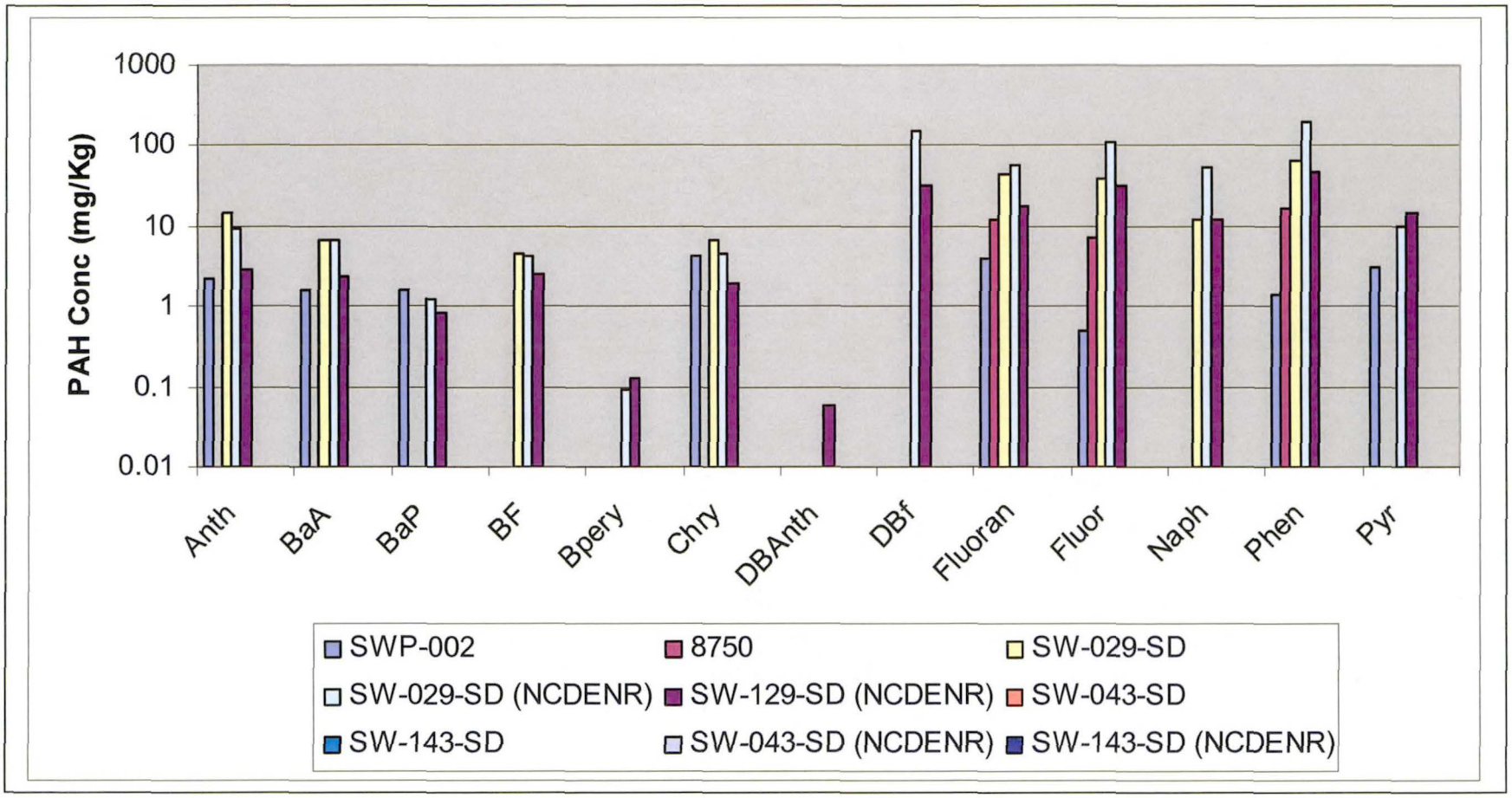

Figure C1-4b. Comparison of PAH Concentrations in Samples Collected from the Same Locations on Different Dates from Cedar Creek – Samples SWP-001, 8749, 8891, SW-030-SD, SW-030-SD (NCDENR), SW-044-SD and SW-044-SD (NCDENR)

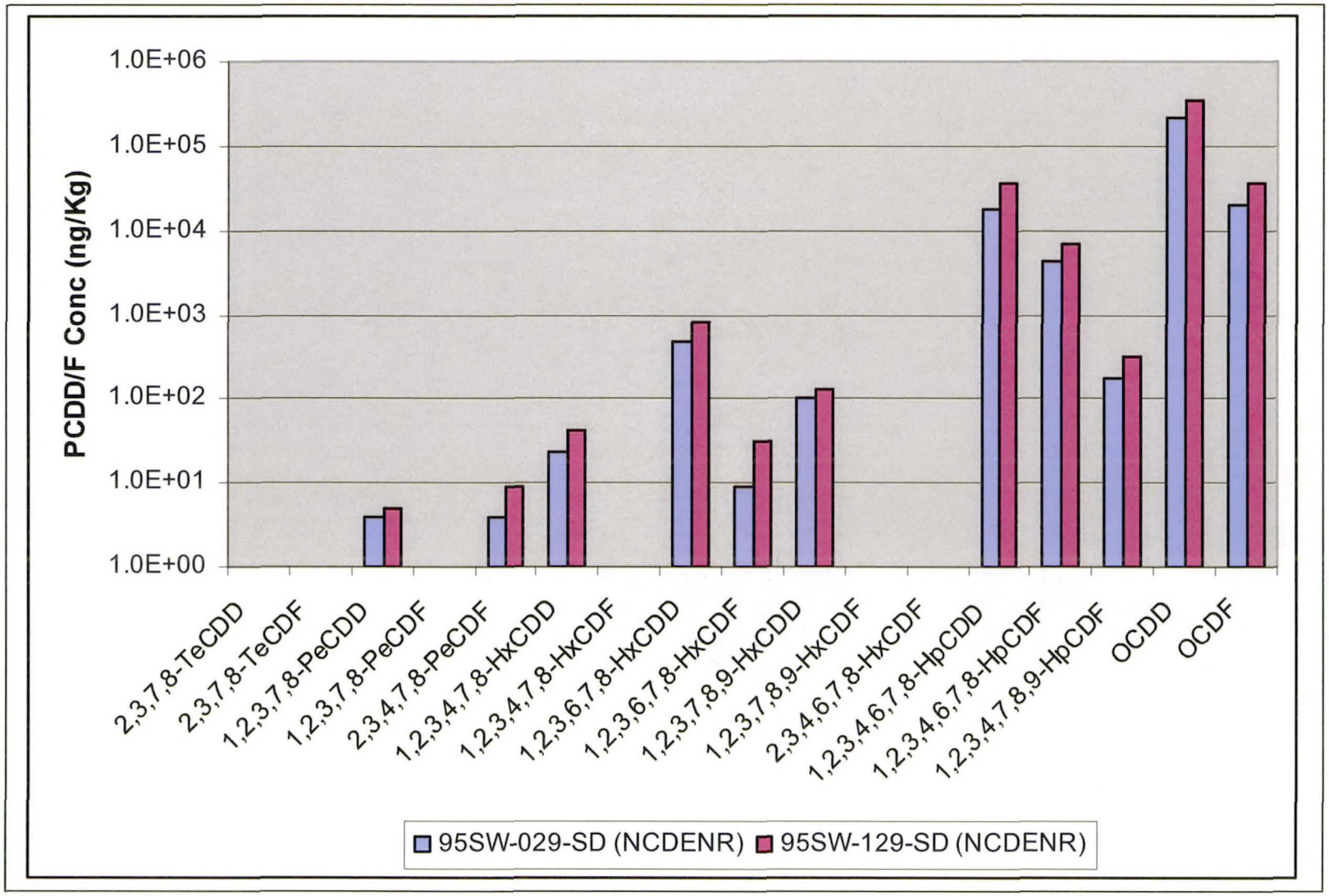

Figure C1-5a. Comparison of PCDD/F Congener Concentrations in Split Sediment Samples SW-029-SD/SW-129-SD Collected from Cedar Creek

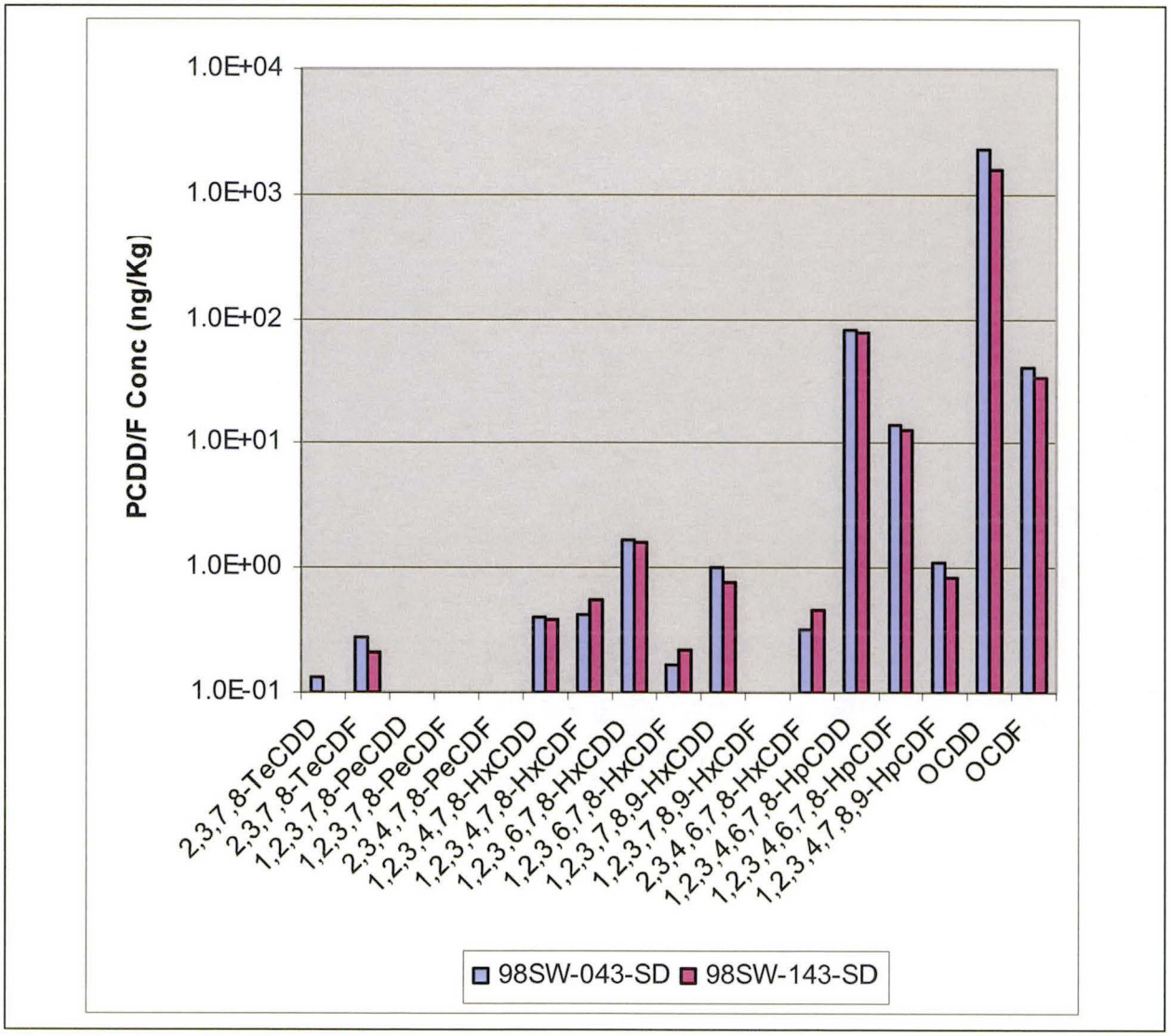

Figure C1-5b. Comparison of PCDD/F Congener Concentrations in Split Sediment Samples SW-043-SD/SW-143-SD Collected from Cedar Creek

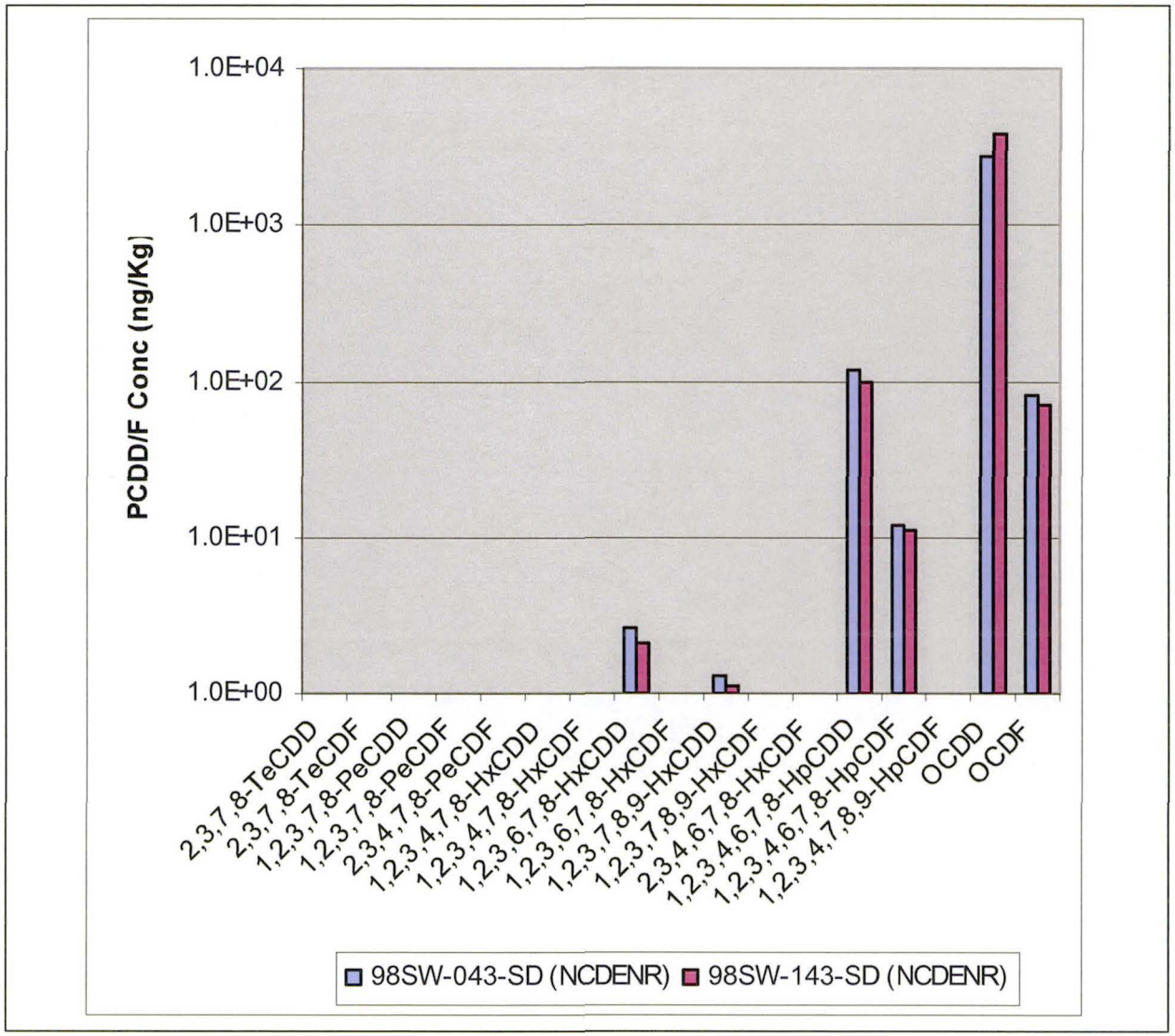

Figure C1-5c. Comparison of PCDD/F Congener Concentrations in Split Sediment Samples SW-043-SD (NCDENR)/SW-143-SD (NCDENR) Collected from Cedar Creek

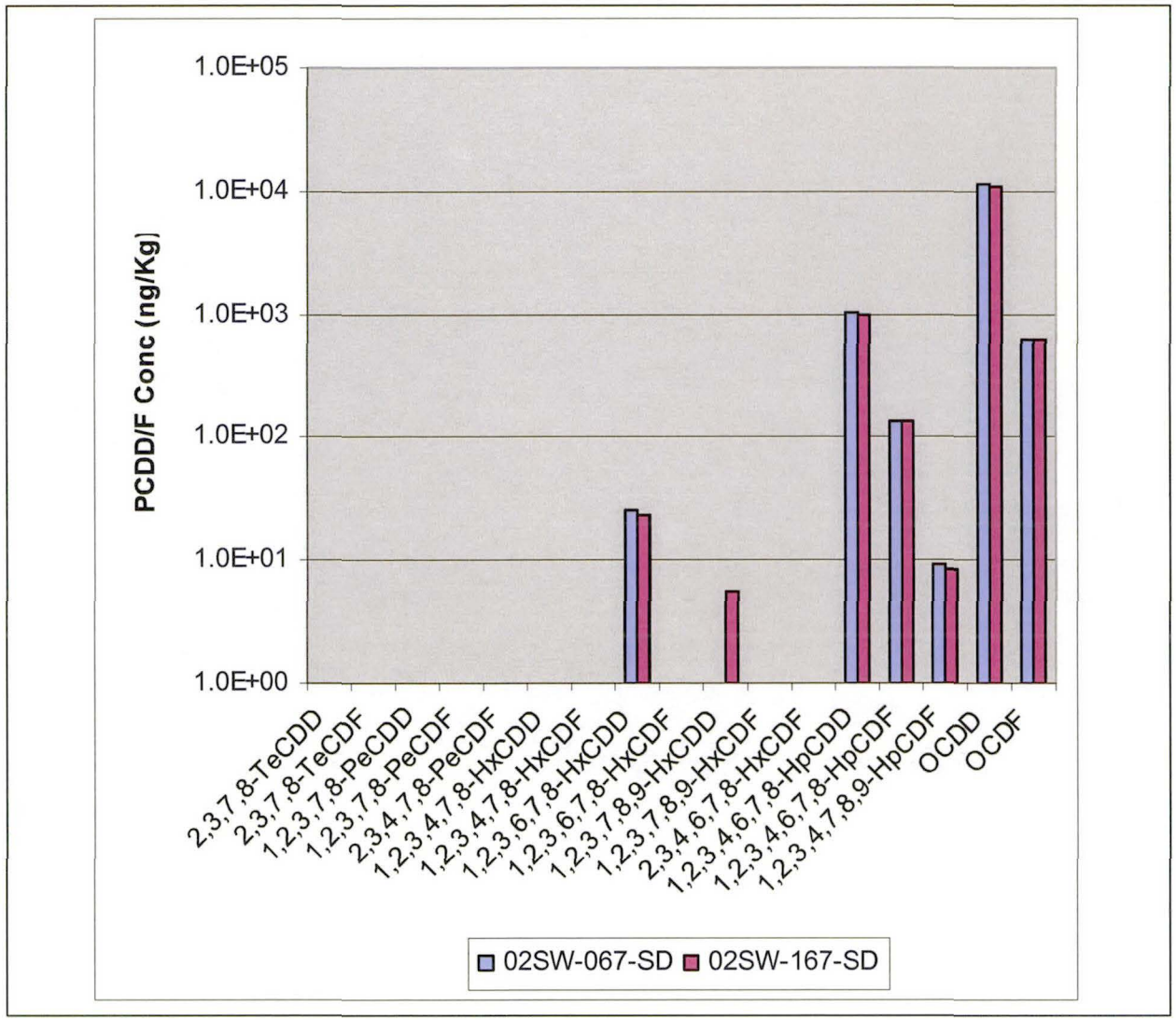

Figure C1-5d. Comparison of PCDD/F Congener Concentrations in Split Sediment Samples SW-067-SD/SW-167-SD Collected from Cedar Creek

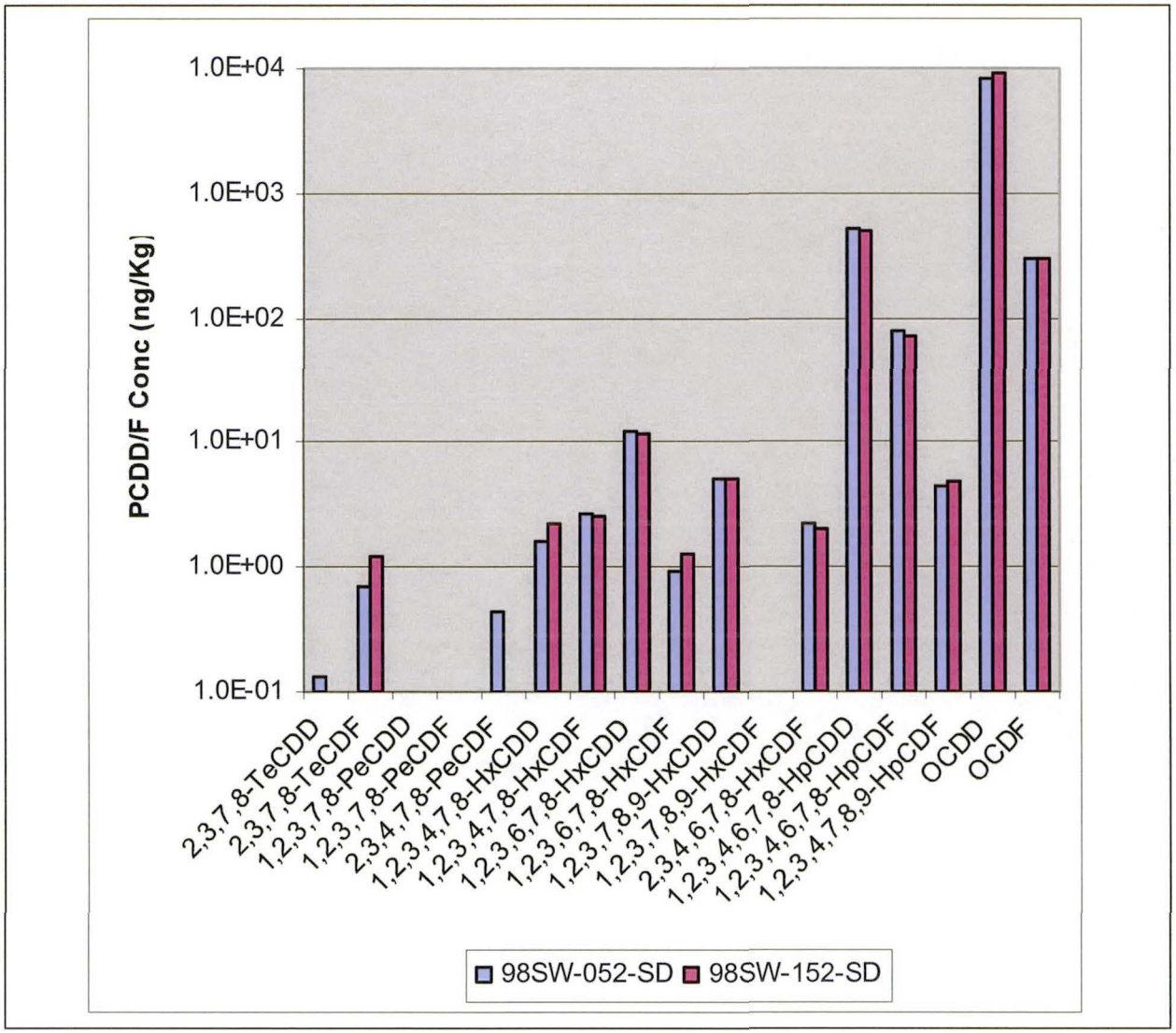

Figure C1-5e. Comparison of PCDD/F Congener Concentrations in Split Sediment Samples SW-052-SD/SW-152-SD Collected from Cedar Creek

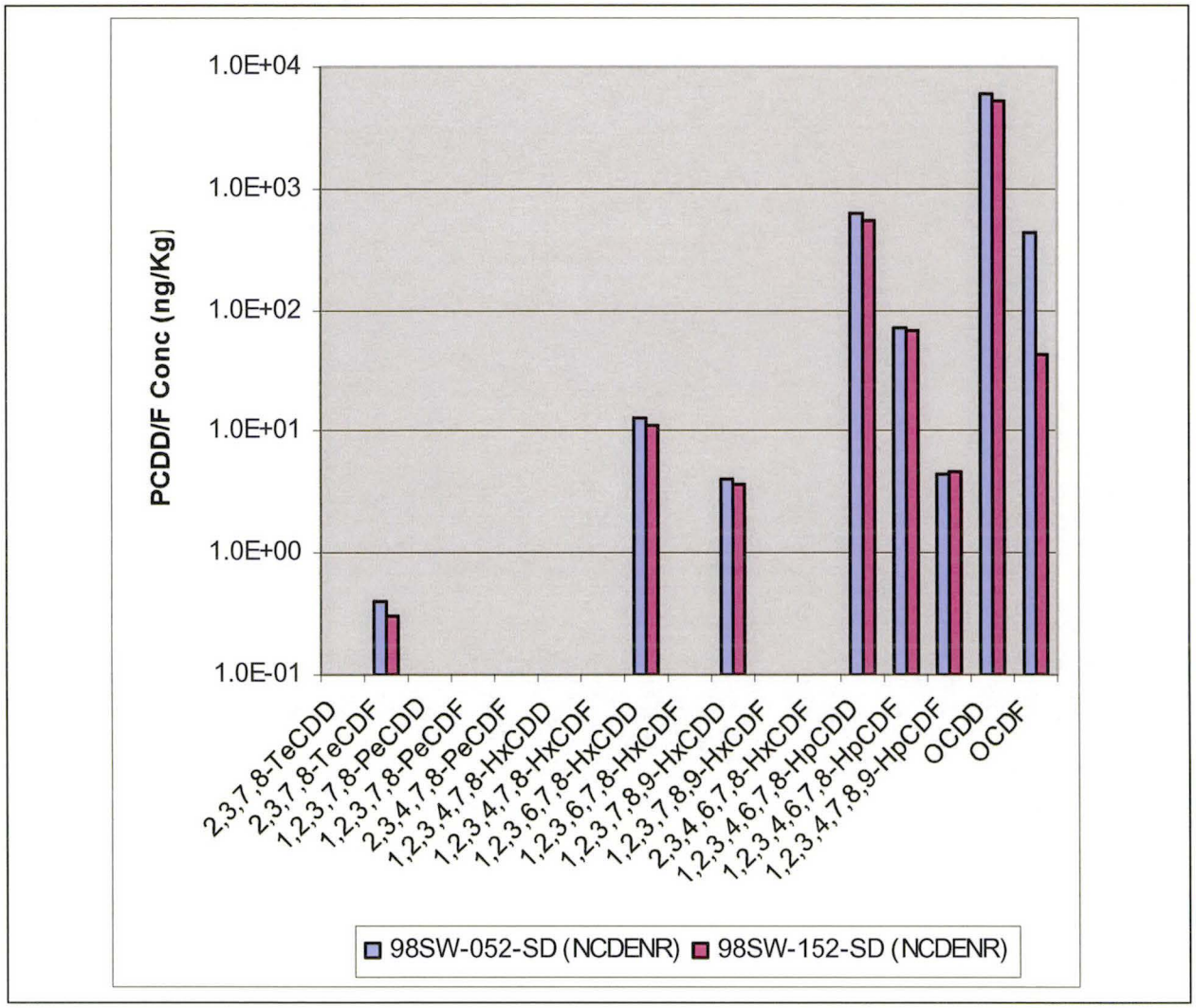

Figure C1-5f. Comparison of PCDD/F Congener Concentrations in Split Sediment Samples SW-052-SD(NCDENR)/SW-152-SD)NCDENR) Collected from Cedar Creek

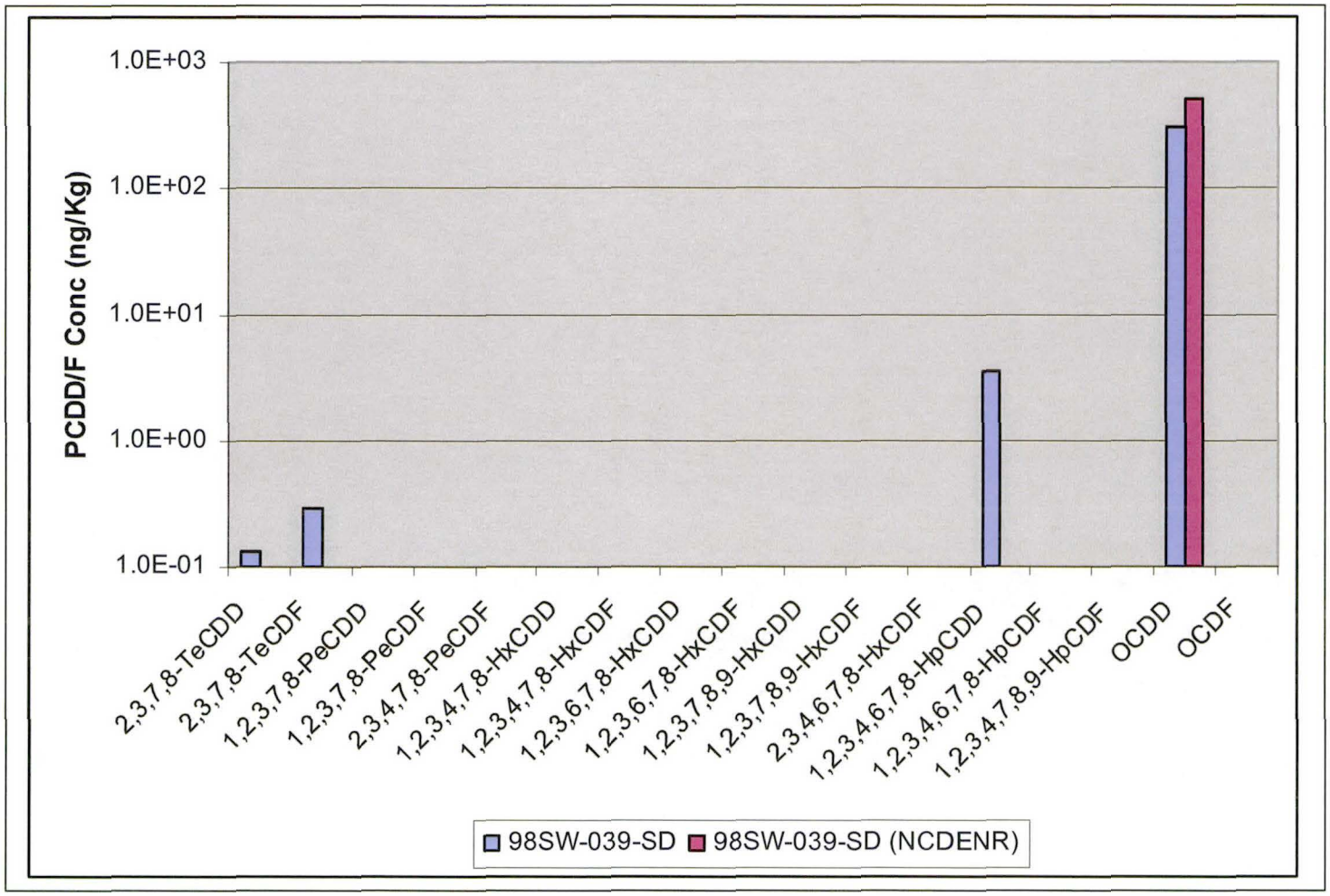

Figure C1-6a. Comparison of PCDD/F Congener Concentrations in Split Sediment Samples SW-039-SD and SW-039-SD (NCDENR) Collected from Cedar Creek

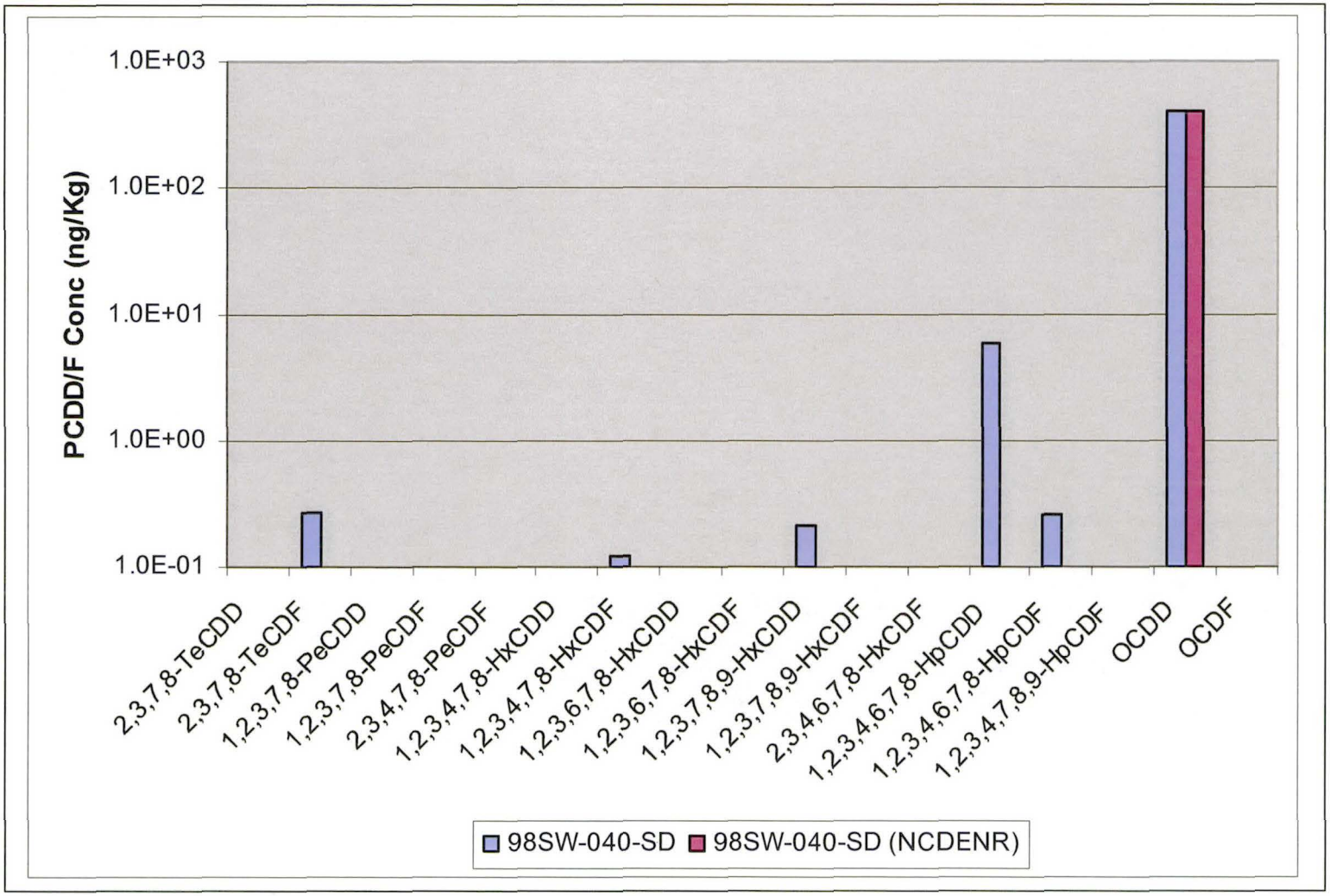

Figure C1-6b. Comparison of PCDD/F Congener Concentrations in Split Sediment Samples SW-040-SD and SW-040-SD (NCDENR) Collected from Cedar Creek

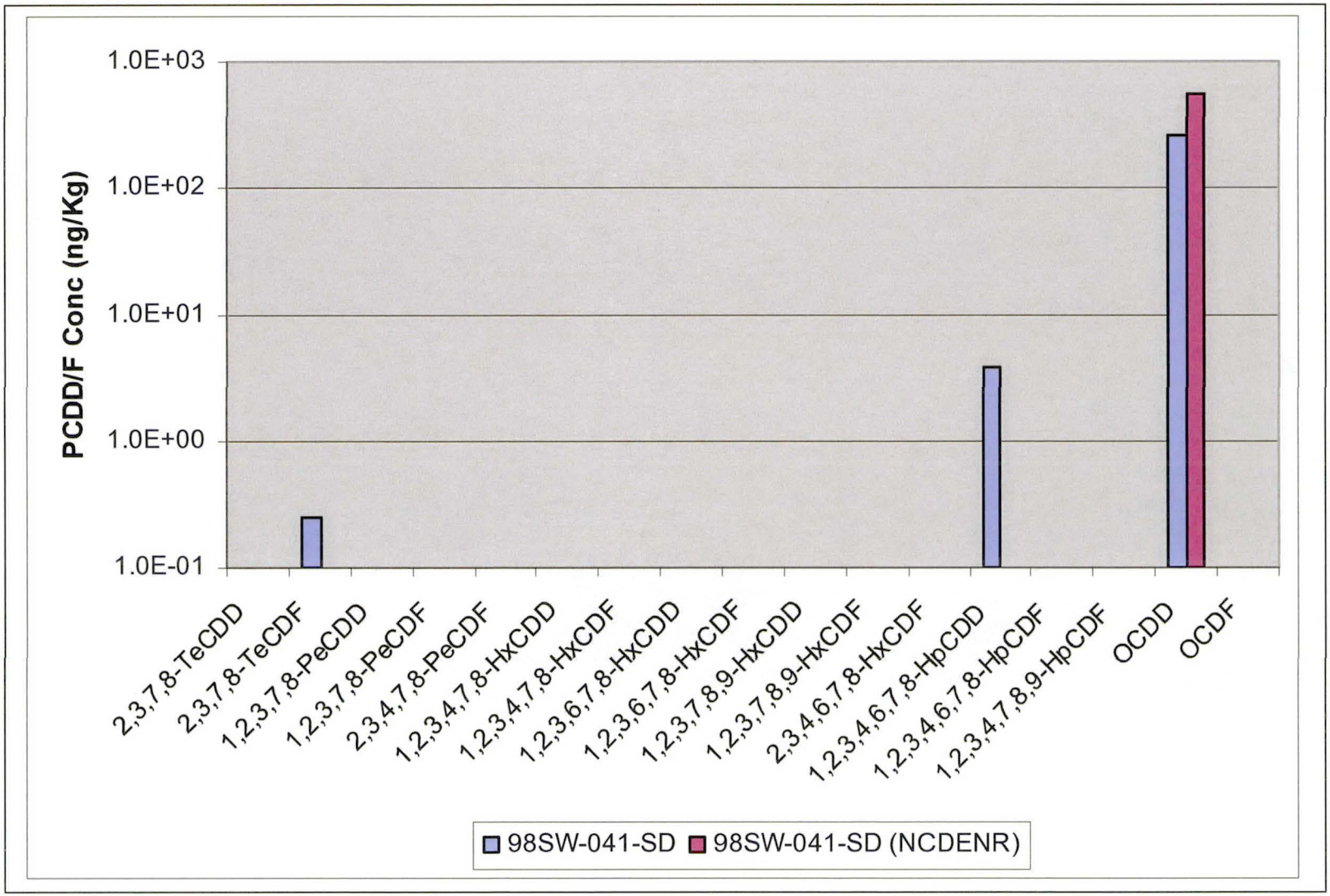

Figure C1-6c. Comparison of PCDD/F Congener Concentrations in Split Sediment Samples SW-041-SD and SW-041-SD (NCDENR) Collected from Cedar Creek

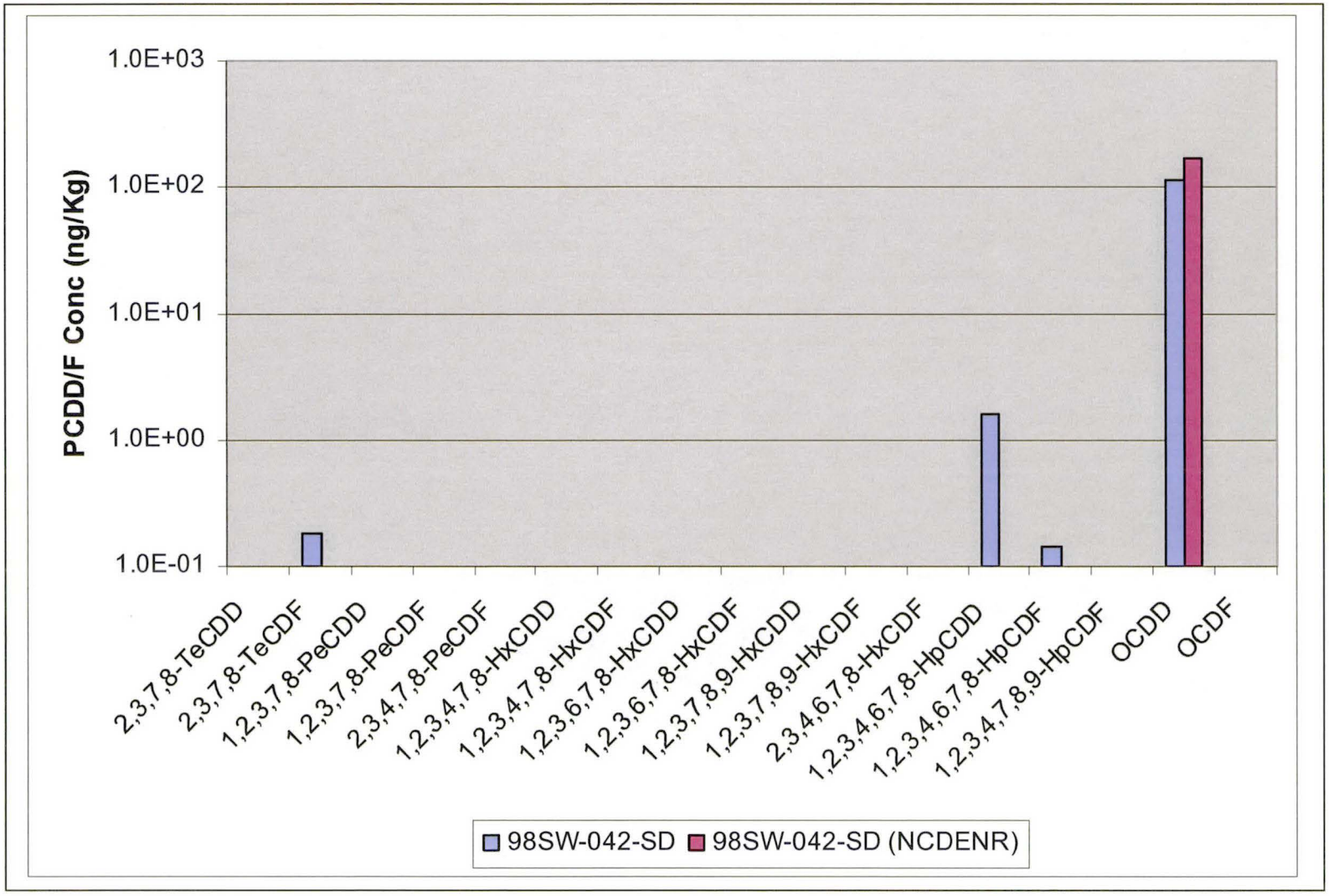

Figure C1-6d. Comparison of PCDD/F Congener Concentrations in Split Sediment Samples SW-042-SD and SW-042-SD (NCDENR) Collected from Cedar Creek

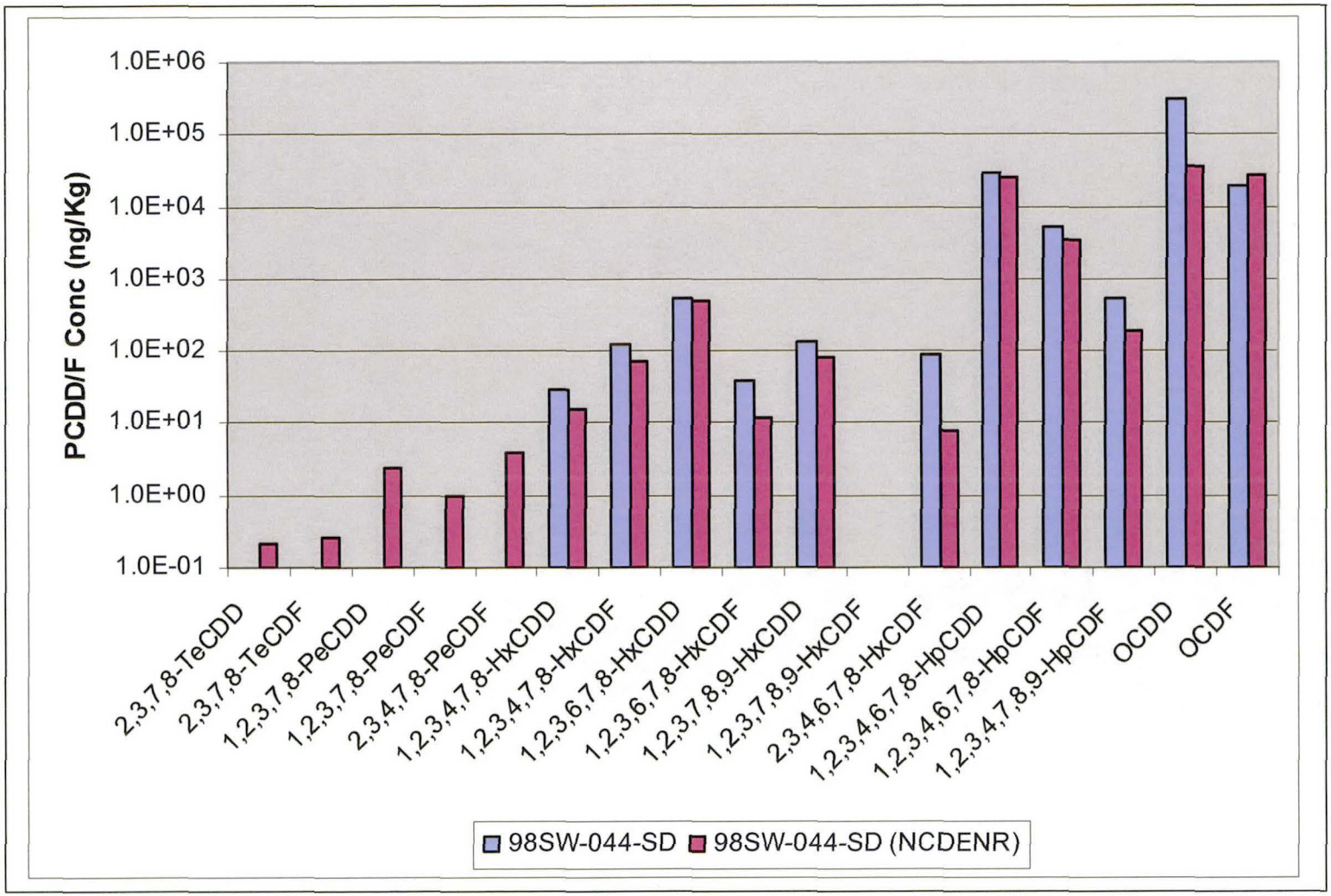

Figure C1-6e. Comparison of PCDD/F Congener Concentrations in Split Sediment Samples SW-044-SD and SW-044-SD (NCDENR) Collected from Cedar Creek

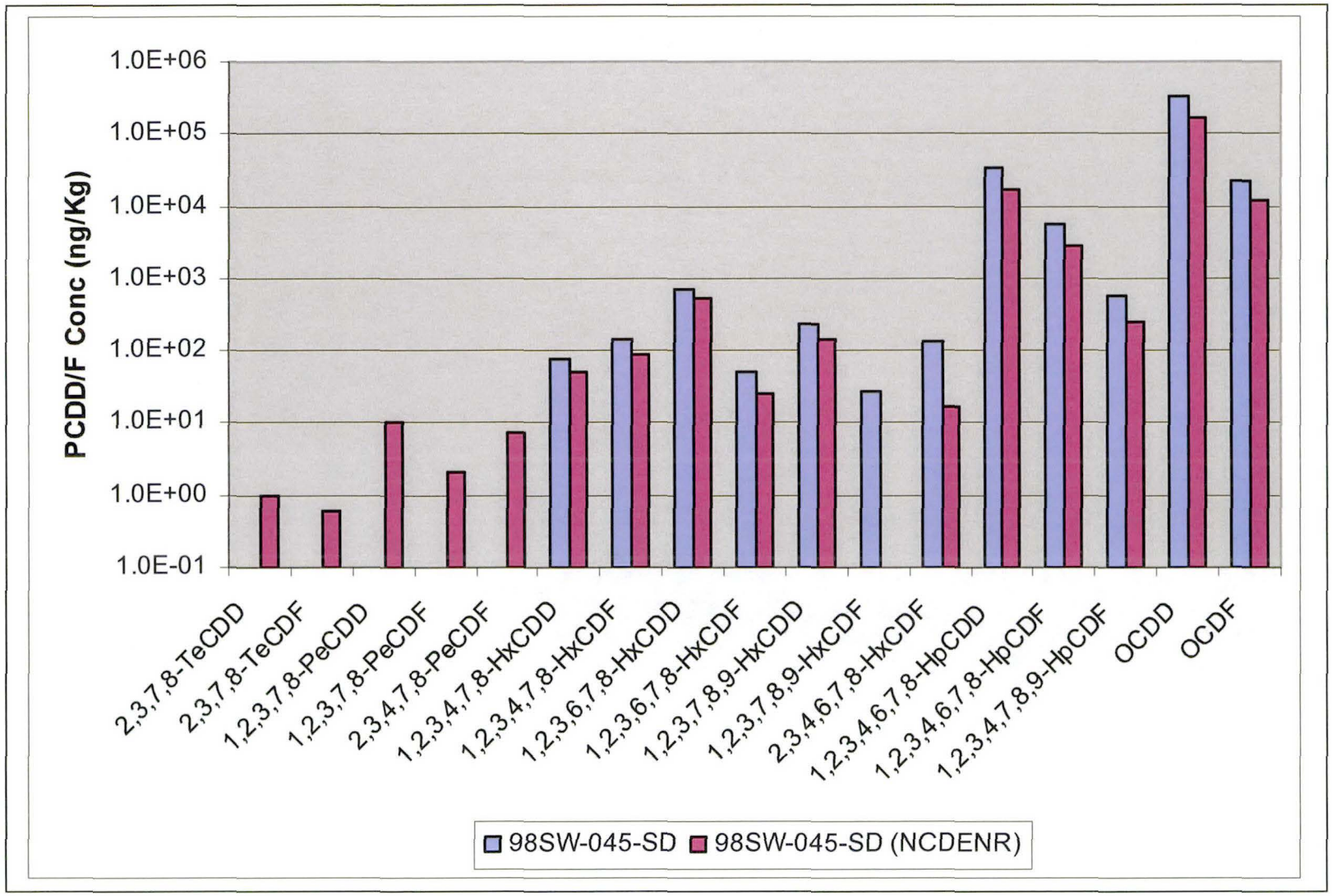

Figure C1-6f. Comparison of PCDD/F Congener Concentrations in Split Sediment Samples SW-045-SD and SW-045-SD (NCDENR) Collected from Cedar Creek

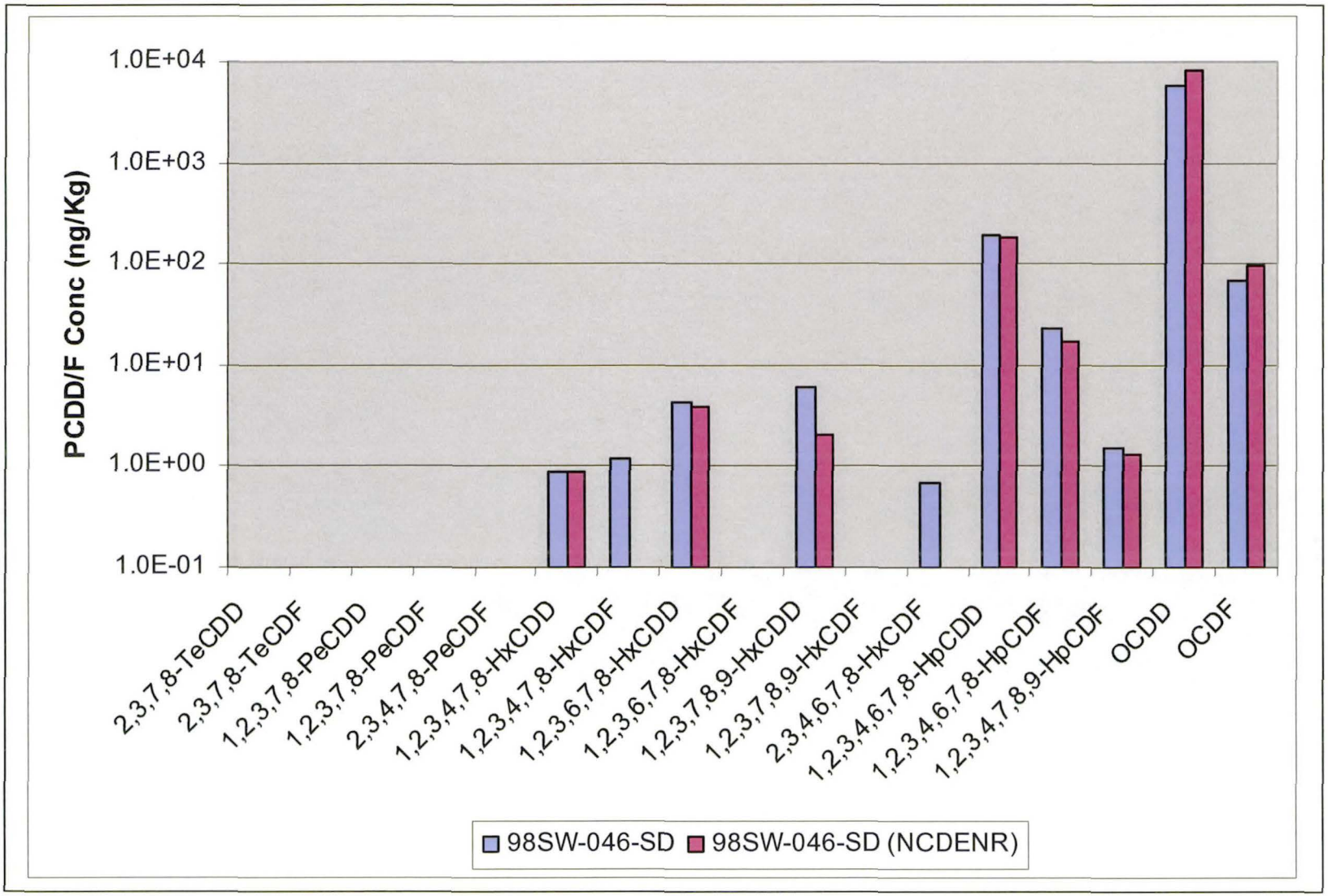

Figure C1-6g. Comparison of PCDD/F Congener Concentrations in Split Sediment Samples SW-046-SD and SW-046-SD (NCDENR) Collected from Cedar Creek

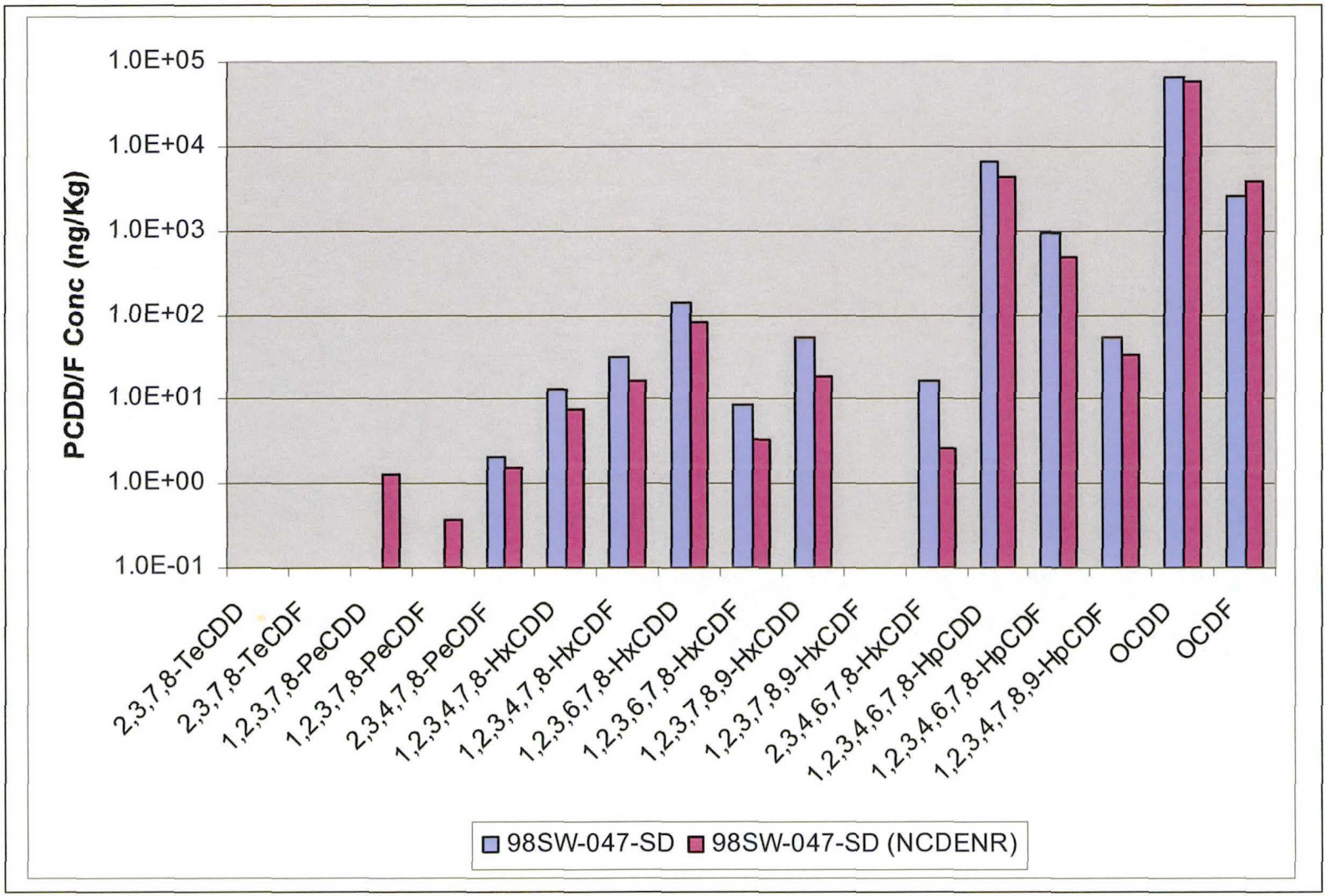

Figure C1-6h. Comparison of PCDD/F Congener Concentrations in Split Sediment Samples SW-047-SD and SW-047-SD (NCDENR) Collected from Cedar Creek

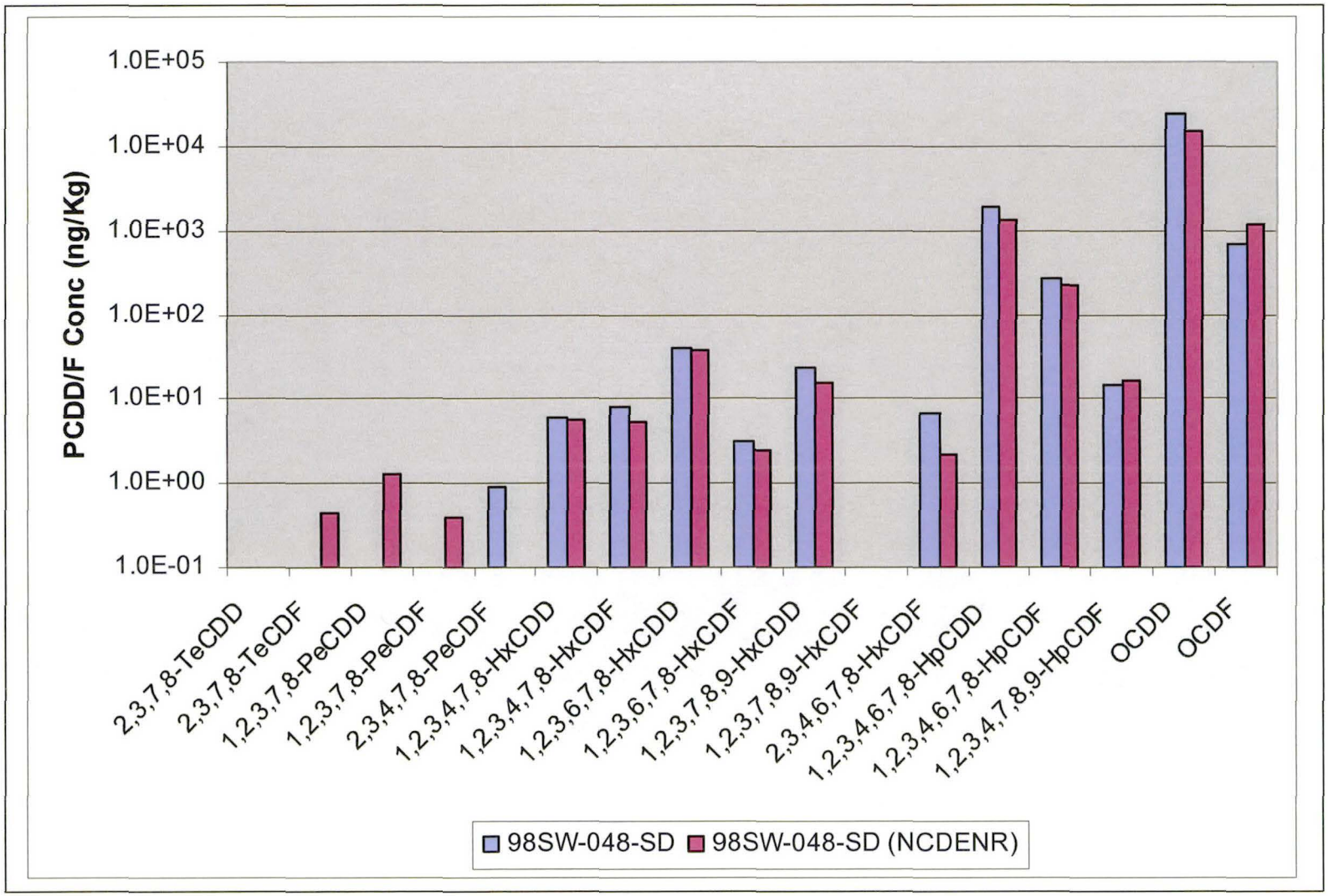

Figure C1-6i. Comparison of PCDD/F Congener Concentrations in Split Sediment Samples SW-048-SD and SW-048-SD (NCDENR) Collected from Cedar Creek

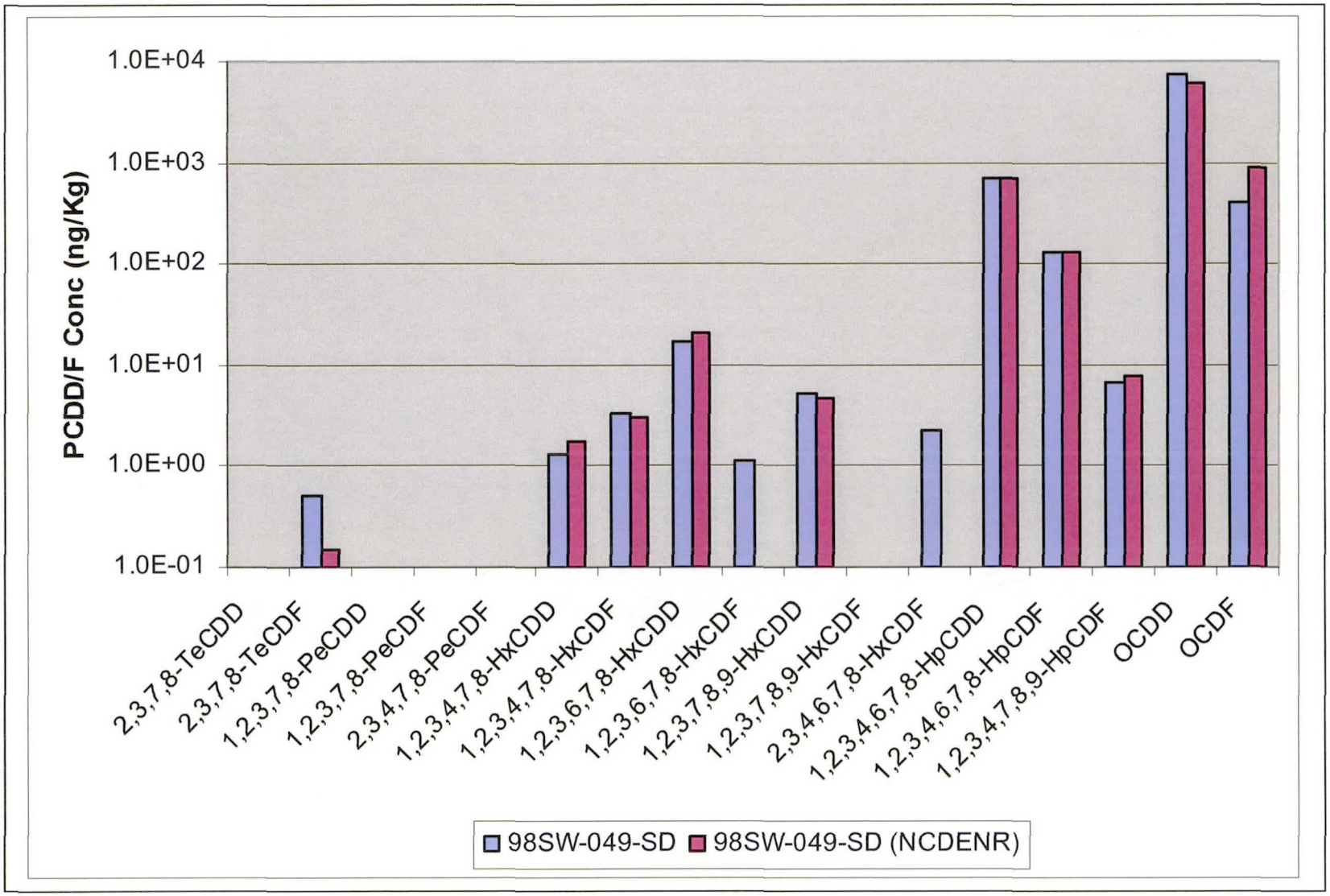

Figure C1-6j. Comparison of PCDD/F Congener Concentrations in Split Sediment Samples SW-049-SD and SW-049-SD (NCDENR) Collected from Cedar Creek

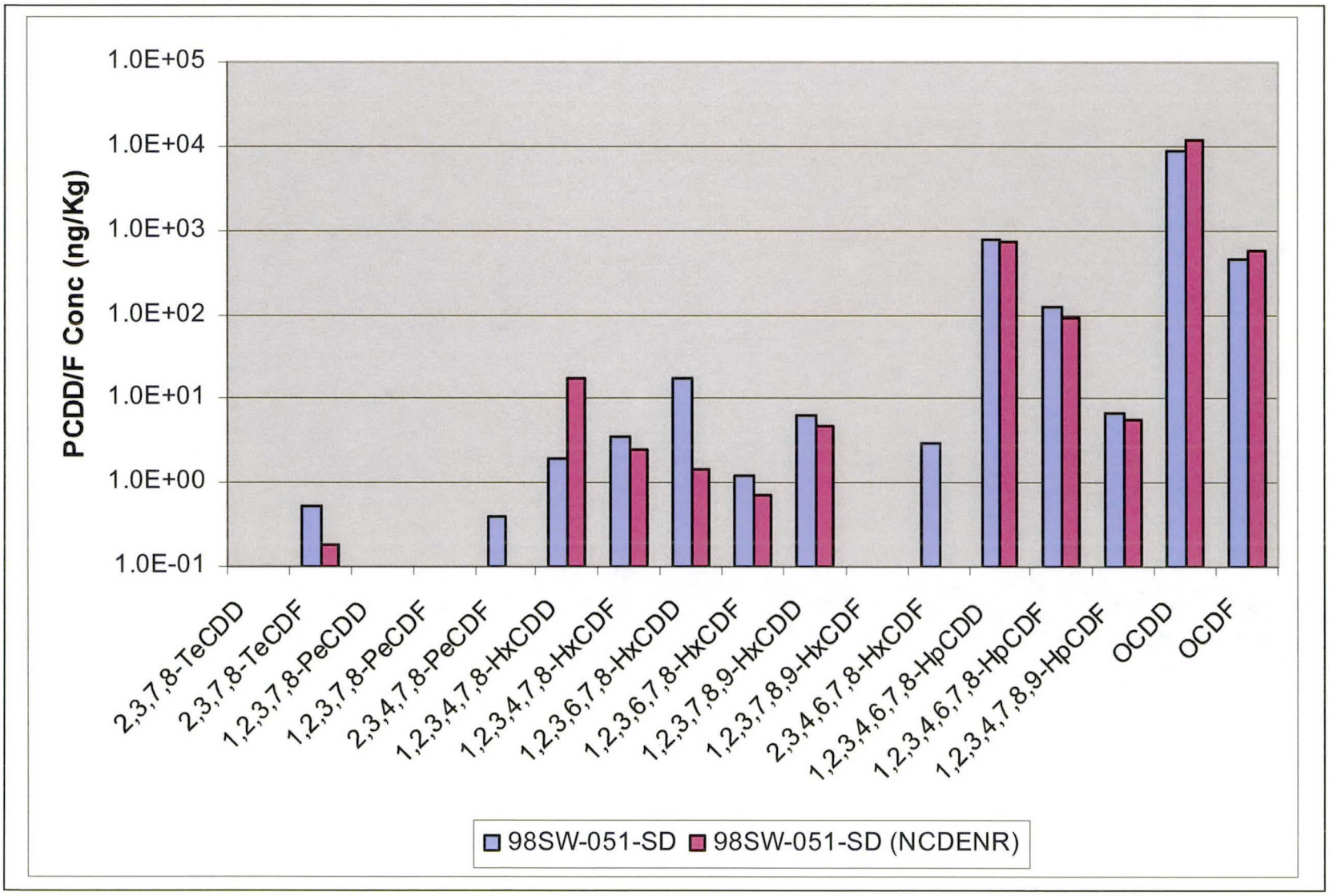

Figure C1-6k. Comparison of PCDD/F Congener Concentrations in Split Sediment Samples SW-051-SD and SW-051-SD (NCDENR) Collected from Cedar Creek

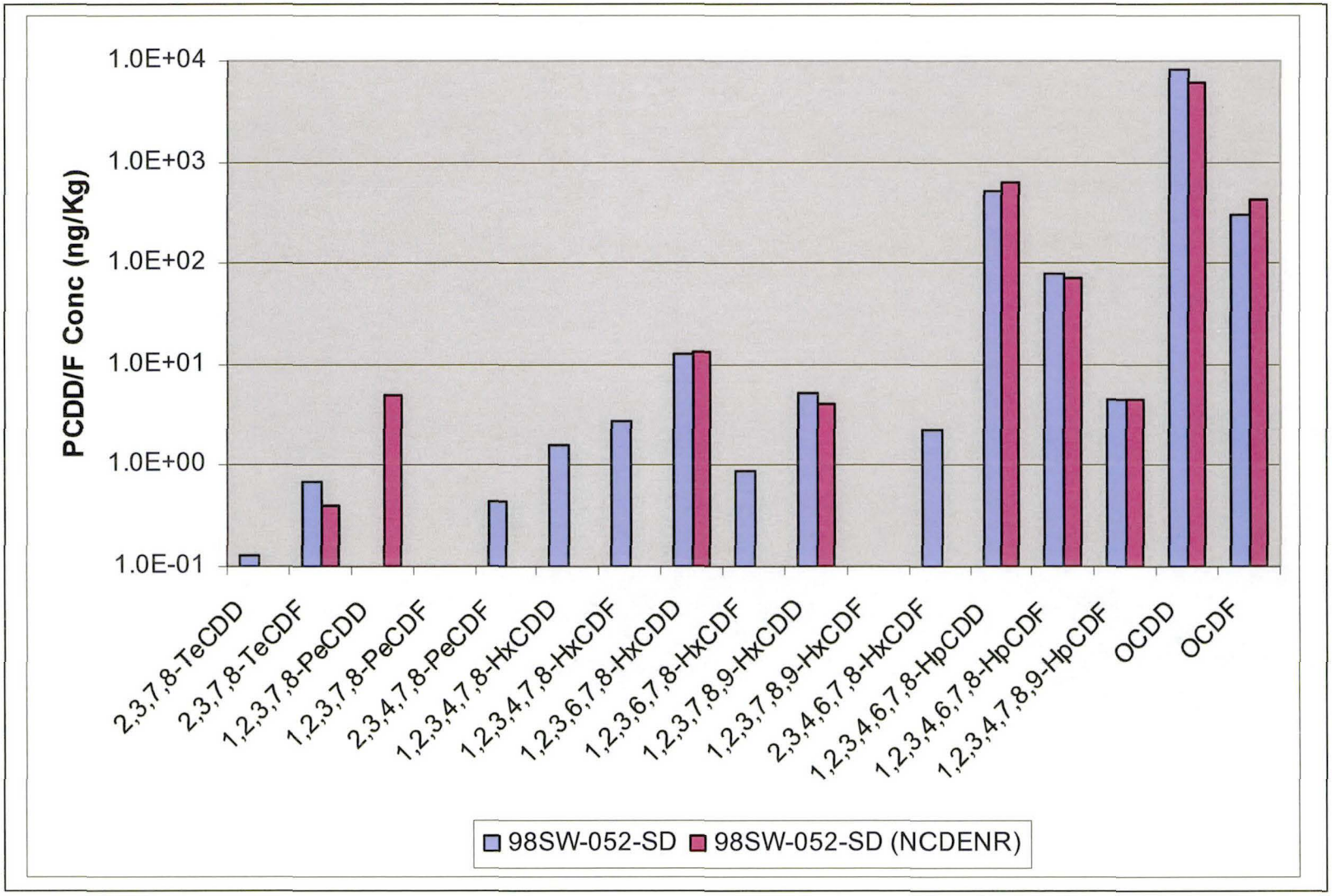

Figure C1-6l. Comparison of PCDD/F Congener Concentrations in Split Sediment Samples SW-052-SD and SW-052-SD (NCDENR) Collected from Cedar Creek

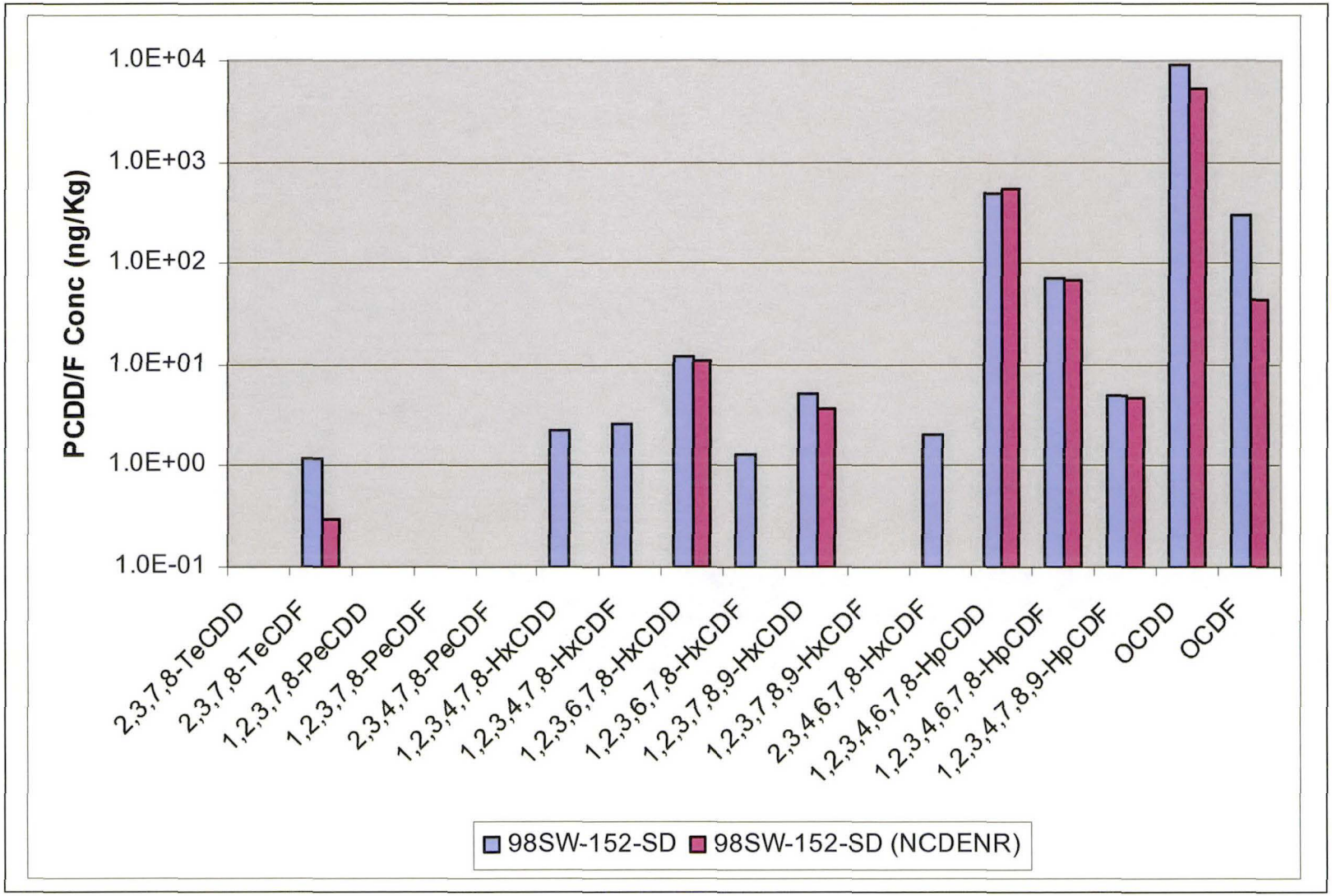

Figure C1-6m. Comparison of PCDD/F Congener Concentrations in Split Sediment Samples SW-152-SD and SW-152-SD (NCDENR) Collected from Cedar Creek

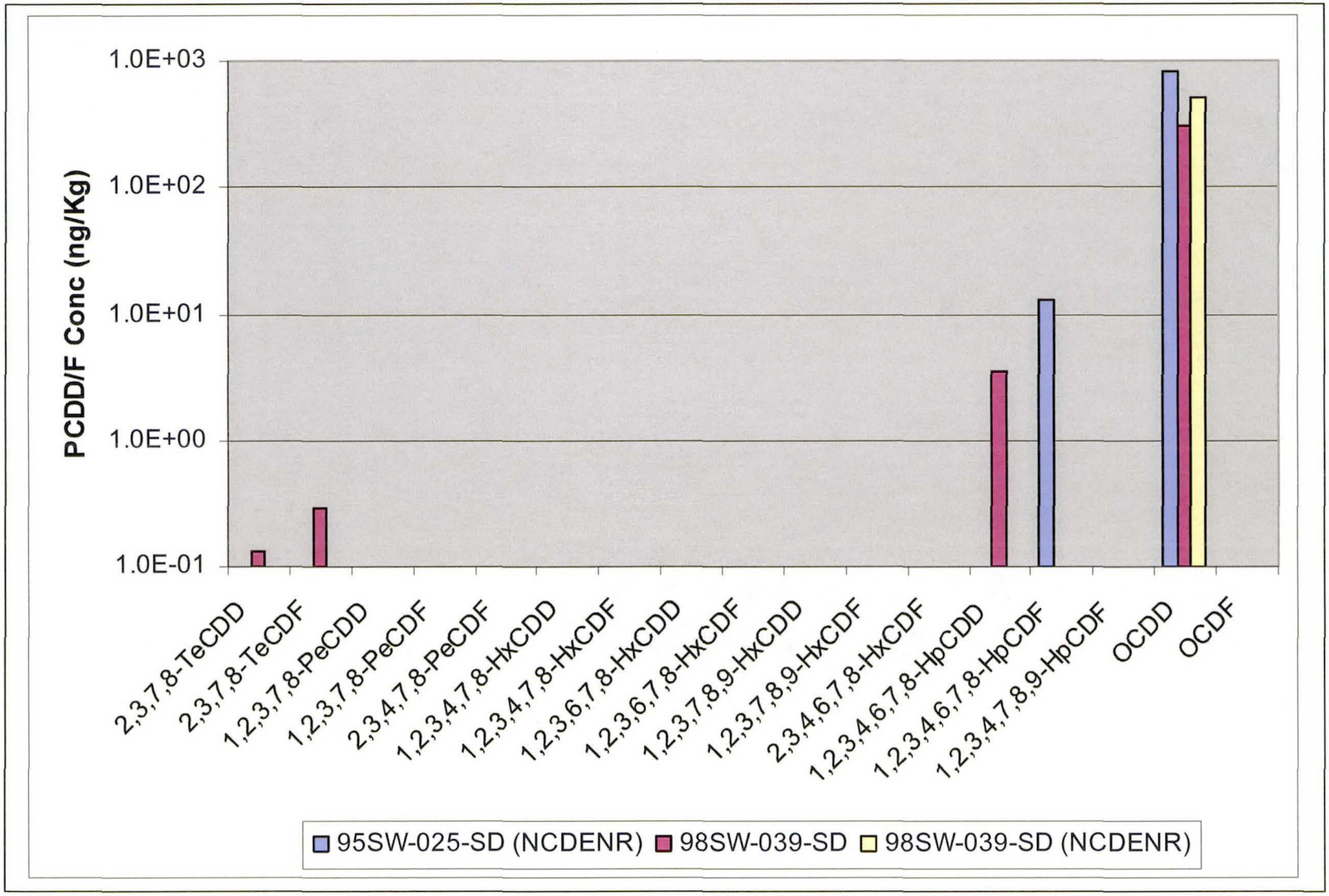

Figure C1-7a. Comparison of PCDD/F Congener Concentrations in Samples Collected at Different Times from Cedar Creek - Samples SW-025-SD, SW-039-SD and SW-039-SD (NCDENR)

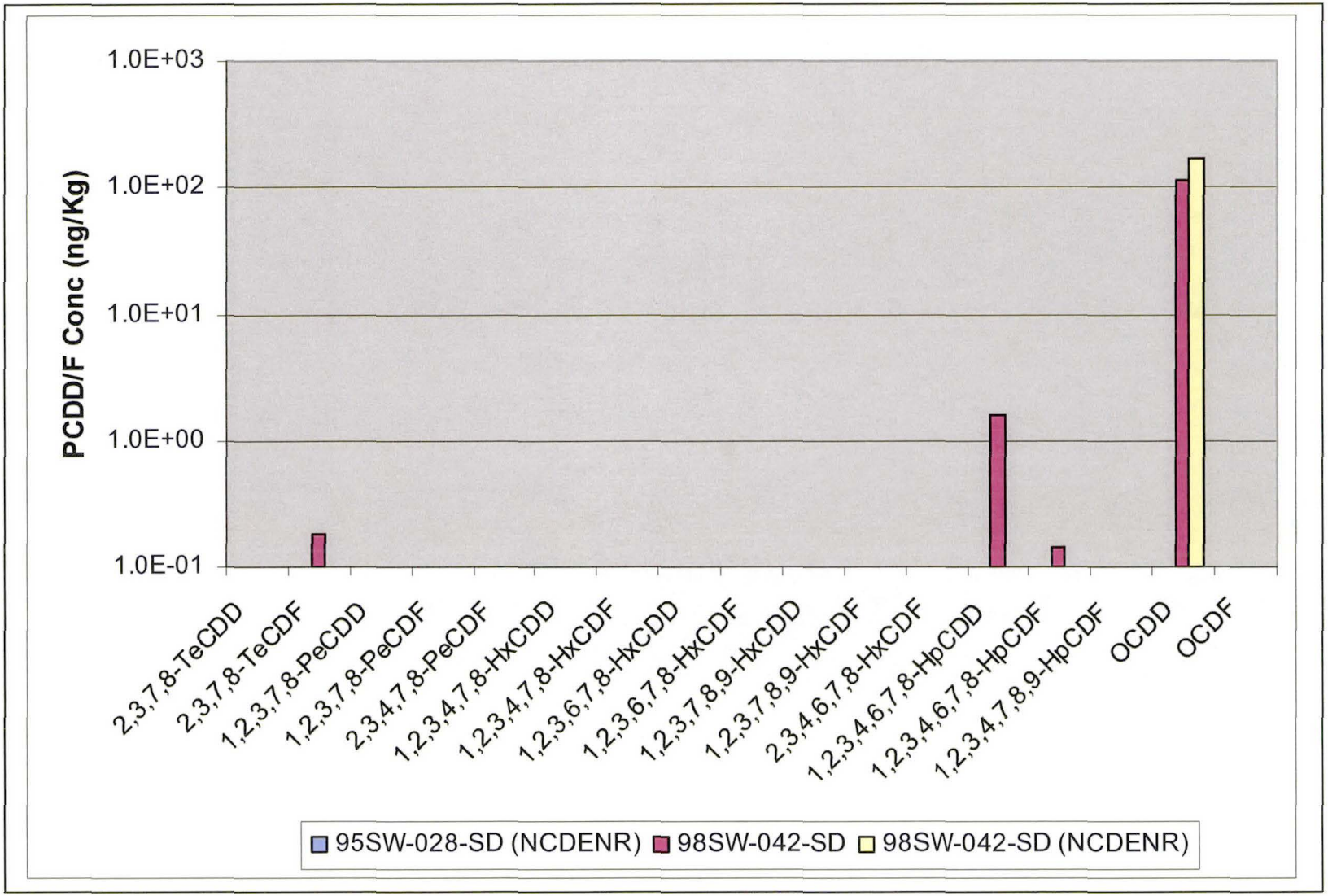

Figure C1-7b. Comparison of PCDD/F Congener Concentrations in Samples Collected at Different Times from Cedar Creek - Samples SW-028-SD, SW-042-SD and SW-042-SD (NCDENR)

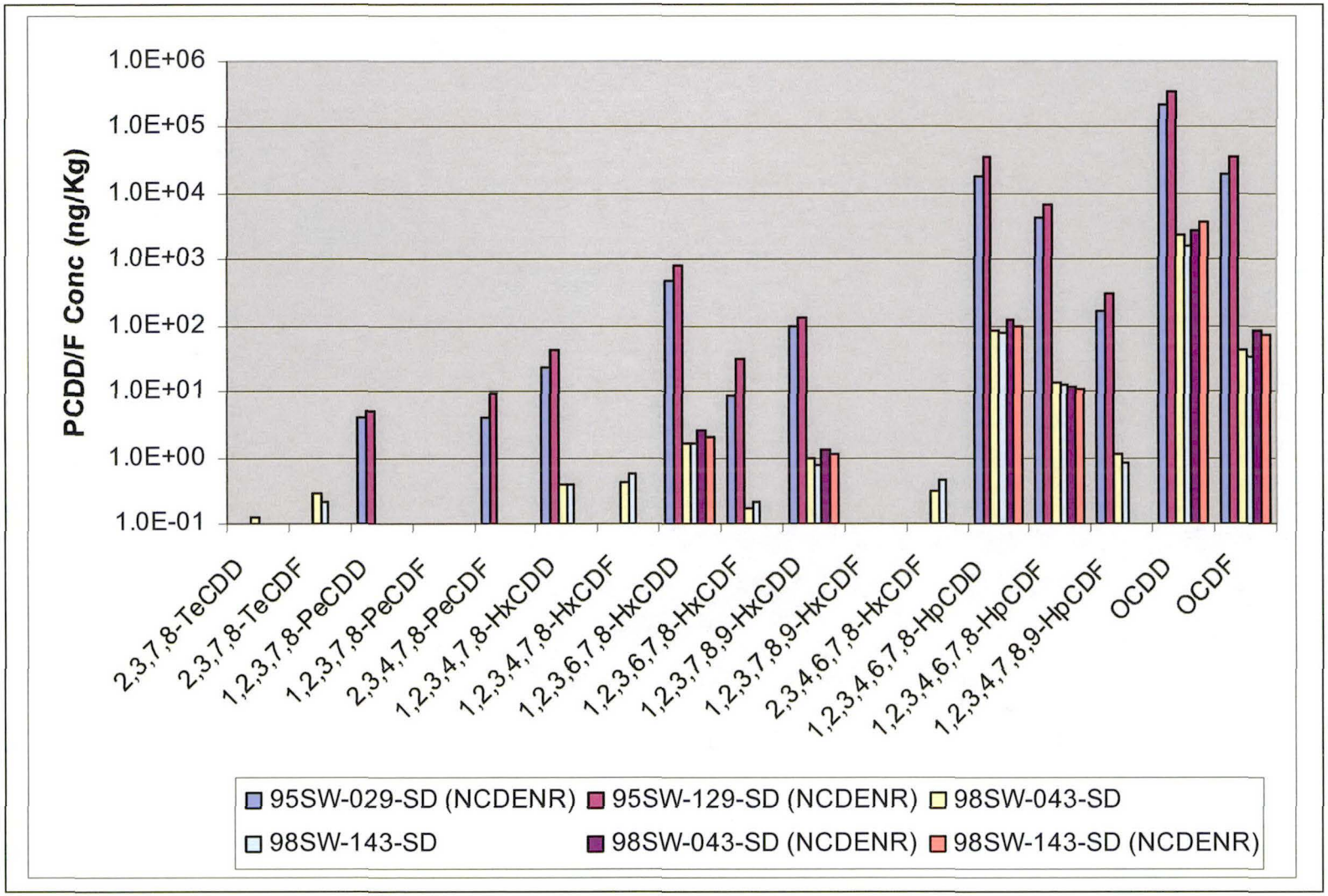

Figure C1-7c. Comparison of PCDD/F Congener Concentrations in Samples Collected at Different Times from Cedar Creek - Samples SW-029-SD, SW-129-SD, SW-043-SD, SW-143-SD, SW-043-SD (NCDENR) and SW-043-SD (NCDENR)

Attachment C2
PCA and CA Numeric Outputs

Appendix C - Attachment C2
PCA and CA Numeric Outputs

Preface

This attachment contains the Principal Components Analysis (PCA) and Cluster Analysis (CA) outputs generated by the MVSP software as part of the chemical fingerprinting assessment. The list of outputs is compiled below and is provided with the electronic (PDF) version of this report only. For clarity, they have been enumerated to match the Figure names used for the PCA and CA analyses.

Item	Description
Figure C2-6a	PCA Output - PCDD/F Congeners in Sediments Collected from the Drainage Ditch and Comparison to PCP Standards, Setting Non-Detects to Zero Values.
Figure C2-6b	PCA Output - PCDD/F Congeners in Sediments Collected from the Drainage Ditch Setting Non-Detects to Zero Values.
Figure C2-7a	PCA Output - PCDD/F Congeners in Sediments Collected from Cedar Creek Setting Non-Detects to Zero Values.
Figure C2-7b	PCA Output - PCDD/F Congeners in Sediments Collected from Cedar Creek Less Sample SW-044-SD (NCDENR) and Setting Non-Detects to Zero Values.
Figure C2-7c	PCA Output - PCDD/F Congeners in Sediments Collected from Cedar Creek Background and Tributaries, and the Deep River, Setting Non-Detects to Zero Values.
Figure C2-8a	PCA Output - PCDD/F Congeners in Sediments Collected from the Drainage Ditch and those from the Cedar Creek Tributaries, Setting Non-Detects to Zero Values.
Figure C2-8b	PCA Output - PCDD/F Congeners in Sediments Collected from the Drainage Ditch and Main Stem of Cedar Creek [Less Sample SW-044-SD (NCDENR)] and Setting Non-Detects to Zero Values.
Figure C2-9	CA Output - PCDD/F Congeners in Sediments Collected from the Drainage Ditch Setting Non-Detects to Zero Values.
Figure C2-10a	CA Output - PCDD/F Congeners in Sediments Collected from Cedar Creek Setting Non-Detects to Zero Values.
Figure C2-10b	CA Output - PCDD/F Congeners in Sediments Collected from Cedar Creek Background (Upstream) Locations, Tributaries and River, Setting Non-Detects to Zero Values.

Principal Components Analysis - Data Output

PCDD/F Congeners in Sediments Collected from the Drainage Ditch and Comparison to PCP Standards, Setting Non-Detects to Zero Values
Corresponding Figure: Figure C-6a

Eigenvalues			
		Axis 1	Axis 2
Eigenvalues		0.085	0.017
Percentage		83.594	16.245
Cum. Percentage		83.594	99.839

PCA variable loadings			
		Axis 1	Axis 2
1,2,3,4,6,7,8-HpCDD		0.723	-0.636
1,2,3,4,6,7,8-HpCDF		0.007	-0.049
1,2,3,4,7,8,9-HpCDF		-0.086	-0.01
1,2,3,4,7,8-HxCDD		-0.091	-0.009
1,2,3,4,7,8-HxCDF		-0.089	-0.008
1,2,3,6,7,8-HxCDD		-0.085	-0.037
1,2,3,6,7,8-HxCDF		-0.091	-0.004
1,2,3,7,8,9-HxCDD		-0.092	-0.014
1,2,3,7,8,9-HxCDF		-0.09	-0.001
1,2,3,7,8-PeCDD		-0.091	-0.003
1,2,3,7,8-PeCDF		-0.091	-0.001
2,3,4,6,7,8-HxCDF		-0.092	-0.008
2,3,4,7,8-PeCDF		-0.091	-0.003
2,3,7,8-TeCDD		-0.091	-0.001
2,3,7,8-TeCDF		-0.091	-0.001
OCDD		-0.148	0.017
OCDF		0.591	0.769

PCA case scores			
	Groups	Axis 1	Axis 2
95SW-013-SL	Background	-0.161	0.012
95SW-015-SL	Downstream	-0.057	0.003
95SW-024-SL	Downstream	-0.054	0
02SW-053-SD	Downstream	-0.004	-0.036
02SW-054-SD	Downstream	-0.026	-0.013
02SW-057-SD	Downstream	-0.071	0.004
02SW-059-SD	Downstream	0.136	-0.089
PCP-Std1	PCP Std	0.102	0.063
PCP-Std2	PCP Std	0.136	0.056

Principal Components Analysis - Data Output

PCDD/F Congeners in Sediments Collected from the Drainage Ditch Setting Non-Detects to Zero Values
Corresponding Figure: Figure C-6b

Eigenvalues			
		Axis 1	Axis 2
Eigenvalues		0.074	0.001
Percentage		98.567	1.362
Cum. Percentage		98.567	99.929

PCA variable loadings			
		Axis 1	Axis 2
1,2,3,4,6,7,8-HpCDD		0.902	-0.312
1,2,3,4,6,7,8-HpCDF		0.022	-0.015
1,2,3,4,7,8,9-HpCDF		-0.077	-0.046
1,2,3,4,7,8-HxCDD		-0.082	-0.066
1,2,3,4,7,8-HxCDF		-0.081	-0.065
1,2,3,6,7,8-HxCDD		-0.067	-0.058
1,2,3,6,7,8-HxCDF		-0.084	-0.069
1,2,3,7,8,9-HxCDD		-0.082	-0.063
1,2,3,7,8,9-HxCDF		-0.084	-0.059
1,2,3,7,8-PeCDD		-0.085	-0.065
1,2,3,7,8-PeCDF		-0.085	-0.056
2,3,4,6,7,8-HxCDF		-0.084	-0.083
2,3,4,7,8-PeCDF		-0.084	-0.066
2,3,7,8-TeCDD		-0.085	-0.059
2,3,7,8-TeCDF		-0.085	-0.056
OCDD		-0.14	0.249
OCDF		0.281	0.888

PCA case scores			
	Groups	Axis 1	Axis 2
95SW-013-SL	Background	-0.149	-0.022
95SW-015-SL	Downstream	-0.033	0.012
95SW-024-SL	Downstream	-0.029	0.01
02SW-053-SD	Downstream	0.04	-0.007
02SW-054-SD	Downstream	0.007	0.008
02SW-057-SD	Downstream	-0.049	0.008
02SW-059-SD	Downstream	0.213	-0.009
SW-055-SD	Downstream	0.038	-0.008
SW-057-SD	Downstream	-0.017	-0.015
SW-059-SD	Downstream	0.194	0.02

Principal Components Analysis - Data Output

PCDD/F Congeners in Sediments Collected from the Drainage Ditch Setting Non-Detects to Zero Values
Corresponding Figure: Figure C-6b

Eigenvalues			
		Axis 1	Axis 2
Eigenvalues		0.074	0.001
Percentage		98.567	1.362
Cum. Percentage		98.567	99.929

PCA variable loadings			
		Axis 1	Axis 2
1,2,3,4,6,7,8-HpCDD		0.902	-0.312
1,2,3,4,6,7,8-HpCDF		0.022	-0.015
1,2,3,4,7,8,9-HpCDF		-0.077	-0.046
1,2,3,4,7,8-HxCDD		-0.082	-0.066
1,2,3,4,7,8-HxCDF		-0.081	-0.065
1,2,3,6,7,8-HxCDD		-0.067	-0.058
1,2,3,6,7,8-HxCDF		-0.084	-0.069
1,2,3,7,8,9-HxCDD		-0.082	-0.063
1,2,3,7,8,9-HxCDF		-0.084	-0.059
1,2,3,7,8-PeCDD		-0.085	-0.065
1,2,3,7,8-PeCDF		-0.085	-0.056
2,3,4,6,7,8-HxCDF		-0.084	-0.083
2,3,4,7,8-PeCDF		-0.084	-0.066
2,3,7,8-TeCDD		-0.085	-0.059
2,3,7,8-TeCDF		-0.085	-0.056
OCDD		-0.14	0.249
OCDF		0.281	0.888

PCA case scores			
	Groups	Axis 1	Axis 2
95SW-013-SL	Background	-0.149	-0.022
95SW-015-SL	Downstream	-0.033	0.012
95SW-024-SL	Downstream	-0.029	0.01
02SW-053-SD	Downstream	0.04	-0.007
02SW-054-SD	Downstream	0.007	0.008
02SW-057-SD	Downstream	-0.049	0.008
02SW-059-SD	Downstream	0.213	-0.009
SW-055-SD	Downstream	0.038	-0.008
SW-057-SD	Downstream	-0.017	-0.015
SW-059-SD	Downstream	0.194	0.02

Principal Components Analysis - Data Output

PCDD/F Congeners in Sediments Collected from the Drainage Ditch Setting Non-Detects to Zero Values
Corresponding Figure: Figure C-6c

Eigenvalues			
		Axis 1	Axis 2
Eigenvalues		0.074	0.001
Percentage		98.565	1.361
Cum. Percentage		98.565	99.926

PCA variable loadings			
		Axis 1	Axis 2
1,2,3,4,6,7,8-HpCDD		0.902	-0.312
1,2,3,4,6,7,8-HpCDF		0.022	-0.015
1,2,3,4,7,8,9-HpCDF		-0.076	-0.046
1,2,3,4,7,8-HxCDD		-0.082	-0.066
1,2,3,4,7,8-HxCDF		-0.084	-0.038
1,2,3,6,7,8-HxCDD		-0.066	-0.058
1,2,3,6,7,8-HxCDF		-0.084	-0.064
1,2,3,7,8,9-HxCDD		-0.081	-0.063
1,2,3,7,8,9-HxCDF		-0.086	-0.076
1,2,3,7,8-PeCDD		-0.084	-0.063
1,2,3,7,8-PeCDF		-0.087	-0.075
2,3,4,6,7,8-HxCDF		-0.083	-0.08
2,3,4,7,8-PeCDF		-0.084	-0.06
2,3,7,8-TeCDD		-0.085	-0.057
2,3,7,8-TeCDF		-0.085	-0.064
OCDD		-0.14	0.25
OCDF		0.282	0.888

PCA case scores			
	Groups	Axis 1	Axis 2
95SW-013-SL	Background	-0.149	-0.022
95SW-015-SL	Downstream	-0.033	0.012
95SW-024-SL	Downstream	-0.029	0.01
02SW-053-SD	Downstream	0.04	-0.007
02SW-054-SD	Downstream	0.007	0.008
02SW-057-SD	Downstream	-0.049	0.008
02SW-059-SD	Downstream	0.213	-0.009

Principal Components Analysis - Data Output

PCDD/F Congeners in Sediments Collected from Cedar Creek Setting Non-Detects to Zero Values
Corresponding Figure: Figure C-7a

Eigenvalues			
		Axis 1	Axis 2
Eigenvalues		0.225	0.006
Percentage		94.491	2.65
Cum. Percentage		94.491	97.141

PCA variable loadings			
		Axis 1	Axis 2
1,2,3,4,6,7,8-HpCDD		0.599	0.724
1,2,3,4,6,7,8-HpCDF		0.012	-0.173
1,2,3,4,7,8,9-HpCDF		-0.066	-0.037
1,2,3,4,7,8-HxCDD		-0.071	-0.044
1,2,3,4,7,8-HxCDF		-0.069	-0.046
1,2,3,6,7,8-HxCDD		-0.058	-0.029
1,2,3,6,7,8-HxCDF		-0.071	-0.046
1,2,3,7,8,9-HxCDD		-0.069	-0.039
1,2,3,7,8,9-HxCDF		-0.071	-0.047
1,2,3,7,8-PeCDD		-0.071	-0.046
1,2,3,7,8-PeCDF		-0.071	-0.047
2,3,4,6,7,8-HxCDF		-0.071	-0.044
2,3,4,7,8-PeCDF		-0.072	-0.046
2,3,7,8-TeCDD		-0.071	-0.046
2,3,7,8-TeCDF		-0.072	-0.05
OCDD		-0.37	0.466
OCDF		0.664	-0.451

PCA case scores			
	Groups	Axis 1	Axis 2
02SW-064-SD	Downstream	0.022	0.024
02SW-066-SD	Downstream	0.007	0.009
02SW-067-SD	Downstream	0.006	0.009
02SW-068-SD	River	-0.033	-0.004
02SW-167-SD	Downstream	0.007	0.008
95SW-025-SD (NCDENR)	Background	-0.048	-0.017
95SW-029-SD (NCDENR)	Downstream	0.019	-0.005
95SW-031-SD (NCDENR)	Trib	-0.012	0.005
95SW-032-SD (NCDENR)	Trib	0.017	-0.002
95SW-033-SD (NCDENR)	Trib	-0.035	0
95SW-129-SD (NCDENR)	Downstream	0.035	0
98SW-039-SD	Background	-0.044	-0.01
98SW-039-SD (NCDENR)	Background	-0.048	-0.016
98SW-040-SD	Background	-0.043	-0.009
98SW-040-SD (NCDENR)	Background	-0.048	-0.016
98SW-041-SD	Background	-0.043	-0.009
98SW-041-SD (NCDENR)	Background	-0.048	-0.016
PCA case scores - Cont'd			

	Groups	Axis 1	Axis 2
98SW-042-SD	Background	-0.043	-0.009
98SW-042-SD (NCDENR)	Background	-0.048	-0.016
98SW-043-SD	Downstream	-0.028	-0.004
98SW-043-SD (NCDENR)	Downstream	-0.02	-0.004
98SW-044-SD	Downstream	0.014	0.011
98SW-044-SD (NCDENR)	Downstream	0.434	-0.018
98SW-045-SD	Downstream	0.018	0.013
98SW-045-SD (NCDENR)	Downstream	0.017	0.009
98SW-046-SD	Trib	-0.032	-0.004
98SW-046-SD (NCDENR)	Trib	-0.035	-0.009
98SW-047-SD	Downstream	0.005	0.019
98SW-047-SD (NCDENR)	Downstream	0.006	-0.001
98SW-048-SD	Trib	-0.008	0.012
98SW-048-SD (NCDENR)	Trib	0.016	0.001
98SW-049-SD	Downstream	0.007	0.011
98SW-049-SD (NCDENR)	Downstream	0.053	-0.009
98SW-050-SD	Trib	0.003	0.012
98SW-050-SD (NCDENR)	Trib	0.037	-0.006
98SW-051-SD	Downstream	0.005	0.01
98SW-051-SD (NCDENR)	Downstream	-0.007	-0.002
98SW-052-SD	Downstream	-0.012	0.003
98SW-052-SD (NCDENR)	Downstream	0.018	0.011
98SW-143-SD	Downstream	-0.022	0.001
98SW-143-SD (NCDENR)	Downstream	-0.031	-0.009
98SW-152-SD	Downstream	-0.016	0
98SW-152-SD (NCDENR)	Downstream	-0.007	0.028
99SW-053-SD	Trib	-0.018	-0.02
99SW-054-SD	Trib	-0.036	-0.006
99SW-055-SD	Trib	0.019	0.025

Principal Components Analysis - Data Output

PCDD/F Congeners in Sediments Collected from Cedar Creek Less Sample SW-044-SD (NCDENR) and Setting Non-Detects to Zero Values
Corresponding Figure: Figure C-7b

Eigenvalues				
		Axis 1	Axis 2	Axis 3
Eigenvalues		0.037	0.005	0.003
Percentage		81.061	11.451	7.431
Cum. Percentage		81.061	92.512	99.942

PCA variable loadings				
		Axis 1	Axis 2	Axis 3
1,2,3,4,6,7,8-HpCDD		0.701	-0.654	0.146
1,2,3,4,6,7,8-HpCDF		0.001	0.298	0.923
1,2,3,4,7,8,9-HpCDF		-0.089	-0.024	-0.057
1,2,3,4,7,8-HxCDD		-0.097	-0.022	-0.062
1,2,3,4,7,8-HxCDF		-0.097	-0.021	-0.053
1,2,3,6,7,8-HxCDD		-0.078	-0.025	-0.057
1,2,3,6,7,8-HxCDF		-0.098	-0.022	-0.057
1,2,3,7,8,9-HxCDD		-0.095	-0.026	-0.049
1,2,3,7,8,9-HxCDF		-0.099	-0.022	-0.062
1,2,3,7,8-PeCDD		-0.099	-0.022	-0.063
1,2,3,7,8-PeCDF		-0.099	-0.022	-0.063
2,3,4,6,7,8-HxCDF		-0.098	-0.022	-0.049
2,3,4,7,8-PeCDF		-0.1	-0.025	-0.055
2,3,7,8-TeCDD		-0.099	-0.023	-0.065
2,3,7,8-TeCDF		-0.102	-0.022	-0.065
OCDD		-0.071	-0.033	-0.025
OCDF		0.619	0.689	-0.287

PCA case scores				
	Groups	Axis 1	Axis 2	Axis 3
02SW-064-SD	Downstream	0.036	-0.018	0.003
02SW-066-SD	Downstream	0.019	-0.005	0
02SW-067-SD	Downstream	0.017	-0.005	0
02SW-068-SD	River	-0.025	-0.002	-0.002
02SW-167-SD	Downstream	0.018	-0.004	0
95SW-025-SD (NCDENR)	Background	-0.042	0.009	0.004
95SW-029-SD (NCDENR)	Downstream	0.029	0.015	-0.003
95SW-031-SD (NCDENR)	Trib	-0.002	-0.006	-0.002
95SW-032-SD (NCDENR)	Trib	0.027	0.011	-0.005
95SW-033-SD (NCDENR)	Trib	-0.026	-0.006	0.01
95SW-129-SD (NCDENR)	Downstream	0.046	0.013	-0.004
98SW-039-SD	Background	-0.037	0.001	-0.004
98SW-039-SD (NCDENR)	Background	-0.042	0.006	-0.005
98SW-040-SD	Background	-0.036	0	-0.003
98SW-040-SD (NCDENR)	Background	-0.042	0.006	-0.005
98SW-041-SD	Background	-0.036	0	-0.004
98SW-041-SD (NCDENR)	Background	-0.042	0.006	-0.005
PCA case scores - cont'd				

	Groups	Axis 1	Axis 2	Axis 3
98SW-042-SD	Background	-0.036	0	-0.003
98SW-042-SD (NCDENR)	Background	-0.042	0.006	-0.005
98SW-043-SD	Downstream	-0.019	0	-0.002
98SW-043-SD (NCDENR)	Downstream	-0.011	0.002	-0.004
98SW-044-SD	Downstream	0.026	-0.004	0.002
98SW-045-SD	Downstream	0.031	-0.006	0.002
98SW-045-SD (NCDENR)	Downstream	0.029	-0.002	0
98SW-046-SD	Trib	-0.023	-0.002	-0.002
98SW-046-SD (NCDENR)	Trib	-0.028	0.002	-0.004
98SW-047-SD	Downstream	0.017	-0.016	0.005
98SW-047-SD (NCDENR)	Downstream	0.016	0.006	-0.006
98SW-048-SD	Trib	0.003	-0.012	0.003
98SW-048-SD (NCDENR)	Trib	0.026	0.007	-0.003
98SW-049-SD	Downstream	0.019	-0.007	0.004
98SW-049-SD (NCDENR)	Downstream	0.063	0.028	-0.009
98SW-050-SD	Trib	0.015	-0.009	0.003
98SW-050-SD (NCDENR)	Trib	0.047	0.021	-0.007
98SW-051-SD	Downstream	0.016	-0.006	0.002
98SW-051-SD (NCDENR)	Downstream	0.002	0.003	-0.004
98SW-052-SD	Downstream	-0.002	-0.003	-0.001
98SW-052-SD (NCDENR)	Downstream	0.03	-0.004	-0.002
98SW-143-SD	Downstream	-0.012	-0.004	0
98SW-143-SD (NCDENR)	Downstream	-0.024	0.004	-0.004
98SW-152-SD	Downstream	-0.007	-0.001	-0.002
98SW-152-SD (NCDENR)	Downstream	0.006	-0.031	0.01
99SW-053-SD	Trib	-0.01	0.028	0.051
99SW-054-SD	Trib	-0.028	-0.001	-0.003
99SW-055-SD	Trib	0.032	-0.02	0.005

Principal Components Analysis - Data Output

PCDD/F Congeners in Sediments Collected from Cedar Creek Background and Tributaries, and the Deep River, Setting Non-Detects to Zero Values
Corresponding Figure: Figure C-7c

Eigenvalues			
		Axis 1	Axis 2
Eigenvalues		0.042	0.003
Percentage		93.222	5.801
Cum. Percentage		93.222	99.022

PCA variable loadings			
		Axis 1	Axis 2
1,2,3,4,6,7,8-HpCDD		0.725	-0.641
1,2,3,4,6,7,8-HpCDF		0.012	0.018
1,2,3,4,7,8,9-HpCDF		-0.091	-0.004
1,2,3,4,7,8-HxCDD		-0.099	-0.006
1,2,3,4,7,8-HxCDF		-0.099	-0.011
1,2,3,6,7,8-HxCDD		-0.08	-0.01
1,2,3,6,7,8-HxCDF		-0.099	-0.007
1,2,3,7,8,9-HxCDD		-0.097	-0.017
1,2,3,7,8,9-HxCDF		-0.1	-0.006
1,2,3,7,8-PeCDD		-0.099	-0.006
1,2,3,7,8-PeCDF		-0.1	-0.006
2,3,4,6,7,8-HxCDF		-0.099	-0.01
2,3,4,7,8-PeCDF		-0.101	-0.024
2,3,7,8-TeCDD		-0.1	-0.006
2,3,7,8-TeCDF		-0.103	-0.009
OCDD		-0.063	-0.019
OCDF		0.589	0.766

PCA case scores			
	Groups	Axis 1	Axis 2
02SW-068-SD	River	0.067	-0.026
95SW-025-SD (NCDENR)	Background	0.042	-0.008
95SW-031-SD (NCDENR)	Trib-N1	0.04	-0.007
95SW-032-SD (NCDENR)	Trib-N3	-0.021	-0.005
95SW-033-SD (NCDENR)	Trib-S2	0.041	-0.006
98SW-039-SD	Background	-0.047	0.006
98SW-039-SD (NCDENR)	Background	0.055	0.022
98SW-040-SD	Background	0.012	-0.01
98SW-040-SD (NCDENR)	Background	0.053	0.018
98SW-041-SD	Background	-0.022	-0.016
98SW-041-SD (NCDENR)	Background	0.08	0.02
98SW-042-SD	Background	-0.039	-0.001
98SW-042-SD (NCDENR)	Background	-0.047	0.006
98SW-046-SD	Trib-N1	-0.037	-0.002
98SW-046-SD (NCDENR)	Trib-N1	-0.047	0.006
98SW-048-SD	Trib-N3	-0.037	-0.002
98SW-048-SD (NCDENR)	Trib-N3	-0.047	0.006
98SW-050-SD	Trib-S2	-0.038	-0.002
98SW-050-SD (NCDENR)	Trib-S2	-0.047	0.006
99SW-053-SD	Trib-S2	-0.014	-0.002
99SW-054-SD	Trib-N3	-0.002	0.001
99SW-055-SD	Trib-S1	0.053	-0.007

Principal Components Analysis - Data Output

PCDD/F Congeners in Sediments Collected from the Drainage Ditch and those from the Cedar Creek Tributaries, Setting Non-Detects to Zero Values
Corresponding Figure: Figure C-8a

Eigenvalues				
		Axis 1	Axis 2	Axis 3
Eigenvalues		0.049	0.009	0.006
Percentage		76.397	13.723	9.748
Cum. Percentage		76.397	90.12	99.868

PCA variable loadings				
		Axis 1	Axis 2	Axis 3
1,2,3,4,6,7,8-HpCDD		0.85	-0.266	-0.381
1,2,3,4,6,7,8-HpCDF		-0.082	0.779	-0.572
1,2,3,4,7,8,9-HpCDF		-0.076	-0.071	0.018
1,2,3,4,7,8-HxCDD		-0.082	-0.077	0.014
1,2,3,4,7,8-HxCDF		-0.082	-0.07	0.008
1,2,3,6,7,8-HxCDD		-0.066	-0.071	0.019
1,2,3,6,7,8-HxCDF		-0.084	-0.073	0.011
1,2,3,7,8,9-HxCDD		-0.083	-0.074	0.006
1,2,3,7,8,9-HxCDF		-0.085	-0.078	0.014
1,2,3,7,8-PeCDD		-0.085	-0.078	0.015
1,2,3,7,8-PeCDF		-0.085	-0.077	0.015
2,3,4,6,7,8-HxCDF		-0.084	-0.07	0.004
2,3,4,7,8-PeCDF		-0.088	-0.08	0.003
2,3,7,8-TeCDD		-0.085	-0.08	0.016
2,3,7,8-TeCDF		-0.085	-0.077	0.015
OCDD		-0.111	-0.037	0.074
OCDF		0.413	0.497	0.721

PCA case scores				
	Groups	Axis 1	Axis 2	Axis 3
95SW-013-SL (NCDENR)	DD-Bkgd	-0.06	-0.014	0.002
95SW-015-SL (NCDENR)	DD-Down	0.009	-0.003	0.006
95SW-024-SL (NCDENR)	DD-Down	0.011	-0.004	0.004
02SW-053-SD	DD-Down	0.049	-0.01	-0.011
02SW-054-SD	DD-Down	0.032	-0.004	-0.001
02SW-057-SD	DD-Down	0	-0.004	0.005
02SW-059-SD	DD-Down	0.148	-0.009	-0.029
95SW-031-SD (NCDENR)	Trib-N1	-0.019	-0.012	0.002
95SW-033-SD (NCDENR)	Trib-S2	-0.056	-0.008	-0.019
98SW-046-SD	Trib-N1	-0.054	-0.014	0
98SW-046-SD (NCDENR)	Trib-N1	-0.063	-0.012	0.005
98SW-048-SD	Trib-N3	-0.01	-0.012	-0.009
98SW-048-SD (NCDENR)	Trib-N3	0.017	0.013	0.022
98SW-050-SD	Trib-S2	0.006	-0.005	-0.003
98SW-050-SD (NCDENR)	Trib-S2	0.043	0.033	0.044
99SW-053-SD	Trib-S2	-0.047	0.076	-0.037
99SW-054-SD	Trib-N3	-0.061	-0.016	0
99SW-055-SD	Trib-S1	0.037	-0.01	-0.011
95SW-032-SD (NCDENR)	Trib-N3	0.017	0.016	0.029

Principal Components Analysis - Data Output

PCDD/F Congeners in Sediments Collected from the Drainage Ditch and Main Stem of Cedar Creek [Less Sample SW-044-SD (NCDENR)] and Setting Non-Detects to Zero Values
Corresponding Figure: Figure C-8b

Eigenvalues			
		Axis 1	Axis 2
Eigenvalues		0.049	0.006
Percentage		89.211	10.336
Cum. Percentage		89.211	99.547

PCA variable loadings			
		Axis 1	Axis 2
1,2,3,4,6,7,8-HpCDD		0.804	-0.538
1,2,3,4,6,7,8-HpCDF		0.017	0.014
1,2,3,4,7,8,9-HpCDF		-0.087	-0.026
1,2,3,4,7,8-HxCDD		-0.094	-0.025
1,2,3,4,7,8-HxCDF		-0.094	-0.027
1,2,3,6,7,8-HxCDD		-0.076	-0.025
1,2,3,6,7,8-HxCDF		-0.096	-0.026
1,2,3,7,8,9-HxCDD		-0.092	-0.028
1,2,3,7,8,9-HxCDF		-0.096	-0.025
1,2,3,7,8-PeCDD		-0.096	-0.025
1,2,3,7,8-PeCDF		-0.096	-0.024
2,3,4,6,7,8-HxCDF		-0.095	-0.029
2,3,4,7,8-PeCDF		-0.096	-0.026
2,3,7,8-TeCDD		-0.097	-0.025
2,3,7,8-TeCDF		-0.099	-0.026
OCDD		-0.09	0.022
OCDF		0.481	0.838

PCA case scores			
	Groups	Axis 1	Axis 2
95SW-013-SL	DD-Bkgd	-0.033	-0.002
95SW-015-SL	DD-Down	0.015	0
95SW-024-SL	DD-Down	0.016	-0.001
02SW-053-SD	DD-Down	0.041	-0.014
02SW-054-SD	DD-Down	0.03	-0.005
02SW-057-SD	DD-Down	0.008	0
02SW-059-SD	DD-Down	0.107	-0.03
02SW-064-SD	CC-Down	0.036	-0.011
02SW-066-SD	CC-Down	0.016	0
02SW-067-SD	CC-Down	0.014	0
02SW-068-SD	River	-0.03	-0.004
02SW-167-SD	CC-Down	0.015	0.001
95SW-025-SD (NCDENR)	CC-Bkgd	-0.05	0.002
95SW-029-SD (NCDENR)	CC-Down	0.023	0.023
95SW-129-SD (NCDENR)	CC-Down	0.041	0.024
98SW-039-SD	CC-Bkgd	-0.044	-0.003
PCA case scores (cont'd)			

	Groups	Axis 1	Axis 2
98SW-039-SD (NCDENR)	CC-Bkgd	-0.05	0.001
98SW-040-SD	CC-Bkgd	-0.042	-0.004
98SW-040-SD (NCDENR)	CC-Bkgd	-0.05	0.001
98SW-041-SD	CC-Bkgd	-0.042	-0.004
98SW-041-SD (NCDENR)	CC-Bkgd	-0.05	0.001
98SW-042-SD	CC-Bkgd	-0.042	-0.003
98SW-042-SD (NCDENR)	CC-Bkgd	-0.05	0.001
98SW-043-SD	CC-Down	-0.025	-0.001
98SW-043-SD (NCDENR)	CC-Down	-0.017	0.003
98SW-044-SD	CC-Down	0.024	0.002
98SW-045-SD	CC-Down	0.029	0.001
98SW-045-SD (NCDENR)	CC-Down	0.026	0.005
98SW-047-SD	CC-Down	0.017	-0.013
98SW-047-SD (NCDENR)	CC-Down	0.011	0.012
98SW-049-SD	CC-Down	0.016	-0.003
98SW-049-SD (NCDENR)	CC-Down	0.056	0.044
98SW-051-SD	CC-Down	0.014	-0.002
98SW-051-SD (NCDENR)	CC-Down	-0.003	0.007
98SW-052-SD	CC-Down	-0.006	-0.001
98SW-052-SD (NCDENR)	CC-Down	0.027	0.004
98SW-143-SD	CC-Down	-0.017	-0.004
98SW-143-SD (NCDENR)	CC-Down	-0.03	0.002
98SW-152-SD	CC-Down	-0.012	0
98SW-152-SD (NCDENR)	CC-Down	0.008	-0.031

Cluster Analysis - Data Output

PCDD/F Congeners in Sediments Collected from the Drainage Ditch Setting Non-Detects to Zero Values
Corresponding Figure: Figure C-9

Node	Group 1	Group 2	Dissimil.	Objects in group
1	95SW-015-SL (Downstream)	95SW-024-SL (Downstream)	0.012	2
2	Node 1	02SW-057-SD (Downstream)	0.045	3
3	02SW-053-SD (Downstream)	02SW-054-SD (Downstream)	0.089	2
4	Node 2	Node 3	0.152	5
5	95SW-013-SL (Background)	Node 4	0.343	6
6	Node 5	02SW-059-SD (Downstream)	0.611	7

Cluster Analysis - Data Output

PCDD/F Congeners in Sediments Collected from Cedar Creek Setting Non-Detects to Zero Values
Corresponding Figure: Figure C-10a

Node	Group 1	Group 2	Dissimil.	Objects in group
1	98SW-039-SD (NCDENR) (Background)	98SW-040-SD (NCDENR) (Background)	0	2
2	Node 1	98SW-041-SD (NCDENR) (Background)	0	3
3	Node 2	98SW-042-SD (NCDENR) (Background)	0	4
4	98SW-040-SD (Background)	98SW-041-SD (Background)	0.004	2
5	Node 4	98SW-042-SD (Background)	0.006	3
6	02SW-067-SD (Downstream)	02SW-167-SD (Downstream)	0.008	2
7	02SW-068-SD (River)	98SW-046-SD (Trib)	0.01	2
8	02SW-066-SD (Downstream)	Node 6	0.01	3
9	98SW-039-SD (Background)	Node 5	0.012	4
10	Node 8	98SW-051-SD (Downstream)	0.02	4
11	98SW-045-SD (NCDENR) (Downstream)	98SW-052-SD (NCDENR) (Downstream)	0.023	2
12	95SW-031-SD (NCDENR) (Trib)	98SW-052-SD (Downstream)	0.025	2
13	98SW-046-SD (NCDENR) (Trib)	99SW-054-SD (Trib)	0.027	2
14	Node 10	98SW-049-SD (Downstream)	0.028	5
15	02SW-064-SD (Downstream)	99SW-055-SD (Trib)	0.029	2
16	95SW-032-SD (NCDENR) (Trib)	98SW-048-SD (NCDENR) (Trib)	0.03	2
17	98SW-045-SD (Downstream)	Node 11	0.03	3
18	98SW-044-SD (Downstream)	Node 17	0.031	4
19	Node 7	98SW-043-SD (Downstream)	0.033	3
20	98SW-043-SD (NCDENR) (Downstream)	98SW-152-SD (Downstream)	0.036	2
21	Node 14	98SW-050-SD (Trib)	0.037	6
22	Node 13	98SW-143-SD (NCDENR) (Downstream)	0.039	3
23	95SW-029-SD (NCDENR) (Downstream)	Node 16	0.042	3
24	Node 19	Node 22	0.043	6
25	Node 20	98SW-143-SD (Downstream)	0.044	3
26	Node 9	Node 3	0.055	8
27	95SW-129-SD (NCDENR) (Downstream)	98SW-050-SD (NCDENR) (Trib)	0.056	2
28	Node 12	98SW-051-SD (NCDENR) (Downstream)	0.061	3
29	Node 28	Node 25	0.073	6
30	95SW-025-SD (NCDENR) (Background)	Node 26	0.075	9
31	Node 21	98SW-047-SD (Downstream)	0.075	7

Cluster Analysis - Data Output

PCDD/F Congeners in Sediments Collected from Cedar Creek Setting Non-Detects to Zero Values
Corresponding Figure: Figure C-10a

Node	Group 1	Group 2	Dissimil.	Objects in group
32	Node 31	Node 18	0.086	11
33	Node 23	98SW-047-SD (NCDENR) (Downstream)	0.088	4
34	Node 24	95SW-033-SD (NCDENR) (Trib)	0.098	7
35	Node 29	98SW-048-SD (Trib)	0.102	7
36	Node 34	Node 30	0.111	16
37	Node 32	Node 33	0.127	15
38	Node 27	98SW-049-SD (NCDENR) (Downstream)	0.136	3
39	Node 15	Node 37	0.15	17
40	Node 39	Node 35	0.198	24
41	Node 40	98SW-152-SD (NCDENR) (Downstream)	0.224	25
42	Node 41	Node 38	0.311	28
43	Node 42	Node 36	0.358	44
44	Node 43	99SW-053-SD (Trib)	0.449	45
45	Node 44	98SW-044-SD (NCDENR) (Downstream)	2.981	46

Cluster Analysis - Data Output

PCDD/F Congeners in Sediments Collected from Cedar Creek Background (Upstream) Locations, Tributaries and River, Setting Non-Detects to Zero Values.

Corresponding Figure: Figure C-10b

Node	Group 1	Group 2	Dissimil.	Objects in group
1	98SW-039-SD (NCDENR) (Background)	98SW-040-SD (NCDENR) (Background)	0	2
2	Node 1	98SW-041-SD (NCDENR) (Background)	0	3
3	Node 2	98SW-042-SD (NCDENR) (Background)	0	4
4	98SW-040-SD (Background)	98SW-041-SD (Background)	0.004	2
5	Node 4	98SW-042-SD (Background)	0.006	3
6	02SW-067-SD (Downstream)	02SW-167-SD (Downstream)	0.008	2
7	02SW-068-SD (River)	98SW-046-SD (Trib)	0.01	2
8	02SW-066-SD (Downstream)	Node 6	0.01	3
9	98SW-039-SD (Background)	Node 5	0.012	4
10	Node 8	98SW-051-SD (Downstream)	0.02	4
11	98SW-045-SD (NCDENR) (Downstream)	98SW-052-SD (NCDENR) (Downstream)	0.023	2
12	95SW-031-SD (NCDENR) (Trib)	98SW-052-SD (Downstream)	0.025	2
13	98SW-046-SD (NCDENR) (Trib)	99SW-054-SD (Trib)	0.027	2
14	Node 10	98SW-049-SD (Downstream)	0.028	5
15	02SW-064-SD (Downstream)	99SW-055-SD (Trib)	0.029	2
16	95SW-032-SD (NCDENR) (Trib)	98SW-048-SD (NCDENR) (Trib)	0.03	2
17	98SW-045-SD (Downstream)	Node 11	0.03	3
18	98SW-044-SD (Downstream)	Node 17	0.031	4
19	Node 7	98SW-043-SD (Downstream)	0.033	3
20	98SW-043-SD (NCDENR) (Downstream)	98SW-152-SD (Downstream)	0.036	2
21	Node 14	98SW-050-SD (Trib)	0.037	6
22	Node 13	98SW-143-SD (NCDENR) (Downstream)	0.039	3
23	95SW-029-SD (NCDENR) (Downstream)	Node 16	0.042	3
24	Node 19	Node 22	0.043	6
25	Node 20	98SW-143-SD (Downstream)	0.044	3
26	Node 9	Node 3	0.055	8
27	95SW-129-SD (NCDENR) (Downstream)	98SW-050-SD (NCDENR) (Trib)	0.056	2
28	Node 12	98SW-051-SD (NCDENR) (Downstream)	0.061	3
29	Node 28	Node 25	0.073	6

Cluster Analysis - Data Output

PCDD/F Congeners in Sediments Collected from Cedar Creek Background (Upstream) Locations, Tributaries and River, Setting Non-Detects to Zero Values.

Corresponding Figure: Figure C-10b

Node	Group 1	Group 2	Dissimil.	Objects in group
30	95SW-025-SD (NCDENR) (Background)	Node 26	0.075	9
31	Node 21	98SW-047-SD (Downstream)	0.075	7
32	Node 31	Node 18	0.086	11
33	Node 23	98SW-047-SD (NCDENR) (Downstream)	0.088	4
34	Node 24	95SW-033-SD (NCDENR) (Trib)	0.098	7
35	Node 29	98SW-048-SD (Trib)	0.102	7
36	Node 34	Node 30	0.111	16
37	Node 32	Node 33	0.127	15
38	Node 27	98SW-049-SD (NCDENR) (Downstream)	0.136	3
39	Node 15	Node 37	0.15	17
40	Node 39	Node 35	0.198	24
41	Node 40	98SW-152-SD (NCDENR) (Downstream)	0.224	25
42	Node 41	Node 38	0.311	28
43	Node 42	Node 36	0.358	44
44	Node 43	99SW-053-SD (Trib)	0.449	45
45	Node 44	98SW-044-SD (NCDENR) (Downstream)	2.981	46

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Appendix D
North Carolina Natural Heritage Program Follow-up Correspondence Related to the Plant Identification Performed as Part of the SLERA Ecological Survey

amec

12 July 2007

William P. Arrants
General Manager
Southern Wood Piedmont Company
591 Springfield Road
Spartanburg, South Carolina 29303

RE: Revised Plant Identification from the July 2006 Plant Survey of the Area near the Southern Wood Piedmont Facility in Gulf, North Carolina

Dear Bill:

We have prepared this letter in response to the 4 June 2007 correspondence (attached) from the North Carolina Natural Heritage Program (NCNHP) concerning the natural heritage features near the Southern Wood Piedmont facility in Gulf, North Carolina. Their correspondence included a question concerning one of the plants that were identified during the plant survey (twig rush; *Cladium mariscoides*) since the habitat along Cedar Creek differed from the preferred bog habitat for this species. Our field ecologist re-evaluated his files and concluded that he had erroneously identified this plant during the survey. The correct identification is the dark green bulrush (*Scirpus atrovirens*), which is found in North Carolina and is common throughout most of the US.

We apologize for this misidentification and will update our files to reflect this correction.

Sincerely,

John H. Samuelian, Ph.D.
Senior Environmental Scientist/
Project Manager

Attachment

Cc: Greg Kuntz – Schnabel Engineering

AMEC Earth & Environmental, Inc.
15 Franklin Street
Portland, ME 04101
Tel (207) 879-4222
Fax (207) 879-4223
www.amec.com

amec

June 2007 Correspondence from NCNHP

NCDENR

RECEIVED 6-11-2007

North Carolina Department of Environment and Natural Resources

Michael F. Easley, Governor

William G. Ross Jr., Secretary

June 4, 2007

Mr. John H. Samuelian, Ph.D.
AMEC Earth & Environmental, Inc.
15 Franklin Street
Portland, ME 04101

Subject: Ecological Risk Assessment for Southern Wood Piedmont Facility; Gulf, Chatham County, NC

Dear Mr. Samuelian:

The Natural Heritage Program has no record of rare species, significant natural communities, or significant natural heritage areas at the site. However, the Federal and State Endangered Cape Fear shiner (*Notropis mekistocholas*) has been found in the Deep River near the project area. It has been found at the SR 2153 bridge crossing, just downstream from the confluence of Cedar Creek with the river. We assume that the fish occurs upstream and downstream of this site, as we have records from such places several miles away. Thus, it is imperative that sedimentation from the facility not reach the Cape Fear River.

Also, the Vegetative Cover description for Cedar Creek (Table 2) attached with your letter lists a plant species that is Significantly Rare in North Carolina – twig rush (*Cladium mariscoides*). This species occurs in bogs near the coast, in the Sandhills region, and in the mountains. As bog habitat is probably not present along Cedar Creek, I wonder if the species was correctly identified. Our Program would like to receive more information about this plant (location, number of individuals, etc.) if you feel that the species was correctly identified. A Rare Plant Form is available for downloading on our website (below).

You may wish to check the Natural Heritage Program database website at www.ncnhp.org for a listing of rare plants and animals and significant natural communities in the county and on the quad map.

NC OneMap now provides digital Natural Heritage data online for free. This service provides site specific information on GIS layers with Natural Heritage Program rare species occurrences and Significant Natural Heritage Areas. The NC OneMap website provides Element Occurrence (EO) ID numbers (instead of species name), and the data user is then encouraged to contact the Natural Heritage Program for detailed information. This service allows the user to quickly and efficiently get site specific NHP data without visiting the NHP workroom or waiting for the Information Request to be answered by NHP staff. For more information about data formats and access, visit <www.nconemap.com/data.html>, or email NC OneMap at <dataq@ncmail.net>.

Please do not hesitate to contact me at 919-715-8697 if you have questions or need further information.

Sincerely,

Harry E. LeGrand Jr.

Harry E. LeGrand, Jr., Zoologist
Natural Heritage Program