



# ECOLOGICAL RISK ASSESSMENT REPORT

## MODULE 4 – ECOLOGICAL RISK ASSESSMENT OF IMPOUNDMENTS 13, 17 & 24

**American Cyanamid Superfund Site  
Bridgewater, New Jersey**

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## 1.0 INTRODUCTION

On behalf of Wyeth Holdings LLC (WH) Golder Associates Inc. (Golder) has prepared this Ecological Risk Assessment (ERA) Report for Impoundments 13, 17, and 24, as part of the Pre-Design Investigation (PDI) for the American Cyanamid Superfund Site (Site) in Bridgewater Township, New Jersey (Site). This ERA Report has been prepared pursuant to the Statement of Work (SOW) for Operable Unit 4 (OU4) which is Appendix A of the Administrative Settlement Agreement and Order on Consent between WH and the USEPA, dated March 18, 2003 (as amended August 12, 2003) referred to hereafter as the "OU4RD/OU8FFS Order".

A 2005 Baseline Ecological Risk Assessment (BERA) Report (O'Brien & Gere 2005) documents the risk assessment that considered potential terrestrial ecological risk at the Site in the area outside of the impoundments and potential aquatic risk in Cuckel's Brook and the Raritan River. As stated in the Record of Decision (ROD) for OU4, the BERA concluded "that the level of potential significant impact of Site-related COCs on ecological receptors is likely to be low"; however at the request of USEPA, regular monitoring of surface water and sediment in Cuckel's Brook and the Raritan River in the vicinity of the Site is ongoing for comparison with post-remedial conditions. As outlined in the Record of Decision (ROD; USEPA, 2012) and the OU4RD/OU8FFS Order, an ERA for Impoundments 13, 17, and 24 was required to determine appropriate remedial action(s) based on the presence or absence of unacceptable terrestrial ecological risk. The impoundment contents were previously covered with soil. As further described in the SOW, this ERA addresses terrestrial ecological risk in the ecological exposure zone, which includes existing surface materials, defined herein as from ground surface to a depth of 2 feet.

Brief descriptions of the three impoundments are provided below.

- Impoundment 13 – An approximately 3.9 acre area located in the West Area, just outside of the southwest corner of the flood control dike of the North Area, as shown on Figure 1. From approximately 1948 to 1959 the impoundment was used first for lime storage for Cyanamid's wastewater treatment facility, and subsequently for disposal of sludges.
- Impoundment 17 – An approximately 6.2 acre area located outside in the South Area just south of the Conrail (former Port Reading) Railroad tracks as shown on Figure 1. This area was in active operation from 1966 to 1969, originally for storage of primary sludge generated from the settlement of lime-neutralized effluent, and later for disposal of plant debris.
- Impoundment 24 – An approximately 3.2 acre area located in the West Area of the Site, just north of the Conrail (former Lehigh Valley) Railroad tracks as shown on Figure 1. This area was actively used, at its inception in approximately 1940 for storage of lime for the primary treatment facilities and later for disposal of sludges and general plant wastes.

An initial phase of PDI field work at Impoundments 13, 17, and 24 was conducted in November 2013, in accordance with the USEPA-approved Module 4 PDI Work Plan (Work Plan; Golder 2013), to supplement a dataset from 2010 and support the screening level assessment and problem formulation steps of the



Ecological Risk Assessment Guidance for Superfund (ERAGS; USEPA 1997). Consistent with the sampling approach used in the 2010 investigation, the 2013 field work included the collection of surface soil samples from two depths representing the ecological exposure zone: 0 to 12" and 12" to 24" below ground surface (bgs). Sample locations from both the 2010 and 2013 investigations are shown on Figure 1. During the soil sampling activities, observations of the physical habitat, including soil conditions and vegetation types, were recorded for each of the three impoundments. Wildlife observations were also recorded to assist with development of a conceptual site model. Data collected from this phase of field work was summarized in a Field Sampling and Analysis Report (FSAR; Golder 2014), which was approved by USEPA on November 6, 2014, and is also included as Appendix A of this Report. The 2010 data that was also used for this ERA was reported in *Former American Cyanamid Site: Site Wide Characterization Program Summary Memorandum* (O'Brien & Gere, 2010). There have also been ongoing discussions with USEPA and the New Jersey Department of Environmental Protection (NJDEP) throughout the risk assessment process, including an update presentation to USEPA and USEPA's Technical Assistance Grant recipient on March 26, 2015.

As discussed in the FSAR, the combined 2010 and 2013 (PDI) data set provides adequate areal coverage of each impoundment and, in conjunction with the habitat characterization results, were sufficient to conduct Steps 1 through 2 of the ERAGS Process. The ERAGS Process Steps included in this ERA Report include the following:

- *Screening Level Problem Formulation* — a qualitative evaluation of contaminant release, migration, and fate; identification of contaminants of concern, receptors, exposure pathways, and known ecological effects of the contaminants, and selection of endpoints for further study
- *Screening Level Ecological Effects Assessment* — identification of toxicity reference values (TRVs) based on the selected endpoints (No Observed Adverse Effect Level [NOAEL] versus Lowest Observed Adverse Effect Levels [LOAEL])
- *Screening Level Exposure Assessment* — a quantitative evaluation of contaminant release, migration, and fate; characterization of exposure pathways and receptors, and measurement or estimation of conservative exposure point concentrations (EPCs)
- *Screening Level Risk Characterization* — conservative estimation of potential current and future risks to facilitate a Scientific Management Decision Point as to whether additional evaluation of ecological risks is necessary
- *Scientific Management Decision Point (SMDP)* — determination of whether no action is needed, additional risk assessment is required, or risk management should be performed

Consistent with ERAGS, a SMDP was reached following Step 2 of the ERA and is further described in Section 6.0.



## 2.0 SCREENING LEVEL PROBLEM FORMULATION

### 2.1 Environmental Setting

The Site is located along the Raritan River in the Piedmont physiographic province. According to Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs), Impoundments 13, 17 and 24 are within the 100-year floodplain of the Raritan River. However, it is important to note that the New Jersey Flood Hazard Map distinguishes between Floodway and Flood Fringe areas (Floodways have higher flood flow velocities than Flood Fringe areas), and none of the impoundments at the Site are in the Floodway. In addition, there are engineered berms surrounding the contents of these impoundments that provide protection against flooding. The FEMA FIRM for this area has recently been updated to be consistent with the New Jersey Flood Hazard Map showing that these impoundments are not in the Floodway of the Raritan River. Further, large precipitation and Site flooding events that have occurred in recent years (e.g. Tropical Storms Irene and Floyd) have not caused loss of contents from any of these three Site impoundments.

The ecological habitat of the three impoundments can be generally characterized as field and scrub habitat typically associated with historically developed and disturbed sites. Much of the habitat can be characterized as disturbed field, treeline, and small isolated woodlot habitat dominated by non-native invasive species and native generalist species. Many of the fauna and flora species observed or likely to be present in the impoundments are commonly occurring species found in rural mixed oldfield-woodland habitat.

An initial inspection of the impoundments and associated habitat was performed as part of the PDI. Key observations for each impoundment are summarized as follows.

- Impoundment 13
  - The surface of the impoundment slopes gently downward from the west/southwest towards Cuckel's Brook, which is located at the eastern/northeastern boundary of the impoundment. The impoundment is bounded by an approximately 4 foot high berm to the northwest (adjacent to Impoundment 3 separated by Cuckel's Brook), and to the west by Bufflehead Road which is approximately 4 feet higher than the surface of the impoundment. The impoundment is bounded to the south by a 42-inch aboveground pipe, which is used to convey stormwater from the North Area to Lagoon 7.
  - Vegetation is well established across the impoundment surface and includes grasses, shrubs, small trees, and other vegetation.
  - Surface soils generally consist of brown to dark brown silty sands.
- Impoundment 17
  - The surface of the impoundment is generally flat with a gradual upward slope to the northwest; the impoundment is surrounded by a berm on all sides approximately 6 feet above the impoundment surface.



- Vegetation is present across the impoundment surface and includes grasses, reeds, small trees, other plants. Vegetation is sparse in the central and southeastern portions of the impoundment where standing water has been observed during previous sampling activities (O'Brien & Gere, 2010).
- Surface soils include sand and silty sand (with some organic/vegetative matter near the surface) overlying high moisture content fines.
- Impoundment 24
  - The impoundment surface is generally flat and sparsely vegetated. It is bounded to the northwest and northeast by Lagoon 7 and Former Lagoon 6, respectively. A gravel road forms the southern boundary.
  - Surface soils generally consist of white to gray lime or gray lime mixed with gravel. In some locations, a thin veneer of silty sand is present overlying the lime material.

### 2.1.1 Terrestrial Habitat

An ecological habitat characterization of Impoundments 13, 17, and 24 was conducted in November 2013. Prior to the field event, a desktop review was conducted using publically available information from the following sources to inform the habitat characterization:

- Natural Resources Conservation Service (NRCS) soil survey map
- National Wetland Inventory (NWI) maps
- Historic aerial imagery (Google Earth)
- FEMA FIRMs
- i-mapNJ DEP and NJ-GeoWeb State Geographic Information System (GIS) on-line mappers and libraries

Qualitative vegetation surveys for each impoundment were conducted along meandering transects throughout the entirety of each impoundment. Approximate plant species abundance was visually estimated for each impoundment using the DACFOR qualitative ranking scale (i.e., dominant is greater than 50% cover; abundant is between 30 and 50% cover; common is between 20 and 29% cover; frequent is between 10 and 19% cover; occasional is between 5 and 9% cover; and rare is between 0 and 4 % cover).

#### 2.1.1.1 Impoundment 13

Impoundment 13 is a disturbed field habitat dominated by non-native and common native generalist herbaceous and graminoid species with scattered trees, shrubs, and vines throughout. There was no evidence of stressed or stunted vegetation in Impoundment 13 and total vegetative cover approached 100%. Shallow soil borings indicated that the top layer of soil is primarily silty sand and fill material, with lime deposits encountered in some locations at 20 inches below soil surface.

The interior of the impoundment is dominated by non-native and invasive species (NNIS) such as the common reed (*Phragmites australis*), reed canarygrass (*Phalaris arundinacea*), ragweed (*Ambrosia*



*artemisifolia*), and Canada goldenrod (*Solidago altissima*). The northeast edge of the impoundment is dominated by reed canarygrass while the vegetation in the interior of the impoundment is dominated by common reed.

#### 2.1.1.2 Impoundment 17

Impoundment 17 is a disturbed field habitat dominated by non-native and common native generalist herbaceous and graminoid species with scattered trees, shrubs, and vines. There was no evidence of stressed or stunted vegetation in Impoundment 17 and total vegetative cover approached 100%. Shallow soil borings indicate that the top layer of soil is primarily sand and silty sand down to approximately 12 inches below the soil surface.

The interior of Impoundment 17 is dominated by generalist herbaceous species such as tall thoroughwort (*Eupatorium altissimum*) and calico aster (*Symphotrichum lateriflorum*) and graminoid species such as reed canarygrass. Subdominants in Impoundment 17 include common mullein (*Verbascum thapsus*), bull thistle (*Cirsium vulgare*), and a small stand of common buckthorn (*Rhamnus cathartica*) located near the northern end of the impoundment.

Larger saplings and mature trees with an average diameter at breast height (DBH) of 6 to 14 inches (occasionally 20 to 24 inches DBH) were found along the perimeter of the impoundment. The most common species are tree of heaven (*Ailanthus altissima*), white ash (*Fraxinus americana*) and box elder (*Acer negundo*) along with multiflora rose (*Rosa multiflora*), black raspberry (*Rubus occidentalis*), and blackberry (*Rubus allegheniensis*) in the understory.

#### 2.1.1.3 Impoundment 24

Impoundment 24 is a disturbed field habitat dominated by non-native and common native generalist herbaceous and graminoid species with scattered trees, shrubs, and vines. Vegetative cover is sparse throughout the impoundment and vegetation appears stunted or absent in areas where lime deposits were observed at the soil surface. Approximately 10% of the surface area of Impoundment 24 is covered by exposed lime deposits with little or no vegetation growing on the deposits.

There are two general soil characterizations for Impoundment 24: areas with approximately 10 inches of sand, gravel, and fill material underlain by lime deposits; and areas where lime deposits are present on the soil surface.

Total vegetative cover in Impoundment 24 is approximately 75% and is dominated by ragweed, yellow foxtail grass (*Setaria pumila*), cottonwood (*Populus deltoides*) and box elder. Vegetative cover is higher along the perimeter of the impoundment, particularly in the scrubby treeline along the northeast edge of the



impoundment. The most commonly found trees along the impoundment perimeter are willow (*Salix spp.*), box elder, and American sycamore (*Platanus occidentalis*).

### **2.1.2 Wildlife Observations**

Fauna surveys for each impoundment were conducted in parallel with the vegetation surveys including visual identification of individuals, scat, tracks, evidence of browse or behavior (e.g. deer buck rubs), and the identification of vocal songs or calls (primarily for bird species).

#### **2.1.2.1 Impoundment 13**

Evidence of numerous bird and mammal species was observed throughout Impoundment 13. White-tailed deer (*Odocoileus virginianus*) paths, scat, and hoof prints were common throughout the impoundment. Skunk (likely *Mephitis mephitis*) musk, canid scat (likely coyote [*Canis latrans*] or red fox [*Vulpes vulpes*]), and numerous passerine bird species were observed. Based on the landscape setting and the habitat present in the impoundment, it is likely that numerous small mammal and passerine bird species common to rural mixed field-woodland habitat may be present in Impoundment 13.

#### **2.1.2.2 Impoundment 17**

Evidence of numerous bird and mammal species was observed throughout Impoundment 17. White-tailed deer paths, scat, and hoof prints were common throughout the impoundment and significant antler rubbing damage was present on the buckthorn stems. Raccoon (*Procyon lotor*) scat, a groundhog (*Marmota monax*) burrow, a mouse (likely *Peromyscus sp.*), wild turkey (*Meleagris gallopavo*), and numerous passerine bird species were observed in Impoundment 17. Based on the landscape setting and the habitat present in the impoundment, it is likely that numerous small mammal and passerine bird species common to rural mixed field-woodland habitat may be present in Impoundment 17.

#### **2.1.2.3 Impoundment 24**

Evidence of numerous animal species was observed throughout Impoundment 24. White-tailed deer browse and hoof prints were common throughout the impoundment; a groundhog burrow, and raccoon scat were identified in the impoundment. Few birds other than field sparrows (*Spizella pusilla*), white-throated sparrows (*Zonotrichia albicollis*), and black-capped chickadees (*Parus atricapillus*) were identified within the impoundment, although numerous birds were identified in the vicinity of the impoundment due to its proximity to Lagoon 7 and former Lagoon 6. Based on the proximity of large waterbodies and the relatively poor terrestrial habitat present in the impoundment, it is likely that this habitat is only transiently utilized by small mammal and passerine bird species.

#### **2.1.2.4 General Vicinity**

There are numerous impounded and flowing waterbodies in the vicinity of the three impoundments surveyed (e.g. Lagoon 7, Former Lagoon 6, and Cuckel's Brook) and it is likely that many of the species



observed use these water bodies that are adjacent to, but not present within, the impoundments. In addition to the fauna identified within each impoundment surveyed, other species identified in the vicinity of Impoundments 13, 17, and 24 include: redbelly turtle (*Pseudemys rubriventris*), eastern painted turtle (*Chrysemys picta*), belted kingfisher (*Megaceryle alcyon*), Canada goose (*Branta canadensis*), red-tailed hawk (*Buteo jamaicensis*), great blue heron (*Ardia herodias*), ruddy duck (*Oxyura jamaicensis*), American black duck (*Anas rubripes*), hooded merganser (*Lophodytes cucullatus*), herring gull (*Larus argentatus*), mallard (*Anas platyrhynchos*), turkey vulture (*Cathartes aura*), and a perching bald eagle (*Haliaeetus leucocephalus*). Many of these species were identified in Lagoon 7 and Former Lagoon 6. No bald eagle nests were observed in the vicinity of the surveyed impoundments.

### 2.1.3 Threatened/Endangered Species

As part of the previously conducted BERA, inquiries were sent to the NJDEP Natural Heritage Program (NHP) and United States Fish and Wildlife Service (USFWS) regarding the potential presence of rare, threatened, or endangered species at or in the vicinity of the Site. As summarized in Section 2.2.4 of the BERA, NHP indicated that one or more herptile (*reptile or amphibian*) species of special concern may occur at or in the vicinity of the Site, but did not identify the species and USFWS indicated that no federally listed or proposed threatened or endangered flora or fauna occur within the vicinity of the Site, with the exception of an occasional bald eagle. The BERA went on to summarize that an inquiry with the New Jersey Endangered and Nongame Species Program identified the list of rare herptile species potentially in the vicinity of the Site to include Fowlers toad (*Bufo woodhousii* fowlen) and Eastern box turtle (*Terrapene c. caroline*). Neither of these herptile species was observed in the surveyed impoundments during the habitat characterization, nor was there evidence of bald eagle nests in the vicinity of the impoundments. The threatened and endangered species BERA letter responses from NJDEP, NHP, and USFWS are included in Appendix B.

Further, in support of this ERA, it was confirmed that the NJDEP NJ-Geoweb Landscape Project mapping does not show Natural Heritage Priority Sites in the vicinity of the three impoundments or the Site. Landscape Project Natural Heritage Grid Maps also show no documented threatened or endangered species occurrences within any of these impoundments or within the boundaries of the Site. As described in the sections above, the biotic and abiotic conditions of the impoundments were assessed in the field as part of the PDI and habitats were evaluated as potential Ecologically Sensitive Natural Resources (ESNR's) using guidance from the New Jersey Department of Environmental Protection Bureau of Release Prevention Environmentally Sensitive Areas Guidance Document (NJDEP, June 2012). There was no snow cover during the survey and conditions were suitable for assessing the impoundments for potential threatened and endangered plant species habitat. It is unlikely that any of the surveyed impoundments represent potential habitat for threatened or endangered species because the habitat for all three impoundments is dominated by non-native invasive species and native generalist species.



## 2.2 Preliminary Conceptual Site Model

### 2.2.1 Identification of Complete Exposure Pathways

An environmental exposure pathway is the means by which contaminants are transported from a source to ecological receptors, and identification of complete exposure pathways is critical to assessing ecological risk. This preliminary conceptual site model addresses terrestrial receptors potentially exposed to surface soils. The primary pathways of exposure to Site-related contaminants for terrestrial receptors include the following:

- Direct contact with contaminated environmental media in the form of surface soil
- Direct or incidental ingestion of contaminated abiotic media, (i.e. soil) during feeding
- Dietary ingestion of contaminated prey items

One exposure pathway considers a direct absorption route where the primary producers (plants) and lower trophic level consumers (e.g., terrestrial invertebrates) come into contact with contaminants in environmental media.

A second exposure pathway involves incidental ingestion of soils containing contaminants during other behavioral activities such as grooming (i.e., ingestion of dust or soil particles during cleaning behavior) and feeding (i.e., ingestion of dust or soil particles during ingestion of food). This pathway is typically considered in higher trophic level receptors, and represents a small fraction of the dietary ingestion rate for these receptors.

The third mechanism, ingestion of prey items, applies to higher trophic levels, and accounts for an indirect mechanism of exposure to contaminants, especially those that bioconcentrate or biomagnify within food webs. This pathway considers the direct accumulation and concentration of contaminants within plant or animal tissues, and the subsequent ingestion of these organisms by higher trophic levels. This exposure route often results in greater exposure to bioaccumulating and/or biomagnifying contaminants in predatory species associated with carnivorous trophic level consumers.

The dermal absorption route is not typically considered a significant pathway for higher trophic level receptors (i.e., birds, mammals and reptiles) because they are covered in hair, feathers, or scales. An exception would be amphibians (i.e., frogs, toads and salamanders), which have highly permeable skin that lacks a barrier such as scales, hair, or feathers to offset this exposure route. At the request of USEPA, due to the proximity to water bodies, amphibians were considered for possible food chain modeling, however the habitat characterization work (described in Section 2.1) did not indicate significant amphibious use of the impoundments. Furthermore, exposure factors and toxicity data for amphibians are not readily



available, so quantitative risk analysis would not be possible. Excluding amphibious species from the risk assessment is not likely to significantly underestimate the potential risk.

## 2.2.2 Assessment and Measurement Endpoints

The following Assessment and Measurement Endpoints were established for the ERA calculations:

Ecological Receptor	Assessment Endpoints	Measurement Endpoints
Invertebrates	Protection of <b>terrestrial (soil) invertebrates</b> from the toxic effects (on survival and growth) of Site-related chemicals present in surface soil	Comparison of maximum soil concentrations with terrestrial invertebrate-based screening (benchmark) values
Vegetation	Protection of <b>terrestrial vegetation</b> from the toxic effects (on survival and growth) of Site-related chemicals present in surface soil	Comparison of maximum soil concentrations with terrestrial plant-based screening (benchmark) values
Mammals	Protection of <b>herbivorous, insectivorous, and omnivorous terrestrial mammals</b> to ensure that ingestion of contaminants in surface soil and through diet does not have negative impacts on growth, survival, and reproduction	Dietary HQs are calculated for individual chemicals by dividing an estimated level of exposure by ecotoxicity values that are associated with a no observed adverse effect level (NOAEL) and a lowest observed adverse effect level (LOAEL)
Birds	Protection of <b>omnivorous and carnivorous terrestrial birds</b> to ensure that ingestion of contaminants in surface soil and through diet does not have negative impacts on growth, survival, and reproduction	Dietary HQs are calculated for individual chemicals by dividing an estimated level of exposure by ecotoxicity values that are associated with a no observed adverse effect level (NOAEL) and a lowest observed adverse effect level (LOAEL)

## 2.2.3 Receptor Species

Since it is not feasible to evaluate every species that may be impacted, indicator species representative of the range of possible receptors at the Site must be selected to focus the ERA and allow for characterization of Site-specific risk. Receptor selection was guided by the results of the habitat characterization evaluation and resident species information, and is designed to address various trophic levels (to assess food chain impact and potential concern for bioaccumulation) and, where appropriate, species of statutory concern (such as those protected under federal/territory law).

Species chosen as receptors are representative of those that have been observed or are expected to occur with some frequency on the Site and are summarized below.



Target Receptor	Exposures
Terrestrial vegetation	Direct soil exposure
Terrestrial invertebrates	Direct soil exposure
Herbivorous mammal (Meadow Vole)	Ingestion of food items and incidental ingestion of soil
Insectivorous mammal (Short-tailed Shrew)	Ingestion of food items and incidental ingestion of soil
Carnivorous mammal (Red Fox)	Ingestion of food items and incidental ingestion of soil
Omnivorous bird (American Robin)	Ingestion of food items and incidental ingestion of soil
Carnivorous bird (Red-tailed Hawk)	Ingestion of food items and incidental ingestion of soil

The species selected to represent both mammals and birds were chosen because they are present in central New Jersey and could potentially occur or have been identified as being present at the Site. A list of wildlife observed at the Site is included in Appendix C. These indicator species represent a range of dietary habits and trophic levels and provide appropriate bounds on the range of potential ecological risks for mammals and birds at the Site. In addition, there is adequate information in the literature regarding exposure parameters and/or toxicity data available for the species selected.

### 2.3 Selection of Contaminants of Potential Ecological Concern

Selection of chemicals of potential ecological concern (COPECs) is performed to focus the ERA on those constituents with reported concentrations at the Site that have the potential to pose adverse impacts to ecological receptors. The selection process involved the following steps consistent with the methodology presented in ERAGS and the guidance provided in USEPA's *Ecological Assessment of Superfund Sites: An Overview*, ECO Update Intermittent Bulletin, Volume 1, Number 2, December 1991 (USEPA, 1991).

- Maximum reported chemical concentrations were compared to soil screening values<sup>1</sup> that have been established to protect biota. Chemicals for which the maximum reported field concentration exceeds screening values were retained as COPECs. Chemicals which were not detected, but have established screening values, were compared to the screening values at the method detection limit. Chemicals reported above the detection limit that do not have established screening values were, by default, retained for further consideration as COPECs.
- Detected compounds eliminated from consideration as COPECs based on the criteria above were assessed as to their bioaccumulation potential (see below for additional

<sup>1</sup> Comparison values for screening purposes were taken from the following hierarchy of references: 1) USEPA's Ecological Soil Screening Levels (ECO SSLs); 2) NJDEP Ecological Screening Criteria (ESC); and, 3) Oak Ridge National Laboratory Soil Screening Benchmarks. See Tables 1A, 1B, and 1C for details.



- discussion). Detected chemicals that may bioaccumulate were retained as COPECs, irrespective of concentration or frequency of detection.
- Calcium, magnesium, potassium, and sodium were removed from further consideration as COPECs because they are ubiquitous, occur naturally in high concentrations, and are essential nutrients.

The potential for a detected chemical to bioaccumulate within organisms and biomagnify through the food chain was examined in order to assist in the selection of COPECs. As defined by USEPA, bioaccumulation is “the accumulation of pollutants in living organisms by direct adsorption or through food chains,” and “accumulation by an organism of materials that are not an essential component or nutrient of that organism” (USEPA, 2006). For the purpose of this ERA, compounds were identified as bioaccumulative in soil based on comparisons with Table 4-2, Important Bioaccumulative Compounds, from the document “Bioaccumulation Testing and Interpretation for the Purpose of Sediment Quality Assessment” (USEPA, 2000). All detected compounds identified as bioaccumulative were carried forward as COPECs. Since biota testing was not performed during the PDI, conservative bioconcentration factors from the literature are used in this ERA to estimate concentrations of COPECs in plants and animals, where appropriate.

Identified COPECs, including volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), and inorganics, for Impoundments 13, 17, and 24 are summarized in Tables 1A, 1B, and 1C, respectively.



### 3.0 SCREENING LEVEL ECOLOGICAL EFFECTS ASSESSMENT

The goal of the screening level ecological effects assessment is to determine the potential toxic effects of COPECs at the Site on the selected ecological receptors. The ecological effects assessment includes gathering data about direct exposure toxicity for lower trophic level receptors (plants and invertebrates) and toxicity reference values for upper trophic level receptors (birds and mammals). The following sections summarize the screening level ecological effects assessment.

#### 3.1 Selection of Comparison Values for Direct Exposure

As discussed above, the evaluation of potential ecological risk due to direct exposure was assessed by comparing contaminant concentrations in soil with appropriate screening values. This process was conducted as part of the selection of COPECs as discussed in Section 2.3 above.

#### 3.2 Selection of Toxicity Reference Values

The primary data sources used to establish TRVs were USEPA's Ecological Soil Screening Levels (Eco-SSLs) and *Toxicological Benchmarks for Wildlife: 1996 Revision* (Sample, Opresko, and Suter 1996). This document provides a consolidated listing of toxicity data for a wide range of contaminants. Body weight conversions and other considerations are included in the published toxicity reference values for each receptor. Secondary sources of toxicity data that were used are referenced in Tables 9 and 10.

Chronic NOAELs for COPECs were preferentially selected to represent TRVs used in this assessment to be conservative (i.e., protective) consistent with USEPA guidance (USEPA, 1997). Risk estimates based on chronic LOAELs were also calculated as a means to more accurately represent adverse effects levels. In some cases, acute or chronic LOAELs or median lethal doses (LD<sub>50</sub>) were the only available ecotoxicity values. In such cases, adjustments were made to these values using safety factors to reflect levels of uncertainty. The following protocol was used to obtain an equivalent chronic NOAEL when only a LOAEL or LD<sub>50</sub> was available (Calabrese and Baldwin, 1993):

- Chronic LOAELs (or chronic LD<sub>50</sub>) are multiplied by a correction factor of 0.1
- Acute LOAELs are multiplied by a correction factor of 0.04
- Acute LD<sub>50</sub> are multiplied by a correction factor of 0.01

The toxicity reference values selected for this ERA are summarized in Tables 9 and 10.



## 4.0 SCREENING LEVEL EXPOSURE ASSESSMENT

The screening level exposure assessment step characterizes the expected total exposure for each receptor to COPECs by estimating the exposure point concentrations (i.e., the concentrations of COPECs in soil and food items) and the associated daily doses based on species-specific exposure factors (e.g., ingestion rates).

### 4.1 Exposure Point Concentration Estimates

The exposure point concentrations (EPCs) of Site COPECs were determined for soil and for food items (e.g., plants, invertebrates, small mammals) to which Site receptors may be exposed. For screening level assessments it is customary to use the maximum detected concentration in soil as the EPC; however, using maximum concentrations for screening likely overestimates actual population and community-level ecological risk, and the maximum concentration is often not representative of overall site conditions. Therefore, for this assessment, central tendency EPCs (average and 95% UCL concentrations) were also estimated in addition to the maximum reported concentration. Including the other two central tendency statistics in the evaluation helps differentiate between COPECs retained entirely due to a high degree of conservativeness and those COPECs that actually have a realistic potential to cause ecological risk. Because biota samples were not collected during this field program, food item EPCs were estimated using soil to biota uptake equations/factors from USEPA's Eco-SSL guidance (USEPA, 2007), Baes 1984, or EPA's SLERA Protocol for Hazardous Waste Combustion Facilities (USEPA, 1999). The input parameters used for these equations and the resulting dietary concentrations are presented in Tables 3A, 3B, and 3C, for Impoundments 13, 17 and 24, respectively.

### 4.2 Direct Exposure

All of the receptors selected for this ERA have the potential to be exposed directly to any contaminants present in surface soil from Impoundments 13, 17, and 24; however, as discussed above, the majority of exposure for upper trophic level receptors occurs via ingestion of food items (and to a lesser degree incidental ingestion of soil) and not through direct contact. Therefore, the direct exposure assessment is conducted only for terrestrial plants and soil invertebrates. For the purposes of this ERA, it is assumed that all plant and invertebrate receptors are directly exposed to the soil exposure point concentrations described in Section 4.1.

### 4.3 Food Chain Exposure Dose Estimation

This subsection discusses the methods by which chemical exposures are estimated for the Short-tailed Shrew, Meadow Vole, Red Fox, American Robin, and Red-tailed Hawk. The models used to estimate exposure doses, in milligrams (mg) of chemical intake per kilogram (kg) of body weight per day (mg/kg/day), are presented below and are based on USEPA guidance. Species-specific exposure parameters are presented in Table 2.



In order to calculate a dietary exposure, a number of parameters are required. These include food ingestion rate, body weight, soil ingestion rate, the proportion of diet coming from each food item, and the concentration of each COPEC in the food items. For the purposes of this ERA, an area use factor (AUF) (the ratio of the size of the Site to the size of the receptor's home range or feeding territory size) of 1.0 was used. This value conservatively assumes that all receptors spend all their time at the Site and consume all their food from sources within the impacted area. The basic equation used to estimate food chain daily doses is as follows:

$$Dose = \frac{(IR_{dw} \times P_s \times C_s) + \sum_i (IR_{ww} \times P_f^i \times C_f^i)}{BW} \times AUF$$

where,

Dose	=	Potential dietary exposure through ingestion of soil and typical food items (mg COPC/kg body weight/day)
IR <sub>dw</sub>	=	Food ingestion rate (kg diet/day) (dry weight)
IR <sub>ww</sub>	=	Food ingestion rate (kg diet/day) (wet weight)
P <sub>s</sub>	=	Proportion of diet that is incidental ingestion of soil (unitless)
C <sub>s</sub>	=	Concentration of COPC in soil (mg/kg)
P <sub>f</sub> <sup>i</sup>	=	Proportion of diet that is food item <i>i</i> – (unitless)
C <sub>f</sub> <sup>i</sup>	=	Concentration of the COPC in food item <i>i</i> based on chemical-specific update equations (mg/kg)
BW	=	Body weight (kg)
AUF	=	Area Use Factor (unitless) = 1.0 for conservative screening purposes

Estimates of food chain exposure (i.e., average daily dose) for the mammal and bird receptors evaluated herein are summarized in Tables 4 through 8. Note that estimates were calculated based on maximum reported COPEC concentrations as well as for average and 95% UCL values.



## 5.0 SCREENING LEVEL RISK CHARACTERIZATION

In this ERA, the potential risks to the various receptors were assessed in the following ways:

- Potential direct exposure risks to terrestrial plants and invertebrates were evaluated by comparing the maximum detected soil concentrations to plant and invertebrate screening values as shown in Tables 1A, 1B, and 1C for Impoundments 13, 17, and 24, respectively. Those constituents for which a reported concentration exceeded the relevant screening levels were retained as COPECs in the ERA.
- Potential food chain exposure risks to mammals and birds (i.e., Short-tailed Shrew, Meadow Vole, Red Fox, American Robin, and Red-tailed Hawk) were evaluated by calculating Hazard Quotients using the food chain exposure dose estimates and relevant toxicity reference values.

### 5.1 Estimation of Direct Contact Risk

Potential ecological risks from contaminants in the surface soil in Impoundments 13, 17, and 24 were assessed for terrestrial plants and invertebrates using direct comparisons of contaminant concentrations with benchmark values. Comparisons were made between the maximum detected contaminant levels and available phytotoxicity and invertebrate toxicity data during the screening phase for COPECs (Section 2.5). As noted above, comparisons of maximum detected concentrations of VOCs, SVOCs, and inorganics (including PCBs) to soil direct contact toxicity benchmark values is included in Tables 1A, 1B, and 1C for impoundments 13, 17 and 24, respectively.

### 5.2 Estimation of Food Chain Risk

The potential risks to ecological receptors in Impoundments 13, 17, and 24 were assessed by comparing impoundment surface soil concentrations and/or modeled dietary intake of contaminants with the appropriate TRVs. For receptors with food chain exposure, a hazard quotient (HQ) was calculated for each individual COPEC, defined as the receptor species-specific daily dose (or EPC) divided by the species-specific TRV as shown in the equation below.

$$HQ = \frac{\text{Daily Dose of a given COC}}{\text{Dose - Based Toxicity Reference Value for a given species}}$$

In an ERA, a hazard quotient equal to or less than unity (1.0) indicates that there is no potential for adverse effects on the given species. It is important to note that this methodology is not a measure of, and cannot be used to determine, absolute quantitative risk. Use of this technique, however, can indicate the potential for ecological receptors to be at risk of an adverse effect from exposure to Site-related COPECs. Given the conservativeness of the assumptions and methods used to calculate the screening level HQs, an HQ greater than 1.0 only indicates a potential for an adverse effect and not an absolute effect. Higher HQs represent a higher potential for risk.



Potential food chain risks for contaminant uptake through the food chain were estimated for the Red Fox, Meadow Vole, Short-tailed Shrew, American Robin, and Red-tailed Hawk as detailed in Section 2.3.4. Tables 4A through 8C show, in detail, the food chain evaluation for each receptor species for each of the three impoundments. The NOAEL- and LOAEL-based hazard quotients that exceed unity (1.0) for food chain exposure modeling are summarized in Tables 11A, 11B, and 11C, for each impoundment, respectively. The resultant HQs, which include exceedances of 1.0 for multiple compounds and receptors in each impoundment, indicate that there is potential for unacceptable risk in all three of the impoundments based on the screening level assessment methods.

The HQs based on maximum concentrations and NOAEL toxicity values represent the most conservative and unrealistic assessment of potential adverse effects to individuals. As there are no threatened or endangered species in the study areas, the protection of receptor species populations is the appropriate endpoint of the ERA. Accordingly, HQs based on average or 95% UCL concentrations, central tendency exposures, and LOAEL toxicity values (see Tables 11A, 11B, and 11C) represent the more realistic estimates of potential adverse effects at the population level for the receptor species.



## 6.0 UNCERTAINTY ASSESSMENT

An integral part of any risk assessment is making assumptions for inputs where there are data gaps or where the data (such as TRVs) are based on less than optimal studies. In a screening level assessment, assumptions are made in cases of data gaps or less substantial data with the expectation that they are conservative (i.e., protective) and all assumptions carry with them associated uncertainties which must be identified to put risk estimates in perspective. Typically, at the end of the process, there are multiple layers of conservative assumptions which result in conservative and sometimes unrealistic potential effect level results. The following describes the major assumptions used in this ERA and the associated uncertainties.

The maximum detected contaminant concentration was used to conservatively estimate potential ecological risks from direct exposure to Site soil and to select COPECs. In reality, ecological receptor populations will likely be exposed to a range of contaminant concentrations lower than the maximum concentration, so this assumption may result in an unrealistically high estimate of potential ecological effects. As such, certain central tendency values (95% UCL and average) were also considered in this assessment.

This ERA did not include estimates of potential risks from dermal absorption or inhalation for mammals and birds. These pathways are considered to be minor contributors to exposure in the majority of cases as compared to ingestion and there is significantly less data available for estimating exposure and toxic effects from these pathways. The overall risks are likely underestimated due to the exclusion of these pathways; however, because these pathways are assumed to be minor contributors, this exclusion is not likely to affect risk characterization conclusions.

Available screening values and TRVs may not be representative of toxicity to all potential Site receptors, so these values are not necessarily protective of ecological receptors that may be more sensitive to the effects of a chemical than those considered in this ERA. However, in general, sensitive species and conservative assumptions are used to develop screening values and other toxicity values (such as the one or more order of magnitude adjustment factors applied to various TRVs), which likely contributes to an overestimation of the risk to actual Site receptors. In some cases TRVs were not available, so the potential for ecological risk could not be estimated, which causes uncertainty regarding the potential for risk from those constituents.

All potential risks to mammalian and avian species at the Site were determined solely based on the measured soil concentrations of COPECs. No biota (such as plant, invertebrate, and small mammal) samples were collected for analysis of COPEC concentrations in this investigation. Therefore, bioaccumulation/bioconcentration factors and regression equations were used to model these concentrations from measured soil levels. Actual bioaccumulation into food items is variable, depending upon such factors as chemical state, and soil properties such as organic carbon content. The models may over- or underestimate the actual dietary concentrations. However, these models are often used in



screening level assessments as it is generally accepted that they are conservative in estimating animal and plant tissue concentrations of COPECs, so the risk is not likely to be significantly underestimated, and is more likely overestimated.

The estimation of exposures to ecological receptors through the food chain also includes a number of parameters for which assumptions must be made. Specifically, the parameters used are the dietary composition, the food ingestion rate, the food dry weight fraction, the soil ingestion rate, and the body weight. In this assessment, the EPA 1993 Wildlife Exposure Factors Handbook was used as the primary source for these parameters and USEPA Eco-SSLs guidance was used to supplement. Each parameter introduces some level of uncertainty; however, the values used in this assessment are commonly used for screening level assessments, so the level of uncertainty is considered acceptable. The soil ingestion rate (which is determined by multiplying the soil ingestion fraction by the dry weight food ingestion rate) has a direct and significant effect on the estimated dose (in some cases the incidental soil ingestion portion of exposure comprises more than 50% of the total COPEC dose). The soil ingestion fractions used are based on 50<sup>th</sup> percentile estimates (USEPA, 2007).

As is common in screening steps of the ERA process, an area use factor of 1.0 was assumed for all receptors. This is conservative and results in an overestimate of risks for wide ranging receptors that obtain part of their diet from outside the Site area, especially the Red Fox and Red-tailed Hawk.

Potential toxicological risks to individual receptors have been evaluated in this ERA using maximum contaminant concentrations and NOAEL toxicity values; however, adverse effects on individuals may not be reflected at the population and community level if more realistic assumptions were used. The predicted risks may overestimate the actual population or community level effects. In general, the goal of ecological risk management is to be protective of populations rather than individual ecological receptors. Therefore, hazard quotients for mammals and birds were estimated based on exposure point concentrations that represent the central tendency (average) exposure and LOAEL-based HQs were also estimated.

Receptor risks were characterized by estimating potential risks associated with each individual analyte. Compounds may interact synergistically or antagonistically to either mitigate or aggravate adverse effects from the combined contaminants. However, insufficient research exists to quantify such interactions, and so individual analyte risks are used to evaluate potential impacts.



## 7.0 CONCLUSIONS AND RECOMMENDATIONS

While the risk estimates presented in this ERA Report are designed to be conservative, with the available dataset it cannot be concluded at this time that there is no potential for unacceptable risk. Even using the less conservative assumptions of central tendency exposures, etc., the data and methodologies used in this screening level assessment still indicate a potential for adverse effects, although at a much lower potential. As described in Section 1.0, the ERAGS process allows for an SMDP to be made at this stage of the ecological risk assessment (i.e. following completion of ERAGS Steps 1 and 2). There are three possible SMDP conclusions (as quoted from the ERAGs):

- “There is adequate information to conclude that ecological risks are negligible and therefore no need for remediation on the basis of ecological risk”
- “The information is not adequate to make a decision at this point, and the ecological risk assessment process will continue to Step 3”
- “*The information indicates a potential for adverse ecological effects, and a more thorough assessment is warranted.*” – Note that an alternate approach to conducting “a more thorough assessment” is to perform risk management to address potential adverse ecological effects, even though additional assessment could ultimately conclude that ecological risks are acceptable.

Additional information could be collected to attempt to refine the risk estimates, however this approach would expend significant resources and may not achieve a conclusion of acceptable risk. An alternate approach is to acknowledge the potential risks posed by the current surface soil conditions and take a risk management approach that removes the potential risk by the elimination of potential exposures.

In order to allow the design of the Site-wide Remedy to begin, Wyeth proposes to pursue a risk management approach rather than performing additional risk assessment studies. Consistent with the approach identified in the PDI Module 4 Work Plan Addendum (Golder, 2015), it is proposed that potential ecological risk will be addressed in Impoundments 13, 17, and 24 by removing the ecological exposure zone (i.e., the top 2 feet), relocating the excavated materials to the North Area for consolidation beneath the appropriate cap(s) based on available analytical data, and replacement of the ecological exposure zone with imported clean soils. This will also provide an opportunity to establish appropriate habitat with native plant species within the impoundments and allow for establishment of improved erosion protection in these areas.

The specific grading, biological restoration, erosion protective measures (to provide protection of the impoundments for a potential 500-year storm) and future inspection and maintenance regiments will be determined during detailed design of the OU-4 Impoundments and Site-wide soil remedy component. Once constructed, this proposed risk management approach will be protective against erosion and catastrophic loss of impoundment contents into local waterways. The replacement geotextile and soil layers would be subject to the stringent erosion protection and long term operation and maintenance requirements stated



in the ROD to withstand the effects of a 500-year flood event. In accordance with the Module 4 Work Plan Addendum (Golder 2015), Cone Penetrometer Tests were conducted and samples for geotechnical testing were collected from each of the three impoundments to provide data for the design of the soil removal, and replacement activities. These data will also be used to assess whether the relocated material needs to be strengthened by the addition of amendments to reduce the moisture content, increase the shear strength, or otherwise render the material suitable for handling prior to relocation and placement in the North Area. The geotechnical testing is in progress and the results will be submitted to USEPA separately, along with the CPT testing results, as part of the Module 4 FSAR Addendum to complete the PDI work for these three impoundments.



## 8.0 REFERENCES

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Table 1A  
Selection of COPECs - Impoundment 13  
PDI Module 4 - Ecological Risk Assessment  
American Cyanamid Superfund Site, Bridgewater, NJ

	Summary of Surface Soil Data										Ecological Screening Levels				Comparison of Maximum Detection to Screening Levels			Bioaccumulative	COPEC	Contaminant Category
	Minimum Detected Concentration	Maximum Detected Concentration	Location of Maximum Detection	Detection Frequency	Range of Method Detection Limits (for ND only)	Average Detected Concentration	95% UCL	Concentration Used for Screening <sup>1</sup>	Units	Wildlife <sup>2</sup> (mg/kg)	Invertebrate <sup>3</sup> (mg/kg)	Plant <sup>4</sup> (mg/kg)	Selected Screening Level (mg/kg)	Exceed Wildlife Screening	Exceed Invertebrate Screening	Exceed Plant Screening				
	Location	Depth (inches)																		
<b>Volatiles</b>																				
Acetone	0.0210	0.513	IMP 13-01	0 - 12	4/26	0.0025 - 1.2	0.175	0.0840	0.513	mg/kg	NA	NA	NA	NA	NA	NA	NA	NO	YES	B
Benzene	0.000380	0.0586	IMP 13-07	12 - 24	8/26	0.00013 - 0.00072	0.00831	0.0174	0.0586	mg/kg	0.255	NA	NA	0.255	N	NA	NA	NO	NO	NA
Chlorobenzene	0.000310	0.514	IMP 13-07	12 - 24	12/26	0.0002 - 0.00071	0.0481	0.223	0.514	mg/kg	40	40	NA	40	N	N	NA	NO	NO	NA
cis-1,2-Dichloroethene	0.000470	0.000470	IMP13-2	0 - 6	1/26	0.00021 - 0.055	0.000470	ND	0.000470	mg/kg	NA	NA	NA	NA	NA	NA	NA	NO	YES	B
Ethylbenzene	0.000290	0.0690	IMP 13-07	12 - 24	5/26	0.00018 - 0.00078	0.0152	0.00810	0.0690	mg/kg	5.16	NA	NA	5.16	N	NA	NA	NO	NO	NA
m,p-Xylenes	0.000960	0.229	IMP 13-07	12 - 24	8/26	0.0005 - 0.00099	0.0313	0.0676	0.229	mg/kg	NA	NA	NA	NA	NA	NA	NA	NO	YES	B
Methylene chloride	0.00380	0.00380	IMP 13-08	0 - 12	1/26	0.00025 - 0.46	0.00380	ND	0.00380	mg/kg	4.05	NA	NA	4.05	N	NA	NA	NO	NO	NA
o-Xylene	0.000460	0.137	IMP 13-07	12 - 24	7/26	0.00018 - 0.00099	0.0206	0.0408	0.137	mg/kg	NA	NA	NA	NA	NA	NA	NA	NO	YES	B
Tetrachloroethene	0.000760	0.0154	IMP 13-01	12 - 24	12/26	0.00016 - 0.11	0.00425	0.00366	0.0154	mg/kg	9.92	NA	NA	9.92	N	NA	NA	NO	NO	NA
Trichloroethene	ND	ND	NA	NA	0/26	0.00036 - 0.094	ND	ND	0.0940	mg/kg	12.4	NA	NA	12.4	N	NA	NA	NO	NO	NA
Toluene	0.000510	0.851	IMP 13-07	12 - 24	13/26	0.00015 - 0.00061	0.0677	0.366	0.851	mg/kg	200	NA	200	200	N	NA	N	NO	NO	NA
<b>Semivolatiles</b>																				
1,2,4-Trichlorobenzene	0.0376	3.78	IMP 13-09	12 - 24	18/26	0.00038 - 0.01	1.09	1.12	3.78	mg/kg	20	20	NA	20	N	N	NA	YES	YES	C
1,2-Dichlorobenzene	0.0996	87.8	IMP 13-01	12 - 24	15/26	0.0003 - 0.052	10.2	12.7	87.8	mg/kg	2.96	NA	NA	2.96	Y	NA	NA	YES	YES	A
1,3-Dichlorobenzene	0.0849	0.874	IMP 13-01	12 - 24	5/26	0.0003 - 0.048	0.389	0.207	0.874	mg/kg	37.7	NA	NA	37.7	N	NA	NA	YES	YES	C
1,4-Dichlorobenzene	0.0217	4.01	IMP 13-01	12 - 24	9/26	0.00037 - 0.04	0.865	0.604	4.01	mg/kg	20	20	NA	20	N	N	NA	YES	YES	C
2-Chloronaphthalene	0.0497	6.12	IMP 13-08	12 - 24	15/26	0.01 - 0.056	1.08	1.15	6.12	mg/kg	0.0122	NA	NA	0.0122	Y	NA	NA	NO	YES	A
2-Methylnaphthalene	0.132	12.4	IMP 13-05	12 - 24	16/26	0.019 - 0.11	2.60	2.71	12.4	mg/kg	3.24	NA	NA	3.24	Y	NA	NA	NO	YES	A
Acenaphthene	0.143	5.89	IMP 13-07	12 - 24	16/26	0.0097 - 0.052	2.28	2.12	5.89	mg/kg	20	NA	20	20	N	NA	N	YES	YES	C
Acenaphthylene	0.0390	0.781	IMP 13-10	12 - 24	16/26	0.011 - 0.058	0.406	0.361	0.781	mg/kg	682	NA	NA	682	N	NA	NA	YES	YES	C
Aniline	0.0944	114	IMP 13-05	12 - 24	19/26	0.007 - 0.01	18.1	33.3	114	mg/kg	NA	NA	NA	NA	NA	NA	NA	NO	YES	B
Anthracene	0.0432	10.0	IMP 13-05	12 - 24	17/26	0.012 - 0.063	1.78	1.94	10.0	mg/kg	1480	NA	NA	1480	N	NA	NA	YES	YES	C
Benzo[a]anthracene	0.0305	60.2	IMP 13-05	12 - 24	21/26	0.011 - 0.059	5.51	14.5	60.2	mg/kg	5.21	NA	NA	5.21	Y	NA	NA	YES	YES	A
Benzo[a]pyrene	0.0305	11.5	IMP 13-05	12 - 24	21/26	0.01 - 0.055	1.54	3.27	11.5	mg/kg	1.52	NA	NA	1.52	Y	NA	NA	YES	YES	A
Benzo[b]fluoranthene	0.0332	11.5	IMP 13-05	12 - 24	21/26	0.011 - 0.06	1.89	3.67	11.5	mg/kg	59.8	NA	NA	59.8	N	NA	NA	YES	YES	C
Benzo[k]fluoranthene	0.0187	3.79	IMP 13-05	12 - 24	20/26	0.013 - 0.067	0.776	1.41	3.79	mg/kg	119	NA	NA	119	N	NA	NA	YES	YES	C
Benzo[e]fluoranthene	0.0189	4.38	IMP 13-05	12 - 24	21/26	0.013 - 0.068	0.666	1.35	4.38	mg/kg	148	NA	NA	148	N	NA	NA	YES	YES	C
Bis(2-ethylhexyl) Phthalate	0.0582	1.72	IMP 13-01	12 - 24	11/26	0.029 - 0.33	0.535	0.414	1.72	mg/kg	0.925	NA	NA	0.925	Y	NA	NA	NO	YES	A
Carbazole	0.0345	2.43	IMP 13-05	12 - 24	16/26	0.015 - 0.083	0.592	0.595	2.43	mg/kg	NA	NA	NA	NA	NA	NA	NA	NO	YES	B
Chrysene	0.0262	9.27	IMP 13-05	12 - 24	21/26	0.011 - 0.061	1.49	2.94	9.27	mg/kg	4.73	NA	NA	4.73	Y	NA	NA	YES	YES	A
Dibenzo[a,h]anthracene	0.0159	1.73	IMP 13-05	12 - 24	17/26	0.011 - 0.061	0.299	0.342	1.73	mg/kg	18.4	NA	NA	18.4	N	NA	NA	YES	YES	C
Dibenzofuran	0.0761	2.83	IMP 13-05	12 - 24	16/26	0.0099 - 0.054	1.04	0.947	2.83	mg/kg	NA	NA	NA	NA	NA	NA	NA	NO	YES	B
Dimethyl Phthalate	0.0624	0.167	IMP13-2	18 - 24	2/26	0.012 - 0.13	0.125	0.0934	0.167	mg/kg	NA	200	NA	200	NA	N	NA	NO	NO	NA
Di-n-Butyl Phthalate	0.0517	0.539	IMP 13-01	12 - 24	8/26	0.0074 - 0.04	0.203	0.142	0.539	mg/kg	200	NA	200	200	N	NA	N	NO	NO	NA
Fluoranthene	0.0311	22.7	IMP 13-05	12 - 24	21/26	0.015 - 0.08	3.24	6.72	22.7	mg/kg	122	NA	NA	122	N	NA	NA	YES	YES	C
Fluorene	0.0602	2.90	IMP 13-05	12 - 24	16/26	0.011 - 0.059	0.881	0.829	2.90	mg/kg	122	30	NA	30	N	N	NA	YES	YES	C
Hexachlorobenzene	0.0410	0.185	IMP 13-04	12 - 24	7/26	0.011 - 0.12	0.0977	0.0694	0.185	mg/kg	0.199	NA	NA	0.199	N	NA	NA	YES	YES	C
Indeno[1,2,3-cd]pyrene	0.0225	3.44	IMP 13-05	12 - 24	20/26	0.012 - 0.063	0.672	1.20	3.44	mg/kg	109	NA	NA	109	N	NA	NA	YES	YES	C
Naphthalene	0.0185	145	IMP 13-05	12 - 24	20/26	0.0092 - 0.049	20.6	43.0	145	mg/kg	0.0994	NA	NA	0.0994	Y	NA	NA	NO	YES	A
Nitrobenzene	0.458	120	IMP 13-05	12 - 24	13/26	0.0096 - 0.052	11.2	15.1	120	mg/kg	1.31	40	NA	1.31	Y	Y	NA	NO	YES	A
n-Nitrosodiphenylamine	0.0728	36.7	IMP 13-05	12 - 24	17/26	0.02 - 0.11	7.43	8.23	36.7	mg/kg	0.545	20	NA	0.545	Y	Y	NA	NO	YES	A
Phenanthrene	0.0381	28.1	IMP 13-05	12 - 24	18/26	0.015 - 0.082	4.23	5.21	28.1	mg/kg	45.7	NA	NA	45.7	N	NA	NA	YES	YES	C
Pyrene	0.0315	19.5	IMP 13-05	12 - 24	21/26	0.013 - 0.069	2.91	5.82	19.5	mg/kg	78.5	NA	NA	78.5	N	NA	NA	YES	YES	C
Pyridine	0.290	1.99	IMP 13-05	12 - 24	2/20	0.014 - 0.073	1.14	1.99	1.99	mg/kg	NA	NA	NA	NA	NA	NA	NA	NO	YES	B
Total High Weight Molecular PAHs	0.271	148	IMP 13-05	12 - 24	21/26	NA	18.9	40.9	148	mg/kg	100	29	NA	29	Y	Y	NA	YES	YES	A
Total Low Weight Molecular PAHs	0.0465	192	IMP 13-05	12 - 24	21/26	NA	27.4	9.83	192	mg/kg	1.1	18	NA	1.1	Y	Y	NA	YES	YES	A

Table 1A  
Selection of COPECs - Impoundment 13  
PDI Module 4 - Ecological Risk Assessment  
American Cyanamid Superfund Site, Bridgewater, NJ

	Summary of Surface Soil Data										Ecological Screening Levels				Comparison of Maximum Detection to Screening Levels			Bioaccumulative	COPEC	Contaminant Category
	Minimum Detected Concentration	Maximum Detected Concentration	Location of Maximum Detection	Detection Frequency	Range of Method Detection Limits (for ND only)	Average Detected Concentration	95% UCL	Concentration Used for Screening <sup>1</sup>	Units	Wildlife <sup>2</sup> (mg/kg)	Invertebrate <sup>3</sup> (mg/kg)	Plant <sup>4</sup> (mg/kg)	Selected Screening Level (mg/kg)	Exceed Wildlife Screening	Exceed Invertebrate Screening	Exceed Plant Screening				
<b>Inorganics</b>																				
Aluminum	4860	20900	IMP 13-09	0 - 12	26/26	NA	12425	13712	20900	mg/kg	NA	NA	50	50	NA	NA	Y	NO	YES	A
Antimony	0.210	10.0	IMP 13-09	0 - 12	19/26	0.15 - 3.5	4.29	4.45	10.0	mg/kg	0.27	78	5	0.27	Y	N	Y	NO	YES	A
Arsenic	3.80	40.1	IMP 13-10	0 - 12	25/26	3.5 - 3.5	12.6	20.3	40.1	mg/kg	43	60	18	18	N	N	Y	NO	YES	A
Barium	98.4	718	IMP 13-09	12 - 24	26/26	NA	260	403	718	mg/kg	2000	330	500	330	N	Y	Y	NO	YES	A
Cadmium	0.240	25.4	IMP 13-09	12 - 24	19/26	0.042 - 0.87	7.98	7.99	25.4	mg/kg	0.36	140	32	0.36	Y	N	N	NO	YES	A
Chromium	32.8	491	IMP 13-01	12 - 24	26/26	NA	167	288	491	mg/kg	0.4	0.4	1	0.4	Y	Y	Y	NO	YES	A
Cobalt	9.30	33.2	IMP 13-10	0 - 12	25/26	8.7 - 8.7	14.1	18.5	33.2	mg/kg	120	NA	13	13	N	NA	Y	NO	YES	A
Copper	28.5	8530	IMP 13-05	12 - 24	26/26	NA	911	1502	8530	mg/kg	28	80	70	28	Y	Y	Y	NO	YES	A
Cyanide	0.390	3.50	IMP 13-05	0 - 12	4/26	0.15 - 0.9	1.47	0.793	3.50	mg/kg	1.33	NA	NA	1.33	Y	NA	NA	NO	YES	A
Hexavalent Chromium	0.900	19.9	IMP 13-04	12 - 24	20/20	NA	4.01	5.62	19.9	mg/kg	130	NA	NA	130	N	NA	NA	YES	YES	C
Iron	8700	238000	IMP 13-10	0 - 12	26/26	NA	50312	63700	238000	mg/kg	NA	NA	NA	NA	NA	NA	NA	NO	YES	B
Lead	26.5	1310	IMP 13-05	12 - 24	26/26	NA	327	491	1310	mg/kg	11	1700	120	11	Y	N	Y	NO	YES	A
Manganese	382	922	IMP 13-10	0 - 12	26/26	NA	622	670	922	mg/kg	4000	450	220	220	N	Y	Y	NO	YES	A
Mercury	0.140	47.2	IMP 13-09	0 - 12	26/26	NA	11.1	18.0	47.2	mg/kg	0.00051	0.1	0.3	0.00051	Y	Y	Y	NO	YES	A
Nickel	14.6	279	IMP 13-10	0 - 12	26/26	NA	81.2	108	279	mg/kg	130	280	38	38	Y	N	Y	NO	YES	A
Selenium	0.870	3.80	IMP 13-09	12 - 24	6/26	0.29 - 3.2	1.73	1.34	3.80	mg/kg	0.63	4.1	0.52	0.52	Y	N	Y	NO	YES	A
Silver	0.160	5.30	IMP 13-02	12 - 24	22/26	0.12 - 0.87	1.77	2.15	5.30	mg/kg	4.2	NA	560	4.2	Y	NA	N	NO	YES	A
Vanadium	28.7	103	IMP 13-02	12 - 24	25/26	8.7 - 8.7	44.2	49.5	103	mg/kg	7.8	NA	2	2	Y	NA	Y	NO	YES	A
Zinc	86.2	3320	IMP 13-05	12 - 24	26/26	NA	730	1372	3320	mg/kg	46	120	160	46	Y	Y	Y	NO	YES	A
Aroclor 1260	ND	ND	NA	NA	0/20	0.011 - 0.016	ND	ND	0.0160	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	NO	NA
Aroclor 1254	ND	ND	NA	NA	0/20	0.016 - 0.023	ND	ND	0.0230	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	NO	NA
Aroclor 1268	ND	ND	NA	NA	0/20	0.0099 - 0.014	ND	ND	0.0140	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	NO	NA
Aroclor 1221	ND	ND	NA	NA	0/20	0.02 - 0.029	ND	ND	0.0290	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	NO	NA
Aroclor 1232	ND	ND	NA	NA	0/20	0.017 - 0.024	ND	ND	0.0240	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	NO	NA
Aroclor 1248	ND	ND	NA	NA	0/20	0.01 - 0.015	ND	ND	0.0150	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	NO	NA
Aroclor 1016	ND	ND	NA	NA	0/20	0.0087 - 0.013	ND	ND	0.0130	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	NO	NA
Aroclor 1262	ND	ND	NA	NA	0/20	0.011 - 0.015	ND	ND	0.0150	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	NO	NA
Aroclor 1242	ND	ND	NA	NA	0/20	0.011 - 0.015	ND	ND	0.0150	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	NO	NA

**Notes**

NA = Not Available or Not Applicable

ND = Not Detected

Y = concentration exceeds screening level

N = concentration does not exceed screening level

1. Screening used maximum concentration or the maximum method detection limit (MDL), if analyte was not detected.

2. Screening values were considered in the following order of priority:

a. EPA Ecological Soil Screening Levels. Located at <http://www.epa.gov/ecotox/ecossl/>

b. NJDEP Ecological Screening Criteria. Located at <http://www.nj.gov/dep/serp/guidance/ecoscreening/>

c. Oak Ridge National Laboratory Soil Screening Benchmarks. Located at [http://www.esd.ornl.gov/programs/ecoris/benchmark\\_reports.html](http://www.esd.ornl.gov/programs/ecoris/benchmark_reports.html)

3. Screening values for total chromium were used for chromium and screening values for chromium (VI) were used for hexavalent chromium. Calcium, magnesium, potassium, and sodium are not considered COPECs because they are essential nutrients that are ubiquitous in the environment and naturally occur at high concentrations.

4. Contaminant Categories

A = Constituent was detected at a concentration exceeding its screening value.

B = Constituent was detected at concentrations exceeding its MDL; however, there is no current screening value for the contaminant.

C = Constituent was detected at concentrations exceeding the MDL but below the current screening value for the contaminant; however, the contaminant will be retained for further evaluation due to its potential to bioaccumulate.

Table 1B  
 Selection of COPECs - Impoundment 17  
 PDI Module 4 - Ecological Risk Assessment  
 American Cyanamid Superfund Site, Bridgewater, NJ

	Summary of Surface Soil Data										Ecological Screening Levels				Comparison of Maximum Detection to Screening Levels			Bioaccumulative	COPEC	Contaminant Category
	Minimum Detected Concentration	Maximum Detected Concentration	Location of Maximum Detection	Detection Frequency	Range of Method Detection Limits (for ND only)	Average Detected Concentration	95% UCL	Concentration Used for Screening <sup>1</sup>	Units	Wildlife <sup>2</sup> (mg/kg)	Invertebrate <sup>3</sup> (mg/kg)	Plant <sup>4</sup> (mg/kg)	Selected Screening Level (mg/kg)	Exceed Wildlife Screening	Exceed Invertebrate Screening	Exceed Plant Screening				
			Location	Depth																
<b>Volatiles</b>																				
Acetone	0.0102	9.78	IMP 17-09	0 - 12	9/40	0.01 - 0.052	1.48	0.778	9.78	mg/kg	NA	NA	NA	NA	NA	NA	NA	NO	YES	B
Benzene	ND	ND	NA	NA	0/40	0.00027 - 0.23	ND	ND	0.230	mg/kg	0.255	NA	NA	0.255	N	NA	NA	NO	NO	NA
Methylene chloride	0.00780	0.0103	IMP 17-15	12 - 24	2/40	0.001 - 0.024	0.00905	0.00822	0.0103	mg/kg	4.05	NA	NA	4.05	N	NA	NA	NO	NO	NA
m,p-Xylenes	ND	ND	NA	NA	0/40	0.001 - 0.0069	ND	ND	0.00690	mg/kg	NA	NA	NA	NA	NA	NA	NA	NO	NO	NA
o-Xylene	ND	ND	NA	NA	0/40	0.00038 - 0.0025	ND	ND	0.00250	mg/kg	NA	NA	NA	NA	NA	NA	NA	NO	NO	NA
Zinc	773	4200	IMP 17-10	12 - 24	40/40	NA	2849	3026	4200	mg/kg	46	120	160	46	Y	Y	Y	NO	YES	A
<b>Semivolatiles</b>																				
1,2,4-Trichlorobenzene	0.00290	1.00	IMP 17-08	0 - 12	35/40	0.0016 - 0.16	0.417	0.431	1.00	mg/kg	20	20	NA	20	N	N	NA	YES	YES	C
1,2-Dichlorobenzene	ND	ND	NA	NA	0/40	0.0013 - 0.19	ND	0.0784	0.190	mg/kg	2.96	NA	NA	2.96	N	NA	NA	YES	YES	NA
2-Chloronaphthalene	0.0639	0.163	IMP 17-17	12 - 24	5/40	0.0016 - 0.21	0.0998	0.08	0.163	mg/kg	0.0122	NA	NA	0.0122	Y	NA	NA	NO	YES	A
2-Methylnaphthalene	ND	ND	NA	NA	0/40	0.0029 - 0.37	ND	ND	0.370	mg/kg	3.24	NA	NA	3.24	N	NA	NA	NO	NO	NA
3,3-Dichlorobenzidine	2.61	9.89	IMP 17-07	0 - 12	11/40	0.0013 - 0.17	5.45	3.85	9.89	mg/kg	0.646	NA	NA	0.646	Y	NA	NA	NO	YES	A
Acenaphthene	ND	ND	NA	NA	0/40	0.0015 - 0.19	ND	ND	0.190	mg/kg	20	NA	20	20	N	NA	N	YES	YES	NA
Acenaphthylene	0.0523	0.0523	IMP 17-18	0 - 12	1/40	0.0017 - 0.21	0.0523	NA	0.0523	mg/kg	682	NA	NA	682	N	NA	NA	YES	YES	C
Aniline	0.0393	34.7	IMP 17-08	0 - 12	35/40	0.015 - 0.034	13.0	14.2	34.7	mg/kg	NA	NA	NA	NA	NA	NA	NA	NO	YES	B
Anthracene	0.0553	0.184	IMP 17-17	12 - 24	5/40	0.0018 - 0.23	0.0877	0.0697	0.184	mg/kg	1480	NA	NA	1480	N	NA	NA	YES	YES	C
Benzo[a]anthracene	1.17	4.42	IMP 17-18	12 - 24	7/40	0.0017 - 0.22	2.84	1.68	4.42	mg/kg	5.21	NA	NA	5.21	N	NA	NA	YES	YES	C
Benzo[a]pyrene	0.131	0.196	IMP 17-04	0 - 12	5/40	0.0016 - 0.2	0.154	0.138	0.196	mg/kg	1.52	NA	NA	1.52	N	NA	NA	YES	YES	C
Benzo[b]fluoranthene	0.200	0.757	IMP 17-15	12 - 24	14/40	0.0017 - 0.22	0.479	0.343	0.757	mg/kg	59.8	NA	NA	59.8	N	NA	NA	YES	YES	C
Benzo[g,h,i]perylene	0.0657	0.145	IMP 17-16	0 - 12	4/40	0.0019 - 0.25	0.0984	0.0814	0.145	mg/kg	119	NA	NA	119	N	NA	NA	YES	YES	C
Benzo[k]fluoranthene	0.0624	0.164	IMP 17-15	12 - 24	10/40	0.002 - 0.25	0.118	0.0966	0.164	mg/kg	148	NA	NA	148	N	NA	NA	YES	YES	C
Chrysene	0.593	0.593	IMP 17-1	0 - 6	1/40	0.0018 - 0.22	0.593	NA	0.593	mg/kg	4.73	NA	NA	4.73	N	NA	NA	YES	YES	C
Dibenz[a,h]anthracene	0.0503	0.0503	IMP 17-16	0 - 12	1/40	0.0018 - 0.23	0.0503	NA	0.0503	mg/kg	18.4	NA	NA	18.4	N	NA	NA	YES	YES	C
Fluoranthene	0.0851	0.203	IMP 17-15	0 - 12	11/40	0.0023 - 0.29	0.125	0.115	0.203	mg/kg	122	NA	NA	122	N	NA	NA	YES	YES	C
Fluorene	ND	ND	NA	NA	0/40	0.0017 - 0.22	ND	ND	0.220	mg/kg	122	30	NA	30	N	N	NA	YES	YES	NA
Hexachlorobenzene	0.261	1.34	IMP 17-08	0 - 12	27/40	0.0017 - 0.37	0.784	0.709	1.34	mg/kg	0.199	NA	NA	0.199	Y	NA	NA	YES	YES	A
Indeno[1,2,3-cd]pyrene	0.0772	0.129	IMP 17-16	0 - 12	4/40	0.0018 - 0.23	0.0950	0.0860	0.129	mg/kg	109	NA	NA	109	N	NA	NA	YES	YES	C
Naphthalene	0.271	1.29	IMP 17-08	0 - 12	29/40	0.0014 - 0.13	0.787	0.737	1.29	mg/kg	0.0994	NA	NA	0.0994	Y	NA	NA	NO	YES	A
N-Nitrosodiphenylamine	0.761	5.64	IMP 17-14	12 - 24	29/40	0.0031 - 0.37	3.40	3.13	5.64	mg/kg	0.545	20	NA	0.545	Y	N	NA	NO	YES	A
Phenanthrene	0.0905	0.123	IMP 17-17	12 - 24	7/40	0.0024 - 0.3	0.105	0.10	0.123	mg/kg	45.7	NA	NA	45.7	N	NA	NA	YES	YES	C
Pyrene	0.0937	0.277	IMP 17-18	12 - 24	14/40	0.002 - 0.26	0.147	0.132	0.277	mg/kg	78.5	NA	NA	78.5	N	NA	NA	YES	YES	C
Pyridine	ND	ND	NA	NA	0/38	0.0021 - 0.27	ND	ND	0.270	mg/kg	NA	NA	NA	NA	NA	NA	NA	NO	NO	NA
Total High Weight Molecular PAHs	0.237	5.62	IMP 17-18	12 - 24	17/40	NA	1.96	1.36	5.62	mg/kg	100	29	NA	29	N	N	NA	YES	YES	C
Total Low Weight Molecular PAHs	0.118	1.33	IMP 17-17	12 - 24	29/40	NA	0.829	0.143	1.33	mg/kg	1.1	18	NA	1.1	Y	N	NA	YES	YES	A

Table 1B  
 Selection of COPECs - Impoundment 17  
 PDI Module 4 - Ecological Risk Assessment  
 American Cyanamid Superfund Site, Bridgewater, NJ

	Summary of Surface Soil Data								Ecological Screening Levels				Comparison of Maximum Detection to Screening Levels			Bioaccumulative	COPEC	Contaminant Category		
	Minimum Detected Concentration	Maximum Detected Concentration	Location of Maximum Detection	Detection Frequency	Range of Method Detection Limits (for ND only)	Average Detected Concentration	95% UCL	Concentration Used for Screening <sup>1</sup>	Units	Wildlife <sup>2</sup> (mg/kg)	Invertebrate <sup>2</sup> (mg/kg)	Plant <sup>2</sup> (mg/kg)	Selected Screening Level (mg/kg)	Exceed Wildlife Screening	Exceed Invertebrate Screening				Exceed Plant Screening	
<b>Inorganic</b>																				
Aluminum	29900	147000	IMP 17-10	12 - 24	40/40	NA	100920	107617	147000	mg/kg	NA	NA	50	50	NA	NA	Y	NO	YES	A
Antimony	3.00	25.0	IMP 17-10	12 - 24	39/40	6.6 - 6.6	16.8	17.9	25.0	mg/kg	0.27	78	5	0.27	Y	N	Y	NO	YES	A
Arsenic	12.1	109	IMP 17-19	0 - 12	40/40	NA	68.8	74.2	109	mg/kg	43	60	18	18	Y	Y	Y	NO	YES	A
Barium	1420	9180	IMP 17-02	12 - 24	40/40	NA	4923	5579	9180	mg/kg	2000	330	500	330	Y	Y	Y	NO	YES	A
Cadmium	1.00	4.50	IMP 17-16	12 - 24	39/40	1.7 - 1.7	3.54	3.98	4.50	mg/kg	0.36	140	32	0.36	Y	N	N	NO	YES	A
Chromium	406	2870	IMP 17-14	0 - 12	40/40	NA	2201	2347	2870	mg/kg	0.4	0.4	1	0.4	Y	Y	Y	NO	YES	A
Cobalt	5.00	16.6	IMP 17-04	0 - 12	38/40	15 - 17	12.1	13.5	16.6	mg/kg	120	NA	13	13	N	NA	Y	NO	YES	A
Copper	471	3940	IMP 17-05	0 - 12	40/40	NA	2826	3004	3940	mg/kg	28	80	70	28	Y	Y	Y	NO	YES	A
Cyanide	0.490	3.90	IMP 17-14	0 - 12	12/40	0.54 - 1.5	1.73	1.10	3.90	mg/kg	1.33	NA	NA	1.33	Y	NA	NA	NO	YES	A
Hexavalent Chromium	2.60	141	IMP 17-18	12 - 24	38/38	1 - 1	40.5	52.3	141	mg/kg	130	NA	NA	130	Y	NA	NA	YES	YES	A
Iron	17000	102000	IMP 17-04	0 - 12	40/40	NA	63568	68167	102000	mg/kg	NA	NA	NA	NA	NA	NA	NA	NO	YES	B
Lead	489	3390	IMP 17-10	12 - 24	40/40	NA	2388	2543	3390	mg/kg	11	1700	120	11	Y	Y	Y	NO	YES	A
Manganese	530	1720	IMP 17-03	12 - 24	40/40	NA	1191	1247	1720	mg/kg	4000	450	220	220	N	Y	Y	NO	YES	A
Mercury	20.9	258	IMP 17-12	12 - 24	40/40	NA	130	142	258	mg/kg	0.00051	0.11	0.3	0.00051	Y	Y	Y	NO	YES	A
Nickel	44.9	165	IMP 17-04	0 - 12	40/40	NA	98.3	104	165	mg/kg	130	280	38	38	Y	N	Y	NO	YES	A
Vanadium	42.5	98.5	IMP 17-01	0 - 12	40/40	NA	67.8	71.4	98.5	mg/kg	7.8	NA	2	2	Y	NA	Y	NO	YES	A
Toluene	ND	ND	NA	NA	0/40	0.0003 - 0.002	ND	ND	0.00200	mg/kg	200	NA	200	200	N	NA	N	NO	NO	NA
Vanadium	42.5	98.5	IMP 17-01	0 - 12	40/40	NA	67.8	71.4	98.5	mg/kg	7.8	NA	2	2	Y	NA	Y	NO	YES	A
Aroclor 1254	1.95	3.25	IMP 17-12	12 - 24	3/38	0.026 - 0.15	2.39	2.05	3.25	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	YES	B
Aroclor 1268	ND	ND	NA	NA	0/38	0.017 - 0.096	ND	ND	0.0960	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	NO	NA
Aroclor 1221	ND	ND	NA	NA	0/38	0.034 - 0.2	ND	ND	0.200	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	NO	NA
Aroclor 1232	ND	ND	NA	NA	0/38	0.029 - 0.17	ND	ND	0.170	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	NO	NA
Aroclor 1248	ND	ND	NA	NA	0/38	0.017 - 0.099	ND	ND	0.0990	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	NO	NA
Aroclor 1016	ND	ND	NA	NA	0/38	0.015 - 0.085	ND	ND	0.0850	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	NO	NA
Aroclor 1262	ND	ND	NA	NA	0/38	0.018 - 0.1	ND	ND	0.100	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	NO	NA
Aroclor 1242	ND	ND	NA	NA	0/38	0.018 - 0.1	ND	ND	0.100	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	NO	NA

**Notes**

NA = Not Available or Not Applicable

ND = Not Detected

Y = concentration exceeds screening level

N = concentration does not exceed screening level

1. Screening used maximum concentration or the maximum method detection limit (MDL), if analyte was not detected.

2. Screening values were considered in the following order of priority:

a. EPA Ecological Soil Screening Levels. Located at <http://www.epa.gov/ecotox/ecossl/>

b. NJDEP Ecological Screening Criteria. Located at <http://www.nj.gov/dep/erp/guidance/ecoscreening/>

c. Oak Ridge National Laboratory Soil Screening Benchmarks. Located at [http://www.esd.ornl.gov/programs/ecorisik/benchmark\\_reports.html](http://www.esd.ornl.gov/programs/ecorisik/benchmark_reports.html)

3. Screening values for total chromium were used for chromium and screening values for chromium (VI) were used for hexavalent chromium. Calcium, magnesium, potassium, and sodium are not considered COPECs because they are essential nutrients that are ubiquitous in the environment and naturally occur at high concentrations.

4. Contaminant Categories

A = Constituent was detected at a concentration exceeding its screening value.

B = Constituent was detected at concentrations exceeding its MDL, however, there is no current screening value for the contaminant.

C = Constituent was not detected at concentrations exceeding the MDL and there is a current screening value for the contaminant; however, the contaminant will be retained for further evaluation due to its potential to bioaccumulate.

Table 1C  
 Selection of COPECs - Impoundment 24  
 PDI Module 4 - Ecological Risk Assessment  
 American Cyanamid Superfund Site, Bridgewater, NJ

	Summary of Surface Soil Data									Ecological Screening Levels				Comparison of Maximum Detection to Screening Levels			Bioaccumulative	COPEC	Contaminant Category	
	Minimum Detected Concentration	Maximum Detected Concentration	Location of Maximum Detection	Detection Frequency	Range of Method Detection Limits (for ND only)	Average Detected Concentration	95% UCL	Concentration Used for Screening <sup>1</sup>	Units	Wildlife <sup>2</sup> (mg/kg)	Invertebrates <sup>2</sup> (mg/kg)	Plant <sup>2</sup> (mg/kg)	Selected Screening Level (mg/kg)	Exceed Wildlife Screening	Exceed Invertebrates Screening	Exceed Plant Screening				
			Location	Depth																
<b>Volatiles</b>																				
1,3,5-Trimethylbenzene	0.00110	0.0327	IMP 24-06	12 - 24	5/22	0.00025 - 0.00091	0.00800	0.00536	0.0327	mg/kg	NA	NA	NA	NA	NA	NA	NA	NO	YES	B
Acetone	0.0263	0.517	IMP 24-01	12 - 24	9/22	0.003 - 0.016	0.160	0.128	0.517	mg/kg	NA	NA	NA	NA	NA	NA	NA	NO	YES	B
Benzene	0.000610	0.00290	IMP 24-02	0 - 12	8/22	0.00014 - 0.23	0.00110	0.000983	0.00290	mg/kg	0.255	NA	NA	0.255	N	NA	NA	NO	NO	NA
Chlorobenzene	0.000630	0.0127	IMP 24-06	12 - 24	6/22	0.00022 - 0.39	0.00326	0.00291	0.0127	mg/kg	40	40	NA	40	N	N	NA	NO	NO	NA
cis-1,2-Dichloroethene	0.00110	0.00110	IMP24-3	18 - 24	1/22	0.00023 - 0.00079	0.00110	NA	0.00110	mg/kg	NA	NA	NA	NA	NA	NA	NA	NO	YES	B
Ethylbenzene	0.000480	0.0119	IMP 24-01	12 - 24	4/22	0.0002 - 0.00094	0.00460	0.00	0.0119	mg/kg	5.16	NA	NA	5.16	N	NA	NA	NO	NO	NA
m,p-Xylenes	0.00100	0.0480	IMP 24-01	12 - 24	6/22	0.00054 - 0.0018	0.0134	0.00844	0.0480	mg/kg	NA	NA	NA	NA	NA	NA	NA	NO	YES	B
Methanol	0.460	13.6	IMP 24-01	12 - 24	11/22	0.053 - 0.084	3.84	3.29	13.6	mg/kg	NA	NA	NA	NA	NA	NA	NA	NO	YES	B
Methylene chloride	0.000490	0.0174	IMP 24-08	12 - 24	8/22	0.0003 - 0.0049	0.0115	0.00982	0.0174	mg/kg	4.05	NA	NA	4.05	N	NA	NA	NO	NO	NA
o-Xylene	0.000480	0.0188	IMP 24-01	12 - 24	6/22	0.0002 - 0.0012	0.00541	0.00345	0.0188	mg/kg	NA	NA	NA	NA	NA	NA	NA	NO	YES	B
Tetrachloroethene	0.00670	0.00670	IMP24-3	18 - 24	1/22	0.0002 - 0.27	0.00670	NA	0.00670	mg/kg	9.92	NA	NA	9.92	N	NA	NA	NO	NO	NA
Toluene	0.000610	0.00470	IMP24-3	18 - 24	10/22	0.00016 - 0.00074	0.00139	0.00133	0.00470	mg/kg	200	NA	200	200	N	NA	N	NO	NO	NA
<b>Semivolatiles</b>																				
1,2,4-Trichlorobenzene	0.00210	0.199	IMP 24-07	12 - 24	8/22	0.00047 - 0.054	0.0743	0.0506	0.199	mg/kg	20	20	NA	20	N	N	NA	YES	YES	C
1,2-Dichlorobenzene	0.00140	1.00	IMP 24-01	12 - 24	14/22	0.00037 - 0.013	0.220	0.242	1.00	mg/kg	2.96	NA	NA	2.96	N	NA	NA	YES	YES	C
1,3-Dichlorobenzene	ND	ND	NA	NA	0/22	0.00037 - 0.054	ND	ND	0.0540	mg/kg	37.7	NA	NA	37.7	N	NA	NA	YES	YES	NA
1,2-Diphenylhydrazine	0.0335	11.2	IMP 24-07	12 - 24	11/22	0.014 - 0.034	1.23	5.78	11.2	mg/kg	NA	NA	NA	NA	NA	NA	NA	NO	YES	B
1,4-Dichlorobenzene	0.000900	0.0679	IMP 24-01	12 - 24	2/22	0.00046 - 0.39	0.0344	0.0458	0.0679	mg/kg	20	20	NA	20	N	N	NA	YES	YES	C
2-Chloronaphthalene	0.0224	1.28	IMP 24-01	12 - 24	11/22	0.011 - 0.026	0.335	0.290	1.28	mg/kg	0.0122	NA	NA	0.0122	Y	NA	NA	NO	YES	A
2-Methylnaphthalene	0.0473	1.51	IMP 24-06	12 - 24	13/22	0.021 - 0.051	0.380	0.395	1.51	mg/kg	3.24	NA	NA	3.24	N	NA	NA	NO	NO	NA
Acenaphthene	0.0164	0.755	IMP 24-07	12 - 24	15/22	0.011 - 0.017	0.153	0.184	0.755	mg/kg	20	NA	20	20	N	NA	N	YES	YES	C
Acenaphthylene	0.0224	0.174	IMP 24-07	12 - 24	6/22	0.011 - 0.064	0.0726	0.0508	0.174	mg/kg	682	NA	NA	682	N	NA	NA	YES	YES	C
Aniline	0.0410	42.4	IMP 24-07	12 - 24	20/22	0.0075 - 0.01	4.36	12.4	42.4	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	YES	B
Anthracene	0.0191	1.24	IMP 24-07	12 - 24	14/22	0.013 - 0.07	0.157	0.458	1.24	mg/kg	1480	NA	NA	1480	N	NA	NA	YES	YES	C
Benzidine	0.166	1.22	IMP 24-07	12 - 24	5/22	0.13 - 0.75	0.492	0.336	1.22	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	YES	B
Benzo[a]anthracene	0.0209	1.68	IMP 24-07	12 - 24	18/22	0.012 - 0.03	0.197	0.644	1.68	mg/kg	5.21	NA	NA	5.21	N	NA	NA	YES	YES	C
Benzo[a]pyrene	0.0241	0.775	IMP 24-07	12 - 24	13/22	0.011 - 0.028	0.148	0.343	0.775	mg/kg	1.52	NA	NA	1.52	N	NA	NA	YES	YES	C
Benzo[b]fluoranthene	0.0201	1.28	IMP 24-07	12 - 24	15/22	0.014 - 0.03	0.192	0.524	1.28	mg/kg	59.8	NA	NA	59.8	N	NA	NA	YES	YES	C
Benzo[g,h,i]perylene	0.0214	0.481	IMP 24-07	12 - 24	11/22	0.014 - 0.075	0.107	0.107	0.481	mg/kg	119	NA	NA	119	N	NA	NA	YES	YES	C
Benzo[k]fluoranthene	0.0214	0.370	IMP 24-07	12 - 24	7/22	0.014 - 0.076	0.110	0.0828	0.370	mg/kg	148	NA	NA	148	N	NA	NA	YES	YES	C
Biphenyl	0.0162	16.3	IMP 24-07	12 - 24	13/22	0.0043 - 0.011	1.52	8.37	16.3	mg/kg	60	NA	60	60	N	NA	N	NO	NO	NA
Carbazole	0.0202	0.327	IMP 24-07	12 - 24	10/22	0.017 - 0.093	0.0943	0.0831	0.327	mg/kg	NA	NA	NA	NA	NA	NA	NA	NO	YES	B
Chrysene	0.0168	0.856	IMP 24-07	12 - 24	16/22	0.013 - 0.031	0.164	0.204	0.856	mg/kg	4.73	NA	NA	4.73	N	NA	NA	YES	YES	C
Dibenzofuran	0.0422	4.21	IMP 24-07	12 - 24	12/22	0.011 - 0.025	0.517	1.51	4.21	mg/kg	NA	NA	NA	NA	NA	NA	NA	NO	YES	B
Dimethyl Phthalate	0.0994	0.0994	IMP24-3	18 - 24	1/22	0.013 - 0.071	0.0994	ND	0.0994	mg/kg	NA	200	NA	200	NA	N	NA	NO	NO	NA
Fluoranthene	0.0207	2.98	IMP 24-07	12 - 24	20/22	0.021 - 0.022	0.341	1.21	2.98	mg/kg	122	NA	NA	122	N	NA	NA	YES	YES	C
Fluorene	0.0261	0.816	IMP 24-07	12 - 24	9/22	0.012 - 0.066	0.158	0.148	0.816	mg/kg	122	30	NA	30	N	N	NA	YES	YES	C
Indeno[1,2,3-cd]pyrene	0.0171	0.467	IMP 24-07	12 - 24	7/22	0.013 - 0.07	0.130	0.0951	0.467	mg/kg	109	NA	NA	109	N	NA	NA	YES	YES	C
m,p-Cresol	0.301	0.301	IMP 24-08	0 - 12	1/22	0.045 - 1	0.301	NA	0.301	mg/kg	NA	NA	NA	NA	NA	NA	NA	NO	YES	B
Naphthalene	0.0304	5.39	IMP 24-01	12 - 24	19/22	0.01 - 0.014	0.855	1.93	5.39	mg/kg	0.0994	NA	NA	0.0994	Y	NA	NA	NO	YES	A
Nitrobenzene	0.0897	13.3	IMP 24-01	12 - 24	11/22	0.01 - 0.25	2.58	9.35	13.3	mg/kg	1.31	40	NA	1.31	N	NA	NA	NO	YES	A
n-Nitrosodiphenylamine	0.0571	19.7	IMP 24-07	12 - 24	19/22	0.022 - 0.05	1.88	10.9	19.7	mg/kg	0.545	20	NA	0.545	Y	N	NA	NO	YES	A
Phenanthrene	0.0203	5.06	IMP 24-07	12 - 24	19/22	0.017 - 0.023	0.581	1.94	5.06	mg/kg	45.7	NA	NA	45.7	N	NA	NA	YES	YES	C
Pyrene	0.0199	1.46	IMP 24-07	12 - 24	20/22	0.018 - 0.019	0.229	0.677	1.46	mg/kg	78.5	NA	NA	78.5	N	NA	NA	YES	YES	C
Pyridine	ND	ND	NA	NA	0/16	0.014 - 0.27	ND	ND	0.270	mg/kg	NA	NA	NA	NA	NA	NA	NA	NO	NO	NA
Total High Weight Molecular PAHs	0.0775	10.4	IMP 24-07	12 - 24	20/22	NA	1.22	4.30	10.4	mg/kg	100	29	NA	29	N	N	NA	YES	YES	C
Total Low Weight Molecular PAHs	0.0507	10.9	IMP 24-07	12 - 24	19/22	NA	1.71	3.06	10.9	mg/kg	1.1	18	NA	1.1	Y	N	NA	YES	YES	A

Table 1C  
Selection of COPECs - Impoundment 24  
PDI Module 4 - Ecological Risk Assessment  
American Cyanamid Superfund Site, Bridgewater, NJ

	Summary of Surface Soil Data									Ecological Screening Levels				Comparison of Maximum Detection to Screening Levels			Bioaccumulative	COPEC	Contaminant Category		
	Minimum Detected Concentration	Maximum Detected Concentration	Location of Maximum Detection	Detection Frequency	Range of Method Detection Limits (for ND only)	Average Detected Concentration	95% UCL	Concentration Used for Screening <sup>1</sup>	Units	Wildlife <sup>2</sup> (mg/kg)	Invertebrate <sup>2</sup> (mg/kg)	Plant <sup>2</sup> (mg/kg)	Selected Screening Level (mg/kg)	Exceed Wildlife Screening	Exceed Invertebrate Screening	Exceed Plant Screening					
<b>Inorganics</b>																					
Aluminum	4200	42800	IMP 24-07	0 - 12	22/22	NA	11984	15455	42800	mg/kg	NA	NA	50	50	NA	NA	Y	NO	YES	A	
Antimony	0.420	1.70	IMP 24-01	12 - 24	13/22	0.23 - 3.7	0.935	1.01	1.70	mg/kg	0.27	78	5	0.27	Y	N	N	NO	YES	A	
Barium	34.6	353	IMP 24-05	0 - 12	20/22	30 - 34	115	140	353	mg/kg	2000	330	500	330	N	Y	N	NO	YES	A	
Chromium	5.20	393	IMP 24-07	12 - 24	22/22	NA	43.2	117	393	mg/kg	0.4	0.4	1	0.4	Y	Y	Y	NO	YES	A	
Cobalt	2.10	34.5	IMP 24-07	0 - 12	16/22	7.1 - 9.2	9.51	11.2	34.5	mg/kg	120	NA	13	13	N	NA	Y	NO	YES	A	
Copper	6.50	732	IMP 24-07	12 - 24	22/22	NA	129	218	732	mg/kg	28	80	70	28	Y	Y	Y	NO	YES	A	
Cyanide	0.460	1.90	IMP24-1	18 - 24	7/22	0.27 - 0.67	1.22	0.884	1.90	mg/kg	1.33	NA	NA	1.33	Y	NA	NA	NO	YES	A	
Hexavalent Chromium	0.530	18.5	IMP 24-04	0 - 12	14/16	0.47 - 0.76	4.12	9.13	18.5	mg/kg	130	NA	NA	130	N	NA	NA	YES	YES	C	
Iron	1230	47200	IMP 24-07	0 - 12	22/22	NA	15980	21651	47200	mg/kg	NA	NA	NA	NA	NA	NA	NA	NO	YES	B	
Lead	4.70	262	IMP 24-07	12 - 24	22/22	NA	72.8	99.3	262	mg/kg	11	1700	120	11	Y	N	Y	NO	YES	A	
Manganese	17.3	1250	IMP 24-07	0 - 12	22/22	NA	319	463	1250	mg/kg	4000	450	220	220	N	Y	Y	NO	YES	A	
Mercury	0.0600	6.30	IMP 24-03	0 - 12	20/22	0.046 - 0.056	1.17	2.32	6.30	mg/kg	0.00051	0.1	0.3	0.00051	Y	Y	Y	NO	YES	A	
Nickel	7.70	36.7	IMP 24-07	12 - 24	21/22	6.8 - 6.8	18.0	20.1	36.7	mg/kg	130	280	38	38	N	N	N	NO	NO	NA	
Selenium	0.570	3.70	IMP24-1	18 - 24	13/22	0.26 - 37	1.74	1.79	3.70	mg/kg	0.63	4.1	0.52	0.52	Y	N	Y	NO	YES	A	
Vanadium	8.60	193	IMP 24-07	0 - 12	21/22	8.5 - 8.5	42.5	84.9	193	mg/kg	7.8	NA	2	2	Y	NA	NA	Y	NO	YES	A
Zinc	15.8	166	IMP 24-07	12 - 24	21/22	3.4 - 3.4	72.1	84.0	166	mg/kg	46	120	160	46	Y	Y	Y	NO	YES	A	
Aroclor 1248	0.236	0.236	IMP 24-08	12 - 24	1/16	0.011 - 0.014	0.236	NA	0.236	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	YES	B	
Aroclor 1254	0.101	19.8	IMP 24-05	0 - 12	12/16	0.019 - 0.029	3.950	18.1	19.8	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	YES	B	
Aroclor 1260	ND	ND	NA	NA	0/16	0.012 - 0.021	ND	ND	0.0210	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	NO	NA	
Aroclor 1268	ND	ND	NA	NA	0/16	0.01 - 0.018	ND	ND	0.0180	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	NO	NA	
Aroclor 1221	ND	ND	NA	NA	0/16	0.021 - 0.038	ND	ND	0.0380	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	NO	NA	
Aroclor 1232	ND	ND	NA	NA	0/16	0.018 - 0.032	ND	ND	0.0320	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	NO	NA	
Aroclor 1016	ND	ND	NA	NA	0/16	0.0092 - 0.016	ND	ND	0.0160	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	NO	NA	
Aroclor 1262	ND	ND	NA	NA	0/16	0.011 - 0.02	ND	ND	0.0200	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	NO	NA	
Aroclor 1242	ND	ND	NA	NA	0/16	0.011 - 0.02	ND	ND	0.0200	mg/kg	NA	NA	NA	NA	NA	NA	NA	YES	NO	NA	

**Notes**

NA = Not Available or Not Applicable

ND = Not Detected

Y = concentration exceeds screening level

N = concentration does not exceed screening level

1. Screening used maximum concentration or the maximum method detection limit (MDL), if analyte was not detected.

2. Screening values were considered in the following order of priority:

a. EPA Ecological Soil Screening Levels. Located at <http://www.epa.gov/ecotox/ecossl/>

b. NJDEP Ecological Screening Criteria. Located at <http://www.nj.gov/dep/srp/guidance/ecoscreening/>

c. Oak Ridge National Laboratory Soil Screening Benchmarks. Located at [http://www.esd.ornl.gov/programs/ecorisk/benchmark\\_reports.html](http://www.esd.ornl.gov/programs/ecorisk/benchmark_reports.html)

3. Screening values for total chromium were used for chromium and screening values for chromium (VI) were used for hexavalent chromium. Calcium, magnesium, potassium, and sodium are not considered COPECs because they are essential nutrients that are ubiquitous in the environment and naturally occur at high concentrations.

4. Contaminant Categories

A = Constituent was detected at a concentration exceeding its screening value.

B = Constituent was detected at concentrations exceeding its MDL; however, there is no current screening value for the contaminant.

C = Constituent was detected at concentrations exceeding the MDL but below the current screening value for the contaminant; however, the contaminant will be retained for further evaluation due to its potential to bioaccumulate.

Species	Exposure Parameter	Reported value	Assessment Value	Assumptions/Reference
Red Fox ( <i>Vulpes vulpes</i> )	Home range	96 hectare (237 acres)	Area Use Factor = 1	Conservatively based on Wisconsin/diverse data from EPA, 1993.
	Diet	Mammals/Birds/Insects/ Plants	100% small mammals	Conservative estimate to evaluate the species as a carnivore
	Food ingestion rate (wet weight)	0.069 gram/gram day	0.313 kg/day	Based on nonbreeding Adult from EPA 1993
	Food Dry Weight Fraction	0.32	0.32	Based on mammal moisture content in EPA, 2005
	Food ingestion rate (dry weight)	0.02208 gram/gram-day	0.1 kg/day	Wet weight ingestion rate multiplied by dry fraction.
	Soil ingestion rate	1.3% of food ingestion rate (dry weight)	0.0013 kg/day	Used 50th percentile value for Shrew from EPA, 2005 based on diet above
	Body weight	3.94 - 5.25 kg	4.54 kg	Mean of adult males and females in spring and fall in Illinois, Iowa, Wisconsin, and North Dakota from EPA, 1993.
Meadow Vole ( <i>Microtus pennsylvanicus</i> )	Home range	0.013 hectare (0.032 acres)	Area Use Factor = 1	Based on mean adult male and female in Virginia/old field data from EPA, 1993.
	Diet	Plants	100% Plants	Based on seasonal mean Illinois Bluegrass data from EPA, 1993. Conservative estimate to evaluate the species as an herbivore
	Food ingestion rate (wet weight)	0.325 gram/gram day	0.012 kg/day	Based on Meadow Vole Russian study from EPA 1993
	Food Dry Weight Fraction	0.15	0.15	Based on dietary composition above and moisture content from EPA, 2005
	Food ingestion rate (dry weight)	0.04875 gram/gram-day	0.0018 kg/day	Wet weight ingestion rate multiplied by dry fraction.
	Soil ingestion rate	1.2% of food ingestion rate (dry weight)	0.0000216 kg/day	Used 50th percentile value for Vole from EPA, 2005 based on diet above
	Body weight	35.5 - 39.0 grams	0.037 kg	Based on the mean of adult males and females in south Indiana from EPA, 1993.

Species	Exposure Parameter	Reported value	Assessment Value	Assumptions/Reference
Short-tailed Shrew ( <i>Blarina brevicauda</i> )	Home range	0.108 hectares (0.267 acres)	Area Use Factor = 1	Based on mean adult male and female in Michigan bluegrass data from EPA, 1993.
	Diet	94.6% Insects 5.4% Plants	100% Insects	Based on New York data from EPA, 1993. Conservative estimate to evaluate the species as an insectivore
	Food ingestion rate (wet weight)	0.555 gram/gram day	0.0096 kg/day	Based on mean Ohio Lab data from EPA 1993
	Food Dry Weight Fraction	0.16	0.16	Based on dietary composition above and moisture content from EPA, 2005
	Food ingestion rate (dry weight)	0.0888 gram/gram-day	0.0015 kg/day	Wet weight ingestion rate multiplied by dry fraction.
	Soil ingestion rate	0.9% of food ingestion rate (dry weight)	0.000014 kg/day	Used 50th percentile value for Shrew from EPA, 2005 based on diet above
	Body weight	15.58 - 19.21 grams	0.0173 kg	Based on the mean of adult males and females in Pennsylvania from EPA, 1993.
American Robin ( <i>Turdus migratorius</i> )	Home range	0.81 hectare (2 acres)	Area Use Factor = 1	Based on American Robin data from EPA, 1993.
	Diet	invertebrates and plants	37.5% invertebrates 62.5% plants	Based on American Robin data (arithmetic mean of adults in eastern U.S.) in EPA, 1993.
	Food ingestion rate (wet weight)	0.89 gram/gram-day	0.0685 kg/day	Based on American Robin data for California in EPA, 1993.
	Food Dry Weight Fraction	0.1548	0.1548	Based on dietary composition above and moisture content from EPA, 2005
	Food ingestion rate (dry weight)	0.138 gram/gram-day	0.0106 kg/day	Wet weight ingestion rate multiplied by dry fraction.
	Soil ingestion rate	6.4% of food ingestion rate (dry weight)	0.00068 kg/day	Used 50th percentile value for Robin from EPA, 2005 based on diet above
	Body weight	77.3 grams	0.077 kg	Based on American Robin data for Pennsylvania in EPA, 1993.

Species	Exposure Parameter	Reported value	Assessment Value	Assumptions/Reference
Red-tailed Hawk ( <i>Buteo jamaicensis</i> )	Home range	60 - 160 hectares (148 - 395 acres)	Area Use Factor = 1	Based on adult males and females in spring in California from EPA, 1993. Conservative SLERA assumption that AUF = 1.
	Diet	small mammals, birds, reptiles	100% small mammals	Simplifying assumption. Small mammals are assumed to be deer mouse or similar. Dietary description from EPA, 1993.
	Food ingestion rate (wet weight)	0.093 gram/gram-day	0.105 kg/day	Based on arithmetic mean of adult males in summer and winter in Michigan from EPA, 1993.
	Food Dry Weight Fraction	0.32	0.32	Dry weight fraction for small mammals from EPA, 2005.
	Food ingestion rate (dry weight)	.02976 gram/gram-day	.0337 kg/day	Wet weight ingestion rate multiplied by dry fraction.
	Soil ingestion rate	2.4% of food ingestion rate (dry weight)	0.00081 kg/day	Used 50th percentile value for Hawk from EPA, 2005 based on diet above
	Body weight	1.134 kg	1.134 kg	Based on the arithmetic mean of adult males and females in Michigan, Pennsylvania, sw Idaho, and Ohio. EPA, 1993.

#### References

1. U.S. Environmental Protection Agency (EPA). 1993. *Wildlife Exposure Factors Handbook*. EPA, Office of Health and Environmental Assessment, Office of Research and development; Washington, D.C. EPA/600/R-93/187a. December.
2. U.S. Environmental Protection Agency (EPA). 2005. *Guidance for Developing Ecological Soil Screening Levels (Eco-SSLs)*. Attachment 4-1. February 2005 revision.

Table 3A  
Exposure Point Concentration Estimates - Impoundment 13  
PDI Module 4 - Ecological Risk Assessment  
American Cyanamid Superfund Site, Bridgewater, NJ

Food Item	Dry Fraction
Plant	0.15
Earthworms	0.16
Mammals	0.32

For uptake equations that calculate dry weight tissue concentrations of COPECs, the estimated concentration was multiplied by the appropriate dry fraction to yield the fresh weight COPEC concentration. Dry fraction from USEPA, 2005.

COPC	C <sub>s</sub> <sup>max</sup>	C <sub>s</sub> <sup>95%</sup>	C <sub>s</sub> <sup>mean</sup>	BCF <sub>sp</sub>	C <sub>f</sub> <sup>max</sup>	C <sub>f</sub> <sup>95%</sup>	C <sub>f</sub> <sup>mean</sup>	BCF <sub>fd</sub>	C <sub>i</sub> <sup>max</sup>	C <sub>i</sub> <sup>95%</sup>	C <sub>i</sub> <sup>mean</sup>	K <sub>ow</sub>	Ba <sub>m</sub>	BCF <sub>p-m</sub>	BCF <sub>s-m</sub>	C <sub>s</sub> <sup>smax</sup>	C <sub>s</sub> <sup>sm95%</sup>	C <sub>s</sub> <sup>smmean</sup>
Units----->	mg/kg DW	mg/kg DW	mg/kg DW	Value	mg/kg WW	mg/kg WW	mg/kg WW	Value	mg/kg WW	mg/kg WW	mg/kg WW	Value	Value	Value	Value	mg/kg WW	mg/kg WW	mg/kg WW
<b>Volatiles</b>																		
Acetone	5.13E-01	8.40E-02	1.75E-01	5.33E+01 c	4.10E+00 c	6.71E-01 c	1.40E+00 c	4.54E-02 c	3.50E-03 c	5.72E-04 c	1.19E-03 c	5.75E-01	1.45E-08 c	1.73E-10 c	3.12E-13 c	7.11E-10 c	1.1642E-10	2.43E-10 c
cis-1,2-Dichloroethene	4.70E-04	ND	4.70E-04	2.77E+00 c	1.95E-04 c	-	1.95E-04 c	3.00E+00 c	2.12E-04 c	-	2.12E-04 c	9.60E+01	2.41E-06 c	2.89E-08 c	5.21E-11 c	5.66E-12 c	-	5.66E-12 c
m,p-Xylenes	2.29E-01	6.76E-02	3.13E-02	5.62E-01 c	1.93E-02 c	5.70E-03 c	2.64E-03 c	2.87E+01 c	9.87E-01 c	2.91E-01 c	1.35E-01 c	1.51E+03	3.80E-05 c	4.56E-07 c	8.21E-10 c	8.87E-09 c	2.6194E-09	1.21E-09 c
o-Xylene	1.37E-01	4.06E-02	2.06E-02	6.01E-01 c	1.24E-02 c	3.66E-03 c	1.86E-03 c	2.61E+01 c	5.37E-01 c	1.59E-01 c	8.09E-02 c	1.35E+03	3.39E-05 c	4.07E-07 c	7.32E-10 c	5.05E-09 c	1.4973E-09	7.61E-10 c
<b>Semivolatiles</b>																		
1,2,4-Trichlorobenzene	3.78E+00	1.12E+00	1.09E+00	1.84E-01 c	1.04E-01 c	3.08E-02 c	3.00E-02 c	1.40E+02 c	7.94E+01 c	2.35E+01 c	2.29E+01 c	1.05E+04	2.63E-04 c	3.16E-06 c	5.68E-09 c	3.36E-07 c	9.9253E-08	9.68E-08 c
1,2-Dichlorobenzene	8.78E+01	1.27E+01	1.02E+01	4.31E-01 c	5.67E+00 c	8.21E-01 c	6.56E-01 c	4.19E+01 c	5.52E+02 c	7.98E+01 c	6.38E+01 c	2.40E+03	6.03E-05 c	7.23E-07 c	1.30E-09 c	4.14E-06 c	5.9862E-07	4.79E-07 c
1,3-Dichlorobenzene	8.74E-01	2.07E-01	3.89E-01	4.31E-01 c	5.65E-02 c	1.34E-02 c	2.51E-02 c	4.19E+01 c	5.49E+00 c	1.30E+00 c	2.44E+00 c	2.40E+03	6.03E-05 c	7.23E-07 c	1.30E-09 c	4.12E-08 c	9.779E-09	1.83E-08 c
1,4-Dichlorobenzene	4.01E+00	6.04E-01	8.65E-01	4.48E-01 c	2.70E-01 c	4.06E-02 c	5.82E-02 c	3.96E+01 c	2.38E+01 c	3.58E+00 c	5.14E+00 c	2.24E+03	5.62E-05 c	6.75E-07 c	1.21E-09 c	1.84E-07 c	2.7628E-08	3.96E-08 c
2-Chloronaphthalene	6.12E+00	1.15E+00	1.08E+00	2.13E-01 c	1.95E-01 c	3.67E-02 c	3.43E-02 c	1.14E+02 c	1.05E+02 c	1.96E+01 c	1.84E+01 c	8.13E+03	2.04E-04 c	2.45E-06 c	4.41E-09 c	4.87E-07 c	9.1491E-08	8.57E-08 c
2-Methylnaphthalene	1.24E+01	2.71E+00	2.60E+00	1.63E-01 c	3.03E-01 c	6.62E-02 c	6.37E-02 c	1.66E+02 c	3.09E+02 c	6.74E+01 c	6.48E+01 c	1.29E+04	3.24E-04 c	3.88E-06 c	6.99E-09 c	1.21E-06 c	2.6301E-07	2.53E-07 c
Aniline	1.14E+02	3.33E-01	1.81E+01	1.00E+00 c	1.71E+01 c	4.99E+00 c	2.71E+00 c	3.90E-01 c	6.67E+00 c	1.95E+00 c	1.06E+00 c	7.94E+00	2.00E-07 c	2.39E-09 c	4.31E-12 c	4.11E-08 c	1.2004E-08	6.52E-09 c
Bis(2-ethylhexyl) Phthalate	1.72E+00	4.14E-01	5.35E-01	3.80E-02 c	9.80E-03 c	2.36E-03 c	3.05E-03 c	1.97E+02 c	5.07E+01 c	1.22E+01 c	1.58E+01 c	1.58E+04	3.98E-04 c	4.78E-06 c	8.60E-09 c	5.16E-08 c	1.2407E-08	1.60E-08 c
Carbazole	2.43E+00	5.95E-01	5.92E-01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dibenzofuran	2.83E+00	9.47E-01	1.04E+00	1.51E-01 c	6.39E-02 c	2.14E-02 c	2.35E-02 c	1.86E+02 c	7.89E+01 c	2.64E+01 c	2.91E+01 c	1.48E+04	3.72E-04 c	4.46E-06 c	8.03E-09 c	2.92E-07 c	9.7739E-08	1.08E-07 c
Hexachlorobenzene	1.85E-01	6.94E-02	9.77E-02	2.55E-02 c	7.08E-04 c	2.85E-04 c	3.74E-04 c	2.30E+03 c	6.37E+01 c	2.39E+01 c	3.36E+01 c	2.82E+05	7.08E-03 c	6.50E-05 c	1.53E-07 c	6.92E-08 c	2.5932E-08	3.65E-08 c
Nitrobenzene	1.20E+02	1.51E-01	1.12E+01	3.38E+00 c	6.08E+01 c	7.65E+00 c	5.68E+00 c	2.26E+00 c	4.07E+01 c	5.12E+00 c	3.80E+00 c	-	-	-	-	-	-	-
n-Nitrosodiphenylamine	3.67E+01	8.23E+00	7.43E+00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pyridine	1.99E+00	1.99E+00	1.14E+00	1.63E+01 c	4.87E+00 c	4.87E+00 c	2.79E+00 c	2.43E-01 c	7.27E-02 c	7.27E-02 c	4.16E-02 c	4.47E+00	1.12E-07 c	1.35E-09 c	2.42E-12 c	6.55E-09 c	6.5543E-09	3.75E-09 c
Benzo[a]anthracene	6.02E+01	1.45E+01	5.51E+00	-	1.14E-01 a	4.91E-02 a	2.76E-02 a	-	1.53E+01 a	3.69E+00 a	1.40E+00 a	4.07E+05	-	-	-	-	-	-
Benzo[a]pyrene	1.15E+01	3.27E+00	1.54E+00	-	2.07E-01 a	6.06E-02 a	2.91E-02 a	-	2.45E+00 a	6.96E-01 a	3.28E-01 a	9.77E+05	-	-	-	-	-	-
Benzo[b]fluoranthene	1.15E+01	3.67E+00	1.89E+00	-	5.35E-01 a	1.71E-01 a	8.80E-02 a	-	4.78E+00 a	1.53E+00 a	7.87E-01 a	6.03E+05	-	-	-	-	-	-
Benzo[g,h,i]perylene	3.79E+00	1.41E+00	7.76E-01	-	2.86E-01 a	8.85E-02 a	4.38E-02 a	-	1.78E+00 a	6.62E-01 a	3.65E-01 a	-	-	-	-	-	-	-
Benzo[k]fluoranthene	4.38E+00	1.35E+00	6.66E-01	-	6.17E-02 a	2.24E-02 a	1.22E-02 a	-	1.82E+00 a	5.61E-01 a	2.77E-01 a	2.51E+06	-	-	-	-	-	-
Dibenzo[a,h]anthracene	1.73E+00	3.42E-01	2.99E-01	-	3.37E-02 a	6.66E-03 a	5.83E-03 a	-	6.39E-01 a	1.26E-01 a	1.10E-01 a	3.16E+06	-	-	-	-	-	-
Fluoranthene	2.27E+01	6.72E+00	3.24E+00	-	1.70E+00 a	5.04E-01 a	2.43E-01 a	-	1.10E+01 a	3.27E+00 a	1.57E+00 a	1.00E+05	-	-	-	-	-	-
Indeno[1,2,3-cd]pyrene	3.44E+00	1.20E+00	6.72E-01	-	6.05E-02 a	2.11E-02 a	1.18E-02 a	-	1.57E+00 a	5.49E-01 a	3.07E-01 a	9.33E+05	-	-	-	-	-	-
Pyrene	1.95E+01	5.92E+00	2.91E+00	-	2.25E+00 a	6.82E-01 a	3.35E-01 a	-	3.41E+01 a	1.04E+01 a	5.10E+00 a	5.89E+04	-	-	-	-	-	-
Chrysene	9.27E+00	2.94E+00	1.49E+00	-	3.76E-02 a	1.90E-02 a	1.27E-02 a	-	3.40E+00 a	1.08E+00 a	5.47E-01 a	6.46E+05	-	-	-	-	-	-
Total High Weight Molecular PAHs	1.48E+02	4.09E+01	1.89E+01	-	5.28E+00	1.62E+00	8.09E-01	-	7.69E+01	2.25E+01	1.08E+01	-	-	-	-	-	-	-
Acenaphthene	5.89E+00	2.12E+00	2.28E+00	-	1.26E-04 a	3.03E-04 a	2.84E-04 a	-	1.39E+00 a	4.98E-01 a	5.37E-01 a	8.32E+03	-	-	-	-	-	-
Acenaphthylene	7.81E-01	3.61E-01	4.06E-01	-	3.93E-02 a	2.13E-02 a	2.34E-02 a	-	2.86E+00 a	1.32E+00 a	1.49E+00 a	1.17E+04	-	-	-	-	-	-
Anthracene	1.00E+01	1.94E+00	1.78E+00	-	3.35E-01 a	9.36E-02 a	8.72E-02 a	-	3.87E+00 a	7.53E-01 a	6.87E-01 a	2.82E+04	-	-	-	-	-	-
Fluorene	2.90E+00	8.29E-01	8.81E-01	-	2.32E-04 a	6.77E-04 a	6.42E-04 a	-	4.44E+00 a	1.27E+00 a	1.35E+00 a	1.32E+04	-	-	-	-	-	-
Phenanthrene	2.81E+01	5.21E+00	4.23E+00	-	1.01E+00 a	3.53E-01 a	3.11E-01 a	-	7.73E+00 a	1.43E+00 a	1.16E+00 a	3.72E+04	-	-	-	-	-	-
Naphthalene	1.45E+02	4.30E+01	2.06E+01	-	2.83E+02 a	8.39E+01 a	4.02E+01 a	-	1.02E+02 a	3.02E+01 a	1.45E+01 a	1.19E+03	-	-	-	-	-	-
Total Low Weight Molecular PAHs	1.92E+02	9.83E+00	2.74E+01	-	2.84E+02	8.43E+01	4.06E+01	-	1.22E+02	3.55E+01	1.97E+01	-	-	-	-	-	-	-
<b>Inorganics</b>																		
Aluminum	2.09E+04	1.37E+04	1.24E+04	1.15E-01 c	3.61E+02 c	2.37E+02 c	2.14E+02 c	2.20E-01 c	6.90E+02 c	4.52E+02 c	4.10E+02 c	-	-	-	-	-	-	-
Antimony	1.00E+01	4.45E+00	4.29E+00	-	1.30E+00 a	6.08E-01 a	5.88E-01 a	-	1.60E+00 a	7.12E-01 a	6.86E-01 a	-	-	-	8.00E-02	2.56E-02 a	1.14E-02 a	6.86E-02 a
Arsenic	4.01E+01	2.03E+01	1.26E+01	-	2.26E-01 a	1.14E-01 a	7.11E-02 a	-	5.23E-01 a	3.24E-01 a	3.32E-01 a	-	-	-	1.61E-01	5.16E-02 a	2.96E-02 a	2.00E-02 a
Barium	7.18E+02	4.03E+02	2.60E+02	-	1.68E+01 a	9.42E+00 a	6.08E+00 a	-	1.05E+01 a	5.86E+00 a	2.45E-01 a	-	-	-	2.51E-02	2.51E-02 a	1.41E-02 a	9.08E-03 a
Cadmium	2.54E+01	7.89E+00	7.68E+00	-	5.46E-01 a	2.88E-01 a	2.84E-01 a	-	1.73E+01 a	6.84E+00 a	1.63E-01 a	-	-	-	1.31E+00	4.19E-01 a	2.41E-01 a	2.38E-01 a
Chromium	4.91E+02	2.88E+02	1.67E+02	-	3.02E+00 a	1.77E+00 a	1.03E+00 a	-	2.40E+01 a	1.41E+01 a	1.43E+00 a	-	-	-	2.19E+01	7.01E+00 a	4.74E+00 a	3.17E+00 a
Cobalt	3.32E+01	1.85E+01	1.41E+01	-	3.74E-02 a	2.09E-02 a	1.59E-02 a	-	6.48E-01 a	3.62E-01 a	7.29E-01 a	-	-	-	1.12E+00	3.58E-01	1.67E-01	1.17E-01
Copper	8.53E+03	1.50E+03	9.11E+02	-	1.04E+01 a	5.22E+00 a	4.29E+00 a	-	7.03E+02 a	1.24E+02 a	8.53E-01 a	-	-	-	2.85E+01	9.11E+00 a	7.09E+00 a	6.60E+00 a
Cyanide	3.50E+00	7.93E-01	1.47E+00	1.15E-01 c	6.04E-02 c	1.37E-02 c	2.53E-02 c	2.20E-01 c	1.16E-01 c	2.82E-02 c	4.83E-02 c	-	-	-	-	-	-	-
Hexavalent Chromium	1.99E+01	5.62E+00	4.01E+00	1.15E-01 c	3.43E-01 c	9.69E-02 c	6.91E-02 c	2.20E-01 c	6.57E-01 c	1.85E-01 c	1.32E-01 c	-	-	-	-	-	-	-
Iron	2.38E+05	6.37E+04	5.03E+04	1.15E-01 c	4.11E+03 c	1.10E+03 c	8.68E+02 c	2.20E-01 c	7.85E+03 c	2.10E+03 c	1.66E+03 c	-	-	-	-	-	-	-
Lead	1.31E+03	4.91E+02	3.27E+02	-	2.23E+00 a	1.28E+00 a	1.02E+00 a	-	4.22E+01 a	1.91E+01 a	2.30E+00 a	-	-	-	2.58E+01	8.25E+00 a	5.35E+00 a	4.47E+00 a
Manganese	9.22E+02	6.70E+02	6.22E+02</															

Table 3A  
 Exposure Point Concentration Estimates - Impoundment 13  
 PDI Module 4 - Ecological Risk Assessment  
 American Cyanamid Superfund Site, Bridgewater, NJ

Food Item	Dry Fraction
Plant	0.15
Earthworms	0.16
Mammals	0.32

For uptake equations that calculate dry weight tissue concentrations of COPECs, the estimated concentration was multiplied by the appropriate dry fraction to yield the fresh weight COPEC concentration. Dry fraction from USEPA, 2005.

COPC	C <sub>s</sub> <sup>max</sup>	C <sub>s</sub> <sup>95%</sup>	C <sub>s</sub> <sup>mean</sup>	BCF <sub>s-p</sub>	C <sub>t</sub> <sup>pmax</sup>	C <sub>t</sub> <sup>p95%</sup>	C <sub>t</sub> <sup>pmean</sup>	BCF <sub>s-i</sub>	C <sub>t</sub> <sup>imax</sup>	C <sub>t</sub> <sup>i95%</sup>	C <sub>t</sub> <sup>imean</sup>	K <sub>ow</sub>	Ba <sub>m</sub>	BCF <sub>p-m</sub>	BCF <sub>s-m</sub>	C <sub>t</sub> <sup>smmax</sup>	C <sub>t</sub> <sup>sm95%</sup>	C <sub>t</sub> <sup>smmean</sup>
Units----->	mg/kg DW	mg/kg DW	mg/kg DW	Value	mg/kg WW	mg/kg WW	mg/kg WW	Value	mg/kg WW	mg/kg WW	mg/kg WW	Value	Value	Value	Value	mg/kg WW	mg/kg WW	mg/kg WW
Selenium	3.80E+00	1.34E+00	1.73E+00	-	3.33E-01 a	1.06E-01 a	1.39E-01 a	2.20E-01 c	1.25E-01 c	4.44E-02 c	5.70E-02 c	-	-	-	1.09E+00	3.49E-01 a	2.36E-01 a	2.59E-01 a
Silver	5.30E+00	2.15E+00	1.77E+00	-	1.11E-02 a	4.52E-03 a	3.71E-03 a	-	1.73E+00 a	7.04E-01 a	5.79E-01 a	-	-	-	2.12E-02	6.78E-03 a	2.76E-03 a	2.26E-03 a
Vanadium	1.03E+02	4.95E+01	4.42E+01	-	7.49E-02 a	3.60E-02 a	3.22E-02 a	-	4.72E-04 a	2.27E-04 a	2.97E-06 a	-	-	-	1.27E+00 a	4.05E-01 a	1.95E-01 a	1.74E-01 a
Zinc	3.32E+03	1.37E+03	7.30E+02	-	6.47E+01 a	3.96E+01 a	2.80E+01 a	-	1.96E+02 a	1.46E+02 a	1.19E+02 a	-	-	-	4.94E+00	4.45E+01 a	4.18E+01 a	4.00E+01 a

- Notes**  
 1. DW = dry weight  
 2. WW = wet weight  
 3. "-" indicates a value is either not available or not applicable

**Parameter definitions**

C <sub>s</sub> <sup>max</sup>	Maximum COPEC concentration in soil	K <sub>ow</sub>	Octanol-Water Partition Coefficient
C <sub>s</sub> <sup>95%</sup>	95% UCL of COPEC concentration in soil	Ba <sub>m</sub>	Biotransfer factor for mammals
BCF <sub>s-p</sub>	Soil to plant bioconcentration factor	BCF <sub>p-m</sub>	Plant to mammal bioconcentration factor
C <sub>t</sub> <sup>pmax</sup>	Maximum COPEC concentration in plant tissue	BCF <sub>s-m</sub>	Soil to mammal bioconcentration factor
C <sub>t</sub> <sup>p95%</sup>	95% UCL of COPEC concentration in plant tissue	C <sub>t</sub> <sup>smmax</sup>	Maximum COPEC concentration in small mammals (deer mouse)
BCF <sub>s-i</sub>	Soil to invertebrate bioconcentration factor	C <sub>t</sub> <sup>sm95%</sup>	95% UCL of COPEC concentration in small mammals (deer mouse)
C <sub>t</sub> <sup>imax</sup>	Maximum COPEC concentration in invertebrate (earthworm) tissue		
C <sub>t</sub> <sup>i95%</sup>	95% UCL of COPEC concentration in invertebrate (earthworm) tissue		

- Sources**  
 a. U.S. Environmental Protection Agency (EPA). 2007. Guidance for Developing Ecological Soil Screening Levels (Eco-SSLs). Attachment 4-1. April 2007 revision.  
 b. Spero, et. Al. 2000. Regulatory Chemicals Handbook.  
 Jennifer M. Spero (Editor), Bella DeVito (Editor), Louis Theodore (Editor). (2000) Regulatory Chemicals Handbook. Publisher: CRC (March 1, 2000)  
 c. EPA 1999. Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. EPA530-D-99-001A.  
 d. Baes, C.F., et. al. (1984). A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture. Oak Ridge National Lab, Health and Safety Research Division. September, 1984.  
 For plants, average of reproductive (Br) and vegetative (Bv) uptake factors used. For seeds, reproductive uptake factor used. For mammals, diet to beef numbers were used for Ba<sub>m</sub> values. These were multiplied by the fresh weight plant ingestion rate (see Table 3-1) to yield the BCF<sub>p-m</sub>.

Table 3B  
 Exposure Point Concentration Estimates - Impoundment 17  
 PDI Module 4 - Ecological Risk Assessment  
 American Cyanamid Superfund Site, Bridgewater, NJ

Food Item	Dry Fraction
Plant	0.15
Earthworms	0.16
Mammals	0.32

For uptake equations that calculate dry weight tissue concentrations of COPECs, the estimated concentration was multiplied by the appropriate dry fraction to yield the fresh weight COPEC concentration. Dry fraction from USEPA, 2005.

COPC	C <sub>s</sub> <sup>max</sup>	C <sub>s</sub> <sup>95%</sup>	C <sub>s</sub> <sup>mean</sup>	BCF <sub>sp</sub>	C <sub>f</sub> <sup>max</sup>	C <sub>f</sub> <sup>95%</sup>	C <sub>f</sub> <sup>mean</sup>	BCF <sub>s-i</sub>	C <sub>f</sub> <sup>max</sup>	C <sub>f</sub> <sup>95%</sup>	C <sub>f</sub> <sup>mean</sup>	K <sub>ow</sub>	Ba <sub>m</sub>	BCF <sub>p-m</sub>	BCF <sub>s-m</sub>	C <sub>f</sub> <sup>smmax</sup>	C <sub>f</sub> <sup>sm95%</sup>	C <sub>f</sub> <sup>smmean</sup>
Units----->	mg/kg DW	mg/kg DW	mg/kg DW	Value	mg/kg WW	mg/kg WW	mg/kg WW	Value	mg/kg WW	mg/kg WW	mg/kg WW	Value	Value	Value	Value	mg/kg WW	mg/kg WW	mg/kg WW
<b>Volatiles</b>																		
Acetone	9.78	0.7779	1.484111111	5.33E+01 c	7.82E+01 c	6.22E+00 c	1.19E+01 c	4.54E-02 c	7.11E-02 c	5.66E-03 c	1.08E-02 c	5.75E-01	1.45E-08 c	1.73E-10 c	3.12E-13 c	1.36E-08 c	1.0788E-09	2.06E-09 c
<b>Semivolatiles</b>																		
1,2,4-Trichlorobenzene	1.00E+00	4.31E-01	4.17E-01	1.84E-01 c	2.76E-02 c	1.19E-02 c	1.15E-02 c	1.40E+02 c	2.24E+01 c	9.67E+00 c	9.35E+00 c	1.05E+04	2.63E-04 c	3.16E-06 c	5.68E-09 c	8.89E-08 c	3.8324E-08	3.71E-08 c
2-Chloronaphthalene	1.63E-01	7.80E-02	9.98E-02	2.13E-01 c	5.20E-03 c	2.49E-03 c	3.19E-03 c	1.14E+02 c	2.97E+00 c	1.42E+00 c	1.82E+00 c	8.13E+03	2.04E-04 c	2.45E-06 c	4.41E-09 c	1.30E-08 c	6.2109E-09	7.95E-09 c
2-Methylnaphthalene	ND	ND	ND	1.63E-01 c	-	-	-	1.66E+02 c	-	-	-	1.29E+04	3.24E-04 c	3.88E-06 c	6.99E-09 c	-	-	-
3,3'-Dichlorobenzidine	9.89E+00	3.85E+00	5.45E+00	8.50E-01	1.26E+00 c	4.91E-01 c	6.95E-01 c	5.35E+01 c	8.47E+01 c	3.30E+01 c	4.67E+01 c	3.24E+03	-	5.75E-05 c	1.40E-07 c	7.29E-05 c	2.8427E-05	4.02E-05 c
Aniline	3.47E+01	1.42E+01	1.30E+01	1.00E+00 c	5.21E+00 c	2.13E+00 c	1.95E+00 c	3.90E-01 c	2.17E+00 c	8.86E-01 c	8.10E-01 c	7.94E+00	2.00E-07 c	2.39E-09 c	4.31E-12 c	1.25E-08 c	5.1198E-09	4.68E-09 c
Hexachlorobenzene	1.34E+00	7.09E-01	7.84E-01	2.55E-02 c	5.13E-03 c	2.71E-03 c	3.00E-03 c	2.08E+03 c	4.45E+02 c	2.36E+02 c	2.61E+02 c	2.82E+05	7.08E-03 c	8.50E-05 c	1.53E-07 c	5.01E-07 c	2.6497E-07	2.93E-07 c
n-Nitrosodiphenylamine	5.64E+00	3.13E+00	3.40E+00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pyridine	ND	ND	ND	1.63E+01 c	-	-	-	2.43E-01 c	-	-	-	4.47E+00	1.12E-07 c	1.35E-09 c	2.42E-12 c	-	-	-
Benzo[a]anthracene	4.42E+00	1.68E+00	2.84E+00	-	2.42E-02 a	1.36E-02 a	1.86E-02 a	-	1.12E+00 a	4.28E-01 a	7.23E-01 a	4.07E+05	-	-	-	-	-	-
Benzo[a]pyrene	1.38E-01	1.38E-01	1.54E-01	-	3.90E-03 a	2.76E-03 a	3.09E-03 a	-	4.17E-02 a	2.93E-02 a	3.29E-02 a	9.77E+05	-	-	-	-	-	-
Benzo[b]fluoranthene	7.57E-01	3.43E-01	4.79E-01	-	3.52E-02 a	1.60E-02 a	2.23E-02 a	-	3.15E-01 a	1.43E-01 a	1.99E-01 a	6.03E+05	-	-	-	-	-	-
Benzo[g,h,i]perylene	1.45E-01	8.14E-02	9.84E-02	-	6.02E-03 a	3.04E-03 a	3.81E-03 a	-	6.82E-02 a	3.83E-02 a	4.63E-02 a	-	-	-	-	-	-	-
Benzo[k]fluoranthene	1.64E-01	9.66E-02	1.18E-01	-	3.67E-03 a	2.33E-03 a	2.76E-03 a	-	6.82E-02 a	4.02E-02 a	4.91E-02 a	2.51E+06	-	-	-	-	-	-
Dibenzo[a,h]anthracene	5.03E-02	NA	5.03E-02	-	9.81E-04 a	-	9.81E-04 a	-	1.86E-02 a	-	1.86E-02 a	3.16E+06	-	-	-	-	-	-
Fluoranthene	2.03E-01	1.15E-01	1.25E-01	-	1.52E-02 a	8.60E-03 a	9.40E-03 a	-	9.87E-02 a	5.57E-02 a	6.09E-02 a	1.00E+05	-	-	-	-	-	-
Indeno[1,2,3-cd]pyrene	1.29E-01	8.60E-02	9.50E-02	-	2.27E-03 a	1.51E-03 a	1.67E-03 a	-	5.90E-02 a	3.94E-02 a	4.34E-02 a	9.33E+05	-	-	-	-	-	-
Pyrene	2.77E-01	1.32E-01	1.47E-01	-	3.19E-02 a	1.52E-02 a	1.70E-02 a	-	4.85E-01 a	2.31E-01 a	2.58E-01 a	5.89E+04	-	-	-	-	-	-
Chrysene	5.93E-01	NA	5.93E-01	-	7.33E-03 a	-	7.33E-03 a	-	2.17E-01 a	-	2.17E-01 a	6.46E+05	-	-	-	-	-	-
Total High Weight Molecular PAHs	5.62E+00	1.36E+00	1.96E+00	-	1.31E-01	6.30E-02	8.69E-02	-	2.50E+00	1.00E+00	1.65E+00	-	-	-	-	-	-	-
Acenaphthylene	5.23E-02	NA	5.23E-02	-	4.63E-03 a	-	4.63E-03 a	-	1.92E-01 a	-	1.92E-01 a	1.17E+04	-	-	-	-	-	-
Anthracene	1.84E-01	6.97E-02	8.77E-02	-	1.49E-02 a	7.02E-03 a	8.39E-03 a	-	7.12E-02 a	2.70E-02 a	3.40E-02 a	2.82E+04	-	-	-	-	-	-
Phenanthrene	1.23E-01	9.93E-02	1.05E-01	-	3.46E-02 a	3.03E-02 a	3.13E-02 a	-	3.38E-02 a	2.73E-02 a	2.88E-02 a	3.72E+04	-	-	-	-	-	-
Naphthalene	1.29E+00	7.37E-01	7.87E-01	-	2.52E+00 a	1.44E+00 a	1.54E+00 a	-	9.08E-01 a	5.19E-01 a	5.54E-01 a	1.19E+03	-	-	-	-	-	-
Total Low Weight Molecular PAHs	1.33E+00	1.43E-01	8.29E-01	-	2.57E+00	1.48E+00	1.58E+00	-	1.20E+00	5.73E-01	8.08E-01	-	-	-	-	-	-	-
<b>Inorganics</b>																		
Aluminum	1.47E+05	1.08E+05	1.01E+05	1.15E-01 c	8.27E+02 a	6.06E+02 a	5.68E+02 a	-	1.72E+02 a	1.38E+02 a	1.32E+02 a	-	-	-	1.34E+02	4.28E+01 a	3.31E+01 a	3.14E+01 a
Antimony	2.50E+01	1.79E+01	1.68E+01	-	3.07E+00 a	2.24E+00 a	2.12E+00 a	-	4.00E+00 a	2.86E+00 a	2.69E+00 a	-	-	-	2.00E-01	6.40E-02 a	4.57E-02 a	4.31E-02 a
Arsenic	1.09E+02	7.42E+01	6.88E+01	-	6.13E-01 a	4.17E-01 a	3.87E-01 a	-	1.06E+00 a	8.08E-01 a	7.66E-01 a	-	-	-	3.66E-01	1.17E-01 a	8.54E-02 a	8.03E-02 a
Barium	9.18E+03	5.58E+03	4.92E+03	-	2.15E+02 a	1.31E+02 a	1.15E+02 a	-	1.34E+02 a	8.12E+01 a	3.13E+00 a	-	-	-	3.21E-01	3.21E-01 a	1.95E-01 a	1.72E-01 a
Cadmium	4.50E+00	3.98E+00	3.54E+00	-	2.12E-01 a	1.98E-01 a	1.86E-01 a	-	4.38E+00 a	3.98E+00 a	9.42E-02 a	-	-	-	5.79E-01	1.85E-01 a	1.75E-01 a	1.65E-01 a
Chromium	2.87E+03	2.35E+03	2.20E+03	-	1.77E+01 a	1.44E+01 a	1.35E+01 a	-	1.41E+02 a	1.15E+02 a	8.85E+00 a	-	-	-	8.01E+01	2.56E+01 a	2.21E+01 a	2.11E+01 a
Cobalt	1.66E+01	1.35E+01	1.21E+01	-	1.87E-02 a	1.52E-02 a	1.36E-02 a	-	3.24E-01 a	2.64E-01 a	3.65E-04 a	-	-	-	4.52E-01	1.45E-01	1.10E-01	9.55E-02
Copper	3.94E+03	3.00E+03	2.83E+03	-	7.64E+00 a	6.86E+00 a	6.70E+00 a	-	3.25E+02 a	2.48E+02 a	6.29E-01 a	-	-	-	2.55E+01	8.15E+00 a	7.84E+00 a	7.77E+00 a
Cyanide	3.90E+00	1.10E+00	1.73E+00	1.15E-01 c	6.73E-02 c	1.89E-02 c	2.99E-02 c	2.20E-01 c	1.37E-01 c	3.86E-02 c	6.10E-02 c	-	-	-	-	-	-	-
Hexavalent Chromium	1.41E+02	5.23E+01	4.05E+01	1.15E-01 c	2.43E+00 c	9.01E-01 c	6.99E-01 c	2.20E-01 c	4.96E+00 c	1.84E+00 c	1.43E+00 c	-	-	-	-	-	-	-
Iron	1.02E+05	6.82E+04	6.36E+04	1.15E-01 c	1.76E+03 c	1.18E+03 c	1.10E+03 c	2.20E-01 c	3.59E+03 c	2.40E+03 c	2.24E+03 c	-	-	-	-	-	-	-
Lead	3.39E+03	2.54E+03	2.39E+03	-	3.80E+00 a	3.23E+00 a	3.12E+00 a	-	9.08E+01 a	7.20E+01 a	9.37E+00 a	-	-	-	3.93E+01	1.26E+01 a	1.11E+01 a	1.08E+01 a
Manganese	1.72E+03	1.25E+03	1.19E+03	-	2.04E+01 a	1.48E+01 a	1.41E+01 a	-	1.15E+01 a	9.21E+00 a	5.57E+01 a	-	-	-	4.30E+01 a	1.38E+01 a	9.98E+00 a	9.53E+00 a
Mercury	2.58E+02	1.42E+02	1.30E+02	-	8.71E+00 d	4.78E+00 d	4.38E+00 d	-	1.40E+01 a	7.70E+00 a	1.20E+00 a	-	2.50E-01 d	2.50E-01 d	5.40E-06 c	2.18E+00 c	1.19E+00 c	1.10E+00 c
Nickel	1.65E+02	1.04E+02	9.83E+01	-	7.40E-01 a	5.24E-01 a	5.03E-01 a	2.20E-01 c	5.81E+00 c	3.66E+00 c	3.46E+00 c	-	-	-	8.43E+00	2.70E+00 a	2.18E+00 a	2.12E+00 a
Vanadium	9.85E+01	7.14E+01	6.78E+01	-	7.17E-02 a	5.20E-02 a	4.94E-02 a	-	4.51E-04 a	3.27E-04 a	2.84E-06 a	-	-	-	1.21E+00 a	3.88E-01 a	2.81E-01 a	2.67E-01 a
Zinc	4.20E+03	3.03E+03	2.85E+03	-	7.37E+01 a	6.14E+01 a	5.94E+01 a	-	2.11E+02 a	1.90E+02 a	1.86E+02 a	-	-	-	4.95E+00	4.53E+01 a	4.42E+01 a	4.41E+01 a
<b>PCBs</b>																		
Aroclor 1254	3.25E+00	2.05E+00	2.39E+00	1.00E-02 c	4.88E-03 c	3.08E-03 c	3.59E-03 c	1.13E+00 c	5.88E-01 c	3.71E-01 c	8.81E-04 c	1.61E+06	4.04E-02 c	1.74E-04 c	9.71E-07 c	1.86E-06 c	1.17E-06 c	1.37E-06 c

Table 3B  
 Exposure Point Concentration Estimates - Impoundment 17  
 PDI Module 4 - Ecological Risk Assessment  
 American Cyanamid Superfund Site, Bridgewater, NJ

Food Item	Dry Fraction
Plant	0.15
Earthworms	0.16
Mammals	0.32

For uptake equations that calculate dry weight tissue concentrations of COPECs, the estimated concentration was multiplied by the appropriate dry fraction to yield the fresh weight COPEC concentration. Dry fraction from USEPA, 2005.

COPEC	C <sub>s</sub> <sup>max</sup>	C <sub>s</sub> <sup>95%</sup>	C <sub>s</sub> <sup>mean</sup>	BCF <sub>s-p</sub>	C <sub>t</sub> <sup>max</sup>	C <sub>t</sub> <sup>95%</sup>	C <sub>t</sub> <sup>mean</sup>	BCF <sub>s-i</sub>	C <sub>t</sub> <sup>max</sup>	C <sub>t</sub> <sup>95%</sup>	C <sub>t</sub> <sup>mean</sup>	K <sub>ow</sub>	Ba <sub>m</sub>	BCF <sub>p-m</sub>	BCF <sub>s-m</sub>	C <sub>t</sub> <sup>smmax</sup>	C <sub>t</sub> <sup>sm95%</sup>	C <sub>t</sub> <sup>smmean</sup>
Units----->	mg/kg DW	mg/kg DW	mg/kg DW	Value	mg/kg WW	mg/kg WW	mg/kg WW	Value	mg/kg WW	mg/kg WW	mg/kg WW	Value	Value	Value	Value	mg/kg WW	mg/kg WW	mg/kg WW

**Notes**

1. DW = dry weight
2. WW = wet weight
3. "-" indicates a value is either not available or not applicable

**Parameter definitions**

C <sub>s</sub> <sup>max</sup>	Maximum COPEC concentration in soil
C <sub>s</sub> <sup>95%</sup>	95% UCL of COPEC concentration in soil
BCF <sub>s-p</sub>	Soil to plant bioconcentration factor
C <sub>t</sub> <sup>max</sup>	Maximum COPEC concentration in plant tissue
C <sub>t</sub> <sup>95%</sup>	95% UCL of COPEC concentration in plant tissue
BCF <sub>s-i</sub>	Soil to invertebrate bioconcentration factor
C <sub>t</sub> <sup>max</sup>	Maximum COPEC concentration in invertebrate (earthworm) tissue
C <sub>t</sub> <sup>95%</sup>	95% UCL of COPEC concentration in invertebrate (earthworm) tissue

K <sub>ow</sub>	Octanol-Water Partition Coefficient
Ba <sub>m</sub>	Biotransfer factor for mammals
BCF <sub>p-m</sub>	Plant to mammal bioconcentration factor
BCF <sub>s-m</sub>	Soil to mammal bioconcentration factor
C <sub>t</sub> <sup>smmax</sup>	Maximum COPEC concentration in small mammals (deer mouse)
C <sub>t</sub> <sup>sm95%</sup>	95% UCL of COPEC concentration in small mammals (deer mouse)

**Sources**

- U.S. Environmental Protection Agency (EPA). 2005. Guidance for Developing Ecological Soil Screening Levels (Eco-SSLs). Attachment 4-1. February 2005 revision.
  - Spero, et. Al. 2000. Regulatory Chemicals Handbook.
  - Jennifer M. Spero (Editor), Bella DeVito (Editor), Louis Theodore (Editor). (2000) Regulatory Chemicals Handbook. Publisher: CRC (March 1, 2000)
  - EPA 1999. Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. EPA530-D-99-001A.
  - Baes, C.F., et. al. (1984). A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture. Oak Ridge National Lab, Health and Safety Research Division. September, 1984.
- For plants, average of reproductive (Br) and vegetative (Bv) uptake factors used. For seeds, reproductive uptake factor used. For mammals, diet to beef numbers were used for Ba<sub>m</sub> values. These were multiplied by the fresh weight plant ingestion rate (see Table 3-1) to yield the BCF<sub>p-m</sub>.

Table 3C  
Exposure Point Concentration Estimates - Impoundment 24  
PDI Module 4 - Ecological Risk Assessment  
American Cyanamid Superfund Site, Bridgewater, NJ

Table with 2 columns: Food Item, Dry Fraction. Rows include Plant (0.15), Earthworms (0.16), Mammals (0.32).

For uptake equations that calculate dry weight tissue concentrations of COPECs, the estimated concentration was multiplied by the appropriate dry fraction to yield the fresh weight COPEC concentration. Dry fraction from USEPA, 2005.

Main data table with columns: COPC, C\_s^max, C\_s^95%, C\_s^mean, BCF\_s-p, C\_f^pmax, C\_f^p95%, C\_f^pmean, BCF\_s-i, C\_f^imax, C\_f^i95%, C\_f^imean, K\_ow, Ba\_m, BCF\_p-m, BCF\_s-m, C\_f^smmax, C\_f^sm95%, C\_f^smmean. Rows are categorized into Volatiles, Semivolatiles, and Inorganics.

Table 3C  
 Exposure Point Concentration Estimates - Impoundment 24  
 PDI Module 4 - Ecological Risk Assessment  
 American Cyanamid Superfund Site, Bridgewater, NJ

Food Item	Dry Fraction
Plant	0.15
Earthworms	0.16
Mammals	0.32

For uptake equations that calculate dry weight tissue concentrations of COPECs, the estimated concentration was multiplied by the appropriate dry fraction to yield the fresh weight COPEC concentration. Dry fraction from USEPA, 2005.

COPC	C <sub>s</sub> <sup>max</sup>	C <sub>s</sub> <sup>95%</sup>	C <sub>s</sub> <sup>mean</sup>	BCF <sub>s-p</sub>	C <sub>t</sub> <sup>pmax</sup>	C <sub>t</sub> <sup>p95%</sup>	C <sub>t</sub> <sup>pmean</sup>	BCF <sub>s-i</sub>	C <sub>t</sub> <sup>imax</sup>	C <sub>t</sub> <sup>i95%</sup>	C <sub>t</sub> <sup>imean</sup>	K <sub>ow</sub>	Ba <sub>m</sub>	BCF <sub>p-m</sub>	BCF <sub>s-m</sub>	C <sub>t</sub> <sup>smmax</sup>	C <sub>t</sub> <sup>sm95%</sup>	C <sub>t</sub> <sup>smmean</sup>
Units----->	mg/kg DW	mg/kg DW	mg/kg DW	Value	mg/kg WW	mg/kg WW	mg/kg WW	Value	mg/kg WW	mg/kg WW	mg/kg WW	Value	Value	Value	Value	mg/kg WW	mg/kg WW	mg/kg WW
<b>PCBs</b>																		
Aroclor 1248	2.36E-01	NA	2.36E-01	1.84E-02 c	6.51E-04 c	-	6.51E-04 c	1.13E+00 c	4.27E-02 c	-	4.27E-02 c	5.62E+05	1.41E-02 c	6.07E-05 c	3.39E-07 c	6.51E-08 c	-	6.51E-08 c
Aroclor 1254	1.98E+01	1.81E+01	3.95E+00	1.00E-02 c	2.97E-02 c	2.71E-02 c	5.93E-03 c	1.13E+00 c	3.58E+00 c	3.27E+00 c	7.14E-01 c	1.61E+06	4.04E-02 c	1.74E-04 c	9.71E-07 c	1.13E-05 c	1.03E-05 c	2.26E-06 c

**Notes**

- DW = dry weight
- WW = wet weight
- "-" indicates a value is either not available or not applicable

**Parameter definitions**

C <sub>s</sub> <sup>max</sup>	Maximum COPEC concentration in soil	K <sub>ow</sub>	Octanol-Water Partition Coefficient
C <sub>s</sub> <sup>95%</sup>	95% UCL of COPEC concentration in soil	Ba <sub>m</sub>	Biotransfer factor for mammals
BCF <sub>s-p</sub>	Soil to plant bioconcentration factor	BCF <sub>p-m</sub>	Plant to mammal bioconcentration factor
C <sub>t</sub> <sup>pmax</sup>	Maximum COPEC concentration in plant tissue	BCF <sub>s-m</sub>	Soil to mammal bioconcentration factor
C <sub>t</sub> <sup>p95%</sup>	95% UCL of COPEC concentration in plant tissue	C <sub>t</sub> <sup>smmax</sup>	Maximum COPEC concentration in small mammals (deer mouse)
BCF <sub>s-i</sub>	Soil to invertebrate bioconcentration factor	C <sub>t</sub> <sup>sm95%</sup>	95% UCL of COPEC concentration in small mammals (deer mouse)
C <sub>t</sub> <sup>imax</sup>	Maximum COPEC concentration in invertebrate (earthworm) tissue		
C <sub>t</sub> <sup>i95%</sup>	95% UCL of COPEC concentration in invertebrate (earthworm) tissue		

**Sources**

- U.S. Environmental Protection Agency (EPA). 2005. Guidance for Developing Ecological Soil Screening Levels (Eco-SSLs). Attachment 4-1. February 2005 revision.
  - Spero, et. Al. 2000. Regulatory Chemicals Handbook.
  - Jennifer M. Spero (Editor), Bella DeVito (Editor), Louis Theodore (Editor). (2000) Regulatory Chemicals Handbook. Publisher: CRC (March 1, 2000)
  - EPA 1999. Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. EPA530-D-99-001A.
  - Baes, C.F., et. al. (1984). A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture. Oak Ridge National Lab, Health and Safety Research Division. September, 1984.
- For plants, average of reproductive (Br) and vegetative (Bv) uptake factors used. For seeds, reproductive uptake factor used. For mammals, diet to beef numbers were used for Ba<sub>m</sub> values. These were multiplied by the fresh weight plant ingestion rate (see Table 3-1) to yield the BCF<sub>p-m</sub>.

Hazard Quotient Estimation for Short-tailed Shrew - Impoundment 13
PDI Module 4 - Ecological Risk Assessment
American Cyanamid Superfund Site, Bridgewater, NJ

Table with 4 columns: Parameter, Symbol, Value, Units. Includes parameters like Body Weight, Dry Weight Food Ingestion Rate, Wet Weight Food Ingestion Rate, etc.

Main data table with columns for chemical classes (Volatiles, Semivolatiles, Organics), chemical names, and various exposure and hazard quotient metrics (Cmax, C95%, Cmean, etc.).

Notes
1. "\*" or blank cells indicate value not available.
2. Bold COPC names indicate an HQ exceeding 1.0.

Table 4B  
 Hazard Quotient Estimation for Short-tailed Shrew - Impoundment 17  
 PDI Module 4 - Ecological Risk Assessment  
 American Cyanamid Superfund Site, Bridgewater, NJ

Parameter	Symbol	Value	Units
Body Weight	BW	0.0173	kg
Dry Weight Food Ingestion Rate	IR <sub>dw</sub>	0.0015	kg/day
Wet Weight Food Ingestion Rate	IR <sub>ww</sub>	0.0096	kg/day
Fraction of Diet Comprised of Invertebrates	P <sub>i</sub>	1	unitless
Fraction soil ingestion	P <sub>s</sub>	0.009	unitless
Invertebrate Concentration	C <sub>i</sub>	Chemical-specific	mg/kg
Soil Concentration (C <sub>s</sub> )	C <sub>s</sub>	Chemical-specific	mg/kg
Toxicity Reference Value	TRV	Chemical-specific	mg/kg/day
Area Use Factor	AUF	1	unitless

	NOAEL HQs																LOAEL HQs						
	C <sub>s</sub> max	C <sub>s</sub> 95%	C <sub>s</sub> mean	C <sub>i</sub> max	C <sub>i</sub> 95%	C <sub>i</sub> mean	Max Dose: Soil Exposure	95% Dose: Soil Exposure	Mean Dose: Soil Exposure	Max Dose: Invertebrate Exposure	95% Dose: Invertebrate Exposure	Mean Dose: Invertebrate Exposure	Max Total Dose	95% Total Dose	Mean Total Dose	TRV mg/kg/day	Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient	Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient	
	mg/kg DW	mg/kg DW	mg/kg DW	mg/kg WW	mg/kg WW	mg/kg WW	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	NOAEL	LOAEL	unitless	unitless	unitless	unitless	unitless	unitless
<b>Volatiles</b>																							
Acetone	9.78E+00	7.78E-01	1.48E+00	7.11E-02	5.66E-03	1.08E-02	7.63E-03	6.07E-04	1.16E-03	3.95E-02	3.14E-03	5.99E-03	4.71E-02	3.75E-03	7.15E-03	10	50	4.71E-03	3.75E-04	7.15E-04	9.42E-04	7.49E-05	1.43E-04
<b>SemiVolatiles</b>																							
1,2,4-Trichlorobenzene	1.00E+00	4.31E-01	4.17E-01	2.24E+01	9.67E+00	9.35E+00	7.80E-04	3.37E-04	3.26E-04	1.24E+01	5.36E+00	5.19E+00	1.24E+01	5.36E+00	5.19E+00								
2,Chloronaphthalene	1.63E-01	7.80E-02	2.97E-02	1.82E+00	1.82E+00	1.82E+00	1.27E-04	6.09E-05	7.79E-05	1.65E+00	7.88E-01	1.01E+00	1.65E+00	7.88E-01	1.01E+00								
2-Methylnaphthalene	ND	ND	ND	-	-	-	-	-	-	-	-	-	-	-	-								
3,3'-Dichlorobenzidine	9.89E+00	3.85E+00	5.45E+00	8.47E+01	3.30E+01	4.67E+01	7.72E-03	3.01E-03	4.25E-03	4.70E+01	1.83E+01	2.59E+01	4.70E+01	1.83E+01	2.59E+01	3.52							
Acenaphthylene	5.23E-02	NA	5.23E-02	1.92E-01	-	1.92E-01	4.08E-05	-	4.08E-05	1.06E-01	-	1.06E-01	1.06E-01	-	1.06E-01								
Aniline	3.47E+01	1.42E+01	1.30E+01	2.17E+00	8.86E-01	8.10E-01	2.71E-02	1.11E-02	1.01E-02	1.20E+00	4.92E-01	4.49E-01	1.23E+00	5.03E-01	4.59E-01								
Anthracene	1.84E-01	6.97E-02	8.77E-02	7.12E-02	2.70E-02	3.40E-02	7.72E-03	1.44E-04	5.44E-05	6.85E-05	3.95E-02	1.50E-02	1.88E-02	3.97E-02	1.50E-02	1.89E-02							
Benzo[a]anthracene	4.42E+00	1.63E+00	2.84E+00	1.12E+00	4.28E-01	7.23E-01	3.45E-03	1.31E-03	2.22E-03	6.24E-01	2.39E-01	4.01E-01	6.27E-01	2.39E-01	4.04E-01	167							
Benzo[a]pyrene	1.96E-01	1.38E-01	1.54E-01	4.17E-02	2.93E-02	3.29E-02	1.53E-04	1.07E-04	1.20E-04	2.31E-02	1.63E-02	1.82E-02	2.33E-02	1.64E-02	1.84E-02	1.19	11.89	1.96E-02	1.38E-02	1.54E-02	1.96E-03	1.38E-03	1.54E-03
Benzo[b]fluoranthene	7.57E-01	3.43E-01	4.79E-01	3.15E-01	1.43E-01	1.99E-01	5.91E-04	2.68E-04	3.74E-04	1.75E-01	7.92E-02	1.11E-01	1.75E-01	7.95E-02	1.11E-01	100							
Benzo[e]fluoranthene	1.45E-01	8.14E-02	9.84E-02	6.82E-02	3.83E-02	4.63E-02	1.13E-04	6.35E-05	7.68E-05	3.78E-02	2.13E-02	2.57E-02	3.80E-02	2.13E-02	2.58E-02								
Benzo[k]fluoranthene	1.64E-01	9.66E-02	1.18E-01	6.82E-02	4.02E-02	4.91E-02	1.28E-04	7.54E-05	9.21E-05	3.79E-02	2.23E-02	2.72E-02	3.80E-02	2.24E-02	2.73E-02								
Chrysene	5.93E-01	NA	5.93E-01	2.17E-01	-	2.17E-01	4.63E-04	-	4.63E-04	1.21E-01	-	1.21E-01	1.21E-01	-	1.21E-01								
Dibenz[a,h]anthracene	5.03E-02	NA	5.03E-02	1.86E-02	-	1.86E-02	3.93E-05	-	3.93E-05	1.03E-02	-	1.03E-02	1.04E-02	-	1.04E-02	2							
Fluoranthene	2.03E-01	1.15E-01	1.25E-01	9.87E-02	5.57E-02	6.09E-02	1.58E-04	8.94E-05	9.78E-05	5.48E-02	3.09E-02	3.38E-02	5.50E-02	3.10E-02	3.39E-02								
Hexachlorobenzene	1.34E+00	7.09E-01	7.84E-01	4.45E+02	2.36E+02	2.61E+02	1.05E-03	5.53E-04	6.12E-04	2.47E+02	1.31E+02	1.45E+02	2.47E+02	1.31E+02	1.45E+02	1600							
Indeno[1,2,3-cd]pyrene	1.29E-01	8.60E-02	9.50E-02	5.90E-02	3.94E-02	4.34E-02	1.01E-04	6.71E-05	7.41E-05	3.28E-02	2.18E-02	2.41E-02	3.29E-02	2.19E-02	2.42E-02								
Naphthalene	1.29E+00	7.37E-01	7.87E-01	9.08E-01	5.19E-01	5.54E-01	1.01E-03	5.75E-04	6.14E-04	5.04E-01	2.88E-01	3.07E-01	5.05E-01	2.89E-01	3.08E-01								
n-Nitrosodiphenylamine	5.84E+00	3.13E+00	3.40E+00	-	-	-	4.40E-03	2.44E-03	2.65E-03	-	-	-	-	-	-								
Phenanthrene	1.23E-01	9.93E-02	1.05E-01	3.38E-02	2.73E-02	2.88E-02	9.60E-05	7.75E-05	8.17E-05	1.88E-02	1.52E-02	1.60E-02	1.89E-02	1.52E-02	1.61E-02								
Pyrene	2.77E-01	1.32E-01	1.47E-01	4.85E-01	2.31E-01	2.58E-01	2.16E-04	1.03E-04	1.15E-04	2.69E-01	1.28E-01	1.43E-01	2.69E-01	1.28E-01	1.43E-01								
Pyridine	ND	ND	ND	-	-	-	-	-	-	-	-	-	-	-	-								
Total High Weight Molecular PAHs	5.62E+00	1.36E+00	1.96E+00	2.50E+00	1.00E+00	1.65E+00	4.39E-03	1.06E-03	1.53E-03	1.39E+00	5.59E-01	9.15E-01	1.39E+00	5.59E-01	9.16E-01	0.615	3.07	2.26E+00	9.08E-01	1.49E+00	4.53E-01	1.82E-01	2.99E-01
Total Low Weight Molecular PAHs	1.33E+00	1.43E-01	8.29E-01	1.20E+00	5.73E-01	8.08E-01	1.04E-03	1.12E-04	6.47E-04	6.69E-01	3.19E-01	4.48E-01	6.70E-01	3.19E-01	4.49E-01	65.6	110	1.02E-02	4.85E-03	6.85E-03	6.09E-03	2.89E-03	4.08E-03
<b>Inorganics</b>																							
Aluminum	1.47E+05	1.08E+05	1.01E+05	1.72E+02	1.38E+02	1.32E+02	1.15E+02	8.40E+01	7.88E+01	9.54E+01	7.65E+01	7.31E+01	2.10E+02	1.60E+02	1.52E+02								
Antimony	2.50E+01	1.79E+01	1.68E+01	4.00E+00	2.86E+00	2.69E+00	1.95E-02	1.39E-02	1.31E-02	2.22E+00	1.59E+00	1.49E+00	2.24E+00	1.60E+00	1.51E+00	0.059	0.59	3.80E+01	2.71E+01	2.56E+01	3.80E+00	2.71E+00	2.56E+00
Arsenic	1.09E+02	7.42E+01	6.88E+01	1.06E+00	8.08E-01	7.66E-01	8.51E-02	5.79E-02	5.37E-02	5.88E-01	4.48E-01	4.25E-01	6.73E-01	5.06E-01	4.79E-01	1.04	1.66	6.48E-01	4.87E-01	4.60E-01	4.06E-01	3.05E-01	2.88E-01
Barium	9.18E+03	5.58E+03	4.92E+03	1.34E+02	8.12E+01	3.13E+00	7.16E+00	4.35E+00	3.84E+00	7.42E+01	4.51E+01	1.74E+00	8.13E+01	4.94E+01	5.58E+00	51.8	103.6	1.57E+00	9.54E-01	1.08E-01	7.85E-01	4.77E-01	5.38E-02
Cadmium	4.50E+00	3.98E+00	3.54E+00	4.39E+00	3.98E+00	9.42E-02	3.51E-03	3.11E-03	2.76E-03	2.43E+00	2.21E+00	5.23E-02	2.43E+00	2.21E+00	5.51E-02	2.12	21.2	1.15E+00	1.04E+00	2.60E-02	1.15E-01	1.04E-01	2.60E-03
Chromium	2.87E+03	2.33E+03	2.20E+03	1.41E+02	1.15E+02	8.85E+00	2.24E+00	1.83E+00	1.72E+00	7.80E+01	6.38E+01	4.91E+00	8.02E+01	6.96E+01	6.63E+00	2.4	9.62	3.34E+01	2.73E+01	2.76E+00	8.34E+00	6.82E+00	6.89E-01
Cobalt	1.66E+01	1.35E+01	1.21E+01	3.24E-01	2.64E-01	3.65E-04	1.30E-02	1.05E-02	9.44E-03	1.80E+01	1.46E+01	2.02E-04	1.93E+01	1.57E-01	9.64E-03	7.61	15.22	2.53E-02	2.06E-02	1.27E-03	1.27E-02	1.03E-02	6.33E-04
Copper	3.94E+03	3.00E+03	2.83E+03	3.25E-02	2.48E-02	6.29E-01	3.07E+00	2.34E+00	2.21E+00	1.80E+02	1.37E+02	3.49E-01	1.83E+02	1.40E+02	2.55E+00	5.6	9.34	3.27E+01	2.49E+01	4.56E-01	1.96E+01	1.50E+01	2.73E-01
Cyanide	3.90E+00	1.10E+00	1.73E+00	1.37E-01	3.86E-02	6.10E-02	3.04E-03	8.56E-04	1.35E-03	7.62E-02	2.14E-02	3.39E-02	7.92E-02	2.23E-02	3.52E-02	141.9		5.58E-04	1.57E-04	2.48E-04			
Hexavalent Chromium	1.41E+02	5.23E+01	4.05E+01	4.96E+00	1.84E+00	1.43E+00	1.10E-01	4.08E-02	3.16E-02	2.75E+00	1.02E+00	7.91E-01	2.86E+00	1.06E+00	8.23E-01	3.5		8.18E-01	3.03E-01	2.35E-01			
Iron	1.02E+05	6.82E+04	6.36E+04	3.59E+03	2.40E+03	2.24E+03	7.96E+01	5.32E+01	4.96E+01	1.99E+03	1.33E+03	1.24E+03	2.07E+03	1.38E+03	1.29E+03								
Lead	3.39E+03	2.54E+03	2.39E+03	9.08E+01	7.20E+01	9.37E+00	2.65E+00	1.98E+00	1.86E+00	5.04E+01	4.00E+01	5.20E+00	5.31E+01	4.20E+01	7.07E+00	4.7		1.13E+01	8.93E+00	1.50E+00	1.06E+01	8.39E+00	1.41E+00
Manganese	1.22E+03	1.25E+03	1.19E+03	1.15E+01	9.21E+00	5.57E-01	1.34E+00	9.73E-01	9.30E-01	6.36E+00	5.11E+00	3.99E-01	7.05E+00	6.08E+00	1.24E+00								
Mercury	2.58E+02	1.42E+02	1.30E+02	1.40E+01	7.70E+00	1.20E+00	2.01E-01	1.10E-01	1.01E-01	7.79E+00	4.27E+00	6.66E-01	7.99E+00	4.38E+00	7.67E-01	15.7	157	5.09E-01	2.79E-01	4.89E-02	5.09E-02	2.79E-02	4.89E-03
Nickel	1.65E+02	1.04E+02	9.83E+01	5.81E+00	3.66E+00	3.46E+00	1.29E-01	8.12E-02															

Table 4C
Hazard Quotient Estimation for Short-tailed Shrew - Impoundment 24
PDI Module 4 - Ecological Risk Assessment
American Cyanamid Superfund Site, Bridgewater, NJ

Table with 4 columns: Parameter, Symbol, Value, Units. Lists parameters like Body Weight, Dry Weight Food Ingestion Rate, Wet Weight Food Ingestion Rate, etc.

Main data table with columns for chemical classes (Volatiles, Semivolatiles, Inorganics) and various exposure metrics (Cmax, C95%, Cmean, Cmax, C95%, Cmean, Max Dose, 95% Dose, Mean Dose, etc.).

Notes
1. "-" or blank cells indicate value not available.
2. Bold COPC names indicate an HQ exceeding 1.0.

Table 5A  
Hazard Quotient Estimation for Meadow Vole - Impoundment 13  
PDI Module 4 - Ecological Risk Assessment  
American Cyanamid Superfund Site, Bridgewater, NJ

Parameter	Symbol	Value	Units
Body Weight	BW	0.037	kg
Dry Weight Food Ingestion Rate	IR <sub>dw</sub>	0.0018	kg/day
Wet Weight Food Ingestion Rate	IR <sub>wet</sub>	0.012	kg/day
Fraction of Diet Comprised of Plants	P <sub>p</sub>	1	unitless
Fraction soil ingestion	P <sub>s</sub>	0.012	unitless
Plant Concentration	C <sub>p</sub>	Chemical-specific	mg/kg
Soil Concentration (C <sub>s</sub> )	C <sub>s</sub>	Chemical-specific	mg/kg
Toxicity Reference Value	TRV	Chemical-specific	mg/kg/day
Area Use Factor	AUF	1	unitless

	NOAEL HQs															LOAEL HQs											
	C <sub>1</sub> max	C <sub>1</sub> 95%	C <sub>1</sub> mean	C <sub>1</sub> max	C <sub>1</sub> 95%	C <sub>1</sub> mean	Max Dose: Soil Exposure	95% Dose: Soil Exposure	Mean Dose: Soil Exposure	Max Dose: Plant Exposure	95% Dose: Plant Exposure	Mean Dose: Plant Exposure	Max Total Dose	95% Total Dose	Mean Total Dose	TRV mg/kg/day	NOAEL	LOAEL	Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient	Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient			
	mg/kg DW	mg/kg DW	mg/kg DW	mg/kg WW	mg/kg WW	mg/kg WW	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	unitless	unitless	unitless	unitless	unitless	unitless			
<b>Volatiles</b>																											
Acetone	5.13E-01	8.40E-02	1.75E-01	4.10E+00	6.71E-01	1.40E+00	2.99E-04	4.90E-05	1.02E-04	1.33E+00	2.18E-01	4.54E-01	1.33E+00	2.18E-01	4.54E-01	10	50	1.33E-01	2.18E-02	4.54E-02	2.66E-02	4.35E-03	9.08E-03				
dis-1,2-Dichloroethene	4.70E-04	ND	4.70E-04	1.95E-04	1.95E-04	1.95E-04	2.74E-07	2.74E-07	2.74E-07	6.33E-05	-	6.33E-05	6.33E-05	-	6.36E-05												
m,p-Xylenes	2.29E-01	6.76E-02	3.13E-02	1.93E-02	5.70E-03	2.64E-03	1.34E-04	3.95E-05	1.83E-05	6.26E-03	1.85E-03	8.57E-04	6.40E-03	1.89E-03	8.75E-04												
o-Xylene	1.37E-01	4.06E-02	2.06E-02	1.24E-02	3.66E-03	1.86E-03	8.00E-05	2.37E-05	1.20E-05	4.01E-03	1.19E-03	6.03E-04	4.09E-03	1.21E-03	6.15E-04	1.908	2.363	2.14E-03	6.34E-04	3.22E-04	1.73E-03	5.12E-04	2.60E-04				
<b>Semivolatiles</b>																											
1,2,4-Trichlorobenzene	3.78E+00	1.12E+00	1.09E+00	1.04E-01	3.08E-02	3.00E-02	2.21E-03	6.52E-04	6.36E-04	3.98E-02	9.99E-03	9.75E-03	3.60E-02	1.06E-02	1.04E-02												
1,2-Dichlorobenzene	8.78E+01	1.27E+01	1.02E+01	5.67E+00	8.21E-01	6.56E-01	5.13E-02	7.41E-03	5.93E-03	1.84E+00	2.66E-01	2.13E-01	1.89E+00	2.74E-01	2.19E-01	42.9		4.41E-02	6.38E-03	5.10E-03							
1,3-Dichlorobenzene	8.74E-01	2.07E-01	3.89E-01	5.65E-02	1.34E-02	2.51E-02	5.10E-04	1.21E-04	2.27E-04	1.83E-02	4.35E-03	8.15E-03	1.88E-02	4.47E-03	8.37E-03												
1,4-Dichlorobenzene	4.01E+00	6.04E-01	8.65E-01	2.70E-01	4.06E-02	5.82E-02	2.34E-03	3.52E-04	5.05E-04	8.75E-02	1.32E-02	1.89E-02	8.98E-02	1.35E-02	1.94E-02												
2-Chloronaphthalene	6.12E+00	1.15E+00	1.08E+00	1.95E-01	3.67E-02	3.43E-02	3.57E-03	6.71E-04	6.28E-04	6.34E-02	1.19E-02	1.11E-02	6.89E-02	1.26E-02	1.18E-02												
2-Methylnaphthalene	1.24E+01	2.71E+00	2.60E+00	3.03E-01	6.62E-02	6.37E-02	7.24E-03	1.59E-03	1.52E-03	9.84E-02	2.15E-02	2.07E-02	1.06E-01	2.30E-02	2.22E-02												
Acenaphthene	5.89E+00	2.12E+00	2.28E+00	1.26E-04	3.03E-04	2.84E-04	3.44E-03	1.24E-03	1.33E-03	4.10E-05	9.84E-05	9.22E-05	3.48E-03	1.33E-03	1.43E-03												
Acenaphthylene	7.81E-01	3.61E-01	4.06E-01	3.93E-02	2.13E-02	2.34E-02	4.56E-04	2.11E-04	2.37E-04	1.27E-02	6.92E-03	7.60E-03	1.32E-02	7.13E-03	7.84E-03												
Aniline	1.14E+02	3.33E+01	1.81E+01	1.71E+01	4.99E+00	2.71E+00	6.66E-02	1.94E-02	5.55E+00	1.62E+00	8.90E-01	5.61E+00	1.64E+00	8.90E-01													
Anthracene	1.00E+01	1.94E+00	1.78E+00	3.35E-01	9.35E-02	8.72E-02	5.84E-03	1.13E-03	1.04E-03	1.09E-01	3.04E-02	2.83E-02	1.15E-01	3.15E-02	2.93E-02												
Benzofluoranthracene	6.02E+01	1.45E+01	5.51E+00	1.14E-01	4.91E-02	2.76E-02	3.51E-02	8.47E-03	3.22E-03	3.71E-02	1.59E-02	8.95E-03	7.22E-02	2.44E-02	1.22E-02												
Benzofluorene	1.15E+01	3.27E+00	1.54E+00	2.07E-01	6.06E-02	2.91E-02	6.71E-03	1.91E-03	9.00E-04	6.70E-02	1.97E-02	9.44E-03	7.37E-02	2.16E-02	1.03E-02	0.91	9.09	8.10E-02	2.37E-02	1.14E-02			4.32E-04	1.46E-04	7.29E-05		
Benzofluoranthene	1.15E+01	3.67E+00	1.89E+00	5.38E-01	1.71E-01	8.80E-02	6.71E-03	2.14E-03	1.10E-03	1.73E-01	5.53E-02	2.85E-02	1.80E-01	5.74E-02	2.96E-02	100											
Benzofluorene	3.79E+00	1.41E+00	7.76E-01	2.86E-01	8.85E-02	4.38E-02	2.21E-03	6.21E-04	4.53E-04	9.27E-02	2.87E-02	1.42E-02	9.49E-02	2.95E-02	1.47E-02												
Benzofluoranthene	4.38E+00	1.35E+00	6.66E-01	6.17E-02	2.24E-02	1.22E-02	2.56E-03	7.87E-04	3.89E-04	2.00E-02	7.27E-03	3.97E-03	2.28E-02	8.05E-03	4.36E-03												
Bis(2-ethylhexyl) Phthalate	1.72E+00	4.14E-01	5.35E-01	8.90E-03	2.36E-03	3.05E-03	1.00E-03	2.42E-04	3.12E-04	3.18E-03	7.65E-04	9.99E-04	4.18E-03	1.01E-03	1.30E-03												
Carbazole	2.43E+00	5.95E-01	5.92E-01	-	-	-	1.42E-03	3.47E-04	3.46E-04																		
Chrysene	9.27E+00	2.94E+00	1.49E+00	3.78E-02	1.90E-02	1.27E-02	5.41E-03	1.72E-03	8.71E-04	1.22E-02	6.16E-03	4.12E-03	1.76E-02	7.88E-03	4.99E-03												
Dibenzofluoranthracene	1.73E+00	3.42E-01	2.99E-01	3.37E-02	6.66E-03	5.83E-03	1.01E-03	1.99E-04	1.74E-04	1.09E-02	2.16E-03	1.89E-03	1.20E-02	2.36E-03	2.06E-03												
Dibenzofuran	2.83E+00	9.47E-01	1.04E+00	6.39E-02	2.14E-02	2.35E-02	1.65E-03	5.53E-04	6.09E-04	2.07E-02	6.93E-03	7.64E-03	2.24E-02	7.49E-03	8.25E-03	18.5											
Fluoranthene	2.27E+01	6.72E+00	3.24E+00	1.70E+00	5.04E-01	2.43E-01	1.33E-02	3.92E-03	1.89E-03	5.62E-01	1.63E-01	7.88E-02	5.65E-01	1.67E-01	8.06E-02												
Fluorene	2.90E+00	8.29E-01	8.81E-01	2.32E-04	6.77E-04	6.42E-04	1.69E-03	4.84E-04	5.14E-04	7.51E-05	2.19E-04	2.08E-04	1.77E-03	7.03E-04	7.23E-04												
Hexachlorobenzene	1.85E-01	6.94E-02	9.77E-02	7.03E-04	2.65E-04	3.74E-04	1.08E-04	4.05E-05	5.70E-05	2.30E-04	8.63E-05	1.21E-04	3.30E-04	1.27E-04	1.78E-04	1600											
Indeno(1,2,3-cd)pyrene	3.44E+00	1.20E+00	6.72E-01	6.05E-02	6.72E-02	2.11E-02	2.01E-03	7.00E-04	3.92E-04	1.96E-02	6.84E-03	3.83E-03	2.16E-02	7.54E-03	4.23E-03												
Naphthalene	1.45E+02	4.30E+01	2.06E+01	2.83E+02	8.39E+01	4.02E+01	8.46E-02	2.51E-02	1.20E-02	9.18E+01	2.72E+01	1.30E+01	9.19E+01	2.72E+01	1.30E+01												
Nitrobenzene	1.20E+02	1.51E+01	1.12E+01	6.08E+01	7.65E+00	5.68E+00	7.01E-02	8.81E-03	6.54E-03	1.07E+01	2.48E+00	1.84E+00	1.98E+01	2.49E+00	1.85E+00												
n-Nitrosodiphenylamine	3.67E+01	8.23E+00	7.43E+00	-	-	-	2.14E-02	4.81E-03	4.34E-03																		
Phenanthrene	2.81E+01	5.21E+00	4.23E+00	1.01E+00	3.53E-01	3.11E-01	1.64E-02	3.04E-03	2.47E-03	3.26E-01	1.15E-01	1.01E-01	3.43E-01	1.16E-01	1.03E-01												
Pyrene	1.95E+01	3.92E+00	2.91E+00	2.25E+00	1.35E-01	1.35E-01	1.14E-02	3.45E-03	1.70E-03	7.29E-01	2.21E-01	1.09E-01	7.40E-01	2.25E-01	1.11E-01												
Pyridine	1.99E+00	1.99E+00	1.14E+00	4.87E+00	4.87E+00	2.79E+00	1.16E-03	1.16E-03	6.66E-04	1.58E+00	1.58E+00	1.58E+00	1.58E+00	9.05E-01													
Total High Weight Molecular PAHs	1.48E+02	4.09E+01	1.89E+01	5.28E+00	1.62E+00	8.09E-01	8.64E-02	2.39E-02	1.10E-02	1.71E+00	5.27E-01	2.62E-01	1.80E+00	5.50E-01	2.74E-01	0.615	3.07	2.93E+00	8.95E-01	4.45E-01	5.86E-01	1.79E-01	8.91E-02				
Total Low Weight Molecular PAHs	1.92E+02	9.83E+00	2.74E+01	2.84E+02	8.43E+01	4.06E+01	1.12E-01	5.74E-03	1.60E-02	9.22E+01	2.74E+01	1.32E+01	9.24E+01	2.74E+01	1.32E+01	65.6	110	1.41E+00	4.17E-01	2.01E-01	8.40E-01	2.49E-01	1.20E-01				
<b>Inorganics</b>																											
Aluminum	2.09E+04	1.37E+04	1.24E+04	3.61E+02	2.37E+02	2.14E+02	1.22E+01	8.00E+00	7.25E+00	1.17E+02	7.67E+01	8.89E+01	1.29E+02	8.47E+01	7.68E+01												
Antimony	1.00E+01	4.45E+00	4.29E+00	1.30E+00	6.08E-01	5.88E-01	5.84E-03	2.60E-03	2.50E-03	4.22E-01	1.97E-01	1.91E-01	4.28E-01	2.00E-01	1.93E-01	0.059	0.59	7.25E+00	3.39E+00	3.27E+00	7.25E-01	3.39E-01	3.27E-01				
Arsenic	4.01E+01	2.03E+01	1.26E+01	2.26E-01																							

Table 5B  
Hazard Quotient Estimation for Meadow Vole - Impoundment 17  
PDI Module 4 - Ecological Risk Assessment  
American Cyanamid Superfund Site, Bridgewater, NJ

Parameter	Symbol	Value	Units
Body Weight	BW	0.037	kg
Dry Weight Food Ingestion Rate	IR <sub>dw</sub>	0.0018	kg/day
Wet Weight Food Ingestion Rate	IR <sub>ww</sub>	0.012	kg/day
Fraction of Diet Comprised of Plants	P <sub>f</sub>	1	unitless
Fraction soil ingestion	P <sub>s</sub>	0.012	unitless
Plant Concentration	C <sub>p</sub>	Chemical-specific	mg/kg
Soil Concentration (C <sub>s</sub> )	C <sub>s</sub>	Chemical-specific	mg/kg
Toxicity Reference Value	TRV	Chemical-specific	mg/kg/day
Area Use Factor	AUF	1	unitless

	C <sub>s</sub> max	C <sub>s</sub> 95%	C <sub>s</sub> mean	C <sub>f</sub> pmax	C <sub>f</sub> p95%	C <sub>f</sub> pmean	Max Dose: Soil Exposure	95% Dose: Soil Exposure	Mean Dose: Soil Exposure	Max Dose: Plant Exposure	95% Dose: Plant Exposure	Mean Dose: Plant Exposure	Max Total Dose	95% Total Dose	Mean Total Dose	TRV mg/kg/day	NOAEL HQs			LOAEL HQs																	
																	mg/kg DW	mg/kg DW	mg/kg DW	mg/kg WWW	mg/kg WWW	mg/kg WWW	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day
																	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL
<b>Volatiles</b>																																					
Acetone	9.78E+00	7.78E-01	1.48E+00	7.82E+01	6.22E+00	1.19E+01	5.71E-03	4.54E-04	8.66E-04	2.54E+01	2.02E+00	3.85E+00	2.54E+01	2.02E+00	3.85E+00		10	50	2.54E+00	2.02E-01	3.85E-01	5.07E-01	4.03E-02	7.70E-02													
<b>Semivolatiles</b>																																					
1,2,4-Trichlorobenzene	1.00E+00	4.31E-01	4.17E-01	2.76E-02	1.19E-02	1.15E-02	5.84E-04	2.52E-04	2.44E-04	8.94E-03	3.86E-03	3.73E-03	9.53E-03	4.11E-03	3.98E-03																						
2-Chloronaphthalene	1.63E-01	7.80E-02	9.98E-02	5.20E-03	2.49E-03	3.19E-03	9.52E-05	4.55E-05	5.83E-05	1.69E-03	8.08E-04	1.03E-03	1.78E-03	8.53E-04	1.09E-03																						
2-Methylnaphthalene	ND	ND	ND	-	-	-	-	-	-	-	-	-	-	-	-																						
3,3'-Dichlorobenzidine	9.89E+00	3.85E+00	5.45E+00	1.26E+00	4.91E-01	6.95E-01	5.77E-03	2.25E-03	3.18E-03	4.09E-01	1.59E-01	2.25E-01	4.15E-01	1.62E-01	2.28E-01	3.52			1.18E-01	4.59E-02	6.49E-02																
Acenaphthylene	5.23E-02	NA	5.23E-02	4.63E-03	-	4.63E-03	3.05E-05	-	3.05E-05	1.50E-03	-	1.50E-03	1.53E-03	-	1.53E-03																						
Aniline	3.47E+01	1.42E+01	1.30E+01	5.21E+00	2.13E+00	1.95E+00	2.03E-02	8.29E-03	7.57E-03	1.69E+00	6.91E-01	6.31E-01	1.71E+00	6.99E-01	6.39E-01																						
Anthracene	1.84E-01	6.97E-02	8.77E-02	1.49E-02	7.02E-03	8.39E-03	1.07E-04	4.07E-05	5.12E-05	4.85E-03	2.29E-03	2.72E-03	4.95E-03	2.32E-03	2.77E-03																						
Benz[a]anthracene	4.42E+03	1.68E+03	2.24E+03	2.42E-02	1.36E-02	1.96E-02	2.56E-03	9.83E-04	1.66E-03	7.85E-03	4.42E-03	6.04E-03	1.04E-02	5.40E-03	7.70E-03							6.24E-05	3.24E-05	4.61E-05													
Benzofluoranthene	1.96E-01	1.98E-01	1.54E-01	3.90E-03	2.76E-03	3.09E-03	1.14E-04	8.04E-05	9.01E-05	1.26E-03	8.96E-04	1.00E-03	1.38E-03	9.76E-04	1.09E-03	0.91	167	9.09	1.51E-03	1.07E-03	1.20E-03	1.52E-04	1.07E-04	1.20E-04													
Benzofluoranthene	7.57E-01	3.43E-01	4.79E-01	3.52E-02	1.60E-02	2.23E-02	4.42E-04	2.00E-04	2.79E-04	1.14E-02	5.17E-03	7.22E-03	1.19E-02	5.37E-03	7.50E-03	100					1.19E-04	5.37E-05	7.50E-05														
Benzofluoranthene	1.45E-01	8.14E-02	9.84E-02	6.02E-03	3.04E-03	3.81E-03	8.46E-05	4.75E-05	5.74E-05	1.95E-03	9.86E-04	1.23E-03	2.04E-03	1.03E-03	1.29E-03																						
Benzofluoranthene	1.64E-01	9.66E-02	1.18E-01	3.67E-03	2.33E-03	2.76E-03	9.57E-05	5.64E-05	6.89E-05	1.19E-03	7.54E-04	8.96E-04	1.28E-03	8.11E-04	9.65E-04																						
Chrysene	5.93E-01	NA	5.93E-01	7.33E-03	-	7.33E-03	3.46E-04	-	3.46E-04	2.38E-03	-	2.38E-03	2.72E-03	-	2.72E-03																						
Dibenz[a,h]anthracene	5.03E-02	NA	5.03E-02	9.81E-04	-	9.81E-04	2.94E-05	-	2.94E-05	3.18E-04	-	3.18E-04	3.47E-04	-	3.47E-04	2					1.74E-04			1.74E-04													
Fluoranthene	2.03E-01	1.15E-01	1.25E-01	1.52E-02	8.06E-03	9.40E-03	1.19E-04	6.69E-05	7.31E-05	4.94E-03	2.79E-03	3.95E-03	5.06E-03	2.85E-03	3.12E-03																						
Hexachlorobenzene	1.34E+00	7.09E-01	7.84E-01	5.13E-03	2.71E-03	3.00E-03	7.82E-04	4.14E-04	4.58E-04	1.66E-03	8.79E-04	9.73E-04	2.44E-03	1.29E-03	1.43E-03			1600	1.53E-06	8.08E-07	8.94E-07																
Indeno[1,2,3-cd]pyrene	1.29E-01	8.60E-02	9.50E-02	2.27E-03	1.51E-03	1.67E-03	7.53E-05	5.02E-05	5.54E-05	7.36E-04	4.91E-04	5.42E-04	8.12E-04	5.41E-04	5.97E-04																						
Naphthalene	1.29E+00	7.37E-01	7.87E-01	2.52E+00	1.44E+00	1.54E+00	7.53E-04	4.30E-04	4.59E-04	8.17E-01	4.67E-01	4.98E-01	8.17E-01	4.67E-01	4.98E-01																						
n-Nitrosodiphenylamine	5.64E+00	3.13E+00	3.40E+00	-	-	-	3.29E-03	1.83E-03	1.99E-03	-	-	-	-	-	-																						
Phenanthrene	1.23E-01	9.93E-02	1.05E-01	3.46E-02	3.03E-02	3.13E-02	7.18E-05	5.80E-05	6.11E-05	1.12E-02	9.83E-03	1.02E-02	1.13E-02	9.89E-03	1.02E-02																						
Pyrene	2.77E-01	1.32E-01	1.47E-01	3.19E-02	1.52E-02	1.70E-02	1.62E-04	7.71E-05	8.61E-05	1.03E-02	4.93E-03	5.51E-03	1.05E-02	5.01E-03	5.59E-03																						
Pyridine	ND	ND	ND	-	-	-	-	-	-	-	-	-	-	-	-																						
Total High Weight Molecular PAHs	5.62E+00	1.36E+00	1.96E+00	1.31E-01	6.30E-02	6.89E-02	3.28E-03	7.96E-04	1.14E-03	4.24E-02	2.04E-02	2.82E-02	4.57E-02	2.12E-02	2.93E-02	0.615	3.07	7.43E-02	3.45E-02	4.77E-02	1.49E-02	6.92E-03	9.55E-03														
Total Low Weight Molecular PAHs	1.53E+00	1.43E-01	8.29E-01	2.57E+00	1.48E+00	1.58E+00	7.75E-04	8.35E-05	4.84E-04	8.34E-01	4.79E-01	5.12E-01	8.35E-01	4.79E-01	5.13E-01	65.6	110	1.27E-02	7.30E-03	7.82E-03	7.59E-03	4.35E-03	4.66E-03														
<b>Inorganics</b>																																					
Aluminum	1.47E+05	1.08E+05	1.01E+05	8.27E+02	6.06E+02	5.68E+02	8.58E+01	6.28E+01	5.89E+01	2.68E+02	1.96E+02	1.84E+02	3.54E+02	2.59E+02	2.43E+02																						
Antimony	2.50E+01	1.79E+01	1.68E+01	3.07E+00	2.24E+00	2.12E+00	1.46E-02	1.04E-02	9.83E-03	9.96E-01	7.27E-01	6.87E-01	1.01E+00	7.37E-01	6.97E-01	0.059	0.59			1.71E+01	1.25E+01	1.18E+01	1.71E+00	1.25E+00	1.18E+00												
Arsenic	1.09E+02	7.42E+01	6.88E+01	6.13E-01	4.17E-01	3.87E-01	6.36E-02	4.33E-02	4.02E-02	1.99E-01	1.35E-01	1.26E-01	2.63E-01	1.79E-01	1.66E-01	1.04	1.66			2.52E-01	1.72E-01	1.59E-01	1.58E-01	1.08E-01	9.99E-02												
Barium	9.18E+03	5.58E+03	4.92E+03	2.15E+02	1.31E+02	1.15E+02	5.36E+00	3.26E+00	2.87E+00	6.87E+01	4.23E+01	3.74E+01	7.50E+01	4.56E+01	4.02E+01	51.8	103.6			1.45E+00	8.80E-01	7.77E-01	7.24E-01	4.40E-01	3.88E-01												
Cadmium	4.50E+00	3.98E+00	3.54E+00	2.12E-01	1.19E-01	1.16E-01	2.63E-03	2.33E-03	2.06E-03	6.88E-02	6.44E-02	6.03E-02	7.14E-02	6.67E-02	6.24E-02	1.62	16.199			4.41E-02	4.12E-02	3.85E-02	4.41E-03	4.12E-03	3.85E-03												
Chromium	2.87E+03	2.35E+03	2.20E+03	1.77E+01	1.44E+01	1.35E+01	1.88E+00	1.37E+00	1.29E+00	5.72E+00	4.68E+00	4.39E+00	7.40E+00	6.05E+00	5.68E+00	2.4	9.62			3.08E+00	2.52E+00	2.36E+00	7.69E-01	6.29E-01	5.90E-01												
Cobalt	1.66E+01	1.35E+01	1.21E+01	1.87E-02	1.52E-02	1.36E-02	9.89E-03	7.85E-03	7.06E-03	6.89E-03	4.93E-03	4.41E-03	1.57E-02	1.28E-02	1.15E-02	7.61	15.22			2.07E-03	1.68E-03	1.51E-03	1.03E-03	8.41E-04	7.54E-04												
Copper	3.94E+03	3.00E+03	2.83E+03	7.64E+00	6.86E+00	6.70E+00	2.30E+00	1.75E+00	1.65E+00	2.48E+00	2.23E+00	2.17E+00	4.78E+00	3.98E+00	3.82E+00	5.6	9.34			8.53E-01	7.11E-01	6.83E-01	5.11E-01	4.26E-01	4.09E-01												
Cyanide	3.90E+00	1.10E+00	1.73E+00	6.73E-02	1.89E-02	2.99E-02	2.28E-03	6.40E-04	1.01E-03	2.18E-02	6.14E-03	9.70E-03	2.41E-02	6.78E-03	1.07E-02	108.4			2.22E-04	6.25E-05	9.88E-05																
Hexavalent Chromium	1.41E+02	5.23E+01	4.05E+01	2.43E+00	9.01E-01	6.99E-01	8.23E-02	3.05E-02	2.36E-02	7.89E-01	2.92E-01	2.27E-01	8.71E-01	3.23E-01	2.50E-01	3.5			2.49E-01	9.23E-02	7.15E-02																
Iron	1.02E+05	6.82E+04	6.36E+04	1.76E+03	1.18E+03	1.10E+03	5.95E+01	3.98E+01	3.71E+01	5.71E+02	3.81E+02	3.56E+02	6.30E+02	4.21E+02	3.93E+02																						
Lead	3.39E+03	2.54E+03	2.39E+03	3.80E+00	3.23E+00	3.12E+00	1.98E+00	1.48E+00	1.39E+00	1.23E+00	1.05E+00	1.01E+00	3.21E+00	2.53E+00	2.41E+00	4.7	5			6.83E-01	5.39E-01	5.12E-01	6.42E-01	5.07E-01	4.81E-01												
Manganese	1.72E+03	1.25E+03	1.19E+03	2.04E+01	1.49E+01	1.41E+01	1.03E+00	7.28E-01	6.95E-01	6.81E+00	4.79E+00	4.58E+00	7.81E+00	5.52E+00	5.27E+00																						
Mercury	2.58E+02	1.42E+02	1.30E+02	8.71E+00	4.78E+00	4.38E+00	1.51E-01	8.26E-02	7.58E-02	2.82E+00	1.55E+00	1.42E+00	2.97E+00	1.63E+00	1.50E+00	11.99	119.9			2.48E-01	1.36E-01	1.25E-01	2.48E-02	1.36E-02	1.25E-02												
Nickel	1.65E+02	1.04E+02	9.83E+01	7.40E-01	5.24E-01	5.03E-01	9.63E-02	6.07E-02	5.74E-02	2.40E-01	1.70E-01	1.63E-01	3.36E-01	2.31E-01	2.20E-01	1.7	2.71			1.98E-01	1.36E-01	1.30E-01	1.24E-01	8.51E-02	8.13E-02												
Vanadium	9.85E+01	7.14E+01	6.78E+01	7.17E-02	4.94E-02	4.94E-02	5.75E-02	4.17E-02	3.96E-02	2.32E-02	1.69E-02	1.60E-02	8.85E-02	5.56E-02	5.56E-02	4.16	8.31			1.94E-02	1.41E-02	1.34E-02	9.72E-03	7.05E-03	6.69E-03												
Zinc	4.20E+03	3.03E+03	2.85E+03	7.37E+01	6.14E+01	5.94E+01	2.45E+00	1.77E+00	1.66E+00	2.39E+01	1.99E+01																										

Table 5C  
Hazard Quotient Estimation for Meadow Vole - Impoundment 24  
PDI Module 4 - Ecological Risk Assessment  
American Cyanamid Superfund Site, Bridgewater, NJ

Parameter	Symbol	Value	Units
Body Weight	BW	0.037	kg
Dry Weight Food Ingestion Rate	IR <sub>dw</sub>	0.0018	kg/day
Wet Weight Food Ingestion Rate	IR <sub>ww</sub>	0.012	kg/day
Fraction of Diet Comprised of Plants	P <sub>f</sub>	1	unitless
Fraction soil ingestion	P <sub>s</sub>	0.012	unitless
Plant Concentration	C <sub>p</sub>	Chemical-specific	mg/kg
Soil Concentration (C <sub>s</sub> )	C <sub>s</sub>	Chemical-specific	mg/kg
Toxicity Reference Value	TRV	Chemical-specific	mg/kg/day
Area Use Factor	AUF	1	unitless

Chemical	NOAEL HQs																LOAEL HQs							
	C <sub>max</sub>	C <sub>95%</sub>	C <sub>mean</sub>	C <sub>max</sub>	C <sub>95%</sub>	C <sub>mean</sub>	Max Dose: Soil Exposure	95% Dose: Soil Exposure	Mean Dose: Soil Exposure	Max Dose: Plant Exposure	95% Dose: Plant Exposure	Mean Dose: Plant Exposure	Max Total Dose	95% Total Dose	Mean Total Dose	TRV mg/kg/day	Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient	Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient		
	mg/kg DW	mg/kg DW	mg/kg DW	mg/kg WW	mg/kg WW	mg/kg WW	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	NOAEL	LOAEL	unitless	unitless	unitless	unitless	unitless	unitless	
<b>Volatiles</b>																								
Acetone	5.17E-01	1.28E-01	1.60E-01	4.13E+00	1.02E+00	1.28E+00	3.02E-04	7.44E-05	9.32E-05	1.34E+00	3.31E-01	4.14E-01	1.34E+00	3.31E-01	4.14E-01	10	50	1.34E-01	3.31E-02	4.14E-02	2.68E-02	6.61E-03	8.28E-03	
1,3,5-Trimethylbenzene	3.27E-02	5.36E-03	8.00E-03	2.03E-03	3.33E-04	4.97E-04	1.91E-05	3.13E-06	4.67E-06	6.59E-04	1.08E-04	1.61E-04	6.78E-04	1.11E-04	1.66E-04	14.3	42.9	4.74E-05	7.77E-06	1.16E-05	1.58E-05	2.59E-06	3.86E-06	
cis-1,2-Dichloroethene	1.10E-03	NA	1.10E-03	4.57E-04	-	4.57E-04	6.42E-07	-	6.42E-07	1.48E-04	-	1.48E-04	1.49E-04	-	1.49E-04									
m,p-Xylenes	4.80E-02	8.44E-03	1.34E-02	4.05E-03	7.12E-04	1.13E-03	2.80E-05	4.93E-06	7.83E-06	1.31E-03	2.31E-04	3.67E-04	1.34E-03	2.36E-04	3.75E-04									
Methanol	1.36E+01	3.29E+00	3.84E+00	1.90E+02	4.60E+01	5.37E+01	7.94E-03	1.92E-03	2.24E-03	6.17E+01	1.49E+01	1.74E+01	6.17E+01	1.49E+01	1.74E+01	84	419.8	7.34E-01	1.78E-01	2.07E-01	1.47E-01	3.56E-02	4.15E-02	
o-Xylene	1.88E-02	3.45E-03	5.41E-03	1.69E-03	3.11E-04	4.88E-04	1.10E-05	2.01E-06	3.16E-06	5.50E-04	1.01E-04	1.58E-04	5.81E-04	1.03E-04	1.61E-04	1.908	2.363	2.94E-04	5.38E-05	8.46E-05	2.37E-04	4.35E-05	6.83E-05	
<b>Semivolatiles</b>																								
1,2,4-Trichlorobenzene	1.99E-01	5.06E-02	7.43E-02	5.49E-03	1.39E-03	2.05E-03	1.16E-04	2.95E-05	4.34E-05	1.78E-03	4.52E-04	6.65E-04	1.90E-03	4.82E-04	7.08E-04									
1,2-Dichlorobenzene	1.00E+00	2.42E-01	2.20E-01	6.46E-02	1.56E-02	1.42E-02	5.84E-04	1.41E-04	1.28E-04	2.10E-02	5.07E-03	4.61E-03	2.15E-02	5.21E-03	4.74E-03	42.9		5.02E-04	1.21E-04	1.10E-04				
1,2-Diphenylhydrazine	1.12E+01	5.78E+00	1.23E+00	1.34E+00	6.88E-01	1.46E-01	6.54E-03	3.37E-03	7.15E-04	4.33E-01	2.23E-01	4.74E-02	4.40E-01	2.27E-01	4.81E-02									
1,4-Dichlorobenzene	6.79E-02	4.58E-02	3.44E-02	4.57E-03	3.08E-03	2.31E-03	3.96E-05	2.67E-05	2.01E-05	1.48E-03	9.99E-04	7.50E-04	1.52E-03	1.03E-03	7.71E-04									
2-Chloronaphthalene	1.28E+00	2.95E-01	3.35E-01	4.09E-02	9.25E-03	1.07E-02	7.47E-04	1.69E-04	1.96E-04	1.33E-02	3.00E-03	3.47E-03	1.40E-02	3.17E-03	3.67E-03									
Acenaphthene	7.55E-01	1.84E-01	1.53E-01	7.33E-04	2.45E-03	2.98E-03	4.41E-04	1.08E-04	8.91E-05	2.38E-04	9.94E-04	9.33E-04	6.78E-04	9.02E-04	1.02E-03									
Acenaphthylene	1.74E-01	5.08E-02	7.26E-02	1.20E-02	4.52E-03	6.00E-03	1.02E-04	2.97E-05	4.24E-05	3.89E-03	1.47E-03	1.95E-03	3.99E-03	1.50E-03	1.99E-03									
Aniline	4.24E+01	1.24E+01	4.36E+00	6.36E+00	1.87E+00	6.54E-01	2.48E-02	7.27E-03	2.54E-03	2.06E+00	6.05E-01	2.12E-01	2.09E+00	6.13E-01	2.15E-01									
Anthracene	1.24E+00	4.58E-01	1.57E-01	6.60E-02	3.04E-02	1.32E-02	7.24E-04	2.68E-04	9.17E-05	2.14E-02	9.86E-03	4.29E-03	2.21E-02	1.01E-02	4.38E-03									
Benidine	1.22E+00	3.36E-01	4.92E-01	2.01E+00	5.54E-01	8.12E-01	7.12E-04	1.96E-04	2.87E-04	6.53E-01	1.80E-01	2.63E-01	6.54E-01	1.80E-01	2.64E-01	0.39		1.68E+00	4.61E-01	6.76E-01				
Benzofluoranthene	1.98E+00	6.44E-01	1.97E-01	1.36E-02	7.70E-03	3.81E-03	9.81E-04	3.76E-04	1.15E-04	4.42E-03	2.50E-03	1.23E-03	5.40E-03	2.87E-03	1.35E-03		167				3.23E-05	1.72E-05	8.08E-06	
Benzofluorene	7.75E-01	2.43E-01	1.48E-01	1.49E-02	6.72E-03	2.96E-03	4.52E-04	2.00E-04	8.63E-05	4.83E-03	2.18E-03	9.60E-04	5.28E-03	2.38E-03	1.05E-03	0.91	9.09	5.80E-03	2.62E-03	1.15E-03	5.81E-04	2.62E-04	1.15E-04	
Benzofluoranthene	1.28E+00	5.24E-01	1.92E-01	5.95E-02	2.44E-02	8.94E-03	7.47E-04	3.06E-04	1.12E-04	1.93E-02	7.90E-03	2.90E-03	2.01E-02	8.21E-03	3.01E-03		100				2.01E-04	8.21E-05	3.01E-05	
Benzofluorene	4.81E-01	1.07E-01	1.07E-01	2.49E-02	4.19E-03	1.42E-03	2.81E-04	6.22E-05	6.27E-05	8.07E-03	1.37E-03	8.95E-03	1.42E-03	1.43E-03										
Benzofluoranthene	3.70E-01	8.28E-02	1.10E-01	7.38E-03	2.04E-03	2.60E-03	2.16E-04	4.83E-05	6.43E-05	2.39E-03	6.60E-04	8.44E-04	2.61E-03	7.09E-04	9.08E-04									
Carbazole	3.27E-01	8.31E-02	9.43E-02	-	-	-	1.91E-04	4.85E-05	5.51E-05	-	-	-	-	-	50									
Chrysene	8.56E-01	2.04E-01	1.64E-01	9.12E-03	3.89E-03	3.42E-03	5.00E-04	1.19E-04	9.80E-05	2.96E-03	1.26E-03	1.11E-03	3.46E-03	1.38E-03	1.21E-03									
Dibenzofluoranthene	4.21E+00	1.51E+00	5.17E-01	9.51E-02	3.41E-02	1.17E-02	2.46E-03	8.83E-04	3.02E-04	3.08E-02	1.11E-02	3.78E-03	3.33E-02	1.20E-02	4.09E-03	18.5		1.80E-03	6.46E-04	2.21E-04				
Fluoranthene	2.98E+00	1.21E+00	3.41E-01	2.24E-01	9.07E-02	2.56E-02	1.74E-03	7.08E-04	1.99E-04	7.25E-02	2.94E-02	8.93E-03	7.42E-02	3.01E-02	8.49E-03									
Fluorene	8.16E-01	1.48E-01	1.68E-01	8.66E-04	2.95E-03	2.79E-03	4.76E-04	8.65E-05	9.23E-05	2.22E-04	9.57E-04	9.06E-04	6.99E-04	1.04E-03	9.98E-04									
Indeno[1,2,3-cd]pyrene	4.67E-01	9.51E-02	1.30E-01	6.67E-03	1.67E-03	2.29E-03	2.73E-04	5.55E-05	7.80E-05	2.67E-03	5.43E-04	7.43E-04	2.94E-03	5.98E-04	8.19E-04									
m,p-Cresol	3.01E-01	NA	3.01E-01	-	-	-	1.29E-01	1.76E-04	-	4.18E-02	-	4.18E-02	4.20E-02	-	4.20E-02									
Naphthalene	5.39E+00	1.90E+00	8.55E-01	1.05E+01	3.70E+00	1.67E+00	3.15E-03	1.11E-03	4.99E-04	3.41E+00	1.20E+00	5.41E-01	3.42E+00	1.20E+00	5.42E-01									
Nitrobenzene	1.33E+01	9.33E+00	2.58E+00	6.74E+00	4.74E+00	1.31E+00	7.76E-03	5.46E-03	1.51E-03	2.19E+00	1.54E+00	4.24E-01	2.19E+00	1.54E+00	4.26E-01									
n-Nitrosodiphenylamine	1.97E+01	1.09E+01	1.88E+00	-	-	-	1.15E-02	8.37E-03	1.10E-03	-	-	-	-	-	-									
Phenanthrene	5.06E+00	1.94E+00	5.81E-01	3.47E-01	1.91E-01	9.06E-02	2.95E-03	1.13E-03	3.39E-04	1.13E-01	6.21E-02	2.94E-02	1.16E-01	6.32E-02	2.97E-02									
Pyrene	1.46E+00	6.77E-01	2.29E-01	1.68E-01	7.80E-02	2.63E-02	8.52E-04	3.95E-04	5.45E-02	2.53E-02	8.54E-03	5.54E-02	2.57E-02	8.68E-03										
Total High Weight Molecular PAHs	1.04E+01	4.30E+00	1.22E+00	5.29E-01	2.19E-01	8.02E-02	6.04E-03	2.51E-03	7.10E-04	1.72E-01	7.11E-02	2.60E-02	1.78E-01	7.36E-02	2.67E-02	0.615	3.07	2.89E-01	1.20E-01	4.34E-02	5.79E-02	2.40E-02	8.70E-03	
Total Low Weight Molecular PAHs	1.09E+01	3.06E+00	1.71E+00	1.09E+01	3.93E+00	1.78E+00	6.34E-03	1.79E-03	9.97E-04	3.55E+00	1.28E+00	5.79E-01	3.56E+00	1.28E+00	5.80E-01	65.6	110	5.42E-02	1.95E-02	8.84E-03	3.23E-02	1.16E-02	5.27E-03	
<b>Inorganics</b>																								
Aluminum	4.28E+04	1.55E+04	1.20E+04	2.41E+02	8.70E+01	6.74E+01	2.50E+01	9.02E+00	7.00E+00	7.81E+01	2.82E+01	2.19E+01	1.03E+02	3.72E+01	2.89E+01									
Antimony	1.70E+00	1.01E+00	9.35E-01	2.47E-01	1.51E-01	1.41E-01	9.92E-04	5.87E-04	5.46E-04	8.00E-02	4.89E-02	4.57E-02	8.10E-02	4.95E-02	4.62E-02	0.059	0.59	1.37E+00	8.38E-01	7.84E-01	1.37E-01	8.38E-02	7.84E-02	
Barium	3.53E+02	1.40E+02	1.15E+02	8.26E+00	3.27E+00	2.69E+00	2.06E-01	8.16E-02	6.71E-02	2.69E+00	1.06E+00	8.72E-01	2.89E+00	1.14E+00	9.39E-01	5.8	103.6	5.57E-02	2.21E-02	1.81E-02	2.79E-02	1.10E-02	9.06E-03	
Chromium	3.93E+02	1.17E+02	4.32E+01	2.42E+00	1.71E-01	2.65E-01	2.29E-01	6.61E-02	2.52E-02	7.84E-01	2.33E-01	8.61E-02	1.01E+00	3.01E-01	1.11E-01	2.4	9.62	4.22E-01	1.25E-01	4.64E-02	1.05E-01	3.13E-02	1.16E-02	
Cobalt	3.45E+01	1.12E+01	9.51E+00	3.89E																				

Table 6A  
Hazard Quotient Estimation for Red Fox - Impoundment 13  
PDI Module 4 - Ecological Risk Assessment  
American Cyanamid Superfund Site, Bridgewater, NJ

<b>Parameter</b>	<b>Symbol</b>	<b>Value</b>	<b>Units</b>
Body Weight	BW	4.54	kg
Dry Weight Food Ingestion Rate	IR <sub>dw</sub>	0.1	kg/day
Wet Weight Food Ingestion Rate	IR <sub>ww</sub>	0.313	kg/day
Fraction of Diet Comprised of Small Mammals	P <sub>f</sub>	1	unitless
Fraction soil ingestion	P <sub>s</sub>	0.013	unitless
Small Mammal Concentration	C <sub>sm</sub>	Chemical-specific	mg/kg
Soil Concentration (C <sub>s</sub> )	C <sub>s</sub>	Chemical-specific	mg/kg
Toxicity Reference Value	TRV	Chemical-specific	mg/kg/day
Area Use Factor	AUF	1	unitless

																NOAEL HQs			LOAEL HQs						
	C <sub>s</sub> max	C <sub>s</sub> 95%	C <sub>s</sub> mean	C <sub>sm</sub> max	C <sub>sm</sub> 95%	C <sub>sm</sub> mean	Max Dose: Soil Exposure	95% Dose: Soil Exposure	Mean Dose: Soil Exposure	Max Dose: Small Mammal Exposure	95% Dose: Small Mammal Exposure	Mean Dose: Small Mammal Exposure	Max Total Dose	95% Total Dose	Mean Total Dose	TRV mg/kg/day	Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient	Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient			
	mg/kg DW	mg/kg DW	mg/kg DW	mg/kg WW	mg/kg WW	mg/kg WW	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	LOAEL	NOAEL	unitless	unitless	unitless	unitless	unitless	unitless	
<b>Volatiles</b>																									
Acetone	5.13E-01	8.40E-02	1.75E-01	7.11E-10	1.16E-10	2.43E-10	1.47E-04	2.40E-05	5.01E-05	4.90E-11	8.03E-12	1.67E-11	1.47E-04	2.40E-05	5.01E-05	10	50		1.47E-05	2.40E-06	5.01E-06	2.94E-06	4.81E-07	1.00E-06	
cis-1,2-Dichloroethene	4.70E-04	ND	4.70E-04	5.66E-12			1.35E-07		1.35E-07	3.90E-13		3.90E-13	1.35E-07		1.35E-07										
m,p-Xylenes	2.29E-01	6.76E-02	3.13E-02	8.87E-09	2.62E-09	1.21E-09	6.56E-05	1.94E-05	8.97E-06	6.12E-10	1.81E-10	8.37E-11	6.56E-05	1.94E-05	8.97E-06										
o-Xylene	1.37E-01	4.06E-02	2.06E-02	5.05E-09	1.50E-09		3.92E-05	1.16E-05	5.91E-06	3.48E-10	1.03E-10	5.25E-11	3.92E-05	1.16E-05	5.91E-06	0.6	0.743		6.54E-05	1.94E-05	9.84E-06	5.28E-05	1.56E-05	7.95E-06	
<b>Semivolatiles</b>																									
1,2,4-Trichlorobenzene	3.75E+00	1.12E+00	1.09E+00	3.36E-07	9.93E-08	9.68E-08	1.08E-03	3.20E-04	3.12E-04	2.32E-08	6.84E-09	6.68E-09	1.08E-03	3.20E-04	3.12E-04										
1,2-Dichlorobenzene	8.78E+01	1.27E+01	1.02E+01	4.14E-06	5.99E-07	4.79E-07	2.51E-02	3.64E-03	2.91E-03	2.85E-07	4.13E-08	3.30E-08	2.51E-02	3.64E-03	2.91E-03	42.9			5.86E-04	8.47E-05	6.78E-05				
1,3-Dichlorobenzene	8.74E-01	2.07E-01	3.89E-01	4.12E-08	9.78E-09	1.83E-08	2.50E-04	5.94E-05	1.11E-04	2.84E-09	6.74E-10	1.26E-09	2.50E-04	5.94E-05	1.11E-04										
1,4-Dichlorobenzene	4.05E+00	6.04E+00	1.94E+00	1.94E-07	2.76E-08	3.96E-08	1.15E-03	1.73E-04	2.48E-04	1.27E-08	1.90E-09	2.73E-09	1.15E-03	1.73E-04	2.48E-04										
2-Chloronaphthalene	6.12E+00	1.15E+00	1.08E+00	4.87E-07	9.15E-08	8.57E-08	1.75E-03	3.29E-04	3.08E-04	3.36E-08	6.31E-09	5.91E-09	1.75E-03	3.29E-04	3.08E-04										
2-Methylnaphthalene	1.24E+01	2.71E+00	2.60E+00	1.21E-06	2.63E-07	2.53E-07	3.55E-03	7.75E-04	7.46E-04	8.31E-08	1.81E-08	1.75E-08	3.55E-03	7.75E-04	7.46E-04										
Acenaphthene	5.89E+00	2.12E+00	2.28E+00	-	-	-	1.69E-03	6.06E-04	6.54E-04	-	-	-	-	-	-										
Acenaphthylene	7.81E-01	3.61E-01	4.06E-01	-	-	-	2.24E-04	1.03E-04	1.16E-04	-	-	-	-	-	-										
Aniline	1.74E+02	3.33E+01	1.81E+01	4.11E-08	1.20E-08	6.52E-09	3.26E-02	9.53E-03	5.18E-03	2.83E-09	8.28E-10	4.50E-10	3.26E-02	9.53E-03	5.18E-03										
Anthracene	1.00E+01	1.94E+00	1.78E+00	-	-	-	2.89E-03	5.57E-04	5.08E-04	-	-	-	-	-	-										
Benzo[a]anthracene	6.02E+01	1.45E+01	5.51E+00	-	-	-	1.72E-02	4.16E-03	1.58E-03	-	-	-	-	-	-	167									
Benzo[a]pyrene	1.15E+01	3.27E+00	1.54E+00	-	-	-	3.29E-03	9.37E-04	4.41E-04	-	-	-	-	-	-	0.29	2.86								
Benzo[b]fluoranthene	1.15E+01	3.87E+00	1.89E+00	-	-	-	3.29E-03	1.06E-03	5.42E-04	-	-	-	-	-	-	100									
Benzo[g,h]perylene	3.79E+00	1.41E+00	7.76E-01	-	-	-	1.09E-03	4.03E-04	2.22E-04	-	-	-	-	-	-										
Benzo[k]fluoranthene	4.38E+00	1.35E+00	6.66E-01	-	-	-	1.25E-03	3.89E-04	1.81E-04	-	-	-	-	-	-										
Bis(2-ethylhexyl) Phthalate	1.72E+00	4.14E-01	5.35E-01	5.16E-08	1.24E-08	1.60E-08	4.93E-04	1.19E-04	1.53E-04	3.56E-09	8.55E-10	1.11E-09	4.93E-04	1.19E-04	1.53E-04										
Carbazole	2.43E+00	5.95E-01	5.92E-01	-	-	-	6.96E-04	1.70E-04	1.69E-04	-	-	-	-	-	-	50									
Chrysene	9.27E+00	2.94E+00	1.49E+00	-	-	-	2.65E-03	8.42E-04	4.27E-04	-	-	-	-	-	-										
Dibenz[a,h]anthracene	1.73E+00	3.42E-01	2.99E-01	-	-	-	4.95E-04	9.78E-05	8.55E-05	-	-	-	-	-	-	2									
Dibenzofuran	2.83E+00	8.47E-01	1.04E+00	2.92E-07	9.77E-08	1.08E-07	8.10E-04	2.71E-04	2.99E-04	2.01E-08	6.74E-09	7.42E-09	8.10E-04	2.71E-04	2.99E-04	18.5			4.38E-05	1.47E-05	1.61E-05				
Fluoranthene	2.27E+01	6.72E+00	3.24E+00	-	-	-	6.50E-03	1.93E-03	9.27E-04	-	-	-	-	-	-										
Fluorene	2.90E+00	8.29E-01	8.81E-01	-	-	-	8.30E-04	2.37E-04	2.52E-04	-	-	-	-	-	-										
Hexachlorobenzene	1.85E-01	6.94E-02	9.77E-02	6.92E-08	2.59E-08	3.65E-08	5.30E-05	1.99E-05	2.80E-05	4.77E-09	1.79E-09	2.52E-09	5.30E-05	1.99E-05	2.80E-05	1600			3.31E-08	1.24E-08	1.75E-08				
Indeno[1,2,3-cd]pyrene	3.44E+00	1.20E+00	6.72E-01	-	-	-	9.85E-04	3.43E-04	1.92E-04	-	-	-	-	-	-										
Naphthalene	1.45E+02	4.30E+01	2.06E+01	-	-	-	4.15E-02	1.23E-02	5.89E-03	-	-	-	-	-	-										
Nitrobenzene	1.20E+02	1.51E+01	1.12E+01	-	-	-	3.44E-02	4.32E-03	3.21E-03	-	-	-	-	-	-										
n-Nitrosodiphenylamine	3.67E+01	8.23E+00	7.43E+00	-	-	-	1.05E-02	2.36E-03	2.13E-03	-	-	-	-	-	-										
Phenanthrene	2.81E+01	5.21E+00	4.23E+00	-	-	-	8.05E-03	1.49E-03	1.21E-03	-	-	-	-	-	-										
Pyrene	1.95E+01	5.92E+00	2.91E+00	-	-	-	5.58E-03	1.69E-03	8.34E-04	-	-	-	-	-	-										
Pyridine	1.99E+00	1.99E+00	1.14E+00	6.55E-09	6.55E-09	3.75E-09	5.70E-04	5.70E-04	3.26E-04	4.52E-10	4.52E-10	2.59E-10	5.70E-04	5.70E-04	3.26E-04										
Total High Weight Molecular PAHs	1.48E+02	4.09E+01	1.89E+01	-	-	-	4.24E-02	1.17E-02	5.41E-03	-	-	-	-	-	-	0.615	3.07								
Total Low Weight Molecular PAHs	1.92E+02	9.83E+00	2.74E+01	-	-	-	5.49E-02	2.82E-03	7.84E-03	-	-	-	-	-	-	65.6	110								
<b>Inorganics</b>																									
Aluminum	2.09E+04	1.37E+04	1.24E+04	-	-	-	5.98E+00	3.93E+00	3.56E+00	-	-	-	-	-	-										
Antimony	1.00E+01	4.45E+00	4.29E+00	2.56E-02	1.14E-02	6.86E-02	2.86E-03	1.27E-03	1.23E-03	1.76E-03	7.85E-04	4.73E-03	4.63E-03	2.06E-03	5.96E-03	0.059	0.59		7.84E-02	3.49E-02	1.01E-01	7.84E-03	3.49E-03	1.01E-02	
Arsenic	4.01E+01	2.03E+01	1.26E+01	5.16E-02	2.96E-02	2.00E-02	1.15E-02	5.82E-03	3.62E-03	3.56E-03	2.04E-03	1.38E-03	1.50E-02	7.87E-03	5.00E-03	1.04	1.66		1.45E-02	7.56E-03	4.81E-03	9.06E-03	4.74E-03	3.01E-03	
Barium	7.18E+02	4.03E+02	2.60E+02	2.51E-02	1.41E-02	9.08E-03	2.06E-01	1.15E-01	7.44E-02	1.73E-03	9.70E-04	6.26E-04	2.07E-01	1.16E-01	7.50E-02	51.8	103.6		4.00E-03	2.24E-03	1.45E-03	2.00E-03	1.12E-03	7.24E-04	
Cadmium	2.54E+01	7.89E+00	7.89E+00	4.19E-01	2.41E-01	2.38E-01	7.27E-03	2.29E-03	2.20E-03	2.89E-02	1.66E-02	1.64E-02	3.62E-02	1.89E-02	1.86E-02	0.509	5.094		7.11E-02	3.71E-02	3.69E-02	7.10E-03	3.71E-03	3.69E-03	
Chromium	4.31E+02	2.98E+02	1.67E+02	7.01E+00	4.74E+00	3.18E+00	1.41E-01	8.24E-02	4.78E-02	4.83E-01	3.27E-01	2.19E-01	8.24E-01	4.09E-01	2.67E-01	2.4	9.62		2.60E-01	1.70E-01	1.11E-01	6.49E-02	4.25E-02	2.77E-02	
Cobalt	3.32E+01	1.85E+01	1.41E+01	3.58E-01	1.67E-01	9.51E-03	5.31E-03	4.04E-03	2.46E-02	1.15E-02	8.05E-03	3.42E-02	1.68E-02	1.21E-02	7.61	15.22	4.49E-03	2.21E-03	1.59E-03	2.24E-03	1.11E-03	7.95E-04			
Copper	8.53E+03	1.50E+03	9.11E+02	9.11E+00	7.09E+00	6.60E+00	2.44E																		





Table 7A
Hazard Quotient Estimation for American Robin - Impoundment 13
P01 Module 4 - Ecological Risk Assessment
American Cyanamid Superfund Site, Bridgewater, NJ

Table with columns: Parameter, Symbol, Value, Units, and a large grid of Hazard Quotient (HQ) values for various chemicals. The grid includes rows for Volatiles, Semivolatiles, and Inorganics, with multiple columns for different exposure scenarios and HQ metrics.

Notes
1. \* or blank cells indicate value not available.
2. Bold COPC names indicate an HQ exceeding 1.0.

Table 7B  
Hazard Quotient Estimation for American Robin - Impoundment 17  
PDI Module 4 - Ecological Risk Assessment  
American Cyanamid Superfund Site, Bridgewater, NJ

Parameter Symbol Value Units  
Body Weight BW 0.077 kg  
Dry Weight Food Ingestion Rate IR<sub>DW</sub> 0.0107 kg/day  
Wet Weight Food Ingestion Rate IR<sub>WW</sub> 0.0588 kg/day  
Fraction of Diet Composed of Plants P<sub>F</sub> 0.5225 unitless  
Fraction of Diet Composed of Invertebrates P<sub>I</sub> 0.4775 unitless  
Diet soil ingestion P<sub>s</sub> 0.064 unitless  
Plant Concentration C<sub>P</sub> Chemical-specific mg/kg  
Invertebrate Concentration C<sub>I</sub> Chemical-specific mg/kg  
Soil Concentration (C<sub>s</sub>) C<sub>s</sub> Chemical-specific mg/kg  
Toxicity Reference Value TRV Chemical-specific mg/kg/day  
Area Use Factor AUF 1 unitless

Table with columns: Chemical Name, C<sub>s</sub> max, C<sub>s</sub> 95%, C<sub>s</sub> min, C<sub>P</sub> max, C<sub>P</sub> 95%, C<sub>P</sub> min, C<sub>I</sub> max, C<sub>I</sub> 95%, C<sub>I</sub> min, Max Dose: Soil Exposure, 95% Dose: Soil Exposure, Mean Dose: Soil Exposure, Max Dose: Plant Exposure, 95% Dose: Plant Exposure, Mean Dose: Plant Exposure, Max Total Dose, 95% Total Dose, Mean Total Dose, TRV mg/kg/day, NOEL HQs (Max Hazard Quotient, 95% Hazard Quotient, Mean Hazard Quotient), LOEL HQs (Max Hazard Quotient, 95% Hazard Quotient, Mean Hazard Quotient). Rows include Volatiles (Acetone), Semivolatiles (1,2,4-Trichlorobenzene, 2-Chloronaphthalene, 2-Methylnaphthalene, 3,3-Dichlorobenzidine, Acenaphthylene, Aniline, Anthracene, Benzo[a]anthracene, Benzo[a]fluoranthene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Chrysene, Dibenz[a,h]anthracene, Fluoranthene, Hexachlorobenzene, Indeno[1,2,3-cd]pyrene, Naphthalene, n-Nitrosodiphenylamine, Phenanthrene, Pyrene, Pyridine, Total High Weight Molecular PAHs, Total Low Weight Molecular PAHs), Inorganics (Aluminum, Antimony, Arsenic, Barium, Bismuth, Cadmium, Chromium, Cobalt, Copper, Cyanide, Hexavalent Chromium, Iron, Lead, Manganese, Mercury, Nickel, Potassium, Zinc), and PCBs (Aroclor 1254).

Notes  
1. \* or blank cells indicate value not available.  
2. Bold COPC names indicate an HQ exceeding 1.0.

Table with columns: Parameter, Symbol, Value, Units, C1max, C195, C2max, C295, C3max, C395, C4max, C495, C5max, C595, C6max, C695, C7max, C795, C8max, C895, C9max, C995, Max Dose, 95% Dose, Mean Dose, etc. Rows include Volatiles, Semivolatiles, and Inorganics.

Notes  
1. \* or blank cells indicate value not available.  
2. Bold COPC names indicate an HQ exceeding 1.0.

Table 8A  
Hazard Quotient Estimation for Red-tailed Hawk - Impoundment 13  
PDI Module 4 - Ecological Risk Assessment  
American Cyanamid Superfund Site, Bridgewater, NJ

Parameter Symbol Value Units
Body Weight BW 1.134 kg
Dry Weight Food Ingestion Rate IR\_dw 0.0337 kg/day
Wet Weight Food Ingestion Rate IR\_w 0.105 kg/day
Fraction of Diet Comprised of Small Mammals P\_p^f 1 unitless
Fraction soil ingestion P\_s 0.024 unitless
Small Mammal Concentration C\_p^s Chemical-specific mg/kg
Soil Concentration (C\_s) C\_s Chemical-specific mg/kg
Toxicity Reference Value TRV Chemical-specific mg/kg/day
Area Use Factor AUF 1 unitless

Table with columns for chemical name, various exposure metrics (C\_max, C\_95, C\_mean, C\_TOT\_max, C\_TOT\_95, C\_TOT\_mean, Max Dose, 95% Dose, Mean Dose, 95% Dose, Mean Dose, Max Total Dose, 95% Total Dose, Mean Total Dose, TRV mg/kg/day, LOAEL, NOAEL, and various Hazard Quotients (Max, 95%, Mean) under NOAEL HQs and LOAEL HQs.

Notes
1. \*, \* or blank cells indicate value not available.
2. Bold COPC names indicate an HQ exceeding 1.0.

Table 8B  
Hazard Quotient Estimation for Red-tailed Hawk - Impoundment 17  
PDI Module 4 - Ecological Risk Assessment  
American Cyanamid Superfund Site, Bridgewater, NJ

Parameter	Symbol	Value	Units
Body Weight	BW	1.134	kg
Dry Weight Food Ingestion Rate	IR <sub>dw</sub>	0.0337	kg/day
Wet Weight Food Ingestion Rate	IR <sub>w</sub>	0.105	kg/day
Fraction of Diet Comprised of Small Mammals	P <sub>f</sub>	1	unitless
Fraction soil ingestion	P <sub>s</sub>	0.024	unitless
Small Mammal Concentration	C <sub>f</sub>	Chemical-specific	mg/kg
Soil Concentration (C <sub>s</sub> )	C <sub>s</sub>	Chemical-specific	mg/kg
Toxicity Reference Value	TRV	Chemical-specific	mg/kg/day
Area Use Factor	AUF	1	unitless

	NOAEL HQs															LOAEL HQs							
	C <sub>s</sub> max	C <sub>s</sub> 95%	C <sub>s</sub> Mean	C <sub>10m</sub> max	C <sub>10m</sub> 95%	C <sub>10m</sub> Mean	Max Dose: Soil Exposure	95% Dose: Soil Exposure	Mean Dose: Soil Exposure	Max Dose: Small Mammal Exposure	95% Dose: Small Mammal Exposure	Mean Dose: Small Mammal Exposure	Max Total Dose	95% Total Dose	Mean Total Dose	TRV mg/kg/day	Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient	Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient	
	mg/kg DW	mg/kg DW	mg/kg DW	mg/kg WW	mg/kg WW	mg/kg WW	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	LOAEL	NOAEL	unitless	unitless	unitless	unitless	unitless	unitless
<b>Volatiles</b>																							
Acetone	9.78E+00	7.78E-01	1.48E+00	1.36E-08	1.08E-09	2.06E-09	6.98E-03	5.55E-04	1.06E-03	1.26E-09	9.99E-11	1.91E-10	6.98E-03	5.55E-04	1.06E-03	200.89				3.47E-05	2.78E-06	5.27E-06	
<b>Semi-volatiles</b>																							
1,2,4-Trichlorobenzene	1.00E+00	4.31E-01	4.17E-01	8.89E-08	3.83E-08	3.71E-08	7.13E-04	3.08E-04	2.98E-04	8.23E-09	3.55E-09	3.43E-09	7.13E-04	3.08E-04	2.98E-04								
2-Chloronaphthalene	1.63E-01	7.90E-02	9.98E-02	1.30E-08	6.21E-09	7.95E-09	1.16E-04	5.66E-05	7.12E-05	1.20E-09	5.75E-10	7.36E-10	1.16E-04	5.66E-05	7.12E-05								
2-Methylnaphthalene	ND	ND	ND	-	-	-	-	-	-	-	-	-	-	-	-								
3,3'-Dichlorobenzidine	9.89E+00	3.85E+00	5.45E+00	7.29E-05	2.84E-05	4.02E-05	7.05E-03	2.75E-03	3.89E-03	6.75E-06	2.63E-06	3.72E-06	7.06E-03	2.75E-03	3.89E-03								
Acenaphthylene	5.23E-02	NA	5.23E-02	-	-	-	3.73E-05	-	3.73E-05	4.84E-03	-	4.84E-03	4.88E-03	-	4.88E-03								
Aniline	3.47E+01	1.42E+01	1.39E+01	1.25E-08	5.12E-09	4.68E-09	2.47E-02	1.01E-02	9.25E-03	1.16E-09	4.74E-10	4.33E-10	2.47E-02	1.01E-02	9.25E-03								
Anthracene	1.94E-01	6.97E-02	8.77E-02	-	-	-	1.31E-04	4.97E-05	6.28E-05	1.70E-02	6.45E-03	8.12E-03	1.72E-02	6.50E-03	8.18E-03								
Benzo[a]anthracene	4.42E+00	1.68E+00	2.84E+00	-	-	-	3.15E-03	1.20E-03	2.03E-03	4.09E-01	1.56E-01	2.63E-01	4.12E-01	1.57E-01	2.65E-01								
Benzo[a]pyrene	1.98E-01	1.38E-01	1.54E-01	-	-	-	1.40E-04	9.82E-05	1.10E-04	1.81E-02	1.28E-02	1.43E-02	1.83E-02	1.28E-02	1.44E-02	1.41	14.4	1.30E-02	9.11E-03	1.02E-02	1.27E-03	8.92E-04	1.00E-03
Benzo[b]fluoranthene	7.57E-01	3.43E-01	4.79E-01	-	-	-	5.40E-04	2.45E-04	3.41E-04	7.01E-02	3.18E-02	4.43E-02	7.06E-02	3.20E-02	4.47E-02								
Benzo[g,h,i]perylene	1.45E-01	8.14E-02	9.84E-02	-	-	-	1.03E-04	5.81E-05	7.02E-05	1.34E-02	7.54E-03	9.11E-03	1.35E-02	7.60E-03	9.18E-03								
Benzo[k]fluoranthene	1.64E-01	9.66E-02	1.18E-01	-	-	-	1.17E-04	6.89E-05	8.42E-05	1.52E-02	8.94E-03	1.09E-02	1.53E-02	9.01E-03	1.10E-02								
Chrysene	5.93E-01	NA	5.93E-01	-	-	-	4.23E-04	-	4.23E-04	5.49E-02	-	5.49E-02	5.53E-02	-	5.53E-02	1					5.53E-02		5.53E-02
Dibenz[a,h]anthracene	5.03E-02	NA	5.03E-02	-	-	-	3.59E-05	-	3.59E-05	4.86E-03	-	4.86E-03	4.89E-03	-	4.89E-03								
Fluoranthene	2.03E-01	1.15E-01	1.25E-01	-	-	-	1.45E-04	8.17E-05	9.94E-05	1.88E-02	1.06E-02	1.16E-02	1.89E-02	1.07E-02	1.17E-02								
Hexachlorobenzene	1.34E+00	7.09E-01	7.84E-01	5.01E-07	2.65E-07	2.93E-07	9.56E-04	5.05E-04	5.59E-04	4.64E-08	2.45E-08	2.71E-08	9.56E-04	5.05E-04	5.59E-04	225	1	4.25E-06	2.25E-06	2.49E-06			
Indeno[1,2,3-cd]pyrene	1.29E-01	8.60E-02	9.50E-02	-	-	-	9.20E-05	6.14E-05	6.77E-05	1.19E-02	7.96E-03	8.79E-03	1.20E-02	8.03E-03	8.86E-03						1.20E-02	8.03E-03	8.86E-03
Naphthalene	1.29E+00	7.37E-01	7.87E-01	-	-	-	9.20E-05	5.26E-04	5.61E-04	1.19E-01	6.83E-02	7.28E-02	1.20E-01	6.88E-02	7.34E-02								
n-Nitrosodiphenylamine	5.64E+00	3.13E+00	3.40E+00	-	-	-	4.02E-03	2.23E-03	2.43E-03	5.22E-01	2.90E-01	3.15E-01	5.26E-01	2.92E-01	3.17E-01								
Phenanthrene	1.23E-01	9.93E-02	1.05E-01	-	-	-	8.77E-05	7.08E-05	7.47E-05	1.14E-02	9.20E-03	9.69E-03	1.15E-02	9.27E-03	9.77E-03								
Pyrene	2.77E-01	1.32E-01	1.47E-01	-	-	-	1.98E-04	9.41E-05	1.05E-04	2.56E-02	1.22E-02	1.37E-02	2.58E-02	1.23E-02	1.38E-02								
Pyridine	ND	ND	ND	-	-	-	-	-	-	-	-	-	-	-	-								
Total High Weight Molecular PAHs	5.62E+00	1.36E+00	1.96E+00	-	-	-	4.00E-03	9.72E-04	1.40E-03	5.20E-01	1.26E-01	1.81E-01	5.24E-01	1.27E-01	1.83E-01								
Total Low Weight Molecular PAHs	1.33E+00	1.43E-01	8.29E-01	-	-	-	9.47E-04	1.02E-04	5.91E-04	1.23E-01	1.32E-02	7.68E-02	1.24E-01	1.33E-02	7.74E-02								
<b>Inorganics</b>																							
Aluminum	1.47E+05	1.08E+05	1.01E+05	4.28E+01	3.31E+01	3.14E+01	1.05E+02	7.68E+01	7.20E+01	3.96E+00	3.07E+00	2.91E+00	1.09E+02	7.98E+01	7.49E+01								
Antimony	2.50E+01	1.79E+01	1.68E+01	6.40E-02	4.57E-02	4.31E-02	1.78E-02	1.27E-02	1.20E-02	5.93E-03	4.23E-03	3.99E-03	2.38E-02	1.70E-02	1.60E-02								
Arsenic	1.09E+02	7.42E+01	6.88E+01	1.17E-01	8.54E-02	8.03E-02	7.77E-02	5.29E-02	4.91E-02	1.08E-02	7.91E-03	7.44E-03	8.86E-02	6.08E-02	5.65E-02	2.24	3.55	3.95E-02	2.71E-02	2.52E-02	2.50E-02	1.71E-02	1.59E-02
Barium	9.18E+03	5.58E+03	4.92E+03	3.21E-01	1.95E-01	1.72E-01	6.55E+00	3.98E+00	3.51E+00	2.97E-02	1.81E-02	1.59E-02	6.58E+00	4.00E+00	3.53E+00								
Cadmium	4.50E+00	3.98E+00	3.54E+00	1.85E-01	1.75E-01	1.65E-01	3.21E-03	2.84E-03	2.52E-03	1.72E-02	1.62E-02	1.53E-02	2.04E-02	1.90E-02	1.78E-02	1.45	20	1.40E-02	1.31E-02	1.23E-02	1.02E-03	9.82E-04	8.91E-04
Chromium	2.87E+03	2.35E+03	2.20E+03	2.56E+01	2.21E+01	2.11E+01	2.05E+00	1.67E+00	1.57E+00	2.37E+00	2.05E+00	1.95E+00	4.42E+00	3.72E+00	3.52E+00	2.66	2.78	<b>1.66E+00</b>	<b>1.40E+00</b>	<b>1.32E+00</b>	<b>1.59E+00</b>	<b>1.34E+00</b>	<b>1.27E+00</b>
Cobalt	1.66E+01	1.35E+01	1.21E+01	1.45E-01	1.10E-01	9.55E-02	1.18E-02	9.63E-03	8.63E-03	1.34E-02	1.02E-02	8.85E-03	2.52E-02	1.98E-02	1.75E-02								
Copper	3.94E+03	3.00E+03	2.83E+03	8.15E+00	7.84E+00	7.77E+00	2.81E+00	2.14E+00	2.02E+00	7.55E-01	7.26E-01	7.19E-01	3.56E+00	2.87E+00	2.73E+00	4.05	4.68	8.80E-01	7.08E-01	6.75E-01	7.62E-01	6.13E-01	5.84E-01
Cyanide	3.90E+00	1.10E+00	1.73E+00	-	-	-	2.78E-03	7.82E-04	1.24E-03	3.61E-01	1.02E-01	1.60E-01	3.64E-01	1.02E-01	1.62E-01								
Hexavalent Chromium	1.41E+02	5.23E+01	4.05E+01	-	-	-	1.01E-01	3.73E-02	2.89E-02	1.31E+01	4.84E+00	3.75E+00	1.32E+01	4.88E+00	3.78E+00	6.71	11.5	<b>1.96E+00</b>	7.27E-01	5.63E-01	<b>1.14E+00</b>	4.24E-01	3.29E-01
Iron	1.02E+05	6.82E+04	6.36E+04	-	-	-	7.27E+01	4.86E+01	4.53E+01	9.44E+03	6.31E+03	5.89E+03	9.52E+03	6.36E+03	5.93E+03	0.29	0.368	<b>3.28E+04</b>	<b>2.19E+04</b>	<b>2.05E+04</b>	<b>2.59E+04</b>	<b>1.73E+04</b>	<b>1.61E+04</b>
Lead	3.39E+03	2.54E+03	2.39E+03	1.26E+01	1.11E+01	1.06E+01	2.42E+00	1.81E+00	1.70E+00	1.02E+00	9.97E-01	9.58E-01	2.84E+00	2.70E+00	2.56E+00	1.63	1.94	<b>2.20E+00</b>	<b>1.74E+00</b>	<b>1.66E+00</b>	<b>1.85E+00</b>	<b>1.46E+00</b>	<b>1.39E+00</b>
Manganese	1.72E+03	1.25E+03	1.19E+03	1.38E+01	9.98E+00	9.53E+00	1.23E+00	8.89E-01	8.50E-01	1.27E+00	9.24E-01	8.82E-01	2.55E+00	1.81E+00	1.72E+00	179	358	1.40E-02	1.01E-02	9.68E-03	6.95E-03	5.06E-03	4.84E-03
Mercury	2.58E+02	1.42E+02	1.30E+02	2.18E+00	1.19E+00	1.10E+00	1.84E-01	1.01E-01	9.26E-02	2.02E-01	1.11E-01	1.01E-01	3.86E-01	2.11E-01	1.94E-01	0.45	0.9	8.57E-01	4.70E-01	4.31E-01	4.28E-01	2.35E-01	2.16E-01
Nickel	1.65E+02	1.04E+02	9.83E+01	2.70E+00	2.18E+00	2.12E+00	1.18E-01	7.42E-02	7.01E-02	2.50E-01	2.02E-01	1.96E-01	3.68E-01	2.76E-01	2.66E-01	6.71	8.16	5.48E-02	4.11E-02	3.97E-02	4.50E-02	3.38E-02	3.27E-02
Vanadium	9.95E+01	7.14E+01	6.78E+01	3.88E-01	2.81E-01	2.67E-01	7.03E-02	5.09E-02	4.84E-02	3.59E-02	2.60E-02	2.47E-02	1.06E-01	6.71E-02	7.31E-02	0.344	0.688	3					

Table 8C  
Hazard Quotient Estimation for Red-tailed Hawk - Impoundment 24  
PDI Module 4 - Ecological Risk Assessment  
American Cyanamid Superfund Site, Bridgewater, NJ

Parameter	Symbol	Value	Units
Body Weight	BW	1.134	kg
Dry Weight Food Ingestion Rate	IR <sub>DW</sub>	0.0337	kg/day
Wet Weight Food Ingestion Rate	IR <sub>WW</sub>	0.105	kg/day
Fraction of Diet Comprised of Small Mammals	P <sub>P</sub>	1	unitless
Fraction soil ingestion	P <sub>s</sub>	0.024	unitless
Small Mammal Concentration	C <sub>P</sub>	Chemical-specific	mg/kg
Soil Concentration (C <sub>s</sub> )	C <sub>s</sub>	Chemical-specific	mg/kg
Toxicity Reference Value	TRV	Chemical-specific	mg/kg/day
Area Use Factor	AUF	1	unitless

	NOAEL HQs														LOAEL HQs								
	C <sub>s</sub> max	C <sub>s</sub> 95%	C <sub>s</sub> Mean	C <sub>10th</sub> max	C <sub>10th</sub> 95%	C <sub>10th</sub> Mean	Max Dose: Soil Exposure	95% Dose: Soil Exposure	Mean Dose: Soil Exposure	Max Dose: Small Mammal Exposure	95% Dose: Small Mammal Exposure	Mean Dose: Small Mammal Exposure	Max Total Dose	95% Total Dose	Mean Total Dose	TRV mg/kg/day	Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient	Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient	
	mg/kg DW	mg/kg DW	mg/kg DW	mg/kg WW	mg/kg WW	mg/kg WW	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	LOAEL	NOAEL	unitless	unitless	unitless	unitless	unitless	unitless
<b>Volatiles</b>																							
Acetone	5.17E-01	1.28E-01	1.60E-01	7.17E-10	1.77E-10	2.21E-10	3.69E-04	9.09E-05	1.14E-04	6.64E-11	1.64E-11	2.05E-11	3.69E-04	9.09E-05	1.14E-04	200.89		1.84E-06	4.53E-07	5.67E-07			
1,3,5-Trimethylbenzene	3.27E-02	5.36E-03	8.00E-03	1.59E-09	2.60E-10	3.89E-10	2.33E-05	3.83E-06	5.71E-06	1.47E-10	2.41E-11	3.60E-11	2.33E-05	3.83E-06	5.71E-06								
cis-1,2-Dichloroethene	1.10E-03	NA	1.10E-03	1.32E-11	-	1.32E-11	7.85E-07	-	7.85E-07	1.23E-12	-	1.23E-12	7.85E-07	-	7.85E-07								
m,p-Xylenes	4.80E-02	8.44E-03	1.34E-02	1.86E-09	3.27E-10	5.20E-10	3.42E-05	6.02E-06	9.57E-06	1.72E-10	3.03E-11	4.81E-11	3.42E-05	6.02E-06	9.57E-06	2.97	3.677	1.15E-05	2.03E-06	3.22E-06	9.31E-06	1.64E-06	2.60E-06
Methanol	1.36E+01	3.29E+00	3.84E+00	1.25E-08	3.04E-09	3.54E-09	9.70E-03	2.35E-03	2.74E-03	1.16E-09	2.81E-10	3.28E-10	9.70E-03	2.35E-03	2.74E-03	130.7	653.4	7.42E-05	1.80E-05	2.10E-05	1.48E-05	3.59E-06	4.19E-06
o-Xylene	1.85E-02	3.45E-03	5.41E-03	6.94E-10	1.27E-10	2.00E-10	1.34E-05	2.46E-06	3.86E-06	6.42E-11	1.18E-11	1.65E-11	1.34E-05	2.46E-06	3.86E-06	2.97	3.677	4.51E-06	8.27E-07	1.30E-06	3.65E-06	6.88E-07	1.05E-06
<b>Semivolatiles</b>																							
1,2,4-Trichlorobenzene	1.95E-01	5.06E-02	7.43E-02	1.77E-08	4.49E-09	6.60E-09	1.42E-04	3.61E-05	5.30E-05	1.64E-09	4.16E-10	6.12E-10	1.42E-04	3.61E-05	5.30E-05								
1,2-Dichlorobenzene	1.00E+00	2.42E-01	2.20E-01	4.72E-08	1.14E-08	1.04E-08	7.13E-04	1.72E-04	1.57E-04	4.37E-09	1.06E-09	9.60E-10	7.13E-04	1.72E-04	1.57E-04								
1,2-Diphenylhydrazine	1.12E+01	5.78E+00	1.23E+00	3.36E-07	1.73E-07	3.68E-08	7.99E-03	4.12E-03	8.74E-04	3.11E-08	1.61E-08	3.41E-09	7.99E-03	4.12E-03	8.74E-04								
1,4-Dichlorobenzene	6.79E-02	4.58E-02	3.44E-02	3.11E-09	2.10E-09	1.57E-09	4.94E-05	3.27E-05	2.45E-05	2.88E-10	1.94E-10	1.46E-10	4.94E-05	3.27E-05	2.45E-05								
2-Chloronaphthalene	1.28E+00	2.30E-01	3.35E-01	1.02E-07	2.31E-08	2.67E-08	1.20E-03	4.59E-04	1.40E-04	1.56E-01	3.96E-02	1.57E-01	1.20E-03	4.59E-04	1.40E-04								
Acenaphthene	7.55E-01	1.84E-01	1.53E-01	-	-	-	5.38E-04	1.31E-04	1.09E-04	6.99E-02	1.71E-02	1.41E-02	7.04E-02	1.72E-02	1.42E-02								
Acenaphthylene	1.74E-01	5.08E-02	7.26E-02	-	-	-	1.24E-04	3.62E-05	5.18E-05	1.61E-02	4.70E-03	6.72E-03	1.62E-02	4.74E-03	6.77E-03								
Aniline	4.24E+01	1.24E+01	4.36E+00	1.53E-08	4.49E-09	1.57E-09	3.02E-02	8.88E-03	3.11E-03	1.42E-09	4.15E-10	1.45E-10	3.02E-02	8.88E-03	3.11E-03								
Anthracene	1.24E+00	4.58E-01	1.57E-01	-	-	-	8.84E-04	3.27E-04	1.12E-04	1.15E-01	4.24E-02	1.45E-02	1.15E-01	4.28E-02	1.47E-02								
Benzo[a]pyrene	1.22E+00	3.36E-01	4.82E-01	1.33E-08	3.66E-09	5.36E-09	8.70E-04	2.40E-04	3.51E-04	1.23E-09	3.38E-10	4.96E-10	8.70E-04	2.40E-04	3.51E-04								
Benzo[a]anthracene	1.68E+00	6.44E-01	1.97E-01	-	-	-	1.20E-03	4.59E-04	1.40E-04	1.56E-01	3.96E-02	1.57E-01	1.20E-03	4.59E-04	1.40E-04								
Benzo[a]ylene	7.75E-01	3.43E-01	1.48E-01	-	-	-	5.53E-04	2.44E-04	1.05E-04	7.18E-02	3.17E-02	1.37E-02	7.23E-02	3.20E-02	1.38E-02	1.41	14.4	5.13E-02	2.27E-02	9.79E-03	5.02E-03	2.22E-03	9.58E-04
Benzo[b]fluoranthene	1.95E-01	5.24E-01	1.92E-01	-	-	-	9.13E-04	3.74E-04	1.37E-04	1.19E-01	4.85E-02	1.78E-02	1.19E-01	4.89E-02	1.79E-02								
Benzo[g,h,i]perylene	4.81E-01	1.07E-01	1.07E-01	-	-	-	3.43E-04	7.60E-05	7.67E-05	4.45E-02	9.66E-03	9.95E-03	4.45E-02	9.94E-03	1.00E-02								
Benzo[k]fluoranthene	3.70E-01	8.28E-02	1.10E-01	-	-	-	2.64E-04	5.90E-05	7.85E-05	3.43E-02	7.66E-03	1.02E-02	3.43E-02	7.72E-03	1.03E-02								
Carbazole	3.27E-01	8.31E-02	9.43E-02	-	-	-	2.33E-04	5.93E-05	6.73E-05	3.03E-02	7.69E-03	8.73E-03	3.05E-02	7.75E-03	8.80E-03								
Chrysene	8.56E-01	2.04E-01	1.64E-01	-	-	-	6.11E-04	1.45E-04	1.17E-04	7.93E-02	1.88E-02	1.52E-02	7.93E-02	1.90E-02	1.33E-02								
Dibenzofuran	4.21E+00	1.51E+00	5.17E-01	4.35E-07	1.56E-07	5.33E-08	3.00E-03	1.05E-03	3.68E-04	4.03E-08	1.45E-08	4.94E-09	3.00E-03	1.08E-03	3.88E-04						7.99E-02	1.90E-02	1.53E-02
Fluoranthene	2.98E+00	1.21E+00	3.41E-01	-	-	-	2.13E-03	8.62E-04	2.43E-04	2.76E-01	1.12E-01	3.16E-02	2.76E-01	1.13E-01	3.18E-02								
Fluorene	8.16E-01	1.48E-01	1.58E-01	-	-	-	5.82E-04	1.06E-04	1.13E-04	7.56E-02	1.37E-02	1.46E-02	7.56E-02	1.38E-02	1.47E-02								
Indeno[1,2,3-cd]pyrene	4.67E-01	9.51E-02	1.30E-01	-	-	-	3.33E-04	6.78E-05	9.29E-05	4.32E-02	8.81E-03	1.21E-02	4.32E-02	8.88E-03	1.21E-02								
m,p-Cresol	3.01E-01	NA	3.01E-01	3.54E-09	-	3.54E-09	2.15E-04	-	2.15E-04	3.28E-10	-	3.28E-10	2.15E-04	-	2.15E-04								
Naphthalene	5.39E+00	1.90E+00	8.35E-01	-	-	-	3.84E-03	1.35E-03	6.10E-04	4.99E-01	1.76E-01	7.92E-02	5.03E-01	1.77E-01	7.98E-02								
Nitrobenzene	1.33E-01	9.35E-02	2.58E-02	-	-	-	9.49E-03	6.67E-03	1.84E-03	1.23E+00	8.66E-01	2.39E-01	1.23E+00	8.73E-01	2.41E-01								
n-Nitrosodiphenylamine	1.97E+01	1.09E+01	1.88E+00	-	-	-	1.41E-02	7.78E-03	1.34E-03	1.82E+00	1.01E+00	1.74E-01	1.82E+00	1.02E+00	1.76E-01								
Phenanthrene	5.06E+00	1.94E+00	5.81E-01	-	-	-	3.61E-03	1.38E-03	4.14E-04	4.69E-01	1.79E-01	5.38E-02	4.72E-01	1.81E-01	5.42E-02								
Pyrene	1.46E+00	6.77E-01	2.29E-01	-	-	-	1.04E-03	4.83E-04	1.63E-04	1.35E-01	6.27E-02	2.12E-02	1.35E-01	6.31E-02	2.13E-02								
Total High Weight Molecular PAHs	1.04E+01	4.30E+00	1.22E+00	-	-	-	7.38E-03	3.07E-03	8.67E-04	9.58E-01	3.99E-01	1.13E-01	9.66E-01	4.02E-01	1.13E-01								
Total Low Weight Molecular PAHs	1.09E+01	3.06E+00	1.71E+00	-	-	-	7.74E-03	2.18E-03	1.22E-03	1.01E+00	2.84E-01	1.58E-01	1.01E+00	2.86E-01	1.59E-01								
<b>Inorganics</b>																							
Aluminum	4.28E+04	1.55E+04	1.20E+04	1.56E+01	6.76E+00	5.49E+00	3.05E+01	1.10E+01	8.55E+00	1.44E+00	6.26E-01	5.08E-01	3.20E+01	1.16E+01	9.06E+00								
Antimony	1.70E+00	1.01E+00	9.35E-01	4.35E-03	2.57E-03	1.50E-02	1.21E-03	7.17E-04	6.67E-04	4.03E-04	2.38E-04	1.39E-03	1.62E-03	9.55E-04	2.05E-03								
Barium	3.53E+02	1.40E+02	1.15E+02	1.23E-02	4.89E-03	4.01E-03	2.52E-01	9.97E-02	8.19E-02	1.14E-03	4.52E-04	3.72E-04	2.53E-01	1.00E-01	8.23E-02								
Chromium	3.93E+02	1.17E+02	4.32E+01	5.96E+00	2.44E+00	1.18E+00	2.80E-01	8.32E-02	3.08E-02	5.51E-01	2.26E-01	1.09E-01	8.32E-01	3.09E-01	1.40E-01	2.66	2.78	3.13E-01	1.16E-01	5.25E-02	2.99E-01	1.11E-01	5.03E-02
Cobalt	3.45E+01	1.12E+01	9.51E+00	3.76E-01	8.68E-02	6.97E-02	2.46E-02	8.02E-03	6.78E-03	3.48E-02	8.04E-03	6.46E-03	5.94E-02	1.61E-02	1.32E-02								
Copper	7.32E+02	2.18E+02	1.29E+02	6.39E+00	3.36E+00	4.98E+00	5.72E-01	1.55E-01	9.23E-02	5.92E-01	4.97E-01	4.61E-01	1.11E+00	6.52E-01	5.33E-01	4.05	4.68	2.75E-01	1.61E-01	1.37E-01	2.38E-01	1.39E-01	1.18E-01
Cyanide	1.90E+00	8.84E-01	1.22E+00	-	-	-	1.36E-03	6.30E-04	8.69E-04	1.78E-01	8.19E-02	1.13											

Bioaccumulative Compound	Test Species	Form	Endpoint	Reference	Red Fox TRV		Meadow Vole TRV		Short-tailed Shrew TRV	
					NOAEL mg/kgBW-day	LOAEL mg/kgBW-day	NOAEL mg/kgBW-day	LOAEL mg/kgBW-day	NOAEL mg/kgBW-day	LOAEL mg/kgBW-day
<b>Inorganics</b>										
Aluminum										
Antimony				c	0.059	0.59	0.059	0.59	0.059	0.59
Arsenic	Dog		Growth	c	1.04	1.66	1.04	1.66	1.04	1.66
Barium				c	51.8	103.6	51.8	103.6	51.8	103.6
Cadmium	Rat	Cadmium Chloride	Reproduction	a	0.509	5.094	1.62	16.199	2.12	21.2
Chromium	Various/Mouse		Various	c	2.4	9.62	2.4	9.62	2.4	9.62
Cobalt				c	7.61	15.22	7.61	15.22	7.61	15.22
Copper	Pig		Growth Survival	c	5.6	9.34	5.6	9.34	5.6	9.34
Cyanide				a	34.1		108.4		141.9	
Hexavalent Chromium				d	3.5		3.5		3.5	
Iron										
Lead	Rat		Growth	c	4.7	5	4.7	5	4.7	5
Manganese										
Mercury	Mouse	mercuric sulfide	Reproduction	a	3.77	37.7	11.99	119.9	15.7	157
Nickel	Mouse		Reproduction	c	1.7	2.71	1.7	2.71	1.7	2.71
Selenium	Pig		Growth	c	0.143	0.145	0.143	0.145	0.143	0.145
Silver	Pig	silver	Growth	c	6.02	60.2	6.02	60.2	6.02	60.2
Vanadium				c	4.16	8.31	4.16	8.31	4.16	8.31
Zinc	Geometric Mean		Reproduction, Growth, and Survival	c	75.4	741	75.4	741	75.4	741
<b>PAHs</b>										
Acenaphthylene										
Acenaphthene										
Anthracene										
Fluorene										
Benzo[a]anthracene				d		167		167		167
Benzo[a]pyrene				a	0.29	2.86	0.91	9.09	1.19	11.89
Benzo[b]fluoranthene				d		100		100		100
Benzo[g,h,i]perylene										
Benzo[k]fluoranthene										
Chrysene										
Dibenzo[a,h]anthracene				d		2		2		2
Fluoranthene										
Indeno[1,2,3-cd]pyrene										
Pyrene										
Total Low Weight Molecular PAHs				a	65.60	110.00	65.60	110.00	65.60	110.00
Total High Weight Molecular PAHs				c	0.615	3.07	0.615	3.07	0.615	3.07
<b>VOCs</b>										
1,3,5-Trimethylbenzene				e	14.3	42.9	14.3	42.9	14.3	42.9
Acetone				a	10	50	10	50	10	50
cis-1,2-Dichloroethene										
Methanol				a	26.4	132	84	419.8	109.9	549.5
m,p-Xylenes										
o-Xylene				a	0.6	0.743	1.908	2.363	2.497	3.092
<b>SVOCS</b>										
1,2,4-Trichlorobenzene										
1,2-Dichlorobenzene				j	42.9		42.9		42.9	
1,2-Diphenylhydrazine										
1,3-Dichlorobenzene										
1,4-Dichlorobenzene										
2-Chloronaphthalene										
2-Methylnaphthalene										
3,3-Dichlorobenzidine				f	3.52		3.52		3.52	
Aniline										
Benzidine				g	0.39		0.39		0.39	
Carbazole				h	50		50		50	
Dibenzofuran				i	18.5		18.5		18.5	
Hexachlorobenzene				d	1600		1600		1600	
Bis(2-ethylhexyl) Phthalate										
m,p-Cresol										
Naphthalene										
Nitrobenzene										
n-Nitrosodiphenylamine										
Phenanthrene										
Pyridine										
<b>Aroclors</b>										
Aroclor 1248	Monkey			a	0.01	0.103	0.033	0.326	0.043	0.427
Aroclor 1254	Mouse			a	-	-	0.051	0.511	0.067	0.668

**Note**

1. Most of the literature TRVs included in the table were not calculated for each receptor in their respective studies, and therefore the same NOAEL and LOAEL values were included in the table for all three small mammal receptors. As shown on the table, Reference A included specific calculated TRVs for cadmium and mercury for each of the three receptors.

**References**

- a. Sample, et. al. 1996. Toxicological Benchmarks for Wildlife. ES/ER/TM-86/R;
- b. Linder, R. E., Gaines, T. B., and Kimbrough, R. D. The effect of apolychlorinated biphenyl on rat reproduction. Food Cosmet. Toxicol. 12: 63-77 (1974)
- c. Compound-specific Ecological Soil Screening Level. Arsenic: March 2005; Chromium: April 2008; Copper: February 2007; DDT and metabolites: April 2007;
- d. USEPA 1999 Appendix E
- e. Industry Institute of Toxicology Research Institute (1995)
- f. Gaines and Nelson (1977), as cited in USEPA Ambient Water Quality Guidelines (1980). An uncertainty factor of 0.01 was applied to derive a NOAEL from the LD5
- g. Oral LD50 values were obtained from RTECS (1985); LD50s based on mouse study data were adjusted for the standard mouse body weight (0.03 kg) and food ingestion rate (0.0055 kg/day), and LD50s based on rat study data were adjusted for the standard rat body weight (0.35 kg) and food ingestion rate (0.028 kg/day), avian study not adjusted for food intake or body weight.
- h. Eagle and Carlson (1950). An uncertainty factor of 0.01 was applied to derive a NOAEL from the LD50
- i. Thomas et al. (1940).
- j. NTP 1985 (as cited in USEPA IRIS 2007a; oral RfD last revised in 1991)

Bioaccumulative Compound	Test Species	Form	Endpoint	Reference	Red-Tailed Hawk		America Robin	
					NOAEL mg/kgBW- day	LOAEL mg/kgBW- day	NOAEL mg/kgBW- day	LOAEL mg/kgBW- day
<b>Inorganics</b>								
Aluminum								
Antimony								
Arsenic	Chicken		Growth	b	2.24	3.55	2.24	3.55
Barium								
Cadmium	Mallard	cadmium chloride	Reproduction	a	1.45	20	1.45	20
Chromium	Geometric Mean	Various	Various	b	2.66	2.78	2.66	2.78
Cobalt								
Copper	Chicken		Reproduction	b	4.05	4.68	4.05	4.68
Cyanide								
Lead	Chicken		Reproduction	b	1.63	1.94	1.63	1.94
Mercury	Japanese Quail	mercuric chloride	Reproduction	a	0.45	0.9	0.45	0.9
Hexavalent Chromium	Geometric Mean		Reproduction and Growth	b	6.71	11.5	6.71	11.5
Iron	Chicken		Survival	b	0.29	0.368	0.29	0.368
Manganese				b	179	358	179	358
Nickel				b	6.71	8.16	6.71	8.16
Selenium				a	0.4		0.4	
Silver				b	2.02	60.5		
Vanadium				b	0.344	0.688	0.344	0.688
Zinc	Geometric Mean		Reproduction and Growth	b	66.1	154	66.1	154
<b>PAHs</b>								
Acenaphthylene								
Acenaphthene								
Anthracene								
Fluorene								
Benzo[a]anthracene								
Benzo[a]pyrene				a	1.41	14.4	1.41	14.4
Benzo[b]fluoranthene								
Benzo[g,h,i]perylene								
Benzo[k]fluoranthene								
Dibenzo[a,h]anthracene								
Chrysene				d		1		1
Fluoranthene								
Indeno[1,2,3-cd]pyrene				d		1		1
Pyrene								
Total Low Weight Molecular PAHs								
Total High Weight Molecular PAHs								
<b>VOCs</b>								
1,3,5-Trimethylbenzene				e	200.89		200.89	
Acetone								
cis-1,2-Dichloroethene								
m,p-Xylenes				a	2.97	3.677	2.97	3.677
Methanol				a	130.7	653.4	130.7	653.4
o-Xylene				a	2.97	3.677	2.97	3.677
<b>SVOCs</b>								
1,2,4-Trichlorobenzene								
1,2-Dichlorobenzene								
1,2-Diphenylhydrazine								
1,3-Dichlorobenzene								
1,4-Dichlorobenzene								
2-Chloronaphthalene								
2-Methylnaphthalene								
3,3'-Dichlorobenzidine								
Aniline								
Benzidine								
Carbazole								
Dibenzofuran								
di-n-Butyl Phthalate								
Hexachlorobenzene				d	225		225	
Bis(2-ethylhexyl) Phthalate				d	111		111	
m,p-Cresol								
Naphthalene								
Nitrobenzene								
n-Nitrosodiphenylamine								
Phenanthrene								
Pyridine								
<b>Aroclors</b>								
Aroclor 1248	White Leghorn Hen	n/a		b	0.1	1	0.1	1
Aroclor 1254	ring-necked pheasant	n/a		a	0.18	1.8	0.18	1.8

**References**

- a. Sample, et. al. 1996. Toxicological Benchmarks for Wildlife. ES/ER/TM-86/R3
- b. Compound-specific Ecological Soil Screening Level. Arsenic: March 2005; Chromium: April 2008; Copper: February 2007; DDT and metabolites: April 2007; Dieldrin: April 2007; Lead: March 2005; Nickel: March 2007; PAHs: June 2007; Selenium: July 2007; Silver: September 2006; Zinc: June 2007.
- c. Hill, EF and MB Camardese. 1986. Lethal Dietary Toxicities of Environmental Contaminants and Pesticides to Coturnix. United States Fish And Wildlife Service: Fish and Wildlife Tech Rep 2 (NTIS PB86-176914). Laurel, MD. 154 pp.
- d. Oral LD50 values were obtained from RTECS (1985); LD50s based on mouse study data were adjusted for the standard mouse body weight (0.03 kg) and food ingestion rate (0.0055 kg/day), and LD50s based on rat study data were adjusted for the standard rat body weight (0.35 kg) and food ingestion rate (0.028 kg/day), avian study not adjusted for food intake or body weight.
- e. Los Alamos National Laboratory (LANL;2005)

Summary of Food Chain Exposure Hazard Quotients Exceeding 1.0 - Impoundment 13  
 Ecological Risk Assessment  
 American Cyanamid Superfund Site, Bridgewater, NJ

Receptor	Compounds with Max NOAEL HQs >1	Compounds with Average NOAEL HQs > 1	Compounds with 95% NOAEL HQs >1	Compounds with Max LOAEL HQs >1	Compounds with Average LOAEL HQs > 1	Compounds with 95% LOAEL HQs >1
<b>Short-tailed Shrew</b>	1,2-Dichlorobenzene Antimony Benzo[a]pyrene Cadmium Chromium Copper Dibenzofuran Lead Nickel High PAHs Low PAHs Zinc	Antimony High PAHs Low PAHs	1,2-Dichlorobenzene Antimony Cadmium Chromium Copper Lead Nickel High PAHs Zinc	Antimony Chromium Copper Lead Nickel High PAHs		Copper Lead High PAHs
<b>Meadow Vole</b>	High PAHs Low PAHs Antimony Copper	Antimony	Antimony			
<b>Red Fox</b>						
<b>American Robin</b>	Cadmium Chromium Copper Iron <sup>1</sup> Lead Mercury Nickel Vanadium Zinc	Copper Iron <sup>1</sup> Lead Vanadium Zinc	Cadmium Chromium Copper Iron <sup>1</sup> Lead Mercury Vanadium Zinc	Chrysene Chromium Copper Iron <sup>1</sup> Lead Mercury Vanadium	Copper Iron <sup>1</sup> Lead	Chromium Copper Iron <sup>1</sup> Lead
<b>Red-tailed Hawk</b>	Copper Iron <sup>1</sup> Lead	Iron <sup>1</sup>	Iron <sup>1</sup>	Copper Iron <sup>1</sup>	Iron <sup>1</sup>	Iron <sup>1</sup>

**Note**

1. The 2005 Baseline Ecological Risk Assessment (O'Brien & Gere, 2005) for the Site screened iron out of the assessment based on uncertainties associated with evaluating toxicity under typical field conditions, however iron has been included in this ERA for completeness.

Checked by: RMW



Summary of Food Chain Exposure Hazard Quotients Exceeding 1.0 - Impoundment 17  
 Ecological Risk Assessment  
 American Cyanamid Superfund Site, Bridgewater, NJ

Receptor	Compounds with Max NOAEL HQs >1	Compounds with Average NOAEL HQs > 1	Compounds with 95% NOAEL HQs >1	Compounds with Max LOAEL HQs >1	Compounds with Average LOAEL HQs > 1	Compounds with 95% LOAEL HQs >1
<b>Short-tailed Shrew</b>	3,3'-Dichlorobenzidine Antimony Aroclor 1254 Barium Cadmium Chromium Copper Lead Nickel High PAHs Zinc	3,3'-Dichlorobenzidine Antimony Chromium Lead Nickel Zinc	3,3'-Dichlorobenzidine Antimony Aroclor 1254 Cadmium Chromium Copper Lead Nickel High PAHs Zinc	Antimony Chromium Copper Lead Nickel High PAHs	Antimony Lead	Antimony Chromium Copper Lead High PAHs
<b>Meadow Vole</b>	Acetone Antimony Barium Chromium	Antimony Chromium	Antimony Chromium	Antimony	Antimony	Antimony
<b>Red Fox</b>	Chromium					
<b>American Robin</b>	Aroclor 1254 Cadmium Chromium Copper Iron <sup>1</sup> Lead Mercury Vanadium Zinc	Chromium Copper Iron <sup>1</sup> Lead Mercury Vanadium Zinc	Cadmium Chromium Copper Iron <sup>1</sup> Lead Mercury Vanadium Zinc	Chromium Copper Iron <sup>1</sup> Lead Mercury Vanadium Zinc	Chromium Copper Iron <sup>1</sup> Lead Mercury	Chromium Copper Iron <sup>1</sup> Lead Mercury
<b>Red-tailed Hawk</b>	Chromium Hexavalent Chromium Iron <sup>1</sup> Lead	Chromium Iron <sup>1</sup> Lead	Chromium Iron <sup>1</sup> Lead	Chromium Hexavalent Chromium Iron <sup>1</sup> Lead	Chromium Iron <sup>1</sup> Lead	Chromium Iron <sup>1</sup> Lead

**Note**  
 1. The 2005 Baseline Ecological Risk Assessment (O'Brien & Gere, 2005) for the Site screened iron out of the assessment based on uncertainties associated with evaluating toxicity under typical field conditions, however iron has been included in this ERA for completeness.

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Summary of Food Chain Exposure Hazard Quotients Exceeding 1.0 - Impoundment 24  
 Ecological Risk Assessment  
 American Cyanamid Superfund Site, Bridgewater, NJ

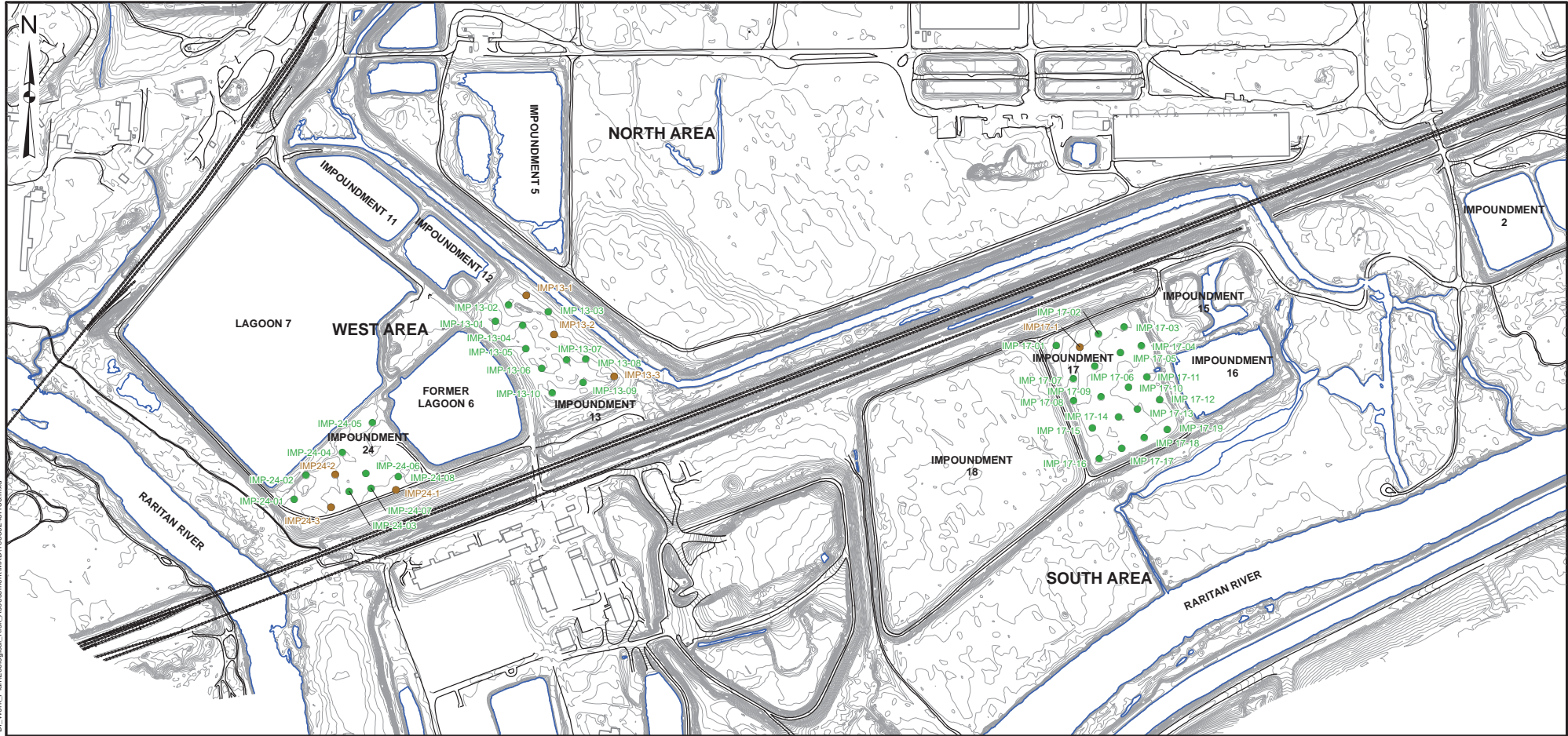
Receptor	COPECs with Max NOAEL HQs >1	COPECs with Average NOAEL HQs > 1	COPECs with 95% NOAEL HQs >1	COPECs with Max LOAEL HQs >1	COPECs with Average LOAEL HQs > 1	COPECs with 95% LOAEL HQs >1
Short-tailed Shrew	Antimony Aroclor 1254 Chromium Copper Dibenzofuran Lead High PAHs	Aroclor 1254 Antimony High PAHs	Antimony Aroclor 1254 Chromium Copper Dibenzofuran High PAHs	Aroclor 1254 Chromium Copper Lead High PAHs		Aroclor 1254 Copper
Meadow Vole	Antimony Benzidine					
Red Fox						
American Robin	Aroclor 1254 Chromium Copper Iron <sup>1</sup> Lead Vanadium	Aroclor 1254 Iron <sup>1</sup> Vanadium	Aroclor 1254 Chromium Copper Lead Iron <sup>1</sup> Vanadium	Chrysene Chromium Copper Lead Iron <sup>1</sup> Vanadium	Iron <sup>1</sup>	Chromium Copper Lead Iron <sup>1</sup> Vanadium
Red-tailed Hawk	Iron <sup>1</sup>	Iron <sup>1</sup>	Iron <sup>1</sup>	Iron <sup>1</sup>	Iron <sup>1</sup>	Iron <sup>1</sup>

**Note**

1. The 2005 Baseline Ecological Risk Assessment (O'Brien & Gere, 2005) for the Site screened iron out of the assessment based on uncertainties associated with evaluating toxicity under typical field conditions, however iron has been included in this ERA for completeness.

Checked by: RMW





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### LEGEND

- PRE-DESIGN INVESTIGATION (PDI)
- SOIL SAMPLE LOCATION (SEE REFERENCE 3)
- PREVIOUS SOIL SAMPLE LOCATION (COLLECTED IN 2010)

### NOTE

1.) SOIL SAMPLES WERE COLLECTED FROM THE GROUND SURFACE TO A DEPTH OF 2 FEET.

### REFERENCES

- 1.) BASE MAP FROM DIGITAL CAD FILE AM\_CYAN-04-12-11.DWG, SHEET 1 OF 36, ENTITLED "GENERAL LOCATION MAP AND SHEET KEY," DATED APRIL 12, 2011, PREPARED BY VARGO ASSOCIATES.
- 2.) COORDINATES FOR 2010 SOIL SAMPLE LOCATIONS FROM OBG, OCTOBER 2010, SITE WIDE CHARACTERIZATION PROGRAM.
- 3.) 2013 SOIL SAMPLE LOCATIONS SURVEYED BY VARGO ASSOCIATES ON DECEMBER 16, 2013 (VARGO LOCATIONS 121613.XLSX).



REV.	DATE	DES	REVISION DESCRIPTION	GIS	CHK	RVV
PROJECT AMERICAN CYANAMID SUPERFUND SITE BRIDGEWATER, NEW JERSEY						
TITLE ECOLOGICAL RISK ASSESSMENT SAMPLE LOCATIONS						
PROJECT No.		103-86245		FILE No.		10386245136
DESIGN	SLB	05/16/16	SCALE:	AS SHOWN	REV.	0
GIS	AM	05/16/16				
CHECK	SLB	05/16/16				
REVIEW	APJ	05/16/16				



**FIGURE 1**

**APPENDIX A**

**PRE-DESIGN INVESTIGATION SURFACE SOIL ANALYTICAL DATA USED FOR THE  
IMPOUNDMENTS 13, 17, AND 24 ECOLOGICAL RISK ASSESSMENT**

Table 1  
Validated Analytical Results  
Module 4 Impoundment 13 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID	Sample Date	IMP 13-01			IMP 13-01			IMP 13-02			IMP 13-02			IMP 13-03			IMP 13-03		
		11/20/2013	11/20/2013	11/20/2013	11/20/2013	11/20/2013	11/20/2013	11/20/2013	11/20/2013	11/20/2013	11/20/2013	11/20/2013	11/20/2013	11/20/2013	11/20/2013	11/20/2013	11/20/2013	11/20/2013	
N=Normal, FD=Field Duplicate		N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	
Start Depth (in)		0	12	0	12	0	12	0	12	0	12	0	12	0	12	0	12		
End Depth (in)		12	24	12	24	12	24	12	24	12	24	12	24	12	24	12	24		
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
<b>Volatile Organic Compounds</b>																			
Acetone	ug/kg	513	J	17	< 14	U	14	< 12	U	12	21		19	< 10	U	10	< 10	U	10
Benzene	ug/kg	< 1.7	U	1.7	0.5	J	1.4	< 1.2	U	1.2	< 1.9	U	1.9	< 1	U	1	< 1	U	1
Chlorobenzene	ug/kg	< 8.3	U	8.3	2.1	J	7.1	< 5.8	U	5.8	1.9	J	9.3	< 5.1	U	5.1	< 5.2	U	5.2
cis-1,2-Dichloroethene	ug/kg	< 8.3	U	8.3	< 7.1	U	7.1	< 5.8	U	5.8	< 9.3	U	9.3	< 5.1	U	5.1	< 5.2	U	5.2
Ethylbenzene	ug/kg	< 1.7	U	1.7	< 1.4	U	1.4	< 1.2	U	1.2	< 1.9	U	1.9	< 1	U	1	< 1	U	1
m,p-Xylenes	ug/kg	< 1.7	U	1.7	< 1.4	U	1.4	< 1.2	U	1.2	< 1.9	U	1.9	< 1	U	1	< 1	U	1
Methylene Chloride	ug/kg	< 8.3	U	8.3	< 7.1	U	7.1	< 5.8	U	5.8	< 9.3	U	9.3	< 5.1	U	5.1	< 5.2	U	5.2
o-Xylene	ug/kg	< 1.7	U	1.7	< 1.4	U	1.4	< 1.2	U	1.2	< 1.9	U	1.9	< 1	U	1	< 1	U	1
Tetrachloroethene	ug/kg	1.7	J	8.3	15.4		7.1	< 5.8	U	5.8	2.2	J	9.3	< 5.1	U	5.1	< 5.2	U	5.2
Toluene	ug/kg	< 1.7	U	1.7	1.3	J	1.4	< 1.2	U	1.2	0.93	J	1.9	< 1	U	1	< 1	U	1
Trichloroethene	ug/kg	< 8.3	U	8.3	< 7.1	U	7.1	< 5.8	U	5.8	< 9.3	U	9.3	< 5.1	U	5.1	< 5.2	U	5.2
<b>Semivolatile Organic Compounds</b>																			
1,2,4-Trichlorobenzene	ug/kg	228		140	2130	J	370	37.6	J	76	673		190	< 76	U	76	< 76	U	76
1,2-Dichlorobenzene	ug/kg	1010		140	87800		3700	< 76	U	76	8530		190	< 76	U	76	< 76	U	76
1,3-Dichlorobenzene	ug/kg	< 140	U	140	874	J	370	< 76	U	76	219		190	< 76	U	76	< 76	U	76
1,4-Dichlorobenzene	ug/kg	63.3	J	140	4010	J	370	< 76	U	76	474		190	< 76	U	76	< 76	U	76
2-Chloronaphthalene	ug/kg	328		140	2410	J	370	< 76	U	76	525		190	< 76	U	76	< 76	U	76
2-Methylnaphthalene	ug/kg	946		140	4760	J	370	381		76	5220		190	< 76	U	76	< 76	U	76
Acenaphthene	ug/kg	719		71	4310	J	180	191		38	2460		93	< 38	U	38	< 38	U	38
Acenaphthylene	ug/kg	159		71	770	J	180	118		38	711		93	< 38	U	38	< 38	U	38
Aniline	ug/kg	16700		1400	37900		3700	2690		76	35400		1900	< 76	U	76	< 76	U	76
Anthracene	ug/kg	542		71	3330	J	180	270		38	2960		93	< 38	U	38	< 38	U	38
Benzo[a]anthracene	ug/kg	2090		71	9180	J	180	863		38	7360		93	30.5	J	38	41.8		38
Benzo[a]pyrene	ug/kg	582		71	2560	J	180	437		38	3730		93	30.5	J	38	39.4		38
Benzo[b]fluoranthene	ug/kg	896		71	3190	J	180	630		38	4980		93	33.2	J	38	53.8		38
Benzo[g,h,i]perylene	ug/kg	239		71	1050	J	180	243		38	2760		93	29.4	J	38	30.3	J	38
Benzo[k]fluoranthene	ug/kg	197		71	1140	J	180	198		38	1780		93	20.5	J	38	18.9	J	38
Bis(2-ethylhexyl) Phthalate	ug/kg	302		140	1720	J	370	118		76	1500		190	< 76	U	76	< 76	U	76
Carbazole	ug/kg	195		140	996	J	370	82.7		76	1820		190	< 76	U	76	< 76	U	76
Chrysene	ug/kg	564		71	3050	J	180	433		38	3570		93	26.2	J	38	45.9		38
Dibenzo[a,h]anthracene	ug/kg	82.3		71	394	J	180	71.4		38	425		93	15.9	J	38	< 38	U	38
Dibenzofuran	ug/kg	357		140	2120	J	370	146		76	1610		190	< 76	U	76	< 76	U	76
Dimethyl Phthalate	ug/kg	< 140	U	140	< 370	UJ	370	< 76	U	76	< 190	U	190	< 76	U	76	< 76	U	76
Di-n-Butyl Phthalate	ug/kg	< 140	U	140	539	J	370	< 76	U	76	111	J	190	< 76	U	76	< 76	U	76
Fluoranthene	ug/kg	1190		71	6850	J	180	799		38	7490		93	31.1	J	38	91.1		38
Fluorene	ug/kg	259		71	1850	J	180	118		38	1720		93	< 38	U	38	< 38	U	38

Checked by: DTP 2/14/14

Table 1  
Validated Analytical Results  
Module 4 Impoundment 13 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID	Sample Date	IMP 13-01			IMP 13-01			IMP 13-02			IMP 13-02			IMP 13-03			IMP 13-03		
		11/20/2013	11/20/2013	11/20/2013	11/20/2013	11/20/2013	11/20/2013	11/20/2013	11/20/2013	11/20/2013	11/20/2013	11/20/2013	11/20/2013	11/20/2013	11/20/2013	11/20/2013	11/20/2013	11/20/2013	
N=Normal, FD=Field Duplicate		N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	
Start Depth (in)		0	12	0	12	0	12	0	12	0	12	0	12	0	12	0	12		
End Depth (in)		12	24	12	24	12	24	12	24	12	24	12	24	12	24	12	24		
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
Hexachlorobenzene	ug/kg	< 140	U	140	< 370	UJ	370	< 76	U	76	< 190	U	190	< 76	U	76	< 76	U	76
Indeno[1,2,3-cd]pyrene	ug/kg	228		71	1050	J	180	219		38	1610		93	22.5	J	38	23.8	J	38
Naphthalene	ug/kg	6550		71	53400		1800	2420		38	66000		930	< 38	U	38	18.5	J	38
Nitrobenzene	ug/kg	940		140	3670	J	370	< 76	U	76	1950		190	< 76	U	76	< 76	U	76
N-Nitrosodiphenylamine	ug/kg	2840		360	14900	J	920	849		190	12400		4700	72.8	J	190	< 190	U	190
Phenanthrene	ug/kg	1230		71	8350	J	180	738		38	8350		93	< 38	U	38	38.1		38
Pyrene	ug/kg	1220		71	6950	J	180	714		38	6830		93	31.5	J	38	75.2		38
Pyridine	ug/kg	< 140	U	140	< 370	UJ	370	< 76	U	76	< 190	U	190	< 76	U	76	< 76	U	76
<b>Polychlorinated Biphenyls</b>																			
Aroclor 1016	ug/kg	< 38	U	38	< 41	U	41	< 38	U	38	< 48	U	48	< 37	U	37	< 38	U	38
Aroclor 1221	ug/kg	< 38	U	38	< 41	U	41	< 38	U	38	< 48	U	48	< 37	U	37	< 38	U	38
Aroclor 1232	ug/kg	< 38	U	38	< 41	U	41	< 38	U	38	< 48	U	48	< 37	U	37	< 38	U	38
Aroclor 1242	ug/kg	< 38	U	38	< 41	U	41	< 38	U	38	< 48	U	48	< 37	U	37	< 38	U	38
Aroclor 1248	ug/kg	< 38	U	38	< 41	U	41	< 38	U	38	< 48	U	48	< 37	U	37	< 38	U	38
Aroclor 1254	ug/kg	< 38	U	38	< 41	U	41	< 38	U	38	< 48	U	48	< 37	U	37	< 38	U	38
Aroclor 1260	ug/kg	< 38	U	38	< 41	U	41	< 38	U	38	< 48	U	48	< 37	U	37	< 38	U	38
Aroclor 1262	ug/kg	< 38	U	38	< 41	U	41	< 38	U	38	< 48	U	48	< 37	U	37	< 38	U	38
Aroclor 1268	ug/kg	< 38	U	38	< 41	U	41	< 38	U	38	< 48	U	48	< 37	U	37	< 38	U	38
<b>Metals</b>																			
Aluminum	mg/kg	14300	J+	58	12200	J+	62	14200	J+	56	13800	J+	50	13800		20	12000		20
Antimony	mg/kg	3.2	J-	2.3	5	J-	2.5	0.63	J-	2.3	3.2	J-	2	< 0.98	U	0.98	0.21	J	0.99
Arsenic	mg/kg	9.2		2.3	13.9		2.5	6.3		2.3	17.8		2	4.5	J	0.98	3.8	J	0.99
Barium	mg/kg	233		23	474		25	120		23	271		20	120	J	4.9	135	J	5
Cadmium	mg/kg	4.1	J-	0.58	9.1	J-	1.2	0.8	J-	0.56	4.3	J-	1	0.24	J	0.39	< 0.4	U	0.4
Calcium	mg/kg	11300		580	22400		620	4700		560	25700		500	2670	J	490	4450	J	500
Chromium	mg/kg	162		1.2	491	J	2.5	56.4		1.1	322	J	2	39.9	J	0.98	32.8	J	0.99
Cobalt	mg/kg	14		5.8	16		6.2	9.9		5.6	12.4		5	11.8		4.9	10.4		5
Copper	mg/kg	756		2.9	1410	J	6.2	198		2.8	1400	J	5	31		2.4	28.5		2.5
Iron	mg/kg	36800		58	56200		120	26000		56	70400		100	27800		20	21800		9.9
Lead	mg/kg	315		2.3	641	J	5	82.1		2.3	496	J	4	28.3	J	0.98	27.4	J	0.99
Manganese	mg/kg	694		1.7	725	J	3.7	541		1.7	621	J	3	619	J	1.5	743	J	1.5
Mercury	mg/kg	4.1		0.38	10.1		1.8	4.1		0.38	26.2		4.6	0.47		0.035	0.19		0.035
Nickel	mg/kg	65.8		4.6	101		5	34.2		4.5	116		4	20.5	J	3.9	18.5	J-	4
Selenium	mg/kg	1.2	J	2.3	1.1	J	5	< 2.3	U	2.3	< 4	UJ	4	< 0.98	U	0.98	< 0.99	U	0.99
Silver	mg/kg	0.64		0.58	4.5	J	1.2	0.6		0.56	5.3	J	1	< 0.49	U	0.49	0.16	J	0.5
Vanadium	mg/kg	39.9		5.8	44.3		6.2	33.9		5.6	103		5	41	J	0.98	31.8	J	0.99
Zinc	mg/kg	746		2.3	1410		2.5	281		2.3	1310		2	91.9	J	2	86.2	J	2

Checked by: DTP 2/14/14

Table 1  
Validated Analytical Results  
Module 4 Impoundment 13 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID	IMP 13-01	IMP 13-01			IMP 13-02			IMP 13-02			IMP 13-03			IMP 13-03					
Sample Date	11/20/2013	11/20/2013			11/20/2013			11/20/2013			11/20/2013			11/20/2013					
N=Normal, FD=Field Duplicate	N	N			N			N			N			N					
Start Depth (in)	0	12			0			12			0			12					
End Depth (in)	12	24			12			24			12			24					
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL			
<b>General Chemistry Parameters</b>																			
Cyanide	mg/kg	< 0.26	R	0.26	< 0.22	R	0.22	1.1	J-	0.19	< 0.26	R	0.26	< 0.22	R	0.22	< 0.15	R	0.15
Ferrous Iron	%	NA			NA			NA			NA			NA			NA		
Hexavalent Chromium	mg/kg	2.5		0.46	3.1		0.49	1.6		0.47	6.3		0.6	1.3		0.46	0.9		0.46
Oxidation-Reduction Potential	millivolts	340		0	354		0	324		0	352		0	301		0	311		0
pH	pH units	7.55	J	0	7.4	J	0	7.64	J	0	7.4	J	0	7.92	J	0	7.85	J	0
Sulfate	mg/kg	1150		120	16300		730	550		120	22700		1000	< 110	U	110	< 120	U	120
Sulfide Screen	none	NA			NA			NA			NA			NA			NA		
Sulfur	mg/kg	1670		5.8	8150	J	12	937		5.6	15700	J	10						
Total Organic Carbon	mg/kg	41500		120	77100		120	19000		120	120000		150	10900		120	22400		120
<b>Grain Size</b>																			
% GRAVEL	%	18			17.7			27.7			25.8			10.5			18.3		
% SAND	%	39.7			45			31.7			43.8			34.5			35.5		
% Silt, Clay, Colloids	%	42.2			37.3			40.6			30.4			55			46.2		

**Qualifiers:**

J = estimated

J+ = estimated high

J- = estimated low

R = rejected

U = not detected above the RL

UJ = not detected above the RL, RL is estimated

**Abbreviations:**

mg/kg = milligrams per kilogram

NA = not analyzed

Qual = interpreted qualifier

RL = reporting limit

ug/kg = micrograms per kilogram

Checked by: DTP 2/14/14

Table 1  
Validated Analytical Results  
Module 4 Impoundment 13 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID		IMP 13-04			IMP 13-04			IMP 13-05			IMP 13-05			IMP 13-06		
Sample Date		11/20/2013			11/20/2013			11/20/2013			11/20/2013			11/19/2013		
N=Normal, FD=Field Duplicate		N			N			N			N			N		
Start Depth (in)		0			12			0			12			0		
End Depth (in)		12			24			12			24			12		
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
<b>Volatile Organic Compounds</b>																
Acetone	ug/kg	< 18	U	18	< 14	U	14	< 15	U	15	< 16	U	16	< 16	U	16
Benzene	ug/kg	< 1.8	U	1.8	1.5		1.4	< 1.5	U	1.5	2.5		1.6	< 1.6	U	1.6
Chlorobenzene	ug/kg	0.53	J	9.1	19		7	< 7.7	U	7.7	34.3		8.2	0.97	J	8.2
cis-1,2-Dichloroethene	ug/kg	< 9.1	U	9.1	< 7	U	7	< 7.7	U	7.7	< 8.2	U	8.2	< 8.2	U	8.2
Ethylbenzene	ug/kg	< 1.8	U	1.8	4.1		1.4	< 1.5	U	1.5	1.9		1.6	< 1.6	U	1.6
m,p-Xylenes	ug/kg	< 1.8	U	1.8	2.8		1.4	8.8		1.5	3.6		1.6	< 1.6	U	1.6
Methylene Chloride	ug/kg	< 9.1	U	9.1	< 7	U	7	< 7.7	U	7.7	< 8.2	U	8.2	< 8.2	U	8.2
o-Xylene	ug/kg	< 1.8	U	1.8	1.2	J	1.4	< 1.5	U	1.5	3.2		1.6	< 1.6	U	1.6
Tetrachloroethene	ug/kg	6.5	J	9.1	9.7		7	0.89	J	7.7	2.4	J	8.2	< 8.2	U	8.2
Toluene	ug/kg	< 1.8	U	1.8	4		1.4	< 1.5	U	1.5	6		1.6	0.51	J	1.6
Trichloroethene	ug/kg	< 9.1	U	9.1	< 7	U	7	< 7.7	U	7.7	< 8.2	U	8.2	< 8.2	U	8.2
<b>Semivolatile Organic Compounds</b>																
1,2,4-Trichlorobenzene	ug/kg	212		68	2090		150	54.6	J	68	3190		760	267		140
1,2-Dichlorobenzene	ug/kg	811		68	3150		150	326		68	24400		760	450		140
1,3-Dichlorobenzene	ug/kg	< 68	U	68	84.9	J	150	< 68	U	68	512	J	760	< 140	U	140
1,4-Dichlorobenzene	ug/kg	41.4	J	68	176		150	21.7	J	68	1400		760	< 140	U	140
2-Chloronaphthalene	ug/kg	313		68	2070		150	49.7	J	68	1390		760	227		140
2-Methylnaphthalene	ug/kg	819		68	3460		150	156		68	12400		760	586		140
Acenaphthene	ug/kg	910		34	5860		75	143		34	4790		380	822		72
Acenaphthylene	ug/kg	257		34	575		75	39		34	778		380	185		72
Aniline	ug/kg	9250		680	22600		3000	1780		68	114000		7600	5710		140
Anthracene	ug/kg	503		34	2210		75	108		34	10000		380	423		72
Benzo[a]anthracene	ug/kg	2630		34	8510		1500	529		34	60200		3800	1280		72
Benzo[a]pyrene	ug/kg	478		34	1540		1500	120		34	11500		3800	417		72
Benzo[b]fluoranthene	ug/kg	796		34	1640		75	184		34	11500		380	557		72
Benzo[g,h,i]perylene	ug/kg	18.7	J	34	777		75	50.3		34	3790		380	222		72
Benzo[k]fluoranthene	ug/kg	226		34	395		75	40.1		34	4380		380	171		72
Bis(2-ethylhexyl) Phthalate	ug/kg	366		68	939		150	58.2	J	68	< 760	U	760	< 140	U	140
Carbazole	ug/kg	156		68	651		150	38.6	J	68	2430		760	117	J	140
Chrysene	ug/kg	530		34	1090		75	106		34	9270		380	410		72
Dibenzo[a,h]anthracene	ug/kg	127		34	169		75	18	J	34	1730		380	72.4		72
Dibenzofuran	ug/kg	384		68	2180		150	77		68	2830		760	319		140
Dimethyl Phthalate	ug/kg	< 68	U	68	< 150	U	150	< 68	U	68	< 760	U	760	< 140	U	140
Di-n-Butyl Phthalate	ug/kg	51.7	J	68	107	J	150	< 68	U	68	463	J	760	< 140	U	140
Fluoranthene	ug/kg	830		34	2130		75	202		34	22700		380	798		72
Fluorene	ug/kg	254		34	1630		75	62.3		34	2900		380	226		72

Checked by: DTP 2/14/14

Table 1  
Validated Analytical Results  
Module 4 Impoundment 13 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID Sample Date N=Normal, FD=Field Duplicate Start Depth (in) End Depth (in)		IMP 13-04 11/20/2013 N 0 12			IMP 13-04 11/20/2013 N 12 24			IMP 13-05 11/20/2013 N 0 12			IMP 13-05 11/20/2013 N 12 24			IMP 13-06 11/19/2013 N 0 12		
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
Hexachlorobenzene	ug/kg	51.1	J	68	185		150	< 68	U	68	< 760	U	760	41	J	140
Indeno[1,2,3-cd]pyrene	ug/kg	254		34	439		75	41.4		34	3440		380	200		72
Naphthalene	ug/kg	8560		340	38700		1500	1880		34	145000		3800	4530		72
Nitrobenzene	ug/kg	550		68	2950		150	458		68	120000		7600	564		140
N-Nitrosodiphenylamine	ug/kg	2440		170	8360		7500	781		170	36700		1900	1350		360
Phenanthrene	ug/kg	982		34	3970		75	224		34	28100		380	836		72
Pyrene	ug/kg	827		34	2110		75	195		34	19500		380	730		72
Pyridine	ug/kg	< 68	U	68	< 150	U	150	< 68	U	68	1990		760	< 140	U	140
Polychlorinated Biphenyls																
Aroclor 1016	ug/kg	< 36	U	36	< 37	U	37	< 34	U	34	< 40	U	40	< 37	U	37
Aroclor 1221	ug/kg	< 36	U	36	< 37	U	37	< 34	U	34	< 40	U	40	< 37	U	37
Aroclor 1232	ug/kg	< 36	U	36	< 37	U	37	< 34	U	34	< 40	U	40	< 37	U	37
Aroclor 1242	ug/kg	< 36	U	36	< 37	U	37	< 34	U	34	< 40	U	40	< 37	U	37
Aroclor 1248	ug/kg	< 36	U	36	< 37	U	37	< 34	U	34	< 40	U	40	< 37	U	37
Aroclor 1254	ug/kg	< 36	U	36	< 37	U	37	< 34	U	34	< 40	U	40	< 37	U	37
Aroclor 1260	ug/kg	< 36	U	36	< 37	U	37	< 34	U	34	< 40	U	40	< 37	U	37
Aroclor 1262	ug/kg	< 36	U	36	< 37	U	37	< 34	U	34	< 40	U	40	< 37	U	37
Aroclor 1268	ug/kg	< 36	U	36	< 37	U	37	< 34	U	34	< 40	U	40	< 37	U	37
Metals																
Aluminum	mg/kg	14800	J+	56	11200	J+	62	15600	J+	55	9410	J+	61	11000		20
Antimony	mg/kg	2.7	J-	2.3	4.9	J-	2.5	1.6	J-	2.2	9.4	J-	2.4	2	J	1
Arsenic	mg/kg	15.7		2.3	15.6		2.5	5.8		2.2	22.5		2.4	6.3	J	1
Barium	mg/kg	238		23	405		25	119		22	646		24	218	J	5.1
Cadmium	mg/kg	7.5	J-	0.56	13.8	J-	1.2	1.3	J-	0.55	13.3	J-	1.2	5.1		0.4
Calcium	mg/kg	21500		560	13200		620	3720		550	22000		610	42400	J	510
Chromium	mg/kg	147		1.1	340	J	2.5	66.2		1.1	465	J	2.4	71.5	J	1
Cobalt	mg/kg	11.4		5.6	15.1		6.2	10.2		5.5	24.7		6.1	10.6		5.1
Copper	mg/kg	598		2.8	1530	J	6.2	376		2.8	8530		6.1	355		2.5
Iron	mg/kg	34700		56	61900		120	26300		55	76200		120	33200		100
Lead	mg/kg	233		2.3	597	J	4.9	101		2.2	1310	J	4.9	189	J	1
Manganese	mg/kg	491		1.7	622	J	3.7	513		1.7	821	J	3.7	492	J	1.5
Mercury	mg/kg	6.6		0.35	17.6		1.8	1.8		0.17	32.1		4	7.4		3.8
Nickel	mg/kg	85.6		4.5	152		4.9	38.1		4.4	229		4.9	42.4	J-	4
Selenium	mg/kg	< 2.3	U	2.3	< 4.9	UJ	4.9	< 2.2	U	2.2	0.89	J	4.9	< 1	U	1
Silver	mg/kg	2.5		0.56	4.9	J	1.2	2		0.55	5.1	J	1.2	0.22	J	0.51
Vanadium	mg/kg	44.3		5.6	54.9		6.2	33.1		5.5	53.3		6.1	31.4	J	1
Zinc	mg/kg	619		2.3	1540		2.5	328		2.2	3320		2.4	461	J	2

Checked by: DTP 2/14/14

Table 1  
Validated Analytical Results  
Module 4 Impoundment 13 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID	IMP 13-04	IMP 13-04			IMP 13-05			IMP 13-05			IMP 13-06					
Sample Date	11/20/2013	11/20/2013			11/20/2013			11/20/2013			11/19/2013					
N=Normal, FD=Field Duplicate	N	N			N			N			N					
Start Depth (in)	0	12			0			12			0					
End Depth (in)	12	24			12			24			12					
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL			
<b>General Chemistry Parameters</b>																
Cyanide	mg/kg	< 0.18	R	0.18	< 0.24	R	0.24	3.5	J-	0.2	0.87	J-	0.22	< 0.21	R	0.21
Ferrous Iron	%	NA			NA			NA			NA			NA		
Hexavalent Chromium	mg/kg	1		0.45	19.9		0.47	1.3		0.44	1.1		0.49	3.8	J-	0.47
Oxidation-Reduction Potential	millivolts	299		0	361		0	350		0	384		0	361		0
pH	pH units	7.78	J	0	7.27	J	0	7.35	J	0	7.26	J	0	7.94	J	0
Sulfate	mg/kg	187		110	6540		350	615		110	5250		240	< 120	U	120
Sulfide Screen	none	NA			NA			NA			NA			NA		
Sulfur	mg/kg	999		5.6	4240	J	12	555		5.5	5820	J	12	594		5.7
Total Organic Carbon	mg/kg	43800		110	117000		120	18600		110	160000		120	12900		120
<b>Grain Size</b>																
% GRAVEL	%	19.4			20.8			16.3			18			17.1		
% SAND	%	36.5			48.3			34.2			45.1			36.1		
% Silt, Clay, Colloids	%	44.2			30.9			49.5			36.9			46.8		

**Qualifiers:**

J = estimated

J+ = estimated high

J- = estimated low

R = rejected

U = not detected above the RL

UJ = not detected above the RL, RL is estimated

**Abbreviations:**

mg/kg = milligrams per kilogram

NA = not analyzed

Qual = interpreted qualifier

RL = reporting limit

ug/kg = micrograms per kilogram

Checked by: DTP 2/14/14

Table 1  
Validated Analytical Results  
Module 4 Impoundment 13 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID	IMP 13-06	IMP 13-07			IMP 13-07			IMP 13-08			IMP 13-08					
Sample Date	11/19/2013	11/19/2013			11/19/2013			11/19/2013			11/19/2013					
N=Normal, FD=Field Duplicate	N	N			N			N			N					
Start Depth (in)	12	0			12			0			12					
End Depth (in)	24	12			24			12			24					
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
<b>Volatile Organic Compounds</b>																
Acetone	ug/kg	< 11	U	11	< 12	U	12	< 2700	U	2700	< 16	U	16	< 19	U	19
Benzene	ug/kg	< 1.1	U	1.1	< 1.2	U	1.2	58.6	J	270	0.38	J	1.6	< 1.9	U	1.9
Chlorobenzene	ug/kg	< 5.3	U	5.3	0.31	J	6.2	514	J	1300	0.33	J	8.2	< 9.4	U	9.4
cis-1,2-Dichloroethene	ug/kg	< 5.3	U	5.3	< 6.2	U	6.2	< 1300	U	1300	< 8.2	U	8.2	< 9.4	U	9.4
Ethylbenzene	ug/kg	< 1.1	U	1.1	< 1.2	U	1.2	69	J	270	< 1.6	U	1.6	< 1.9	U	1.9
m,p-Xylenes	ug/kg	< 1.1	U	1.1	< 1.2	U	1.2	229	J	270	< 1.6	U	1.6	< 1.9	U	1.9
Methylene Chloride	ug/kg	< 5.3	U	5.3	< 6.2	U	6.2	< 1300	U	1300	3.8	J	8.2	< 9.4	U	9.4
o-Xylene	ug/kg	< 1.1	U	1.1	< 1.2	U	1.2	137	J	270	< 1.6	U	1.6	< 1.9	U	1.9
Tetrachloroethene	ug/kg	< 5.3	U	5.3	< 6.2	U	6.2	< 1300	U	1300	0.76	J	8.2	< 9.4	U	9.4
Toluene	ug/kg	< 1.1	U	1.1	0.52	J	1.2	851		270	1.1	J	1.6	< 1.9	U	1.9
Trichloroethene	ug/kg	< 5.3	U	5.3	< 6.2	U	6.2	< 1300	U	1300	< 8.2	U	8.2	< 9.4	U	9.4
<b>Semivolatile Organic Compounds</b>																
1,2,4-Trichlorobenzene	ug/kg	66.5	J	150	1080		150	2620		130	1020		350	691		180
1,2-Dichlorobenzene	ug/kg	99.6	J	150	1450		150	11200		2700	10600		350	1270		180
1,3-Dichlorobenzene	ug/kg	< 150	U	150	< 150	U	150	253		130	< 350	U	350	< 180	U	180
1,4-Dichlorobenzene	ug/kg	< 150	U	150	< 150	U	150	1160		130	442		350	< 180	U	180
2-Chloronaphthalene	ug/kg	79.6	J	150	863		150	724		130	329	J	350	6120		180
2-Methylnaphthalene	ug/kg	132	J	150	2830		150	4610		130	1720		350	1200		180
Acenaphthene	ug/kg	185		73	2910		74	5890		67	2960		170	2120		91
Acenaphthylene	ug/kg	56.8	J	73	439		74	685		67	402		170	399		91
Aniline	ug/kg	1390		150	13300		1500	15700		2700	9940		350	11800		910
Anthracene	ug/kg	116		73	1220		74	2210		67	2160		170	1720		91
Benzo[a]anthracene	ug/kg	337		73	3680		74	3850		67	4290		170	3940		91
Benzo[a]pyrene	ug/kg	129		73	1050		74	1160		67	1810		170	2590		91
Benzo[b]fluoranthene	ug/kg	182		73	1570		74	1530		67	3240		170	3540		91
Benzo[g,h,i]perylene	ug/kg	78.8		73	580		74	491		67	1460		170	1450		91
Benzo[k]fluoranthene	ug/kg	49.4	J	73	452		74	511		67	1340		170	1140		91
Bis(2-ethylhexyl) Phthalate	ug/kg	< 150	U	150	< 150	U	150	< 130	U	130	< 350	U	350	285		180
Carbazole	ug/kg	34.5	J	150	352		150	651		130	416		350	589		180
Chrysene	ug/kg	135		73	994		74	1150		67	2530		170	2550		91
Dibenzo[a,h]anthracene	ug/kg	< 73	U	73	159		74	170		67	422		170	496		91
Dibenzofuran	ug/kg	76.1	J	150	1180		150	2160		130	1070		350	850		180
Dimethyl Phthalate	ug/kg	< 150	U	150	< 150	U	150	< 130	U	130	< 350	U	350	< 180	U	180
Di-n-Butyl Phthalate	ug/kg	< 150	U	150	194		150	87	J	130	75.2	J	350	< 180	U	180
Fluoranthene	ug/kg	256		73	2140		74	2570		67	6440		170	5850		91
Fluorene	ug/kg	60.2	J	73	666		74	1480		67	791		170	809		91

Checked by: DTP 2/14/14

Table 1  
Validated Analytical Results  
Module 4 Impoundment 13 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID		IMP 13-06			IMP 13-07			IMP 13-07			IMP 13-08			IMP 13-08		
Sample Date		11/19/2013			11/19/2013			11/19/2013			11/19/2013			11/19/2013		
N=Normal, FD=Field Duplicate		N			N			N			N			N		
Start Depth (in)		12			0			12			0			12		
End Depth (in)		24			12			24			12			24		
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
Hexachlorobenzene	ug/kg	< 150	U	150	106	J	150	133		130	< 350	U	350	64.6	J	180
Indeno[1,2,3-cd]pyrene	ug/kg	64.7	J	73	507		74	503		67	1440		170	1350		91
Naphthalene	ug/kg	1390		73	16400		740	25900		1300	14800		350	7600		91
Nitrobenzene	ug/kg	< 150	U	150	1390		150	2010		130	1610		350	1060		180
N-Nitrosodiphenylamine	ug/kg	461		370	4890		370	7290		6700	3880		870	3080		460
Phenanthrene	ug/kg	247		73	2460		74	3790		67	4470		170	4630		91
Pyrene	ug/kg	229		73	2020		74	2590		67	4910		170	4720		91
Pyridine	ug/kg	< 150	U	150	< 150	U	150	< 130	U	130	< 350	U	350	< 180	U	180
Polychlorinated Biphenyls																
Aroclor 1016	ug/kg	< 37	U	37	< 36	U	36	< 38	U	38	< 36	U	36	< 48	U	48
Aroclor 1221	ug/kg	< 37	U	37	< 36	U	36	< 38	U	38	< 36	U	36	< 48	U	48
Aroclor 1232	ug/kg	< 37	U	37	< 36	U	36	< 38	U	38	< 36	U	36	< 48	U	48
Aroclor 1242	ug/kg	< 37	U	37	< 36	U	36	< 38	U	38	< 36	U	36	< 48	U	48
Aroclor 1248	ug/kg	< 37	U	37	< 36	U	36	< 38	U	38	< 36	U	36	< 48	U	48
Aroclor 1254	ug/kg	< 37	U	37	< 36	U	36	< 38	U	38	< 36	U	36	< 48	U	48
Aroclor 1260	ug/kg	< 37	U	37	< 36	U	36	< 38	U	38	< 36	U	36	< 48	U	48
Aroclor 1262	ug/kg	< 37	U	37	< 36	U	36	< 38	U	38	< 36	U	36	< 48	U	48
Aroclor 1268	ug/kg	< 37	U	37	< 36	U	36	< 38	U	38	< 36	U	36	< 48	U	48
Metals																
Aluminum	mg/kg	11200		18	11100		19	11200		20	10600		19	8170		26
Antimony	mg/kg	0.63	J	0.92	5.1	J	0.96	3.5	J	0.99	4.3	J	0.93	2.2	J	1.3
Arsenic	mg/kg	4.6	J	0.92	13.8	J	0.96	11.2	J	0.99	11.4	J	0.93	7.3	J	1.3
Barium	mg/kg	98.4	J	4.6	370	J	4.8	381	J	4.9	346	J	4.7	306	J	6.6
Cadmium	mg/kg	1.3		0.37	11.3		0.38	9.1		0.39	12.8		0.37	6.1		0.52
Calcium	mg/kg	16100	J	460	22400	J	480	15200	J	490	27500	J	470	121000	J	3300
Chromium	mg/kg	47.4	J	0.92	182	J	0.96	172	J	0.99	188	J	0.93	135	J	1.3
Cobalt	mg/kg	9.3		4.6	16.6		4.8	11.7		4.9	16.9		4.7	13.3		6.6
Copper	mg/kg	87.2		2.3	976		2.4	973		2.5	985		2.3	679		3.3
Iron	mg/kg	28800		92	68300		48	48200		49	62700		47	37700		66
Lead	mg/kg	54.8	J	0.92	399	J	0.96	429	J	0.99	489	J	0.93	308	J	1.3
Manganese	mg/kg	451	J	1.4	705	J	1.4	908	J	1.5	601	J	1.4	439	J	2
Mercury	mg/kg	2.3		0.36	17.3		3.5	10.1		3.7	23.8		3.6	10.1		4.5
Nickel	mg/kg	23.6	J-	3.7	114	J-	3.8	91.2	J-	3.9	130	J-	3.7	83.6	J-	5.2
Selenium	mg/kg	< 0.92	U	0.92	< 1.9	U	1.9	< 0.99	U	0.99	< 0.93	U	0.93	0.87	J	1.3
Silver	mg/kg	< 0.46	U	0.46	0.44	J	0.48	0.46	J	0.49	0.41	J	0.47	0.62	J	0.66
Vanadium	mg/kg	29.7	J	0.92	48.4	J	0.96	49.6	J	0.99	43	J	0.93	31.1	J	1.3
Zinc	mg/kg	156	J	1.8	1060	J	1.9	1000	J	2	1280	J	1.9	822	J	2.6

Checked by: DTP 2/14/14

Table 1  
Validated Analytical Results  
Module 4 Impoundment 13 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID	IMP 13-06	IMP 13-07	IMP 13-07	IMP 13-08	IMP 13-08											
Sample Date	11/19/2013	11/19/2013	11/19/2013	11/19/2013	11/19/2013											
N=Normal, FD=Field Duplicate	N	N	N	N	N											
Start Depth (in)	12	0	12	0	12											
End Depth (in)	24	12	24	12	24											
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
<b>General Chemistry Parameters</b>																
Cyanide	mg/kg	< 0.37	R	0.37	< 0.21	R	0.21	< 0.23	R	0.23	< 0.46	R	0.46	< 0.44	R	0.44
Ferrous Iron	%	NA			NA			NA			0.88	J	0.2	NA		
Hexavalent Chromium	mg/kg	1.7	J-	0.46	3.9	J-	0.45	3.3	J-	0.46	3.7	J-	0.45	5.3	J-	0.6
Oxidation-Reduction Potential	millivolts	340		0	372		0	376		0	371		0	359		0
pH	pH units	8.45	J	0	7.85	J	0	7.55	J	0	7.78	J	0	8.14	J	0
Sulfate	mg/kg	< 110	U	110	633		110	4600		230	< 110	U	110	339		150
Sulfide Screen	none	NA			NA			NA			NEGATIVE			NA		
Sulfur	mg/kg	250		5.8	2150	J	11	3920	J	12	1650	J	11	1720	J	9.7
Total Organic Carbon	mg/kg	6270		110	56200		110	81600		110	27700		110	17300		150
<b>Grain Size</b>																
% GRAVEL	%	9.9			15.7			16.2			10.2			30.9		
% SAND	%	42.3			47.2			60.6			47.5			22.7		
% Silt, Clay, Colloids	%	47.8			37.1			23.2			42.3			46.4		

**Qualifiers:**

J = estimated

J+ = estimated high

J- = estimated low

R = rejected

U = not detected above the RL

UJ = not detected above the RL, RL is estimated

**Abbreviations:**

mg/kg = milligrams per kilogram

NA = not analyzed

Qual = interpreted qualifier

RL = reporting limit

ug/kg = micrograms per kilogram

Checked by: DTP 2/14/14

Table 1  
Validated Analytical Results  
Module 4 Impoundment 13 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID	IMP 13-09	IMP 13-09	IMP 13-10	IMP 13-10	IMP 13-10											
Sample Date	11/15/2013	11/15/2013	11/19/2013	11/19/2013	11/19/2013											
N=Normal, FD=Field Duplicate	N	N	N	FD	N											
Start Depth (in)	0	12	0	0	12											
End Depth (in)	12	24	12	12	24											
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
<b>Volatile Organic Compounds</b>																
Acetone	ug/kg	< 17	U	17	< 16	U	16	< 11	U	11	< 12	U	12	105		13
Benzene	ug/kg	0.79	J	1.7	0.82	J	1.6	< 1.1	U	1.1	< 1.2	U	1.2	1.4		1.3
Chlorobenzene	ug/kg	0.47	J	8.3	1.2	J	8	< 5.7	U	5.7	< 6.1	U	6.1	1.7	J	6.3
cis-1,2-Dichloroethene	ug/kg	< 8.3	U	8.3	< 8	U	8	< 5.7	U	5.7	< 6.1	U	6.1	< 6.3	U	6.3
Ethylbenzene	ug/kg	< 1.7	U	1.7	0.64	J	1.6	< 1.1	U	1.1	< 1.2	U	1.2	0.29	J	1.3
m,p-Xylenes	ug/kg	0.96	J	1.7	1	J	1.6	< 1.1	U	1.1	< 1.2	U	1.2	1.7		1.3
Methylene Chloride	ug/kg	< 8.3	U	8.3	< 8	U	8	< 5.7	U	5.7	< 6.1	U	6.1	< 6.3	U	6.3
o-Xylene	ug/kg	0.46	J	1.7	0.68	J	1.6	< 1.1	U	1.1	< 1.2	U	1.2	0.83	J	1.3
Tetrachloroethene	ug/kg	0.95	J	8.3	2.6	J	8	< 5.7	U	5.7	< 6.1	U	6.1	1.8	J	6.3
Toluene	ug/kg	2		1.7	1.8		1.6	< 1.1	U	1.1	< 1.2	U	1.2	8.3		1.3
Trichloroethene	ug/kg	< 8.3	U	8.3	< 8	U	8	< 5.7	U	5.7	< 6.1	U	6.1	< 6.3	U	6.3
<b>Semivolatile Organic Compounds</b>																
1,2,4-Trichlorobenzene	ug/kg	748		140	3780		360	49.7	J	71	44	J	71	676		140
1,2-Dichlorobenzene	ug/kg	< 140	U	140	< 360	U	360	111		71	109		71	1130		140
1,3-Dichlorobenzene	ug/kg	< 140	U	140	< 360	U	360	< 71	U	71	< 71	U	71	< 140	U	140
1,4-Dichlorobenzene	ug/kg	< 140	U	140	< 360	U	360	< 71	U	71	< 71	U	71	< 140	U	140
2-Chloronaphthalene	ug/kg	< 140	U	140	< 360	U	360	61.7	J	71	51.6	J	71	647		140
2-Methylnaphthalene	ug/kg	< 140	U	140	< 360	U	360	237		71	284		71	2160		140
Acenaphthene	ug/kg	< 69	U	69	< 180	U	180	200		36	165		36	2070		70
Acenaphthylene	ug/kg	< 69	U	69	< 180	U	180	149		36	106		36	781		70
Aniline	ug/kg	7590		690	26000		3600	1190		71	1000		71	10600		1400
Anthracene	ug/kg	< 69	U	69	< 180	U	180	330		36	232		36	2030		70
Benzo[a]anthracene	ug/kg	< 69	U	69	< 180	U	180	1160	J	36	617	J	36	5400		70
Benzo[a]pyrene	ug/kg	< 69	U	69	< 180	U	180	732	J	36	379	J	36	3130		70
Benzo[b]fluoranthene	ug/kg	< 69	U	69	< 180	U	180	1080	J	36	572	J	36	3740		70
Benzo[g,h,i]perylene	ug/kg	< 69	U	69	< 180	U	180	434	J	36	221	J	36	1560		70
Benzo[k]fluoranthene	ug/kg	< 69	U	69	< 180	U	180	287	J	36	184	J	36	1410		70
Bis(2-ethylhexyl) Phthalate	ug/kg	< 140	U	140	< 360	U	360	62.6	J	71	86.6		71	353		140
Carbazole	ug/kg	< 140	U	140	< 360	U	360	97.8		71	65.1	J	71	843		140
Chrysene	ug/kg	< 69	U	69	< 180	U	180	879	J	36	525	J	36	3660		70
Dibenzo[a,h]anthracene	ug/kg	< 69	U	69	< 180	U	180	134	J	36	67.7	J	36	510		70
Dibenzofuran	ug/kg	< 140	U	140	< 360	U	360	163		71	164		71	1160		140
Dimethyl Phthalate	ug/kg	< 140	U	140	< 360	U	360	< 71	U	71	< 71	U	71	< 140	U	140
Di-n-Butyl Phthalate	ug/kg	< 140	U	140	< 360	U	360	< 71	U	71	< 71	U	71	< 140	U	140
Fluoranthene	ug/kg	< 69	U	69	< 180	U	180	1420	J	36	759	J	36	5620		70
Fluorene	ug/kg	< 69	U	69	< 180	U	180	119		36	124		36	1150		70

Checked by: DTP 2/14/14

Table 1  
Validated Analytical Results  
Module 4 Impoundment 13 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID	Sample Date	IMP 13-09			IMP 13-09			IMP 13-10			IMP 13-10			IMP 13-10		
		11/15/2013	11/15/2013	11/15/2013	11/15/2013	11/15/2013	11/15/2013	11/19/2013	11/19/2013	11/19/2013	11/19/2013	11/19/2013	11/19/2013	11/19/2013	11/19/2013	
N=Normal, FD=Field Duplicate		N	N	N	N	N	N	N	N	N	FD	FD	FD	N	N	
Start Depth (in)	End Depth (in)	0	12	12	0	24	0	12	12	0	12	12	0	12	24	
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
Hexachlorobenzene	ug/kg	< 140	U	140	< 360	U	360	< 71	U	71	< 71	U	71	103	J	140
Indeno[1,2,3-cd]pyrene	ug/kg	< 69	U	69	< 180	U	180	384	J	36	196	J	36	1430		70
Naphthalene	ug/kg	< 69	U	69	< 180	U	180	852		36	797		36	17300		700
Nitrobenzene	ug/kg	< 140	U	140	< 360	U	360	< 71	U	71	< 71	U	71	8500		1400
N-Nitrosodiphenylamine	ug/kg	< 340	U	340	< 900	U	900	461		180	401		180	25500		3500
Phenanthrene	ug/kg	< 69	U	69	< 180	U	180	1040		36	834		36	6470		70
Pyrene	ug/kg	< 69	U	69	< 180	U	180	1400	J	36	654	J	36	5630		70
Pyridine	ug/kg	< 140	U	140	290	J	360	< 71	U	71	< 71	U	71	< 140	U	140
Polychlorinated Biphenyls																
Aroclor 1016	ug/kg	< 40	U	40	< 40	U	40	< 36	U	36	< 35	U	35	< 35	U	35
Aroclor 1221	ug/kg	< 40	U	40	< 40	U	40	< 36	U	36	< 35	U	35	< 35	U	35
Aroclor 1232	ug/kg	< 40	U	40	< 40	U	40	< 36	U	36	< 35	U	35	< 35	U	35
Aroclor 1242	ug/kg	< 40	U	40	< 40	U	40	< 36	U	36	< 35	U	35	< 35	U	35
Aroclor 1248	ug/kg	< 40	U	40	< 40	U	40	< 36	U	36	< 35	U	35	< 35	U	35
Aroclor 1254	ug/kg	< 40	U	40	< 40	U	40	< 36	U	36	< 35	U	35	< 35	U	35
Aroclor 1260	ug/kg	< 40	U	40	< 40	U	40	< 36	U	36	< 35	U	35	< 35	U	35
Aroclor 1262	ug/kg	< 40	U	40	< 40	U	40	< 36	U	36	< 35	U	35	< 35	U	35
Aroclor 1268	ug/kg	< 40	U	40	< 40	U	40	< 36	U	36	< 35	U	35	< 35	U	35
Metals																
Aluminum	mg/kg	20900		62	6410		62	7620		19	6320		19	6880		19
Antimony	mg/kg	10		2.5	9.8		2.5	6.5	J	0.96	8	J	0.93	5.1	J	0.93
Arsenic	mg/kg	29.2		2.4	23.3		2	34.6	J	0.96	40.1	J	0.93	26.9	J	0.93
Barium	mg/kg	342		24	718		20	118	J	4.8	113	J	4.6	313	J	4.6
Cadmium	mg/kg	7.1		0.61	25.4	J	1.5	3.9		0.38	5.8		0.37	7.5		0.37
Calcium	mg/kg	5210		610	12200		490	1170	J	480	1330	J	460	7650	J	460
Chromium	mg/kg	364		1.2	376	J	2.9	199	J	0.96	224	J	0.93	165	J	0.93
Cobalt	mg/kg	11.7		6.1	15.5		4.9	30.6		4.8	33.2		4.6	19.5		4.6
Copper	mg/kg	785		3	2240	J	7.3	621		2.4	582		2.3	856		2.3
Iron	mg/kg	48400		62	48900		62	215000		96	238000		190	115000		93
Lead	mg/kg	964		2.4	1030	J	5.9	138	J	0.96	160	J	0.93	424	J	0.93
Manganese	mg/kg	648		1.9	490		1.9	922	J	1.4	896	J	1.4	733	J	1.4
Mercury	mg/kg	47.2		3.8	35.4		4.1	2.9		0.35	2.6		0.35	22.9		3.5
Nickel	mg/kg	82.2		5	106		5	241	J-	3.8	279	J-	3.7	159	J-	3.7
Selenium	mg/kg	2.5		2.5	3.8		2.5	< 4.8	U	4.8	< 4.6	U	4.6	< 9.3	U	9.3
Silver	mg/kg	1.6		0.61	3.1	J	1.5	< 0.48	U	0.48	< 2.3	U	2.3	0.21	J	0.46
Vanadium	mg/kg	47.4		6.2	41.1		6.2	61.2	J	0.96	66.3	J	0.93	49.1	J	0.93
Zinc	mg/kg	892		2.5	1830		2.5	142	J	1.9	158	J	1.9	884	J	1.9

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Table 1  
Validated Analytical Results  
Module 4 Impoundment 13 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID	IMP 13-09	IMP 13-09			IMP 13-10			IMP 13-10			IMP 13-10					
Sample Date	11/15/2013	11/15/2013			11/19/2013			11/19/2013			11/19/2013					
N=Normal, FD=Field Duplicate	N	N			N			FD			N					
Start Depth (in)	0	12			0			0			12					
End Depth (in)	12	24			12			12			24					
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
<b>General Chemistry Parameters</b>																
Cyanide	mg/kg	< 0.29	R	0.29	< 0.3	R	0.3	< 0.15	R	0.15	< 0.24	R	0.24	< 0.23	R	0.23
Ferrous Iron	%	2.4	J	0.2	NA			NA			NA			NA		
Hexavalent Chromium	mg/kg	7.6	J-	0.48	1.7	J-	0.5	1.8	J-	0.44	6.1	J-	0.45	4	J-	0.44
Oxidation-Reduction Potential	millivolts	383		0	376		0	398		0	385		0	346		0
pH	pH units	6.97	J	0	7.29	J	0	6.51	J	0	5.99	J	0	7.43	J	0
Sulfate	mg/kg	< 120	J-	120	247	J-	120	268		110	321		110	211		110
Sulfide Screen	none	NEGATIVE			NA			NA			NA			NA		
Sulfur	mg/kg	1840		5.9	3730		4.9	1560	J	29	1350	J	54	2300	J	17
Total Organic Carbon	mg/kg	70500		120	108000		130	90600		110	104000		110	101000		110
<b>Grain Size</b>																
% GRAVEL	%	16			17.6			6.4			NA			14.7		
% SAND	%	41.4			48.7			29.7			NA			41.3		
% Silt, Clay, Colloids	%	42.6			33.6			63.9			NA			44		

**Qualifiers:**

J = estimated

J+ = estimated high

J- = estimated low

R = rejected

U = not detected above the RL

UJ = not detected above the RL, RL is estimated

**Abbreviations:**

mg/kg = milligrams per kilogram

NA = not analyzed

Qual = interpreted qualifier

RL = reporting limit

ug/kg = micrograms per kilogram

Checked by: DTP 2/14/14

Table 2  
Validated Analytical Results  
Module 4 Impoundment 17 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID	IMP 17-01	IMP 17-01	IMP 17-02	IMP 17-02	IMP 17-03											
Sample Date	11/12/2013	11/12/2013	11/12/2013	11/12/2013	11/12/2013											
N=Normal, FD=Field Duplicate	N	N	N	N	N											
Start Depth (in)	0	12	0	12	0											
End Depth (in)	12	24	12	24	12											
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
<b>Volatile Organic Compounds</b>																
Acetone	ug/kg	10.2	J	21	< 68	UJ	68	< 50	UJ	50	< 70	UJ	70	< 44	UJ	44
Benzene	ug/kg	< 2.1	U	2.1	< 6.8	UJ	6.8	< 5	UJ	5	< 7	UJ	7	< 4.4	UJ	4.4
m,p-Xylenes	ug/kg	< 2.1	U	2.1	< 6.8	UJ	6.8	< 5	UJ	5	< 7	UJ	7	< 4.4	UJ	4.4
Methylene Chloride	ug/kg	< 11	U	11	< 34	UJ	34	< 25	UJ	25	< 35	UJ	35	< 22	UJ	22
o-Xylene	ug/kg	< 2.1	U	2.1	< 6.8	UJ	6.8	< 5	UJ	5	< 7	UJ	7	< 4.4	UJ	4.4
Toluene	ug/kg	< 2.1	U	2.1	< 6.8	UJ	6.8	< 5	UJ	5	< 7	UJ	7	< 4.4	UJ	4.4
<b>Semivolatile Organic Compounds</b>																
1,2,4-Trichlorobenzene	ug/kg	< 220	U	220	265	J	520	411	J	620	343	J	430	303	J	330
1,2-Dichlorobenzene	ug/kg	< 220	U	220	< 520	UJ	520	< 620	UJ	620	< 430	UJ	430	< 330	UJ	330
2-Chloronaphthalene	ug/kg	< 220	U	220	< 520	UJ	520	< 620	UJ	620	< 430	UJ	430	< 330	UJ	330
2-Methylnaphthalene	ug/kg	< 220	U	220	< 520	UJ	520	< 620	UJ	620	< 430	UJ	430	< 330	UJ	330
3,3'-Dichlorobenzidine	ug/kg	< 540	U	540	< 1300	UJ	1300	< 1500	UJ	1500	< 1100	UJ	1100	< 820	UJ	820
Acenaphthene	ug/kg	< 110	U	110	< 260	UJ	260	< 310	UJ	310	< 210	UJ	210	< 160	UJ	160
Acenaphthylene	ug/kg	< 110	U	110	< 260	UJ	260	< 310	UJ	310	< 210	UJ	210	< 160	UJ	160
Aniline	ug/kg	2430		220	5910	J	520	16700	J	620	13100	J	430	14800	J	330
Anthracene	ug/kg	< 110	U	110	< 260	UJ	260	< 310	UJ	310	< 210	UJ	210	< 160	UJ	160
Benzo[a]anthracene	ug/kg	< 110	U	110	< 260	UJ	260	< 310	UJ	310	< 210	UJ	210	< 160	UJ	160
Benzo[a]pyrene	ug/kg	< 110	U	110	< 260	UJ	260	< 310	UJ	310	< 210	UJ	210	< 160	UJ	160
Benzo[b]fluoranthene	ug/kg	< 110	U	110	< 260	UJ	260	< 310	UJ	310	< 210	UJ	210	< 160	UJ	160
Benzo[g,h,i]perylene	ug/kg	< 110	U	110	< 260	UJ	260	< 310	UJ	310	< 210	UJ	210	< 160	UJ	160
Benzo[k]fluoranthene	ug/kg	< 110	U	110	< 260	UJ	260	< 310	UJ	310	< 210	UJ	210	< 160	UJ	160
Bis(2-ethylhexyl) Phthalate	ug/kg	< 220	U	220	< 520	UJ	520	< 620	UJ	620	< 430	UJ	430	< 330	UJ	330
Chrysene	ug/kg	< 110	U	110	< 260	UJ	260	< 310	UJ	310	< 210	UJ	210	< 160	UJ	160
Dibenzo[a,h]anthracene	ug/kg	< 110	U	110	< 260	UJ	260	< 310	UJ	310	< 210	UJ	210	< 160	UJ	160
Fluoranthene	ug/kg	< 110	U	110	< 260	UJ	260	< 310	UJ	310	< 210	UJ	210	< 160	UJ	160
Fluorene	ug/kg	< 110	U	110	< 260	UJ	260	< 310	UJ	310	< 210	UJ	210	< 160	UJ	160
Hexachlorobenzene	ug/kg	< 220	U	220	< 520	UJ	520	< 620	UJ	620	< 430	UJ	430	< 330	UJ	330
Indeno[1,2,3-cd]pyrene	ug/kg	< 110	U	110	< 260	UJ	260	< 310	UJ	310	< 210	UJ	210	< 160	UJ	160
Naphthalene	ug/kg	< 110	U	110	< 260	UJ	260	< 310	UJ	310	< 210	UJ	210	< 160	UJ	160

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Table 2  
Validated Analytical Results  
Module 4 Impoundment 17 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID		IMP 17-01			IMP 17-01			IMP 17-02			IMP 17-02			IMP 17-03		
Sample Date		11/12/2013			11/12/2013			11/12/2013			11/12/2013			11/12/2013		
N=Normal, FD=Field Duplicate		N			N			N			N			N		
Start Depth (in)		0			12			0			12			0		
End Depth (in)		12			24			12			24			12		
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
N-Nitrosodiphenylamine	ug/kg	< 540	U	540	< 1300	UJ	1300	< 1500	UJ	1500	< 1100	UJ	1100	< 820	UJ	820
Phenanthrene	ug/kg	< 110	U	110	< 260	UJ	260	< 310	UJ	310	< 210	UJ	210	< 160	UJ	160
Pyrene	ug/kg	< 110	U	110	< 260	UJ	260	< 310	UJ	310	< 210	UJ	210	< 160	UJ	160
Pyridine	ug/kg	< 220	U	220	< 520	UJ	520	< 620	UJ	620	< 430	UJ	430	< 330	UJ	330
Polychlorinated Biphenyls																
Aroclor 1016	ug/kg	< 56	U	56	< 130	UJ	130	< 80	UJ	80	< 110	UJ	110	< 78	UJ	78
Aroclor 1221	ug/kg	< 56	U	56	< 130	UJ	130	< 80	UJ	80	< 110	UJ	110	< 78	UJ	78
Aroclor 1232	ug/kg	< 56	U	56	< 130	UJ	130	< 80	UJ	80	< 110	UJ	110	< 78	UJ	78
Aroclor 1242	ug/kg	< 56	U	56	< 130	UJ	130	< 80	UJ	80	< 110	UJ	110	< 78	UJ	78
Aroclor 1248	ug/kg	< 56	U	56	< 130	UJ	130	< 80	UJ	80	< 110	UJ	110	< 78	UJ	78
Aroclor 1254	ug/kg	< 56	U	56	< 130	UJ	130	< 80	UJ	80	< 110	UJ	110	< 78	UJ	78
Aroclor 1260	ug/kg	< 56	U	56	< 130	UJ	130	< 80	UJ	80	< 110	UJ	110	< 78	UJ	78
Aroclor 1262	ug/kg	< 56	U	56	< 130	UJ	130	< 80	UJ	80	< 110	UJ	110	< 78	UJ	78
Aroclor 1268	ug/kg	< 56	U	56	< 130	UJ	130	< 80	UJ	80	< 110	UJ	110	< 78	UJ	78
Metals																
Aluminum	mg/kg	29900		50	71100	J	50	89900	J	150	120000	J	100	101000	J	100
Antimony	mg/kg	3	J-	2	14.2	J-	2	13.7	J-	2	23.4	J-	2	16.8	J-	2
Arsenic	mg/kg	16.4		2	74.3	J	2	53.5	J	2	82.3	J	2	71	J	2
Barium	mg/kg	1420		20	4050	J	20	3700	J	59	9180	J	40	8520	J	40
Cadmium	mg/kg	1		0.5	2.2	J	0.5	3.6	J	1.5	3.9	J	1	3.5	J	1
Calcium	mg/kg	71400		500	34500	J	500	13300	J	490	21600	J	500	8630	J	500
Chromium	mg/kg	406	J	1	1170	J	1	2190	J	0.98	2340	J	1	2280	J	1
Cobalt	mg/kg	5	J-	5	7.3	J-	5	11.3	J-	4.9	11.2	J-	5	12.3	J-	5
Copper	mg/kg	471		2.5	1790	J	2.5	3000	J	7.3	3120	J	5	3100	J	5
Iron	mg/kg	17200		50	35900	J	50	55900	J	150	66100	J	100	74500	J	150
Lead	mg/kg	489		2	1490	J	2	2120	J	5.9	2790	J	4	2380	J	4
Manganese	mg/kg	1060		1.5	1100	J	1.5	1220	J	4.4	1470	J	3	1360	J	3
Mercury	mg/kg	20.9		4.4	90.1	J	8.4	117	J	5.9	163	J	8.5	123	J	5.7
Nickel	mg/kg	54	J-	4	77.8	J-	4	91.2	J-	3.9	97.7	J-	4	117	J-	4
Vanadium	mg/kg	98.5	J	5	86.7	J	5	56.8	J	4.9	83.6	J	5	71.8	J	5
Zinc	mg/kg	773	J	2	1640	J	2	2510	J	2	3160	J	2	2780	J	2

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Table 2  
Validated Analytical Results  
Module 4 Impoundment 17 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID	IMP 17-01	IMP 17-01	IMP 17-02	IMP 17-02	IMP 17-03											
Sample Date	11/12/2013	11/12/2013	11/12/2013	11/12/2013	11/12/2013											
N=Normal, FD=Field Duplicate	N	N	N	N	N											
Start Depth (in)	0	12	0	12	0											
End Depth (in)	12	24	12	24	12											
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
<b>General Chemistry Parameters</b>																
Cyanide	mg/kg	0.49	J-	0.4	1.7	J-	0.94	< 0.6	UJ	0.6	< 0.84	UJ	0.84	< 0.63	UJ	0.63
Ferrous Iron	%	NA			NA			2.6	J	0.2	NA			NA		
Hexavalent Chromium	mg/kg	2.6	J-	0.7	15.9	J-	1.6	14.3	J-	1	23.6	J-	1.4	37.1	J-	1
Oxidation-Reduction Potential	millivolts	190			231	J		356	J		341	J		324	J	
pH	pH units	9.51	J		8.96	J		7.8	J		7.93	J		7.59	J	
Sulfate	mg/kg	< 180	UJ	180	1030	J-	410	421	J-	250	679	J-	350	< 260	UJ	260
Sulfide Screen	none	NA			NA			NEGATIVE			NA			NA		
Sulfur	mg/kg	2690		5	5940	J	5	6190	J	4.9	8720	J	10	6810	J	10
Total Organic Carbon	mg/kg	18600		170	51800	J	410	99800	J	250	69500	J	350	104000	J	260
<b>Grain Size</b>																
% GRAVEL	%	0			< 4.2		4.2	0			0			0		
% SAND	%	73.9			87.9			77.2			88.5			74.9		
% Silt, Clay, Colloids	%	26.1			12.1			22.8			11.5			25.1		

**Qualifiers:**

J = estimated

J- = estimated low

R = rejected

U = not detected above the RL

UJ = not detected above the RL, RL is estimated

**Abbreviations:**

mg/kg = milligrams per kilogram

NA = not analyzed

Qual = interpreted qualifier

RL = reporting limit

ug/kg = micrograms per kilogram

Checked by: DPT 2/14/14

Table 2  
Validated Analytical Results  
Module 4 Impoundment 17 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID	IMP 17-03	IMP 17-04	IMP 17-04	IMP 17-05	IMP 17-05											
Sample Date	11/12/2013	11/13/2013	11/13/2013	11/12/2013	11/12/2013											
N=Normal, FD=Field Duplicate	N	N	N	N	N											
Start Depth (in)	12	0	12	0	12											
End Depth (in)	24	12	24	12	24											
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
<b>Volatile Organic Compounds</b>																
Acetone	ug/kg	< 66	UJ	66	< 50	UJ	50	< 65	UJ	65	38.8	J	51	< 88	UJ	88
Benzene	ug/kg	< 6.6	UJ	6.6	< 5	UJ	5	< 6.5	UJ	6.5	< 5.1	UJ	5.1	< 8.8	UJ	8.8
m,p-Xylenes	ug/kg	< 6.6	UJ	6.6	< 5	UJ	5	< 6.5	UJ	6.5	< 5.1	UJ	5.1	< 8.8	UJ	8.8
Methylene Chloride	ug/kg	< 33	UJ	33	< 25	UJ	25	< 33	UJ	33	< 26	UJ	26	< 44	UJ	44
o-Xylene	ug/kg	< 6.6	UJ	6.6	< 5	UJ	5	< 6.5	UJ	6.5	< 5.1	UJ	5.1	< 8.8	UJ	8.8
Toluene	ug/kg	< 6.6	UJ	6.6	< 5	UJ	5	< 6.5	UJ	6.5	< 5.1	UJ	5.1	< 8.8	UJ	8.8
<b>Semivolatile Organic Compounds</b>																
1,2,4-Trichlorobenzene	ug/kg	290	J	470	304	J	340	291	J	460	338	J	800	266	J	1200
1,2-Dichlorobenzene	ug/kg	< 470	UJ	470	< 340	UJ	340	< 460	UJ	460	< 800	UJ	800	< 1200	UJ	1200
2-Chloronaphthalene	ug/kg	< 470	UJ	470	85.8	J	340	< 460	UJ	460	< 800	UJ	800	< 1200	UJ	1200
2-Methylnaphthalene	ug/kg	< 470	UJ	470	< 340	UJ	340	< 460	UJ	460	< 800	UJ	800	< 1200	UJ	1200
3,3'-Dichlorobenzidine	ug/kg	8020	J	470	< 850	UJ	850	< 1200	UJ	1200	3200	J	800	2610	J	1200
Acenaphthene	ug/kg	< 230	UJ	230	< 170	UJ	170	< 230	UJ	230	< 400	UJ	400	< 580	UJ	580
Acenaphthylene	ug/kg	< 230	UJ	230	< 170	UJ	170	< 230	UJ	230	< 400	UJ	400	< 580	UJ	580
Aniline	ug/kg	7920	J	470	13900	J	340	15100	J	460	7520	J	800	6100	J	1200
Anthracene	ug/kg	< 230	UJ	230	69.8	J	170	< 230	UJ	230	< 400	UJ	400	< 580	UJ	580
Benzo[a]anthracene	ug/kg	< 230	UJ	230	< 170	UJ	170	< 230	UJ	230	< 400	UJ	400	< 580	UJ	580
Benzo[a]pyrene	ug/kg	< 230	UJ	230	196	J	170	143	J	230	< 400	UJ	400	< 580	UJ	580
Benzo[b]fluoranthene	ug/kg	< 230	UJ	230	473	J	170	337	J	230	< 400	UJ	400	< 580	UJ	580
Benzo[g,h,i]perylene	ug/kg	< 230	UJ	230	107	J	170	< 230	UJ	230	< 400	UJ	400	< 580	UJ	580
Benzo[k]fluoranthene	ug/kg	< 230	UJ	230	93.1	J	170	< 230	UJ	230	< 400	UJ	400	< 580	UJ	580
Bis(2-ethylhexyl) Phthalate	ug/kg	< 470	UJ	470	244	J	340	302	J	460	< 800	UJ	800	< 1200	UJ	1200
Chrysene	ug/kg	< 230	UJ	230	< 170	UJ	170	< 230	UJ	230	< 400	UJ	400	< 580	UJ	580
Dibenzo[a,h]anthracene	ug/kg	< 230	UJ	230	< 170	UJ	170	< 230	UJ	230	< 400	UJ	400	< 580	UJ	580
Fluoranthene	ug/kg	113	J	230	135	J	170	< 230	UJ	230	< 400	UJ	400	< 580	UJ	580
Fluorene	ug/kg	< 230	UJ	230	< 170	UJ	170	< 230	UJ	230	< 400	UJ	400	< 580	UJ	580
Hexachlorobenzene	ug/kg	595	J	470	564	J	340	529	J	460	618	J	800	585	J	1200
Indeno[1,2,3-cd]pyrene	ug/kg	< 230	UJ	230	93.4	J	170	< 230	UJ	230	< 400	UJ	400	< 580	UJ	580
Naphthalene	ug/kg	509	J	230	653	J	170	600	J	230	509	J	400	442	J	580

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Table 2  
Validated Analytical Results  
Module 4 Impoundment 17 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID Sample Date N=Normal, FD=Field Duplicate Start Depth (in) End Depth (in)		IMP 17-03 11/12/2013 N 12 24			IMP 17-04 11/13/2013 N 0 12			IMP 17-04 11/13/2013 N 12 24			IMP 17-05 11/12/2013 N 0 12			IMP 17-05 11/12/2013 N 12 24		
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
N-Nitrosodiphenylamine	ug/kg	2650	J	1200	2620	J	850	2640	J	1200	1680	J	2000	2040	J	2900
Phenanthrene	ug/kg	< 230	UJ	230	112	J	170	< 230	UJ	230	< 400	UJ	400	< 580	UJ	580
Pyrene	ug/kg	124	J	230	133	J	170	< 230	UJ	230	< 400	UJ	400	< 580	UJ	580
Pyridine	ug/kg	< 470	UJ	470	< 340	UJ	340	< 460	UJ	460	< 800	UJ	800	< 1200	UJ	1200
Polychlorinated Biphenyls																
Aroclor 1016	ug/kg	< 120	UJ	120	< 85	UJ	85	< 120	UJ	120	< 87	UJ	87	< 120	UJ	120
Aroclor 1221	ug/kg	< 120	UJ	120	< 85	UJ	85	< 120	UJ	120	< 87	UJ	87	< 120	UJ	120
Aroclor 1232	ug/kg	< 120	UJ	120	< 85	UJ	85	< 120	UJ	120	< 87	UJ	87	< 120	UJ	120
Aroclor 1242	ug/kg	< 120	UJ	120	< 85	UJ	85	< 120	UJ	120	< 87	UJ	87	< 120	UJ	120
Aroclor 1248	ug/kg	< 120	UJ	120	< 85	UJ	85	< 120	UJ	120	< 87	UJ	87	< 120	UJ	120
Aroclor 1254	ug/kg	< 120	UJ	120	< 85	UJ	85	< 120	UJ	120	< 87	UJ	87	< 120	UJ	120
Aroclor 1260	ug/kg	< 120	UJ	120	< 85	UJ	85	< 120	UJ	120	< 87	UJ	87	< 120	UJ	120
Aroclor 1262	ug/kg	< 120	UJ	120	< 85	UJ	85	< 120	UJ	120	< 87	UJ	87	< 120	UJ	120
Aroclor 1268	ug/kg	< 120	UJ	120	< 85	UJ	85	< 120	UJ	120	< 87	UJ	87	< 120	UJ	120
Metals																
Aluminum	mg/kg	115000	J	99	94000	J	22	133000	J	31	108000	J	100	116000	J	100
Antimony	mg/kg	21.6	J-	2	16.4	J-	1.1	21.9	J-	1.5	20	J-	2	21.7	J-	2
Arsenic	mg/kg	68.7	J	2	67	J	1.1	68	J	1.5	55.3	J	2	68.2	J	2
Barium	mg/kg	7860	J	40	3020	J	27	6740	J	77	7460	J	41	5330	J	40
Cadmium	mg/kg	3.8	J	0.99	3.2	J	0.44	4.2	J	0.62	3.7	J	1	3.9	J	1
Calcium	mg/kg	21100	J	500	7560	J-	540	12700	J-	770	11000	J	510	19800	J	500
Chromium	mg/kg	2200	J	0.99	2370	J	5.4	2690	J	15	2800	J	1	2440	J	1
Cobalt	mg/kg	12.6	J-	5	16.6	J	5.4	12.1	J	7.7	12.9	J-	5.1	12.1	J-	5
Copper	mg/kg	3020	J	5	2920	J	14	3080	J	38	3940	J	5.1	3440	J	5
Iron	mg/kg	87100	J	99	102000	J	54	73500	J	150	81800	J	250	79200	J	250
Lead	mg/kg	2770	J	4	2200	J	5.4	3260	J	15	2730	J	4.1	2840	J	4
Manganese	mg/kg	1720	J	3	1130	J	1.6	1190	J	2.3	1150	J	3.1	1370	J	3
Mercury	mg/kg	162	J	8.1	141	J	7.8	164	J	12	112	J	5.5	151	J	8.1
Nickel	mg/kg	111	J-	4	165	J-	4.4	96	J-	6.2	123	J-	4.1	119	J-	4
Vanadium	mg/kg	82.6	J	5	59.2	J	1.1	73.4	J	1.5	66.3	J	5.1	78.2	J	5
Zinc	mg/kg	2980	J	2	2820	J	11	3890	J	31	3230	J-	2	3150	J	2

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Table 2  
Validated Analytical Results  
Module 4 Impoundment 17 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID	IMP 17-03	IMP 17-04	IMP 17-04	IMP 17-05	IMP 17-05											
Sample Date	11/12/2013	11/13/2013	11/13/2013	11/12/2013	11/12/2013											
N=Normal, FD=Field Duplicate	N	N	N	N	N											
Start Depth (in)	12	0	12	0	12											
End Depth (in)	24	12	24	12	24											
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
<b>General Chemistry Parameters</b>																
Cyanide	mg/kg	< 0.83	UJ	0.83	< 0.58	R	0.58	< 0.86	R	0.86	< 0.64	UJ	0.64	< 0.84	UJ	0.84
Ferrous Iron	%	NA			NA			NA			2.1	J	0.2	NA		
Hexavalent Chromium	mg/kg	68.1	J-	1.5	7.4	J-	1	34.4	J-	1.5	51.1	J-	1.1	48.9	J-	1.5
Oxidation-Reduction Potential	millivolts	321	J		291	J		306	J		306	J		308	J	
pH	pH units	7.87	J		7.55	J		7.88	J		7.61	J		7.84	J	
Sulfate	mg/kg	555	J-	380	362	J	260	644	J	360	340	J	270	885	J-	370
Sulfide Screen	none	NA			NA			NA			NEGATIVE			NA		
Sulfur	mg/kg	8060	J	9.9	7350	J	24	8010	J	10	8010	J	10	8020	J	10
Total Organic Carbon	mg/kg	88200	J	380	88500	J	260	60700	J	370	99200	J	270	76100	J	370
<b>Grain Size</b>																
% GRAVEL	%	0			0			0			0			3.2		
% SAND	%	89.7			73.8			86.9			99.4			90.5		
% Silt, Clay, Colloids	%	10.3			26.2			13.1			0.56			6.3		

**Qualifiers:**

J = estimated

J- = estimated low

R = rejected

U = not detected above the RL

UJ = not detected above the RL, RL is estimated

**Abbreviations:**

mg/kg = milligrams per kilogram

NA = not analyzed

Qual = interpreted qualifier

RL = reporting limit

ug/kg = micrograms per kilogram

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Table 2  
Validated Analytical Results  
Module 4 Impoundment 17 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID	IMP 17-06	IMP 17-06	IMP 17-07	IMP 17-07	IMP 17-08											
Sample Date	11/12/2013	11/12/2013	11/12/2013	11/12/2013	11/13/2013											
N=Normal, FD=Field Duplicate	N	N	N	N	N											
Start Depth (in)	0	12	0	12	0											
End Depth (in)	12	24	12	24	12											
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
<b>Volatile Organic Compounds</b>																
Acetone	ug/kg	< 48	UJ	48	< 75	UJ	75	< 49	UJ	49	< 86	UJ	86	< 71	UJ	71
Benzene	ug/kg	< 4.8	UJ	4.8	< 7.5	UJ	7.5	< 4.9	UJ	4.9	< 8.6	UJ	8.6	< 7.1	UJ	7.1
m,p-Xylenes	ug/kg	< 4.8	UJ	4.8	< 7.5	UJ	7.5	< 4.9	UJ	4.9	< 8.6	UJ	8.6	< 7.1	UJ	7.1
Methylene Chloride	ug/kg	< 24	UJ	24	< 38	UJ	38	< 25	UJ	25	< 43	UJ	43	< 35	UJ	35
o-Xylene	ug/kg	< 4.8	UJ	4.8	< 7.5	UJ	7.5	< 4.9	UJ	4.9	< 8.6	UJ	8.6	< 7.1	UJ	7.1
Toluene	ug/kg	< 4.8	UJ	4.8	< 7.5	UJ	7.5	< 4.9	UJ	4.9	< 8.6	UJ	8.6	< 7.1	UJ	7.1
<b>Semivolatile Organic Compounds</b>																
1,2,4-Trichlorobenzene	ug/kg	324	J	800	407	J	1100	766	J	880	659	J	1300	1000	J	940
1,2-Dichlorobenzene	ug/kg	< 800	UJ	800	< 1100	UJ	1100	< 880	UJ	880	< 1300	UJ	1300	< 940	UJ	940
2-Chloronaphthalene	ug/kg	< 800	UJ	800	< 1100	UJ	1100	< 880	UJ	880	< 1300	UJ	1300	< 940	UJ	940
2-Methylnaphthalene	ug/kg	< 800	UJ	800	< 1100	UJ	1100	< 880	UJ	880	< 1300	UJ	1300	< 940	UJ	940
3,3'-Dichlorobenzidine	ug/kg	3640	J	800	4040	J	1100	9890	J	880	6340	J	1300	< 940	UJ	940
Acenaphthene	ug/kg	< 400	UJ	400	< 530	UJ	530	< 440	UJ	440	< 640	UJ	640	< 470	UJ	470
Acenaphthylene	ug/kg	< 400	UJ	400	< 530	UJ	530	< 440	UJ	440	< 640	UJ	640	< 470	UJ	470
Aniline	ug/kg	9150	J	800	7830	J	1100	20600	J	880	15800	J	1300	34700	J	940
Anthracene	ug/kg	< 400	UJ	400	< 530	UJ	530	< 440	UJ	440	< 640	UJ	640	< 470	UJ	470
Benzo[a]anthracene	ug/kg	< 400	UJ	400	< 530	UJ	530	< 440	UJ	440	< 640	UJ	640	< 470	UJ	470
Benzo[a]pyrene	ug/kg	< 400	UJ	400	< 530	UJ	530	< 440	UJ	440	< 640	UJ	640	< 470	UJ	470
Benzo[b]fluoranthene	ug/kg	< 400	UJ	400	< 530	UJ	530	< 440	UJ	440	< 640	UJ	640	< 470	UJ	470
Benzo[g,h,i]perylene	ug/kg	< 400	UJ	400	< 530	UJ	530	< 440	UJ	440	< 640	UJ	640	< 470	UJ	470
Benzo[k]fluoranthene	ug/kg	< 400	UJ	400	< 530	UJ	530	< 440	UJ	440	< 640	UJ	640	< 470	UJ	470
Bis(2-ethylhexyl) Phthalate	ug/kg	< 800	UJ	800	< 1100	UJ	1100	< 880	UJ	880	< 1300	UJ	1300	< 940	UJ	940
Chrysene	ug/kg	< 400	UJ	400	< 530	UJ	530	< 440	UJ	440	< 640	UJ	640	< 470	UJ	470
Dibenzo[a,h]anthracene	ug/kg	< 400	UJ	400	< 530	UJ	530	< 440	UJ	440	< 640	UJ	640	< 470	UJ	470
Fluoranthene	ug/kg	< 400	UJ	400	< 530	UJ	530	< 440	UJ	440	< 640	UJ	640	< 470	UJ	470
Fluorene	ug/kg	< 400	UJ	400	< 530	UJ	530	< 440	UJ	440	< 640	UJ	640	< 470	UJ	470
Hexachlorobenzene	ug/kg	820	J	800	711	J	1100	1150	J	880	1240	J	1300	1340	J	940
Indeno[1,2,3-cd]pyrene	ug/kg	< 400	UJ	400	< 530	UJ	530	< 440	UJ	440	< 640	UJ	640	< 470	UJ	470
Naphthalene	ug/kg	544	J	400	666	J	530	1110	J	440	1100	J	640	1290	J	470

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Table 2  
Validated Analytical Results  
Module 4 Impoundment 17 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID Sample Date N=Normal, FD=Field Duplicate Start Depth (in) End Depth (in)		IMP 17-06 11/12/2013 N 0 12			IMP 17-06 11/12/2013 N 12 24			IMP 17-07 11/12/2013 N 0 12			IMP 17-07 11/12/2013 N 12 24			IMP 17-08 11/13/2013 N 0 12		
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
N-Nitrosodiphenylamine	ug/kg	< 2000	UJ	2000	3130	J	2700	5160	J	2200	5600	J	3200	4910	J	2300
Phenanthrene	ug/kg	< 400	UJ	400	< 530	UJ	530	< 440	UJ	440	< 640	UJ	640	< 470	UJ	470
Pyrene	ug/kg	< 400	UJ	400	< 530	UJ	530	< 440	UJ	440	< 640	UJ	640	< 470	UJ	470
Pyridine	ug/kg	< 800	UJ	800	< 1100	UJ	1100	< 880	UJ	880	< 1300	UJ	1300	< 940	UJ	940
Polychlorinated Biphenyls																
Aroclor 1016	ug/kg	< 84	UJ	84	< 110	UJ	110	< 90	UJ	90	< 140	UJ	140	< 97	UJ	97
Aroclor 1221	ug/kg	< 84	UJ	84	< 110	UJ	110	< 90	UJ	90	< 140	UJ	140	< 97	UJ	97
Aroclor 1232	ug/kg	< 84	UJ	84	< 110	UJ	110	< 90	UJ	90	< 140	UJ	140	< 97	UJ	97
Aroclor 1242	ug/kg	< 84	UJ	84	< 110	UJ	110	< 90	UJ	90	< 140	UJ	140	< 97	UJ	97
Aroclor 1248	ug/kg	< 84	UJ	84	< 110	UJ	110	< 90	UJ	90	< 140	UJ	140	< 97	UJ	97
Aroclor 1254	ug/kg	< 84	UJ	84	< 110	UJ	110	< 90	UJ	90	< 140	UJ	140	< 97	UJ	97
Aroclor 1260	ug/kg	< 84	UJ	84	< 110	UJ	110	< 90	UJ	90	< 140	UJ	140	< 97	UJ	97
Aroclor 1262	ug/kg	< 84	UJ	84	< 110	UJ	110	< 90	UJ	90	< 140	UJ	140	< 97	UJ	97
Aroclor 1268	ug/kg	< 84	UJ	84	< 110	UJ	110	< 90	UJ	90	< 140	UJ	140	< 97	UJ	97
Metals																
Aluminum	mg/kg	103000	J	100	106000	J	100	93000	J	99	118000	J	100	81600	J	25
Antimony	mg/kg	16.3	J-	2	16.3	J-	2	16.2	J-	2	24.1	J-	2	13.5	J-	1.3
Arsenic	mg/kg	62.3	J	2	62	J	2	68.6	J	2	87.2	J	2	47.5	J	1.3
Barium	mg/kg	2830	J	40	5880	J	41	3720	J	39	7580	J	40	3860	J	64
Cadmium	mg/kg	4	J	1	3.2	J	1	3.6	J	0.99	3.7	J	1	3.1	J	0.51
Calcium	mg/kg	10700	J	500	28200	J	510	29500	J	490	25000	J	500	20700	J-	640
Chromium	mg/kg	2510	J	1	1810	J	1	2220	J	0.99	2180	J	1	2460	J	13
Cobalt	mg/kg	12.3	J-	5	10	J-	5.1	10.3	J-	4.9	10.6	J-	5	12.3	J	6.4
Copper	mg/kg	3430	J	5	2220	J	5.1	3050	J	4.9	2950	J	5	3090	J	32
Iron	mg/kg	64300	J	100	51000	J	100	52500	J	99	80900	J	100	58800	J	130
Lead	mg/kg	2430	J	4	2170	J	4.1	2180	J	3.9	2730	J	4	2160	J	13
Manganese	mg/kg	1130	J	3	1420	J	3	1280	J	3	1390	J	3	1200	J	1.9
Mercury	mg/kg	117	J	5.9	122	J	8	104	J	6.6	153	J	9.4	88.8	J	9.8
Nickel	mg/kg	105	J-	4	80.3	J-	4.1	87.9	J-	3.9	91.2	J-	4	96.5	J-	5.1
Vanadium	mg/kg	67.4	J	5	84.6	J	5.1	63.9	J	4.9	88.6	J	5	49.7	J	1.3
Zinc	mg/kg	2920	J	2	2590	J	2	2690	J	2	2980	J	2	2930	J	25

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Table 2  
Validated Analytical Results  
Module 4 Impoundment 17 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID	IMP 17-06	IMP 17-06	IMP 17-07	IMP 17-07	IMP 17-08											
Sample Date	11/12/2013	11/12/2013	11/12/2013	11/12/2013	11/13/2013											
N=Normal, FD=Field Duplicate	N	N	N	N	N											
Start Depth (in)	0	12	0	12	0											
End Depth (in)	12	24	12	24	12											
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
<b>General Chemistry Parameters</b>																
Cyanide	mg/kg	1.1	J-	0.57	< 0.79	UJ	0.79	1.1	J-	0.62	1.6	J-	0.95	< 0.7	R	0.7
Ferrous Iron	%	NA			NA			NA			NA			NA		
Hexavalent Chromium	mg/kg	10.3	J-	1	40.3	J-	1.4	31.2	J-	1.1	64.9	J-	1.7	17.3	J-	1.2
Oxidation-Reduction Potential	millivolts	361	J		295	J		326	J		320	J		345	J	
pH	pH units	7.42	J		7.81	J		7.96	J		8.04	J		7.71	J	
Sulfate	mg/kg	403	J-	260	616	J-	350	434	J-	290	623	J-	410	403	J	300
Sulfide Screen	none	NA			NA			NA			NA			NA		
Sulfur	mg/kg	6260	J	5	7880	J	5.1	7520	J	4.9	8390	J	10	6040	J	9.9
Total Organic Carbon	mg/kg	81200	J	260	67300	J	350	82800	J	290	63400	J	410	86200	J	300
<b>Grain Size</b>																
% GRAVEL	%	0			1.3			0			5.6			0		
% SAND	%	63.1			96.8			73.1			89.1			62.7		
% Silt, Clay, Colloids	%	36.9			1.9			26.9			5.2			37.4		

**Qualifiers:**

J = estimated

J- = estimated low

R = rejected

U = not detected above the RL

UJ = not detected above the RL, RL is estimated

**Abbreviations:**

mg/kg = milligrams per kilogram

NA = not analyzed

Qual = interpreted qualifier

RL = reporting limit

ug/kg = micrograms per kilogram

Checked by: DPT 2/14/14

Table 2  
Validated Analytical Results  
Module 4 Impoundment 17 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID	IMP 17-08	IMP 17-09	IMP 17-09	IMP 17-10	IMP 17-10											
Sample Date	11/13/2013	11/13/2013	11/13/2013	11/13/2013	11/13/2013											
N=Normal, FD=Field Duplicate	N	N	N	N	N											
Start Depth (in)	12	0	12	0	12											
End Depth (in)	24	12	24	12	24											
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
<b>Volatile Organic Compounds</b>																
Acetone	ug/kg	< 69	UJ	69	9780	J	3200	< 80	UJ	80	125	J	49	1780	J	140
Benzene	ug/kg	< 6.9	UJ	6.9	< 4.8	UJ	4.8	< 8	UJ	8	< 4.9	UJ	4.9	< 14	UJ	14
m,p-Xylenes	ug/kg	< 6.9	UJ	6.9	< 4.8	UJ	4.8	< 8	UJ	8	< 4.9	UJ	4.9	< 14	UJ	14
Methylene Chloride	ug/kg	< 34	UJ	34	< 24	UJ	24	< 40	UJ	40	< 24	UJ	24	< 71	UJ	71
o-Xylene	ug/kg	< 6.9	UJ	6.9	< 4.8	UJ	4.8	< 8	UJ	8	< 4.9	UJ	4.9	< 14	UJ	14
Toluene	ug/kg	< 6.9	UJ	6.9	< 4.8	UJ	4.8	< 8	UJ	8	< 4.9	UJ	4.9	< 14	UJ	14
<b>Semivolatile Organic Compounds</b>																
1,2,4-Trichlorobenzene	ug/kg	442	J	1000	740	J	840	154	J	510	304	J	360	284	J	810
1,2-Dichlorobenzene	ug/kg	< 1000	UJ	1000	< 840	UJ	840	< 510	UJ	510	< 360	UJ	360	< 810	UJ	810
2-Chloronaphthalene	ug/kg	< 1000	UJ	1000	< 840	UJ	840	< 510	UJ	510	< 360	UJ	360	< 810	UJ	810
2-Methylnaphthalene	ug/kg	< 1000	UJ	1000	< 840	UJ	840	< 510	UJ	510	< 360	UJ	360	< 810	UJ	810
3,3'-Dichlorobenzidine	ug/kg	< 1000	UJ	1000	< 840	UJ	840	< 510	UJ	510	< 900	UJ	900	< 2000	UJ	2000
Acenaphthene	ug/kg	< 520	UJ	520	< 420	UJ	420	< 250	UJ	250	< 180	UJ	180	< 410	UJ	410
Acenaphthylene	ug/kg	< 520	UJ	520	< 420	UJ	420	< 250	UJ	250	< 180	UJ	180	< 410	UJ	410
Aniline	ug/kg	19000	J	1000	31400	J	840	7250	J	510	9120	J	360	10500	J	810
Anthracene	ug/kg	< 520	UJ	520	< 420	UJ	420	< 250	UJ	250	< 180	UJ	180	< 410	UJ	410
Benzo[a]anthracene	ug/kg	< 520	UJ	520	< 420	UJ	420	1650	J	250	< 180	UJ	180	< 410	UJ	410
Benzo[a]pyrene	ug/kg	< 520	UJ	520	< 420	UJ	420	< 250	UJ	250	141	J	180	< 410	UJ	410
Benzo[b]fluoranthene	ug/kg	< 520	UJ	520	< 420	UJ	420	412	J	250	360	J	180	362	J	410
Benzo[g,h,i]perylene	ug/kg	< 520	UJ	520	< 420	UJ	420	< 250	UJ	250	75.9	J	180	< 410	UJ	410
Benzo[k]fluoranthene	ug/kg	< 520	UJ	520	< 420	UJ	420	< 250	UJ	250	80.9	J	180	< 410	UJ	410
Bis(2-ethylhexyl) Phthalate	ug/kg	< 1000	UJ	1000	< 840	UJ	840	< 510	UJ	510	< 360	UJ	360	542	J	810
Chrysene	ug/kg	< 520	UJ	520	< 420	UJ	420	< 250	UJ	250	< 180	UJ	180	< 410	UJ	410
Dibenzo[a,h]anthracene	ug/kg	< 520	UJ	520	< 420	UJ	420	< 250	UJ	250	< 180	UJ	180	< 410	UJ	410
Fluoranthene	ug/kg	< 520	UJ	520	< 420	UJ	420	< 250	UJ	250	89	J	180	< 410	UJ	410
Fluorene	ug/kg	< 520	UJ	520	< 420	UJ	420	< 250	UJ	250	< 180	UJ	180	< 410	UJ	410
Hexachlorobenzene	ug/kg	950	J	1000	1150	J	840	495	J	510	512	J	360	522	J	810
Indeno[1,2,3-cd]pyrene	ug/kg	< 520	UJ	520	< 420	UJ	420	< 250	UJ	250	77.2	J	180	< 410	UJ	410
Naphthalene	ug/kg	809	J	520	1190	J	420	271	J	250	532	J	180	537	J	410

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Table 2  
Validated Analytical Results  
Module 4 Impoundment 17 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID		IMP 17-08			IMP 17-09			IMP 17-09			IMP 17-10			IMP 17-10		
Sample Date		11/13/2013			11/13/2013			11/13/2013			11/13/2013			11/13/2013		
N=Normal, FD=Field Duplicate		N			N			N			N			N		
Start Depth (in)		12			0			12			0			12		
End Depth (in)		24			12			24			12			24		
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
N-Nitrosodiphenylamine	ug/kg	3780	J	2600	4880	J	2100	1820	J	1300	2140	J	900	4070	J	2000
Phenanthrene	ug/kg	< 520	UJ	520	< 420	UJ	420	< 250	UJ	250	< 180	UJ	180	< 410	UJ	410
Pyrene	ug/kg	< 520	UJ	520	< 420	UJ	420	122	J	250	95.3	J	180	197	J	410
Pyridine	ug/kg	< 1000	UJ	1000	< 840	UJ	840	< 510	UJ	510	< 360	UJ	360	< 810	UJ	810
Polychlorinated Biphenyls																
Aroclor 1016	ug/kg	< 110	UJ	110	< 87	UJ	87	< 180	UJ	180	< 91	UJ	91	< 330	UJ	330
Aroclor 1221	ug/kg	< 110	UJ	110	< 87	UJ	87	< 180	UJ	180	< 91	UJ	91	< 330	UJ	330
Aroclor 1232	ug/kg	< 110	UJ	110	< 87	UJ	87	< 180	UJ	180	< 91	UJ	91	< 330	UJ	330
Aroclor 1242	ug/kg	< 110	UJ	110	< 87	UJ	87	< 180	UJ	180	< 91	UJ	91	< 330	UJ	330
Aroclor 1248	ug/kg	< 110	UJ	110	< 87	UJ	87	< 180	UJ	180	< 91	UJ	91	< 330	UJ	330
Aroclor 1254	ug/kg	< 110	UJ	110	< 87	UJ	87	< 180	UJ	180	< 91	UJ	91	< 330	UJ	330
Aroclor 1260	ug/kg	< 110	UJ	110	< 87	UJ	87	< 180	UJ	180	< 91	UJ	91	< 330	UJ	330
Aroclor 1262	ug/kg	< 110	UJ	110	< 87	UJ	87	< 180	UJ	180	< 91	UJ	91	< 330	UJ	330
Aroclor 1268	ug/kg	< 110	UJ	110	< 87	UJ	87	< 180	UJ	180	< 91	UJ	91	< 330	UJ	330
Metals																
Aluminum	mg/kg	113000	J	30	117000	J	230	102000	J	23	99200	J	24	147000	J	37
Antimony	mg/kg	19.1	J-	1.5	17.1	J-	1.1	16.9	J-	1.1	17	J-	1.2	25	J-	1.9
Arsenic	mg/kg	92	J	1.5	79.1	J	1.1	49	J	1.1	63.7	J	1.2	100	J	1.9
Barium	mg/kg	8890	J	75	2090	J	56	3090	J	57	3000	J	59	7220	J	94
Cadmium	mg/kg	4	J	0.6	3.3	J	0.45	2.8	J	0.46	3.5	J	0.47	4.3	J	0.75
Calcium	mg/kg	15300	J-	750	9020	J-	560	24700	J-	570	11400	J-	590	30700	J-	940
Chromium	mg/kg	1980	J	1.5	2810	J	11	1650	J	1.1	2760	J	12	2290	J	1.9
Cobalt	mg/kg	11.9	J	7.5	12.8	J	5.6	10.9	J	5.7	13.6	J	5.9	14.5	J	9.4
Copper	mg/kg	2490	J	37	3390	J	28	2350	J	29	3200	J	29	3110	J	47
Iron	mg/kg	70500	J	150	76000	J	110	53600	J	110	74400	J	120	78700	J	190
Lead	mg/kg	2620	J	15	2680	J	11	2380	J	11	2510	J	12	3390	J	19
Manganese	mg/kg	985	J	2.2	830	J	1.7	1280	J	1.7	972	J	1.8	1690	J	2.8
Mercury	mg/kg	131	J	11	125	J	8.3	120	J	12	130	J	8.8	172	J	22
Nickel	mg/kg	84.2	J-	6	105	J-	4.5	79.8	J-	4.6	110	J-	4.7	113	J-	7.5
Vanadium	mg/kg	75.1	J	1.5	59.7	J	1.1	65.4	J	1.1	52.8	J	1.2	96.1	J	1.9
Zinc	mg/kg	3360	J	30	3460	J	23	2900	J	23	3310	J	24	4200	J	37

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Table 2  
Validated Analytical Results  
Module 4 Impoundment 17 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID	IMP 17-08	IMP 17-09	IMP 17-09	IMP 17-10	IMP 17-10											
Sample Date	11/13/2013	11/13/2013	11/13/2013	11/13/2013	11/13/2013											
N=Normal, FD=Field Duplicate	N	N	N	N	N											
Start Depth (in)	12	0	12	0	12											
End Depth (in)	24	12	24	12	24											
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
<b>General Chemistry Parameters</b>																
Cyanide	mg/kg	< 0.8	R	0.8	< 0.63	R	0.63	< 0.87	R	0.87	0.61	J	0.6	< 1.5	R	1.5
Ferrous Iron	%	NA			NA			NA			NA			NA		
Hexavalent Chromium	mg/kg	52.5	J-	1.4	17.7	J-	1	59.5	J-	1.5	3.6	J-	1.1	52	J-	2.6
Oxidation-Reduction Potential	millivolts	316	J		314	J		305	J		305	J		305	J	
pH	pH units	7.93	J		7.79	J		8.05	J		7.77	J		7.98	J	
Sulfate	mg/kg	457	J	340	424	J	260	908	J	380	551	J	270	1930	J	660
Sulfide Screen	none	NA			NA			NA			NA			NA		
Sulfur	mg/kg	7250	J	9.9	7370	J	10	8380	J	9.9	7620	J	9.9	10300	J	9.9
Total Organic Carbon	mg/kg	60700	J	340	85400	J	260	63800	J	380	88500	J	270	80100	J	650
<b>Grain Size</b>																
% GRAVEL	%	0			0			0			0			0		
% SAND	%	73.2			74.6			79.1			68.3			87.9		
% Silt, Clay, Colloids	%	26.8			25.4			20.9			30.7			12.1		

**Qualifiers:**

J = estimated

J- = estimated low

R = rejected

U = not detected above the RL

UJ = not detected above the RL, RL is estimated

**Abbreviations:**

mg/kg = milligrams per kilogram

NA = not analyzed

Qual = interpreted qualifier

RL = reporting limit

ug/kg = micrograms per kilogram

Checked by: DPT 2/14/14

Table 2  
Validated Analytical Results  
Module 4 Impoundment 17 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID	IMP 17-11	IMP 17-11	IMP 17-12	IMP 17-12	IMP 17-13											
Sample Date	11/13/2013	11/13/2013	11/14/2013	11/14/2013	11/13/2013											
N=Normal, FD=Field Duplicate	N	N	N	N	N											
Start Depth (in)	0	12	0	12	0											
End Depth (in)	12	24	12	24	12											
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
<b>Volatile Organic Compounds</b>																
Acetone	ug/kg	< 42	UJ	42	915	J	69	< 45	UJ	45	< 85	UJ	85	366	J	46
Benzene	ug/kg	< 4.2	UJ	4.2	< 6.9	UJ	6.9	< 4.5	UJ	4.5	< 8.5	UJ	8.5	< 4.6	UJ	4.6
m,p-Xylenes	ug/kg	< 4.2	UJ	4.2	< 6.9	UJ	6.9	< 4.5	UJ	4.5	< 8.5	UJ	8.5	< 4.6	UJ	4.6
Methylene Chloride	ug/kg	7.8	J	21	< 34	UJ	34	< 23	UJ	23	< 42	UJ	42	< 23	UJ	23
o-Xylene	ug/kg	< 4.2	UJ	4.2	< 6.9	UJ	6.9	< 4.5	UJ	4.5	< 8.5	UJ	8.5	< 4.6	UJ	4.6
Toluene	ug/kg	< 4.2	UJ	4.2	< 6.9	UJ	6.9	< 4.5	UJ	4.5	< 8.5	UJ	8.5	< 4.6	UJ	4.6
<b>Semivolatile Organic Compounds</b>																
1,2,4-Trichlorobenzene	ug/kg	214	J	280	195	J	530	135	J	350	221	J	580	605	J	790
1,2-Dichlorobenzene	ug/kg	< 280	UJ	280	< 530	UJ	530	< 350	UJ	350	< 580	UJ	580	< 790	UJ	790
2-Chloronaphthalene	ug/kg	82.5	J	280	< 530	UJ	530	< 350	UJ	350	< 580	UJ	580	< 790	UJ	790
2-Methylnaphthalene	ug/kg	< 280	UJ	280	< 530	UJ	530	< 350	UJ	350	< 580	UJ	580	< 790	UJ	790
3,3'-Dichlorobenzidine	ug/kg	< 700	UJ	700	< 1300	UJ	1300	< 350	UJ	350	< 580	UJ	580	< 790	UJ	790
Acenaphthene	ug/kg	< 140	UJ	140	< 270	UJ	270	< 170	UJ	170	< 290	UJ	290	< 390	UJ	390
Acenaphthylene	ug/kg	< 140	UJ	140	< 270	UJ	270	< 170	UJ	170	< 290	UJ	290	< 390	UJ	390
Aniline	ug/kg	8150	J	280	5020	J	530	3900	J	350	4810	J	580	21800	J	790
Anthracene	ug/kg	72	J	140	< 270	UJ	270	< 170	UJ	170	< 290	UJ	290	< 390	UJ	390
Benzo[a]anthracene	ug/kg	< 140	UJ	140	< 270	UJ	270	< 170	UJ	170	< 290	UJ	290	< 390	UJ	390
Benzo[a]pyrene	ug/kg	131	J	140	< 270	UJ	270	< 170	UJ	170	< 290	UJ	290	< 390	UJ	390
Benzo[b]fluoranthene	ug/kg	300	J	140	200	J	270	< 170	UJ	170	< 290	UJ	290	< 390	UJ	390
Benzo[g,h,i]perylene	ug/kg	65.7	J	140	< 270	UJ	270	< 170	UJ	170	< 290	UJ	290	< 390	UJ	390
Benzo[k]fluoranthene	ug/kg	62.4	J	140	< 270	UJ	270	< 170	UJ	170	< 290	UJ	290	< 390	UJ	390
Bis(2-ethylhexyl) Phthalate	ug/kg	154	J	280	< 530	UJ	530	< 350	UJ	350	< 580	UJ	580	< 790	UJ	790
Chrysene	ug/kg	< 140	UJ	140	< 270	UJ	270	< 170	UJ	170	< 290	UJ	290	< 390	UJ	390
Dibenzo[a,h]anthracene	ug/kg	< 140	UJ	140	< 270	UJ	270	< 170	UJ	170	< 290	UJ	290	< 390	UJ	390
Fluoranthene	ug/kg	119	J	140	< 270	UJ	270	< 170	UJ	170	< 290	UJ	290	< 390	UJ	390
Fluorene	ug/kg	< 140	UJ	140	< 270	UJ	270	< 170	UJ	170	< 290	UJ	290	< 390	UJ	390
Hexachlorobenzene	ug/kg	295	J	280	261	J	530	< 350	UJ	350	< 580	UJ	580	880	J	790
Indeno[1,2,3-cd]pyrene	ug/kg	80.2	J	140	< 270	UJ	270	< 170	UJ	170	< 290	UJ	290	< 390	UJ	390
Naphthalene	ug/kg	482	J	140	402	J	270	< 170	UJ	170	< 290	UJ	290	1120	J	390

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Table 2  
Validated Analytical Results  
Module 4 Impoundment 17 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID Sample Date N=Normal, FD=Field Duplicate Start Depth (in) End Depth (in)		IMP 17-11 11/13/2013 N 0 12			IMP 17-11 11/13/2013 N 12 24			IMP 17-12 11/14/2013 N 0 12			IMP 17-12 11/14/2013 N 12 24			IMP 17-13 11/13/2013 N 0 12		
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
N-Nitrosodiphenylamine	ug/kg	1820	J	700	1970	J	1300	< 870	UJ	870	< 1500	UJ	1500	3740	J	2000
Phenanthrene	ug/kg	93.3	J	140	< 270	UJ	270	< 170	UJ	170	< 290	UJ	290	< 390	UJ	390
Pyrene	ug/kg	121	J	140	110	J	270	< 170	UJ	170	< 290	UJ	290	< 390	UJ	390
Pyridine	ug/kg	< 280	UJ	280	< 530	UJ	530	< 350	UJ	350	< 580	UJ	580	< 790	UJ	790
Polychlorinated Biphenyls																
Aroclor 1016	ug/kg	< 78	UJ	78	< 130	UJ	130	< 87	UJ	87	< 140	UJ	140	< 82	UJ	82
Aroclor 1221	ug/kg	< 78	UJ	78	< 130	UJ	130	< 87	UJ	87	< 140	UJ	140	< 82	UJ	82
Aroclor 1232	ug/kg	< 78	UJ	78	< 130	UJ	130	< 87	UJ	87	< 140	UJ	140	< 82	UJ	82
Aroclor 1242	ug/kg	< 78	UJ	78	< 130	UJ	130	< 87	UJ	87	< 140	UJ	140	< 82	UJ	82
Aroclor 1248	ug/kg	< 78	UJ	78	< 130	UJ	130	< 87	UJ	87	< 140	UJ	140	< 82	UJ	82
Aroclor 1254	ug/kg	< 78	UJ	78	< 130	UJ	130	1950	J	87	3250	J	140	< 82	UJ	82
Aroclor 1260	ug/kg	< 78	UJ	78	< 130	UJ	130	< 87	UJ	87	< 140	UJ	140	< 82	UJ	82
Aroclor 1262	ug/kg	< 78	UJ	78	< 130	UJ	130	< 87	UJ	87	< 140	UJ	140	< 82	UJ	82
Aroclor 1268	ug/kg	< 78	UJ	78	< 130	UJ	130	< 87	UJ	87	< 140	UJ	140	< 82	UJ	82
Metals																
Aluminum	mg/kg	109000	J	100	131000	J	250	89200	J	50	111000	J	100	108000	J	210
Antimony	mg/kg	17.7	J-	1	23.2	J-	1.2	10.8	J	4	18.8	J	4	14.7	J-	1
Arsenic	mg/kg	87.1	J	1	92.5	J	1.2	64.4	J	2	80.7	J	2	69.6	J	1
Barium	mg/kg	2900	J	26	4610	J	62	3280	J	20	6080	J	40	2760	J	52
Cadmium	mg/kg	3.1	J	0.41	3.4	J	0.49	3.6	J	1	3.7	J	1	3.4	J	0.42
Calcium	mg/kg	9450	J-	510	15600	J-	620	8430	J	500	14200	J	500	8760	J-	520
Chromium	mg/kg	2150	J	5.1	2240	J	12	2400	J	2	2100	J	2	2760	J	10
Cobalt	mg/kg	14.5	J	5.1	11.3	J	6.2	12.4	J	5	13.3	J	5	12.3	J	5.2
Copper	mg/kg	2730	J	13	2840	J	31	3020	J	5	2750	J	5	3200	J	26
Iron	mg/kg	81100	J	51	66900	J	120	58000	J	100	59800	J	100	69500	J	100
Lead	mg/kg	2480	J	5.1	2960	J	12	2210	J	4	2610	J	4	2420	J	10
Manganese	mg/kg	1140	J	1.5	1090	J	1.9	875	J	3	1230	J	3	863	J	1.6
Mercury	mg/kg	134	J	7.7	167	J	14	132	J	5.9	258	J	10	102	J	5.2
Nickel	mg/kg	132	J-	4.1	97.2	J-	4.9	97.5	J	4	103	J	4	95.9	J-	4.2
Vanadium	mg/kg	69.3	J	1	73.3	J	1.2	54.4	J	5	74.1	J	5	51.9	J	1
Zinc	mg/kg	2790	J	10	3290	J	25	2700	J	2	2620	J	2	3180	J	21

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Table 2  
Validated Analytical Results  
Module 4 Impoundment 17 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID	IMP 17-11	IMP 17-11	IMP 17-12	IMP 17-12	IMP 17-13											
Sample Date	11/13/2013	11/13/2013	11/14/2013	11/14/2013	11/13/2013											
N=Normal, FD=Field Duplicate	N	N	N	N	N											
Start Depth (in)	0	12	0	12	0											
End Depth (in)	12	24	12	24	12											
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
<b>General Chemistry Parameters</b>																
Cyanide	mg/kg	< 0.54	R	0.54	< 0.93	R	0.93	< 0.6	UJ	0.6	< 1	UJ	1	1.4	J	0.58
Ferrous Iron	%	NA			NA			NA			NA			NA		
Hexavalent Chromium	mg/kg	7.4	J-	0.94	44.9	J-	1.7	46	J-	1	71.9	J-	1.8	16.6	J-	0.99
Oxidation-Reduction Potential	millivolts	300	J		311	J		290	J		290	J		317	J	
pH	pH units	7.84	J		7.98	J		7.64	J		7.94	J		7.75	J	
Sulfate	mg/kg	410	J	240	1100	J	430	350	J	260	877	J	440	266	J	250
Sulfide Screen	none	NA			NA			NA			NA			NA		
Sulfur	mg/kg	7110	J	15	8130	J	9.7	5090	J	5	6770	J	10	5560	J	10
Total Organic Carbon	mg/kg	72100	J	240	64500	J	430	74400	J	260	77300	J	440	84700	J	250
<b>Grain Size</b>																
% GRAVEL	%	0			0			0			0			0		
% SAND	%	65.2			91.9			67.1			84.2			70.3		
% Silt, Clay, Colloids	%	34.8			8.1			32.9			15.9			29.7		

**Qualifiers:**

J = estimated

J- = estimated low

R = rejected

U = not detected above the RL

UJ = not detected above the RL, RL is estimated

**Abbreviations:**

mg/kg = milligrams per kilogram

NA = not analyzed

Qual = interpreted qualifier

RL = reporting limit

ug/kg = micrograms per kilogram

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Table 2  
Validated Analytical Results  
Module 4 Impoundment 17 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID	IMP 17-13	IMP 17-14	IMP 17-14	IMP 17-15	IMP 17-15											
Sample Date	11/13/2013	11/13/2013	11/13/2013	11/13/2013	11/13/2013											
N=Normal, FD=Field Duplicate	N	N	N	N	FD											
Start Depth (in)	12	0	12	0	0											
End Depth (in)	24	12	24	12	12											
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
Volatile Organic Compounds																
Acetone	ug/kg	176	J	65	166	J	56	< 75	UJ	75	< 54	UJ	54	< 59	UJ	59
Benzene	ug/kg	< 6.5	UJ	6.5	< 5.6	UJ	5.6	< 7.5	UJ	7.5	< 5.4	UJ	5.4	< 5.9	UJ	5.9
m,p-Xylenes	ug/kg	< 6.5	UJ	6.5	< 5.6	UJ	5.6	< 7.5	UJ	7.5	< 5.4	UJ	5.4	< 5.9	UJ	5.9
Methylene Chloride	ug/kg	< 33	UJ	33	< 28	UJ	28	< 38	UJ	38	< 27	UJ	27	< 30	UJ	30
o-Xylene	ug/kg	< 6.5	UJ	6.5	< 5.6	UJ	5.6	< 7.5	UJ	7.5	< 5.4	UJ	5.4	< 5.9	UJ	5.9
Toluene	ug/kg	< 6.5	UJ	6.5	< 5.6	UJ	5.6	< 7.5	UJ	7.5	< 5.4	UJ	5.4	< 5.9	UJ	5.9
Semivolatile Organic Compounds																
1,2,4-Trichlorobenzene	ug/kg	305	J	1200	612	J	920	510	J	1300	816	J	870	480	J	330
1,2-Dichlorobenzene	ug/kg	< 1200	UJ	1200	< 920	UJ	920	< 1300	UJ	1300	< 870	UJ	870	< 330	UJ	330
2-Chloronaphthalene	ug/kg	< 1200	UJ	1200	< 920	UJ	920	< 1300	UJ	1300	< 870	UJ	870	< 330	UJ	330
2-Methylnaphthalene	ug/kg	< 1200	UJ	1200	< 920	UJ	920	< 1300	UJ	1300	< 870	UJ	870	< 330	UJ	330
3,3'-Dichlorobenzidine	ug/kg	< 1200	UJ	1200	< 920	UJ	920	< 1300	UJ	1300	< 870	UJ	870	< 830	UJ	830
Acenaphthene	ug/kg	< 600	UJ	600	< 460	UJ	460	< 660	UJ	660	< 440	UJ	440	< 170	UJ	170
Acenaphthylene	ug/kg	< 600	UJ	600	< 460	UJ	460	< 660	UJ	660	< 440	UJ	440	< 170	UJ	170
Aniline	ug/kg	9060	J	1200	28400	J	920	28300	J	1300	32500	J	870	25100	J	1300
Anthracene	ug/kg	< 600	UJ	600	< 460	UJ	460	< 660	UJ	660	< 440	UJ	440	< 170	UJ	170
Benzo[a]anthracene	ug/kg	< 600	UJ	600	< 460	UJ	460	< 660	UJ	660	< 440	UJ	440	< 170	UJ	170
Benzo[a]pyrene	ug/kg	< 600	UJ	600	< 460	UJ	460	< 660	UJ	660	< 440	UJ	440	< 170	UJ	170
Benzo[b]fluoranthene	ug/kg	< 600	UJ	600	< 460	UJ	460	< 660	UJ	660	< 440	UJ	440	369	J	170
Benzo[g,h,i]perylene	ug/kg	< 600	UJ	600	< 460	UJ	460	< 660	UJ	660	< 440	UJ	440	< 170	UJ	170
Benzo[k]fluoranthene	ug/kg	< 600	UJ	600	< 460	UJ	460	< 660	UJ	660	< 440	UJ	440	98.6	J	170
Bis(2-ethylhexyl) Phthalate	ug/kg	< 1200	UJ	1200	< 920	UJ	920	< 1300	UJ	1300	< 870	UJ	870	218	J	330
Chrysene	ug/kg	< 600	UJ	600	< 460	UJ	460	< 660	UJ	660	< 440	UJ	440	< 170	UJ	170
Dibenzo[a,h]anthracene	ug/kg	< 600	UJ	600	< 460	UJ	460	< 660	UJ	660	< 440	UJ	440	< 170	UJ	170
Fluoranthene	ug/kg	< 600	UJ	600	< 460	UJ	460	< 660	UJ	660	203	J	440	88	J	170
Fluorene	ug/kg	< 600	UJ	600	< 460	UJ	460	< 660	UJ	660	< 440	UJ	440	< 170	UJ	170
Hexachlorobenzene	ug/kg	655	J	1200	1120	J	920	1220	J	1300	1050	J	870	580	J	330
Indeno[1,2,3-cd]pyrene	ug/kg	< 600	UJ	600	< 460	UJ	460	< 660	UJ	660	< 440	UJ	440	< 170	UJ	170
Naphthalene	ug/kg	585	J	600	1030	J	460	922	J	660	1260	J	440	787	J	170

Checked by: DPT 2/14/14

Table 2  
Validated Analytical Results  
Module 4 Impoundment 17 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID		IMP 17-13			IMP 17-14			IMP 17-14			IMP 17-15			IMP 17-15		
Sample Date		11/13/2013			11/13/2013			11/13/2013			11/13/2013			11/13/2013		
N=Normal, FD=Field Duplicate		N			N			N			N			FD		
Start Depth (in)		12			0			12			0			0		
End Depth (in)		24			12			24			12			12		
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
N-Nitrosodiphenylamine	ug/kg	3130	J	3000	4350	J	2300	5640	J	3300	5030	J	2200	2880	J	830
Phenanthrene	ug/kg	< 600	UJ	600	< 460	UJ	460	< 660	UJ	660	< 440	UJ	440	< 170	UJ	170
Pyrene	ug/kg	< 600	UJ	600	< 460	UJ	460	< 660	UJ	660	< 440	UJ	440	93.7	J	170
Pyridine	ug/kg	< 1200	UJ	1200	< 920	UJ	920	< 1300	UJ	1300	< 870	UJ	870	< 330	UJ	330
Polychlorinated Biphenyls																
Aroclor 1016	ug/kg	< 110	UJ	110	< 92	UJ	92	< 150	UJ	150	< 88	UJ	88	< 87	UJ	87
Aroclor 1221	ug/kg	< 110	UJ	110	< 92	UJ	92	< 150	UJ	150	< 88	UJ	88	< 87	UJ	87
Aroclor 1232	ug/kg	< 110	UJ	110	< 92	UJ	92	< 150	UJ	150	< 88	UJ	88	< 87	UJ	87
Aroclor 1242	ug/kg	< 110	UJ	110	< 92	UJ	92	< 150	UJ	150	< 88	UJ	88	< 87	UJ	87
Aroclor 1248	ug/kg	< 110	UJ	110	< 92	UJ	92	< 150	UJ	150	< 88	UJ	88	< 87	UJ	87
Aroclor 1254	ug/kg	< 110	UJ	110	< 92	UJ	92	< 150	UJ	150	< 88	UJ	88	< 87	UJ	87
Aroclor 1260	ug/kg	< 110	UJ	110	< 92	UJ	92	< 150	UJ	150	< 88	UJ	88	< 87	UJ	87
Aroclor 1262	ug/kg	< 110	UJ	110	< 92	UJ	92	< 150	UJ	150	< 88	UJ	88	< 87	UJ	87
Aroclor 1268	ug/kg	< 110	UJ	110	< 92	UJ	92	< 150	UJ	150	< 88	UJ	88	< 87	UJ	87
Metals																
Aluminum	mg/kg	128000	J	210	95700	J	24	146000	J	39	81800	J	22	77300	J	21
Antimony	mg/kg	17.8	J-	1.1	16.8	J-	1.2	24.6	J-	1.9	13.5	J-	1.1	12.1	J-	1.1
Arsenic	mg/kg	75.9	J	1.1	69.6	J	1.2	76.9	J	1.9	52.5	J	1.1	31.2	J	1.1
Barium	mg/kg	3280	J	53	2900	J	30	8470	J	97	2070	J	56	2300	J	53
Cadmium	mg/kg	3.6	J	0.42	3.3	J	0.48	4.3	J	0.77	3	J	0.45	2.9	J	0.43
Calcium	mg/kg	13500	J-	530	14600	J-	600	19200	J-	970	14100	J-	560	15800	J-	530
Chromium	mg/kg	2730	J	11	2870	J	12	2390	J	1.9	2610	J	11	2580	J	11
Cobalt	mg/kg	10.2	J	5.3	15	J	6	12.7	J	9.7	12.1	J	5.6	11.3	J	5.3
Copper	mg/kg	3020	J	26	3440	J	30	3320	J	48	3250	J	28	3270	J	27
Iron	mg/kg	64200	J	110	88700	J	60	70400	J	190	64600	J	110	58000	J	110
Lead	mg/kg	2780	J	11	2300	J	6	3310	J	19	2280	J	11	2140	J	11
Manganese	mg/kg	942	J	1.6	1070	J	1.8	1270	J	2.9	1150	J	1.7	1150	J	1.6
Mercury	mg/kg	145	J	8.1	95.2	J	6.1	135	J	9.6	98.2	J	8.2	96.9	J	8.2
Nickel	mg/kg	77.5	J-	4.2	144	J-	4.8	98.7	J-	7.7	101	J-	4.5	91.8	J-	4.3
Vanadium	mg/kg	63.3	J	1.1	56.2	J	1.2	85.2	J	1.9	46.6	J	1.1	40.3	J	1.1
Zinc	mg/kg	3520	J	21	2980	J	12	3930	J	39	3100	J	22	2960	J	21

Checked by: DPT 2/14/14

Table 2  
Validated Analytical Results  
Module 4 Impoundment 17 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID	IMP 17-13	IMP 17-14	IMP 17-14	IMP 17-15	IMP 17-15											
Sample Date	11/13/2013	11/13/2013	11/13/2013	11/13/2013	11/13/2013											
N=Normal, FD=Field Duplicate	N	N	N	N	FD											
Start Depth (in)	12	0	12	0	0											
End Depth (in)	24	12	24	12	12											
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
<b>General Chemistry Parameters</b>																
Cyanide	mg/kg	< 0.81	R	0.81	3.9	J	0.66	< 1.1	R	1.1	2	J	0.62	1.1	J	0.62
Ferrous Iron	%	NA			NA			2.5	J	0.2	NA			NA		
Hexavalent Chromium	mg/kg	34.6	J-	1.5	13	J-	1.1	60.1	J-	1.8	3.7	J-	1.1	< 1	UJ	1
Oxidation-Reduction Potential	millivolts	281	J		323	J		325	J		327	J		318	J	
pH	pH units	7.88	J		7.92	J		7.93	J		7.65	J		7.87	J	
Sulfate	mg/kg	763	J	360	353	J	280	737	J	450	382	J	270	459	J	260
Sulfide Screen	none	NA			NA			NEGATIVE			NA			NA		
Sulfur	mg/kg	7210	J	10	6650	J	10	6940	J	5	6320	J	10	6260	J	10
Total Organic Carbon	mg/kg	60200	J	370	86500	J	280	71800	J	450	127000	J	270	120000	J	260
<b>Grain Size</b>																
% GRAVEL	%	0			0			0			0					
% SAND	%	82			65			82			65.5					
% Silt, Clay, Colloids	%	18			35			18			34.5					

**Qualifiers:**

J = estimated

J- = estimated low

R = rejected

U = not detected above the RL

UJ = not detected above the RL, RL is estimated

**Abbreviations:**

mg/kg = milligrams per kilogram

NA = not analyzed

Qual = interpreted qualifier

RL = reporting limit

ug/kg = micrograms per kilogram

Checked by: DPT 2/14/14

Table 2  
Validated Analytical Results  
Module 4 Impoundment 17 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID	IMP 17-15	IMP 17-15	IMP 17-16	IMP 17-16	IMP 17-17											
Sample Date	11/13/2013	11/13/2013	11/14/2013	11/14/2013	11/14/2013											
N=Normal, FD=Field Duplicate	N	FD	N	N	N											
Start Depth (in)	12	12	0	12	0											
End Depth (in)	24	24	12	24	12											
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
<b>Volatile Organic Compounds</b>																
Acetone	ug/kg	< 53	UJ	53	< 59	UJ	59	< 53	UJ	53	< 68	UJ	68	< 59	UJ	59
Benzene	ug/kg	< 5.3	UJ	5.3	< 5.9	UJ	5.9	< 5.3	UJ	5.3	< 6.8	UJ	6.8	< 5.9	UJ	5.9
m,p-Xylenes	ug/kg	< 5.3	UJ	5.3	< 5.9	UJ	5.9	< 5.3	UJ	5.3	< 6.8	UJ	6.8	< 5.9	UJ	5.9
Methylene Chloride	ug/kg	< 27	UJ	27	10.3	J	30	< 27	UJ	27	< 34	UJ	34	< 29	UJ	29
o-Xylene	ug/kg	< 5.3	UJ	5.3	< 5.9	UJ	5.9	< 5.3	UJ	5.3	< 6.8	UJ	6.8	< 5.9	UJ	5.9
Toluene	ug/kg	< 5.3	UJ	5.3	< 5.9	UJ	5.9	< 5.3	UJ	5.3	< 6.8	UJ	6.8	< 5.9	UJ	5.9
<b>Semivolatile Organic Compounds</b>																
1,2,4-Trichlorobenzene	ug/kg	611	J	990	649	J	430	432	J	140	< 1200	UJ	1200	542	J	160
1,2-Dichlorobenzene	ug/kg	< 990	UJ	990	< 430	UJ	430	< 140	UJ	140	< 1200	UJ	1200	< 160	UJ	160
2-Chloronaphthalene	ug/kg	< 990	UJ	990	< 430	UJ	430	< 140	UJ	140	< 1200	UJ	1200	63.9	J	160
2-Methylnaphthalene	ug/kg	< 990	UJ	990	< 430	UJ	430	< 140	UJ	140	< 1200	UJ	1200	< 160	UJ	160
3,3'-Dichlorobenzidine	ug/kg	< 990	UJ	990	< 1100	UJ	1100	5190	J	140	< 1200	UJ	1200	5730	J	160
Acenaphthene	ug/kg	< 500	UJ	500	< 220	UJ	220	< 72	UJ	72	< 620	UJ	620	< 79	UJ	79
Acenaphthylene	ug/kg	< 500	UJ	500	< 220	UJ	220	< 72	UJ	72	< 620	UJ	620	< 79	UJ	79
Aniline	ug/kg	18800	J	990	33100	J	1700	< 140	UJ	140	2920	J	1200	< 160	UJ	160
Anthracene	ug/kg	< 500	UJ	500	< 220	UJ	220	55.3	J	72	< 620	UJ	620	57.5	J	79
Benzo[a]anthracene	ug/kg	< 500	UJ	500	< 220	UJ	220	3310	J	72	1170	J	620	3170	J	79
Benzo[a]pyrene	ug/kg	< 500	UJ	500	< 220	UJ	220	161	J	72	< 620	UJ	620	< 79	UJ	79
Benzo[b]fluoranthene	ug/kg	< 500	UJ	500	757	J	220	512	J	72	< 620	UJ	620	642	J	79
Benzo[g,h,i]perylene	ug/kg	< 500	UJ	500	< 220	UJ	220	145	J	72	< 620	UJ	620	< 79	UJ	79
Benzo[k]fluoranthene	ug/kg	< 500	UJ	500	164	J	220	117	J	72	< 620	UJ	620	135	J	79
Bis(2-ethylhexyl) Phthalate	ug/kg	< 990	UJ	990	627	J	430	< 140	UJ	140	< 1200	UJ	1200	375	J	160
Chrysene	ug/kg	< 500	UJ	500	< 220	UJ	220	< 72	UJ	72	< 620	UJ	620	< 79	UJ	79
Dibenzo[a,h]anthracene	ug/kg	< 500	UJ	500	< 220	UJ	220	50.3	J	72	< 620	UJ	620	< 79	UJ	79
Fluoranthene	ug/kg	< 500	UJ	500	129	J	220	150	J	72	< 620	UJ	620	136	J	79
Fluorene	ug/kg	< 500	UJ	500	< 220	UJ	220	< 72	UJ	72	< 620	UJ	620	< 79	UJ	79
Hexachlorobenzene	ug/kg	1100	J	990	1170	J	430	469	J	140	< 1200	UJ	1200	671	J	160
Indeno[1,2,3-cd]pyrene	ug/kg	< 500	UJ	500	< 220	UJ	220	129	J	72	< 620	UJ	620	< 79	UJ	79
Naphthalene	ug/kg	1060	J	500	1210	J	220	817	J	72	440	J	620	929	J	79

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Table 2  
Validated Analytical Results  
Module 4 Impoundment 17 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID Sample Date N=Normal, FD=Field Duplicate Start Depth (in) End Depth (in)		IMP 17-15 11/13/2013 N 12 24			IMP 17-15 11/13/2013 FD 12 24			IMP 17-16 11/14/2013 N 0 12			IMP 17-16 11/14/2013 N 12 24			IMP 17-17 11/14/2013 N 0 12		
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
N-Nitrosodiphenylamine	ug/kg	4090	J	2500	4980	J	1100	2660	J	360	< 3100	UJ	3100	3210	J	400
Phenanthrene	ug/kg	< 500	UJ	500	118	J	220	99.6	J	72	< 620	UJ	620	96.4	J	79
Pyrene	ug/kg	< 500	UJ	500	160	J	220	144	J	72	< 620	UJ	620	171	J	79
Pyridine	ug/kg	< 990	UJ	990	< 430	UJ	430	< 140	UJ	140	< 1200	UJ	1200	< 160	UJ	160
Polychlorinated Biphenyls																
Aroclor 1016	ug/kg	< 99	UJ	99	< 110	UJ	110	< 85	UJ	85	< 120	UJ	120	< 87	UJ	87
Aroclor 1221	ug/kg	< 99	UJ	99	< 110	UJ	110	< 85	UJ	85	< 120	UJ	120	< 87	UJ	87
Aroclor 1232	ug/kg	< 99	UJ	99	< 110	UJ	110	< 85	UJ	85	< 120	UJ	120	< 87	UJ	87
Aroclor 1242	ug/kg	< 99	UJ	99	< 110	UJ	110	< 85	UJ	85	< 120	UJ	120	< 87	UJ	87
Aroclor 1248	ug/kg	< 99	UJ	99	< 110	UJ	110	< 85	UJ	85	< 120	UJ	120	< 87	UJ	87
Aroclor 1254	ug/kg	< 99	UJ	99	< 110	UJ	110	< 85	UJ	85	< 120	UJ	120	< 87	UJ	87
Aroclor 1260	ug/kg	< 99	UJ	99	< 110	UJ	110	< 85	UJ	85	< 120	UJ	120	< 87	UJ	87
Aroclor 1262	ug/kg	< 99	UJ	99	< 110	UJ	110	< 85	UJ	85	< 120	UJ	120	< 87	UJ	87
Aroclor 1268	ug/kg	< 99	UJ	99	< 110	UJ	110	< 85	UJ	85	< 120	UJ	120	< 87	UJ	87
Metals																
Aluminum	mg/kg	101000	J	25	104000	J	28	62300	J	50	115000	J	98	83900	J	49
Antimony	mg/kg	18	J-	1.3	19.7	J-	1.4	7.7	J-	2	14.7	J-	3.9	10.7	J	1.9
Arsenic	mg/kg	68.9	J	1.3	67.9	J	1.4	25.1	J-	2	78.3	J-	2	64.9	J	1.9
Barium	mg/kg	3750	J	64	5120	J	71	4790	J	60	4030	J	20	3590	J	19
Cadmium	mg/kg	3.6	J	0.51	3.7	J	0.57	2.8	J-	0.5	4.5	J-	0.98	3.9	J	0.97
Calcium	mg/kg	17200	J-	640	17000	J-	710	7560	J	500	9970	J	490	9460	J	490
Chromium	mg/kg	2670	J	13	2620	J	14	1550	J	1	2530	J	2	2460	J	1.9
Cobalt	mg/kg	11.6	J	6.4	10.7	J	7.1	11.8	J-	5	14.1	J-	4.9	13.6	J	4.9
Copper	mg/kg	3150	J	32	2920	J	35	2170	J	2.5	3340	J	4.9	3290	J	4.9
Iron	mg/kg	67400	J	130	62700	J	140	39800	J	50	62000	J	98	61300	J	97
Lead	mg/kg	2660	J	13	2560	J	14	1530	J	2	2790	J	3.9	2310	J	3.9
Manganese	mg/kg	1110	J	1.9	1050	J	2.1	869	J	1.5	1380	J	2.9	1410	J	2.9
Mercury	mg/kg	129	J	6.5	145	J	7.1	93.4	J	5.6	173	J	8	100	J	5.6
Nickel	mg/kg	93.5	J-	5.1	87.3	J-	5.7	86.6	J-	4	108	J-	3.9	108	J	3.9
Vanadium	mg/kg	57.4	J	1.3	63.4	J	1.4	47.9	J-	5	71.4	J-	4.9	58	J	4.9
Zinc	mg/kg	3380	J	25	3280	J	28	1940	J	2	3040	J	2	2530	J	1.9

Checked by: DPT 2/14/14

Table 2  
Validated Analytical Results  
Module 4 Impoundment 17 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID	IMP 17-15	IMP 17-15	IMP 17-16	IMP 17-16	IMP 17-17											
Sample Date	11/13/2013	11/13/2013	11/14/2013	11/14/2013	11/14/2013											
N=Normal, FD=Field Duplicate	N	FD	N	N	N											
Start Depth (in)	12	12	0	12	0											
End Depth (in)	24	24	12	24	12											
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
<b>General Chemistry Parameters</b>																
Cyanide	mg/kg	3	J	0.71	2.8	J	0.8	< 0.59	R	0.59	< 0.84	R	0.84	< 0.61	UJ	0.61
Ferrous Iron	%	NA			NA			3.3	J	0.2	4.5	J	0.2	NA		
Hexavalent Chromium	mg/kg	20.8	J-	1.2	18.2	J-	1.3	9.7	J-	1	64.6	J-	1.5	4.4	J-	1.1
Oxidation-Reduction Potential	millivolts	357	J		313	J		306	J		297	J		308	J	
pH	pH units	7.93	J		7.94	J		6.9	J		7.68	J		7.59	J	
Sulfate	mg/kg	635	J	310	759	J	340	259	J-	250	569	J-	370	339	J	270
Sulfide Screen	none	NA			NA			NEGATIVE			NEGATIVE			NA		
Sulfur	mg/kg	7750	J	9.9	7920	J	9.9	5060	J	5	6560	J	4.9	6160	J	9.7
Total Organic Carbon	mg/kg	72800	J	310	93800	J	330	165000	J	260	104000	J	370	117000	J	270
<b>Grain Size</b>																
% GRAVEL	%	0						0			0			0		
% SAND	%	69.5						31.1			79			49.1		
% Silt, Clay, Colloids	%	30.5						68.9			21			50.9		

**Qualifiers:**

- J = estimated
- J- = estimated low
- R = rejected
- U = not detected above the RL
- UJ = not detected above the RL, RL is estimated

**Abbreviations:**

- mg/kg = milligrams per kilogram
- NA = not analyzed
- Qual = interpreted qualifier
- RL = reporting limit
- ug/kg = micrograms per kilogram

Checked by: DPT 2/14/14



Table 2  
Validated Analytical Results  
Module 4 Impoundment 17 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID		IMP 17-17			IMP 17-18			IMP 17-18			IMP 17-19			IMP 17-19		
Sample Date		11/14/2013			11/14/2013			11/14/2013			11/14/2013			11/14/2013		
N=Normal, FD=Field Duplicate		N			N			N			N			N		
Start Depth (in)		12			0			12			0			12		
End Depth (in)		24			12			24			12			24		
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
<b>Volatile Organic Compounds</b>																
Acetone	ug/kg	< 110	UJ	110	< 64	UJ	64	< 85	UJ	85	< 50	UJ	50	< 100	UJ	100
Benzene	ug/kg	< 11	UJ	11	< 6.4	UJ	6.4	< 8.5	UJ	8.5	< 5	UJ	5	< 10	UJ	10
m,p-Xylenes	ug/kg	< 11	UJ	11	< 6.4	UJ	6.4	< 8.5	UJ	8.5	< 5	UJ	5	< 10	UJ	10
Methylene Chloride	ug/kg	< 57	UJ	57	< 32	UJ	32	< 42	UJ	42	< 25	UJ	25	< 52	UJ	52
o-Xylene	ug/kg	< 11	UJ	11	< 6.4	UJ	6.4	< 8.5	UJ	8.5	< 5	UJ	5	< 10	UJ	10
Toluene	ug/kg	< 11	UJ	11	< 6.4	UJ	6.4	< 8.5	UJ	8.5	< 5	UJ	5	< 10	UJ	10
<b>Semivolatile Organic Compounds</b>																
1,2,4-Trichlorobenzene	ug/kg	476	J	320	462	J	180	536	J	330	< 840	UJ	840	2.9	J	10
1,2-Dichlorobenzene	ug/kg	< 320	UJ	320	< 180	UJ	180	< 330	UJ	330	< 840	UJ	840	< 10	UJ	10
2-Chloronaphthalene	ug/kg	163	J	320	104	J	180	< 330	UJ	330	< 840	UJ	840	< 10	UJ	10
2-Methylnaphthalene	ug/kg	< 320	UJ	320	< 180	UJ	180	< 330	UJ	330	< 840	UJ	840	< 10	UJ	10
3,3'-Dichlorobenzidine	ug/kg	< 320	UJ	320	5700	J	180	5570	J	330	< 840	UJ	840	< 10	UJ	10
Acenaphthene	ug/kg	< 160	UJ	160	< 91	UJ	91	< 160	UJ	160	< 420	UJ	420	< 5.2	UJ	5.2
Acenaphthylene	ug/kg	< 160	UJ	160	52.3	J	91	< 160	UJ	160	< 420	UJ	420	< 5.2	UJ	5.2
Aniline	ug/kg	< 320	UJ	320	< 180	UJ	180	< 330	UJ	330	3560	J	840	39.3	J	10
Anthracene	ug/kg	184	J	160	< 91	UJ	91	< 160	UJ	160	< 420	UJ	420	< 5.2	UJ	5.2
Benzo[a]anthracene	ug/kg	3350	J	160	2830	J	91	4420	J	160	< 420	UJ	420	< 5.2	UJ	5.2
Benzo[a]pyrene	ug/kg	< 160	UJ	160	< 91	UJ	91	< 160	UJ	160	< 420	UJ	420	< 5.2	UJ	5.2
Benzo[b]fluoranthene	ug/kg	609	J	160	682	J	91	687	J	160	< 420	UJ	420	< 5.2	UJ	5.2
Benzo[g,h,i]perylene	ug/kg	< 160	UJ	160	< 91	UJ	91	< 160	UJ	160	< 420	UJ	420	< 5.2	UJ	5.2
Benzo[k]fluoranthene	ug/kg	152	J	160	152	J	91	125	J	160	< 420	UJ	420	< 5.2	UJ	5.2
Bis(2-ethylhexyl) Phthalate	ug/kg	< 320	UJ	320	< 180	UJ	180	1020	J	330	< 840	UJ	840	< 10	UJ	10
Chrysene	ug/kg	< 160	UJ	160	< 91	UJ	91	< 160	UJ	160	< 420	UJ	420	< 5.2	UJ	5.2
Dibenzo[a,h]anthracene	ug/kg	< 160	UJ	160	< 91	UJ	91	< 160	UJ	160	< 420	UJ	420	< 5.2	UJ	5.2
Fluoranthene	ug/kg	85.1	J	160	113	J	91	106	J	160	< 420	UJ	420	< 5.2	UJ	5.2
Fluorene	ug/kg	< 160	UJ	160	< 91	UJ	91	< 160	UJ	160	< 420	UJ	420	< 5.2	UJ	5.2
Hexachlorobenzene	ug/kg	872	J	320	729	J	180	< 330	UJ	330	< 840	UJ	840	< 10	UJ	10
Indeno[1,2,3-cd]pyrene	ug/kg	< 160	UJ	160	< 91	UJ	91	< 160	UJ	160	< 420	UJ	420	< 5.2	UJ	5.2
Naphthalene	ug/kg	974	J	160	816	J	91	1060	J	160	< 420	UJ	420	< 5.2	UJ	5.2

Checked by: DPT 2/14/14

Table 2  
Validated Analytical Results  
Module 4 Impoundment 17 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID Sample Date N=Normal, FD=Field Duplicate Start Depth (in) End Depth (in)		IMP 17-17 11/14/2013 N 12 24			IMP 17-18 11/14/2013 N 0 12			IMP 17-18 11/14/2013 N 12 24			IMP 17-19 11/14/2013 N 0 12			IMP 17-19 11/14/2013 N 12 24		
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
N-Nitrosodiphenylamine	ug/kg	3910	J	790	3200	J	450	5540	J	820	< 2100	UJ	2100	< 26	UJ	26
Phenanthrene	ug/kg	123	J	160	90.5	J	91	< 160	UJ	160	< 420	UJ	420	< 5.2	UJ	5.2
Pyrene	ug/kg	166	J	160	150	J	91	277	J	160	< 420	UJ	420	< 5.2	UJ	5.2
Pyridine	ug/kg	< 320	UJ	320	< 180	UJ	180	< 330	UJ	330	< 840	UJ	840	< 10	UJ	10
Polychlorinated Biphenyls																
Aroclor 1016	ug/kg	< 160	UJ	160	< 99	UJ	99	< 160	UJ	160	< 85	UJ	85	< 170	UJ	170
Aroclor 1221	ug/kg	< 160	UJ	160	< 99	UJ	99	< 160	UJ	160	< 85	UJ	85	< 170	UJ	170
Aroclor 1232	ug/kg	< 160	UJ	160	< 99	UJ	99	< 160	UJ	160	< 85	UJ	85	< 170	UJ	170
Aroclor 1242	ug/kg	< 160	UJ	160	< 99	UJ	99	< 160	UJ	160	< 85	UJ	85	< 170	UJ	170
Aroclor 1248	ug/kg	< 160	UJ	160	< 99	UJ	99	< 160	UJ	160	< 85	UJ	85	< 170	UJ	170
Aroclor 1254	ug/kg	< 160	UJ	160	< 99	UJ	99	< 160	UJ	160	1970	J	85	< 170	UJ	170
Aroclor 1260	ug/kg	< 160	UJ	160	< 99	UJ	99	< 160	UJ	160	< 85	UJ	85	< 170	UJ	170
Aroclor 1262	ug/kg	< 160	UJ	160	< 99	UJ	99	< 160	UJ	160	< 85	UJ	85	< 170	UJ	170
Aroclor 1268	ug/kg	< 160	UJ	160	< 99	UJ	99	< 160	UJ	160	< 85	UJ	85	< 170	UJ	170
Metals																
Aluminum	mg/kg	123000	J	100	90500	J	51	118000	J	99	78100	J	51	102000	J	100
Antimony	mg/kg	22.6	J	4	12.8	J	4.1	17.5	J	4	12.9	J	4.1	16.1	J	4
Arsenic	mg/kg	89.4	J	2	97.9	J	2	67.8	J	2	109	J	2	80.3	J	2
Barium	mg/kg	4550	J	40	4220	J	41	5410	J	40	7110	J	41	5330	J	40
Cadmium	mg/kg	4.1	J	1	3.8	J	1	4	J	0.99	3.2	J	1	3.7	J	1
Calcium	mg/kg	15000	J	500	8900	J	510	15500	J	500	6750	J	510	12700	J	500
Chromium	mg/kg	2450	J	2	2440	J	2	2250	J	2	1840	J	2	2120	J	2
Cobalt	mg/kg	11.1	J	5	13.2	J	5.1	11.9	J	5	13.9	J	5.1	12	J	5
Copper	mg/kg	2850	J	5	3170	J	5.1	2770	J	5	2360	J	5.1	2660	J	5
Iron	mg/kg	60700	J	100	62400	J	100	55700	J	99	64900	J	100	55100	J	100
Lead	mg/kg	2750	J	4	2330	J	4.1	2750	J	4	1850	J	4.1	2520	J	4
Manganese	mg/kg	1050	J	3	1090	J	3	1180	J	3	1010	J	3	1110	J	3
Mercury	mg/kg	211	J	10	150	J	6.8	199	J	10	124	J	5.5	128	J	12
Nickel	mg/kg	79.3	J	4	101	J	4.1	85.5	J	4	108	J	4.1	87.5	J	4
Vanadium	mg/kg	71.7	J	5	61.8	J	5.1	71.4	J	5	60.6	J	5.1	65.1	J	5
Zinc	mg/kg	3010	J	2	2620	J	2	2910	J	2	2190	J	2	2770	J	2

Checked by: DPT 2/14/14

Table 2  
Validated Analytical Results  
Module 4 Impoundment 17 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID	IMP 17-17	IMP 17-18	IMP 17-18	IMP 17-19	IMP 17-19											
Sample Date	11/14/2013	11/14/2013	11/14/2013	11/14/2013	11/14/2013											
N=Normal, FD=Field Duplicate	N	N	N	N	N											
Start Depth (in)	12	0	12	0	12											
End Depth (in)	24	12	24	12	24											
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
<b>General Chemistry Parameters</b>																
Cyanide	mg/kg	< 1	UJ	1	< 0.71	UJ	0.71	< 1.1	UJ	1.1	< 0.59	UJ	0.59	< 1.2	UJ	1.2
Ferrous Iron	%	NA			NA			NA			NA			NA		
Hexavalent Chromium	mg/kg	77	J-	1.9	97.2	J-	1.2	141	J-	2	35.4	J-	1	138	J-	2.1
Oxidation-Reduction Potential	millivolts	299	J		309	J		314	J		321	J		306	J	
pH	pH units	8.03	J		7.7	J		8.01	J		7.63	J		7.96	J	
Sulfate	mg/kg	919	J	470	477	J	310	1180	J	490	283	J	260	1020	J	520
Sulfide Screen	none	NA			NA			NA			NA			NA		
Sulfur	mg/kg	6580	J	5	5720	J	5.1	7100	J	9.9	5400	J	5.1	6710	J	5
Total Organic Carbon	mg/kg	76700	J	480	83800	J	310	81200	J	490	82500	J	260	81100	J	520
<b>Grain Size</b>																
% GRAVEL	%	0			0			0			0			0		
% SAND	%	75.5			63.2			82.7			61.5			86.7		
% Silt, Clay, Colloids	%	24.5			36.8			17.3			38.5			13.3		

**Qualifiers:**

J = estimated

J- = estimated low

R = rejected

U = not detected above the RL

UJ = not detected above the RL, RL is estimated

**Abbreviations:**

mg/kg = milligrams per kilogram

NA = not analyzed

Qual = interpreted qualifier

RL = reporting limit

ug/kg = micrograms per kilogram

Checked by: DPT 2/14/14

Table 3  
Validated Analytical Results  
Module 4 Impoundment 24 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID		IMP 24-01			IMP 24-01			IMP 24-02			IMP 24-02			IMP 24-03		
Sample Date		11/18/2013			11/18/2013			11/18/2013			11/18/2013			11/19/2013		
N=Normal, FD=Field Duplicate		N			N			N			N			N		
Start Depth (in)		0			12			0			12			0		
End Depth (in)		12			24			12			24			12		
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
<b>Volatile Organic Compounds</b>																
1,3,5-Trimethylbenzene	ug/kg	< 9.6	U	9.6	< 9.6	UJ	9.6	< 13	UJ	13	< 18	U	18	1.1	J	11
Acetone	ug/kg	26.7		19	517	J	19	48.8	J	27	< 35	U	35	179	J	21
Benzene	ug/kg	< 1.9	U	1.9	0.89	J	1.9	2.9	J	2.7	< 3.5	U	3.5	0.72	J	2.1
Chlorobenzene	ug/kg	< 9.6	U	9.6	1.9	J	9.6	< 13	UJ	13	< 18	U	18	1	J	11
cis-1,2-Dichloroethene	ug/kg	< 9.6	U	9.6	< 9.6	UJ	9.6	< 13	UJ	13	< 18	U	18	< 11	UJ	11
Ethylbenzene	ug/kg	< 1.9	U	1.9	11.9	J	1.9	< 2.7	UJ	2.7	< 3.5	U	3.5	< 2.1	UJ	2.1
m,p-Xylenes	ug/kg	< 1.9	U	1.9	48	J	1.9	< 2.7	UJ	2.7	< 3.5	U	3.5	< 2.1	UJ	2.1
Methylene Chloride	ug/kg	< 9.6	U	9.6	6.2	J	9.6	12.3	J	13	14	J	18	< 11	UJ	11
o-Xylene	ug/kg	< 1.9	U	1.9	18.8	J	1.9	< 2.7	UJ	2.7	< 3.5	U	3.5	0.48	J	2.1
Tetrachloroethene	ug/kg	< 9.6	U	9.6	< 9.6	UJ	9.6	< 13	UJ	13	< 18	U	18	< 11	UJ	11
Toluene	ug/kg	< 1.9	U	1.9	1	J	1.9	0.98	J	2.7	< 3.5	U	3.5	0.69	J	2.1
<b>Semivolatiles Organic Compounds</b>																
1,2,4-Trichlorobenzene	ug/kg	< 400	U	400	162	J	190	< 180	U	180	< 180	U	180	< 80	U	80
1,2-Dichlorobenzene	ug/kg	120	J	400	1000		190	162	J	180	48.2	J	180	61.2	J	80
1,2-Diphenylhydrazine	ug/kg	129	J	400	729		190	134	J	180	81.4	J	180	< 80	U	80
1,3-Dichlorobenzene	ug/kg	< 400	U	400	< 190	U	190	< 180	U	180	< 180	U	180	< 80	U	80
1,4-Dichlorobenzene	ug/kg	< 400	U	400	67.9	J	190	< 180	U	180	< 180	U	180	< 80	U	80
2-Chloronaphthalene	ug/kg	506		400	1280		190	245		180	84.8	J	180	240		80
2-Methylnaphthalene	ug/kg	157	J	400	774		190	102	J	180	< 180	U	180	71.8	J	80
Acenaphthene	ug/kg	159	J	200	422		94	111		88	36.7	J	91	58.2		40
Acenaphthylene	ug/kg	< 200	U	200	114		94	< 88	U	88	< 91	U	91	31.2	J	40
Aniline	ug/kg	2740		400	13100		750	2320		180	1310		180	2300		80
Anthracene	ug/kg	< 200	U	200	137		94	40.9	J	88	< 91	U	91	44.6		40
Benzidine	ug/kg	< 4000	U	4000	< 1900	U	1900	< 1800	U	1800	< 1800	U	1800	< 800	U	800
Benzo[a]anthracene	ug/kg	133	J	200	155		94	56.5	J	88	< 91	U	91	68.6		40
Benzo[a]pyrene	ug/kg	89.4	J	200	70.3	J	94	< 88	U	88	< 91	U	91	57.1		40
Benzo[b]fluoranthene	ug/kg	124	J	200	144		94	54.7	J	88	< 91	U	91	93.8		40
Benzo[g,h,i]perylene	ug/kg	< 200	U	200	59.6	J	94	< 88	U	88	< 91	U	91	57.8		40
Benzo[k]fluoranthene	ug/kg	< 200	U	200	< 94	U	94	< 88	U	88	< 91	U	91	23.6	J	40
Biphenyl	ug/kg	107	J	400	1870		190	72.8	J	180	< 180	U	180	50.4	J	80
Bis(2-ethylhexyl) Phthalate	ug/kg	< 400	U	400	< 190	U	190	< 180	U	180	< 180	U	180	< 80	U	80
Carbazole	ug/kg	< 400	U	400	120	J	190	< 180	U	180	< 180	U	180	20.2	J	80
Chrysene	ug/kg	123	J	200	238		94	79.6	J	88	< 91	U	91	78.6		40
Dibenzofuran	ug/kg	158	J	400	875		190	106	J	180	42.2	J	180	56.1	J	80

Checked by: WM 2/14/14

Table 3  
Validated Analytical Results  
Module 4 Impoundment 24 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID		IMP 24-01			IMP 24-01			IMP 24-02			IMP 24-02			IMP 24-03		
Sample Date		11/18/2013			11/18/2013			11/18/2013			11/18/2013			11/19/2013		
N=Normal, FD=Field Duplicate		N			N			N			N			N		
Start Depth (in)		0			12			0			12			0		
End Depth (in)		12			24			12			24			12		
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
Dimethyl Phthalate	ug/kg	< 400	U	400	< 190	U	190	< 180	U	180	< 180	U	180	< 80	U	80
Fluoranthene	ug/kg	212		200	282		94	92.4		88	42.5	J	91	169		40
Fluorene	ug/kg	< 200	U	200	236		94	44.5	J	88	< 91	U	91	27.2	J	40
Indeno[1,2,3-cd]pyrene	ug/kg	< 200	U	200	51.1	J	94	< 88	U	88	< 91	U	91	< 40	U	40
m,p-Cresol	ug/kg	< 400	U	400	< 190	U	190	< 180	U	180	< 180	UJ	180	< 80	U	80
Naphthalene	ug/kg	897		200	5390		94	608		88	199		91	280		40
Nitrobenzene	ug/kg	215	J	400	13300		750	224		180	89.7	J	180	< 80	U	80
N-Nitrosodiphenylamine	ug/kg	874	J	1000	7910		470	903		440	418	J	460	398		200
Phenanthrene	ug/kg	319		200	817		94	210		88	95.8		91	171		40
Pyrene	ug/kg	165	J	200	207		94	79.9	J	88	38	J	91	144		40
Pyridine	ug/kg	< 400	U	400	< 190	U	190	< 180	U	180	< 180	U	180	< 80	U	80
Polychlorinated Biphenyls																
Aroclor 1016	ug/kg	< 40	U	40	< 44	U	44	< 43	U	43	< 46	U	46	< 45	U	45
Aroclor 1221	ug/kg	< 40	U	40	< 44	U	44	< 43	U	43	< 46	U	46	< 45	U	45
Aroclor 1232	ug/kg	< 40	U	40	< 44	U	44	< 43	U	43	< 46	U	46	< 45	U	45
Aroclor 1242	ug/kg	< 40	U	40	< 44	U	44	< 43	U	43	< 46	U	46	< 45	U	45
Aroclor 1248	ug/kg	< 40	U	40	< 44	U	44	< 43	U	43	< 46	U	46	< 45	U	45
Aroclor 1254	ug/kg	101	J	40	445	J	44	134		43	233	J	46	< 45	U	45
Aroclor 1260	ug/kg	< 40	U	40	< 44	U	44	< 43	U	43	< 46	U	46	< 45	U	45
Aroclor 1262	ug/kg	< 40	U	40	< 44	U	44	< 43	U	43	< 46	U	46	< 45	U	45
Aroclor 1268	ug/kg	< 40	U	40	< 44	U	44	< 43	U	43	< 46	U	46	< 45	U	45
Metals																
Aluminum	mg/kg	10400		63	8850	J	150	5040	J	150	5600	J	150	8950		51
Antimony	mg/kg	1.2	J-	2.5	1.7	J-	2	0.97	J-	2.1	1.3	J-	2	0.61	J-	2
Barium	mg/kg	121		25	96.2		20	36.1		21	88.8		20	125		20
Calcium	mg/kg	204000		1900	239000		1500	234000		1500	238000		1500	230000		1500
Chromium	mg/kg	29.7	J	1.3	51.1	J	1	19	J	1	28.2	J	1	32.3		1
Cobalt	mg/kg	5.8	J	6.3	5.1		5.1	2.1	J	5.1	2.4	J	5.1	5.2		5.1
Copper	mg/kg	93	J+	3.2	205	J+	2.6	70.7	J+	2.6	74.5	J+	2.6	118		2.5
Iron	mg/kg	12700	J-	63	13400	J-	51	3870	J-	51	4810	J-	51	11500	J+	51
Lead	mg/kg	80.9		2.5	131	J	6.1	49.5	J	6.2	84.8	J	6.1	104		2
Manganese	mg/kg	264	J	1.9	238	J	1.5	80.4	J	1.5	88.3	J	1.5	188	J+	1.5
Mercury	mg/kg	1.2	J+	0.074	2.5	J+	0.22	0.98	J+	0.04	0.94	J+	0.043	6.3		0.44
Nickel	mg/kg	18.3		5	19.8		4.1	7.7		4.1	9.8		4.1	17.9		4.1
Selenium	mg/kg	0.57	J	2.5	0.65	J	2	< 2.1	U	2.1	1.1	J	2	1.2	J	2

Checked by: WM 2/14/14

Table 3  
Validated Analytical Results  
Module 4 Impoundment 24 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID	IMP 24-01	IMP 24-01	IMP 24-02	IMP 24-02	IMP 24-03											
Sample Date	11/18/2013	11/18/2013	11/18/2013	11/18/2013	11/19/2013											
N=Normal, FD=Field Duplicate	N	N	N	N	N											
Start Depth (in)	0	12	0	12	0											
End Depth (in)	12	24	12	24	12											
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL			
Vanadium	mg/kg	23	J-	6.3	21.7	J-	5.1	11.4	J-	5.1	13.9	J-	5.1	28.7		5.1
Zinc	mg/kg	88	J	7.6	101	J	6.1	39.6	J	6.2	62.8	J	6.1	83.7	J	2
<b>General Chemistry Parameters</b>																
Cyanide	mg/kg	< 0.54	R	0.54	< 0.66	R	0.66	< 0.32	R	0.32	< 0.66	R	0.66	< 0.46	R	0.46
Ferrous Iron	%	NA			NA			NA			NA			NA		
Hexavalent Chromium	mg/kg	0.88	J	0.49	2.7	J	0.57	0.53	J	0.53	1.1	J	0.56	1.2		0.54
Methanol	ug/kg	5240		230	13600		270	5900		260	1210		280	3180		270
Oxidation-Reduction Potential	millivolts	121			125			109			107			93.6		
pH	pH units	11.3	J		11.2	J		11.44	J		11.26	J		11.97	J	
Sulfate	mg/kg	< 120	R	120	< 140	R	140	< 130	R	130	< 140	R	140	< 130	U	130
Sulfide Screen	none	NA			NA			NA			NA			NA		
Sulfur	mg/kg	1930		4.8	2310		4.9	2640		5.1	1810		5	1680	J+	15
Total Organic Carbon	mg/kg	18400		120	14200		140	11400		130	9790		140	17600		140
<b>Grain Size</b>																
% GRAVEL	%	14.3			14.2			5.8			17.7			10		
% SAND	%	53.7			63.9			60.4			59.7			65.9		
% Silt, Clay, Colloids	%	32.1			21.9			33.9			22.6			24.2		

**Qualifiers:**

J = estimated

J+ = estimated high

J- = estimated low

R = rejected

U = not detected above the RL

UJ = not detected above the RL, RL is estimated

**Abbreviations:**

mg/kg = milligrams per kilogram

NA = not analyzed

Qual = interpreted qualifier

RL = reporting limit

ug/kg = micrograms per kilogram

Checked by: WM 2/14/14

Table 3  
Validated Analytical Results  
Module 4 Impoundment 24 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID		IMP 24-03			IMP 24-04			IMP 24-04			IMP 24-05		
Sample Date		11/19/2013			11/18/2013			11/18/2013			11/14/2013		
N=Normal, FD=Field Duplicate		N			N			N			N		
Start Depth (in)		12			0			12			0		
End Depth (in)		24			12			24			12		
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
<b>Volatile Organic Compounds</b>													
1,3,5-Trimethylbenzene	ug/kg	3.3	J	12	< 13	U	13	< 14	UJ	14	< 6.4	U	6.4
Acetone	ug/kg	317	J	25	< 26	U	26	198	J	29	< 13	U	13
Benzene	ug/kg	0.75	J	2.5	< 2.6	U	2.6	< 2.9	UJ	2.9	< 1.3	U	1.3
Chlorobenzene	ug/kg	2.2	J	12	< 13	U	13	< 14	UJ	14	< 6.4	U	6.4
cis-1,2-Dichloroethene	ug/kg	< 12	UJ	12	< 13	U	13	< 14	UJ	14	< 6.4	U	6.4
Ethylbenzene	ug/kg	< 2.5	UJ	2.5	< 2.6	U	2.6	< 2.9	UJ	2.9	< 1.3	U	1.3
m,p-Xylenes	ug/kg	1.8	J	2.5	< 2.6	U	2.6	< 2.9	UJ	2.9	< 1.3	U	1.3
Methylene Chloride	ug/kg	< 12	UJ	12	13.3		13	< 14	UJ	14	< 6.4	U	6.4
o-Xylene	ug/kg	1	J	2.5	< 2.6	U	2.6	< 2.9	UJ	2.9	< 1.3	U	1.3
Tetrachloroethene	ug/kg	< 12	UJ	12	< 13	U	13	< 14	UJ	14	< 6.4	U	6.4
Toluene	ug/kg	0.67	J	2.5	0.61	J	2.6	< 2.9	UJ	2.9	< 1.3	U	1.3
<b>Semivolatile Organic Compounds</b>													
1,2,4-Trichlorobenzene	ug/kg	24.2	J	86	< 75	U	75	125		93	17.6	J	75
1,2-Dichlorobenzene	ug/kg	133		86	< 75	U	75	< 93	U	93	< 75	U	75
1,2-Diphenylhydrazine	ug/kg	< 86	U	86	< 75	U	75	77.6	J	93	< 75	U	75
1,3-Dichlorobenzene	ug/kg	< 86	U	86	< 75	U	75	< 93	U	93	< 75	U	75
1,4-Dichlorobenzene	ug/kg	< 86	U	86	< 75	U	75	< 93	U	93	< 75	U	75
2-Chloronaphthalene	ug/kg	315		86	< 75	U	75	< 93	U	93	< 75	U	75
2-Methylnaphthalene	ug/kg	264		86	< 75	U	75	54.5	J	93	< 75	U	75
Acenaphthene	ug/kg	58.6		43	< 37	U	37	87.5		47	< 38	U	38
Acenaphthylene	ug/kg	34.8	J	43	< 37	U	37	< 47	U	47	22.4	J	38
Aniline	ug/kg	2570		86	320		75	299		93	419		75
Anthracene	ug/kg	41.8	J	43	< 37	U	37	278		47	31.1	J	38
Benzidine	ug/kg	< 860	U	860	< 750	U	750	< 930	U	930	< 750	U	750
Benzo[a]anthracene	ug/kg	104		43	29.5	J	37	570		47	214		38
Benzo[a]pyrene	ug/kg	85.6		43	24.1	J	37	499		47	92.9		38
Benzo[b]fluoranthene	ug/kg	116		43	37.1		37	639		47	148		38
Benzo[g,h,i]perylene	ug/kg	70.5		43	21.4	J	37	300		47	60.9		38
Benzo[k]fluoranthene	ug/kg	40.4	J	43	< 37	U	37	237		47	53.8		38
Biphenyl	ug/kg	216		86	< 75	U	75	51.3	J	93	< 75	U	75
Bis(2-ethylhexyl) Phthalate	ug/kg	49.1	J	86	52.9	J	75	49.8	J	93	40.9	J	75
Carbazole	ug/kg	42.5	J	86	< 75	U	75	208		93	33	J	75
Chrysene	ug/kg	126		43	36.8	J	37	587		47	137		38
Dibenzofuran	ug/kg	137		86	< 75	U	75	84.3	J	93	< 75	U	75

Checked by: WM 2/14/14

Table 3  
Validated Analytical Results  
Module 4 Impoundment 24 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID	Sample Date	IMP 24-03			IMP 24-04			IMP 24-04			IMP 24-05		
		11/19/2013			11/18/2013			11/18/2013			11/14/2013		
N=Normal, FD=Field Duplicate		N			N			N			N		
Start Depth (in)		12			0			12			0		
End Depth (in)		24			12			24			12		
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
Dimethyl Phthalate	ug/kg	< 86	U	86	< 75	U	75	< 93	U	93	< 75	U	75
Fluoranthene	ug/kg	244		43	58		37	1530		47	252		38
Fluorene	ug/kg	32.7	J	43	< 37	U	37	96.1		47	< 38	U	38
Indeno[1,2,3-cd]pyrene	ug/kg	< 43	U	43	17.1	J	37	277		47	54.6		38
m,p-Cresol	ug/kg	< 86	U	86	< 75	U	75	< 93	R	93	< 75	U	75
Naphthalene	ug/kg	796		43	54.7		37	96.7		47	36.7	J	38
Nitrobenzene	ug/kg	517		86	< 75	U	75	< 93	U	93	< 75	U	75
N-Nitrosodiphenylamine	ug/kg	487		220	133	J	190	153	J	230	193		190
Phenanthrene	ug/kg	515		43	46		37	1290		47	184		38
Pyrene	ug/kg	233		43	43.9		37	1040		47	206		38
Pyridine	ug/kg	< 86	U	86	< 75	U	75	< 93	U	93	< 75	U	75
Polychlorinated Biphenyls													
Aroclor 1016	ug/kg	< 48	U	48	< 41	U	41	< 44	U	44	< 37	U	37
Aroclor 1221	ug/kg	< 48	U	48	< 41	U	41	< 44	U	44	< 37	U	37
Aroclor 1232	ug/kg	< 48	U	48	< 41	U	41	< 44	U	44	< 37	U	37
Aroclor 1242	ug/kg	< 48	U	48	< 41	U	41	< 44	U	44	< 37	U	37
Aroclor 1248	ug/kg	< 48	U	48	< 41	U	41	< 44	U	44	< 37	U	37
Aroclor 1254	ug/kg	< 48	U	48	12600		830	920		44	19800	J	740
Aroclor 1260	ug/kg	< 48	U	48	< 41	U	41	< 44	U	44	< 37	U	37
Aroclor 1262	ug/kg	< 48	U	48	< 41	U	41	< 44	U	44	< 37	U	37
Aroclor 1268	ug/kg	< 48	U	48	< 41	U	41	< 44	U	44	< 37	U	37
Metals													
Aluminum	mg/kg	11200		48	6180	J	150	8690	J	150	9520		19
Antimony	mg/kg	0.87	J-	1.9	0.86	J-	2	1.1	J-	2	0.6	J	0.95
Barium	mg/kg	102		19	43.8		20	61.5		20	353	J	4.7
Calcium	mg/kg	260000		1400	183000		1500	259000		1500	123000	J	4700
Chromium	mg/kg	25.8		0.97	10.5	J	0.99	22.6	J	3	37.7	J	0.95
Cobalt	mg/kg	6.2		4.8	3.1	J	4.9	5.4		5	7.4	J	4.7
Copper	mg/kg	473		2.4	26.8	J+	2.5	52.4	J+	2.5	73.7	J	2.4
Iron	mg/kg	13200	J+	48	4980	J-	49	11100	J-	50	20500		9.5
Lead	mg/kg	134		1.9	22.7		2	84.7	J	6	97.9	J	0.95
Manganese	mg/kg	233	J+	1.4	77.6	J	1.5	186	J	1.5	466	J	1.4
Mercury	mg/kg	1		0.045	0.28	J+	0.041	0.3	J+	0.047	1.3		0.074
Nickel	mg/kg	20.5		3.9	8.7		3.9	10.4		4	19.9	J	3.8
Selenium	mg/kg	0.67	J	1.9	< 2	U	2	< 2	U	2	< 0.95	U	0.95

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Table 3  
Validated Analytical Results  
Module 4 Impoundment 24 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID		IMP 24-03			IMP 24-04			IMP 24-04			IMP 24-05		
Sample Date		11/19/2013			11/18/2013			11/18/2013			11/14/2013		
N=Normal, FD=Field Duplicate		N			N			N			N		
Start Depth (in)		12			0			12			0		
End Depth (in)		24			12			24			12		
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
Vanadium	mg/kg	31.8		4.8	16.5	J-	4.9	40.2	J-	5	25.6	J	0.95
Zinc	mg/kg	127	J	1.9	23.5	J	5.9	45.7	J	6	93	J-	1.9
<b>General Chemistry Parameters</b>													
Cyanide	mg/kg	0.67	J-	0.52	< 0.61	R	0.61	< 0.63	R	0.63	< 0.28	U	0.28
Ferrous Iron	%	NA			NA			NA			0.83	J	0.2
Hexavalent Chromium	mg/kg	0.74		0.57	18.5	J	0.52	0.63	J	0.57	11.4	J	0.48
Methanol	ug/kg	3110		290	< 240	U	240	3150		290	< 240	U	240
Oxidation-Reduction Potential	millivolts	96.9			204			91.5			218		
pH	pH units	11.83	J		8.6	J		10.42	J		7.69	J	
Sulfate	mg/kg	< 140	U	140	< 130	R	130	< 140	R	140	< 120	U	120
Sulfide Screen	none	NA			NA			NA			NEGATIVE		
Sulfur	mg/kg	2130	J+	14	828	J	14	2740	J	15	579	J	11
Total Organic Carbon	mg/kg	12200		140	8440		130	9340		140	11800		120
<b>Grain Size</b>													
% GRAVEL	%	14.3			9			19			42.3		
% SAND	%	65			60.7			53.3			39.1		
% Silt, Clay, Colloids	%	20.7			30.3			27.7			18.7		

**Qualifiers:**

J = estimated

J+ = estimated high

J- = estimated low

R = rejected

U = not detected above the RL

UJ = not detected above the RL, RL is estimated

**Abbreviations:**

mg/kg = milligrams per kilogram

NA = not analyzed

Qual = interpreted qualifier

RL = reporting limit

ug/kg = micrograms per kilogram

Checked by: WM 2/14/14

Table 3  
Validated Analytical Results  
Module 4 Impoundment 24 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID		IMP 24-05			IMP 24-06			IMP 24-06			IMP 24-07		
Sample Date		11/14/2013			11/18/2013			11/18/2013			11/18/2013		
N=Normal, FD=Field Duplicate		N			N			N			N		
Start Depth (in)		12			0			12			0		
End Depth (in)		24			12			24			12		
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
<b>Volatile Organic Compounds</b>													
1,3,5-Trimethylbenzene	ug/kg	< 5.6	U	5.6	1.1	J	10	32.7	J	14	< 7.4	U	7.4
Acetone	ug/kg	< 11	U	11	< 21	U	21	69.4	J	28	< 15	U	15
Benzene	ug/kg	< 1.1	U	1.1	< 2.1	U	2.1	1.4	J	2.8	< 1.5	U	1.5
Chlorobenzene	ug/kg	< 5.6	U	5.6	< 10	U	10	12.7	J	14	< 7.4	U	7.4
cis-1,2-Dichloroethene	ug/kg	< 5.6	U	5.6	< 10	U	10	< 14	UJ	14	< 7.4	U	7.4
Ethylbenzene	ug/kg	< 1.1	U	1.1	< 2.1	U	2.1	3	J	2.8	< 1.5	U	1.5
m,p-Xylenes	ug/kg	< 1.1	U	1.1	< 2.1	U	2.1	13.9	J	2.8	< 1.5	U	1.5
Methylene Chloride	ug/kg	< 5.6	U	5.6	4.9	J	10	10.9	J	14	< 7.4	U	7.4
o-Xylene	ug/kg	< 1.1	U	1.1	< 2.1	U	2.1	7.7	J	2.8	< 1.5	U	1.5
Tetrachloroethene	ug/kg	< 5.6	U	5.6	< 10	U	10	< 14	UJ	14	< 7.4	U	7.4
Toluene	ug/kg	< 1.1	U	1.1	< 2.1	U	2.1	3	J	2.8	< 1.5	U	1.5
<b>Semivolatile Organic Compounds</b>													
1,2,4-Trichlorobenzene	ug/kg	< 71	U	71	42.2	J	83	< 170	U	170	< 74	U	74
1,2-Dichlorobenzene	ug/kg	< 71	U	71	192		83	368		170	< 74	U	74
1,2-Diphenylhydrazine	ug/kg	< 71	U	71	431		83	< 170	U	170	< 74	U	74
1,3-Dichlorobenzene	ug/kg	< 71	U	71	< 83	U	83	< 170	U	170	< 74	U	74
1,4-Dichlorobenzene	ug/kg	< 71	U	71	< 83	U	83	< 170	U	170	< 74	U	74
2-Chloronaphthalene	ug/kg	< 71	U	71	< 83	U	83	< 170	U	170	< 74	U	74
2-Methylnaphthalene	ug/kg	47.3	J	71	656		83	1510		170	< 74	U	74
Acenaphthene	ug/kg	42.1		36	39.5	J	41	197		84	< 37	U	37
Acenaphthylene	ug/kg	< 36	U	36	< 41	U	41	< 84	U	84	< 37	U	37
Aniline	ug/kg	< 71	U	71	2140		83	7600		170	41	J	74
Anthracene	ug/kg	102		36	42.1		41	105		84	< 37	U	37
Benzidine	ug/kg	< 710	U	710	< 830	U	830	< 1700	U	1700	< 740	U	740
Benzo[a]anthracene	ug/kg	66.6		36	73.6		41	70.5	J	84	< 37	U	37
Benzo[a]pyrene	ug/kg	29.9	J	36	< 41	U	41	< 84	U	84	< 37	U	37
Benzo[b]fluoranthene	ug/kg	54.3		36	< 41	U	41	< 84	U	84	20.1	J	37
Benzo[g,h,i]perylene	ug/kg	24.9	J	36	< 41	U	41	< 84	U	84	< 37	U	37
Benzo[k]fluoranthene	ug/kg	21.4	J	36	< 41	U	41	< 84	U	84	< 37	U	37
Biphenyl	ug/kg	16.2	J	71	145		83	370		170	< 74	U	74
Bis(2-ethylhexyl) Phthalate	ug/kg	321		71	< 83	U	83	< 170	U	170	< 74	U	74
Carbazole	ug/kg	29.1	J	71	29.4	J	83	99.4	J	170	< 74	U	74
Chrysene	ug/kg	66		36	54.7		41	74	J	84	16.8	J	37
Dibenzofuran	ug/kg	60.9	J	71	< 83	U	83	< 170	U	170	< 74	U	74

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Table 3  
Validated Analytical Results  
Module 4 Impoundment 24 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID		IMP 24-05			IMP 24-06			IMP 24-06			IMP 24-07		
Sample Date		11/14/2013			11/18/2013			11/18/2013			11/18/2013		
N=Normal, FD=Field Duplicate		N			N			N			N		
Start Depth (in)		12			0			12			0		
End Depth (in)		24			12			24			12		
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
Dimethyl Phthalate	ug/kg	< 71	U	71	< 83	U	83	< 170	U	170	< 74	U	74
Fluoranthene	ug/kg	194		36	106		41	197		84	20.7	J	37
Fluorene	ug/kg	61.1		36	< 41	U	41	< 84	U	84	< 37	U	37
Indeno[1,2,3-cd]pyrene	ug/kg	19.3	J	36	< 41	U	41	< 84	U	84	< 37	U	37
m,p-Cresol	ug/kg	< 71	U	71	< 83	U	83	< 170	U	170	< 74	U	74
Naphthalene	ug/kg	252		36	796		41	1630		84	< 37	U	37
Nitrobenzene	ug/kg	< 71	U	71	252		83	953		170	< 74	U	74
N-Nitrosodiphenylamine	ug/kg	63.3	J	180	1140		210	< 420	U	420	< 190	U	190
Phenanthrene	ug/kg	191		36	287		41	1030		84	< 37	U	37
Pyrene	ug/kg	157		36	145		41	231		84	19.9	J	37
Pyridine	ug/kg	< 71	U	71	< 83	U	83	< 170	U	170	< 74	U	74
Polychlorinated Biphenyls													
Aroclor 1016	ug/kg	< 35	U	35	< 42	U	42	< 45	U	45	< 39	U	39
Aroclor 1221	ug/kg	< 35	U	35	< 42	U	42	< 45	U	45	< 39	U	39
Aroclor 1232	ug/kg	< 35	U	35	< 42	U	42	< 45	U	45	< 39	U	39
Aroclor 1242	ug/kg	< 35	U	35	< 42	U	42	< 45	U	45	< 39	U	39
Aroclor 1248	ug/kg	< 35	U	35	< 42	U	42	< 45	U	45	< 39	U	39
Aroclor 1254	ug/kg	11400	J	350	114		42	459		45	115		39
Aroclor 1260	ug/kg	< 35	U	35	< 42	U	42	< 45	U	45	< 39	U	39
Aroclor 1262	ug/kg	< 35	U	35	< 42	U	42	< 45	U	45	< 39	U	39
Aroclor 1268	ug/kg	< 35	U	35	< 42	U	42	< 45	U	45	< 39	U	39
Metals													
Aluminum	mg/kg	12800		18	33300		50	15200		49	42800		52
Antimony	mg/kg	0.42	J	0.88	< 2	UJ	2	0.53	J-	2	< 2.1	UJ	2.1
Barium	mg/kg	160	J	4.4	191		20	127		20	83.1		21
Calcium	mg/kg	22500	J	440	104000		990	189000		1500	12700		520
Chromium	mg/kg	43.2	J	0.88	32.9	J	2	46.8	J	0.99	22.4	J	2.1
Cobalt	mg/kg	10.8	J	4.4	29.7		5	9.2		4.9	34.5		5.2
Copper	mg/kg	47.6	J	2.2	101	J+	5	182	J+	2.5	63.8	J+	5.2
Iron	mg/kg	27200		88	45200	J-	99	21000	J-	49	47200	J-	100
Lead	mg/kg	42.1	J	0.88	39.6		4	108		2	11.8	J	4.1
Manganese	mg/kg	625	J	1.3	1230	J	3	376	J	1.5	1250	J	3.1
Mercury	mg/kg	0.29		0.033	0.33	J+	0.041	1.3	J+	0.091	0.06	J+	0.038
Nickel	mg/kg	23.1	J	3.5	27	J	7.9	24.7		4	28.9	J	8.3
Selenium	mg/kg	< 0.88	U	0.88	1.8	J	4	0.74	J	2	2.3	J	4.1

Checked by: WM 2/14/14

Table 3  
Validated Analytical Results  
Module 4 Impoundment 24 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID		IMP 24-05			IMP 24-06			IMP 24-06			IMP 24-07		
Sample Date		11/14/2013			11/18/2013			11/18/2013			11/18/2013		
N=Normal, FD=Field Duplicate		N			N			N			N		
Start Depth (in)		12			0			12			0		
End Depth (in)		24			12			24			12		
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
Vanadium	mg/kg	28.6	J	0.88	159	J-	5	46.4	J-	4.9	193	J-	5.2
Zinc	mg/kg	84.9	J-	1.8	90.7	J	4	132	J	5.9	56.3	J	2.1
<b>General Chemistry Parameters</b>													
Cyanide	mg/kg	< 0.27	U	0.27	0.46	J-	0.29	< 0.67	R	0.67	< 0.56	R	0.56
Ferrous Iron	%	NA			NA			NA			NA		
Hexavalent Chromium	mg/kg	1.7	J	0.45	2.3	J	0.51	3	J	0.57	< 0.47	UJ	0.47
Methanol	ug/kg	< 220	U	220	2800		240	1410		280	< 230	U	230
Oxidation-Reduction Potential	millivolts	276			173			143			249		
pH	pH units	7.5	J		12	J		12.05	J		7.13	J	
Sulfate	mg/kg	< 110	U	110	< 130	R	130	< 140	R	140	< 120	R	120
Sulfide Screen	none	NA			NA			NA			NA		
Sulfur	mg/kg	220		5.5	1030	J	10	3290	J	15	134		6.1
Total Organic Carbon	mg/kg	11900		110	7110		130	18100		140	5730		120
<b>Grain Size</b>													
% GRAVEL	%	22.1			28.7			19.7			33.6		
% SAND	%	50.5			50			49.9			29.5		
% Silt, Clay, Colloids	%	27.4			21.3			30.4			36.9		

**Qualifiers:**

J = estimated

J+ = estimated high

J- = estimated low

R = rejected

U = not detected above the RL

UJ = not detected above the RL, RL is estimated

**Abbreviations:**

mg/kg = milligrams per kilogram

NA = not analyzed

Qual = interpreted qualifier

RL = reporting limit

ug/kg = micrograms per kilogram

Checked by: WM 2/14/14

Table 3  
Validated Analytical Results  
Module 4 Impoundment 24 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID		IMP 24-07			IMP 24-08			IMP 24-08			IMP 24-08		
Sample Date		11/18/2013			11/18/2013			11/18/2013			11/18/2013		
N=Normal, FD=Field Duplicate		N			N			N			FD		
Start Depth (in)		12			0			12			12		
End Depth (in)		24			12			24			24		
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
<b>Volatile Organic Compounds</b>													
1,3,5-Trimethylbenzene	ug/kg	< 7.4	U	7.4	< 9.7	U	9.7	< 19	UJ	19	< 18	UJ	18
Acetone	ug/kg	< 15	U	15	< 19	U	19	54.8	J	38	52.4	J	35
Benzene	ug/kg	0.61	J	1.5	< 1.9	U	1.9	< 3.8	UJ	3.8	0.83	J	3.5
Chlorobenzene	ug/kg	0.63	J	7.4	< 9.7	U	9.7	< 19	UJ	19	< 18	UJ	18
cis-1,2-Dichloroethene	ug/kg	< 7.4	U	7.4	< 9.7	U	9.7	< 19	UJ	19	< 18	UJ	18
Ethylbenzene	ug/kg	0.48	J	1.5	< 1.9	U	1.9	< 3.8	UJ	3.8	< 3.5	UJ	3.5
m,p-Xylenes	ug/kg	4.9		1.5	1	J	1.9	< 3.8	UJ	3.8	< 3.5	UJ	3.5
Methylene Chloride	ug/kg	< 7.4	U	7.4	12.6		9.7	17.4	J	19	15.4	J	18
o-Xylene	ug/kg	1.3	J	1.5	< 1.9	U	1.9	< 3.8	UJ	3.8	< 3.5	UJ	3.5
Tetrachloroethene	ug/kg	< 7.4	U	7.4	< 9.7	U	9.7	< 19	UJ	19	< 18	UJ	18
Toluene	ug/kg	0.73	J	1.5	0.68	J	1.9	< 3.8	UJ	3.8	0.8	J	3.5
<b>Semivolatile Organic Compounds</b>													
1,2,4-Trichlorobenzene	ug/kg	199		150	22.5	J	83	< 120	U	120	< 120	U	120
1,2-Dichlorobenzene	ug/kg	685		150	203		83	85.5	J	120	53	J	120
1,2-Diphenylhydrazine	ug/kg	11200		1500	162		83	122		120	50.2	J	120
1,3-Dichlorobenzene	ug/kg	< 150	U	150	< 83	U	83	< 120	U	120	< 120	U	120
1,4-Dichlorobenzene	ug/kg	< 150	U	150	< 83	U	83	< 120	U	120	< 120	U	120
2-Chloronaphthalene	ug/kg	< 150	U	150	357		83	78.1	J	120	41.2	J	120
2-Methylnaphthalene	ug/kg	826		150	206		83	50.8	J	120	< 120	U	120
Acenaphthene	ug/kg	755		75	157		41	52.5	J	62	< 59	U	59
Acenaphthylene	ug/kg	174		75	59.2		41	< 62	U	62	< 59	U	59
Aniline	ug/kg	42400		1500	2990		83	1540	J	120	328	J	120
Anthracene	ug/kg	1240		75	56.2		41	29.9	J	62	< 59	U	59
Benzidine	ug/kg	1220	J	1500	< 830	U	830	< 1200	U	1200	< 1200	U	1200
Benzo[a]anthracene	ug/kg	1680		75	101		41	59.5	J	62	47.5	J	59
Benzo[a]pyrene	ug/kg	775		75	62.8		41	49.2	J	62	< 59	U	59
Benzo[b]fluoranthene	ug/kg	1280		75	63.8		41	36.4	J	62	< 59	U	59
Benzo[g,h,i]perylene	ug/kg	481		75	42.2		41	< 62	U	62	27.6	J	59
Benzo[k]fluoranthene	ug/kg	370		75	24.5	J	41	< 62	U	62	< 59	U	59
Biphenyl	ug/kg	16300		1500	75.3	J	83	28.6	J	120	< 120	U	120
Bis(2-ethylhexyl) Phthalate	ug/kg	< 150	U	150	62.8	J	83	< 120	U	120	< 120	U	120
Carbazole	ug/kg	327		150	34.5	J	83	< 120	U	120	< 120	U	120
Chrysene	ug/kg	856		75	59.3		41	46.6	J	62	31.6	J	59
Dibenzofuran	ug/kg	4210		150	129		83	53.3	J	120	< 120	U	120

Checked by: WM 2/14/14

Table 3  
Validated Analytical Results  
Module 4 Impoundment 24 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID		IMP 24-07			IMP 24-08			IMP 24-08			IMP 24-08		
Sample Date		11/18/2013			11/18/2013			11/18/2013			11/18/2013		
N=Normal, FD=Field Duplicate		N			N			N			FD		
Start Depth (in)		12			0			12			12		
End Depth (in)		24			12			24			24		
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
Dimethyl Phthalate	ug/kg	< 150	U	150	< 83	U	83	< 120	U	120	< 120	U	120
Fluoranthene	ug/kg	2980		75	101		41	73.8		62	53.1	J	59
Fluorene	ug/kg	816		75	82.5		41	26.1	J	62	< 59	U	59
Indeno[1,2,3-cd]pyrene	ug/kg	467		75	25.2	J	41	< 62	U	62	< 59	U	59
m,p-Cresol	ug/kg	< 150	U	150	301		83	< 120	R	120	< 120	R	120
Naphthalene	ug/kg	2810		75	1120		41	296	J	62	84.4	J	59
Nitrobenzene	ug/kg	12100		1500	249		83	176		120	59	J	120
N-Nitrosodiphenylamine	ug/kg	19700		3700	1040		210	583	J	310	169	J	290
Phenanthrene	ug/kg	5060		75	212		41	143	J	62	79.4	J	59
Pyrene	ug/kg	1460		75	80.2		41	61.6	J	62	43	J	59
Pyridine	ug/kg	< 150	U	150	< 83	U	83	< 120	U	120	< 120	U	120
Polychlorinated Biphenyls													
Aroclor 1016	ug/kg	< 38	U	38	< 42	U	42	< 63	U	63	< 58	U	58
Aroclor 1221	ug/kg	< 38	U	38	< 42	U	42	< 63	U	63	< 58	U	58
Aroclor 1232	ug/kg	< 38	U	38	< 42	U	42	< 63	U	63	< 58	U	58
Aroclor 1242	ug/kg	< 38	U	38	< 42	U	42	< 63	U	63	< 58	U	58
Aroclor 1248	ug/kg	< 38	U	38	< 42	U	42	130	J	63	236	J	58
Aroclor 1254	ug/kg	1080		38	< 42	U	42	< 63	U	63	< 58	U	58
Aroclor 1260	ug/kg	< 38	U	38	< 42	U	42	< 63	U	63	< 58	U	58
Aroclor 1262	ug/kg	< 38	U	38	< 42	U	42	< 63	U	63	< 58	U	58
Aroclor 1268	ug/kg	< 38	U	38	< 42	U	42	< 63	U	63	< 58	U	58
Metals													
Aluminum	mg/kg	18600		61	8450		50	12900	J	49	7630	J	51
Antimony	mg/kg	< 2.4	UJ	2.4	0.8	J-	2	1.2	J-	2	1	J-	2
Barium	mg/kg	282		24	176		20	55.8		20	21.4		20
Calcium	mg/kg	74000		610	160000		1000	262000		1500	227000		1500
Chromium	mg/kg	393	J	1.2	25.7	J	1	16.8	J	0.99	14.7	J	1
Cobalt	mg/kg	13.3		6.1	6.6		5	5.3		4.9	2.5	J	5.1
Copper	mg/kg	732	J+	3	78.2	J+	2.5	60.9	J+	2.5	29.9	J+	2.5
Iron	mg/kg	35700	J-	61	13000	J-	50	8370	J-	49	3750	J-	51
Lead	mg/kg	262		2.4	47.3		2	45.5	J	5.9	16.7	J	6.1
Manganese	mg/kg	539	J	1.8	144	J	1.5	178	J	1.5	59.6	J	1.5
Mercury	mg/kg	2.1	J+	0.19	0.96	J+	0.082	1	J+	0.061	0.12	J+	0.055
Nickel	mg/kg	36.7		4.9	15		4	9.9		4	6		4.1
Selenium	mg/kg	2.1	J	2.4	2		2	2.3		2	0.99	J	2

Checked by: WM 2/14/14

Table 3  
Validated Analytical Results  
Module 4 Impoundment 24 Surface Soil Samples  
American Cyanamid Superfund Site  
Bridgewater Township, NJ

Sample ID		IMP 24-07			IMP 24-08			IMP 24-08			IMP 24-08		
Sample Date		11/18/2013			11/18/2013			11/18/2013			11/18/2013		
N=Normal, FD=Field Duplicate		N			N			N			FD		
Start Depth (in)		12			0			12			12		
End Depth (in)		24			12			24			24		
Parameter	Unit	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
Vanadium	mg/kg	85.6	J-	6.1	35.5	J-	5	27.7	J-	4.9	13.6	J-	5.1
Zinc	mg/kg	166	J	2.4	62.4	J	4	50.4	J	5.9	24.2	J	6.1
<b>General Chemistry Parameters</b>													
Cyanide	mg/kg	< 0.57	R	0.57	< 0.61	R	0.61	1.6	J-	0.92	1.1	J-	0.79
Ferrous Iron	%	NA			1.6	J	0.2	NA			NA		
Hexavalent Chromium	mg/kg	7.4	J	0.48	5.6	J	0.51	< 0.76	UJ	0.76	< 0.71	UJ	0.71
Methanol	ug/kg	< 220	U	220	< 240	U	240	2180	J	380	1180	J	340
Oxidation-Reduction Potential	millivolts	255			143			110			97.4		
pH	pH units	9.81	J		10.16	J		11.77	J		11.5	J	
Sulfate	mg/kg	356	J-	120	260	J-	130	< 190	R	190	< 180	R	180
Sulfide Screen	none	NA			NEGATIVE			NA			NA		
Sulfur	mg/kg	1550		6.1	722	J	15	4800	J	15	6600	J	15
Total Organic Carbon	mg/kg	33900		120	20300		130	21200	J	190	4130	J	180
<b>Grain Size</b>													
% GRAVEL	%	31.7			34.4			31.2			NA		
% SAND	%	45.8			42.7			49.9			NA		
% Silt, Clay, Colloids	%	22.6			23			18.9			NA		

**Qualifiers:**

J = estimated

J+ = estimated high

J- = estimated low

R = rejected

U = not detected above the RL

UJ = not detected above the RL, RL is estimated

**Abbreviations:**

mg/kg = milligrams per kilogram

NA = not analyzed

Qual = interpreted qualifier

RL = reporting limit

ug/kg = micrograms per kilogram

Checked by: WM 2/14/14

**APPENDIX B**  
**NJDEP, NHP, AND USFWS THREATENED/ENDANGERED SPECIES BERA LETTER**  
**RESPONSES**



State of New Jersey

James E. McGreevey  
Governor

Department of Environmental Protection  
Division of Parks and Forestry  
Office of Natural Lands Management  
Natural Heritage Program  
P.O. Box 404  
Trenton, NJ 08625-0404  
Tel. #609-984-1339  
Fax. #609-984-1427

Bradley M. Campbell  
Commissioner

November 5, 2003

Ronald P. Chiarello  
O'Brien & Gere Engineers, Inc.  
5000 Brittonfield Parkway, P.O. Box 4873  
Syracuse, NY 13221-4873

NJ0002173276

Re: Wyeth, American Cyanamid Site, Bound Brook

Dear Mr. Chiarello:

Thank you for your data request regarding rare species information for the above referenced project site in Bridgewater Township and Bound Brook Borough, Somerset County.

Searches of the Natural Heritage Database and the Landscape Project are based on a representation of the boundaries of your project site in our Geographic Information System (GIS). We make every effort to accurately transfer your project bounds from the topographic map(s) submitted with the Request for Data into our Geographic Information System. We do not verify that your project bounds are accurate, or check them against other sources. Landscape patches are searched using the boundary depicted on your map buffered by 15 meters. The 15-meter buffer is to accommodate for inherent GIS mapping imprecision.

We have checked the Natural Heritage Database and the Landscape Project habitat mapping for occurrences of any rare wildlife species or wildlife habitat on the referenced site. Please see Table 1 for species list and conservation status.

Table 1 (on referenced site).

Common Name	Scientific Name	Federal Status	State Status	Grank	Srank
herptile species of special concern					

Neither the Natural Heritage Database nor the Landscape Project has records for any additional rare wildlife species or wildlife habitat within 1/4 mile of the referenced site.

We have also checked the Natural Heritage Database for occurrences of rare plant species or natural communities. The Natural Heritage Data Base does not have any records for rare plants or natural communities on or within 1/4 mile of the site.

Attached is a list of rare species and natural communities that have been documented from Somerset County. If suitable habitat is present at the project site, these species have potential to be present.

Status and rank codes used in the tables and lists are defined in the attached EXPLANATION OF CODES USED IN NATURAL HERITAGE REPORTS.

If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend that you visit the interactive I-Map-NJ website at the following URL, <http://www.state.nj.us/dep/gis/imapnj/imapnj.htm> or contact the Division of Fish and Wildlife, Endangered and Nongame Species Program.

PLEASE SEE THE ATTACHED 'CAUTIONS AND RESTRICTIONS ON NHP DATA'.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,

*Herbert A. Lord*

Herbert A. Lord  
Data Request Specialist

cc: Robert J. Cartica  
Lawrence Niles  
NHP File No. 03-4007455

27 JUN 2002

SOMERSET COUNTY  
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN  
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
*** Vertebrates						
ACCIPITER COOPERII	COOPER'S HAWK		T/T		G5	S3B, S4N
AMBYSTOMA LATERALE	BLUE-SPOTTED SALAMANDER		E		G5	S1
AMMODRAMUS HENSLOWII	HENSLOW'S SPARROW		E		G4	S1B
AMMODRAMUS SAVANNARUM	GRASSHOPPER SPARROW		T/S		G5	S2B
ARDEA HERODIAS	GREAT BLUE HERON		S/S		G5	S2B, S4N
BARTRAMIA LONGICAUDA	UPLAND SANDPIPER		E		G5	S1B
BUTEO LINEATUS	RED-SHOULDERED HAWK		E/T		G5	S1B, S2N
CLEMMYS INSCULPTA	WOOD TURTLE		T		G4	S3
CLEMMYS MUHLENBERGII	BOG TURTLE	LT	E		G3	S2
DOLICHONYX ORYZIVORUS	BOBOLINK		T/T		G5	S2B
EURYCEA LONGICAUDA LONGICAUDA	LONGTAIL SALAMANDER		T		G5T5	S2
LYNX RUFUS	BOBCAT		E		G5	S3
MELANERPES ERYTHROCEPHALUS	RED-HEADED WOODPECKER		T/T		G5	S2B, S2N
PASSERCULUS SANDWICHENSIS	SAVANNAH SPARROW		T/T		G5	S2B, S4N
PETROCHELIDON PYRRHONOTA	CLIFF SWALLOW		S/S		G5	S2B
POECCETES GRAMINEUS	VESPER SPARROW		E		G5	S1B, S2N
STRIX VARIA	BARRED OWL		T/T		G5	S3B
*** Ecosystems						
CAVE AQUATIC COMMUNITY	CAVE AQUATIC COMMUNITY				G4?	S2
CAVE TERRESTRIAL COMMUNITY	CAVE TERRESTRIAL COMMUNITY				G4?	S3
FLOODPLAIN FOREST	FLOODPLAIN FOREST				G4	S3?
TRAPROCK GLADE/ROCK OUTCROP COMMUNITY	TRAPROCK GLADE/ROCK OUTCROP COMMUNITY				G2	S1?
*** Invertebrates						
ALASMIDONTA UNDULATA	TRIANGLE FLOATER		T		G4	S3
ALASMIDONTA VARICOSA	BROOK FLOATER		E		G3	S1
GOMPHUS ABBREVIATUS	SPINE-CROWNED CLUBTAIL				G3G4	S2S3

SOMERSET COUNTY  
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN  
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
HESPERIA LEONARDUS	LEONARD'S SKIPPER				G4	S2
LAMPSILIS CARIOSA	YELLOW LAMPUSSEL		T		G3G4	S1
METARRANTHIS PILOSARIA	COASTAL BOG METARRANTHIS				G3G4	S3S4
*** Other types						
PRIMEVAL FOREST	PRIMEVAL FOREST				G3?	S1
*** Vascular plants						
ACER NIGRUM	BLACK MAPLE				G5	S2
AGASTACHE NEPETOIDES	YELLOW GIANT-HYSSOP				G5	S2
ALISMA TRIVIALE	LARGE WATER-PLANTAIN		E		G5	S1
ASCLEPIAS RUBRA	RED MILKWEED			LP	G4G5	S2
ASTER PRAEALTUS	WILLOW-LEAF ASTER		E		G5T5?	S1
BOTRYCHIUM ONEIDENSE	BLUNT-LOBE GRAPE FERN				G4Q	S2
BOUTELOUA CURTIPENDULA	SIDE-OATS GRAMA GRASS		E		G5T5	S1
CALYSTEGIA SPITHAMAEA	ERECT BINDWEED		E		G4G5T4T5	S1
CARDAMINE ANGUSTATA	SLENDER TOOTHWORT				G5	S3
CAREX CRAWFORDII	CRAWFORD'S SEDGE				G5	S2
CAREX FRANKII	FRANK'S SEDGE				G5	S3
CAREX PALLESCENS	PALE SEDGE				G5	S2
CAREX WILLDENOWII VAR WILLDENOWII	WILLDENOW'S SEDGE				G5T5	S2
CASTILLEJA COCCINEA	SCARLET INDIAN-PAINTBRUSH				G5	S2
CERCIS CANADENSIS	REDBUD		E		G5T5	S1
CHEILANTHES LANOSA	HAIRY LIPFERN				G5	S2
CLEMATIS OCCIDENTALIS VAR OCCIDENTALIS	PURPLE CLEMATIS				G5T5	S2
CRATAEGUS PUNCTATA	DOTTED HAWTHORN				G5	S2
CYNOGLOSSUM VIRGINIANUM VAR VIRGINIANUM	WILD COMFREY				G5T5	S2

27 JUN 2002

SOMERSET COUNTY  
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN  
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK
DOELLINGERIA INFIRMA	CORNEL-LEAF ASTER				G5	S2
ELEOCHARIS TENUIS VAR VERRUCOSA	WARTY SPIKE-RUSH		E		G5T3T5	S1.1
MELANTHIUM VIRGINICUM	VIRGINIA BUNCHFLOWER		E		G5	S1
MUHLENBERGIA CAPILLARIS	LONG-AWN SMOKE GRASS		E		G5T7	S1
PHLOX PILOSA	DOWNY PHLOX		E		G5T5	SH
PLANTAGO PUSILLA	DWARF PLANTAIN		E		G5	SH
POTAMOGETON ROBBINSII	ROBBIN'S PONDWEED		E		G5	S2
PTELEA TRIFOLIATA	WAFER-ASH		E		G5T5	S1
RANUNCULUS PUSILLUS VAR PUSILLUS	LOW SPEARWORT				G5T4?	S2
RUDBECKIA FULGIDA	ORANGE CONEFLOWER		E		G5T4?	S1
SAGITTARIA AUSTRALIS	SOUTHERN ARROWHEAD		E		G5	S1
SANICULA TRIFOLIATA	LARGE-FRUIT BLACK-SNAKEROOT		E		G4	S1
SCUTELLARIA LEONARDII	SMALL SKULLCAP		E		G4T4	S1
SELAGINELLA RUPESTRIS	ROCK SPIKE-MOSS				G5	S2
SPIRANTHES LACINIATA	LACE-LIP LADIES'-TRESSES		E		G4G5	S1
SPOROBOLUS NEGLECTUS	SMALL RUSH-GRASS		E		G5	S1
STACHYS PALUSTRIS VAR HOMOTRICHA	HAIRY HEDGE-NETTLE		E		G5T7	SH
TRIOSTEUM ANGUSTIFOLIUM	NARROW-LEAF HORSE-GENTIAN		E		G5	S1

15 Records Processed

## CAUTIONS AND RESTRICTIONS ON NATURAL HERITAGE DATA

The quantity and quality of data collected by the Natural Heritage Program is dependent on the research and observations of many individuals and organizations. Not all of this information is the result of comprehensive or site-specific field surveys. Some natural areas in New Jersey have never been thoroughly surveyed. As a result, new locations for plant and animal species are continuously added to the database. Since data acquisition is a dynamic, ongoing process, the Natural Heritage Program cannot provide a definitive statement on the presence, absence, or condition of biological elements in any part of New Jersey. Information supplied by the Natural Heritage Program summarizes existing data known to the program at the time of the request regarding the biological elements or locations in question. They should never be regarded as final statements on the elements or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments. The attached data is provided as one source of information to assist others in the preservation of natural diversity.

This office cannot provide a letter of interpretation or a statement addressing the classification of wetlands as defined by the Freshwater Wetlands Act. Requests for such determination should be sent to the DEP Land Use Regulation Program, P.O. Box 401, Trenton, NJ 08625-0401.

The Landscape Project was developed by the Division of Fish & Wildlife, Endangered and Nongame Species Program to map critical habitat for rare animal species. Some of the rare species data in the Landscape Project is in the Natural Heritage Database, while other records were obtained from other sources. Natural Heritage Database response letters will list all species (if any) found during a search of the Landscape Project. However, any reports that are included with the response letter will only reference specific records if they are in the Natural Heritage Database. This office cannot answer any inquiries about the Landscape Project. All questions should be directed to the DEP Division of Fish and Wildlife, Endangered and Nongame Species Program, P.O. Box 400, Trenton, NJ 08625-0400.

**This cautions and restrictions notice must be included whenever information provided by the Natural Heritage Database is published.**



NJ Department of Environmental Protection  
Division of Parks and Forestry

Natural Lands Management

## EXPLANATIONS OF CODES USED IN NATURAL HERITAGE REPORTS

### FEDERAL STATUS CODES

The following U.S. Fish and Wildlife Service categories and their definitions of endangered and threatened plants and animals have been modified from the U.S. Fish and Wildlife Service (F.R. Vol. 50 No. 188; Vol. 61, No. 40; F.R. 50 CFR Part 17). Federal Status codes reported for species follow the most recent listing.

- LE Taxa formally listed as endangered.
- LT Taxa formally listed as threatened.
- PE Taxa already proposed to be formally listed as endangered.
- PT Taxa already proposed to be formally listed as threatened.
- C Taxa for which the Service currently has on file sufficient information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened species.
- S/A Similarity of appearance species.

### STATE STATUS CODES

Two animal lists provide state status codes after the Endangered and Nongame Species Conservation Act of 1973 (NSSA 23:2A-13 et. seq.): the list of endangered species (N.J.A.C. 7:25-4.13) and the list defining status of indigenous, nongame wildlife species of New Jersey (N.J.A.C. 7:25-4.17(a)). The status of animal species is determined by the Nongame and Endangered Species Program (ENSP). The state status codes and definitions provided reflect the most recent lists that were revised in the New Jersey Register, Monday, June 3, 1991.

- D Declining species—a species which has exhibited a continued decline in population numbers over the years.
- E Endangered species—an endangered species is one whose prospects for survival within the state are in immediate danger due to one or many factors – a loss of habitat, over exploitation, predation, competition, disease. An endangered species requires immediate assistance or extinction will probably follow.
- EX Extirpated species—a species that formerly occurred in New Jersey, but is not now known to exist within the state.
- I Introduced species—a species not native to New Jersey that could not have established itself here without the assistance of man.
- INC Increasing species—a species whose population has exhibited a significant increase, beyond the normal range of its life cycle, over a long term period.
- T Threatened species—a species that may become endangered if conditions surrounding the species begin to or continue to deteriorate.
- P Peripheral species—a species whose occurrence in New Jersey is at the extreme edge of its present natural range.
- S Stable species—a species whose population is not undergoing any long-term increase/decrease within its natural cycle.
- U Undetermined species—a species about which there is not enough information available to determine the status.

Status for animals separated by a slash(/) indicate a dual status. First status refers to the state breeding population, and the second status refers to the migratory or winter population.

Plant taxa listed as endangered are from New Jersey's official Endangered Plant Species List N.J.S.A. 131B-15.151 et seq.

**E Native New Jersey plant species whose survival in the State or nation is in jeopardy.**

**REGIONAL STATUS CODES FOR PLANTS**

- LP** Indicates taxa listed by the Pinelands Commission as endangered or threatened within their legal jurisdiction. Not all species currently tracked by the Pinelands Commission are tracked by the Natural Heritage Program. A complete list of endangered and threatened Pineland species is included in the New Jersey Pinelands Comprehensive Management Plan.

**EXPLANATION OF GLOBAL AND STATE ELEMENT RANKS**

The Nature Conservancy has developed a ranking system for use in identifying elements (rare species and natural communities) of natural diversity most endangered with extinction. Each element is ranked according to its global, national, and state (or subnational in other countries) rarity. These ranks are used to prioritize conservation work so that the most endangered elements receive attention first. Definitions for element ranks are after The Nature Conservancy (1982: Chapter 4, 4.1-1 through 4.4.1.3-3).

**GLOBAL ELEMENT RANKS**

- G1** Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.
- G2** Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.
- G3** Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single western state, a physiographic region in the East) or because of other factors making it vulnerable to extinction throughout its range; with the number of occurrences in the range of 21 to 100.
- G4** Apparently secure globally; although it may be quite rare in parts of its range, especially at the periphery.
- G5** Demonstrably secure globally; although it may be quite rare in parts of its range, especially at the periphery.
- GH** Of historical occurrence throughout its range i.e., formerly part of the established biota, with the expectation that it may be rediscovered.
- GU** Possibly in peril range-wide but status uncertain; more information needed.
- GX** Believed to be extinct throughout range (e.g., passenger pigeon) with virtually no likelihood that it will be rediscovered.
- G7** Species has not yet been ranked.

**STATE ELEMENT RANKS**

- S1** Critically imperiled in New Jersey because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres). Elements so ranked are often restricted to very specialized conditions or habitats and/or restricted to an extremely small geographical area of the state. Also included are elements which were formerly more abundant, but because of habitat destruction or some other critical factor of its biology, they have been demonstrably reduced in abundance. In essence, these are elements for which, even with intensive searching, sizable additional occurrences are unlikely to be discovered.

- S2 Imperiled in New Jersey because of rarity (6 to 20 occurrences). Historically many of these elements may have been more frequent but are now known from very few extant occurrences, primarily because of habitat destruction. Diligent searching may yield additional occurrences.
- 
- S3 Rare in state with 21 to 100 occurrences (plant species in this category have only 21 to 50 occurrences). Includes elements which are widely distributed in the state but with small populations/acreage or elements with restricted distribution, but locally abundant. Not yet imperiled in state but may soon be if current trends continue. Searching often yields additional occurrences.
- S4 Apparently secure in state, with many occurrences.
- S5 Demonstrably secure in state and essentially ineradicable under present conditions.
- SA Accidental in state, including species (usually birds or butterflies) recorded once or twice or only at very great intervals, hundreds or even thousands of miles outside their usual range; a few of these species may even have bred on the one or two occasions they were recorded; examples include European strays or western birds on the East Coast and vice-versa.
- SE Elements that are clearly exotic in New Jersey including those taxa not native to North America (introduced taxa) or taxa deliberately or accidentally introduced into the State from other parts of North America (adventive taxa). Taxa ranked SE are not a conservation priority (viable introduced occurrences of G1 or G2 elements may be exceptions).
- SH Elements of historical occurrence in New Jersey. Despite some searching of historical occurrences and/or potential habitat, no extant occurrences are known. Since not all of the historical occurrences have been field surveyed, and unsearched potential habitat remains, historically ranked taxa are considered possibly extant, and remain a conservation priority for continued field work.
- SP Element has potential to occur in New Jersey, but no occurrences have been reported.
- SR Elements reported from New Jersey, but without persuasive documentation which would provide a basis for either accepting or rejecting the report. In some instances documentation may exist, but as of yet, its source or location has not been determined.
- SRF Elements erroneously reported from New Jersey, but this error persists in the literature.
- SU Elements believed to be in peril but the degree of rarity uncertain. Also included are rare taxa of uncertain taxonomical standing. More information is needed to resolve rank.
- SX Elements that have been determined or are presumed to be extirpated from New Jersey. All historical occurrences have been searched and a reasonable search of potential habitat has been completed. Extirpated taxa are not a current conservation priority.
- SXC Elements presumed extirpated from New Jersey, but native populations collected from the wild exist in cultivation.
- SZ Not of practical conservation concern in New Jersey, because there are no definable occurrences, although the taxon is native and appears regularly in the state. An SZ rank will generally be used for long distance migrants whose occurrences during their migrations are too irregular (in terms of repeated visitation to the same locations), transitory, and dispersed to be reliably identified, mapped and protected. In other words, the migrant regularly passes through the state, but enduring, mappable element occurrences cannot be defined.

Typically, the SZ rank applies to a non-breeding population (N) in the state - for example, birds on migration. An SZ rank may in a few instances also apply to a breeding population (B), for example certain lepidoptera which regularly die out every year with no significant return migration.

Although the SZ rank typically applies to migrants, it should not be used indiscriminately. Just because a species is on migration does not mean it receives an SZ rank. SZ will only apply when the migrants occur in an irregular, transitory and dispersed manner.

- B** Refers to the breeding population of the element in the state.
- N** Refers to the non-breeding population of the element in the state.
- T** Element ranks containing a "T" indicate that the infraspecific taxon is being ranked differently than the full species. For example *Stachys palustris* var. *homotricha* is ranked "GST? SH" meaning the full species is globally secure but the global rarity of the var. *homotricha* has not been determined; in New Jersey the variety is ranked historic.
- Q** Elements containing a "Q" in the global portion of its rank indicates that the taxon is of questionable, or uncertain taxonomical standing, e.g., some authors regard it as a full species, while others treat it at the subspecific level.
- .1** Elements documented from a single location.

**Note:** To express uncertainty, the most likely rank is assigned and a question mark added (e.g., G2?). A range is indicated by combining two ranks (e.g., G1G2, S1S3).

#### IDENTIFICATION CODES

These codes refer to whether the identification of the species or community has been checked by a reliable individual and is indicative of significant habitat.

- Y** Identification has been verified and is indicative of significant habitat.
- BLANK** Identification has not been verified but there is no reason to believe it is not indicative of significant habitat.
- ?** Either it has not been determined if the record is indicative of significant habitat or the identification of the species or community may be confusing or disputed.



United States Department of the Interior  
FISH AND WILDLIFE SERVICE

New Jersey Field Office

Ecological Service

927 North Main Street, Building D  
Pleasantville, New Jersey 08132

Tel: 609-646-9310

Fax: 609-646-8352

<http://njfieldoffice.fws.gov>



IN REPLY REFER TO:  
ES-03/NE080

DEC 3 2013

Ronald P. Chiarillo, Project Scientist  
O'Brien & Gere Engineers, Inc.  
5000 Brimfield Parkway  
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Syracuse, New York 13221-4873  
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Reference: Threatened and endangered species review in the vicinity of the proposed Wynth American  
Cyanamid site located in Round Brook Township, Somerset County, New Jersey

The U.S. Fish and Wildlife Service (Service) has reviewed the above-referenced proposed project pursuant to Section 7 of the Endangered Species Act of 1973 (87 Stat. 834, as amended; 16 U.S.C. 1531 *et seq.*) to ensure the protection of Federally listed endangered and threatened species. The following comments do not address all Service concerns for fish and wildlife resources and do not preclude separate review and comment by the Service as afforded by other applicable environmental legislation.

Except for an occasional transient bald eagle (*Haliaeetus leucocephalus*), no other Federally listed or proposed endangered or threatened flora or fauna under Service jurisdiction are known to occur within the vicinity of the proposed project site. Therefore, no further consultation pursuant to Section 7 of the Endangered Species Act is required by the Service. This determination is based on the best available information. If additional information on Federally listed species becomes available, or if project plans change, this determination may be reconsidered. Please be aware that this determination is valid for 90 days; therefore, if the project is not initiated within this time, the Service should be contacted prior to project implementation to verify the accuracy of this information. The Service will review current information to ensure that no Federally listed threatened or endangered species will be adversely affected by the proposed project.

Enclosed is current information regarding Federally listed and candidate species occurring in New Jersey. The Service encourages federal agencies and other planners to consider candidate species in project planning. The addresses of State agencies that may be contacted for current site-specific information regarding Federal candidate and State-listed species are also enclosed.

Authorizing Supervisor:

Enclosure: Current summaries of Federally listed and candidate species in New Jersey  
Addresses for additional information on candidate and State-listed species

Sect 7 (see NE6067.doc) 11/24/03



## FEDERALLY LISTED ENDANGERED AND THREATENED SPECIES IN NEW JERSEY



An **ENDANGERED** species is any species that is in danger of extinction throughout all or a significant portion of its range.

A **THREATENED** species is any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

	COMMON NAME	SCIENTIFIC NAME	STATUS
<b>FISHES</b>		<i>Acipenser brevirostrum</i>	E
<b>REPTILES</b>		<i>Clemmys muhlenbergii</i>	T
		<i>Lepidochelys kempi</i>	E
		<i>Chelonia mydas</i>	T
		<i>Eretmochelys imbricata</i>	E
		<i>Dermochelys coriacea</i>	E
		<i>Caretta caretta</i>	T
<b>BIRDS</b>		<i>Haliaeetus leucocephalus</i>	T
		<i>Charadrius melodus</i>	T
		<i>Sterna dougalli dougalli</i>	E
<b>MAMMALS</b>		<i>Felis concolor cougar</i>	E+
		<i>Myotis sodalis</i>	E
		<i>Canis lupus</i>	E+
		<i>Sciurus niger cinereus</i>	E+
		<i>Balaenoptera musculus</i>	E
		<i>Balaenoptera physalus</i>	E
		<i>Megaptera novaeangliae</i>	E
		<i>Balaena glacialis</i>	E
		<i>Balaenoptera borealis</i>	E
	<i>Physeter macrocephalus</i>	E	

	COMMON NAME	SCIENTIFIC NAME	STATUS
INVERTEBRATES		<i>Alasmidonta heterodon</i>	E
		<i>Cicindela dorsalis dorsalis</i>	T
		<i>Neonympha m. mitchellii</i>	E+
		<i>Nicrophorus americanus</i>	E+
PLANTS		<i>Isotria medeoloides</i>	T
		<i>Helenium bullata</i>	T
		<i>Rhynchospora krieskernii</i>	T
		<i>Schwalbea americana</i>	E
		<i>Aeschynomene virginica</i>	T
		<i>Amaranthus pumilus</i>	T

E	endangered species	PE	proposed endangered
T	threatened species	PT	proposed threatened
+	presumed extirpated**		

\* Except for sea turtle nesting habitat, principal responsibility for these species is vested with the National Marine Fisheries Service.

\*\* Current records indicate the species does not presently occur in New Jersey, although the species did occur in the State historically.

Note: for a complete listing of Endangered and Threatened Wildlife and Plants, refer to 50 CFR 17.11 and 17.12.

For further information, please contact:

U.S. Fish and Wildlife Service  
 New Jersey Field Office  
 927 N. Main Street, Building D  
 Pleasantville, New Jersey 08232  
 Phone: (609) 646-9310  
 Fax: (609) 646-0352

Revised 12/06/00



## FEDERAL CANDIDATE SPECIES IN NEW JERSEY

**CANDIDATE SPECIES** are species that appear to warrant consideration for addition to the federal List of Endangered and Threatened Wildlife and Plants. Although these species receive no substantive or procedural protection under the Endangered Species Act, the U.S. Fish and Wildlife Service encourages federal agencies and other planners to give consideration to these species in the environmental planning process.

SPECIES	SCIENTIFIC NAME
[REDACTED]	<i>Narthecium americanum</i>
[REDACTED]	<i>Panicum hirtell</i>

Note: For complete listings of taxa under review as candidate species, refer to Federal Register Vol. 64, No. 205, October 25, 1999 (Endangered and Threatened Wildlife and Plants; Review of Plant and Animal Taxa that are Candidates for Listing as Endangered or Threatened Species).

## **FEDERAL CANDIDATE AND STATE-LISTED SPECIES**

Candidate species are species under consideration by the U.S. Fish and Wildlife Service (Service) for possible inclusion on the List of Endangered and Threatened Wildlife and Plants. Although these species receive no substantive or procedural protection under the Endangered Species Act, the Service encourages federal agencies and other planners to consider federal candidate species in project planning.

The New Jersey Natural Heritage Program maintains the most up-to-date information on federal candidate species and State-listed species in New Jersey and may be contacted at the following address:

Coordinator  
Natural Heritage Program  
Division of Parks and Forestry  
P.O. Box 404  
Trenton, New Jersey 08625  
(609) 984-0097

Additionally, information on New Jersey's State-listed wildlife species may be obtained from the following office:

Dr. Larry Niles  
Endangered and Nongame Species Program  
Division of Fish and Wildlife  
P.O. Box 400  
Trenton, New Jersey 08625  
(609) 292-9400

If information from either of the aforementioned sources reveals the presence of any federal candidate species within a project area, the Service should be contacted to ensure that these species are not adversely affected by project activities.

Revised 07/03

## PERMIT REQUIREMENTS FOR ACTIVITIES IN WETLANDS

A review of the Service's National Wetland Inventory maps indicates that wetlands occur within the project area. Wetlands provide habitats for a variety of migratory and resident species of fish and wildlife. Thus, the Service discourages activities in and affecting the Nation's wetlands that would unnecessarily damage, degrade, or destroy the values associated with them. Project activities in wetlands may require federal and State permits from the U.S. Army Corps of Engineers pursuant to the Clean Water Act of 1977 (33 U.S.C. 1344 *et seq.*), and the New Jersey Department of Environmental Protection and Energy pursuant to the Freshwater Wetlands Protection Act (N.J.S.A. 13:9B-1 *et seq.*). Thus, if work is proposed in or adjacent to wetlands, the following offices must be contacted to determine federal and State permit requirements, respectively:

### Federal Permitting Authority:

Regulatory Branch  
U.S. Army Corps of Engineers  
New York District  
26 Federal Plaza  
New York, New York 10278-0090  
(212) 264-3996  
Fax #: (212) 264-4260

or

Regulatory Branch  
U.S. Army Corps of Engineers  
Philadelphia District  
100 Penn Square East  
Philadelphia, Pennsylvania 19107-3390  
(215) 656-6725  
Fax #: (215) 656-6724



### State Permitting Authority:

Land Use Regulation Program  
New Jersey Department of Environmental Protection  
P.O. Box 439  
501 East State St., 2<sup>nd</sup> Floor  
Trenton, New Jersey 08625  
(609) 984-3444  
Fax #: Northern Counties (609-292-1231); Southern Counties (609-292-8115)

**APPENDIX C**  
**SUMMARY OF IDENTIFIED PLANT SPECIES AND FAUNA BY IMPOUNDMENT**

Appendix C  
 Summary of Identified Plant Species and Fauna by Impoundment  
 PDI Module 4 - Ecological Risk Assessment  
 American Cyanamid Superfund Site, Bridgewater, NJ

Impoundment	Plant Species		Fauna	
	Scientific Name	Common Name	Scientific Name	Common Name
13	<i>Phragmites australis</i>	Common reed	<i>Odocoileus virginianus</i>	White-tailed deer
	<i>Phalaris arundinacea</i>	Reed canary grass	<i>Canis latrans</i> or <i>Vulpes vulpes</i>	Eastern coyote or Red fox
	<i>Ambrosia artemisifolia</i>	Common ragweed	<i>Mephitis mephitis</i>	Striped skunk
	<i>Solidago altissima</i>	Canada goldenrod		Perching birds
	<i>Ailanthus altissima</i>	Tree-of-heaven		Woodpeckers
	<i>Rubus allegheniensis</i>	Blackberry		
	<i>Rubus phoenicolasius</i>	Wineberry		
	<i>Lonicera japonica</i>	Japanese honeysuckle		
	<i>Ageratina altissima</i>	Tall boneset		
	<i>Acer rubrum</i>	Red maple		
17	<i>Eupatorium altissimum</i>	Tall boneset	<i>Odocoileus virginianus</i>	White-tailed deer
	<i>Symphyotrichum lateriflorum</i>	Calico aster	<i>Procyon lotor</i>	Raccoon
	<i>Phalaris arundinacea</i>	Reed canary grass	<i>Marmota monax</i>	Groundhog
	<i>Verbascum thapsus</i>	Common mullein	<i>Peromyscus sp.</i>	Mouse
	<i>Cirsium vulgare</i>	Bull thistle	<i>Meleagris gallopavo</i>	Wild turkey
	<i>Phragmites australis</i>	Common reed		Perching birds
	<i>Linaria vulgaris</i>	Butter and eggs		Woodpeckers
	<i>Artemisia vulgaris</i>	Common mugwort		
	<i>Asclepias syriaca</i>	Common milkweed		
	<i>Rhamnus cathartica</i>	Common buckthorn		
24	<i>Ambrosia artemisifolia</i>	Common ragweed	<i>Odocoileus virginianus</i>	White-tailed deer
	<i>Setaria pumila</i>	Yellow foxtail grass		Terrestrial land snail
	<i>Populus deltoides</i>	Cottonwood	<i>Procyon lotor</i>	Raccoon
	<i>Solidago altissima</i>	Canada goldenrod		Soaring birds
	<i>Juniperus virginiana</i>	Red cedar		Frogs
	<i>Phragmites australis</i>	Common reed	<i>Marmota monax</i>	Groundhog
	<i>Acer negundo</i>	Box-elder	<i>Picoides pubescens</i>	Downy woodpecker
	<i>Dichanthelium clandestinum</i>	Deer-tongue grass		Perching birds
	<i>Platanus occidentalis</i>	American sycamore		
<i>Daucus carota</i>	Queen-Anne's lace			

**Notes**

1. Flora and fauna observed during a November 2013 habitat assessment are listed in the table. Wildlife listed may not have been directly observed, but other evidence was noted (e.g. scat trails, burrows).

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