

**PATHWAY ANALYSIS REPORT
KOPPERS POND KENTUCKY AVENUE
WELLFIELD SITE, OPERABLE UNIT 4
HORSEHEADS, NEW YORK**

Submitted to:

Koppers Pond RI/FS Group

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TABLE OF CONTENTS

	Page
1.0 INTRODUCTION.....	1
2.0 MESA.....	3
3.0 CHEMICALS OF POTENTIAL CONCERN	6
4.0 EXPOSURE POINT CONCENTRATIONS.....	9
5.0 TOXICOLOGICAL DATA AND OTHER CHEMICAL-SPECIFIC DATA	11
6.0 SUMMARY	13
7.0 REFERENCES.....	14

LIST OF FIGURES

- Figure 1 Site Location and Topographic Map
- Figure 2 Koppers Pond and Local Setting

LIST OF TABLES

- Table 1 Chemical-Specific Parameter Values, Kentucky Avenue Wellfield Site, OU 4 -
Koppers Pond, Horseheads, New York

ATTACHMENTS

- Attachment A RAGS Part D Tables

List of Acronyms

BHHRA	Baseline Human Health Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPCs	Chemicals of Potential Concern
CSFs	Cancer Slope Factors
CSMs	Conceptual Site Models
CTE	Central Tendency Exposure
EWB	Elmira Water Board
RAGS	Risk Assessment Guidance for Superfund
RfD	Reference Dose
HEAST	Health Effects Assessment Summary Tables
IRIS	Integrated Risk Information System
MCL	Maximum Contaminant Level
MESA	Memorandum on Exposure Scenarios and Assumptions
NYSDOH	New York State Department of Health
PAHs	Polycyclic Aromatic Hydrocarbons
PAR	Pathway Analysis Report
PCBs	Polychlorinated Biphenyls
PRGs	Preliminary Remediation Goals
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maximum Exposure

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1.0 INTRODUCTION

Under a Settlement Agreement entered with the U.S. Environmental Protection Agency (USEPA), the Koppers Pond RI/FS Group is conducting a remedial investigation and feasibility study (RI/FS) of Koppers Pond as Operable Unit 4 of the Kentucky Avenue Wellfield Superfund Site (Site), which is located within the Village of Horseheads and the Town of Horseheads in Chemung County, New York (Figure 1). The Kentucky Avenue Well is a municipal water supply well owned by the Elmira Water Board (EWB) that was used as part of the EWB system to furnish potable water to local communities. The Kentucky Avenue Well was closed in 1980 when it was found that the groundwater produced from this well contained trichloroethylene. In 1983, USEPA included the Kentucky Avenue Wellfield Site on the National Priorities List for response actions under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

As a component of the RI/FS, a Baseline Human Health Risk Assessment (BHHRA) is being conducted in accordance with USEPA guidance promulgated under CERCLA as amended by the Superfund Amendment and Reauthorization Act and implemented by the National Oil and Hazardous Substances Contingency Plan. As part of the BHHRA and in accordance with the Settlement Agreement, this Pathway Analysis Report (PAR) describes the risk assessment process and how potential risks will be evaluated. It builds on the *Memorandum on Exposure Scenarios and Assumptions* (MESA), submitted on May 29, 2008, and currently under agency review. In particular, the PAR includes the following information:

- Selection of Chemicals of Potential Concern (COPCs);
- Development of exposure point concentrations (EPCs) for the COPCs;
- Toxicological data for the COPCs, and
- Other COPC-specific data (e.g., absorption factors).

Section 2 briefly summarizes the information provided in the MESA for the Site. Section 3 describes the selection of the COPCs, Section 4 discusses EPC development, and Section 5 summarizes the toxicological data and other chemical-specific data. A summary and references

are provided in Sections 6 and 7, respectively. Attachment A contains the USEPA Risk Assessment Guidance under Superfund (RAGS) Part D tables relevant to this PAR.

2.0 MESA

The MESA was developed from key points outlined in the preliminary conceptual site models (CSMs) that have been submitted and accepted by USEPA. The key points from these CSMs are summarized below:

- Koppers Pond is a shallow, flow-through pond with typical water depths of approximately two to six feet and an open water area that covers approximately nine acres. The pond bottom is comprised of soft, mucky (silty) sediments.
- The origin of the pond is not well documented. It is situated in a previously low-lying, wet area that apparently began to fill with water with the onset of discharges from the former Westinghouse Electric Corporation (Westinghouse) Horseheads plant, which began operating in 1952, and industrial development on the south side of the area that began around 1953.
- The Industrial Drainageway begins approximately 2,300 feet to the north-northwest of Koppers Pond at the outlet of the "Chemung Street Outfall" (Figure 2). This drainageway conveys surface water runoff from a 1,400± acre watershed comprised primarily of commercial and industrial properties as well as discharges from the former Westinghouse Horseheads plant site. The Industrial Drainageway discharges to Koppers Pond.
- Two outlet streams flow from the southern end of Koppers Pond and merge about 500 feet downstream to a single outlet channel that flows past the Hardinge, Inc. (Hardinge) plant site and into Halderman Hollow Creek. From there, the creek flows through mixed industrial, commercial, and residential areas and discharges into Newtown Creek approximately three miles south of Koppers Pond.
- Metals, pesticides, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs) have been detected in pond sediments. Metals and pesticides have been found in the surface water of the pond. Metals and PCBs have been detected in fish tissue.
- Historical sources of metals to the pond include industrial discharges from the former Westinghouse Horseheads plant site, as well as from urban and industrial runoff. Ongoing sources include runoff and, to some extent, industrial discharges, although

these discharges have been reduced with many of the past operations no longer discharging to the Drainageway.

- The source of the PCBs found in Koppers Pond sediment has not been determined.
- The pond is situated on property owned by Hardinge, the Village of Horseheads, and the EWB. The pond is surrounded by an area of vacant and active industrial/governmental properties. To the north and northeast is the Old Horseheads Landfill, to the south is the Kentucky Avenue Well site, to the southeast is the Hardinge facility, to the east is Fairway Spring Company, and to the west is a Norfolk Southern railroad right-of-way with active tracks.
- The Norfolk Southern right-of-way runs to the west of the Industrial Drainageway and to the east of this drainage channel are the Chemung County Department of Public Works maintenance facility and the Old Horseheads Landfill.
- Access to Koppers Pond is impeded by the railroad tracks and by the adjacent industrial/governmental properties that are partially fenced. Nevertheless, the presence of litter and off-road vehicle tracks suggest that periodic trespassing occurs in the area. Individuals have been observed bank fishing in Koppers Pond, but there is no evidence of swimming in the pond.
- No recreational or other use of the pond is authorized by any of the property owners. "No Trespassing" signs are posted at the Hardinge property, and the Village and Town of Horseheads have begun more aggressive efforts to discourage trespassing. Such measures include posting "No Trespassing" signs and increased police patrols.
- Because of PCB levels in fish found in 1988 sampling, the New York State Department of Health (NYDOH) issued a fish advisory for Koppers Pond. The NYSDOH advisory, which is still in effect, is for carp with a recommendation to eat no more than one meal per month and for infants, children under the age of 15, and women of childbearing age to eat no fish from Koppers Pond.

Based on this understanding of the Site and as presented in the MESA, the potentially complete exposure pathways for the BHHRA are the following:

- Dermal contact with and incidental ingestion of surface water from the pond during wading events related to trespassing or fishing activity;

Pathway Analysis Report

Koppers Pond, Kentucky Avenue Wellfield Site, Operable Unit 4

Revised – 06/08/2009

- Dermal contact with and incidental ingestion of pond sediment during wading events related to trespassing or fishing activity;
- Dermal contact with and incidental ingestion of surface water from the outlet channel during wading events related to trespassing;
- Dermal contact with and incidental ingestion of sediment in the outlet channel during wading events related to trespassing; and,
- Consumption of fish taken from Koppers Pond.

Exposure equations for each exposure pathway and non chemical-specific exposure parameter values were described fully in the MESA. Chemical-specific parameter values are discussed in Section 5.0.

3.0 CHEMICALS OF POTENTIAL CONCERN

Based on the most recent (2008) set of chemical data, AMEC has identified the COPCs present in all sampled media. For COPC identification, AMEC has used only the data collected in 2008 as part of the Operable Unit 4 RI. The rationale for using the 2008 dataset is summarized below and is fully discussed in the Site Characterization Summary Report (Cummings/Riter, 2008). In addition, it was agreed during the 26 February 2009 SLERA conference call that the 2008 surface water, sediment, and fish data are appropriate to use for the RI/FS and risk assessments, assuming that reference will be made to the prior data for historical perspective.

- Surface Water: All of the surface water characterization and quality data from prior studies were collected at a time when much larger quantities of treated industrial wastewaters were being discharged from the former Westinghouse Horseheads plant site. Surface water sampling at those times showed the presence of several metals that were regulated constituents in past industrial discharge permits (e.g., aluminum, chromium, lead, zinc), as well as fluoride. Such discharges have now been reduced or eliminated, and the data for such constituents from prior sampling events are not representative of current conditions.
- Sediment: Much of the prior sediment sampling was conducted without regard to vertical intervals within the sediment, and the data from such sampling programs are not comparable to the 2008 RI data sets where vertically profiling was performed. Where data are comparable (i.e., 0 to 6-inch surface sediment), metal concentrations found in the Operable Unit 4 (2008) sampling of Koppers Pond surface sediments are similar to those observed in prior data sets. PCB concentrations in surface sediment appear to have been reduced slightly since the prior sampling. Even with similarities in the data, the PAR evaluates only the 2008 RI surface sediment because the quality control of these more-recent data is better understood and the 2008 RI data have been fully validated.
- Fish Tissue: As described in the *Site Characterization Summary Report*, comparisons of prior (2003) fish tissue sampling results to the more-recent (2008) data show differences in some metals and PCB concentrations. Because of these differences and the greater confidence in the quality control and data validation associated with the more-recent data, only the 2008 fish tissue data are included in the PAR evaluation.

In addition to samples collected from Koppers Pond and its outlet channel, the RI included collection of surface water and sediment samples from the Chemung Street Outfall and other locations upstream of Koppers Pond. These samples were collected to identify and

characterize other potential and ongoing sources of COPCs to Koppers Pond and are not representative of media conditions within the pond or outlet channels. Accordingly, data from these upstream sample locations were not included in the chemical database used for COPC screening.

Selection of the COPCs is presented in RAGS Part D Table 2 format and these tables appear in Attachment A. Tables A2.1 and A2.2 summarize the occurrence, distribution and selection of COPCs in surface water from Koppers Pond and the outlet channel, respectively. Tables A2.3 and A2.4 summarize the occurrence, distribution and selection of COPCs in sediment from Koppers Pond and the outlet channel, respectively. Lastly, Table A2.5 summarizes the occurrence, distribution, and selection of COPCs in fish from Koppers Pond.

These tables include any chemical that was detected at least once in their respective medium. The minimum and maximum concentrations along with the detection frequency are reported. The maximum concentration is used to screen COPCs. No background concentrations are available. The Statement of Work appended to the Settlement Agreement specifies that USEPA Region IX residential soil preliminary remediation goals (PRGs) be used for the screening toxicity values. These PRGs were developed for residential soils and represent a very conservative surrogate for sediment screening. Use of these PRGs leads to the inclusion of a large number of COPCs, including chemicals that pose *de minimis* potential risk to human receptors contacting Koppers Pond sediments. Given the Settlement Agreement requirement, maximum sediment concentrations of COPCs detected in Koppers Pond and the outlet channel were compared to the residential Region IX PRGs, updated September 2008 (Tables A2.3 and A2.4).

In the case of COPCs detected in surface water, maximum concentrations were screened against USEPA Region IX PRGs for tapwater (Tables A2.1 and A2.2). These represent very conservative screening values because exposure to surface water at this Site would be incidental to other activities (e.g., wading), and the surface water is not a drinking water source. For lead, the maximum concentration was screened against USEPA's action level for lead in public water supplies (15 ppb).

Region IX PRGs are not available to screen COPCs detected in fish tissue. Region 3 has established screening levels for fish. During discussions of the RI/FS workplan, EPA recommended that these screening values be used. Therefore, the maximum concentrations detected in fish from Koppers Pond were screened against Region 3 values, except in the case of lead. In the Columbia River Basin Fish Contaminant Survey 1996-1998, USEPA (2002) derived an acceptable lead level in fish based on its Integrated Exposure Uptake Biokinetic model for lead in children. Using default and high-end exposure parameters from the lead model in conjunction with fish ingestion rates from the Columbia River Intertribal Fish

Commission, USEPA (2002) concluded, “risks to children from fish consumption are unlikely to exceed 5% at lead concentrations less than 500 µg/kg. Similarly, fetal risks are unlikely to exceed 5% at concentrations less than 700 µg/kg.” Therefore, concentrations of lead detected in fish tissue were screened against USEPA (2002) acceptable lead concentration in fish of 500 micrograms per kilogram (µg/Kg) (0.5 milligrams per kilogram [mg/Kg]).

The COPC screening results are summarized as follows:

- Koppers Pond Surface Water: Results of the surface water screening process for Koppers Pond indicate that the following chemicals will be retained as COPCs and carried forward in the BHHRA (Table A-2.1).

Benzo(b)fluoranthene
Arsenic
Lead

- Outlet Channel Surface Water: Results of the surface water screening process for the outlet channel indicate that the following chemicals will be retained as COPCs and carried forward in the BHHRA (Table A-2.2).

Benzo(b)fluoranthene	Benzo(a)anthracene
Arsenic	Tetrachloroethene
Lead	

It should be noted that although the maximum concentrations for tetrachloroethene, arsenic, benzo(a)anthracene and benzo(b)fluoranthene exceeded the USEPA Region IX tapwater values, the concentrations are less than their respective maximum contaminant levels (MCLs) under the Safe Drinking Water Act. Both the Region IX tapwater and MCL values are highly conservative for this Site because the surface water is not a drinking water source. However, because EPA does not recommend using the MCLs for screening purposes, tetrachloroethene, arsenic, benzo(a)anthracene and benzo(b)fluoranthene are retained as COPCs.

USEPA’s action level for lead (15 ppb), which was used to screen lead in surface water, will also be used in the BHHRA as the benchmark when exposure to lead in surface water is evaluated.

- Koppers Pond Sediments: Results of the sediment screen for Koppers Pond indicate that the following chemicals will be retained as COPCs and carried forward in the BHHRA (Table A-2.3):

Pathway Analysis Report

Koppers Pond, Kentucky Avenue Wellfield Site, Operable Unit 4

Revised – 06/08/2009

Benzo(a)anthracene	Total PCBs (Aroclor 1254)*
Benzo(a)pyrene	Arsenic
Benzo(b)fluoranthene	Cadmium
Benzo(ghi)perylene	Chromium
Dibenz(a,h)anthracene	Lead
Indeno(1,2,3-cd)pyrene	
* Aroclor 1254 was the only Aroclor detected in sediment; therefore, total PCBs is equivalent to Aroclor 1254.	

Lead is retained as a COPC in Koppers Pond sediment because the maximum concentration exceeded Region IX residential PRG for lead (400 ppm). It should be noted that the 400 ppm is the allowable concentration for lead in soil that is derived when default assumptions are used in EPA's Integrated Exposure and Uptake Biokinetic (IEUBK) model. This model is based on young children (0-7 years), and residential exposures (soil, house dust, drinking water, air and food). Agreement has been reached with USEPA that the potential receptors at this Site are of adolescent age or older. Therefore, when lead is evaluated in the BHHRA, the adult lead model that is designed for non-residential exposures (outdoor soil and indoor dust) and appropriate for older children (USEPA, 2003) will be used. Furthermore, when the adult lead model is used, the exposure frequency will be adjusted for less than occupational exposures (default EF). The adjusted frequency will represent infrequent contact, while maintaining steady state blood levels of lead as recommended by USEPA.

- Outlet Channel Sediments: Results of the sediment screen for the outlet channel indicate the following chemicals will be retained as COPCs and carried forward in the BHHRA (Table A-2.4):

Benzo(a)anthracene	Indeno(1,2,3-cd)pyrene
Benzo(a)pyrene	Total PCBs (Aroclor 1254)*
Benzo(b)fluoranthene	Arsenic
Benzo(ghi)perylene	Cadmium
Dibenz(a,h)anthracene	
* Aroclor 1254 was the only Aroclor detected in sediment; therefore, total PCBs is equivalent to Aroclor 1254.	

- Fish: Results of the screening process for fish tissue indicate that the following chemicals will be retained as COPCs and carried forward in the BHHRA (Table A-2.5):

Total PCBs
Arsenic
Mercury

4.0 EXPOSURE POINT CONCENTRATIONS

This section discusses the approach and calculation of the EPCs that will be used in the BHHRA to assess the reasonable maximum exposure (RME) to an individual. In accordance with the Settlement Agreement, the EPC for RME scenarios represents the 95-percent upper confidence limit (UCL) of the mean, derived using the most recent version of USEPA's ProUCL software (version 4.02). In cases where the 95-percent UCL exceeds the maximum concentration, the maximum concentration is used as the EPC. The EPCs are presented in RAGS Part D Table 3 format and provide the following information: exposure point, COPC, units, arithmetic mean, 95-percent UCL, maximum concentration, EPC value, EPC units, EPC statistic, and EPC rationale. Tables A-3.1 and A-3.2 summarize EPCs for COPCs in surface water for Koppers Pond and the outlet channel, respectively. Tables A-3.3 and A-3.4 summarize EPCs for RME scenarios for COPCs in sediment for Koppers Pond and the outlet channel, respectively. Table A-3.5a summarizes RME-scenario EPCs for COPCs in fish.

As part of the uncertainty analysis, the BHHRA will also examine the central tendency exposure (CTE) for human consumption of fish taken from Koppers Pond. For CTE scenarios, the EPCs will be one of the following:

- Arithmetic mean for COPCs determined to be normally distributed in fish tissue samples;
- Geometric mean for COPC distributions in fish tissue found to be best approximated by log-normal or gamma-normal distributions; and
- Mean derived by the Kaplan-Meier method, as provided by EPA guidance, for fish tissue arsenic concentrations, which were not normally or log-normally distributed.

Table A-3.5b summarizes CTE-scenario EPCs for COPCs in fish.

5.0 TOXICOLOGICAL DATA AND OTHER CHEMICAL-SPECIFIC DATA

Toxicity values estimate the incidence or potential for adverse effects as a function of human exposure to a COPC (USEPA, 1989). A reference dose (RfD) is the toxicity value used to evaluate potential non-carcinogenic effects resulting from potential exposure. A cancer slope factor (CSF) is the toxicity value used to evaluate potential carcinogenic effects. RfDs and CSFs have been developed for the oral and inhalation routes of exposure, but dermal toxicity values are not available. In the absence of dermal toxicity values, USEPA (2004) recommends using the oral value, adjusted when necessary. Oral RfDs and CSFs are expressed as administered doses, whereas the exposure estimates for the dermal pathway are expressed as absorbed doses. For certain chemicals, the oral toxicity value is adjusted to represent an absorbed rather than administered dose. The adjustment accounts for the absorption efficiency in the critical study that forms the basis of the oral toxicity value (USEPA, 2004). When the oral absorption in the critical study is greater than 50 percent, it is assumed that the absorbed dose is equivalent to the administered dose, and USEPA (2004) does not require an adjustment. On the other hand, when oral absorption in the critical study is poor, the absorbed dose is much lower than the administered dose and toxicity factors need to be adjusted (USEPA, 2004). When an adjustment is necessary, the oral RfD is multiplied by the oral absorption in the critical toxicity study, while the oral CSF is divided by the oral absorption fraction.

In selecting the appropriate toxicity value, AMEC followed USEPA's hierarchy for sources of toxicological information:

Tier 1. Integrated Risk Information System (IRIS).

Tier 2. The Provisional Peer Reviewed Toxicity Values (PPRTV) developed for the USEPA OSWER Office of Superfund Remediation and Technology Innovation (OSRTI) programs.

Tier 3. Other toxicity values.

The "other" level of the hierarchy includes several sources of toxicity values that are commonly consulted by the USEPA Superfund program when a relevant toxicity value is not available from either IRIS or the PPRTV database. These sources include: 1) California Environmental Protection Agency (Cal EPA) toxicity values; 2) the Agency for Toxic Substances and Disease Registry (ATSDR) Minimal Risk Levels (MRLs, addressing noncancer effects only); 3) the USEPA Superfund Health Effects Assessment Summary Tables (HEAST) database; and 4) additional sources of toxicity values.

In cases where no toxicity values are available for a given chemical, USEPA recommends contacting the National Center for Environmental Assessment (NCEA) for surrogate values. For this analysis, there are no chemicals that lack toxicity values.

Oral RfDs are presented in RAGS Part D Table A-5.1 and inhalation RfDs are summarized in Table A-5.2. These tables provide the following information: COPC, oral or inhalation RfD value and units, oral absorption efficiency for dermal, absorbed RfD for dermal value and units, primary target organ(s), combined uncertainty/modifying factors, source(s), and target organ(s). Oral CSFs are presented in RAGS Part D Table A-6.1 and inhalation CSFs are summarized in Table A-6.2. These tables provide the following information: COPC, oral or inhalation CSF value and units, oral absorption efficiency for dermal, absorbed CSF for dermal value and units, weight of evidence/cancer guideline description, source(s), and date(s) of oral CSF.

The MESA presented intake assumptions for all exposure parameters, except for those parameters that are chemical-specific. These chemical-specific values are reported here as part of the PAR. Table 1 summarizes the parameters, the proposed values, and sources of the data. As presented, the values represent USEPA default values. These values may be updated based on additional literature review when the BHHRA is prepared.

6.0 SUMMARY

In accordance with the requirements of the RI/FS Work Plan, this PAR selects the COPCs, derives EPCs for each COPC in each medium, and proposes the toxicological and other chemical-specific data that will be used in the BHHRA. In conjunction with the exposure pathways, equations and intake assumptions presented in the MESA, the information presented in this PAR fully outlines how the potential risks for Koppers Pond Operable Unit 4 of the Kentucky Avenue Wellfield Superfund Site will be assessed.

7.0 REFERENCES

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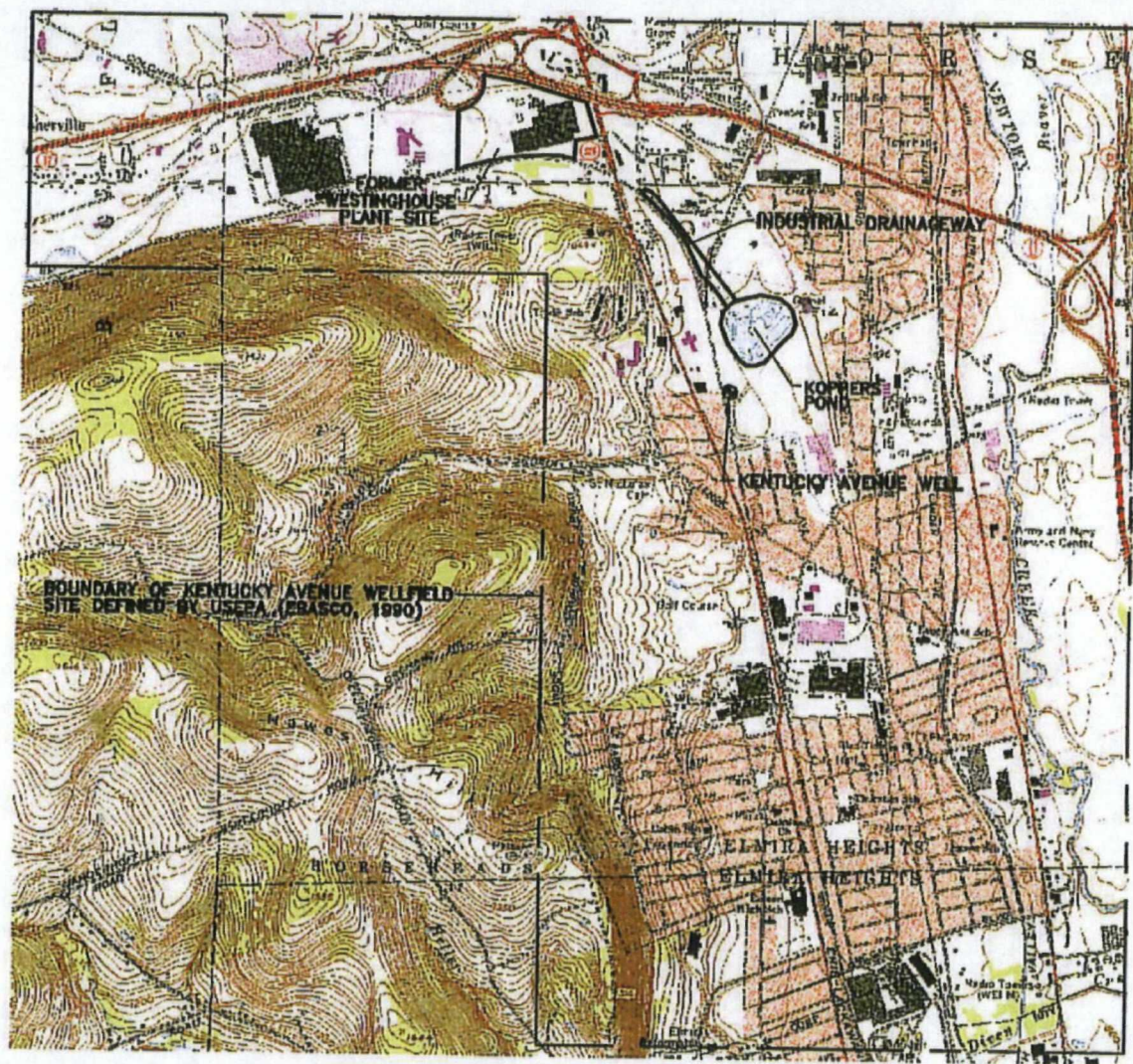
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FIGURES

DRAWING
NUMBER
07502B1



QUADRANGLE LOCATION

REFERENCE:
MODIFIED FROM U.S. GEOLOGICAL SURVEY HORSEHEADS,
NEW YORK, AND ELMIRA, NEW YORK-PENNSYLVANIA,
QUADRANGLES, PHOTOREVISED 1976.

FIGURE 1
SITE LOCATION MAP

KENTUCKY AVENUE WELLFIELD SITE - OUA
HORSEHEADS, NEW YORK

PREPARED FOR
KOPPERS POND RI/FS GROUP

**CUMMINGS
RITER**
CONSULTANTS, INC.

DRAWING NUMBER
07502B1

DRAWN BY: T.E. McKee	DATE: 1-31-07
CHECKED BY: W.C. Smith	DATE: 2-19-07
APPROVED BY: W.C. Smith	DATE: 2-19-07

PLOT SCALE: 1"=1

SCALE
0 2000 4000 FEET



FIGURE 2
SITE PLAN
 KENTUCKY AVE. WELLFIELD SITE - OU4
 HORSEHEADS, NEW YORK

TABLE

**Table 1. Chemical-Specific Parameter Values
Kentucky Avenue Wellfield Site, OU 4 - Koppers Pond
Horseheads, New York [1]**

Chemical of Concern	Oral Absorption Factor (ABS_o) (unitless)	Dermal Absorption Factor (ABS_d) (unitless)	Oral Absorption Factor - Fish (ABS_{fish}) [2] (unitless)	Dermal Permeability Coefficient (K_p) (cm/hour)	Fraction Absorbed (FA) unitless	Lag Time per Event (t event) (hour/event)
Tetrachloroethene	1	NA	NA	3.30E-02	1.0	0.91
Benzo(a)anthracene	1	0.13	NA	4.70E-01	1.0	2.03
Benzo(a)pyrene	1	0.13	NA	NA	NA	NA
Benzo(b)fluoranthene	1	0.13	NA	7.00E-01	1.0	2.77
Benzo(ghi)perylene [3]	1	0.13	NA	NA	NA	NA
Dibenz(a,h)anthracene	1	0.13	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	1	0.13	NA	NA	NA	NA
Total PCBs (Aroclor 1254)	1	0.14	1	NA	NA	NA
Arsenic	1	0.03	1	1.00E-03	NA	NA
Cadmium	soil:0.025; water:0.05	0.001	NA	NA	NA	NA
Chromium VI	0.025	0.013 [4]	NA	NA	NA	NA
Lead	1	0.001 [5]	NA	1.00E-04	NA	NA
Mercury (methyl)	NA	NA	1	NA	NA	NA

Notes:

[1] EPA (2004) source for all values, unless otherwise noted.

[2] ABS_{fish} assumed to be 100%

[3] benzo(b)fluoranthene surrogate for benzo(ghi)perylene

[4] Chen et al., 2001

[5] Moore et al., 1980 cited in USEPA, 2001

NA = Not Applicable

Attachment A

USEPA RAGS Part D (2001)

Tables A-0, A-2.1, A-2.2, A-2.3, A-2.4, A-2.5, A-3.1, A-3.2, A-3.3, A-3.4, A-3.5a, A-3.5b, A-5.1, A-5.2, A-6.1, A-6.2

ATTACHMENT A TABLES

Table A-0	Site Risk Assessment Identification Information - Koppers Pond Kentucky Avenue Wellfield Site, Operable Unit 4, Horseheads, NY
Table A-2.1	Occurrence, Distribution, and Selection of Chemicals of Potential Concern, Surface Water, Koppers Pond - Koppers Pond Kentucky Avenue Wellfield Site, Operable Unit 4, Horseheads, NY
Table A-2.2	Occurrence, Distribution, and Selection of Chemicals of Potential Concern, Surface Water, Outlet Channel - Koppers Pond Kentucky Avenue Wellfield Site, Operable Unit 4, Horseheads, NY
Table A-2.3	Occurrence, Distribution, and Selection of Chemicals of Potential Concern, Sediment, Koppers Pond - Koppers Pond Kentucky Avenue Wellfield Site, Operable Unit 4, Horseheads, NY
Table A-2.4	Occurrence, Distribution, and Selection of Chemicals of Potential Concern, Sediment, Outlet Channel - Koppers Pond Kentucky Avenue Wellfield Site, Operable Unit 4, Horseheads, NY
Table A-2.5	Occurrence, Distribution, and Selection of Chemicals of Potential Concern, Fish - Koppers Pond Kentucky Avenue Wellfield Site, Operable Unit 4, Horseheads, NY
Table A-3.1	Exposure Point Concentration, Surface Water - Koppers Pond Kentucky Avenue Wellfield Site, Operable Unit 4
Table A-3.2	Exposure Point Concentration, Surface Water – Outlet Channel Kentucky Avenue Wellfield Site, Operable Unit 4
Table A-3.3	Exposure Point Concentration, Sediment - Koppers Pond Kentucky Avenue Wellfield Site, Operable Unit 4
Table A-3.4	Exposure Point Concentration, Sediment – Outlet Channel Kentucky Avenue Wellfield Site, Operable Unit 4
Table A-3.5a	Exposure Point Concentration – Reasonable Maximum Exposure, Fish - Koppers Pond Kentucky Avenue Wellfield Site, Operable Unit 4
Table A-3.5b	Exposure Point Concentration – Central Tendency Exposure, Fish - Koppers Pond Kentucky Avenue Wellfield Site, Operable Unit 4
Table A-5.1	Non-Cancer Toxicity Data, Oral/Dermal - Koppers Pond Kentucky Avenue Wellfield Site, Operable Unit 4
Table A-5.2	Non-Cancer Toxicity Data, Inhalation - Koppers Pond Kentucky Avenue Wellfield Site, Operable Unit 4
Table A-6.1	Cancer Toxicity Data, Oral/Dermal - Koppers Pond Kentucky Avenue Wellfield Site, Operable Unit 4
Table A-6.2	Cancer Toxicity Data, Inhalation - Koppers Pond Kentucky Avenue Wellfield Site, Operable Unit 4

TABLE A-0

SITE RISK ASSESSMENT IDENTIFICATION INFORMATION

KOPPER'S POND KENTUCKY AVENUE WELLFIELD SUPERFUND SITE, OPERABLE UNIT 4

Site Name/OU:	Kopper's Pond Kentucky Avenue Wellfield Superfund Site, Operable Unit 4, Horseheads, New York
Region:	II
EPA ID Number:	NYD980650667
State:	New York
Status:	
Federal Facility (Y/N):	
EPA Project Manager:	
EPA Risk Assessor:	
Prepared by (Organization):	AMEC Earth & Environmental, Inc.
Prepared for (Organization):	Koppers Pond RI/FS Group
Document Title:	Pathway Analysis Report (PAR)
Document Date:	October 2008 - Revised March 2009
Probabilistic Risk Assessment (Y/N):	No
Comments:	

TABLE A-2.1
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
KOPPERS POND KENTUCKY AVENUE WELLFIELD SITE, OPERABLE UNIT 4, HORSEHEADS, NY

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1) (ug/L)	Background Value	Screening Toxicity Value (2) (N/C) (ug/L)	N/C	Potential ARAR/TBC Value (ug/L)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (7)	
Koppers Pond	71-55-6	1,1,1-Trichloroethane	0.36	0.36	ug/L	-	1/6	1 - 1	0.36	NA	9.10E+03	N	-	-	N	BSL	
	67-66-3	Chloroform	0.083	0.083	ug/L	-	1/6	1 - 1	0.083	NA	1.90E-01	C	-	-	N	BSL	
	108-88-3	Toluene	0.28	0.28	ug/L	-	1/6	1 - 1	0.28	NA	2.30E+03	N	-	-	N	BSL	
	100-52-7	Benzaldehyde	0.057	0.057	ug/L	-	1/6	0.94 - 0.97	0.057	NA	3.70E+03	N	-	-	N	BSL	
	205-89-2	Benzo(b)fluoranthene	0.25	0.25	ug/L	-	1/6	0.19 - 0.19	0.25	NA	2.90E-02	C	2.00E+00	MCL (6)	Y	ASL	
	218-01-9	Chrysene	0.05	0.05	ug/L	-	1/6	0.19 - 0.19	0.05	NA	2.90E+00	C	-	-	N	BSL	
	132-64-9	Dibenzofuran	0.17	0.17	ug/L	-	5/6	0.95 - 0.95	0.17	NA	1.20E+01	N	(3)	-	-	N	BSL
	84-74-2	Di-n-butyl phthalate	0.32	0.43	ug/L	-	6/6	-	0.43	NA	3.70E+03	N	-	-	N	BSL	
	206-44-0	Fluoranthene	0.44	0.51	ug/L	-	3/6	0.19 - 0.19	0.51	NA	1.50E+03	N	-	-	N	BSL	
	85-01-8	Phenanthrene	0.17	0.26	ug/L	-	5/6	0.19 - 0.19	0.26	NA	6.20E+00	N	(4)	-	-	N	BSL
	108-95-2	Phenol	0.1	0.1	ug/L	-	1/6	0.19 - 0.19	0.1	NA	1.10E+04	N	-	-	N	BSL	
	129-00-0	Pyrene	0.067	0.067	ug/L	-	1/6	0.19 - 0.19	0.067	NA	1.10E+03	N	-	-	N	BSL	
	7429-90-5	Aluminum	178	446	ug/L	-	6/6	-	446	NA	3.70E+04	N	-	-	N	BSL	
	7440-36-0	Antimony	0.23	0.72	ug/L	-	6/6	-	0.72	NA	1.50E+01	N	-	-	N	BSL	
	7440-38-2	Arsenic	0.17	0.33	ug/L	-	4/6	1 - 1	0.33	NA	4.50E-02	C*	1.00E+01	MCL	Y	ASL	
	7440-39-3	Barium	104	123	ug/L	-	6/6	-	123	NA	7.30E+03	N	-	-	N	BSL	
	7440-43-9	Cadmium	0.59	7.1	ug/L	-	6/6	-	7.1	NA	1.80E+01	N	-	-	N	BSL	
	7440-70-2	Calcium	54600	68600	ug/L	-	6/6	-	68600	NA	NA	-	-	-	N	EN	
	7440-47-3	Chromium	4.9	9.3	ug/L	-	6/6	-	9.3	NA	1.10E+02	N	(3)	-	-	N	BSL
	7440-48-4	Cobalt	0.25	0.38	ug/L	-	6/6	-	0.38	NA	1.10E+01	N	-	-	N	BSL	
	7440-50-8	Copper	3	9.9	ug/L	-	6/6	-	9.9	NA	1.50E+03	N	-	-	N	BSL	
	7439-89-6	Iron	260	550	ug/L	-	6/6	-	550	NA	2.60E+04	N	-	-	N	BSL	
	7439-92-1	Lead	9.1	25.7	ug/L	-	6/6	-	25.7	NA	1.50E+01	N	(5)	1.50E+01	MCL	Y	ASL
	7439-95-4	Magnesium	10700	13700	ug/L	-	6/6	-	13700	NA	NA	-	-	-	N	EN	
	7439-96-5	Manganese	8.3	10	ug/L	-	6/6	-	10	NA	8.80E+02	N	-	-	N	BSL	
	7440-02-0	Nickel	1.9	2.8	ug/L	-	6/6	-	2.8	NA	7.30E+02	N	-	-	N	BSL	
	7440-09-7	Potassium	893	1110	ug/L	-	6/6	-	1110	NA	NA	-	-	-	N	EN	
	7782-49-2	Selenium	0.28	0.44	ug/L	-	2/6	5 - 5	0.44	NA	1.80E+02	N	-	-	N	BSL	
	7440-22-4	Silver	0.087	0.72	ug/L	-	5/6	1 - 1	0.72	NA	1.80E+02	N	-	-	N	BSL	
	7440-23-5	Sodium	68300	93900	ug/L	-	6/6	-	93900	NA	NA	-	-	-	N	EN	
	7440-62-2	Vanadium	0.43	1.2	ug/L	-	6/6	-	1.2	NA	2.60E+02	N	-	-	N	BSL	
	7440-66-6	Zinc	13.8	119	ug/L	-	6/6	-	119	NA	1.10E+04	N	-	-	N	BSL	

Notes:

- (1) Maximum concentration used for screening chemicals.
- (2) All compounds were compared against Region IX tapwater PRGs (updated 12Sept2008), unless otherwise noted.
- (3) Compound screened against Region VI residential water Human Health Screening Levels (updated 7March2008)
- (4) Naphthalene used as surrogate (EPA, Region 2)
- (5) Lead screened against EPA's TRW tap water
- (6) MCL based on MCL for benzo(a)pyrene * 10
- (7) Rational Codes:

BSL = Below Screening Level
ASL = Above Screening Level
BMCL = Below MCL
EN = Essential Nutrient

Definitions: NA = Not Applicable

C = Carcinogen
C* = Known human carcinogen
N = Noncarcinogen
MCL = Maximum Contaminant Level (maximum permissible level of contaminant allowed in drinking water)

TABLE A-2.2
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
KOPPERS POND KENTUCKY AVENUE WELLFIELD SITE, OPERABLE UNIT 4, HORSEHEADS, NY

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1) (ug/L)	Background Value	Screening Toxicity Value (2) (ug/L)			Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (7)
Outlet Channel	71-55-6	1,1,1-Trichloroethane	0.29	0.29	ug/L	-	1/4	1 - 1	0.29	NA	9.10E+03	N		-	-	N	BSL
	67-66-3	Chloroform	0.069	0.069	ug/L	-	1/4	1 - 1	0.069	NA	1.90E-01	C		-	-	N	BSL
	127-18-4	Tetrachloroethene	0.22	0.22	ug/L	-	1/4	1 - 1	0.22	NA	1.10E-01	C		5.00E+00	MCL	Y	ASL
	108-88-3	Toluene	0.21	0.21	ug/L	-	1/4	1 - 1	0.21	NA	2.30E+03	N		-	-	N	BSL
	83-32-9	Acenaphthene	0.16	0.16	ug/L	-	1/4	0.19 - 0.19	0.16	NA	2.20E+03	N		-	-	N	BSL
	100-52-7	Benzaldehyde	0.13	0.13	ug/L	-	1/4	0.95 - 0.95	0.13	NA	3.70E+03	N		-	-	N	BSL
	56-55-3	Benzo(a)anthracene	0.05	0.05	ug/L	-	1/4	0.19 - 0.19	0.051	NA	2.90E-02	C		2.00E+00	MCL (6)	Y	ASL
	205-99-2	Benzo(b)fluoranthene	0.27	0.27	ug/L	-	1/4	0.19 - 0.19	0.27	NA	2.90E-02	C		2.00E+00	MCL (6)	Y	ASL
	218-01-9	Chrysene	0.06	0.06	ug/L	-	1/4	0.19 - 0.19	0.061	NA	2.90E+00	C		-	-	N	BSL
	132-64-9	Dibenzofuran	0.16	0.17	ug/L	-	4/4	-	0.17	NA	1.20E+01	N	(3)	-	-	N	BSL
	84-74-2	Di-n-butyl phthalate	0.37	0.61	ug/L	-	3/4	0.95 - 0.95	0.61	NA	3.70E+03	N		-	-	N	BSL
	206-44-0	Fluoranthene	0.43	0.51	ug/L	-	3/4	0.19 - 0.19	0.51	NA	1.50E+03	N		-	-	N	BSL
	86-73-7	Fluorene	0.47	0.47	ug/L	-	1/4	0.19 - 0.19	0.47	NA	1.50E+03	N		-	-	N	BSL
	85-01-8	Phenanthrene	0.17	0.23	ug/L	-	4/4	-	0.23	NA	6.20E+00	N	(4)	-	-	N	BSL
	129-00-0	Pyrene	0.07	0.07	ug/L	-	1/4	0.19 - 0.19	0.069	NA	1.10E+03	N		-	-	N	BSL
	7429-90-5	Aluminum	128	417	ug/L	-	4/4	-	417	NA	3.70E+04	N		-	-	N	BSL
	7440-36-0	Antimony	0.27	0.49	ug/L	-	4/4	-	0.49	NA	1.50E+01	N		-	-	N	BSL
	7440-38-2	Arsenic	0.21	0.79	ug/L	-	2/4	1 - 1	0.79	NA	4.50E-02	C*		1.00E+01	MCL	Y	ASL
	7440-39-3	Barium	118	129	ug/L	-	4/4	-	129	NA	7.30E+03	N		-	-	N	BSL
	7440-43-9	Cadmium	0.52	2.1	ug/L	-	3/4	1 - 1	2.1	NA	1.80E+01	N		-	-	N	BSL
	7440-70-2	Calcium	63500	70500	ug/L	-	4/4	-	70500	NA	NA	-		-	-	N	EN
	7440-47-3	Chromium	3.8	6.7	ug/L	-	4/4	-	6.7	NA	1.10E+02	N	(3)	-	-	N	BSL
	7440-48-4	Cobalt	0.24	0.41	ug/L	-	4/4	-	0.41	NA	1.10E+01	N		-	-	N	BSL
	7440-50-8	Copper	2	6.6	ug/L	-	4/4	-	6.6	NA	1.50E+03	N		-	-	N	BSL
	7439-89-6	Iron	267	559	ug/L	-	4/4	-	559	NA	2.60E+04	N		-	-	N	BSL
	7439-92-1	Lead	6.2	16.9	ug/L	-	4/4	-	16.9	NA	1.50E+01	N	(5)	1.50E+01	MCL	Y	ASL
	7439-95-4	Magnesium	13000	14200	ug/L	-	4/4	-	14200	NA	NA	-		-	-	N	EN
	7439-96-5	Manganese	11.7	28.5	ug/L	-	4/4	-	28.5	NA	8.80E+02	N		-	-	N	BSL
	7440-02-0	Nickel	1.5	2.8	ug/L	-	4/4	-	2.8	NA	7.30E+02	N		-	-	N	BSL
	7440-09-7	Potassium	1060	1400	ug/L	-	4/4	-	1400	NA	NA	-		-	-	N	EN
	7782-49-2	Selenium	0.34	0.34	ug/L	-	1/4	5 - 5	0.34	NA	1.80E+02	N		-	-	N	BSL
	7440-22-4	Silver	0.22	0.22	ug/L	-	1/4	1 - 1	0.22	NA	1.80E+02	N		-	-	N	BSL
	7440-23-5	Sodium	87900	95600	ug/L	-	4/4	-	95600	NA	NA	-		-	-	N	EN
	7440-62-2	Vanadium	0.5	0.75	ug/L	-	3/4	1 - 1	0.75	NA	2.60E+02	N		-	-	N	BSL
	7440-66-6	Zinc	13.6	49.2	ug/L	-	4/4	-	49.2	NA	1.10E+04	N		-	-	N	BSL

Notes:

- (1) Maximum concentration used for screening chemicals.
(2) All compounds were compared against Region IX tapwater PRGs (updated 12Sept2008), unless otherwise noted.
(3) Compound screened against Region VI residential water Human Health Screening Levels (updated 7March2008)
(4) Naphthalene used as surrogate (EPA, Region 2)
(5) Lead screened against EPA's TRW tap water
(6) MCL based on MCL for benzo(a)pyrene * 10
(7) Rational Codes:

BSL = Below Screening Level
ASL = Above Screening Level
EN = Essential Nutrient

Definitions: NA = Not Applicable

C = Carcinogen
C* = Known human carcinogen
N = Noncarcinogen
MCL = Maximum Contaminant Level (maximum permissible level of contaminant allowed in drinking water)

TABLE A-2.3
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
KOPPERS POND KENTUCKY AVENUE WELLFIELD SITE, OPERABLE UNIT 4, HORSEHEADS, NY

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment (Koppers Pond)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1) (mg/kg)	Background Value	Screening Toxicity Value (2) (mg/kg)	N/C	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (8)	
Koppers Pond	78-93-3	2-Butanone	14	14	ug/kg	-	1/15	6.9 - 20	0.01	NA	2.80E+04	N	-	-	N	BSL	
	67-84-1	Acetone	31	73	ug/kg	-	3/15	28 - 80	0.07	NA	6.10E+04	N	-	-	N	BSL	
	79-20-9	Methyl acetate	5.6	8.9	ug/kg	-	3/15	6.9 - 20	0.01	NA	7.80E+04	N	-	-	N	BSL	
	91-57-6	2-Methylnaphthalene	14	24	ug/kg	-	3/15	54 - 270	0.02	NA	3.10E+02	N	-	-	N	BSL	
	106-44-5	4-Methylphenol	15	53	ug/kg	-	4/15	270 - 1300	0.05	NA	3.10E+02	N	-	-	N	BSL	
	208-96-8	Acenaphthylene	51	310	ug/kg	-	5/15	31 - 270	0.31	NA	3.40E+03	N	-	-	N	BSL	
	120-12-7	Anthracene	12	510	ug/kg	-	12/15	65 - 140	0.51	NA	1.70E+04	N	-	-	N	BSL	
	100-52-7	Benzaldehyde	28	48	ug/kg	-	4/15	310 - 1300	0.05	NA	7.80E+03	N	-	-	N	BSL	
	56-55-3	Benzo(a)anthracene	37	1200	ug/kg	-	15/15	-	1.20	NA	1.50E-01	C	-	-	Y	ASL	
	50-32-8	Benzo(a)pyrene	100	1400	ug/kg	-	15/15	-	1.40	NA	1.50E-02	C	-	-	Y	ASL	
	205-99-2	Benzo(b)fluoranthene	72	2000	ug/kg	-	15/15	-	2.00	NA	1.50E-01	C	-	-	Y	ASL	
	191-24-2	Benzo(ghi)perylene	34	1200	ug/kg	-	15/15	-	1.20	NA	1.50E-01	C	(3)	-	-	Y	ASL
	207-08-9	Benzo(k)fluoranthene	21	920	ug/kg	-	9/15	31 - 140	0.92	NA	1.50E+00	C	-	-	N	BSL	
	117-81-7	bis(2-Ethylhexyl) phthalate	20	1400	ug/kg	-	11/15	320 - 890	1.40	NA	3.50E+01	C	-	-	N	BSL	
	85-68-7	Butyl benzyl phthalate	42	130	ug/kg	-	4/15	150 - 1300	0.13	NA	2.60E+02	C	-	-	N	BSL	
	105-60-2	Caprolactam	55	120	ug/kg	-	4/15	310 - 1300	0.12	NA	3.10E+04	N	-	-	N	BSL	
	86-74-8	Carbazole	29	490	ug/kg	-	7/15	31 - 270	0.49	NA	2.40E+01	C	(4)	-	-	N	BSL
	218-01-9	Chrysene	70	1600	ug/kg	-	15/15	-	1.60	NA	1.50E+01	C	-	-	N	BSL	
	53-70-3	Dibenz(a,h)anthracene	12	370	ug/kg	-	11/15	65 - 180	0.37	NA	1.50E-02	C	-	-	Y	ASL	
	132-64-9	Dibenzofuran	12	17	ug/kg	-	2/15	270 - 1300	0.02	NA	1.50E+02	N	(4)	-	-	N	BSL
	206-44-0	Fluoranthene	97	3200	ug/kg	-	15/15	-	3.20	NA	2.30E+03	N	-	-	N	BSL	
	86-73-7	Fluorene	20	670	ug/kg	-	6/15	31 - 270	0.67	NA	2.30E+03	N	-	-	N	BSL	
	193-39-5	Indeno(1,2,3-cd)pyrene	29	1100	ug/kg	-	15/15	-	1.10	NA	1.50E-01	C	-	-	Y	ASL	
	91-20-3	Naphthalene	18	24	ug/kg	-	2/15	54 - 270	0.02	NA	3.90E+00	C	-	-	N	BSL	
	85-01-8	Phenanthrene	70	1200	ug/kg	-	15/15	-	1.20	NA	3.90E+00	C	(5)	-	-	N	BSL
	129-00-0	Pyrene	45	2000	ug/kg	-	15/15	-	2.00	NA	1.70E+03	N	-	-	N	BSL	
	319-86-8	delta-BHC	4.9	4.9	ug/kg	-	1/15	1.6 - 160	0.005	NA	5.20E-01	C	(6)	-	-	N	BSL
	58-89-9	gamma-BHC (Lindane)	15	15	ug/kg	-	1/15	0.93 - 160	0.02	NA	5.20E-01	C	-	-	N	BSL	
	11097-69-1	Total PCBs (Aroclor 1254)	20	2700	ug/kg	-	15/15	-	2.70	NA	2.20E-01	C	-	-	Y	ASL	
	7429-90-5	Aluminum	5910	17000	mg/kg	-	15/15	-	17,000	NA	7.70E+04	N	-	-	N	BSL	
	7440-36-0	Antimony	0.28	5.2	mg/kg	-	15/15	-	5.2	NA	3.10E+01	N	-	-	N	BSL	
	7440-38-2	Arsenic	1.9	4.8	mg/kg	-	15/15	-	4.8	NA	3.90E-01	C*	-	-	Y	ASL	
	7440-39-3	Barium	187	596	mg/kg	-	15/15	-	596	NA	1.50E+04	N	-	-	N	BSL	
	7440-41-7	Beryllium	0.26	0.88	mg/kg	-	15/15	-	0.88	NA	1.60E+02	N	-	-	N	BSL	
	7440-43-9	Cadmium	2	739	mg/kg	-	15/15	-	739	NA	7.00E+01	N	-	-	Y	ASL	

TABLE A-2.3
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
KOPPERS POND KENTUCKY AVENUE WELLFIELD SITE, OPERABLE UNIT 4, HORSEHEADS, NY

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment (Koppers Pond)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1) (mg/kg)	Background Value	Screening Toxicity Value (2) (mg/kg)	N/C	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (8)
	7440-70-2	Calcium	3670	199000	mg/kg	-	15/15	-	199,000	NA	NA	-	-	-	N	EN
	7440-47-3	Chromium	17.5	462	mg/kg	-	15/15	-	462	NA	2.80E+02	C**	-	-	Y	ASL
	7440-48-4	Cobalt	5	13.3	mg/kg	-	15/15	-	13.3	NA	2.30E+01	N	-	-	N	BSL
	7440-50-8	Copper	25.9	820	mg/kg	-	15/15	-	820	NA	3.10E+03	N	-	-	N	BSL
	57-12-5	Cyanide, Total	0.17	2.1	mg/kg	-	6/15	0.34 - 1.6	2.1	NA	1.60E+03	N	-	-	N	BSL
	7439-89-6	Iron	11800	19700	mg/kg	-	15/15	-	19,700	NA	5.50E+04	N	-	-	N	BSL
	7439-92-1	Lead	36.6	1620	mg/kg	-	15/15	-	1,620	NA	4.00E+02	N	(7)	-	Y	ASL
	7439-95-4	Magnesium	2290	5970	mg/kg	-	15/15	-	5,970	NA	NA	-	-	-	N	EN
	7439-96-5	Manganese	77.8	141	mg/kg	-	15/15	-	141	NA	1.80E+03	N	-	-	N	BSL
	7439-97-6	Mercury	0.096	1.4	mg/kg	-	15/15	-	1.4	NA	6.70E+00	N	-	-	N	BSL
	7440-02-0	Nickel	16.3	180	mg/kg	-	15/15	-	180	NA	1.60E+03	N	-	-	N	BSL
	7440-09-7	Potassium	475	1220	mg/kg	-	15/15	-	1,220	NA	NA	-	-	-	N	EN
	7782-49-2	Selenium	0.32	2.5	mg/kg	-	15/15	-	2.5	NA	3.90E+02	N	-	-	N	BSL
	7440-22-4	Silver	0.34	52.5	mg/kg	-	15/15	-	52.5	NA	3.90E+02	N	-	-	N	BSL
	7440-23-5	Sodium	162	733	mg/kg	-	15/15	-	733	NA	NA	-	-	-	N	EN
	7440-28-0	Thallium	0.15	0.42	mg/kg	-	14/15	0.18 - 0.18	0.42	NA	5.10E+00	N	-	-	N	BSL
	7440-62-2	Vanadium	9.8	27.5	mg/kg	-	15/15	-	27.5	NA	5.50E+02	N	-	-	N	BSL
	7440-66-6	Zinc	101	12500	mg/kg	-	15/15	-	12,500	NA	2.30E+04	N	-	-	N	BSL

Notes:

- (1) Maximum concentration used for screening chemicals.
- (2) All compounds were compared against Region IX residential PRGs (updated 12Sept2008), unless otherwise noted.
- (3) Benzo(b)fluoranthene used as surrogate (EPA, Region 2)
- (4) Compound screened against Region VI residential Human Health Screening Levels (updated 7March2008)
- (5) Naphthalene used as surrogate (EPA, Region 2)
- (6) Gamma BHC (lindane) used as surrogate
- (7) Lead screened against EPA's IUEBK lead model
- (8) Rational Codes:

BSL = Below Screening Level
ASL = Above Screening Level
EN = Essential Nutrient

Definitions: NA = Not Applicable

C = Carcinogen
C* = Known human carcinogen
C** = Known human carcinogen by inhalation only
N = Noncarcinogen

TABLE A-2.4
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
KOPPERS POND KENTUCKY AVENUE WELLFIELD SITE, OPERABLE UNIT 4, HORSEHEADS, NY

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment (Outlet Channel)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1) (mg/kg)	Background Value	Screening Toxicity Value (2) (mg/kg)	N/C	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (7)
Outlet Channel	87-84-1	Acetone	11	79	ug/kg	-	3/5	26 - 52	0.08	NA	6.10E+04	N	-	-	N	BSL
	79-20-9	Methyl acetate	23	23	ug/kg	-	1/5	6.6 - 16	0.02	NA	7.80E+04	N	-	-	N	BSL
	108-88-3	Toluene	160	160	ug/kg	-	1/5	6.6 - 30	0.16	NA	5.00E+03	N	-	-	N	BSL
	91-57-6	2-Methylnaphthalene	19	48	ug/kg	-	3/5	35 - 66	0.05	NA	3.10E+02	N	-	-	N	BSL
	108-44-5	4-Methylphenol	35	1,600	ug/kg	-	4/5	330 - 330	1.60	NA	3.10E+02	N	-	-	N	BSL
	83-32-9	Acenaphthene	19	230	ug/kg	-	3/5	35 - 66	0.23	NA	3.40E+03	N	-	-	N	BSL
	208-96-8	Acenaphthylene	24	190	ug/kg	-	4/5	35 - 35	0.19	NA	3.40E+03	N	-	-	N	BSL
	98-88-2	Acetophenone	58	66	ug/kg	-	2/5	260 - 490	0.07	NA	1.70E+03	N (3)	-	-	N	BSL
	120-12-7	Anthracene	10	490	ug/kg	-	5/5	-	0.49	NA	1.70E+04	N	-	-	N	BSL
	100-52-7	Benzaldehyde	52	170	ug/kg	-	4/5	330 - 330	0.17	NA	7.80E+03	N	-	-	N	BSL
	56-55-3	Benzo(a)anthracene	46	2,200	ug/kg	-	5/5	-	2.20	NA	1.50E-01	C	-	-	Y	ASL
	50-32-8	Benzo(a)pyrene	48	940	ug/kg	-	5/5	-	0.94	NA	1.50E-02	C	-	-	Y	ASL
	205-99-2	Benzo(b)fluoranthene	89	2,600	ug/kg	-	5/5	-	2.60	NA	1.50E-01	C	-	-	Y	ASL
	191-24-2	Benzo(ghi)perylene	55	580	ug/kg	-	5/5	-	0.58	NA	1.50E-01	C (4)	-	-	Y	ASL
	207-08-9	Benzo(k)fluoranthene	60	60	ug/kg	-	1/5	35 - 100	0.06	NA	1.50E+00	C	-	-	N	BSL
	117-81-7	bis(2-Ethylhexyl) phthalate	53	260	ug/kg	-	4/5	330 - 330	0.26	NA	3.50E+01	C	-	-	N	BSL
	85-68-7	Butyl benzyl phthalate	36	75	ug/kg	-	3/5	280 - 330	0.08	NA	2.60E+02	C	-	-	N	BSL
	105-60-2	Caprolactam	90	250	ug/kg	-	2/5	220 - 330	0.25	NA	3.10E+04	N	-	-	N	BSL
	86-74-8	Carbazole	13	380	ug/kg	-	3/5	52 - 66	0.38	NA	2.40E+01	C (3)	-	-	N	BSL
	218-01-9	Chrysene	66	3,400	ug/kg	-	5/5	-	3.40	NA	1.50E+01	C	-	-	N	BSL
	53-70-3	Dibenz(a,h)anthracene	14	85	ug/kg	-	4/5	66 - 66	0.09	NA	1.50E-02	C	-	-	Y	ASL
	132-84-9	Dibenzofuran	20	180	ug/kg	-	3/5	170 - 330	0.18	NA	1.50E+02	N (3)	-	-	N	BSL
	84-74-2	Di-n-butyl phthalate	68	68	ug/kg	-	1/5	170 - 490	0.07	NA	6.10E+03	N	-	-	N	BSL
	206-44-0	Fluoranthene	140	10,000	ug/kg	-	5/5	-	10.00	NA	2.30E+03	N	-	-	N	BSL
	86-73-7	Fluorene	24	310	ug/kg	-	3/5	35 - 66	0.31	NA	2.30E+03	N	-	-	N	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	48	580	ug/kg	-	5/5	-	0.58	NA	1.50E-01	C	-	-	Y	ASL
	91-20-3	Naphthalene	22	28	ug/kg	-	2/5	35 - 66	0.03	NA	3.90E+00	C	-	-	N	BSL
	85-01-8	Phenanthrene	46	1,600	ug/kg	-	5/5	-	1.60	NA	3.90E+00	C (5)	-	-	N	BSL
	108-95-2	Phenol	29	29	ug/kg	-	1/5	35 - 100	0.03	NA	1.80E+04	N	-	-	N	BSL
	129-00-0	Pyrene	67	4,600	ug/kg	-	5/5	-	4.60	NA	1.70E+03	N	-	-	N	BSL
	12789-03-6	gamma-Chlordane	2	2	ug/kg	-	1/5	2.8 - 84	0.002	NA	1.60E+00	C	-	-	N	BSL
	11097-69-1	Total PCBs (Aroclor 1254)	20	280	ug/kg	-	4/5	16 - 16	0.28	NA	2.20E-01	C	-	-	Y	ASL
	7428-90-5	Aluminum	8100	16700	mg/kg	-	5/5	-	16,700	NA	7.70E+04	N	-	-	N	BSL
	7440-38-0	Antimony	0.27	6	mg/kg	-	5/5	-	6	NA	3.10E+01	N	-	-	N	BSL
	7440-38-2	Arsenic	2.6	7.2	mg/kg	-	5/5	-	7	NA	3.90E-01	C*	-	-	Y	ASL
	7440-39-3	Barium	198	282	mg/kg	-	5/5	-	282	NA	1.50E+04	N	-	-	N	BSL
	7440-41-7	Beryllium	0.41	0.93	mg/kg	-	5/5	-	0.93	NA	1.60E+02	N	-	-	N	BSL
	7440-43-9	Cadmium	1.3	91.9	mg/kg	-	5/5	-	91.9	NA	7.00E+01	N	-	-	Y	ASL
	7440-70-2	Calcium	3630	70100	mg/kg	-	5/5	-	70,100	NA	NA	-	-	-	N	EN
	7440-47-3	Chromium	21.4	149	mg/kg	-	5/5	-	149	NA	2.80E+02	C**	-	-	N	BSL
	7440-48-4	Cobalt	6.9	13.1	mg/kg	-	5/5	-	13.1	NA	2.30E+01	N	-	-	N	BSL
	7440-50-8	Copper	21.2	175	mg/kg	-	5/5	-	175	NA	3.10E+03	N	-	-	N	BSL
	7439-89-6	Iron	16800	37400	mg/kg	-	5/5	-	37,400	NA	5.50E+04	N	-	-	N	BSL

TABLE A-2.4
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
KOPPERS POND KENTUCKY AVENUE WELLFIELD SITE, OPERABLE UNIT 4, HORSEHEADS, NY

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment (Outlet Channel)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1) (mg/kg)	Background Value	Screening Toxicity Value (2) (mg/kg)	N/C	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (7)
	7439-92-1	Lead	34.3	288	mg/kg	-	5/5	-	288	NA	4.00E+02	N (6)	-	-	N	BSL
	7439-95-4	Magnesium	3320	6540	mg/kg	-	5/5	-	8,540	NA	NA	-	-	-	N	EN
	7439-96-5	Manganese	170	415	mg/kg	-	5/5	-	415	NA	1.80E+03	N	-	-	N	BSL
	7439-97-6	Mercury	0.044	0.25	mg/kg	-	5/5	-	0.25	NA	6.70E+00	N	-	-	N	BSL
	7440-02-0	Nickel	21.4	55.5	mg/kg	-	5/5	-	55.5	NA	1.80E+03	N	-	-	N	BSL
	7440-09-7	Potassium	598	1150	mg/kg	-	5/5	-	1,150	NA	NA	-	-	-	N	EN
	7782-49-2	Selenium	0.47	1.3	mg/kg	-	5/5	-	1.3	NA	3.90E+02	N	-	-	N	BSL
	7440-22-4	Silver	0.42	14.5	mg/kg	-	5/5	-	14.5	NA	3.90E+02	N	-	-	N	BSL
	7440-23-5	Sodium	158	875	mg/kg	-	5/5	-	875	NA	NA	-	-	-	N	EN
	7440-28-0	Thallium	0.13	0.22	mg/kg	-	4/5	0.3 - 0.3	0.22	NA	5.10E+00	N	-	-	N	BSL
	7440-62-2	Vanadium	15.2	24.7	mg/kg	-	5/5	-	24.7	NA	5.50E+02	N	-	-	N	BSL
	7440-66-6	Zinc	94.5	1890	mg/kg	-	5/5	-	1,890	NA	2.30E+04	N	-	-	N	BSL

Notes:

- (1) Maximum concentration used for screening chemicals.
- (2) All compounds were compared against Region IX residential PRGs (updated 12Sept2008), unless otherwise noted.
- (3) Compound screened against Region VI residential Human Health Screening Levels (updated 7March2008)
- (4) Benzo(b)fluoranthene used as surrogate (EPA, Region 2)
- (5) Naphthalene used as surrogate (EPA, Region 2)
- (6) Lead screened against EPA's IUEBK lead model
- (7) Rational Codes:

BSL = Below Screening Level
ASL = Above Screening Level
EN = Essential Nutrient

Definitions: NA = Not Applicable

C = Carcinogen
C* = Known human carcinogen
C** = Known human carcinogen by inhalation only
N = Noncarcinogen

TABLE A-2.5
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
KOPPERS POND KENTUCKY AVENUE WELLFIELD SITE, OPERABLE UNIT 4, HORSEHEADS, NY

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Fish

Exposure Point	CAS Number	Chemical	Positive Range	Minimum Concentration (Qualifier)	Maximum Concentration (Qualifier)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (1)	Background Value	Screening Toxicity Value (2) (mg/kg)	N/C	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (6)
Koppers Pond	11097-69-1	Total PCBs	90 - 2,060	90	2,060	µg/Kg (ww)	-	17/17	—	2.06	NA	1.58E-03	C	-	-	Y	ASL
	7429-90-5	Aluminum	0.32 - 1.5	0.32	1.5	mg/Kg (ww)	-	20/20	—	1.5	NA	1.35E+03	N	-	-	N	BSL
	7440-38-0	Antimony	0.0034 - 0.034	0.0034	0.034	mg/Kg (ww)	-	16/20	0.1 - 0.1	0.034	NA	5.41E-01	N	-	-	N	BSL
	7440-38-2	Arsenic	0.018 - 0.15	0.018	0.15	mg/Kg (ww)	-	15/20	—	0.15	NA	2.10E-03	C*	-	-	Y	ASL
	7440-39-3	Barium	0.057 - 0.93	0.057	0.93	mg/Kg (ww)	-	20/20	—	0.93	NA	2.70E+02	N	-	-	N	BSL
	7440-70-2	Calcium	83.3 - 2130	83.3	2,130	mg/Kg (ww)	-	20/20	—	2130	NA	NA	-	-	-	N	EN
	18540-29-9	Chromium	0.32 - 1.2	0.32	1.2	mg/Kg (ww)	-	20/20	—	1.2	NA	4.06E+00	N (3)	-	-	N	BSL
	7440-48-4	Cobalt	0.0028 - 0.05	0.0028	0.05	mg/Kg (ww)	-	20/20	—	0.05	NA	4.06E-01	N	-	-	N	BSL
	7440-50-8	Copper	0.21 - 1	0.21	1	mg/Kg (ww)	-	20/20	—	1	NA	5.41E+01	N	-	-	N	BSL
	7439-89-6	Iron	0.85 - 15.2	0.85	15.2	mg/Kg (ww)	-	20/20	—	15.2	NA	9.46E+02	N	-	-	N	BSL
	7439-92-1	Lead	0.0065 - 0.17	0.0065	0.17	mg/Kg (ww)	-	20/20	—	0.17	NA	0.5	(4)	-	-	N	BSL
	7439-95-4	Magnesium	220 - 315	220	315	mg/Kg (ww)	-	20/20	—	315	NA	-	-	-	-	N	EN
	7439-96-5	Manganese	0.069 - 0.26	0.069	0.26	mg/Kg (ww)	-	20/20	—	0.26	NA	1.89E+02	N	-	-	N	BSL
	7439-97-6	Mercury	0.011 - 0.37	0.011	0.37	mg/Kg (ww)	-	20/20	—	0.37	NA	1.35E-01	N (5)	-	-	Y	ASL
	7440-02-0	Nickel	0.012 - 0.1	0.012	0.1	mg/Kg (ww)	-	20/20	—	0.1	NA	2.70E+01	N	-	-	N	BSL
	7440-09-7	Potassium	2530 - 3480	2,530	3,480	mg/Kg (ww)	-	20/20	—	3480	NA	-	-	-	-	N	EN
	7782-49-2	Selenium	0.2 - 0.44	0.2	0.44	mg/Kg (ww)	-	20/20	—	0.44	NA	6.76E+00	N	-	-	N	BSL
	7440-23-5	Sodium	355 - 592	355	592	mg/Kg (ww)	-	20/20	—	592	NA	-	-	-	-	N	BSL
	7440-28-0	Thallium	0.0023 - 0.032	0.0023	0.032	mg/Kg (ww)	-	12/20	0.1 - 0.1	0.032	NA	8.76E-02	N	-	-	N	BSL
	7440-62-2	Vanadium	0.027 - 0.28	0.027	0.28	mg/Kg (ww)	-	15/20	0.1 - 0.1	0.28	NA	9.46E+00	N	-	-	N	BSL
	7440-66-6	Zinc	4.8 - 26.1	4.8	26.1	mg/Kg (ww)	-	20/20	—	26.1	NA	4.06E+02	N	-	-	N	BSL

Notes:

- (1) Maximum concentration used for screening chemicals.
(2) All compounds were compared against Region 3 fish ingestion PRGs (May, 2008), unless otherwise noted.
(3) Screening value for chromium VI (particulates).
(4) Lead screened against acceptable lead concentration in fish derived by EPA Region 10, *Columbia River Basin Fish Contaminant Survey 1996-1998* (EPA, 2002).
(5) Screening value for methyl mercury.
(6) Rational Codes:

BSL = Below Screening Level
ASL = Above Screening Level
EN = Essential Nutrient

Definitions: NA = Not Applicable/Not Available
C = Carcinogen
C* = Known human carcinogen
N = Noncarcinogen

TABLE A-3.1
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
KOPPERS POND KENTUCKY AVENUE WELLFIELD SITE, OPERABLE UNIT 4, HORSEHEADS, NY

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Koppers Pond	Lead	ug/L	14.13	19.21	(N)	25.7	19.21	ug/L	95% UCL - N	95% Student's-t UCL
	Benzo(b)fluoranthene	ug/L	0.25	NC	-	0.25	0.25	ug/L	Max	Maximum concentration
	Arsenic	ug/L	0.24	0.295	(NP)	0.33	0.295	ug/L	95% UCL - NP	95% KM (Percentile Bootstrap) UCL

Notes:

NC = Not calculated due to small sample size

N = Normal distribution

KM = Kaplan-Meier Method

TABLE A-3.1
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE

KOPPERS POND KENTUCKY AVENUE WELLFIELD SITE, OPERABLE UNIT 4, HORSEHEADS, NY

Scenario Timeframe: Current/Future

Medium: Surface Water

Exposure Medium: Surface Water

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Outlet Channel	Lead	ug/L	11.6	NC	16.9	16.9	ug/L	Max	Maximum concentration
	Tetrachloroethene	ug/L	0.22	NC	0.22	0.22	ug/L	Max	Maximum concentration
	Benzo(a)anthracene	ug/L	0.051	NC	0.051	0.051	ug/L	Max	Maximum concentration
	Benzo(b)fluoranthene	ug/L	0.27	NC	0.27	0.27	ug/L	Max	Maximum concentration
	Arsenic	ug/L	0.5	NC	0.79	0.79	ug/L	Max	Maximum concentration

Notes:

NC = Not calculated due to small sample size

TABLE A-3.3
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
KOPPERS POND KENTUCKY AVENUE WELLFIELD SITE, OPERABLE UNIT 4, HORSEHEADS, NY

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Koppers Pond	Benzo(a)anthracene	ug/kg	372.8	611.7	(G)	1200	611.7	ug/kg	95% UCL - G	95% Approximate Gamma UCL
	Benzo(a)pyrene	ug/kg	514	777.7	(G)	1400	777.7	ug/kg	95% UCL - G	95% Approximate Gamma UCL
	Benzo(b)fluoranthene	ug/kg	711.5	1090.0	(G)	2000	1090.0	ug/kg	95% UCL - G	95% Approximate Gamma UCL
	Benzo(ghi)perylene	ug/kg	414.2	682.2	(G)	1200	682.2	ug/kg	95% UCL - G	95% Approximate Gamma UCL
	Dibenz(a,h)anthracene	ug/kg	123	172.5	(NP)	370	172.5	ug/kg	95% UCL - NP	95% KM (Percentile Bootstrap) UCL
	Indeno(1,2,3-cd)pyrene	ug/kg	347.3	562.8	(G)	1100	562.8	ug/kg	95% UCL - G	95% Approximate Gamma UCL
	Total PCBs (Aroclor 1254)	ug/kg	760.3	1343.0	(G)	2700	1343.0	ug/kg	95% UCL - G	95% Approximate Gamma UCL
	Arsenic	mg/kg	2.99	3.4	(N)	4.8	3.4	mg/kg	95% UCL - N	95% Student's-t UCL
	Cadmium	mg/kg	228.3	455.0	(G)	739	455.0	mg/kg	95% UCL - G	95% Approximate Gamma UCL
	Chromium	mg/kg	223.6	289.2	(N)	462	289.2	mg/kg	95% UCL - N	95% Student's-t UCL
	Lead	mg/kg	577.9	962.7	(G)	1620	962.7	mg/kg	95% UCL - G	95% Approximate Gamma UCL

Notes:

G = Gamma distribution

NP = Nonparametric

TABLE A-3.4
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE

KOPPERS POND KENTUCKY AVENUE WELLFIELD SITE, OPERABLE UNIT 4, HORSEHEADS, NY

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Outlet Channel	Benzo(a)anthracene	ug/kg	551	1367.0	(NP)	2200	1367.0	ug/kg	95% UCL - NP	95% Percentile Bootstrap UCL
	Benzo(a)pyrene	ug/kg	331.6	670.6	(N)	940	670.6	ug/kg	95% UCL - N	95% Student's-t UCL
	Benzo(b)fluoranthene	ug/kg	771.8	1620.0	(NP)	2600	1620.0	ug/kg	95% UCL - NP	95% Percentile Bootstrap UCL
	Benzo(ghi)perylene	ug/kg	288.8	506.3	(N)	580	506.3	ug/kg	95% UCL - N	95% Student's-t UCL
	Dibenz(a,h)anthracene	ug/kg	14	74.0	(NP)	85	74.0	ug/kg	95% UCL - NP	95% Student's-t UCL
	Indeno(1,2,3-cd)pyrene	ug/kg	0	0.0	(N)	580	0.0	ug/kg	95% UCL - N	95% Student's-t UCL
	Total PCBs (Aroclor 1254)	ug/kg	125.6	220.0	(NP)	280	220.0	ug/kg	95% UCL - NP	95% KM (Percentile Bootstrap) UCL
	Arsenic	mg/kg	4.04	5.8	(N)	7.2	5.8	mg/kg	95% UCL - N	95% Student's-t UCL
	Cadmium	mg/kg	33.52	69.6	(N)	91.9	69.6	mg/kg	95% UCL - N	95% Student's-t UCL

Notes:

G = Gamma distribution

NP = Nonparametric

N = Normal distribution

KM = Kaplan-Meier Method

TABLE A-3.5a
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE

KOPPERS POND KENTUCKY AVENUE WELLFIELD SITE, OPERABLE UNIT 4, HORSEHEADS, NY

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Fish

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Koppers Pond	Total PCBs	µg/Kg (ww)	525.2	826.5	(G)	2060	826.5	µg/Kg (ww)	95% UCL - G	95% Approximate Gamma UCL
	Arsenic	mg/Kg (ww)	0.0619	0.0751	(NP)	0.15	0.0751	mg/Kg (ww)	95% UCL - NP	95% KM (Percentile Bootstrap) UCL
	Mercury	mg/Kg (ww)	0.138	0.211	(G)	0.37	0.211	mg/Kg (ww)	95% UCL - G	95% Approximate Gamma UCL

Notes:

G = Gamma distribution

NP = Nonparametric

N = Normal distribution

KM = Kaplan-Meier Method

TABLE A-3.5b
EXPOSURE POINT CONCENTRATION SUMMARY
CENTRAL TENDENCY EXPOSURE¹
KOPPERS POND KENTUCKY AVENUE WELLFIELD SITE, OPERABLE UNIT 4, HORSEHEADS, NY

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Fish

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)	Exposure Point Concentration - Central Tendency Exposure ¹			
							Value	Units	Statistic	Rationale
Koppers Pond	Total PCBs	µg/Kg (ww)	525.2	826.5	(G)	2060	321	µg/Kg (ww)	Geometric mean - G	Geometric mean; Gamma distribution
	Arsenic	mg/Kg (ww)	0.0619	0.0751	(NP)	0.15	0.063	mg/Kg (ww)	KM mean - NP	KM mean
	Mercury	mg/Kg (ww)	0.138	0.211	(G)	0.37	0.081	mg/Kg (ww)	Geometric mean - G	Geometric mean; Gamma distribution

Notes:

1 = CTE EPCs to be used in the uncertainty analysis

G = Gamma distribution

NP = Nonparametric

N = Normal distribution

KM = Kaplan-Meier Method

TABLE A5.1
NON-CANCER TOXICITY DATA – ORAL/DERMAL
KOPPERS POND KENTUCKY AVENUE WELLFIELD SITE, OPERABLE UNIT 4, HORSEHEADS, NY

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal (1)	Absorbed RfD for Dermal (2)		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units		Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Arsenic (3)	Chronic	3.0E-04	mg/kg-day	1	3.0E-04	mg/kg-day	hyperpigmentation; keratosis; possible vascular complications	3	IRIS	10/8/2008
Benzo(a)anthracene	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Benzo(ghi)perylene	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Cadmium	Chronic	1.8E-03	mg/kg-day	0.025	4.5E-05	mg/kg-day	significant proteinuria	10	IRIS	10/8/2008
Chromium VI	Chronic	3.0E-03	mg/kg-day	0.025	7.5E-05	mg/kg-day	none reported	300	IRIS	10/9/2008
Dibenz(a,h)anthracene	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Lead (4)	Chronic	NA	NA	1	NA	NA	NA	NA	NA	NA
Mercury (5)	Chronic	1.0E-04	mg/kg-day	1	1.0E-04	mg/kg-day	developmental neurologic abnormalities in infants	10	IRIS	3/31/2009
Tetrachloroethene	Chronic	1.00E-02	mg/kg-day	1	1.0E-02	mg/kg-day	hepatotoxicity, weight gain	1000	IRIS	3/31/2009
Total PCBs (Aroclor 1254)	Chronic	2.0E-05	mg/kg-day	1	2.0E-05	mg/kg-day	ocular; immune system	300	IRIS	10/8/2008

Notes:

(1) RAGS Part E (EPA, 2004)

(2) Equation for dermal RfD: Oral RfD * Oral Absorption Efficiency (EPA, 2004)

Definitions:

NA = Not Available/Applicable

IRIS = Integrated Risk Information System

TABLE A5.2
NON-CANCER TOXICITY DATA – INHALATION
KOPPERS POND KENTUCKY AVENUE WELLFIELD SITE, OPERABLE UNIT 4, HORSEHEADS, NY

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Extrapolated RfD (1)		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s)	
		Value	Units	Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Arsenic	Chronic	1.5E-05	mg/m ³	4.3E-06	mg/kg-day	NA	NA	CalEPA	3/31/2009
Benzo(a)anthracene	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(ghi)perylene	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
Chromium VI	Chronic	1.0E-04	mg/m ³	2.9E-05	mg/kg-day	lung (bronchioalveolar)	300	IRIS	10/9/2008
Dibenz(a,h)anthracene	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
Lead	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
Mercury (methyl)	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	Chronic	6.00E-01	mg/m ³	1.7E-01	mg/kg-day	tubular cell karyomegaly	30	NCEA	cited in ORNL:03/312009
Total PCBs (Aroclor 1254)	Chronic	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

(1) Extrapolation equation: $\text{InhRfC (mg/m}^3\text{)} \times 20\text{m}^3/\text{d} \times 1/70\text{kg}$

Definitions: NA = Not Available/Applicable

IRIS = Integrated Risk Information System

TABLE A6.1
CANCER TOXICITY DATA – ORAL/DERMAL
KOPPERS POND KENTUCKY AVENUE WELLFIELD SITE, OPERABLE UNIT 4, HORSEHEADS, NY

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal (1)	Absorbed Cancer Slope Factor for Dermal (2)		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units		Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
Arsenic	1.5E+00	(mg/kg-day) ⁻¹	1	1.5E+00	(mg/kg-day) ⁻¹	A	IRIS	10/8/2008
Benzo(a)anthracene	7.3E-01	(mg/kg-day) ⁻¹	1	7.3E-01	(mg/kg-day) ⁻¹	B2	IRIS	10/8/2008
Benzo(a)pyrene	7.3E+00	(mg/kg-day) ⁻¹	1	7.3E+00	(mg/kg-day) ⁻¹	B2	IRIS	10/8/2008
Benzo(b)fluoranthene	7.3E-01	(mg/kg-day) ⁻¹	1	7.3E-01	(mg/kg-day) ⁻¹	B2	IRIS	10/8/2008
Benzo(ghi)perylene	7.3E-01	(mg/kg-day) ⁻¹	1	7.3E-01	(mg/kg-day) ⁻¹	D	IRIS	10/8/2008
Cadmium	NA	NA	0.025	NA	NA	NA	NA	NA
Chromium VI	NA	NA	0.025	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	7.3E+00	(mg/kg-day) ⁻¹	1	7.3E+00	(mg/kg-day) ⁻¹	B2	IRIS	10/8/2008
Lead	NA	NA	1	NA	NA	NA	NA	NA
Mercury (methyl)	NA	NA	1	NA	NA	C	IRIS	3/31/2009
Tetrachloroethene	5.40E-01	(mg/kg-day) ⁻¹	1	5.4E-01	(mg/kg-day) ⁻¹	NA	CalEPA	3/31/2009
Total PCBs	2.0E+00	(mg/kg-day) ⁻¹	1	2.0E+00	(mg/kg-day) ⁻¹	B2	IRIS	10/8/2008

Notes:

(1) RAGS Part E (EPA, 2004)

(2) Equation for dermal CSF: Oral CSF / Oral Absorption Efficiency (EPA, 2004)

Definitions:

NA = Not Available/Applicable

IRIS = Integrated Risk Information System

CalEPA = California Environmental Protection Agency

A = Human Carcinogen

B2 = Probable Human Carcinogen

TABLE A6.2
CANCER TOXICITY DATA – INHALATION
KOPPERS POND KENTUCKY AVENUE WELLFIELD SITE, OPERABLE UNIT 4, HORSEHEADS, NY

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor (1)		Weight of Evidence/ Cancer Guideline Description	Unit Risk : Inhalation CSF	
	Value	Units	Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
Arsenic	4.3E-03	($\mu\text{g}/\text{m}^3$) ⁻¹	1.5E+01	(mg/kg-day) ⁻¹	A	IRIS	10/8/2008
Benzo(a)anthracene	1.1E-04	($\mu\text{g}/\text{m}^3$) ⁻¹	3.9E-01	(mg/kg-day) ⁻¹	B2	CalEPA	9/12/2008
Benzo(a)pyrene	1.1E-03	($\mu\text{g}/\text{m}^3$) ⁻¹	3.9E+00	(mg/kg-day) ⁻¹	B2	CalEPA	9/12/2008
Benzo(b)fluoranthene	1.1E-04	($\mu\text{g}/\text{m}^3$) ⁻¹	3.9E-01	(mg/kg-day) ⁻¹	B2	CalEPA	9/12/2008
Benzo(ghi)perylene	1.1E-04	($\mu\text{g}/\text{m}^3$) ⁻¹	3.9E-01	(mg/kg-day) ⁻¹	D	CalEPA	9/12/2008
Cadmium	1.8E-03	($\mu\text{g}/\text{m}^3$) ⁻¹	6.3E+00	(mg/kg-day) ⁻¹	B1	IRIS	10/9/2008
Chromium VI	8.4E-02	($\mu\text{g}/\text{m}^3$) ⁻¹	2.9E+02	(mg/kg-day) ⁻¹	A	IRIS	10/9/2008
Dibenz(a,h)anthracene	1.2E-03	($\mu\text{g}/\text{m}^3$) ⁻¹	4.2E+00	(mg/kg-day) ⁻¹	B2	CalEPA	9/12/2008
Lead	NA	NA	NA	NA	NA	NA	NA
Mercury (methyl)	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	5.90E-06	($\mu\text{g}/\text{m}^3$) ⁻¹	2.1E-02	(mg/kg-day) ⁻¹	NA	CalEPA	3/31/2009
Total PCBs	5.7E-04	($\mu\text{g}/\text{m}^3$) ⁻¹	2.0E+00	(mg/kg-day) ⁻¹	B2	IRIS	10/9/2008

Notes:

(1) Extrapolation equation: $\text{InhUR} (\mu\text{g}/\text{m}^3) * 1/20\text{m}^3/\text{d} * 70\text{kg} * 1000\mu\text{g}/\text{mg}$

Definitions:

NA = Not Available/Applicable

IRIS = Integrated Risk Information System

CalEPA = California Environmental Protection Agency

A = Human Carcinogen

B1 = Probable Human Carcinogen