# SCREENING HUMAN HEALTH RISK ASSESSMENT
# DUCK AND OTTER CREEKS
# TOLEDO AND OREGON, OHIO

**Prepared for**

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## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ADD | Average daily dose |
| AScI | AScI Corporation |
| AWQC | Ambient water quality criterion |
| BEC | BEC Laboratories, Inc. |
| COPC | Chemical of potential concern |
| CSM | Conceptual site model |
| DL | Detection limit |
| ELCR | Excess lifetime cancer risk |
| ENVIRON | ENVIRON International Corporation |
| EPA | U.S. Environmental Protection Agency |
| EPC | Exposure point concentration |
| ETC | Environmental Testing and Certification Corporation |
| FDA | Food and Drug Administration |
| G.I. | Gastrointentinal |
| GCN | Generic cleanup number |
| GOF | Goodness-of-fit |
| HHRA | Human health risk assessment |
| HQ | Hazard quotient |
| IEUBK | Integrated Exposure Uptake Biokinetic Model for Lead in Children |
| LADD | Lifetime average daily dose |
| LOAEL | Lowest observed adverse effect levels |
| MAOC | Maumee River Area of Concern |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| OEPA | Ohio Environmental Protection Agency |
| OERR | Office of Emergency and Remedial Response |
| OSHA | Occupational Safety and Health Administration |
| OSWER | Office of Solid Waste and Emergency Response |
| PAH | Polynuclear aromatic hydrocarbons |
| Partnership | The Duck and Otter Creek Partnership, Inc. |
| PbB | Blood lead concentration |
| PBT | Persistent bioaccumulative toxin |
| PCB | Polychlorinated biphenyl |
| PCDD | Polychlorinated dibenzo-p-dioxin |
| PCDF | Polychlorinated dibenzofuran |

| | |
|---|---|
| ppm | Parts per million |
| PTRL | PTRL Environmental Services, Inc. |
| QAPP | Quality assurance project plan |
| RAGS | Risk Assessment Guidance for Superfund |
| RBRG | Risk-based remediation goals |
| RCRIS | Resource Conservation and Recovery Act Information System |
| RfD | Reference dose |
| RME | Reasonable maximum exposure |
| SF | Slope factor |
| SQL | Sample quantitation limit |
| SVOC | Semivolatile organic compound |
| TEF | Toxicity equivalent factor |
| Tetra Tech | Tetra Tech EM Inc. |
| TTL | Toledo Testing Laboratory, Inc. |
| UCL | Upper confidence limit |
| USCB | U.S. Census Bureau |
| USDA | U.S. Department of Agriculture |
| USDC | U.S. Department of Commerce |
| WSU | Wright State University |
| XRF | X-ray fluorescence |

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## EXECUTIVE SUMMARY

The Duck and Otter Creeks watershed in the Maumee River Area of Concern has been an urban and industrial hub on Lake Erie for over 100 years. As a result, the health of both creeks has been impacted over time. Historical impacts on the creeks have included major habitat modifications and degradation of water and sediment quality. A sediment quality assessment of Duck and Otter Creeks was completed in 1999, and the assessment report identified the potential for sediment toxicity and bioaccumulation-related risks (that is, risks related to contaminant concentrations building up in receptor tissues) to ecological receptors. Human health risks were noted to be a matter of concern because individuals may wade or play in publicly accessible areas of the creeks. However, the report did not specifically assess potential exposures or characterize risks to human receptors associated with the creeks.

The Duck and Otter Creek Partnership, Inc. (Partnership) has planned a two-phase human health and ecological risk assessment study for Duck and Otter Creeks. The overall purpose of the study is "to determine whether sediment contaminants pose a significant risk to human health or the environment, and if so, to identify specific chemicals contributing to toxicity and define the spatial extent [where risks are located] of risks [to human and ecological receptors]." This screening human health risk assessment (HHRA) was prepared as part of the first phase of this study.

The screening HHRA was prepared in accordance with U.S. Environmental Protection Agency (EPA) and Ohio Environmental Protection Agency (OEPA) guidance. The primary guidance document upon which the screening HHRA is based is called "Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part A)" and is referred to as RAGS. This document recommends preparing a risk assessment that includes four primary parts: data evaluation and identification of chemicals of potential concern (COPC), exposure assessment, toxicity assessment, and risk characterization.

Data evaluation concerns how and which data are selected for use in the risk assessment. It is important to understand that no new samples were collected in order to prepare the screening HHRA. Only data and materials generated previously by other organizations and individuals were used. The "secondary data" used in the screening HHRA was carefully selected following a plan developed in accordance with policies and procedures recommended by EPA's Great Lakes National Program Office.

COPCs are those chemicals that may be associated with the site and that are present at concentrations that could potentially result in adverse health effects to people. COPCs were identified using a conservative process that helped make sure no potentially significant chemicals were overlooked. COPCs identified for the screening HHRA included: metals, volatile organic compounds, semivolatile organic compounds, including a class of chemicals referred to as polynuclear aromatic hydrocarbons (PAH) which are typically associated with incomplete combustion, pesticides, and polychlorinated biphenyls.

The exposure assessment looks at where, how, and which people may be exposed to COPCs in Duck and Otter Creek. Risk assessors review where the contamination is located, what kinds of activities people engage in that may result in their exposure in the creeks (for example, walking along or wading in the creeks), and how people may come into contact with COPCs in sediment or surface water (for example, directly contacting contaminated sediment or drinking water from the creeks). Specifically, the exposure assessment looked at the following:

- **Where:** For surface water the exposure assessment looked at exposure throughout both Duck and Otter Creeks. For sediment, Duck and Otter Creek were each divided into five different segments called exposure areas and exposures were calculated for each area. Fish ingestion was considered only in Hecklinger Pond, the upstream-most segment of Duck Creek (exposure area DC-1).

- **How:** The screening HHRA looked at ingestion of and direct contact with surface water, ingestion of and direct contact with sediment, and ingestion of fish tissue.

- **Who:** The screening HHRA looked at adults, youths (age 7 to 18), and children (age 1 to 6)

Exposures were calculated using equations and input values recommended by EPA and OEPA. The input values were selected to generate a reasonable maximum exposure (RME) – that is, the highest reasonably expected exposure. For sediment in exposure areas where only a small number of samples were collected, exposures were estimated by comparing concentrations to EPA- and OEPA-recommended screening levels and to concentrations measured in other exposure areas.

The toxicity assessment identifies values that reflect how much of an adverse health effect may result from potential exposure to a COPC. Adverse effects are grouped into two general types: carcinogenic (that is, cancer forming) and non-carcinogenic (for example, liver effects or impacts to the central nervous system). COPC-specific toxicity values were identified in accordance with EPA recommendations.

The risk characterization combines the exposure assessment and toxicity assessment parts of the risk assessment and produces estimates of carcinogenic risk (risk) and non-carcinogenic hazards (hazards). Risks represent the probability of an individual developing cancer. A risk of 1E-04 (or $1 \times 10^{-4}$) represents one chance in an exposed population of 10,000 people. Calculated risks were compared to

EPA's acceptable risk range of 1E-06 to 1E-04. Risks were also compared to OEPA's statewide goal of 1E-05 for total additive carcinogenic risk. Hazards are calculated as a ratio of the calculated exposure and an acceptable exposure associated with no adverse effects. Hazards were compared to a value of 1 which represents OEPA's statewide goal for additive non-carcinogenic risk.

Risks and hazards for sediment in the two upstream-most (northern) exposure areas in Otter Creek (OC-1 and OC-2) and for Hecklinger Pond (DC-1) were evaluated qualitatively by comparing concentrations to screening values and to concentrations measured in other sediment exposure areas. Risks and hazards from potential ingestion of fish from Hecklinger Pond were also evaluated qualitatively by comparing fish tissue concentrations to acceptable levels.

The results of the risk characterization are summarized below:

- All risks and hazards associated with potential exposure to COPCs in surface water are less than 1E-06 and 1, respectively
- All hazards associated with potential exposure to COPCs in sediment are less than 1
- Risks calculated for all sediment exposure areas in both creeks exceed EPA's point of departure (1E-06) in all exposure areas except for adult-, youth-, and child-specific risks in the downstream-most exposure area in Duck Creek (DC-5)
- Risks calculated for sediment exposure areas DC-2, DC-3, and DC-4 equal or exceed OEPA's statewide goal of 1E-05
- Sediment risks are driven by potential exposure to PAHs, particularly benzo(a)pyrene
- Based on a qualitative evaluation, potential exposure to lead may be associated with elevated risks only in exposure area OC-4. This result is driven by a lead concentration measured at a single sediment sample location in this exposure area.
- Based on a qualitative evaluation, infrequent consumption of fillets from fish caught in Hecklinger Pond is not expected to be associated with significant risks or hazards to human receptors. However, individuals who consume fish from Hecklinger Pond on a more regular basis may experience risks greater than 1E-06.

The screening HHRA results are subject to uncertainty introduced in all of the four primary parts of the process. The largest sources of uncertainty are associated with (1) the collection of medium-specific samples by different organizations, for different reasons, and using different techniques and the analysis of these samples using different laboratory procedures and (2) relatively small number and representativeness of medium-specific samples.

# 1.0 INTRODUCTION

The Duck and Otter Creeks watershed in the Maumee River Area of Concern (MAOC) has been an urban and industrial hub on Lake Erie for over 100 years (see Figure 1). As a result, the health of both creeks has been impacted over time. Historical impacts on the creeks have included major habitat modifications and degradation of water and sediment quality. Despite significant improvements in water quality in the creeks, sediment contamination remains a concern. A sediment quality assessment of Duck and Otter Creeks was completed in 1999, and the assessment report identified the potential for sediment toxicity and bioaccumulation-related risks to ecological receptors (ChemRisk 1999). However, the report also noted that additional data collection was required to determine whether the potential adverse effects actually posed a threat. Human health risks were noted to be a matter of concern because individuals may wade or play in publicly accessible areas of the creeks. However, the report did not specifically assess potential exposures or characterize risks to human receptors associated with the creeks.

The Duck and Otter Creek Partnership, Inc. (Partnership) has planned a two-phase human health and ecological risk assessment study for Duck and Otter Creeks. The overall purpose of the study is “to determine whether sediment contaminants pose a significant risk to human health or the environment, and if so, to identify specific chemicals contributing to toxicity and define the spatial extent of risks [to human and ecological receptors]” (Partnership 2004). As part of the first phase of this study, Tetra Tech EM Inc. (Tetra Tech) has prepared this screening human health risk assessment (HHRA) for Duck and Otter Creeks. The methodology and assumptions used to prepare the screening HHRA were previously submitted to and discussed with the Partnership (Tetra Tech 2005d, 2005e). In addition to potential sediment exposures, the Partnership agreed to consider potential surface water and fish tissue exposures.

The rest of this section summarizes the scope of the screening HHRA (Section 1.1), the overall technical approach (Section 1.2) of the screening HHRA, and the organization of the screening HHRA (Section 1.3).

## 1.1 SCREENING HHRA SCOPE

Consistent with the Partnership’s objective, the screening HHRA focuses on potential exposures, and carcinogenic risks (risks) and noncarcinogenic hazards (hazards) associated with potential exposures to human receptors in the creeks themselves (for example, potential exposure to contaminants in surface water, sediment, and aquatic biota [e.g. fish]). Contamination present near or adjacent to the creeks will be addressed as potential sources of in-creek contamination. However, the screening HHRA does not quantitatively address potential exposure to contaminants present in media outside of the creeks.

As suggested by its title, the screening HHRA represents the first step in assessing potential human exposures to contaminants in media from Duck and Otter Creeks and characterizing risks and hazards associated with these exposures. Data gaps (e.g. limitations) associated with the available analytical data necessitate modifications of standard risk assessment procedures in some cases as discussed elsewhere in this document. Uncertainties introduced as a result of these limitations and modifications are discussed in the uncertainty section of this report. It is the Partnership's intent that the results of this screening HHRA, supplemented with analytical data associated with samples collected in the future to fill identified data gaps, will be used to prepare a final HHRA as part of Phase 2 of the overall study.

## 1.2 SCREENING HHRA TECHNICAL APPROACH

The screening HHRA will be conducted in accordance with U.S. Environmental Protection Agency (EPA) guidance. Some of the key EPA guidance documents that will be used to conduct the screening HHRA are listed below. This list is not comprehensive, and other EPA guidance documents as well as documents prepared by other organizations may also be used as appropriate.

- EPA. 1989. "Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part A)" (RAGS). Interim Final. Office of Emergency and Remedial Response (OERR). Washington, DC. EPA/540/1-89/002. December.

- EPA 1991. "RAGS, Volume I: Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors." Interim Final. Office of Solid Waste and Emergency Response (OSWER) Directive 9285.6-03. March 25.

- EPA 1992. "Guidance for Data Usability in Risk Assessment (Part A) Final." OERR. Publication 9285.7-09A. April.

- EPA 1997. "Exposure Factors Handbook." Volumes 1 through 3. Office of Research and Development. EPA/600/P-95/002Fa, -Fb, and -Fc. August.

- EPA. 2002. "Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites." OSWER 9285.6-10. December.

- EPA 2003. "Human Health Toxicity Values in Superfund Risk Assessments." OSWER Directive 9285.7-53. December 5.

- EPA 2004a. "ProUCL Version 3.0 User's Guide. Prepared by A. Singh, A.K. Singh, and R.W. Maichle." National Exposure Research Laboratory Environmental Sciences, Technical Support Center for Monitoring and Site Characterization.
- EPA 2004b. "Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). Final. OSWER. EPA/540/R/99/005. July.


## 1.3 SCREENING HHRA ORGANIZATION

As described in EPA guidance, an HHRA is typically conducted in four basic steps (EPA 1989). These four steps are (1) data evaluation and identification of chemicals of potential concern (COPC), (2) exposure assessment, (3) toxicity assessment, and (4) risk and hazard characterization. These four steps and uncertainties associated with the screening HHRA process are discussed in Sections 2.0 through 6.0, respectively. References, figures, tables, and appendixes cited in the text are presented after Section 6.0.

# 2.0 DATA EVALUATION AND IDENTIFICATION OF COPCS

The primary objectives of this section are to discuss the sources of analytical data available for media associated with Duck and Otter Creeks (Section 2.1) and to discuss methods that were used to identify COPCs for the screening HHRA (Section 2.2). COPCs are chemicals carried through the screening HHRA for which risks and hazards are estimated.

## 2.1 DATA COLLECTION AND EVALUATION

Data relevant to Duck and Otter Creeks are available from a variety of sources. This data is considered secondary data since it was generated by others; no new sampling in the creeks was conducted to support the screening HHRA. These sources are summarized in Section 2.1.1. The methods used to evaluate analytical data from these sources for the purpose of identifying data that will be used in the screening HHRA are summarized in Section 2.1.2. Secondary data sources were identified and evaluated in accordance with the site-specific secondary quality assurance project plan (QAPP) (Tetra Tech 2005b).

### 2.1.1 Sources of Secondary Data

Secondary data relevant to Duck and Otter Creeks are available from a variety of sources. Much of the available data are from studies or sampling efforts conducted by the Ohio Environmental Protection

Agency (OEPA). The OEPA studies are typically part of an evaluation of the Maumee River Area of Concern (MAOC) and include studies of overall stream quality (OEPA 1994 and 1998, 1992 to 1998, 1995; AScI Corporation [AScI] 1997) and stream quality in the vicinity of specific disposal or industrial operations along Duck and Otter Creeks (OEPA 1997a, 1997b, 1997c, 1998). Secondary data have also been generated as part of the following activities:

- Investigations of industrial operations along Duck and Otter Creeks (PTRL Environmental Services, Inc. [PTRL] 1997a, 1997b, 1997c; ENVIRON International Corporation [ENVIRON] and The Mannik & Smith Group, Inc. [Mannik & Smith] 2003)
- Preparation of spill reports and routine water quality sampling by the City of Oregon (2003, 2004a, 2004b, 2005a, 2005b, 2005c)
- Investigation of a release from the City of Toledo Wastewater Treatment Plant lime sludge ponds (City of Toledo 1988)
- Investigations of Hecklinger Pond (BEC Laboratories, Inc. [BEC] 1998, 2003, 2004; Environmental Testing and Certification Corporation [ETC] 1989; OEPA 2003; Toledo Testing Laboratory, Inc. [TTL] 1988; City of Toledo 1989a, 1989b, 1991; and Wright State University [WSU] 1991)

Tetra Tech commissioned an environmental database search for the Duck and Otter Creek watersheds (EDR 2005). The search effort identified and mapped sites along and releases to Duck and Otter Creeks that are listed in various government databases such as Ohio Spills, the Resource Conservation and Recovery Act Information System (RCRIS), the hazardous material incident report system, and others. (Note: the results of this environmental database search have been provided to the Partnership in electronic format).

Table 1 summarizes the secondary data sources identified and the type and location of medium-specific samples associated with each data source. Figures 2 and 3 show the location of surface water and sediment sampling locations, respectively, by year associated with the identified secondary data sources.

### 2.1.2 Data Evaluation Methodology

This section summarizes the evaluation process employed to determine whether to include and combine various analytical data sets in the screening HHRA. EPA's "Guidance for Data Usability in Risk Assessment (Part A) Final" identifies five primary criteria that ideally should be satisfied before data is used in a quantitative risk assessment (EPA 1992). These criteria are summarized below.

- Reports should be available to risk assessors that include site descriptions and present the sampling program design, sampling locations, analytical methods, detection limits, sampling results, and sample quantitation limits (SQL).

- Documentation should be available for review of sampling results as they relate to geographic locations (that is, chain-of-custody documentation, standard operating procedures, and field and analytical records).

- Sampling results should be available for each medium within an exposure area, should have been generated using a broad spectrum of analytical techniques, and should be accompanied by documentation of any field measurements needed to support fate and transport modeling.

- Acceptable analytical methods should have been used with SQLs capable of detecting concentrations of significant health concern.

- A data validation review should have been performed, including a consideration of data completeness, comparability, representativeness, precision, and accuracy.

These five criteria were the primary basis for determining the analytical data sets that will be combined for use in the screening HHRA (Tetra Tech 2005b). It should be noted that the data sets associated with the studies, investigations, and activities listed in Section 2.1.1 meet most of these criteria. However, not all of the data sets meet all of the criteria.

Specifically, some of the sediment samples collected as part of the Phase III – 1997 OEPA sampling program (OEPA 1992 to 1998) were analyzed using a variety of screening analytical procedures including x-ray fluorescence (XRF) and immunoassay tests. The sediment quality assessment report (ChemRisk 1999) noted a poor correlation between the results from the immunoassay tests and the corresponding fixed laboratory results. Although EPA encourages the use of field screening analytical techniques under the Triad approach (EPA 2004d), the screening data must have a reasonable correlation to the fixed laboratory results. Given the complexity of the sediment matrix (as reflected in the poor correlation between the screening and fixed and fixed laboratory results), the availability of existing fixed laboratory data, and the expectation that additional fixed laboratory results will be collected as part of Phase 2 of the project, the existing screening data were not considered in the screening HHRA.

Uncertainties associated with using analytical results from data sets that do not meet all of EPA's recommended criteria are discussed in Section 6.0.

## 2.2 COPC IDENTIFICATION

Medium-specific COPCs were identified using a four-step process applied to all available secondary data determined to be usable in the screening HHRA (EPA 1989, 1992). The first step in the COPC identification process for each medium was to identify all chemicals that were positively identified in a least one sample, including chemicals with no data qualifiers and chemicals with data qualifiers indicating known identities but unknown concentrations (for example, J-qualified data). Summary statistics were calculated for all detected chemicals as discussed in Section 2.2.1

### 2.2.1 Summary Statistics

The following summary statistics were calculated for chemicals in Duck and Otter Creek sediment and surface for both the complete data sets (that is, all reaches combined), as well as for individual reaches within each creek (sediment only): (1) the number of detected samples, total number of samples, and detection frequency; (2) the minimum and maximum reported concentration for censored (nondetect) data; (3) the minimum and maximum reported concentration for detected data; (4) the arithmetic mean; (5) the geometric mean; and (6) the $50^{th}$, $90^{th}$, and $95^{th}$ percentiles. In addition, for chemicals within individual reaches of both creeks, distribution tests were conducted and calculations of the upper confidence limit (UCL) of the mean and exposure point concentrations (EPC) were performed. The calculation of EPCs is discussed further in Section 3.3.1.

Statistical results for the full sediment data sets for Duck and Otter Creeks are provided in Tables 2 and 3, respectively, the full surface water data set in Table 4, and sediment statistical results for individual reaches for each creek are provided in Tables 5 and 6. Tables 6a and 6b present complete lists of all sediment and surface water analytes, respectively. Details of the methods for calculating each of the parameters in the summary tables are provided below.

The minimum and maximum concentrations were reported separately for detected and censored (nondetect, or data below the detection limit [DL]) data. For censored data, the values represent the minimum and maximum DL. For calculations of the mean and percentiles, one-half the DL was substituted for each censored datum. Both the arithmetic and geometric means were reported. The geometric mean was calculated by taking the arithmetic mean of the natural logs of the data, and back-transforming the mean to original units. The percentiles were calculated using a nonparametric approach (that is, based on the rank-ordered concentrations) following methods described in Gilbert (1987).

As discussed in RAGS, these initial medium-specific lists of chemicals may be reduced based on the following factors (EPA 1989):

- Comparison with appropriate background concentrations
- Evaluation of detection frequency
- Evaluation of essential nutrients
- Use of a toxicity-concentration screen

In addition to the four factors recommended by EPA as listed above, the screening HHRA also considered factors and methods recommended by OEPA (OEPA 2005b). Specifically, OEPA provided recommendations regarding:

- Persistent bioaccumulative toxins (PBT)
- Consideration of the cumulative impact of multiple contaminants
- Appropriate medium-specific screening levels

Finally, various secondary data included results for biological samples and indices, general water quality parameters, and non-specific parameters. With the exception of analytical results associated with fish tissue samples associated with Hecklinger Pond, the screening HHRA did not consider these biologically-related data.

Appropriate background concentrations were not identified for either surface water or sediment. Therefore, only the last three EPA-recommended criteria, as well as consideration of PBTs as recommended by OEPA were used to identify COPCs for the screening HHRA. (Note: OEPA's recommendations regarding the cumulative impact of multiple contaminants and the selection of appropriate medium-specific screening levels are addressed as part of the use of a toxicity screen). Tables 7 and 8 document the basis for each chemical's retention as a COPC in surface water and sediment, respectively. Each of the criteria used to select COPCs is briefly discussed below in Sections 2.2.1 through 2.2.6.

### 2.2.1 Evaluation of Detection Frequency

EPA's RAGS states "Chemicals that are infrequently detected may be artifacts in the data due to sampling, analytical, or other problems, and therefore may not be related to site operations or disposal practices (EPA 1989). However, RAGS also cautions that an evaluation of a chemical's detection frequency in one medium must consider the following additional factors:

- A chemical's potential relationship to site operations
- A chemical's detection in other media
- The concentration at which a chemical was detected in each medium

Historically, a detection frequency of 5 percent has often been used as a basis for identifying COPCs (EPA 1989). The screening HHRA will eliminate chemicals as COPCs if they were detected in less than 5 percent of medium-specific samples, contingent on consideration of the additional factors listed above. Also, as discussed in Section 2.2.4, detected PBTs will be retained as COPCs regardless of the frequency at which they were detected in a particular medium.

### 2.2.2 Evaluation of Essential Nutrients

In accordance with EPA guidance, essential nutrients such as magnesium, calcium, potassium, and sodium will be eliminated as COPCs in the screening HHRA (EPA 1989).

### 2.2.3 Use of a Toxicity-Concentration Screen

The screening HHRA will compare the maximum concentration detected of each analyte to medium-specific screening levels. Chemicals for which the maximum detected concentration is less than the medium-specific screening level will be eliminated as COPCs in that medium except as described below. Sediment-specific analytical results were compared to EPA Region 9 residential soil preliminary remediation goals (PRG) (EPA 2004c). Surface water-specific analytical results were compared to OEPA's generic cleanup numbers (GCN) for direct contact with groundwater (OEPA 2005a).

As necessary, the chemical-specific screening levels were adjusted to reflect target risk and hazard targets of 1E-06 and 0.1, respectively. This required that EPA Region 9 residential soil PRGs based on a noncarcinogenic endpoint were multiplied by an adjustment factor of 0.1. Similarly, OEPA's GCNs, based on both carcinogenic and noncarcinogenic endpoints were multiplied by an adjustment factor of 0.1.

The cumulative impact of multiple contaminants was considered when applying the toxicity-concentration screen. Specifically, all chemicals with a maximum detected concentration greater than medium-specific screening levels were retained as COPCs. Further, ratios of the maximum detected concentration to the medium-specific screening level for each chemical were calculated. These rations were then summed. When the summed ratios exceeded OEPA's 1E-05 and 1 risk and hazard goals, chemicals contributing significantly to these risks and hazards were identified and retained as COPCs. Chemicals retained on this basis described as "contributes to cumulative risk" or "contributes to cumulative hazard."

### 2.2.4 Persistent, Bioaccumulative Toxins (PBT)

OEPA recommends retaining any detected PBTs as COPCs regardless of the frequency with which they were detected in a medium (OEPA 2005b). OEPA has identified the following chemicals as PBTs (OEPA 2005d):

- 4,4'-DDD
- 4,4'-DDE
- 4,4'-DDT
- Aldrin
- Benzo(a)pyrene
- Dieldrin
- Polychlorinated biphenyls (PCB)
- Mercury

(Note: In comments received on the draft screening HHRA [Tetra Tech 2005f], OEPA requested that additional chemicals be identified and retained as COPCs because they were identified as PBTs in EPA [2004e] and OEPA [2005d]. A comparison of these additional PBT chemicals to existing COPCs revealed that six additional chemicals would have been identified as COPCs. These additional chemicals are: anthracene, beryllium, chlordane, chromium, heptachlor, and phenanthrene. These additional chemicals were not identified as COPCs for the purpose of the screening HHRA because they were reported at maximum detected concentrations less than the screening levels discussed in Section 2.2.3. The impact of not including these six additional chemicals as COPCs is also discussed in Section 6.0).

In addition to retaining the seven individual chemicals listed above as COPCs (PCBs are a class of compounds), the following decisions were made regarding other chemicals as COPCs:

- In addition to benzo(a)pyrene, all detected carcinogenic polynuclear aromatic hydrocarbons (PAH) were retained as COPCs regardless of detection frequency
- All detected PCB aroclors were retained as COPCs regardless of detection frequency

### 2.2.5 Biological Results, Water Quality Parameters, and Non-Specific Parameters

Secondary data included results for various biological samples and indices (results), water quality parameters, and non-specific parameters. In accordance with general risk assessment practices, HHRAs do not consider (1) biological results unless human receptors are or could be exposed to chemicals present in biota, (2) water quality parameters, and (3) non-specific parameters. Therefore, except as described below, biological results, water quality parameters, and non-specific parameters were not considered in the selection of COPCs specifically and the screening HHRA in general. Each of these types of results and parameters is briefly discussed below.

**Biological Samples and Indices**

Secondary data considered in the screening HHRA included tallies of the number, lifestage, mass, and number of various biological species in Duck and Otter Creeks (OEPA 1992 to 1998, 1994 and 1998, and 1995). With the exception of information regarding the species, lifestage, and numbers of fish identified in Duck and Otter Creeks (these data were used to evaluate the presence of fishable populations in the creeks), these data were not considered in the screening HHRA. The reason these data were not considered is because it is unlikely that human receptors will be exposed to chemicals actually or potentially present in the biological species samples (e.g. invertebrates) except indirectly as a result of fish ingestion.

Similarly, OEPA evaluated the relative health and condition of Duck and Otter Creeks using several different biological indices. These indices included the index of biotic integrity, an invertebrate community index, and a qualitative habitat evaluation index. These data provide information that will be used in an ecological risk assessment of the creeks.  However, they are not useful for evaluating potential human exposures, and the risks and hazards associated with these exposures.  Therefore, these data were not considered in the screening HHRA.

The only biological results considered directly in the screening HHRA were analytical results associated with fish tissue samples from fish collected in Hecklinger Pond (at the head of Duck Creek).  COPCs in fish tissue samples were identified as described elsewhere in this section.

**Water Quality Parameters**

A large number of surface water samples collected from Duck and Otter Creeks were analyzed entirely or in part for a large variety of general water quality parameters.  These parameters include:

- Ammonia
- Biochemical oxygen demand
- Chemical oxygen demand
- Chloride
- Coliforms
- Conductivity
- Dissolved oxygen
- E. Coli
- Fecal coliforms
- Fecal streptococci
- Hardness
- Nitrate
- Nitrate + Nitrite
- Nitrite
- Nitrogen
- Oil and grease
- Oxidation reduction potential
- Phosphates
- Phosphorous
- Sulfide
- Temperature
- Total Kjeldahl nitrogen
- Total filterable residue
- Total nonfilterable residue
- Turbidity
- pH

These parameters are typically used to assess the overall quality of the water in water bodies.  Also, toxicity factors which could be used to evaluate potential risks and hazards associated with these parameters are unavailable (EPA 2003).  Therefore, these water quality parameters were not considered further in the screening HHRA.

**Non-Specific Parameters**

Two types of compounds were analyzed for in a limited number of instances on a non-specific basis. Specifically, a small number of sediment samples reported analytical results in terms of total PCBs and total PAHs. In the majority of instances PCBs were analyzed for in terms of aroclors and PAHs were analyzed for in terms of specific compounds. Because toxicity factors are not available for total PCBs and total PAHs and the majority of the analytical results are presented in terms of specific PCB aroclors and specific PAH compounds for which toxicity factors are available, the analytical results associated with total PCBs and total PAHs were not considered in the identification of COPCs.

# 3.0 EXPOSURE ASSESSMENT

This section discusses methods that will be used to estimate the type and magnitude of human exposure to COPCs in sediment, surface water, and aquatic life in Duck and Otter Creeks. Exposure is defined as contact with a chemical or physical agent (EPA 1989). The exposure assessment will consist of three fundamental steps: (1) exposure setting characterization, (2) exposure pathway identification, and (3) exposure quantification. Each of these steps is summarized below in Sections 3.1 through 3.3.

## 3.1 EXPOSURE SETTING CHARACTERIZATION

The exposure setting consists of the physical setting of the site and the human populations living near the site. Figure 1 shows the location of the Duck and Otter Creeks watershed. In general the area is mixed use with residential and commercial land use dominating along upstream and center portions of each stream, becoming more heavily industrial along the northern third of each stream. Sections 3.1.1 and 3.1.2 discuss general receptor locations and meteorology of the area, respectively. Section 3.1.3 discusses the demographics of the study area.

### 3.1.1 General Receptor Locations

The watershed is located in the MAOC along the boundary between Toledo and Oregon, Ohio. Specifically, Duck Creek is located in Toledo and discharges into the Maumee River, while Otter Creek is located in Oregon and discharges into Maumee Bay – a part of Lake Erie. Other population centers located around the watershed include Perrysburg, Rossford, Walbridge, Northwood, and Millbury. The majority of the watershed is located in Lucas County. However, the southern portion of the watershed is located in Wood County.

### 3.1.2 Meteorology

The climate in the area surrounding the watershed is cold in winter and warm and occasionally hot in summer. The average high temperature ranges from 87 degrees in July to 33 degrees in January. The highest recorded temperature was 105°F in 1999. The lowest recorded temperature was -16°F in 1985. The average monthly precipitation ranges from 3.84 inches in June to 2.00 inches in January. The average annual precipitation is 34 inches (USDA 1980).

### 3.1.3 Demographics

In general, the following types of information are required to characterize the number, type, and location of potential human receptors (including sensitive subpopulations) that may be exposed to contaminants in the creeks.

- Population density
- Locations of special subpopulations (including children and elderly people)
- The estimated number of exposed individuals
- A detailed estimated of the exposed population

This information was collected for increasing distances from a point located at the approximate center of the Duck and Otter Creeks watershed up to a maximum of 6 miles and is summarized below.

**Demographic Information**

Based on 2000 U.S. Census Bureau (USCB) population data, approximately 214,000 people live within 6 miles of the approximate center of the watershed (U.S. Department of Commerce [USDC] 2002). The majority (about 94 percent) of the individuals living within 6 miles of the approximate center of the watershed are identified as being either white (about 68 percent) or black (about 26 percent). The population density varies between 4,640 and 3,057 people per square mile up to 2 miles from the approximate center of the watershed. The population density drops by about one-half beyond 2 miles, ranging from about 1,555 to 2,053 people per square mile from 2 to 6 miles from the approximate center of the watershed (USDC 2002).

Population statistics were reviewed for the cities of Toledo and Oregon and for Lucas and Ottawa Counties – these two counties border Wood County (the county in which the watershed is located) to the west and east, respectively (USCB 2001). Based on this information, it is clear that the significant majority of the people living within 6 miles of the approximate center of the watershed reside in the City of Toledo. Also, based on information for the cities of Toledo and Oregon, it is expected that there are slightly more female and male receptors present within 6 miles of the approximate center of the watershed. Specifically, the split is about 47 percent male and 53 percent female. Also, approximately one-quarter of the population is under the age of 18 and about 12 percent is over the age of 65.

**Special Subpopulations**

EPA defines special subpopulations as human receptors or segments in the population that may be potentially at higher risk because of receptor sensitivity to COPCs (for example, elderly, infants and children, and fetuses of pregnant women) (EPA 1989). Consistent with EPA guidance and for the purposes of the screening HHRA, special subpopulations were identified based on the location of hospitals and medical facilities, schools, retirement and nursing homes, and child care facilities. Each of these potential subpopulation groups is addressed below:

- **Hospitals** – there are 19 hospitals in the Toledo area and two hospitals in the Oregon area that are part of the Ohio Hospital Association or the Hospital Council of Northwest Ohio. The closest hospital to Otter Creek is St. Charles Mercy Hospital, which is approximately 0.5 mile from the creek at the intersection of Navarre and Wheeling Roads.

- **Schools** – there are approximately seven schools in the area in the City of Oregon. The school located closest to one of the creeks is First St. John Lutheran School which is located at 2471 Seaman Road about 0.25 mile from Otter Creek.

- **Retirement/Nursing Homes** – there are two or more retirement/nursing homes located near the creeks. The facility located closest to one of the creeks is the Lutheran Housing Service located just south of Duck Creek at its intersection with Wheeling Road.

- **Child Care Facilities** – the City of Oregon has approximately three child care facilities located near the creeks. The closest of these facilities is within about 0.5 mile of Duck Creek.

## 3.2 CONCEPTUAL SITE MODEL

The screening HHRA characterizes risks and hazards to human receptors associated with potential exposures to COPCS in media in Duck and Otter Creeks. For the purposes of the screening HHRA, the potential future land use along both creeks is considered to be the same as the current land use. The single exception to this assumption is the potential development of the wetland located just downstream of Hecklinger Pond along Duck Creek as community ecological education center (Tetra Tech 2005a).

Figure 4 is a human health conceptual site model (CSM) for Duck and Otter Creeks under current land use conditions. The CSM links potential or actual releases to potential human exposures. Specifically, the CSM identifies (1) potential contaminant sources and mechanisms of release, (2) potential receptors and exposure pathways, and (3) exposure scenarios. The purpose of the screening HHRA is to characterize risks and hazards to human receptors. Therefore, potential contaminant sources and mechanisms of release into the creeks are identified only generally and are not discussed in detail in the screening HHRA. The remainder of this section summarizes potential receptors and exposure pathways (Section 3.2.1) and exposure scenarios (Section 3.2.2).

### 3.2.1 Potential Receptors and Exposure Pathways

Identification and evaluation of potential current and future receptors and exposure pathways for Duck and Otter Creeks was performed based primarily on three factors: physical setting, field observations, and demographics. Potential receptors and exposure pathways were identified on these factors as summarized below.

#### Potential Receptors

Exposures within Duck and Otter Creeks are expected to occur almost exclusively as a result of recreational activities, including wading and hiking through and along the streams. Fishing is assumed to be limited primarily to Hecklinger Pond. Therefore, potential receptors are referred to as recreationalists. As shown in Figure 4, the screening HHRA will consider three potential receptor groups: child (1 to 6 years of age), youth (7 to 18 years of age), and adult recreationalists. Child recreationslists are assumed to be exposed exclusively in residential (or near residential) portions of the streams, as well as portions of the streams that pass through public recreational areas such as Collins Golf Course. Children are also assumed to have de minimus exposure in the portions of the streams that pass through heavily industrial or isolated areas (generally, the northernmost portions of both streams).

Youth and adult recreationalists are assumed to be potentially exposed throughout the length of both streams. However, exposures are expected to be most frequent in those sections of the streams that pass through residential or near residential areas and public recreational areas, and least frequent in those sections of the streams that pass through more heavily industrial and isolated areas.

Municipal, industrial, and commercial workers may also be exposed to COPCs in surface water and sediment in Duck and Otter Creeks. However, worker’s exposures are assumed to occur as part of their work duties that are subject to Occupational Safety and Health Administration (OSHA) regulations. Accordingly, it was assumed that these workers will follow appropriate health and safety plans as required by OSHA. These health and safety plans may include the use of personal protective equipment (such as gloves and rubber boots) designed to eliminate or reduce potential exposures. Therefore, the screening HHRA did not consider further any potential exposures by workers in Duck and Otter Creeks.

**Exposure Pathways**

Receptors are expected to be potentially exposed to COPCs in Duck and Otter Creeks through a variety of exposure pathways as shown in the human health CSM (see Figure 4). The potentially complete exposure pathways that were evaluated in the screening HHRA include the following:

- Direct contact with surface water and sediment
- Incidental ingestion with surface water and sediment
- Ingestion of aquatic life (e.g. fish) (assumed to be limited to fish caught in Hecklinger Pond)

### 3.2.2 Exposure Scenarios

Complete exposure pathways and scenarios exist when a point of contact exists between an affected medium and a receptor. For Duck and Otter Creeks, potentially complete exposure scenarios are identified in the human health CSM (see Figure 4) and are associated with the following receptors:

- Child recreationalists (1 to 6 years of age)

- Youth recreationalists (7 to 18 years of age)
- Adult recreationalists

Portions of the creeks pass through residential areas. Some yards open directly onto the creeks (see Photographs No. 21 and 22 in Appendix A). In other cases, the creeks pass closely by school yards and Duck Creek passes through Collins Golf Course (see Photographs No. 9 through 11 in Appendix A). An area of woods along Otter Creek (near Starr Avenue) is used as a paint ball field (see Photographs No. 33 and 41 through 43 in Appendix A). Also, signs of all terrain vehicle (ATV) use have been observed near both creeks (see Photographs No. 28, 30, and 31 in Appendix A). All of these situations afford the opportunity for individuals to play and walk along the creeks or wade in the creeks.

It is assumed that no swimming takes place in either creek. This assumption is supported by the fact that the water depth is less than 2 feet in all but the downstream-most segments of both creeks (Tetra Tech 2005c; Quanterra 1997; City of Oregon 2004a, 2005c; OEPA 1995). The water depth is the downstream-most segments may reach 3 to 4 feet. However, these segments are isolated and accessibility is limited. Also, security is increased in these segments. Altogether, it is judged unlikely that receptors will swim in the downstream-most segments of both creeks. Also, Hecklinger Pond is posted with signs that state the pond is unsafe for water activities including swimming and fishing (see Photographs No. 16 and 17 in Appendix A). However, these signs may be removed in the future. Therefore, for the purposes of the screening HHRA, it was assumed that regular, but infrequent swimming takes place in Hecklinger Pond. The deepest portion of both creeks is the downstream portion (north end). Duck and Otter Creeks discharge into the Maumee River and Maumee Bay, respectively. The downstream-most one mile of each creek passes through heavily industrialized and relatively isolated areas. Also, security concerns have made access to the portion of Otter Creek north of Millard Avenue and the portion of Duck Creek north of the CSX rail crossing difficult (Tetra Tech 2005a).

Considering (1) the varying exposure potential and conditions along both Duck and Otter Creeks, (2) the distribution of medium-specific sampling locations, and (3) the distribution of medium-specific chemical concentrations along both creeks, the screening HHRA assessed receptor-specific exposures in specific portions of each creek rather than throughout the length of each creek (EPA 1989). Each of these creek portions is referred to as an exposure area. Figure 5 shows the locations of the five Duck Creek and five Otter Creek exposure areas that were considered in the screening HHRA. Table 9 identifies the boundaries of each creek-specific exposure area and provides a brief explanation of its selection.

## 3.3 EXPOSURE QUANTIFICATION

Exposure is defined as the contact of an organism with a chemical or physical agent. The magnitude of potential chemical exposure, which depends on the amount of a chemical available at human exchange boundaries (skin, lungs, and gut) during a specified time, were quantitatively assessed for the human receptors discussed in Section 3.2.

Exposure dose equations that consider contact rate, receptor body-weight, and frequency and duration of exposure will be used to estimate the intake or dose of each COPC for each receptor. Exposure doses will be calculated for the reasonable maximum exposure (RME) case, which represents the highest exposure reasonably expected to occur.

An exposure can occur over a period of time. The total exposure can be divided by the time period to calculate an average exposure per unit of time. An average exposure can be expressed in terms of body weight. All exposures quantified in the HHRA were normalized for time and body weight, are presented in units of milligrams of chemical per kilogram of body weight per day (mg/kg-day), and are termed "intakes." Equation 1 is a generic equation for calculating chemical intake (EPA 1989).

$$D = (C * CR * EF * ED)/(BW * AT) \qquad (1)$$

where

D = Dose: the amount of chemical at the exchange boundary (mg/kg-day); to evaluate exposure to noncarcinogenic chemicals, the intake is referred to as the average daily dose (ADD); to evaluate exposure to carcinogenic chemicals, the intake is referred to as the lifetime average daily dose (LADD)

C = Chemical concentration: the average concentration (referred to as the exposure point concentration [EPC]) contacted over the exposure period (for example, mg/kg for soil and mg/L for groundwater)

CR = Contact rate: the amount of contaminated medium contacted per unit of time or event (for example, mg/day for soil and L/day for groundwater)

EF = Exposure frequency: how often the exposure occurs (days/year)

ED = Exposure duration: how long the exposure occurs (years)

BW = Body weight: the average body weight of the receptor over the exposure period (kg)

AT = Averaging time: the period over which exposure is averaged (days); for carcinogens, the averaging time is 25,550 days based on a lifetime exposure of 70 years; for noncarcinogens, the averaging time is calculated as exposure duration (years) x 365 days/year

Variations of Equation 1 were used to calculate pathway-specific exposures to COPCs. The equations and parameter values used for each exposure pathway are presented in Figure 6 and Tables 10 through 12, respectively. The EPC calculations and pathway-specific intake equations and exposure parameters are discussed below. As noted in Section 3.2.1, fishing is assumed to occur within the Duck and Otter Creeks watershed (see Figure 1) only in Hecklinger Pond. However, signs stating that the pond is unsafe for water activities including fishing and swimming have been posted around the pond (see Photographs No. 16 and 17 in the appendix). Therefore, any fishing that takes place in Hecklinger Pond is assumed to be limited in frequency. It is further assumed that little or none of the fish caught in Hecklinger Pond are ingested. Accordingly, potential exposure to COPCs in the tissue of fish from Hecklinger Pond was evaluated qualitatively and not quantitatively as part of the screening HHRA.

### 3.3.1 EPC Calculations

The EPC is defined as the concentration of a COPC that a human receptor is exposed to at an exposure point. It was determined that an insufficient number of sediment analytical results were available to support calculation of EPCs in three of the 10 exposure areas – OC-1, OC-2, and DC-1 (Hecklinger Pond). Therefore, the maximum detected concentration of each COPC in sediment was used as the EPC in these three exposure areas. Similarly, it was determined that an insufficient number of surface water analytical results were available to support calculation of EPCs within all exposure areas. Therefore, the maximum detected concentration of each COPC in surface water was used as the EPC for the entire surface water data set. The remainder of this section summarizes how medium-specific EPCs were calculated for sediment.

Calculations of the UCL were based on distribution-dependent formulae. Distribution testing was conducted for all chemicals with at least 5 samples and detection frequencies of at least 50 percent. Both graphical methods and statistical goodness-of-fit (GOF) tests were used to assign a best-fit distribution for each chemical. Graphical methods included the preparation of quantile probability plots, outlier box plots, and frequency histograms for three potential fits: normal, lognormal, and gamma. Statistical tests were conducted using two well-established GOF tests: the Shapiro-Wilk W test (for normal and lognormal distributions) and the Cramer-von Mises W test (for gamma distributions). All statistical tests used the five percent significance level (equivalent to the 95 percent confidence level) as the cutoff for evaluating each potential distribution. Chemicals that did not fit any of the three distributions tested were listed as "nonparametric" in the summary tables.

A UCL of the mean was calculated for all chemicals with at least five samples. For chemicals with detection frequencies of at least 85 percent, one-half the DL was substituted for censored data, and calculations were performed following the protocols recommended in the U.S. Environmental Protection Agency's ProUCL software package (EPA 2004a). Following EPA (2004a) the UCL can be either a 95, 97.5, or 99 percent confidence limit.

For chemicals with detection frequencies less than 85 percent, stochastic methods were used following the "bounding" approach described in EPA (2002). This approach treats each censored datum as a random, uniform variable that can assume any value between zero and its respective DL. Monte Carlo simulation is used to develop a distribution of the range of possible estimates for each UCL based on the selection of a particular mathematical form for the UCL. Random surrogate values between zero and the reporting limit are used for individual censored measurements in each calculation (default is 2,000 calculations) of the UCL, therefore, the resulting distribution reflects the entire range of possible values that could be calculated for the UCL. Because substitution of random surrogate values is made for each censored measurement, this technique reflects the uncertainty contributed by varying levels of censored data, and is appropriate for samples with either single or multiple censoring limits. Depending on the underlying distribution, one of three mathematical models was used to calculate the UCL: normal distributions (Student's t), skewed distributions (minimum variance unbiased Chebyshev method), and nonparametric distributions (nonparametric Chebyshev method). For chemicals with detection frequencies less than 50 percent (that is, formal distribution testing was not conducted), the distribution was treated as nonparametric. The $95^{th}$ percentile of each distribution was used as the UCL reported in the summary tables.

The EPC was calculated as the lesser of the UCL and the maximum detected concentration for sediment and the maximum detected concentration for surface water. Exposure area-specific sediment EPCs are documented in Tables 5 and 6 for Duck and Otter Creeks, respectively. Surface water EPCs are documented in Table 4. Medium-specific EPCs are summarized in Table 13.

### 3.3.2 Pathway-Specific Intake Equations and Exposure Parameters

The pathway-specific intake equations and exposure parameter values used to estimate receptor-specific exposures under RME conditions for each exposure pathway are presented in Figure 6 and Tables 10 through 12, respectively. Chemical-specific parameters referred to in Table 10 are presented in Table 12. The intake equations and exposure parameter values used in the screening HHRA were taken or adapted from EPA guidance documents, including RAGS (EPA 1989); "Exposure Factors Handbook" (EPA 1997); and "Dermal Exposure Assessment: Principles and Applications" (EPA 2004b). These documents provide guidance for selection of exposure parameters and were used along with information from peer-reviewed scientific literature to identify appropriate RME exposure parameter values.

# 4.0 TOXICITY ASSESSMENT

This section discusses the toxicity values that were used to quantify potential adverse effects on human health associated with potential exposure to COPCs in Duck and Otter Creeks. These toxicity values include slope factors (SF) for carcinogenic COPCs and reference doses (RfD) for noncarcinogenic COPCs. The toxicity values used to assess the effects of carcinogenic COPCs are summarized in Section 4.1. The toxicity values used to assess the effects of noncarcinogenic COPCs are summarized in Section 4.2. Section 4.3 discusses the approach used to estimate toxicity values for evaluation of dermal exposure. Table 14 documents the carcinogenic and noncarcinogenic toxicity factors identified for each COPC.

## 4.1 TOXICTY VALUES FOR CARCINOGENIC COPCS

This section discusses the development and use of SFs for quantifying the potential adverse effects on human health resulting from exposure to carcinogenic COPCs. Section 4.1.1 discusses the general development of SFs. Of the COPCs identified for Duck and Otter Creeks, PCBs and PAHs have unique aspects to their toxicity; therefore, development and use of SFs for these COPCs are discussed in Sections 4.1.2 and 4.1.3, respectively.

### 4.1.1 SF Development

The potential for exposure to a given chemical to result in carcinogenic effects is evaluated differently than for noncarcinogenic effects. The upper-bound excess lifetime cancer risk (ELCR) associated with a given dose is calculated by multiplying the dose from a given route of exposure by an SF. An SF is an upper-bound estimate of the probability of a carcinogenic response per unit dose of a chemical over a lifetime. SFs are derived through use of mathematical models based on a high-to-low dose extrapolation and under the assumption that no threshold exists for initiation of cancer. Because of the use of the nonthreshold assumption and the UCL 95 of the slope of the dose-response curve, use of SFs provides a conservative, upper-bound estimate of potential cancer risks. The actual response to a given dose of a chemical is therefore probably less than the predicted response (EPA 1989).

SFs are specific to a chemical and a route of exposure and are generally available for both the oral (ingestion or gavage) and inhalation routes. SFs will be selected in accordance with EPA's "Human Health Toxicity Values in Superfund Risk Assessments" (EPA 2003).

#### 4.1.2 SFs for PCBs

Most of the samples that were analyzed for PCBs were analyzed for a series of congener mixtures trade-named "Aroclors." Based on EPA guidance (EPA 1996a) and a review of the major congener composition of commercial PCB mixtures, Aroclors were organized into three groups as described below.

- Group 1: Aroclors 1248, 1254, and 1260
- Group 2: Aroclors 1232 and 1242
- Group 3: Aroclors 1016 and 1221

Studies of these groups of Aroclors (or one or more Aroclors within a group) are the primary bases for the SFs developed by EPA for high risk and persistence, low risk and persistence, and lowest risk and persistence conditions. Based on EPA guidance and the IRIS database, SFs will be assigned as detailed below (EPA 1996a, 2005b). The three groups of Aroclors are, in some cases, identified as "PCB high," "PCB low," and "PCB lowest," respectively.

| **PCB Group** | **Exposure Pathway** | **Slope Factor $(mg/kg\text{-}day)^{-1}$** |
|---|---|---|
| 1 and 2 | Fish ingestion<br>Sediment ingestion<br>Surface water ingestion<br>Dermal contact with surface water and sediment | 2 |
| 3 | All complete exposure pathways | 0.07 |

EPA's IRIS database recommends the use of RME-specific SFs for the low risk and persistence group of 0.4 and 0.3 (mg/kg-day)-1, respectively, under specific circumstances. These SFs are applicable when the HHRA is evaluating (1) ingestion of water soluble congeners, (2) inhalation of evaporated congeners, or (3) dermal exposure (if no absorption factor has been applied) (EPA 1996a). Therefore, consistent with EPA guidance, the SFs for the high risk and persistence group were also applied to the low risk and persistence group (EPA 1996a).

### 4.1.3 SFs for PAHs

The only PAH for which an SF has been developed is benzo(a)pyrene, whose SF is 7.3 $(mg/kg\text{-}day)^{-1}$ (EPA 2005b). To characterize carcinogenic risks for the other six potentially carcinogenic PAHs, their carcinogenic potency relative to benzo(a)pyrene was estimated. For the purposes of the HHRA, EPA-derived benzo(a)pyrene toxicity equivalent factors (TEF) were used to derive PAH-specific SFs as shown in Equation 2.

PAH-specific SF = SF for benzo(a)pyrene x PAH-specific TEF (2)

The EPA-derived TEFs (EPA 1993) used to derive PAH-specific SFs are listed below.

| Compound | TEF |
|---|---|
| Benzo(a)pyrene | 1.0 |
| Benzo(a)anthracene | 0.1 |
| Benzo(b)fluoranthene | 0.1 |
| Benzo(k)fluoranthene | 0.01 |
| Chrysene | 0.001 |
| Dibenzo(a,h)anthracene | 1.0 |
| Indeno(1,2,3-cd)pyrene | 0.1 |

## 4.2 TOXICITY VALUES FOR NONCARCINOGENIC COPCS

This section discusses the development and use of RfDs for quantifying the potential adverse effects on human health resulting from exposure to noncarcinogenic COPCs. Section 4.2.1 discusses the general development of RfDs. Of the COPCs identified in Duck and Otter Creeks, PCBs and PAHs have unique aspects to their toxicity; therefore, development and use of RfDs for these COPCs are discussed in Sections 4.2.2 and 4.2.3, respectively. Toxicity factors are not available for lead. Section 4.2.4 discusses how the screening HHRA will assess lead toxicity.

### 4.2.1 Reference Dose Development

Standard risk assessment models are based on the assumption that noncarcinogenic effects, unlike carcinogenic effects, exhibit a threshold; that is, a level of exposure exists below which no adverse effects are observed. The potential for noncarcinogenic health effects resulting from exposure to a COPC will be assessed by comparing an exposure estimate for intake to an RfD. The RfD represents an estimated daily intake rate for a noncarcinogenic COPC that is believed to pose no appreciable risk of adverse effects on human health, including the health of sensitive populations, during a lifetime. RfDs also apply to the noncarcinogenic effects of potential carcinogens.

An RfD is specific to a chemical and a route of exposure, such as ingestion or inhalation. Additionally, chronic and subchronic RfDs are developed for different periods of exposure. Chronic RfDs are used to evaluate exposures occurring over periods of more than 7 years, and subchronic RfDs are used to evaluate exposures occurring over periods of 2 weeks to 7 years. For the screening HHRA, chronic oral RfDs selected in accordance with EPA’s “Human Health Toxicity Values in Superfund Risk Assessments” (EPA 2003) will be used.

### 4.2.2 RfDs for PCBs

EPA’s IRIS database lists oral RfDs of 7E-05 and 2E-05 mg/kg-day for Aroclors 1016 and 1254, respectively (EPA 2005b). Consistent with the Aroclor grouping described in Section 4.1.2, the oral RfD for Aroclor 1254 was used to represent Groups 1 and 2, and the oral RfD for Aroclor 1016 was used to represent Group 3.

#### 4.2.3 RfDs for PAHs

EPA's IRIS database lists oral RfDs for six PAHs: acenaphthene, anthracene, fluoranthene, fluorene, naphthalene, and pyrene (EPA 2005b). For the purposes of the HHRA, oral RfDs will be assigned to additional PAHs using surrogates (EPA 1989). Under this approach, oral RfDs for acenaphthene, anthracene, fluoranthene, and pyrene were assigned to PAHs without oral RfDs based on structural similarities. Specifically, PAHs without oral RfDs were assigned the following surrogates:

- Acenaphthene was assigned as the surrogate for acenaphthylene.
- Anthracene was assigned as the surrogate for benzo(a)anthracene, dibenzo(a,h)anthracene, chrysene, and phenanthrene.
- Fluoranthene was assigned as the surrogate for benzo(b)fluoranthene, benzo(k)fluoranthene, and indeno(1,2,3-cd)pyrene.
- Pyrene was assigned as the surrogate for benzo(g,h,i)perylene and benzo(a)pyrene.

#### 4.2.4 Lead

Toxicity factors are not available for lead. The potential for human health effects as a result of exposure to lead is typically estimated on the basis of calculated lead concentrations in blood. EPA guidance recommends use of separate models for assessing risks associated with exposure to lead in soil by children and adults. Specifically, EPA recommends using the "Integrated Exposure Uptake Biokinetic Model for Lead in Children" (IEUBK), Version 0.99d, to assess lead exposure for children 0 to 7 years (84 months) of age (EPA 1994a, 1994b). To assess the risks associated with lead exposure for adults, EPA suggests use of the "Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil" (EPA 1996b). Each of these models can be run in a "reverse" mode to obtain on-site lead concentrations that can be used as risk-based remediation goals (RBRG) to limit receptor-specific blood lead concentrations (PbB) exceeding 10 micrograms per deciliter (µg/dL) to 5 percent or less.

Review of available analytical data for sediment samples from Duck and Otter Creeks indicates that lead has been detected at concentrations less than OEPA's generic, risk-based soil cleanup number of 245 mg/kg for residential direct contact exposure to lead in soils in all but one instance – lead was measured at an average concentration of 4,850 mg/kg at sediment sample location JME-019 located in exposure area

OC-4 between Consaul Street and the rail yard to the north. Also, receptor-specific exposures to sediment are expected to be less than exposure to soil under residential conditions. Therefore, an acceptable concentration of lead in sediments based solely on site-specific human exposure potential would be even higher than 245 mg/kg. No ambient water quality criterion (AWQC) for lead based on consumption of water and aquatic life is available. However, Duck and Otter Creeks are not used as sources for drinking water. Therefore, lead present in surface water from Duck and Otter Creeks is not expected to pose a significant risk to human health. These results indicate that potential exposure to lead in sediment and surface water in Duck and Otter Creeks are not expected to be associated with significant risks and hazards except, potentially, in a single sediment exposure area – OC-4. Therefore, potential exposure to lead will be further evaluated only in sediment exposure area OC-4 (see Section 5.5.1.2).

## 4.3 ESTIMATION OF TOXICITY VALUES FOR DERMAL EXPOSURE

RfDs and SFs are not available for the dermal exposure pathway. However, in many cases, noncarcinogenic hazards and carcinogenic risks associated with the dermal exposure pathway can be evaluated using an oral RfD or SF (EPA 1989). Most oral RfDs and SFs are expressed as the amount of substance administered per unit time and unit body weight, or the administered dose. However, exposure estimates developed for dermal exposure to COPCs in soil or water are expressed as the amount of substance absorbed, or the absorbed dose. Adjustments are sometimes required to ensure that the exposure estimate and the toxicity value are both expressed as absorbed doses or are both expressed as administered doses.

To ensure that the exposure estimate and toxicity value are comparable, the toxicity value (RfD or SF), which is generally based on an administered dose, is adjusted to reflect an absorbed dose. Specifically, the oral RfD or SF for a COPC is adjusted using the gastrointestinal (G.I.) absorption efficiency for that COPC (EPA 1989). For a noncarcinogen, the absorbed dose RfD is the product of the oral administered dose RfD and the G.I. absorption efficiency. For a carcinogen, the absorbed dose SF is the quotient of the oral administered dose SF and the G.I. absorption efficiency. However, if the toxicity value derived is expressed as an absorbed dose, no adjustment is required.

In accordance with EPA guidance, adjustments to oral toxicity values should be performed only in instances where the G.I. absorption efficiencies are significantly less than 50 percent (EPA 2004b). The majority of COPCs identified for sediment and surface water have G.I. absorption efficiencies at or greater than 50 percent. However, at the request of OEPA (2005c), dermal toxicity values were calculated using COPC-specific G.I. absorption efficiencies as described above (see Table 12). These dermal toxicity values were used to characterize risks and hazards associated with potential exposure to COPCs in surface water and sediment.

## 5.0 RISK CHARACTERIZATION

This section summarizes the methods by which the carcinogenic risks and noncarcinogenic hazards associated with the exposure pathways identified in Section 3.0 will be characterized. Risks and hazards are characterized for individual COPCs, for multiple COPCs within each exposure pathway, and for exposures attributable to multiple exposure pathways, as appropriate. Carcinogenic risk estimates were derived based on LADDs, and noncarcinogenic hazard estimates were derived based on ADDs.

Sections 5.1 and 5.2 discuss the methodologies that were used to quantitatively characterize carcinogenic risks and noncarcinogenic hazards, respectively, for sediment exposure areas OC-3, OC-4, OC-5, DC-2, DC-3, DC-4, and DC-5 and for surface water.

Section 5.3 discusses the methodology that was used to qualitatively characterize carcinogenic risks and noncarcinogenic hazards associated with potential sediment exposures in exposure areas DC-1, DC-2, and OC-1. Quantitative exposures were not calculated for these exposure areas because of an insufficient amount of analytical data. Therefore, the risk characterization consists of a qualitative comparison of the maximum detected to screening levels and to EPCs and the range of detected concentrations in these three exposure areas to the range of detected concentrations for other exposure areas.

Section 5.4 discusses the methodology that was used to characterize carcinogenic risks and noncarcinogenic hazards associated with potential fish tissue exposures in exposure area DC-1 (Hecklinger Pond). Quantitative exposures were not calculated because the pond is posted with signs prohibiting fishing and it is assumed that regular ingestion of fish from the pond does not occur. Therefore, the risk characterization consists of a qualitative comparison of the measured tissue concentrations to screening or acceptable levels.

## 5.1 RISK CHARACTERIZATION METHODOLOGY

For carcinogenic COPCs, risk estimates represent the incremental probability that an individual will develop cancer over a lifetime as a result of exposure to the COPCs (EPA 1989). These ELCRs are calculated as shown in Equation 3.

$$\text{Upper-Bound ELCR (Risk)} = \text{LADD} \times \text{SF} \qquad (3)$$

where

LADD = Lifetime average daily dose (mg/kg-day)

SF = Slope factor $(\text{mg/kg-day})^{-1}$

Risk is expressed as a probability. For example, a risk of $1 \times 10^{-6}$ indicates one additional case of cancer in an exposed population of 1 million. The SF in almost all cases represents a UCL 95 of the probability of a carcinogenic response based on experimental data used in a multistage model. The resulting risk estimate therefore represents an upper-bound estimate of the carcinogenic risk. The actual risk probably does not exceed the estimate and is likely to be less.

In the revised "National Oil and Hazardous Substances Pollution Contingency Plan" (NCP) (EPA 1990), EPA has established an "acceptable" range for carcinogenic risk associated with exposure at Superfund sites of $1 \times 10^{-6}$ to $1 \times 10^{-4}$ (one case of cancer in an exposed population of 10,000). In general, a potential upper-bound risk of $1 \times 10^{-6}$ is used by EPA as a point of departure for determining remediation goals. Although Duck and Otter Creeks are not Superfund sites, EPA's range is relevant and appropriate for use in evaluating risk levels. In addition, the State of Ohio has adopted a statewide goal of 1E-05 for total additive carcinogenic risk.

Within a given exposure pathway, receptors may be exposed to more than one chemical. The total upper-bound risk associated with exposure to multiple chemicals through a single pathway is estimated as shown in Equation 4.

$$\text{Risk}_{(EP)} = \text{Risk}_1 + \text{Risk}_2 + \ldots + \text{Risk}_i \qquad (4)$$

where

$\text{Risk}_{(EP)}$ = Total risk for a given exposure pathway

$\text{Risk}_i$ = Risk estimate for the ith COPC

At particular exposure points, receptors may be exposed through a number of exposure pathways (see Figure 4). At each exposure point, the total exposure for a receptor equals the sum of the exposures through the various exposure pathways to which the receptor is exposed. Under each exposure scenario, exposure pathway combinations were developed for each receptor. The total risk posed to a receptor through a combination of pathways is calculated as shown in Equation 5.

$$\text{Total Risk} = \text{Risk}\ (EP_1) + \text{Risk}\ (EP_2) + \ldots + \text{Risk}\ (EP_j) \qquad (5)$$

where

| | | |
|---|---|---|
| Total Risk | = | Risk resulting from multiple exposure pathways |
| Risk ($EP_j$) | = | Risk resulting from the jth exposure pathway |

The approach described above is consistent with the widely held belief that the total carcinogenic risk associated with exposure to multiple carcinogenic COPCs can be estimated as the sum of the carcinogenic risks posed by individual COPCs (EPA 1986).

## 5.2 HAZARD CHARACTERIZATION METHODOLOGY

The potential for receptors to develop noncancerous health effects is characterized by comparing an intake for a specific exposure period (the ADD) to an RfD developed for a similar exposure period. When performed for a single chemical, this comparison yields a ratio known as the hazard quotient (HQ), which is calculated as shown in Equation 6.

$$HQ = ADD/RfD \qquad (6)$$

where

| | | |
|---|---|---|
| ADD | = | Average daily dose (mg/kg-day) |
| RfD | = | Reference dose (mg/kg-day) |

Generally, an HQ of less than or equal to 1 is considered to be health-protective. For example, the State of Ohio has adopted a statewide goal of 1 for total additive non-carcinogenic risk (hazard). An HQ exceeding 1 indicates a potential for adverse noncarcinogenic health effects (EPA 1989). For the purposes of the HHRA, chronic RfDs were used to characterize noncarcinogenic hazards for all receptor-exposure pathway combinations.

As with carcinogenic COPCs within a given exposure pathway, a receptor may be exposed to multiple substances associated with noncarcinogenic health effects.  To estimate the total noncarcinogenic hazards for each exposure pathway, the procedures outlined in "Guidelines for the Health Risk Assessment of Chemical Mixtures" and RAGS (EPA 1986, 1989) were used in the HHRA.  The total noncarcinogenic hazard attributable to exposure to multiple COPCs through a single pathway is calculated as shown in Equation 7.

$$HI_{(EP)} = HQ_1 + HQ_2 + \ldots + HQ_i \qquad (7)$$

where

$HI_{(EP)}$ = Total hazard index (HI) for a given exposure pathway

$HQ_i$ = Hazard quotient for the ith COPC

This summation methodology is based on the assumption that the effects of the various COPCs to which a receptor is exposed are additive.

The total noncarcinogenic hazard posed to a receptor through a combination of exposure pathways is calculated as shown in Equation 8.

$$\text{Total HI} = HI\,(EP_1) + HI\,(EP_2) + \ldots + HI\,(EP_j) \qquad (8)$$

where

$HI\,(EP_j)$ = Hazard index resulting from the jth exposure pathway

In accordance with EPA guidance, all total HIs exceeding 1 are further evaluated (EPA 1989).  The total HI for an exposure pathway can exceed 1 as a result of the presence of either (1) a single COPC with an HQ exceeding 1 or (2) several COPCs whose HQ sum exceeds 1, but whose individual HQs do not exceed 1.  In the second case, a detailed analysis is required to determine whether the potential for noncarcinogenic health effects is accurately represented by the total HI because the toxicological effects associated with exposure to multiple COPCs may not be additive; therefore, the total HI may overestimate the potential for noncarcinogenic health effects.  To address this possibility, the primary contributors to the total HI are grouped according to target organ or effect, and the total segregated HI for each group is derived.  This process is referred to as segregation of the HI.

Target organs and systems may be identified from a variety of sources. Typically, target organs and systems affected by each COPC are identified based on (1) effects (termed “critical effects” by EPA) that occur at levels of exposure corresponding to lowest observed adverse effect levels (LOAEL), or (2) effects at exposure levels slightly exceeding LOAELs, as appropriate (EPA 2005b). However, as noted in Section 5.5, receptor-specific hazards are driven by single COPCs or multiple COPCs of the same chemical class (for example, PAHs). Therefore, it was unnecessary to segregate the receptor-specific hazard results.

## 5.3 QUALITATIVE RISK CHARACTERIZATION – SEDIMENT

As discussed above, a quantitative risk characterization was not performed for sediment in exposure areas OC-1, OC-2, and DC-1. Instead, the risk characterization consists of a comparison of measured concentrations to generic screening levels and to contaminant concentrations measured in other stream segments. Specifically, Sections 5.3.1 and 5.3.2 present comparisons of the maximum detected COPC concentrations in each of these segments to EPA Region 9 residential soil PRGs and to maximum detected concentrations and EPCs as measured and calculated for other exposure areas (EPA 2004c).

### 5.3.1 Comparison to EPA Region 9 Residential Soil PRGs

The maximum detected COPC concentrations in exposure areas OC-1, OC-2, and DC-1 were compared to EPA Region 9 residential soil PRGs. Table 15 presents these comparisons and Section 5.5.2 discusses the results of the comparisons.

### 5.3.2 Comparison to Exposure Area Concentrations

The maximum detected COPC concentrations in exposure areas OC-1, OC-2, and DC-1 were compared to maximum detected concentrations and EPCs as measured and calculated for other exposure areas (see Tables 5 and 6). Section 5.5.2 discusses the results of the comparisons.

## 5.4 QUALITATIVE RISK CHARACTERIZATION – FISH TISSUE

As discussed in Section 3.2.2, Hecklinger Pond is currently posted with signs warning that the pond is unsafe for fishing and that “fish caught in the area may be contaminated and unsafe to eat” (see Photograph No. 17 in Appendix A). Regardless of the presence of the warning signs, it is assumed that some fishing in Hecklinger Pond occurs or could occur in the future. However, given the history of contaminant concerns in Hecklinger Pond and the variety of alternate fishing sites in the general area, it is likely that most fishing is of a recreational nature, all or the majority of fish are caught and released, and that no subsistence fishing occurs in the pond.

Potential risks and hazards associated with consumption of fish caught in Hecklinger Pond were evaluated using a qualitative comparison of the concentrations of chemicals (primarily PCBs) measured in the tissue of fish caught from the pond to levels recommended by the Food and Drug Administration and the Great Lakes Fish Task Force to be safe for consumption, and to risk-based concentrations (RBC) developed by EPA Region 3 (EPA 2005c).

## 5.5 RESULTS

This section presents the risk characterization results based on the methodologies discussed in Sections 5.1 through 5.4. Specifically, Section 5.5.1 presents the quantitative risk characterization results associated with potential surface water (all exposure areas) and sediment (exposure areas OC-3, OC-4, OC-5, DC-2 through DC-5) exposures. Section 5.5.2 presents the qualitative sediment risk characterization results for exposure areas OC-1, OC-2, and DC-1. Section 5.5.3 presents the qualitative fish tissue risk characterization results for Hecklinger Pond (DC-1). Finally, Section 5.5.4 summarizes the results with particular focus on comparing the quantitative results across the creek-specific exposure areas.

### 5.5.1 Quantitative Risk Characterization Results

This section presents the quantitative risk characterization results associated with potential surface water (all exposure areas) and sediment (exposure areas OC-3, OC-4, OC-5, DC-2 through DC-5) exposures. Surface water results are discussed first in Section 5.5.1.1 followed by sediment results in Section 5.5.1.2.

#### 5.5.1.1 Surface Water Results

As discussed in Section 3.3.1, risks and hazards associated with potential exposure to COPCs in surface water were evaluated using the maximum detected concentration of each COPC. This approach was selected because it was judged that an insufficient amount of analytical results were available to calculate exposure area-specific exposures, risks and hazards. For the purpose of the screening HHRA, the maximum detected concentrations were combined with the exposure factors for exposure area OC-3. This exposure area was judged to be a good representative segment. The northern-most segments of both creeks are somewhat deeper than at OC-3. However, because these northern-most segments (OC-5 and DC-5) are more isolated and in a more heavily industrial area, it was assumed that these segments would be frequented somewhat less often than the more upstream segments of both creeks. The depth and exposure frequency aspects should largely cancel each other out, supporting the selection of OC-3 as a representative surface water exposure area.

As shown in Table 16, risks for adult, youth, and child receptors based on ingestion and dermal exposure pathways are less than 1E-06. Total risk (the sum of adult and child risks) is less than 1E-06 also. These results indicate that there are no significant receptor-specific risks associated with potential exposure to COPCs in surface water throughout both creeks based on available analytical data.

As shown in Table 16, the HQs for adult, youth, and child receptors based on ingestion and dermal contact exposure pathways are all less than 1E-02 and 1E-01, respectively. These levels are well below the OEPA's hazard goal of 1. Therefore, these results indicate that there are no significant receptor-specific hazards associated with potential exposure to COPCs in surface water throughout both creeks based on available analytical data. As discussed in Section 6.0, all risk characterization results are associated with uncertainty from a variety of sources, including the relatively limited amount of surface water analytical data.

#### 5.5.1.2 Sediment Results

Quantitative risk characterization results are available for eight exposure areas: OC-3, OC-4, OC-5, DC-2, DC-3, DC-4, and DC-5. Results are discussed on an exposure area-specific basis (see Tables 16 through 22). For each set of results, risks are discussed first, followed by hazards. Exposure pathway-specific results are presented for each receptor group (adult, youth, and child). Total risks (the sum of adult- and child-specific results) are also presented. COPCs that contribute significantly ("risk drivers") are identified for all risk results greater than 1E-06 and all hazard results greater than 1. Table 23 presents a summary of the exposure area-specific results.

**Exposure Area OC-3**

Receptor-specific, exposure pathway-specific, and total risks and hazards for exposure area OC-3 are presented in Table 16.

For adults, risks associated with ingestion and dermal contact exposures were calculated as 1E-06 and 3E-06, respectively. Both of these results, as well as the total adult risk of 4E-06, are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene, which contributes about 60 percent of the totals.

For youth receptors, risks associated with ingestion and dermal contact exposures were calculated as 1E-06 and 3E-06, respectively. Both of these results, as well as the total youth risk of 4E-06, are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene, which contributes about 60 percent of the totals.

For child receptors, risks associated with ingestion and dermal contact exposures were calculated as 2E-06 and 2E-06, respectively. Both of these results, as well as the total child risk of 4E-06, are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene, which contributes about 60 percent of the totals.

Total risks (the sum of adult and child risks) associated with ingestion and dermal contact exposures were calculated as 3E-06 and 5E-06, respectively for an overall total risk of 8E-06. All of these results are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene, which contributes about 60 percent of the totals.

For adult, youth, and child receptors all hazards (ingestion, dermal contact, and total) are less than 1E-02.

**Exposure Area OC-4**

Receptor-specific, exposure pathway-specific, and total risks and hazards for exposure area OC-4 are presented in Table 17.

For adults, risks associated with ingestion and dermal contact exposures were calculated as 1E-06 and 3E-06, respectively. Both of these results, as well as the total adult risk of 4E-06, are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene, which contributes about 67 percent of the totals.

For youth receptors, risks associated with ingestion and dermal contact exposures were calculated as 1E-06 and 2E-06, respectively. Both of these results, as well as the total youth risk of 3E-06, are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene, which contributes about 67 percent of the totals.

For child receptors, risks associated with ingestion and dermal contact exposures were calculated as 2E-06 and 2E-06, respectively. Both of these results, as well as the total child risk of 3E-06, are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene, which contributes about 68 percent of the totals.

Total risks (the sum of adult and child risks) associated with ingestion and dermal contact exposures were calculated as 3E-06 and 5E-06, respectively for an overall total risk of 7E-06. All of these results are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene, which contributes about 67 percent of the totals.

For adult, youth, and child receptors all hazards (ingestion, dermal contact, and total) are less than 1E-01.

As discussed in Section 4.2, exposure area OC-4 is the only exposure area where the calculated lead EPC (887 mg/kg) exceeds the OEPA generic, risk-based soil cleanup number of 245 mg/kg for residential direct contact exposures to lead in soil (OEPA 2005a). The significant majority of lead values measured in sediment samples collected from both creeks, including in exposure area OC-4 are less than or slightly exceeding the 245 mg/kg value. As a result, EPCs for all other exposure areas were calculated to be less than this value. However, one sediment sample from exposure area OC-4, JME-019, that was collected in Otter Creek between the rail yard and Consaul Street (see Figure 5) had a lead concentration of 4,850 mg/kg (average of investigative and duplicate samples). This concentration is significantly higher than any other lead concentration found in either creek.

Two reasons suggest that the risk to human receptors associated with potential exposure to lead in sediment from OC-4 is not as high as it would appear based on a comparison of the exposure area-specific EPC and the OEPA generic screening level. First, the expected receptor-specific exposure for human receptors in Otter Creek is less than was assumed in calculating the generic residential screening value.

Therefore, a site-specific lead screening level would be greater than 245 mg/kg. Second, any risk from potential exposure to lead in OC-4 appears to be limited to the area near sample JME-019. This issue should be further evaluated in Phase 2 of the project.

**Exposure Area OC-5**

Receptor-specific, exposure pathway-specific, and total risks and hazards for exposure area OC-5 are presented in Table 18.

For adults, risks associated with ingestion and dermal contact exposures were calculated as 1E-06 and 3E-06, respectively. Both of these results, as well as the total adult risk of 4E-06, are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene and dibenzo(a,h)anthracene, which contribute about 36 and 42 percent of the totals, respectively, of the totals.

For youth receptors, risks associated with ingestion and dermal contact exposures were calculated as 1E-06 and 2E-06, respectively. Both of these results, as well as the total youth risk of 3E-06, are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene and dibenzo(a,h)anthracene, which contribute about 36 and 42 percent of the totals, respectively, of the totals.

For child receptors, risks associated with ingestion and dermal contact exposures were calculated as 2E-06 and 2E-06, respectively. Both of these results, as well as the total child risk of 3E-06, are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene and dibenzo(a,h)anthracene, which contribute about 36 and 42 percent of the totals, respectively.

Total risks (the sum of adult and child risks) associated with ingestion and dermal contact exposures were calculated as 3E-06 and 5E-06, respectively for an overall total risk of 8E-06. All of these results are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene and dibenzo(a,h)anthracene, which contribute about 36 and 42 percent of the totals, respectively.

For adult, youth, and child receptors all hazards (ingestion, dermal contact, and total) are less than 1E-02.

**Exposure Area DC-2**

Receptor-specific, exposure pathway-specific, and total risks and hazards for exposure area DC-2 are presented in Table 19.

For adults, risks associated with ingestion and dermal contact exposures were calculated as 2E-06 and 6E-06, respectively.  Both of these results, as well as the total adult risk of 8E-06, are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene which contributes about 73 percent of the totals.

For youth receptors, risks associated with ingestion and dermal contact exposures were calculated as 2E-06 and 5E-06, respectively.  Both of these results, as well as the total youth risk of 7E-06, are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene which contributes about 73 percent of the totals.

For child receptors, risks associated with ingestion and dermal contact exposures were calculated as 3E-06 and 4E-06, respectively.  Both of these results, as well as the total child risk of 7E-06, are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene which contributes about 73 percent of the totals.

Total risks (the sum of adult and child risks) associated with ingestion and dermal contact exposures were calculated as 5E-06 and 9E-06, respectively for an overall total risk of 1E-05.  All of these results are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene, which contributes about 73 percent of the totals.

For adult, youth, and child receptors all hazards (ingestion, dermal contact, and total) are less than 1E-03.

**Exposure Area DC-3**

Receptor-specific, exposure pathway-specific, and total risks and hazards for exposure area DC-3 are presented in Table 20.

For adults, risks associated with ingestion and dermal contact exposures were calculated as 3E-06 and 9E-06, respectively.  Both of these results, as well as the total adult risk of 1E-05, are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene which contributes about 74 percent of the totals.

For youth receptors, risks associated with ingestion and dermal contact exposures were calculated as 3E-06 and 7E-06, respectively. Both of these results, as well as the total youth risk of 1E-05, are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene which contributes about 74 percent of the totals.

For child receptors, risks associated with ingestion and dermal contact exposures were calculated as 5E-06 and 5E-06, respectively. Both of these results, as well as the total child risk of 1E-05, are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene which contributes about 74 percent of the totals.

Total risks (the sum of adult and child risks) associated with ingestion and dermal contact exposures were calculated as 8E-06 and 1E-05, respectively for an overall total risk of 2E-05. All of these results are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene, which contributes about 74 percent of the totals.

For adult, youth, and child receptors all hazards (ingestion, dermal contact, and total) are less than 1E-03.

**Exposure Area DC-4**

Receptor-specific, exposure pathway-specific, and total risks and hazards for exposure area DC-4 are presented in Table 21.

For adults, risks associated with ingestion and dermal contact exposures were calculated as 5E-06 and 1E-05, respectively. Both of these results, as well as the total adult risk of 2E-05, are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene which contributes about 64 percent of the totals, respectively.

For youth receptors, risks associated with ingestion and dermal contact exposures were calculated as 5E-06 and 1E-05, respectively. Both of these results, as well as the total youth risk of 2E-05, are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene which contributes about 64 percent of the totals.

For child receptors, risks associated with ingestion and dermal contact exposures were calculated as 8E-06 and 9E-06, respectively. Both of these results, as well as the total child risk of 2E-05, are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene which contributes about 64 percent of the totals.

Total risks (the sum of adult and child risks) associated with ingestion and dermal contact exposures were calculated as 1E-05 and 2E-05, respectively for an overall total risk of 4E-05. All of these results are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene, which contributes about 64 percent of the totals.

For adult, youth, and child receptors all hazards (ingestion, dermal contact, and total) are less than 1E-02.

**Exposure Area DC-5**

Receptor-specific, exposure pathway-specific, and total risks and hazards for exposure area DC-5 are presented in Table 22.

For adults, risks associated with ingestion and dermal contact exposures were calculated as 2E-07 and 7E-07, respectively. Both of these results, as well as the total adult risk of 9E-07, are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene which contributes about 79 percent of the totals.

For youth receptors, risks associated with ingestion and dermal contact exposures were calculated as 3E-07 and 6E-07, respectively. Both of these results, as well as the total youth risk of 8E-07, are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene which contributes about 79 percent of the totals.

For child receptors, risks associated with ingestion and dermal contact exposures were calculated as 4E-07 and 4E-07, respectively. Both of these results, as well as the total child risk of 8E-07, are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene which contributes about 79 percent of the totals.

Total risks (the sum of adult and child risks) associated with ingestion and dermal contact exposures were calculated as 6E-07 and 1E-06, respectively for an overall total risk of 2E-06. All of these results are driven almost entirely by potential exposure to PAHs – particularly benzo(a)pyrene, which contributes about 79 percent of the totals.

For adult, youth, and child receptors all hazards (ingestion, dermal contact, and total) are less than 1E-02.

### 5.5.2 Qualitative Sediment Results

Table 15 presents a comparison of the maximum detected concentration of sediment COPCs detected in each of these three segments to their respective EPA Region 9 residential soil PRG. Only seven COPCs – six PAHs (benzo[a]anthracene, benzo[a]pyrene, benzo[b]flouranthene, benzo[k]fluoranthene, dibenzo[a,h]anthracene, and indeno[1,2,3-cd]pyrene) and one metal – iron were found to exceed their respective EPA Region 9 residential soil PRGs. Not all of the COPCs exceeded their PRGs in all three segments. These results are similar to the quantitative risk characterization results calculated for the other seven sediment segments (OC-3, OC-4, OC-5, DC-2, DC-3, DC-4, and DC-5) as shown in Tables 16 through 22. Carcinogenic PAHs and in particular benzo(a)pyrene were found to drive the carcinogenic risks associated with potential exposure to COPCs in sediment.

The maximum detected concentrations of COPCs in sediment for exposure areas OC-1, OC-2, and DC-1 in Table 15 were compared to the maximum detected concentrations and EPCs calculated for the remaining sediment exposure areas as presented in Tables 5 and 6. The results of these comparisons indicate that the maximum detected concentrations and ranges of detected concentrations in OC-1, OC-2, and DC-1 are similar to the maximum detected concentrations and ranges of detected concentrations in exposure areas OC-3, OC-4, OC-5, DC-2, and DC-5 and somewhat less than the maximum detected concentrations and ranges of detected concentrations in exposure areas DC-3 and D-4. In all cases, the maximum detected concentrations measured in exposure areas OC-1, OC-2, and DC-1 exceed the EPCs calculated for the remaining exposure areas.

These results indicate that the risks and hazards associated with potential exposure to COPCs in sediment from exposure areas OC-1, OC-2, and DC-1 are likely to be similar to the risks and hazards calculated for exposure areas OC-3, OC-4, OC-5, DC-2, and DC-5 and somewhat less than the risks and hazards calculated for exposure areas DC-3 and DC-4. Interpretation of the potential risks and hazards for exposure areas OC-1, OC-2, and DC-1 is limited by the small number of available analytical results for these segments.

### 5.5.3 Qualitative Fish Tissue Results

A health advisory was issued for Hecklinger Pond in 1989 based on the analysis of a single composite sample of filleted fish tissue. The composite sample was comprised of tissue from carp, sunfish, bass, crappie, and minnows; however, the sample consisted of about 85 percent crappie tissue by weight. PCBs (in particular Aroclor 1254) was detected in the sample at a concentration of 44.4 parts per million (ppm). This concentration exceeds the FDA recommended limit of 2 ppm in fish tissue "to be considered safe for human consumption and the maximum level established by the Great Lakes Fish Advisory Task Force of 0.05 ppm for "no restriction in fish consumption" (City of Toledo 1989c; Kassa and Bisesi 2000; FDA 1995).

Additional fish tissue samples were collected from Hecklinger Pond in 1991. Samples of carp, rock bass, crappie, and blue gill were collected. Fillet composite samples were prepared for carp, rock bass, and crappie samples and whole body composite samples were prepared for carp and blue gill samples. The results were analyzed for pesticides, PCBs, and selected semivolatile organic compounds (SVOC), as well as polychlorinated dibenzo-p-dioxin (PCDD) and polychlorinated dibenzofuran (PCDF) (Wright State University [WSU] 1991).

Low levels of PCBs, PCDDs, PCDFs, and several pesticides were detected in the samples. With regard to PCBs, because only a single (or in one case two) congener group was detected, it was not possible to "correlate these PCB with a specific Aroclor formulation" (WSU 1991). In August 1991, the results of these samples were sent to OEPA for review. OEPA concluded, "all chemical residues were within safe limits, except the pesticide endosulfan II." However, the City of Toledo noted "this chemical may be within safe limits because there is only a proposed action level and no standard has been adopted" (City of Toledo 1995).

In March 1991, 10 walleye fish were collected from the Low Service Pumping Station. Five of the fish were filleted and five were kept whole. All samples were analyzed for heavy metals, pesticides, and PCBs. Most compounds were not detected. Detected compounds (including copper, lead, mercury, zinc, Aroclor 1242, and Aroclor 1260) were compared to FDA action levels (FDA 1990). No action levels were available for copper, lead, and zinc. All detected mercury levels were below the FDA level of

1.0 ppm.  All detected individual Aroclor concentrations were below the FDA level of 2 ppm.  However, the total Aroclor concentration (the sum of Aroclor 1254 and Aroclor 1260 concentrations) of 2.46 ppm as measured in the whole body composite sample slightly exceeds the FDA level of 2 ppm (FDA 1995). The FDA level is for edible portions of the fish and excludes the head, scale, uneatable bones, and viscera.  The total Aroclor concentration measured in the fillet composite sample (which represents the edible portion of the fish) of 0.43 ppm is less than the FDA limit (City of Toledo 1991), but exceeds the maximum level established by the Great Lakes Fish Advisory Task Force of 0.05 ppm for "no restriction in fish consumption" (Kassa and Bisesi 2000).

In an effort to provide some resolution regarding the question of how much Aroclor is present in fish from Hecklinger Pond and to evaluate whether consumption of fish from the pond would pose a health risk, Kassa and Bisesi (2000) conducted a study of tissue samples of 85 fish collected from Hecklinger Pond. The fish were collected on several occasions in 1998 and 1999.  Species included carp, white perch, blue gill, and white crappie.  All samples were filleted and were analyzed as composite or individual samples. The concentration of Aroclor 1254 measured in these samples ranged from 0.2 ppm in white crappie to 1.0 ppm in carp.

These levels are less than the FDA recommended level of 2 ppm, but exceed the 0.05 ppm level recommended by the Great Lakes Fish Advisory Task Force (Kassa and Bisesi 2000).  The authors noted that "assuming such fish are not consumed raw, and in view of reported substantial reduction in concentration of PCBs during cooking, it can be assumed that the low levels of PCBs would be reduced to even safer levels."  The authors also noted "none of the published epidemiological data located link PCBs, at levels reported in this study or considered to represent background levels in the environment, to serious adverse health effects in humans."  Therefore, the authors concluded that the "no fish consumption" health advisory should be revised.  The authors did not propose a specific revision, but recommended that any revision should consider the "identities and levels of all other toxic chemical contaminants potentially present in fish tissues, prior to lifting the "no fish consumption" restrictions" (Kassa and Bisesi 2000).

In summary, only a single composite fillet sample collected in 1989 (44.4 ppm Aroclor 1254) and a whole body composite sample collected in 1991 (2.46 ppm – sum of Aroclor 1254 and Aroclor 1260) had PCB results exceeding the FDA recommended level of 2 ppm.  No other individual or composite fillet samples had PCB concentrations approaching the FDA recommended level.  However, a number of fillet samples are associated with PCB concentrations exceeding the Great Lakes Fish Advisory Task Force level of

0.05 ppm associated with "no restriction in fish consumption." Also, these fillet concentrations also exceed the RBC of 1.6E-03 mg/kg developed by EPA Region 3 (EPA 2005c). Assuming (1) individuals are unlikely to consume whole fish except in exceptional circumstances, (2) cooking of fish tissue will reduce the concentration of PCBs in the fillets, and (3) individuals are unlikely to consume fish from Hecklinger Pond as a substantial portion of their diet (given the number and proximity of other fishing spots in the area), and considering that "none of the published epidemiological data located link PCBs, at levels [measured in fillet samples from fish collected in Hecklinger Pond since 1989] or considered to represent background levels in the environment, to serious adverse health effects in humans" infrequent consumption of fillets from fish caught in Hecklinger Pond is not expected to be associated with significant risks or hazards to human receptors. However, individuals who consume fish from Hecklinger Pond on a more regular basis may experience risks greater than 1E-06.

### 5.5.4 Summary

Significant risk characterization results as reported in Sections 5.5.1 through 5.5.3 are summarized below.

- Individual COPC-specific and total risks and hazards associated with potential exposure to COPCs in surface water are less than the low end of EPA's target risk range (1E-06) and EPA's target hazard level and OEPA's statewide goal for "additive non-carcinogenic risk (hazard) of 1, respectively.

- Individual COPC-specific and total hazards associated with potential exposure to COPC in sediment in exposure areas OC-3, OC-4, OC-5, DC-2, DC-3, DC-4, and DC-5 are less than the EPA's target hazard level and OEPA's statewide goal for "additive non-carcinogenic risk (hazard) of 1.

- Receptor-specific (adult, youth, and child) and overall total risks (adult plus child results) associated with potential exposure to COPCs in sediment in exposure areas OC-3, OC-4, OC-5, DC-2, DC-3, DC-4, and DC-5 exceed the low end of EPA's risk range (1E-06) for all receptors in all exposure areas except for adult, youth, and child risks in exposure areas DC-5 (receptor-specific risks in this exposure area are 8E-07 or 9E-07).

- Receptor-specific total risks associated with potential exposure to COPCs in sediment equal or exceed OEPA's statewide goal of 1E-05 for total additive risk in exposure areas DC-3 and DC-4. Adult, youth, and child receptors all have total risks of 1E-05 and 2E-05 in exposure areas DC-3 and DC-4, respectively. These risks are driven by potential risks to PAHs, in particular benzo(a)pyrene which contributes 74 and 64 percent of the total risks in exposure areas DC-3 and DC-4, respectively.

- Overall total risks (adult plus child results) associated with potential exposure to COPCs in sediment equal or exceed OEPA's statewide goal of 1E-05 for total additive risk in exposure areas DC-2 (1E-05), DC-3 (2E-05), and DC-4 (4E-05). These risks are driven by potential risks to PAHs, in particular benzo(a)pyrene which contributes 73, 74, and 64 percent of the total risks in exposure areas DC-2, DC-3, and DC-4, respectively.

- Based on a qualitative evaluation, risks associated with potential exposure to lead in sediment appear to be insignificant in all exposure areas, with the exception of OC-4. The EPC calculated for lead in sediment for OC-4, 887 mg/kg, exceeds the OEPA risk-based level of 245 mg/kg which is based on potential residential exposure to lead in soil. Any risk appears to be located near a single sample location (JME-019) between Consaul Street and the rail yard to the north. This issue should be further evaluated as in Phase 2 of the project.

- Based on a qualitative evaluation, risks and hazards associated with potential exposure to sediment in exposure areas OC-1, OC-2, and DC-1 are expected to be similar to risks and hazards in exposure areas OC-3, OC-4, OC-5, DC-2, and DC-5 and somewhat less than the risks and hazards calculated for exposure areas DC-3 and DC-4. These risks and hazards are driven by potential exposure to PAHs, particularly benzo(a)pyrene.

- Based on a qualitative evaluation, infrequent consumption of fillets from fish caught in Hecklinger Pond is not expected to be associated with significant risks or hazards to human receptors. However, individuals who consume fish from Hecklinger Pond on a more regular basis may experience risks greater than 1E-06.

It should be noted that the numerical risk and hazard results presented above and interpretation of these results are associated with significant uncertainties as discussed in Section 6.0.

# 6.0 UNCERTAINTIES

Uncertainties are introduced into the screening HHRA as part of each of the four basic components: (1) data evaluation and identification of COPCs, (2) exposure assessment, (3) toxicity assessment, and (4) risk characterization. Potentially significant sources of uncertainty associated with each of these components are discussed below in Sections 6.1 through 6.4. To the extent possible, the discussion addresses the likely magnitude and direction of the uncertainty introduced by each source.

## 6.1 DATA EVALUATION AND IDENTIFICATION OF COPCs

As discussed in detail in “Secondary Data Quality Assurance Project Plan for Human Health and Ecological Risk Assessments, Duck and Otter Creeks, Toledo and Oregon, Ohio,” analytical data used in the screening HHRA were collected from a wide variety of sources (Tetra Tech 2005b). Medium-specific samples were collected by different organizations, for different purposes, and using different techniques, and were analyzed by a variety of laboratories using a variety of analytical methods.

Care was taken to use only data that met all or most of the criteria recommended by EPA for identifying data for use in risk assessments (EPA 1992). Nonetheless, uncertainties are introduced particularly by the use of analytical methods with different detection limits and the location and depth from which samples were collected. For example, samples analyzed using techniques with higher detection limits may report particular chemicals as nondetect. If these samples had been analyzed using techniques with lower detection limits, these same chemicals may have been detected. Uncertainty associated with data evaluation is expected to range from low to moderate and could contribute to both over- and underestimating receptor-specific exposures.

With regard to the identification of COPCs, it is unlikely that many medium-specific COPCs were missed. The laboratory methods used to analyze the medium-specific samples covered a wide range of analytes. It is unlikely that chemicals for which toxicity factors are available (or for which surrogates could reasonably be identified) were not analyzed for in at least some medium-specific samples. Also, the process used to identify COPCs was deliberately conservative and included comparison of maximum detected concentrations to medium-specific screening levels adjusted to reflect risks of 1E-06 and hazards of 0.1. Chemicals that were detected based on this comparison were included as COPCs for all exposure areas regardless of the fact that a chemical did not exceed its medium-specific screening level in one or more exposure areas. Finally, the cumulative impact of chemicals whose maximum detected concentrations did not exceed screening levels was also considered. This step added back in several chemicals as COPCs that would have been eliminated if only the maximum concentration step was included. Therefore, the uncertainty introduced regarding the identification of COPCs is considered small.

As discussed in Section 2.2.4, six additional chemicals were identified as PBTs based on information referenced by OEPA in comments on the draft screening HHRA (OEPA 2005c). However, these additional chemicals were detected at maximum concentrations less than chemical-specific screening levels. As a result, the six additional chemicals were not included as COPCs for the purpose of the screening HHRA. As discussed earlier in this section, because the maximum detected concentrations for these chemicals were less than their respective screening levels, not including these chemicals as COPCs is expected to have minimal impact on the screening HHRA results.

## 6.2 EXPOSURE ASSESSMENT

Uncertainties associated with the exposure assessment component of the HHRA process can be grouped into two primary categories: (1) identification of complete or potentially complete exposure pathways and (2) estimation of receptor- and exposure pathway-specific exposures. Uncertainties associated with these two categories are discussed in Sections 6.2.1 and 6.2.2, respectively.

### 6.2.1 Identification of Complete or Potentially Complete Exposure Pathways

Complete or potentially complete exposure pathways were identified based on actual or probable activity patterns as determined by physical setting, field observations, demographics, and discussions with knowledgeable individuals. Selection of complete or potentially complete exposure pathways was documented in the CSM (see Figure 4). It is not possible for all complete or potentially complete exposure pathways to be included in a risk assessment; however, the exposure pathways selected for inclusion in the screening HHRA are judged to conservatively represent exposure pathways (including other receptors) not considered in the screening HHRA. The uncertainty introduced into the screening HHRA associated with the identification of complete or potentially complete exposure pathways is expected to be small.

### 6.2.2 Estimation of Receptor- and Exposure Pathway-specific Exposures

Receptor- and exposure pathway-specific exposures were calculated using standard algorithms as recommended by EPA and OEPA. Parameter values used in these algorithms were selected so as to RME conditions. RME conditions are designed to represent the maximum exposures that can reasonably be assumed to occur at a site. Therefore, it is unlikely that receptor-specific exposures were underestimated. This is especially true in those segments of both creeks that pass through more heavily industrial and isolated areas. (Note: the screening HHRA used a single set of exposure frequency values to potential exposure in all stream segments). These segments include DC-4, DC-5, OC-4, and OC-5. Also, access to the downstream-most segments (DC-5 and OC-5) is expected to be restricted due to security concerns. Therefore, exposure potential in these four exposure areas is likely to be overstated. Therefore, the level of uncertainty introduced by the selection of exposure algorithms and parameter values is expected to be low, with one exception.

Medium-specific EPCs are included in all the exposure algorithms.  As discussed in Section 6.1, low to moderate uncertainty is associated with the variety of organizations collecting the analytical data, the different purposes for which the data were collected, and the laboratory techniques used to analyze the samples used in the screening HHRA.  This uncertainty is compounded by the fact that some samples were collected at locations that human receptors are unlikely or less likely to contact.  Examples include samples collected in the middle of the stream, rather than at or near the edge of the stream, or from depths greater than 6 inches below the sediment surface.  Analytical results associated with these samples may not be representative of human exposures in the streams.

Even more important is the relatively small numbers of samples collected in each exposure area.  The small number of samples often resulted in the selection of the maximum detected concentration as the EPC for some COPCs.  The maximum detected concentration may not be representative of the concentration to which receptors are routinely exposed.  Even if the maximum detected concentration wasn't selected as the EPC, an EPC calculated based on a small number of samples that doesn't spatially represent an exposure area is unlikely to be fully representative of the concentration to which human receptors may be exposed.  The uncertainty introduced to the HHRA process associated with calculation of exposure area-specific EPCs is considered to be moderate.

## 6.3 TOXICITY ASSESSMENT

Uncertainties associated with the toxicity assessment are inherent in the methodology used to quantify various toxicological effects and the difficulties encountered in identifying toxicological effects of COPCs.  In some instances, these uncertainties may result in overestimation of risk, and in others, risk may be underestimated.  Sources of uncertainty include (1) extrapolation of animal data to humans, (2) limited availability of chemical-specific data, (3) modeling of SFs, and (4) estimation of toxicity values for dermal exposure.  Each of these sources of uncertainty are summarized below in Sections 6.3.1 through 6.3.4.

### 6.3.1 Extrapolation of Animal Data to Humans

In the development of toxicity values, several assumptions are typically made that may result in overestimation of the actual hazard or risk to human health from exposure to a COPC. One assumption involves use of animal study data to extrapolate high doses administered to laboratory animals to much lower doses expected to be experienced by humans. The dose-response relationship may not be the same at these lower doses, and their extrapolation may therefore result in overestimation of risk. EPA's updated cancer risk guidelines presents recommendations for revisions to the procedures for determining the carcinogenic effects of chemicals (EPA 2005a). More specifically, EPA plans to evaluate a broader range of health effects than is addressed by the current procedures, which are based on observations of tumors in animals exposed to large doses of chemicals in laboratory experiments. The additional health effects to be evaluated include the effects on human cells and genetic material.

### 6.3.2 Limited Availability of Chemical-Specific Data

Overestimation of risks and hazards may result from use of safety factors to derive RfDs when data from animal studies is used to predict adverse health effects in humans. The limited availability of toxicity information on some chemicals affects the use of uncertainty and modifying factors in development of the RfDs. In some cases, only limited data is available; in others, a greater volume of data is available but is to some degree contradictory.

### 6.3.3 Modeling of SFs

To develop an SF, an upper confidence limit on the dose-response relationship is calculated and used as the final toxicity value. Use of this mathematical model results in a conservative estimate of the potential carcinogenic response and may result in overestimation of the true health effects associated with exposure to a given chemical.

### 6.3.4 Estimation of Toxicity Values for Dermal Exposure

Oral toxicity values were used to characterize risks and hazards associated with potential exposure to COPCs through dermal exposure pathways without any adjustments. This was done because the majority of COPCs have G.I. absorption efficiencies at or above 50 percent and, therefore, do not need adjustment (EPA 2004b). Uncertainty is introduced for the COPCs with G.I. absorption less than 50 percent (primarily metals). The hazards calculated for these COPCs is likely to be somewhat underestimated. However, because the hazards associated with potential exposures are much less than 1, any adjustment to oral RfDs will have an insignificant impact on the calculated hazards. Similarly, risks associated with potential dermal exposure to metals in surface water and sediment are limited to potential exposure to arsenic. All calculated dermal risks are less than 1E-07. Therefore, any adjustment of oral SFs would have an insignificant impact on the calculated risks.

## 6.4 RISK CHARACTERIZATION

Because the risk characterization is built upon the uncertainties associated with the three previously discussed components of the risk assessment process, this is the point where these uncertainties manifest themselves numerically. Therefore, all previously discussed sources of uncertainty are applicable to this section as well. Also, of particular note is the uncertainty introduced by the method used to calculate overall total risks. Overall total risks were calculated by summing adult and child risk results. Because adult risks were calculated based on an assumed 30 year exposure duration and child risks were calculated based on an assumed exposure duration of 6 years, the overall total risks were calculated based on an assumed exposure duration of 36 years.

Thirty years is typically considered the RME residential exposure duration. The use of a 36 year exposure duration means that overall total risks are slightly overestimated. However, because the overestimation associated with this method is approximately 20 percent, the impact on risk estimates that are presented to one significant figure is small. For example, risks of 5.6E-07 and 6.7E-07 are approximately 20 percent different and would be presented as 6E-07 and 7E-07. These values are basically indistinguishable from a risk management point of view. Therefore, the uncertainty introduced by the method used to calculate overall total risks is considered small.

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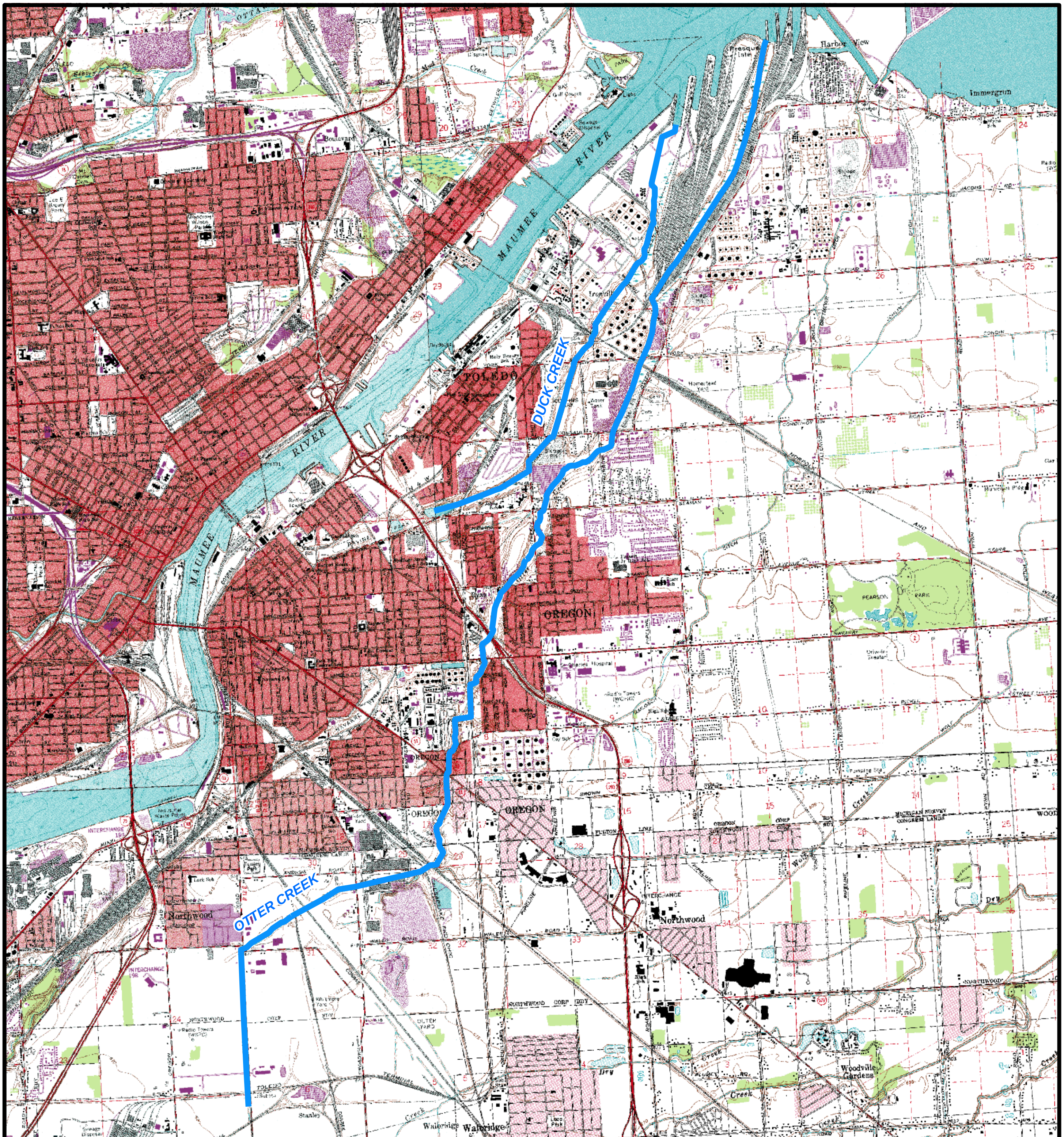
# FIGURES





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Feet

SOURCE: MODIFIED FROM USGS, OREGON, OHIO, QUADRANGLE, 1977; TOLEDO, OHIO-MICHIGAN, QUADRANGLE, 1980; ROSSFORD, OHIO, QUADRANGLE, 1988; AND WALBRIDGE, OHIO, QUADRANGLE, 1994

DUCK AND OTTER CREEKS
TOLEDO AND OREGON, OHIO

FIGURE 1
SITE LOCATION MAP

Tetra Tech EM Inc.

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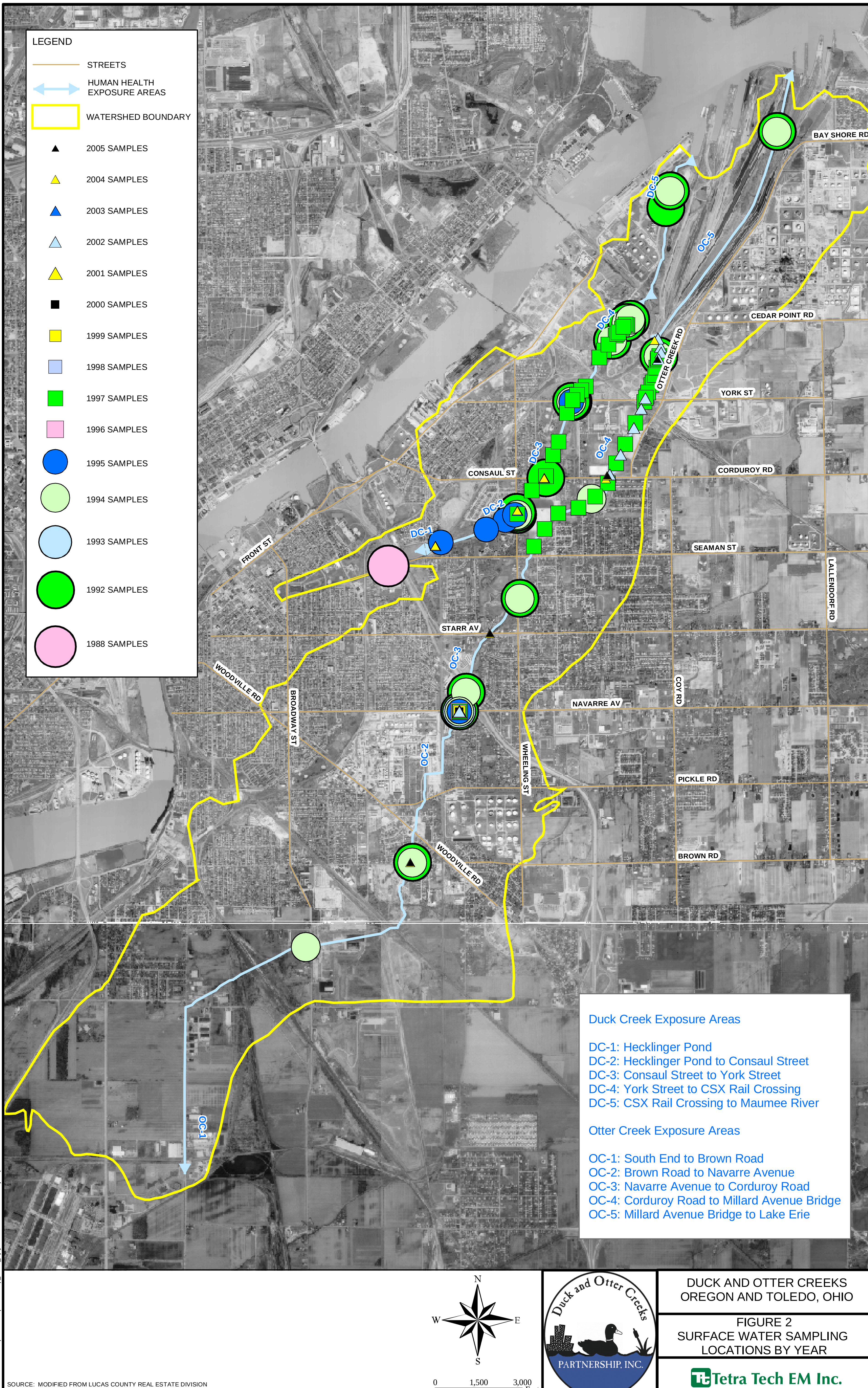



SOURCE: MODIFIED FROM LUCAS COUNTY REAL ESTATE DIVISION AND THE USGS, 2000, AND MANNIK AND SMITH, 2003,

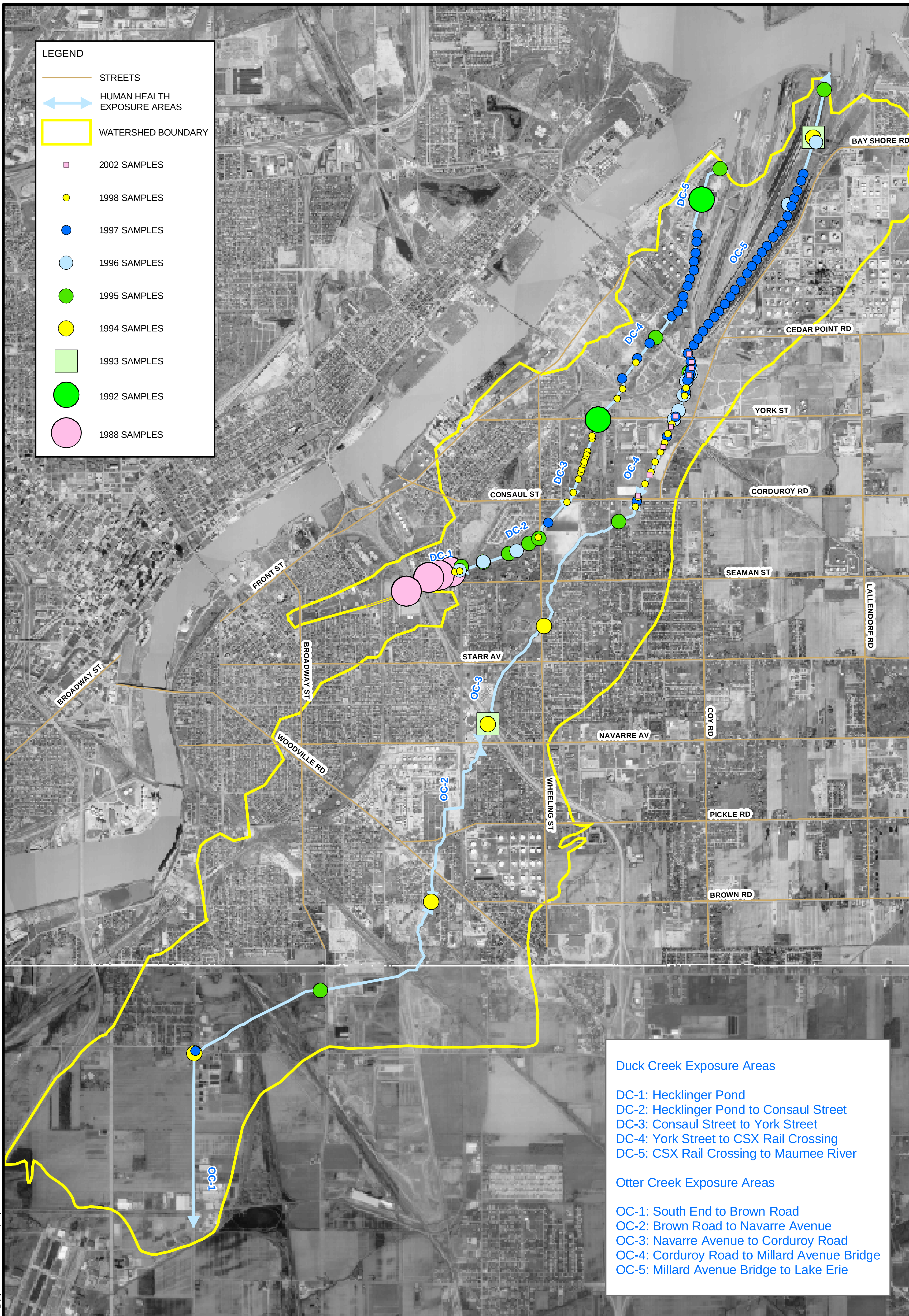
2005-06-16 s:\cadd\p3269\docp\mxd\docp_water_by-year.mxd TTEMI-NV joel.peters

Duck and Otter Creeks PARTNERSHIP, INC.

DUCK AND OTTER CREEKS
OREGON AND TOLEDO, OHIO

FIGURE 2
SURFACE WATER SAMPLING LOCATIONS BY YEAR

Tetra Tech EM Inc.




SOURCE: MODIFIED FROM LUCAS COUNTY REAL ESTATE DIVISION AND THE USGS, 2000, AND MANNIK AND SMITH, 2003,

N W E S

0 1,500 3,000 Feet

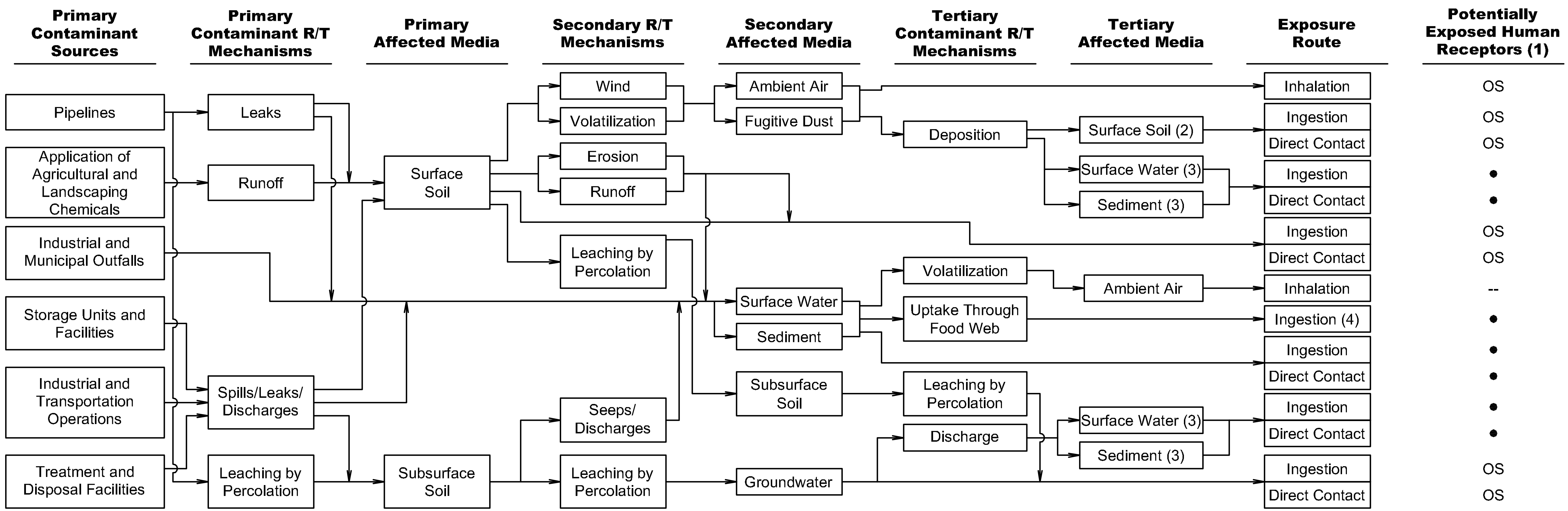
Duck and Otter Creeks PARTNERSHIP, INC.

DUCK AND OTTER CREEKS
OREGON AND TOLEDO, OHIO

FIGURE 3
SEDIMENT SAMPLING LOCATIONS BY YEAR

Tetra Tech EM Inc.

2005-06-16 s:\cadd\gis\3269\docp\mxd\docp_sediment_by-year.mxd TTEMI-NV joel.peters




Notes:

COPC = Chemical of potential concern
OS = Outside the scope of the human health risk assessment (HHRA)
R/T = Release/transport
● = Potentially complete exposure pathway - retained for quantitative analysis
-- = Potentially complete, but insignificant exposure pathway - will not be retained for quantitative analysis

1. Potentially exposed human receptors are assumed to include adults, youths (7 to 18 years old), and children (1 to 6 years old). It is assumed that children are exposed primarily in residential areas, may be exposed in public areas (for example, Collins Park Golf Course), and will not be exposed in the more heavily industrialized and remote portions of both Duck and Otter Creeks. Youth and adult receptors are assumed to be exposed along the length of both creeks; however, exposures are assumed to be more frequent in residential areas.

2. COPCs present in surface soil may also be impacted by the following R/T mechanisms: wind and volatilization; erosion and runoff; and leaching by percolation - see surface soil under primary affected media.

3. COPCs present in surface water and sediment may also be taken up into aquatic food webs; subsequent exposure may occur through ingestion of aquatic life - see surface water and sediment under secondary affected media.

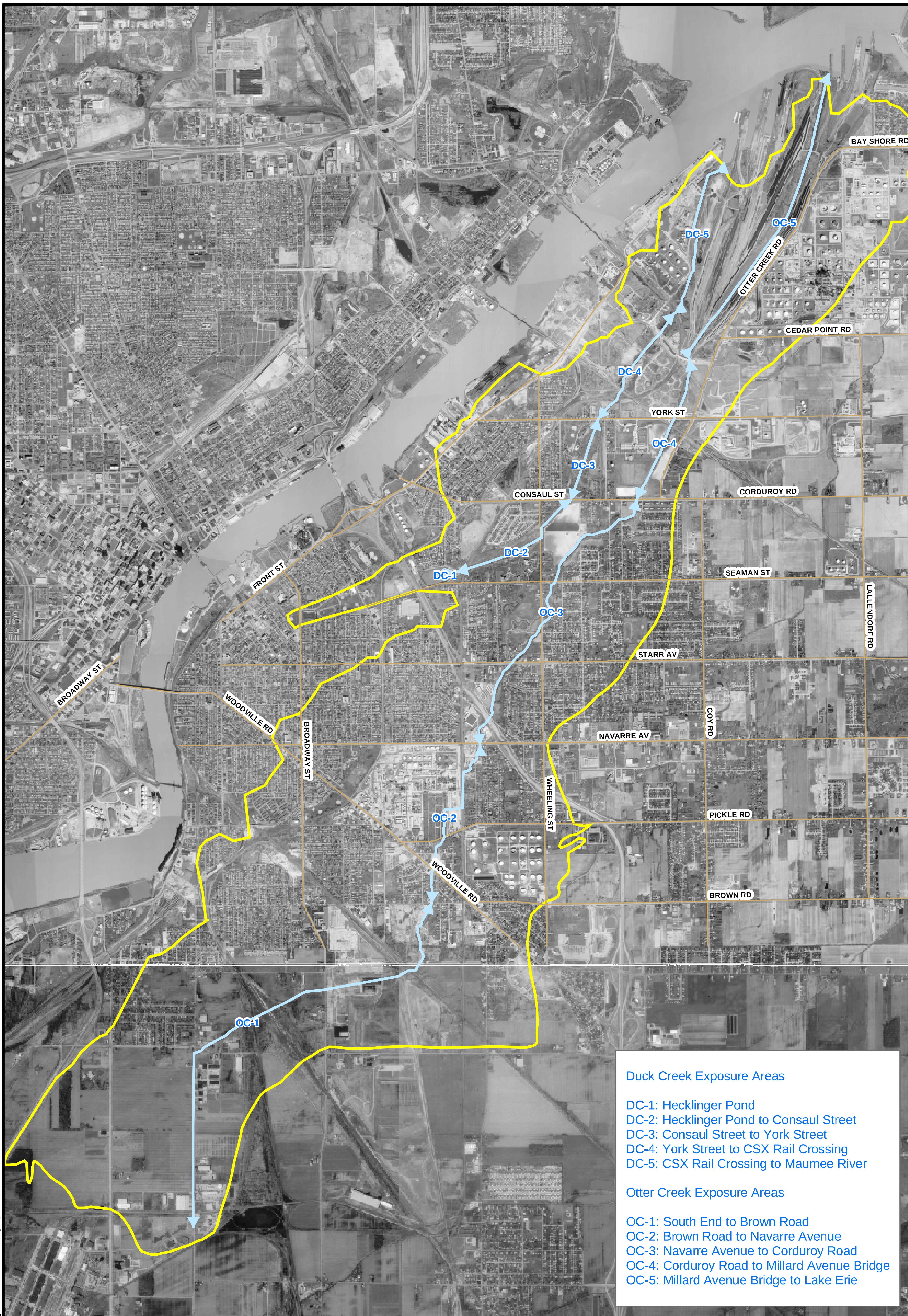
4. For the purposes of the HHRA only ingestion of aquatic life will be evaluated. Potential exposure to COPCs through ingestion of other fauna and flora included in other relevant food webs (for example, ingestion of water fowl feeding in Duck and Otter Creeks) is considered to be relatively insignificant compared to potential exposure through ingestion of aquatic life.

DUCK AND OTTER CREEKS
OREGON AND TOLEDO, OHIO

FIGURE 4
HUMAN HEALTH
CONCEPTUAL SITE MODEL

Tetra Tech EM Inc.

G:\P\3269\03\ HumanHealthConceptualModel.dwg 06/17/2005 chris.caron CH




LEGEND

STREETS

*HUMAN HEALTH EXPOSURE AREAS*

WATERSHED BOUNDARY

SOURCE: MODIFIED FROM LUCAS COUNTY REAL ESTATE DIVISION AND THE USGS, 2000, AND MANNIK AND SMITH, 2003,

N W E S

0 1,500 3,000 Feet

Duck and Otter Creeks PARTNERSHIP, INC.

DUCK AND OTTER CREEKS
OREGON AND TOLEDO, OHIO

FIGURE 5
HUMAN HEALTH EXPOSURE AREAS

Tetra Tech EM Inc.

2005-06-16 s:\cadd\p\3269\docp\mxd\docp_workingoverview.mxd TTEMI-NV joel.peters

## FIGURE 6

## EXPOSURE DOSE EQUATIONS
## HUMAN HEALTH RISK ASSESSMENT
## DUCK AND OTTER CREEKS
## TOLEDO AND OREGON, OHIO

### Surface Water

Ingestion

$$ADD_{(mg/kg\text{-}day)} = \frac{EPC_{sw} \times IR_{sw} \times EF_{sw} \times ED \times CF1\ (\text{organics only})}{BW \times AT_{nc}}$$

$$LADD_{(mg/kg\text{-}day)} = \frac{EPC_{sw} \times IR_{sw} \times EF_{sw} \times ED \times CF1\ (\text{organics only})}{BW \times AT_{c}}$$

Dermal Contact

$$ADD_{(mg/kg\text{-}day)} = \frac{DA_{event} \times SA_{sw} \times EV \times EF_{swd} \times ED}{BW \times AT_{nc}}$$

$$LADD_{(mg/kg\text{-}day)} = \frac{DA_{event} \times SA_{sw} \times EV \times EF_{swd} \times ED}{BW \times AT_{c}}$$

Note: Equations used to calculate chemical-specific $DA_{event}$ values are discussed in Table 3.

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### Sediment

Ingestion

$$ADD_{(mg/kg\text{-}day)} = \frac{EPC_{sed} \times IR_{sed} \times FI\ \text{x}\ EF_{sed} \times ED \times CF1\ (\text{organics only}) \times CF2}{BW \times AT_{nc}}$$

$$LADD_{(mg/kg\text{-}day)} = \frac{EPC_{sed} \times IR_{sed} \times FI\ \text{x}\ EF_{sed} \times ED \times CF1\ (\text{organics only}) \times CF2}{BW \times AT_{c}}$$

**FIGURE 6 (Continued)**

**EXPOSURE DOSE EQUATIONS**
**SCREENING HUMAN HEALTH RISK ASSESSMENTS**
**DUCK AND OTTER CREEKS**
**OREGON AND TOLEDO, OHIO**

Dermal Contact

$$ADD_{(mg/kg-day)} = \frac{EPC_{sed} \times SA_{sed} \times AF \times ABS \times EF_{sed} \times EV \text{ x } ED \times CF1 \text{ (organics only)} \times CF2}{BW \times AT_{nc}}$$

$$LADD_{(mg/kg-day)} = \frac{EPC_{sed} \times SA_{sed} \times AF \times ABS \times EF_{sed} \times EV \text{ x } ED \times CF1 \text{ (organics only)} \times CF2}{BW \times AT_{c}}$$

Notes:

| | | |
|---|---|---|
| ABS | = | Dermal absorption (unitless) |
| AF | = | Adherence factor (milligram per square centimeter [mg/cm$^2$]) |
| $AT_c$ | = | Averaging time – carcinogens (days) |
| $AT_{nc}$ | = | Averaging time – noncarcinogens (days) |
| BW | = | Body weight (kilograms [kg]) |
| CF1 | = | Conversion factor 1 (milligram per microgram [mg/µg]) |
| CF2 | = | Conversion factor 2 (kg/mg) |
| $DA_{event}$ | = | Absorbed dose per event (mg/cm$^2$ – event) |
| ED | = | Exposure duration (years) |
| $EF_{sed}$ | = | Exposure frequency – sediment (days/year) |
| $EF_{sw}$ | = | Exposure frequency – surface water (days/year) |
| $EF_{swd}$ | = | Exposure frequency – surface water direct contact (days/year) |
| $EPC_{sed}$ | = | Exposure point concentration – sediment (µg/kg for organic compounds and mg/kg for inorganic compounds) |
| $EPC_{sw}$ | = | Exposure point concentration – surface water (µg/L for organic compounds and mg/L for inorganic compounds) |
| EV | = | Event frequency (event/day) |
| FI | = | Fraction ingested (unitless) |
| $IR_{sed}$ | = | Ingestion rate – sediment (mg/day) |
| $IR_{sw}$ | = | Ingestion rate – surface water (L/day) |
| $SA_{sed}$ | = | Skin surface area – sediment (cm$^2$/event) |
| $SA_{sw}$ | = | Skin surface area – surface water (cm$^2$/event) |

**TABLES**

**TABLE 1**

**SECONDARY DATA SOURCES**
**HUMAN HEALTH RISK ASSESSMENT**
**DUCK AND OTTER CREEKS**
**OREGON AND TOLEDO, OHIO**

| | | | | | Source of Analytical Data | | | |
|---|---|---|---|---|---|---|---|---|
| **Number** | **Organization** | **Description** | **Reference** | **Date(s)** | **Duck Creek** | **Otter Creek** | **Hecklinger Pond** | **Comment** |
| 1 | OEPA DSW | Phase I/II | OEPA (1992 to 1998) | 1992-1995 | Yes | Yes | | Sediment and surface water samples from both Duck and Otter Creeks |
| 2 | OEPA DSW | Phase III | AScI (1997) | 1995-1996 | Yes | Yes | | Sediment and surface water samples from both Duck and Otter Creeks |
| 3 | OEPA DSW | Phase III | OEPA (1992 TO 1998) | 1997 | Yes | Yes | | Sediment and surface water samples from both Duck and Otter Creeks |
| 4 | OEPA DSW | Phase III | OEPA (1992 TO 1998)) | 1998 | Yes | Yes | | Sediment and surface water samples from both Duck and Otter Creeks |
| 5 | OEPA DSW | Bioassay Sampling | OEPA (1994 AND 1998) | 1998 | Yes | No | | Paired sediment samples and toxicity tests |
| 6 | OEPA DSW | Bioassay Sampling | OEPA (1994 AND 1998) | 1994 | No | Yes | | Paired sediment samples and toxicity tests |
| 7 | OEPA DERR | Counsal Street Landfill Site Assessment (SA) | OEPA (1997c), QSEA (1996a) | 1995 | Yes | No | | Sediment and surface water samples from Duck Creek |
| 8 | OEPA DERR | Buckeye Pipeline Co. Pumping Station SA | OEPA (1997b), QSEA (1996b) | 1996 | No | Yes | | Sediment and surface water samples from Otter Creek |
| 9 | OEPA DERR | Phillips Petroleum SA | OEPA (1997a) | 1995 | Yes | No | | Sediment and surface water samples from Duck Creek |
| 10 | OEPA DERR | Westover Landfill SA | OEPA (1998), Quanterra (1997) | 1996 | No | Yes | | Sediment and surface water samples from Otter Creek |
| 11 | OEPA DERR | Sunoco-Toledo Refinery SA | NA | 1997 | No | Yes | | Sediment and surface water samples from Otter Creek |
| 12 | ChevronTexaco | Chevron-Toledo Refinery | SECOR (2005) | 1997 | Yes | Yes | | Sediment and surface water samples from Duck and Otter Creeks |
| 13 | BEC (for the City of Toledo) | Analysis of Fish Tissue Sample | BEC (1998) | 1998 | No | No | Yes | Whole body composite fish tissue sample from Hecklinger Pond |
| 14 | City of Oregon | Illicit Discharge Detection and Elimination Inciden Reports | City of Oregon (2003, 2004a, 2004b, 2005a, 2005b, 2005c) | 2003-2005 | No | Yes | No | Surface water samples collected after spill incidents and as part of the City of Oregon's storm water management plan |
| 15 | ENVIRON and Mannik & Smith | RCRA RFI Phase I Report and Phase II Work Plan | ENVIRON and Mannik & Smith (2003) | 2002 | No | Yes | No | Surface water and sediment samples collected upstream, adjacent, and downstream of the Envirosafe Otter Creek Road facility |
| 16 | ETC (for the City of Toledo) | Analysis of Fish Tissue Sample | ETC (1989) | 1989 | No | No | Yes | Whole body composite fish tissue sample from Hecklinger Pond |
| 17 | OEPA DES | Analysis of Fish Tissue Samples | OEPA (2003) | 2003 | No | No | Yes | Filet composite fish tissue samples from Hecklinger Pond |
| 18 | PTRL (for Chevron U.S.A.) | Wetlands Characterization and Ecological Risk Assessment for Chevron U.S.A. Toledo Refinery Site | PTRL (1997a, 1997b, 1997c) | Various | No | No | No | Characterization and evaluation of wetlands and ecological communities potentially impacted by facility |
| 19 | Tetra Tech | Photograph Log and Field Notes | See Appendix A | 2005 | No | No | No | Photos along Duck and Otter Creek and associated notes and observations |
| 20 | TTL (for the City of Toledo) | Environmental Site Assessment of Hecklinger Pond | TTL (1988) | 1988 | Yes | No | No | Discussion of fish tissue samples from Hecklinger Pond |
| 21 | City of Toledo | Memorandum regarding Duck Creek sludge samples | City of Toledo (1988) | 1988 | Yes | No | No | Samples related to release from City of Toledo WWTP sludge pond into Duck Creek |
| 22 | City of Toledo | Memoranda regarding ETC (1988) fish tissue sample | City of Toledo (1989a, 1989b, 1991) | 1989 | No | No | No | Discussion of fish tissue samples from Hecklinger Pond |
| 23 | WSU | Letter Regarding Analysis of Fish Tissue Samples | WSU (1991) | 1991 | No | No | Yes | Discussion of fish tissue samples from Hecklinger Pond |
| 24 | BEC (for the City of Toledo) | Analysis of surface water samples | BEC (2003, 2004) | 2003-2004 | Yes | No | No | Surface watr samples from Duck Creek |

Notes:

BEC = BEC Laboratories, Inc.
DERR = Division of Emergency and Remedial Response
DES = Division of Environmental Service
DSW = Division of Surface Water
SECOR = SECOR International, Inc.

ENVIRON = ENVIRON International Corporation
ETC = Environmental Testing and Certification Corporation
Mannik & Smith = The Mannik & Smith Group, Inc.
NA = Not available

OEPA = Ohio Environmental Protection Agency
PTRL = PTRL Environmental Services, Inc.
TTL = Toledo Testing Laboratory
WSU = Wright State University

**TABLE 2**
**SEDIMENT - SPECIFIC SUMMARY STATISTICS FOR DUCK CREEK**
**HUMAN HEALTH RISK ASSESSMENT**
**DUCK AND OTTER CREEKS**
**TOLEDO AND OREGON, OHIO**

| Chemical | Number of Samples | | Detection Frequency (Percent) | Censored Data | | Detected Data | | All Data | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Arithmetic Mean | Geometric Mean | Nonparametric Percentiles | | |
| | Detected | Total | | Min | Max | Min | Max | | | 50th | 90th | 95th |
| 2-Butanone | 2 | 11 | 18 | 1.00E+01 | 1.00E+02 | 1.30E+01 | 1.12E+02 | 3.18E+01 | 3.18E+01 | 1.30E+01 | 1.09E+02 | 1.12E+02 |
| 2-Methylnaphthalene | 7 | 44 | 16 | 3.30E+02 | 1.00E+03 | 3.40E+01 | 1.30E+03 | 4.05E+02 | 4.05E+02 | 7.05E+02 | 9.30E+02 | 1.15E+03 |
| 3 & 4-Methylphenol | 8 | 26 | 31 | 3.30E+02 | 1.00E+03 | 4.20E+01 | 1.90E+03 | 5.29E+02 | 5.29E+02 | 7.80E+02 | 1.13E+03 | 1.66E+03 |
| 4,4'-DDD | 28 | 30 | 93 | 3.30E+01 | 5.00E+03 | 1.40E+01 | 2.20E+03 | 5.05E+02 | 5.05E+02 | 2.58E+02 | 1.92E+03 | 3.46E+03 |
| 4,4'-DDE | 28 | 30 | 93 | 3.30E+01 | 5.00E+03 | 1.40E+01 | 9.49E+02 | 2.70E+02 | 2.70E+02 | 1.30E+02 | 5.65E+02 | 2.77E+03 |
| 4,4'-DDT | 19 | 30 | 63 | 7.30E+00 | 5.00E+03 | 9.20E+00 | 1.49E+02 | 1.16E+02 | 1.16E+02 | 3.49E+01 | 6.95E+01 | 2.33E+03 |
| 4-Methylphenol | 2 | 18 | 11 | 5.00E+02 | 8.00E+02 | 8.00E+02 | 1.10E+03 | 4.06E+02 | 4.06E+02 | 7.00E+02 | 8.30E+02 | 1.10E+03 |
| Acenaphthene | 5 | 49 | 10 | 3.30E+02 | 5.00E+03 | 2.70E+01 | 2.10E+03 | 4.50E+02 | 4.50E+02 | 7.00E+02 | 1.00E+03 | 2.00E+03 |
| Acenaphthylene | 3 | 49 | 6 | 3.30E+02 | 5.00E+03 | 1.80E+01 | 1.50E+03 | 3.87E+02 | 3.87E+02 | 7.00E+02 | 9.10E+02 | 1.25E+03 |
| Acetone | 2 | 12 | 17 | 1.00E+01 | 1.00E+04 | 1.20E+02 | 2.25E+02 | 4.67E+02 | 4.67E+02 | 1.00E+02 | 7.07E+03 | 1.00E+04 |
| Aldrin | 1 | 30 | 3 | 6.60E-01 | 5.00E+03 | 9.10E+00 | 9.10E+00 | 8.70E+01 | 8.70E+01 | 7.90E+00 | 1.54E+01 | 2.26E+03 |
| Aluminum | 29 | 29 | 100 | N/A | N/A | 2.27E+03 | 4.60E+04 | 2.35E+04 | 2.35E+04 | 2.49E+04 | 4.44E+04 | 4.58E+04 |
| Anthracene | 8 | 49 | 16 | 3.30E+02 | 5.00E+03 | 3.30E+01 | 1.00E+04 | 7.47E+02 | 7.47E+02 | 7.00E+02 | 1.30E+03 | 4.95E+03 |
| Aroclor 1248 | 3 | 29 | 10 | 3.20E+01 | 3.30E+02 | 1.05E+02 | 1.68E+02 | 4.06E+01 | 4.06E+01 | 3.87E+01 | 1.68E+02 | 3.30E+02 |
| Aroclor 1254 | 2 | 29 | 7 | 3.20E+01 | 3.30E+02 | 6.91E+01 | 1.80E+02 | 3.66E+01 | 3.66E+01 | 3.92E+01 | 1.80E+02 | 3.30E+02 |
| Aroclor 1260 | 3 | 29 | 10 | 3.20E+01 | 3.30E+02 | 6.65E+01 | 1.40E+02 | 3.70E+01 | 3.70E+01 | 3.87E+01 | 1.40E+02 | 3.30E+02 |
| Arsenic | 33 | 34 | 97 | 2.00E+01 | 2.00E+01 | 7.11E+00 | 7.20E+01 | 2.32E+01 | 2.32E+01 | 2.05E+01 | 3.99E+01 | 5.37E+01 |
| Barium | 34 | 53 | 64 | 6.70E-01 | 1.00E+00 | 3.49E+01 | 3.16E+02 | 9.91E+01 | 9.91E+01 | 8.95E+01 | 2.39E+02 | 2.59E+02 |
| Benzo[a]anthracene | 9 | 29 | 31 | 3.30E+02 | 8.00E+02 | 5.60E+01 | 1.87E+04 | 1.15E+03 | 1.15E+03 | 7.00E+02 | 2.30E+03 | 1.09E+04 |
| Benzo[a]pyrene | 19 | 48 | 40 | 3.30E+02 | 8.80E+02 | 5.40E+01 | 1.95E+04 | 1.41E+03 | 1.41E+03 | 7.40E+02 | 3.07E+03 | 7.66E+03 |
| Benzo[b]fluoranthene | 18 | 47 | 38 | 3.30E+02 | 8.80E+02 | 7.20E+01 | 1.67E+04 | 1.36E+03 | 1.36E+03 | 7.50E+02 | 4.20E+03 | 7.22E+03 |
| Benzo[g,h,i]perylene | 16 | 48 | 33 | 3.30E+02 | 8.80E+02 | 4.60E+01 | 1.24E+04 | 9.76E+02 | 9.76E+02 | 7.05E+02 | 1.90E+03 | 4.96E+03 |
| Benzo[k]fluoranthene | 17 | 49 | 35 | 3.30E+02 | 8.80E+02 | 5.50E+01 | 4.40E+04 | 2.10E+03 | 2.10E+03 | 7.10E+02 | 4.90E+03 | 1.11E+04 |
| Benzoic acid | 2 | 7 | 29 | 1.60E+03 | 1.70E+03 | 1.60E+02 | 1.70E+02 | 6.40E+02 | 6.40E+02 | 1.60E+03 | 1.70E+03 | 1.70E+03 |
| Beryllium | 29 | 29 | 100 | N/A | N/A | 3.30E-01 | 3.57E+00 | 1.21E+00 | 1.21E+00 | 1.21E+00 | 1.63E+00 | 2.69E+00 |
| Cadmium | 28 | 34 | 82 | 5.00E-01 | 1.01E+00 | 2.90E-01 | 2.09E+00 | 9.49E-01 | 9.49E-01 | 9.88E-01 | 1.69E+00 | 1.94E+00 |
| Calcium | 26 | 26 | 100 | N/A | N/A | 1.00E+04 | 1.36E+05 | 5.81E+04 | 5.81E+04 | 6.45E+04 | 1.03E+05 | 1.26E+05 |
| Chromium | 33 | 34 | 97 | 2.00E+01 | 2.00E+01 | 5.90E+00 | 7.50E+01 | 3.47E+01 | 3.47E+01 | 3.96E+01 | 5.90E+01 | 6.45E+01 |
| Chrysene | 26 | 49 | 53 | 3.30E+02 | 8.80E+02 | 6.50E+01 | 2.80E+04 | 2.26E+03 | 2.26E+03 | 8.00E+02 | 5.10E+03 | 1.68E+04 |
| Cobalt | 7 | 7 | 100 | N/A | N/A | 2.40E+00 | 8.40E+00 | 5.58E+00 | 5.58E+00 | 4.65E+00 | 8.40E+00 | 8.40E+00 |
| Copper | 34 | 34 | 100 | N/A | N/A | 1.02E+01 | 8.26E+01 | 3.56E+01 | 3.56E+01 | 3.48E+01 | 5.92E+01 | 7.63E+01 |
| Cyanide | 1 | 7 | 14 | 1.00E+00 | 1.00E+00 | 1.00E+00 | 1.00E+00 | 5.71E-01 | 5.71E-01 | 1.00E+00 | 1.00E+00 | 1.00E+00 |
| Dibenz[a,h]anthracene | 4 | 48 | 8 | 3.30E+02 | 1.00E+03 | 1.00E+03 | 3.80E+03 | 4.52E+02 | 4.52E+02 | 7.00E+02 | 1.00E+03 | 1.47E+03 |
| Dibenzofuran | 4 | 44 | 9 | 3.30E+02 | 1.00E+03 | 2.80E+01 | 1.50E+03 | 3.81E+02 | 3.81E+02 | 7.00E+02 | 9.30E+02 | 1.15E+03 |
| Diethylphthalate | 7 | 48 | 15 | 3.30E+02 | 1.00E+03 | 1.30E+03 | 2.70E+03 | 5.80E+02 | 5.80E+02 | 7.40E+02 | 2.00E+03 | 2.39E+03 |
| Endrin | 1 | 30 | 3 | 3.20E+00 | 5.00E+03 | 4.07E+00 | 4.07E+00 | 8.76E+01 | 8.76E+01 | 7.75E+00 | 3.07E+01 | 2.27E+03 |
| Endrin ketone | 2 | 7 | 29 | 3.30E+00 | 3.30E+01 | 3.60E-01 | 2.50E+00 | 5.83E+00 | 5.83E+00 | 3.30E+00 | 3.30E+01 | 3.30E+01 |
| Fluoranthene | 36 | 49 | 73 | 3.30E+02 | 8.80E+02 | 6.70E+01 | 5.90E+04 | 4.64E+03 | 4.64E+03 | 9.00E+02 | 9.80E+03 | 4.05E+04 |

**TABLE 2**
**SEDIMENT - SPECIFIC SUMMARY STATISTICS FOR DUCK CREEK**
**HUMAN HEALTH RISK ASSESSMENT**
**DUCK AND OTTER CREEKS**
**TOLEDO AND OREGON, OHIO**

| Chemical | Number of Samples | | Detection Frequency (Percent) | Censored Data | | Detected Data | | All Data | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Detected | Total | | Min | Max | Min | Max | Arithmetic Mean | Geometric Mean | Nonparametric Percentiles 50th | 90th | 95th |
| Fluorene | 5 | 49 | 10 | 3.30E+02 | 5.00E+03 | 2.20E+01 | 3.50E+03 | 5.05E+02 | 5.05E+02 | 7.00E+02 | 1.00E+03 | 3.15E+03 |
| Heptachlor epoxide | 1 | 29 | 3 | 6.60E-01 | 1.60E+01 | 1.40E+00 | 1.40E+00 | 3.51E+00 | 3.51E+00 | 7.70E+00 | 9.90E+00 | 1.60E+01 |
| Indeno[1,2,3-cd]pyrene | 15 | 48 | 31 | 3.30E+02 | 8.80E+02 | 5.80E+01 | 1.40E+04 | 1.04E+03 | 1.04E+03 | 7.10E+02 | 2.02E+03 | 5.24E+03 |
| Iron | 34 | 34 | 100 | N/A | N/A | 1.90E+00 | 7.24E+04 | 2.17E+04 | 2.17E+04 | 2.15E+04 | 3.20E+04 | 4.28E+04 |
| Lead | 31 | 34 | 91 | 2.60E+01 | 4.10E+01 | 1.13E+01 | 2.50E+02 | 5.44E+01 | 5.44E+01 | 4.45E+01 | 1.01E+02 | 1.71E+02 |
| Magnesium | 26 | 26 | 100 | N/A | N/A | 2.30E+03 | 1.72E+04 | 1.01E+04 | 1.01E+04 | 1.08E+04 | 1.58E+04 | 1.70E+04 |
| Manganese | 26 | 26 | 100 | N/A | N/A | 1.16E+02 | 6.71E+02 | 3.87E+02 | 3.87E+02 | 4.40E+02 | 5.85E+02 | 6.41E+02 |
| Mercury | 26 | 32 | 81 | 8.00E-02 | 1.00E-01 | 4.00E-02 | 5.49E-01 | 1.20E-01 | 1.20E-01 | 1.03E-01 | 1.94E-01 | 3.26E-01 |
| Methoxychlor | 3 | 29 | 10 | 6.60E+00 | 1.60E+02 | 3.10E+00 | 3.70E+02 | 2.38E+01 | 2.38E+01 | 8.60E+00 | 1.60E+02 | 2.65E+02 |
| Methylene chloride | 1 | 14 | 7 | 2.00E+00 | 7.00E+01 | 4.18E+01 | 4.18E+01 | 1.17E+01 | 1.17E+01 | 1.00E+01 | 6.50E+01 | 7.00E+01 |
| Naphthalene | 20 | 49 | 41 | 6.00E+01 | 5.00E+03 | 1.50E+01 | 3.90E+03 | 6.24E+02 | 6.24E+02 | 7.70E+02 | 1.10E+03 | 2.55E+03 |
| Nickel | 26 | 34 | 76 | 2.60E+01 | 4.10E+01 | 6.00E+00 | 7.47E+01 | 2.99E+01 | 2.99E+01 | 3.20E+01 | 6.03E+01 | 6.82E+01 |
| Phenanthrene | 22 | 49 | 45 | 4.50E+01 | 8.80E+02 | 4.10E+02 | 3.37E+04 | 2.55E+03 | 2.55E+03 | 8.00E+02 | 4.30E+03 | 2.25E+04 |
| Polychlorinated biphenyls | 1 | 1 | 100 | N/A | N/A | 8.00E+02 | 8.00E+02 | N/A | N/A | N/A | N/A | N/A |
| Polynuclear aromatic hydrocarbons | 1 | 1 | 100 | N/A | N/A | 5.97E+01 | 5.97E+01 | N/A | N/A | N/A | N/A | N/A |
| Potassium | 27 | 27 | 100 | N/A | N/A | 3.64E+02 | 1.27E+04 | 5.88E+03 | 5.88E+03 | 5.99E+03 | 1.09E+04 | 1.21E+04 |
| Pyrene | 35 | 49 | 71 | 3.30E+02 | 5.00E+03 | 6.10E+01 | 3.82E+04 | 2.94E+03 | 2.94E+03 | 1.00E+03 | 5.00E+03 | 1.90E+04 |
| Selenium | 19 | 33 | 58 | 5.00E-01 | 1.00E+01 | 9.18E-01 | 4.13E+00 | 2.31E+00 | 2.31E+00 | 2.18E+00 | 1.00E+01 | 1.00E+01 |
| Silver | 3 | 11 | 27 | 1.00E-01 | 1.00E+00 | 4.40E-01 | 6.60E-01 | 4.11E-01 | 4.11E-01 | 6.60E-01 | 1.00E+00 | 1.00E+00 |
| Sodium | 9 | 29 | 31 | 2.93E+03 | 5.18E+03 | 1.18E+02 | 3.83E+02 | 1.37E+03 | 1.37E+03 | 3.53E+03 | 4.29E+03 | 5.13E+03 |
| Strontium | 22 | 22 | 100 | N/A | N/A | 6.70E+01 | 4.82E+02 | 2.14E+02 | 2.14E+02 | 2.11E+02 | 3.09E+02 | 4.58E+02 |
| Vanadium | 7 | 7 | 100 | N/A | N/A | 1.36E+01 | 4.06E+01 | 2.61E+01 | 2.61E+01 | 2.76E+01 | 4.06E+01 | 4.06E+01 |
| Zinc | 34 | 34 | 100 | N/A | N/A | 3.49E+01 | 3.76E+02 | 1.60E+02 | 1.60E+02 | 1.54E+02 | 3.10E+02 | 3.68E+02 |
| alpha-BHC | 1 | 30 | 3 | 6.60E-01 | 5.00E+03 | 1.01E+00 | 1.01E+00 | 8.67E+01 | 8.67E+01 | 7.75E+00 | 1.54E+01 | 2.26E+03 |
| alpha-Chlordane | 1 | 25 | 4 | 1.60E+00 | 1.60E+01 | 2.90E+00 | 2.90E+00 | 4.04E+00 | 4.04E+00 | 8.00E+00 | 1.23E+01 | 1.60E+01 |
| bis(2-Ethylhexyl)phthalate | 18 | 48 | 38 | 7.70E+01 | 1.00E+03 | 7.00E+02 | 4.00E+03 | 7.11E+02 | 7.11E+02 | 7.95E+02 | 1.80E+03 | 1.97E+03 |
| delta-BHC | 2 | 30 | 7 | 1.60E+00 | 5.00E+03 | 3.19E+00 | 4.11E+00 | 8.69E+01 | 8.69E+01 | 7.75E+00 | 1.54E+01 | 2.26E+03 |
| gamma-Chlordane | 3 | 25 | 12 | 1.30E+00 | 1.60E+01 | 1.20E+00 | 9.30E+00 | 4.22E+00 | 4.22E+00 | 8.00E+00 | 1.23E+01 | 1.60E+01 |

**Notes:** Units are milligrams per kilogram for metals and micrograms per kilogram for other chemicals.
One-half the detection limit was substituted for censored (nondetect) measurements in calculations of the mean and percentiles

Min Minimum concentration
Max Maximum concentration
N/A Not applicable

**TABLE 3**
**SEDIMENT - SPECIFIC SUMMARY STATISTICS FOR OTTER CREEK**
**HUMAN HEALTH RISK ASSESSMENT**
**DUCK AND OTTER CREEKS**
**TOLEDO AND OREGON, OHIO**

| Chemical | Number of Samples | | Detection Frequency (Percent) | Censored Data | | Detected Data | | All Data | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Arithmetic Mean[2] | Geometric Mean[2] | Nonparametric Percentiles | | |
| | Detected | Total | | Min | Max | Min | Max | | | 50th | 90th | 95th |
| 1,1,2,2-Tetrachloroethane | 1 | 33 | 3 | 5.00E+00 | 2.00E+03 | 1.70E+02 | 1.70E+02 | 5.19E+01 | 5.19E+01 | 1.10E+01 | 1.88E+02 | 7.40E+02 |
| 2,4,5-TP | 2 | 9 | 22 | 1.00E+01 | 1.00E+01 | 1.22E+01 | 2.13E+01 | 7.61E+00 | 7.61E+00 | 1.00E+01 | 2.13E+01 | 2.13E+01 |
| 2,4-Dimethylphenol | 3 | 118 | 3 | 3.30E+02 | 2.30E+04 | 9.00E+02 | 1.00E+03 | 7.52E+02 | 7.52E+02 | 1.00E+03 | 1.30E+03 | 5.31E+03 |
| 2-Butanone | 11 | 26 | 42 | 2.10E+01 | 2.00E+03 | 1.40E+01 | 2.26E+02 | 9.74E+01 | 9.74E+01 | 7.10E+01 | 2.08E+02 | 1.38E+03 |
| 2-Methylnaphthalene | 80 | 114 | 70 | 5.60E+02 | 8.70E+03 | 1.60E+02 | 1.04E+04 | 2.17E+03 | 2.17E+03 | 1.75E+03 | 5.10E+03 | 6.25E+03 |
| 2-Methylphenol | 1 | 114 | 1 | 5.60E+02 | 2.30E+04 | 1.30E+02 | 1.30E+02 | 7.55E+02 | 7.55E+02 | 1.00E+03 | 1.30E+03 | 5.35E+03 |
| 3 & 4-Methylphenol | 8 | 12 | 67 | 5.60E+02 | 9.40E+02 | 6.60E+02 | 4.10E+03 | 1.31E+03 | 1.31E+03 | 1.30E+03 | 3.47E+03 | 4.10E+03 |
| 4,4'-DDD | 23 | 38 | 61 | 1.67E+00 | 1.40E+01 | 6.57E+00 | 6.72E+01 | 1.55E+01 | 1.55E+01 | 1.11E+01 | 3.88E+01 | 6.71E+01 |
| 4,4'-DDE | 16 | 38 | 42 | 5.60E-01 | 1.30E+01 | 1.80E+00 | 2.99E+01 | 8.16E+00 | 8.16E+00 | 8.05E+00 | 2.11E+01 | 2.49E+01 |
| 4,4'-DDT | 13 | 38 | 34 | 1.67E+00 | 1.30E+01 | 2.15E+00 | 2.14E+01 | 6.38E+00 | 6.38E+00 | 7.05E+00 | 1.98E+01 | 2.07E+01 |
| 4-Methylphenol | 79 | 102 | 77 | 6.00E+02 | 8.70E+03 | 1.50E+02 | 1.05E+04 | 3.52E+03 | 3.52E+03 | 3.95E+03 | 6.94E+03 | 8.66E+03 |
| Acenaphthene | 5 | 118 | 4 | 3.30E+02 | 2.30E+04 | 8.10E+01 | 2.70E+03 | 7.71E+02 | 7.71E+02 | 9.95E+02 | 1.30E+03 | 5.31E+03 |
| Acenaphthylene | 1 | 118 | 1 | 3.30E+02 | 2.30E+04 | 5.40E+01 | 5.40E+01 | 7.36E+02 | 7.36E+02 | 9.95E+02 | 1.30E+03 | 5.31E+03 |
| Acetone | 15 | 25 | 60 | 5.00E+01 | 2.00E+03 | 7.40E+01 | 1.23E+03 | 3.64E+02 | 3.64E+02 | 2.40E+02 | 1.09E+03 | 1.77E+03 |
| Acetonitrile | 3 | 9 | 33 | 5.00E+01 | 5.00E+01 | 3.03E+02 | 3.73E+03 | 6.60E+02 | 6.60E+02 | 5.00E+01 | 3.73E+03 | 3.73E+03 |
| Aldrin | 6 | 38 | 16 | 5.60E-01 | 1.01E+01 | 1.90E+00 | 1.96E+01 | 4.24E+00 | 4.24E+00 | 6.70E+00 | 1.00E+01 | 1.79E+01 |
| Aluminum | 34 | 34 | 100 | N/A | N/A | 5.73E+03 | 4.73E+04 | 1.72E+04 | 1.72E+04 | 1.29E+04 | 3.33E+04 | 3.79E+04 |
| Anthracene | 10 | 118 | 8 | 3.30E+02 | 2.30E+04 | 1.90E+02 | 3.90E+03 | 7.85E+02 | 7.85E+02 | 1.00E+03 | 1.30E+03 | 5.31E+03 |
| Antimony | 5 | 21 | 24 | 2.50E-01 | 1.59E+01 | 9.90E-01 | 1.40E+00 | 1.84E+00 | 1.84E+00 | 1.00E+00 | 1.28E+01 | 1.56E+01 |
| Aroclor 1254 | 23 | 38 | 61 | 2.90E+01 | 1.60E+02 | 5.90E+01 | 1.76E+03 | 2.58E+02 | 2.58E+02 | 1.27E+02 | 9.60E+02 | 1.12E+03 |
| Aroclor 1260 | 13 | 38 | 34 | 2.76E+01 | 1.60E+02 | 3.52E+01 | 2.14E+02 | 5.63E+01 | 5.63E+01 | 7.00E+01 | 1.41E+02 | 1.63E+02 |
| Arsenic | 48 | 48 | 100 | N/A | N/A | 8.27E+00 | 3.65E+01 | 1.72E+01 | 1.72E+01 | 1.51E+01 | 2.94E+01 | 3.04E+01 |
| Barium | 48 | 60 | 80 | 5.60E-01 | 1.00E+00 | 6.80E+01 | 2.30E+02 | 1.05E+02 | 1.05E+02 | 1.18E+02 | 1.80E+02 | 2.03E+02 |
| Benzene | 4 | 29 | 14 | 5.00E+00 | 9.00E+01 | 3.00E+00 | 2.07E+01 | 1.35E+01 | 1.35E+01 | 1.00E+01 | 8.00E+01 | 9.00E+01 |
| Benzo[a]anthracene | 25 | 106 | 24 | 3.30E+02 | 2.30E+04 | 1.90E+02 | 1.13E+04 | 1.10E+03 | 1.10E+03 | 1.10E+03 | 2.03E+03 | 7.58E+03 |
| Benzo[a]pyrene | 28 | 118 | 24 | 3.30E+02 | 1.90E+04 | 1.80E+02 | 8.30E+03 | 9.22E+02 | 9.22E+02 | 1.05E+03 | 2.20E+03 | 3.21E+03 |
| Benzo[b]fluoranthene | 21 | 113 | 19 | 3.30E+02 | 1.90E+04 | 2.40E+02 | 9.10E+03 | 8.57E+02 | 8.57E+02 | 1.00E+03 | 1.66E+03 | 3.69E+03 |
| Benzo[g,h,i]perylene | 22 | 118 | 19 | 3.30E+02 | 1.90E+04 | 1.50E+01 | 3.60E+03 | 8.27E+02 | 8.27E+02 | 1.00E+03 | 1.71E+03 | 3.13E+03 |
| Benzo[k]fluoranthene | 19 | 118 | 16 | 3.30E+02 | 2.30E+04 | 9.80E+01 | 6.60E+03 | 9.79E+02 | 9.79E+02 | 1.00E+03 | 2.29E+03 | 5.31E+03 |
| Beryllium | 36 | 43 | 84 | 5.00E-02 | 1.30E+00 | 2.13E-01 | 1.58E+00 | 6.86E-01 | 6.86E-01 | 7.07E-01 | 1.27E+00 | 1.46E+00 |
| Cadmium | 39 | 48 | 81 | 1.55E-01 | 1.30E+00 | 3.17E-01 | 1.82E+00 | 8.46E-01 | 8.46E-01 | 8.63E-01 | 1.48E+00 | 1.68E+00 |
| Calcium | 24 | 24 | 100 | N/A | N/A | 2.29E+04 | 2.23E+05 | 1.09E+05 | 1.09E+05 | 1.08E+05 | 2.03E+05 | 2.20E+05 |
| Carbon disulfide | 5 | 25 | 20 | 5.00E+00 | 2.00E+03 | 3.00E+00 | 5.31E+01 | 5.98E+01 | 5.98E+01 | 1.10E+01 | 1.40E+02 | 1.46E+03 |
| Chromium | 48 | 48 | 100 | N/A | N/A | 2.61E+01 | 2.97E+02 | 1.07E+02 | 1.07E+02 | 9.89E+01 | 1.76E+02 | 2.02E+02 |
| Chrysene | 80 | 118 | 68 | 3.30E+02 | 1.90E+04 | 3.90E+02 | 1.10E+04 | 1.79E+03 | 1.79E+03 | 1.30E+03 | 3.57E+03 | 5.57E+03 |
| Cobalt | 8 | 21 | 38 | 2.50E+00 | 1.32E+01 | 2.90E+00 | 1.12E+01 | 4.05E+00 | 4.05E+00 | 5.60E+00 | 1.11E+01 | 1.30E+01 |
| Copper | 48 | 48 | 100 | N/A | N/A | 2.20E+01 | 1.97E+02 | 8.90E+01 | 8.90E+01 | 9.01E+01 | 1.32E+02 | 1.46E+02 |
| Cyanide | 9 | 18 | 50 | 8.00E-01 | 1.30E+00 | 1.40E-01 | 1.45E+00 | 4.83E-01 | 4.83E-01 | 8.00E-01 | 1.32E+00 | 1.45E+00 |
| Dibenz[a,h]anthracene | 7 | 118 | 6 | 3.30E+02 | 2.30E+04 | 6.00E+02 | 1.60E+03 | 7.78E+02 | 7.78E+02 | 1.00E+03 | 1.30E+03 | 5.31E+03 |
| Dieldrin | 4 | 38 | 11 | 2.90E+00 | 1.60E+01 | 1.70E+00 | 8.73E+00 | 3.96E+00 | 3.96E+00 | 7.05E+00 | 1.00E+01 | 1.04E+01 |
| Endosulfan I | 1 | 38 | 3 | 2.70E+00 | 1.01E+01 | 1.00E+01 | 1.00E+01 | 3.77E+00 | 3.77E+00 | 6.90E+00 | 1.00E+01 | 1.00E+01 |

**TABLE 3**
**SEDIMENT - SPECIFIC SUMMARY STATISTICS FOR OTTER CREEK**
**HUMAN HEALTH RISK ASSESSMENT**
**DUCK AND OTTER CREEKS**
**TOLEDO AND OREGON, OHIO**

| Chemical | Number of Samples | | Detection Frequency (Percent) | Censored Data | | Detected Data | | All Data | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Arithmetic Mean[2] | Geometric Mean[2] | Nonparametric Percentiles | | |
| | Detected | Total | | Min | Max | Min | Max | | | 50th | 90th | 95th |
| Endosulfan II | 1 | 38 | 3 | 5.30E+00 | 1.60E+01 | 1.28E+01 | 1.28E+01 | 4.43E+00 | 4.43E+00 | 8.20E+00 | 1.28E+01 | 1.41E+01 |
| Endosulfan sulfate | 2 | 38 | 5 | 5.30E+00 | 6.06E+01 | 3.15E+00 | 1.40E+01 | 7.74E+00 | 7.74E+00 | 9.60E+00 | 5.66E+01 | 6.00E+01 |
| Endrin | 3 | 38 | 8 | 5.30E+00 | 1.60E+01 | 3.13E+00 | 1.25E+01 | 4.44E+00 | 4.44E+00 | 7.75E+00 | 1.26E+01 | 1.41E+01 |
| Endrin aldehyde | 2 | 38 | 5 | 5.30E+00 | 1.82E+01 | 4.85E+00 | 5.60E+00 | 4.85E+00 | 4.85E+00 | 9.00E+00 | 1.70E+01 | 1.80E+01 |
| Endrin ketone | 3 | 9 | 33 | 5.30E+00 | 1.30E+01 | 2.60E+00 | 7.70E+00 | 4.13E+00 | 4.13E+00 | 6.90E+00 | 1.30E+01 | 1.30E+01 |
| Fluoranthene | 42 | 118 | 36 | 3.30E+02 | 8.70E+03 | 4.60E+02 | 1.90E+04 | 1.33E+03 | 1.33E+03 | 1.10E+03 | 3.67E+03 | 5.44E+03 |
| Fluorene | 45 | 118 | 38 | 3.30E+02 | 1.90E+04 | 1.20E+02 | 2.60E+03 | 9.81E+02 | 9.81E+02 | 1.10E+03 | 2.00E+03 | 2.51E+03 |
| Heptachlor epoxide | 2 | 38 | 5 | 2.70E+00 | 1.01E+01 | 2.58E+00 | 3.40E+00 | 3.60E+00 | 3.60E+00 | 6.70E+00 | 1.00E+01 | 1.00E+01 |
| Indeno[1,2,3-cd]pyrene | 17 | 118 | 14 | 3.30E+02 | 2.30E+04 | 1.80E+01 | 3.90E+03 | 8.79E+02 | 8.79E+02 | 1.10E+03 | 1.70E+03 | 3.97E+03 |
| Iron | 39 | 39 | 100 | N/A | N/A | 2.13E+00 | 3.67E+04 | 1.90E+04 | 1.90E+04 | 1.73E+04 | 2.96E+04 | 3.11E+04 |
| Lead | 48 | 48 | 100 | N/A | N/A | 3.00E+01 | 4.85E+03 | 2.09E+02 | 2.09E+02 | 9.80E+01 | 2.11E+02 | 2.54E+02 |
| Magnesium | 24 | 24 | 100 | N/A | N/A | 6.80E+03 | 1.65E+04 | 9.80E+03 | 9.80E+03 | 9.26E+03 | 1.40E+04 | 1.63E+04 |
| Manganese | 24 | 24 | 100 | N/A | N/A | 2.40E+02 | 6.33E+02 | 3.89E+02 | 3.89E+02 | 3.77E+02 | 5.27E+02 | 6.13E+02 |
| Mercury | 40 | 48 | 83 | 1.00E-01 | 4.30E-01 | 6.20E-02 | 6.30E-01 | 2.76E-01 | 2.76E-01 | 2.88E-01 | 4.46E-01 | 5.46E-01 |
| Methoxychlor | 9 | 38 | 24 | 5.50E+00 | 4.50E+01 | 5.60E+00 | 2.10E+01 | 9.08E+00 | 9.08E+00 | 1.00E+01 | 3.07E+01 | 3.69E+01 |
| Methylene chloride | 2 | 33 | 6 | 5.00E+00 | 2.00E+03 | 4.00E+00 | 4.00E+00 | 4.81E+01 | 4.81E+01 | 1.00E+01 | 1.56E+02 | 7.54E+02 |
| Naphthalene | 25 | 118 | 21 | 4.00E+01 | 2.30E+04 | 9.80E+01 | 1.06E+04 | 1.14E+03 | 1.14E+03 | 1.00E+03 | 2.72E+03 | 8.73E+03 |
| Nickel | 43 | 48 | 90 | 1.72E+01 | 3.00E+01 | 1.86E+01 | 1.26E+02 | 3.23E+01 | 3.23E+01 | 2.90E+01 | 5.05E+01 | 6.65E+01 |
| Phenanthrene | 95 | 118 | 81 | 3.30E+02 | 1.90E+04 | 4.00E+02 | 1.10E+04 | 2.65E+03 | 2.65E+03 | 2.30E+03 | 5.60E+03 | 7.66E+03 |
| Phenol | 7 | 118 | 6 | 3.30E+02 | 2.30E+04 | 8.20E+02 | 1.20E+03 | 7.76E+02 | 7.76E+02 | 1.00E+03 | 1.30E+03 | 5.31E+03 |
| Polychlorinated biphenyls | 7 | 10 | 70 | 1.00E+02 | 1.00E+02 | 1.23E+02 | 1.40E+03 | 3.60E+02 | 3.60E+02 | 1.34E+02 | 1.35E+03 | 1.40E+03 |
| Polynuclear aromatic hydrocarbons | 1 | 1 | 100 | N/A | N/A | 4.55E+00 | 4.55E+00 | N/A | N/A | N/A | N/A | N/A |
| Potassium | 23 | 24 | 96 | 1.32E+03 | 1.32E+03 | 4.97E+00 | 9.14E+03 | 3.00E+03 | 3.00E+03 | 1.64E+03 | 7.48E+03 | 8.88E+03 |
| Pyrene | 93 | 118 | 79 | 3.30E+02 | 8.70E+03 | 2.00E+02 | 1.68E+04 | 2.39E+03 | 2.39E+03 | 2.10E+03 | 4.82E+03 | 6.41E+03 |
| Selenium | 36 | 47 | 77 | 5.00E-01 | 2.02E+00 | 1.20E+00 | 8.23E+00 | 2.54E+00 | 2.54E+00 | 2.06E+00 | 5.36E+00 | 6.40E+00 |
| Silver | 8 | 25 | 32 | 2.30E-01 | 2.60E+00 | 2.70E-01 | 8.70E-01 | 4.62E-01 | 4.62E-01 | 5.00E-01 | 2.12E+00 | 2.47E+00 |
| Sodium | 8 | 34 | 24 | 2.53E+02 | 5.06E+03 | 2.09E+02 | 6.19E+02 | 1.00E+03 | 1.00E+03 | 1.06E+03 | 4.19E+03 | 4.94E+03 |
| Strontium | 22 | 22 | 100 | N/A | N/A | 8.90E+01 | 7.87E+02 | 2.82E+02 | 2.82E+02 | 2.47E+02 | 5.02E+02 | 7.51E+02 |
| Sulfide | 9 | 9 | 100 | N/A | N/A | 1.87E+02 | 1.70E+03 | 5.70E+02 | 5.70E+02 | 4.60E+02 | 1.70E+03 | 1.70E+03 |
| Thallium | 1 | 21 | 5 | 2.00E-01 | 2.60E+00 | 1.30E+00 | 1.30E+00 | 5.18E-01 | 5.18E-01 | 1.10E+00 | 2.14E+00 | 2.56E+00 |
| Tin | 9 | 9 | 100 | N/A | N/A | 3.70E+00 | 1.30E+01 | 6.48E+00 | 6.48E+00 | 5.10E+00 | 1.30E+01 | 1.30E+01 |
| Toluene | 9 | 33 | 27 | 5.00E+00 | 2.00E+03 | 5.68E+00 | 3.00E+02 | 6.04E+01 | 6.04E+01 | 2.30E+01 | 2.00E+02 | 8.10E+02 |
| Vanadium | 20 | 21 | 95 | 1.25E+00 | 1.25E+00 | 1.70E+01 | 3.95E+01 | 2.43E+01 | 2.43E+01 | 2.27E+01 | 3.90E+01 | 3.95E+01 |
| Vinyl acetate | 1 | 13 | 8 | 1.00E+01 | 1.00E+02 | 1.06E+01 | 1.06E+01 | 1.93E+01 | 1.93E+01 | 1.00E+01 | 1.00E+02 | 1.00E+02 |
| Xylenes | 1 | 21 | 5 | 5.00E+00 | 2.00E+03 | 1.05E+01 | 1.05E+01 | 6.22E+01 | 6.22E+01 | 1.00E+01 | 2.00E+02 | 1.82E+03 |
| Zinc | 48 | 48 | 100 | N/A | N/A | 8.10E+01 | 3.81E+02 | 1.97E+02 | 1.97E+02 | 1.82E+02 | 3.12E+02 | 3.33E+02 |
| alpha-Chlordane | 7 | 29 | 24 | 2.70E+00 | 1.01E+01 | 2.28E+00 | 1.61E+01 | 4.07E+00 | 4.07E+00 | 6.20E+00 | 9.90E+00 | 1.31E+01 |
| bis(2-Ethylhexyl)phthalate | 45 | 118 | 38 | 3.30E+02 | 2.30E+04 | 2.10E+02 | 7.10E+04 | 1.75E+03 | 1.75E+03 | 1.10E+03 | 2.03E+03 | 5.31E+03 |
| delta-BHC | 1 | 38 | 3 | 2.70E+00 | 1.01E+01 | 6.33E+00 | 6.33E+00 | 3.70E+00 | 3.70E+00 | 6.90E+00 | 1.00E+01 | 1.00E+01 |
| gamma-Chlordane | 9 | 29 | 31 | 2.70E+00 | 1.01E+01 | 2.00E+00 | 2.59E+01 | 5.02E+00 | 5.02E+00 | 5.60E+00 | 1.44E+01 | 2.09E+01 |

**Notes:** Units are milligrams per kilogram for metals and micrograms per kilogram for other chemicals.
One-half the detection limit was substituted for censored (nondetect) measurements in calculations of the mean and percentiles

Min — Minimum concentration
Max — Maximum concentration
N/A — Not applicable

**TABLE 4**
**SURFACE WATER - SPECIFIC SUMMARY STATISTICS**
**FOR DUCK AND OTTER CREEKS COMBINED**
**HUMAN HEALTH RISK ASSESSMENT**
**DUCK AND OTTER CREEKS**
**TOLEDO AND OREGON, OHIO**

| Analyte Group | Chemical | Distribution[1] | Number of Samples | | Detection Frequency (Percent) | Censored Data | | Detected Data | | All Data | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Arithmetic Mean | Geometric Mean | Nonparametric Percentiles | | |
| | | | Detected | Total | | Min | Max | Min | Max | | | 50th | 90th | 95th |
| Metals | Aluminum | Gamma | 37 | 46 | 80 | 1.00E-01 | 2.00E-01 | 1.00E-02 | 3.88E+00 | 9.17E-01 | 4.76E-01 | 5.25E-01 | 2.70E+00 | 3.50E+00 |
| | Antimony | Not Tested | 1 | 22 | 5 | 5.00E-03 | 1.00E-01 | 1.20E-02 | 1.20E-02 | 1.16E-02 | 4.63E-03 | 2.50E-03 | 5.00E-02 | 5.00E-02 |
| | Arsenic | Not Tested | 39 | 120 | 32 | 1.00E-03 | 2.00E-01 | 2.00E-03 | 3.30E-02 | 8.04E-03 | 2.09E-03 | 1.00E-03 | 1.80E-02 | 2.98E-02 |
| | Barium | Nonparametric | 55 | 73 | 75 | 1.00E-02 | 5.00E-02 | 1.00E-02 | 2.39E-01 | 4.41E-02 | 3.27E-02 | 3.60E-02 | 8.64E-02 | 1.01E-01 |
| | Beryllium | Not Tested | 1 | 75 | 1 | 2.00E-04 | 2.00E-03 | 1.20E-03 | 1.20E-03 | 2.64E-04 | 1.76E-04 | 1.00E-04 | 5.00E-04 | 1.00E-03 |
| | Cadmium | Not Tested | 4 | 187 | 2 | 2.00E-04 | 5.00E-03 | 2.00E-04 | 1.30E-02 | 4.41E-04 | 1.82E-04 | 1.00E-04 | 1.00E-03 | 2.50E-03 |
| | Calcium | Normal | 42 | 42 | 100 | N/A | N/A | 2.40E+01 | 1.14E+02 | 6.24E+01 | 5.80E+01 | 6.65E+01 | 8.66E+01 | 1.02E+02 |
| | Chromium | Not Tested | 14 | 187 | 7 | 5.00E-04 | 3.00E-02 | 1.00E-03 | 8.05E-02 | 8.92E-03 | 7.01E-03 | 5.00E-03 | 1.50E-02 | 1.50E-02 |
| | Copper | Not Tested | 20 | 186 | 11 | 5.00E-03 | 2.50E-02 | 1.00E-03 | 5.50E-02 | 6.99E-03 | 5.92E-03 | 5.00E-03 | 1.25E-02 | 1.25E-02 |
| | Iron | Nonparametric | 59 | 76 | 78 | 1.00E-04 | 1.00E-04 | 1.10E-04 | 2.18E+01 | 1.30E+00 | 6.07E-02 | 5.94E-01 | 2.97E+00 | 4.66E+00 |
| | Lead | Not Tested | 42 | 183 | 23 | 1.00E-03 | 5.00E-02 | 1.00E-03 | 3.20E-01 | 5.19E-03 | 2.25E-03 | 1.50E-03 | 7.00E-03 | 2.25E-02 |
| | Magnesium | Gamma | 42 | 42 | 100 | N/A | N/A | 8.00E+00 | 4.00E+01 | 1.88E+01 | 1.70E+01 | 1.85E+01 | 3.14E+01 | 3.93E+01 |
| | Manganese | Not Tested | 4 | 4 | 100 | N/A | N/A | 9.00E-03 | 1.39E-01 | 5.78E-02 | 3.32E-02 | 4.15E-02 | 1.39E-01 | 1.39E-01 |
| | Mercury | Not Tested | 6 | 194 | 3 | 2.00E-05 | 2.00E-04 | 2.00E-04 | 2.17E-02 | 2.19E-04 | 1.05E-04 | 1.00E-04 | 1.00E-04 | 1.00E-04 |
| | Nickel | Not Tested | 24 | 131 | 18 | 1.00E-03 | 4.00E-02 | 1.00E-03 | 5.50E-02 | 1.25E-02 | 8.89E-03 | 1.25E-02 | 2.00E-02 | 2.00E-02 |
| | Potassium | Not Tested | 4 | 4 | 100 | N/A | N/A | 5.88E+00 | 1.46E+01 | 1.06E+01 | 9.87E+00 | 1.09E+01 | 1.46E+01 | 1.46E+01 |
| | Selenium | Not Tested | 21 | 154 | 14 | 2.00E-03 | 1.00E-01 | 2.00E-03 | 7.00E-02 | 4.45E-03 | 2.43E-03 | 2.50E-03 | 4.50E-03 | 1.53E-02 |
| | Sodium | Gamma | 42 | 42 | 100 | N/A | N/A | 1.50E+01 | 1.59E+02 | 6.33E+01 | 5.16E+01 | 4.90E+01 | 1.27E+02 | 1.42E+02 |
| | Tin | Not Tested | 1 | 19 | 5 | 1.00E-02 | 1.40E-02 | 1.20E-02 | 1.20E-02 | 5.77E-03 | 5.62E-03 | 5.00E-03 | 7.00E-03 | 1.20E-02 |
| | Vanadium | Not Tested | 1 | 23 | 4 | 1.00E-02 | 5.00E-02 | 1.65E-02 | 1.65E-02 | 2.20E-02 | 1.99E-02 | 2.50E-02 | 2.50E-02 | 2.50E-02 |
| | Zinc | Not Tested | 65 | 174 | 37 | 1.00E-05 | 3.10E-02 | 1.00E-05 | 1.98E-01 | 1.66E-02 | 5.43E-03 | 5.00E-03 | 4.25E-02 | 6.68E-02 |
| Organic Constituents | 2,4-D | Normal | 8 | 9 | 89 | 3.78E-01 | 3.78E-01 | 3.97E-01 | 1.40E+00 | 8.96E-01 | 7.68E-01 | 8.83E-01 | 1.40E+00 | 1.40E+00 |
| | 4,4'-DDD | Not Tested | 1 | 24 | 4 | 6.00E-03 | 1.00E-01 | 6.00E-03 | 6.00E-03 | 2.86E-02 | 1.42E-02 | 5.00E-02 | 5.00E-02 | 5.00E-02 |
| | 4,4'-DDE | Not Tested | 5 | 24 | 21 | 2.00E-03 | 1.00E-01 | 2.00E-03 | 1.30E-02 | 2.85E-02 | 1.12E-02 | 5.00E-02 | 5.00E-02 | 5.00E-02 |
| | 4,4'-DDT | Not Tested | 4 | 24 | 17 | 6.00E-03 | 1.00E-01 | 7.00E-03 | 1.10E-02 | 2.95E-02 | 1.66E-02 | 5.00E-02 | 5.00E-02 | 5.00E-02 |
| | Acetone | Not Tested | 1 | 19 | 5 | 1.00E+01 | 1.00E+01 | 1.14E+01 | 1.14E+01 | 5.34E+00 | 5.22E+00 | 5.00E+00 | 5.00E+00 | 1.14E+01 |
| | Aldrin | Not Tested | 1 | 24 | 4 | 2.00E-03 | 1.00E-01 | 1.00E-02 | 1.00E-02 | 2.38E-02 | 8.16E-03 | 2.50E-02 | 5.00E-02 | 5.00E-02 |
| | Bromodichloromethane | Not Tested | 1 | 30 | 3 | 5.00E-01 | 5.00E+00 | 1.10E+00 | 1.10E+00 | 7.03E-01 | 5.05E-01 | 5.00E-01 | 2.50E+00 | 2.50E+00 |
| | Chloroform | Not Tested | 4 | 30 | 13 | 5.00E-01 | 5.00E+00 | 1.00E+00 | 2.90E+00 | 8.68E-01 | 6.13E-01 | 5.00E-01 | 2.50E+00 | 2.68E+00 |
| | Cyanide | Not Tested | 6 | 19 | 32 | 5.00E-03 | 1.00E-02 | 6.00E-03 | 1.80E-02 | 6.63E-03 | 5.52E-03 | 5.00E-03 | 1.50E-02 | 1.80E-02 |
| | Dieldrin | Not Tested | 3 | 24 | 12 | 2.00E-03 | 1.00E-01 | 6.00E-03 | 9.00E-03 | 2.84E-02 | 1.07E-02 | 5.00E-02 | 5.00E-02 | 5.00E-02 |
| | Endosulfan I | Not Tested | 7 | 24 | 29 | 2.00E-03 | 1.00E-01 | 2.00E-03 | 2.00E-02 | 2.47E-02 | 1.11E-02 | 2.50E-02 | 5.00E-02 | 5.00E-02 |
| | Endosulfan II | Not Tested | 8 | 24 | 33 | 2.00E-03 | 1.00E-01 | 2.00E-03 | 9.00E-03 | 2.92E-02 | 1.43E-02 | 5.00E-02 | 5.00E-02 | 5.00E-02 |
| | Endosulfan sulfate | Not Tested | 1 | 24 | 4 | 2.00E-02 | 1.00E-01 | 2.40E-02 | 2.40E-02 | 3.23E-02 | 2.48E-02 | 5.00E-02 | 5.00E-02 | 5.00E-02 |
| | Endrin | Not Tested | 3 | 24 | 12 | 2.00E-03 | 1.00E-01 | 5.00E-03 | 1.40E-02 | 2.85E-02 | 1.08E-02 | 5.00E-02 | 5.00E-02 | 5.00E-02 |
| | Endrin aldehyde | Not Tested | 2 | 24 | 8 | 6.00E-03 | 1.00E-01 | 8.00E-03 | 1.00E-02 | 2.90E-02 | 1.51E-02 | 5.00E-02 | 5.00E-02 | 5.00E-02 |
| | Ethylbenzene | Not Tested | 1 | 116 | 1 | 5.00E-01 | 5.00E+00 | 1.00E+00 | 1.00E+00 | 5.37E-01 | 4.80E-01 | 5.00E-01 | 5.00E-01 | 5.75E-01 |
| | Heptachlor | Not Tested | 3 | 24 | 12 | 2.00E-03 | 1.00E-01 | 2.00E-03 | 6.00E-03 | 2.37E-02 | 8.46E-03 | 2.50E-02 | 5.00E-02 | 5.00E-02 |
| | Heptachlor epoxide | Not Tested | 5 | 24 | 21 | 2.00E-03 | 1.00E-01 | 2.00E-03 | 9.00E-03 | 2.44E-02 | 1.05E-02 | 2.50E-02 | 5.00E-02 | 5.00E-02 |
| | Phenolics | Nonparametric | 5 | 10 | 50 | 1.00E+01 | 1.00E+01 | 1.10E+01 | 3.30E+01 | 1.20E+01 | 9.35E+00 | 8.00E+00 | 3.19E+01 | 3.30E+01 |
| | Toluene | Not Tested | 1 | 116 | 1 | 5.00E-01 | 5.00E+00 | 1.00E+00 | 1.00E+00 | 5.37E-01 | 4.80E-01 | 5.00E-01 | 5.00E-01 | 5.75E-01 |
| | alpha-BHC | Not Tested | 2 | 24 | 8 | 2.00E-03 | 1.00E-01 | 4.00E-03 | 9.00E-03 | 2.38E-02 | 8.61E-03 | 2.50E-02 | 5.00E-02 | 5.00E-02 |
| | delta-BHC | Not Tested | 4 | 24 | 17 | 2.00E-03 | 1.00E-01 | 2.00E-03 | 2.00E-02 | 2.43E-02 | 9.32E-03 | 2.50E-02 | 5.00E-02 | 5.00E-02 |
| | gamma-BHC | Not Tested | 1 | 24 | 4 | 2.00E-03 | 1.00E-01 | 6.00E-03 | 6.00E-03 | 2.36E-02 | 7.99E-03 | 2.50E-02 | 5.00E-02 | 5.00E-02 |

**Notes:** Units are mg/l for metals and cyanide, and µg/l for all other constituents
One-half the detection limit was substituted for censored (nondetect) measurements in calculations of the mean and percentiles
1 Tested for all chemicals with at least 5 samples and detection frequencies greater than or equal to 50 percent using the Shapiro-Wilk W test (a 5 percent level of significance was used for all tests).
Min Minimum concentration
Max Maximum concentration
mg/l Milligrams per liter
µg/l Micrograms per liter
N/A Not applicable

**References**


U.S. Environmental Protection Agency (EPA). 2002. "Calculating exposure point concentrations at hazardous waste sites." OSWER 9285.6-10. Office of Emergency and Remedial Response. Washington, DC. December.

EPA. 2004a. "ProUCL Version 3.0 User Guide." Prepared by Singh, A., Singh, A.K. and R.W. Maichle for the U.S. Environmental Protection Agency, Technical Support Center, Las Vegas, NV. April.

**TABLE 5**
**SEDIMENT SPECIFIC SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS**
**FOR INDIVIDUAL REACHES OF DUCK CREEK**
**HUMAN HEALTH RISK ASSESSMENT**
**DUCK AND OTTER CREEKS**
**TOLEDO AND OREGON**

| Stream Reach | Chemical | Distribution[1] | Number of Samples | | Detection Frequency (Percent) | Censored Data | | Detected Data | | All Data | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Detected | Total | | Min | Max | Min | Max | Arithmetic Mean | Geometric Mean | Nonparametric Percentiles 50th | 90th | 95th | UCL[2] | EPC |
| | 4,4'-DDD | Not Tested | 1 | 2 | 50 | 5.00E+03 | 5.00E+03 | 6.74E+01 | 6.74E+01 | 1.28E+03 | 1.28E+03 | 2.53E+03 | 5.00E+03 | 5.00E+03 | N/A | 6.74E+01 |
| | 4,4'-DDE | Not Tested | 1 | 2 | 50 | 5.00E+03 | 5.00E+03 | 4.42E+01 | 4.42E+01 | 1.27E+03 | 1.27E+03 | 2.52E+03 | 5.00E+03 | 5.00E+03 | N/A | 4.42E+01 |
| | Aluminum | Not Tested | 1 | 1 | 100 | N/A | N/A | 2.49E+04 | 2.49E+04 | N/A | N/A | N/A | N/A | N/A | N/A | 2.49E+04 |
| | Arsenic | Not Tested | 1 | 1 | 100 | N/A | N/A | 3.68E+01 | 3.68E+01 | N/A | N/A | N/A | N/A | N/A | N/A | 3.68E+01 |
| | Barium | Not Tested | 1 | 2 | 50 | 9.00E-01 | 9.00E-01 | 1.60E+02 | 1.60E+02 | 8.02E+01 | 8.02E+01 | 8.05E+01 | 1.60E+02 | 1.60E+02 | N/A | 1.60E+02 |
| | Benzo[a]pyrene | Not Tested | 1 | 2 | 50 | 5.00E+03 | 5.00E+03 | 2.20E+03 | 2.20E+03 | 2.35E+03 | 2.35E+03 | 3.60E+03 | 5.00E+03 | 5.00E+03 | N/A | 2.20E+03 |
| | Benzo[b]fluoranthene | Not Tested | 1 | 1 | 100 | N/A | N/A | 2.10E+03 | 2.10E+03 | N/A | N/A | N/A | N/A | N/A | N/A | 2.10E+03 |
| | Benzo[g,h,i]perylene | Not Tested | 1 | 1 | 100 | N/A | N/A | 1.70E+03 | 1.70E+03 | N/A | N/A | N/A | N/A | N/A | N/A | 1.70E+03 |
| | Benzo[k]fluoranthene | Not Tested | 2 | 2 | 100 | N/A | N/A | 2.00E+03 | 4.40E+04 | 2.30E+04 | 2.30E+04 | 2.30E+04 | 4.40E+04 | 4.40E+04 | N/A | 4.40E+04 |
| | Beryllium | Not Tested | 1 | 1 | 100 | N/A | N/A | 1.63E+00 | 1.63E+00 | N/A | N/A | N/A | N/A | N/A | N/A | 1.63E+00 |
| | Cadmium | Not Tested | 1 | 1 | 100 | N/A | N/A | 9.08E-01 | 9.08E-01 | N/A | N/A | N/A | N/A | N/A | N/A | 9.08E-01 |
| | Calcium | Not Tested | 1 | 1 | 100 | N/A | N/A | 4.47E+04 | 4.47E+04 | N/A | N/A | N/A | N/A | N/A | N/A | 4.47E+04 |
| | Chromium | Not Tested | 1 | 1 | 100 | N/A | N/A | 4.00E+01 | 4.00E+01 | N/A | N/A | N/A | N/A | N/A | N/A | 4.00E+01 |
| | Chrysene | Not Tested | 2 | 2 | 100 | N/A | N/A | 2.10E+03 | 2.80E+04 | 1.51E+04 | 1.51E+04 | 1.51E+04 | 2.80E+04 | 2.80E+04 | N/A | 2.80E+04 |
| DC-1 | Copper | Not Tested | 1 | 1 | 100 | N/A | N/A | 4.18E+01 | 4.18E+01 | N/A | N/A | N/A | N/A | N/A | N/A | 4.18E+01 |
| | Fluoranthene | Not Tested | 2 | 2 | 100 | N/A | N/A | 4.60E+03 | 5.90E+04 | 3.18E+04 | 3.18E+04 | 3.18E+04 | 5.90E+04 | 5.90E+04 | N/A | 5.90E+04 |
| | Indeno[1,2,3-cd]pyrene | Not Tested | 1 | 1 | 100 | N/A | N/A | 1.70E+03 | 1.70E+03 | N/A | N/A | N/A | N/A | N/A | N/A | 1.70E+03 |
| | Iron | Not Tested | 1 | 1 | 100 | N/A | N/A | 2.58E+04 | 2.58E+04 | N/A | N/A | N/A | N/A | N/A | N/A | 2.58E+04 |
| | Lead | Not Tested | 1 | 1 | 100 | N/A | N/A | 8.20E+01 | 8.20E+01 | N/A | N/A | N/A | N/A | N/A | N/A | 8.20E+01 |
| | Magnesium | Not Tested | 1 | 1 | 100 | N/A | N/A | 1.01E+04 | 1.01E+04 | N/A | N/A | N/A | N/A | N/A | N/A | 1.01E+04 |
| | Manganese | Not Tested | 1 | 1 | 100 | N/A | N/A | 5.04E+02 | 5.04E+02 | N/A | N/A | N/A | N/A | N/A | N/A | 5.04E+02 |
| | Mercury | Not Tested | 1 | 1 | 100 | N/A | N/A | 1.01E-01 | 1.01E-01 | N/A | N/A | N/A | N/A | N/A | N/A | 1.01E-01 |
| | Nickel | Not Tested | 1 | 1 | 100 | N/A | N/A | 3.30E+01 | 3.30E+01 | N/A | N/A | N/A | N/A | N/A | N/A | 3.30E+01 |
| | Phenanthrene | Not Tested | 2 | 2 | 100 | N/A | N/A | 1.20E+03 | 2.00E+04 | 1.06E+04 | 1.06E+04 | 1.06E+04 | 2.00E+04 | 2.00E+04 | N/A | 2.00E+04 |
| | Potassium | Not Tested | 1 | 1 | 100 | N/A | N/A | 5.76E+03 | 5.76E+03 | N/A | N/A | N/A | N/A | N/A | N/A | 5.76E+03 |
| | Pyrene | Not Tested | 1 | 2 | 50 | 5.00E+03 | 5.00E+03 | 3.80E+03 | 3.80E+03 | 3.15E+03 | 3.15E+03 | 4.40E+03 | 5.00E+03 | 5.00E+03 | N/A | 3.80E+03 |
| | Selenium | Not Tested | 1 | 1 | 100 | N/A | N/A | 3.82E+00 | 3.82E+00 | N/A | N/A | N/A | N/A | N/A | N/A | 3.82E+00 |
| | Strontium | Not Tested | 1 | 1 | 100 | N/A | N/A | 1.59E+02 | 1.59E+02 | N/A | N/A | N/A | N/A | N/A | N/A | 1.59E+02 |
| | Zinc | Not Tested | 1 | 1 | 100 | N/A | N/A | 1.79E+02 | 1.79E+02 | N/A | N/A | N/A | N/A | N/A | N/A | 1.79E+02 |
| | 2-Butanone | Not Tested | 2 | 8 | 25 | 1.00E+01 | 1.00E+02 | 1.30E+01 | 1.12E+02 | 2.49E+01 | 2.49E+01 | 1.00E+01 | 1.12E+02 | 1.12E+02 | 1.01E+02 | 1.01E+02 |
| | 2-Methylnaphthalene | Not Tested | 2 | 10 | 20 | 3.30E+02 | 7.90E+02 | 3.40E+01 | 7.80E+01 | 2.03E+02 | 2.03E+02 | 3.30E+02 | 7.81E+02 | 7.90E+02 | 5.98E+02 | 7.80E+01 |
| | 3 & 4-Methylphenol | Not Tested | 1 | 10 | 10 | 3.30E+02 | 7.90E+02 | 4.20E+01 | 4.20E+01 | 2.13E+02 | 2.13E+02 | 3.30E+02 | 7.81E+02 | 7.90E+02 | 5.91E+02 | 4.20E+01 |
| | 4,4'-DDD | Gamma | 9 | 10 | 90 | 3.30E+01 | 3.30E+01 | 1.40E+01 | 2.20E+03 | 4.56E+02 | 4.56E+02 | 1.85E+02 | 2.05E+03 | 2.20E+03 | 1.20E+03 | 1.20E+03 |
| | 4,4'-DDE | Normal | 9 | 10 | 90 | 3.30E+01 | 3.30E+01 | 1.40E+01 | 4.80E+02 | 1.50E+02 | 1.50E+02 | 1.15E+02 | 4.58E+02 | 4.80E+02 | 2.34E+02 | 2.34E+02 |
| | 4,4'-DDT | Normal | 9 | 10 | 90 | 3.30E+01 | 3.30E+01 | 9.20E+00 | 6.94E+01 | 4.31E+01 | 4.31E+01 | 4.65E+01 | 6.88E+01 | 6.94E+01 | 5.44E+01 | 5.44E+01 |
| | Acenaphthene | Not Tested | 2 | 11 | 18 | 3.30E+02 | 7.90E+02 | 2.70E+01 | 2.60E+02 | 2.16E+02 | 2.16E+02 | 3.30E+02 | 7.72E+02 | 7.90E+02 | 5.66E+02 | 2.60E+02 |
| | Acenaphthylene | Not Tested | 2 | 11 | 18 | 3.30E+02 | 7.90E+02 | 1.80E+01 | 4.10E+01 | 1.95E+02 | 1.95E+02 | 3.30E+02 | 7.72E+02 | 7.90E+02 | 5.55E+02 | 4.10E+01 |
| | Acetone | Not Tested | 2 | 8 | 25 | 1.00E+01 | 1.00E+02 | 1.20E+02 | 2.25E+02 | 5.63E+01 | 5.63E+01 | 4.00E+01 | 2.25E+02 | 2.25E+02 | 1.85E+02 | 1.85E+02 |
| | Aldrin | Not Tested | 1 | 10 | 10 | 1.60E+00 | 1.60E+01 | 9.10E+00 | 9.10E+00 | 3.91E+00 | 3.91E+00 | 6.85E+00 | 1.60E+01 | 1.60E+01 | 1.24E+01 | 9.10E+00 |
| | Aluminum | Lognormal | 10 | 10 | 100 | N/A | N/A | 2.27E+03 | 3.69E+04 | 1.09E+04 | 1.09E+04 | 5.37E+03 | 3.53E+04 | 3.69E+04 | 2.42E+04 | 2.42E+04 |
| | Anthracene | Not Tested | 4 | 11 | 36 | 3.30E+01 | 7.00E+02 | 3.30E+01 | 1.30E+03 | 4.08E+02 | 4.08E+02 | 3.30E+02 | 1.26E+03 | 1.30E+03 | 1.01E+03 | 1.01E+03 |
| | Arsenic | Normal | 10 | 11 | 91 | 2.00E+01 | 2.00E+01 | 8.06E+00 | 7.20E+01 | 2.61E+01 | 2.61E+01 | 2.05E+01 | 6.62E+01 | 7.20E+01 | 3.64E+01 | 3.64E+01 |
| | Barium | Normal | 11 | 14 | 79 | 7.00E-01 | 7.90E-01 | 3.49E+01 | 2.26E+02 | 8.52E+01 | 8.52E+01 | 8.56E+01 | 1.83E+02 | 2.26E+02 | 1.15E+02 | 1.15E+02 |
| | Benzo[a]anthracene | Gamma | 5 | 8 | 62 | 3.30E+02 | 3.30E+02 | 5.60E+01 | 3.10E+03 | 6.74E+02 | 6.74E+02 | 3.30E+02 | 3.10E+03 | 3.10E+03 | 3.27E+03 | 3.10E+03 |
| | Benzo[a]pyrene | Gamma | 8 | 11 | 73 | 3.30E+02 | 3.30E+02 | 5.40E+01 | 5.50E+03 | 1.19E+03 | 1.19E+03 | 4.40E+02 | 4.96E+03 | 5.50E+03 | 7.00E+03 | 5.50E+03 |
| | Benzo[b]fluoranthene | Gamma | 7 | 11 | 64 | 3.30E+02 | 3.30E+02 | 7.20E+01 | 4.60E+03 | 1.31E+03 | 1.31E+03 | 7.50E+02 | 4.50E+03 | 4.60E+03 | 9.74E+03 | 4.60E+03 |
| | Benzo[g,h,i]perylene | Lognormal | 6 | 11 | 55 | 3.30E+02 | 3.30E+02 | 4.60E+01 | 3.70E+03 | 6.86E+02 | 6.86E+02 | 3.30E+02 | 3.24E+03 | 3.70E+03 | 3.74E+03 | 3.70E+03 |
| | Benzo[k]fluoranthene | Lognormal | 6 | 11 | 55 | 3.30E+02 | 3.30E+02 | 5.50E+01 | 4.90E+03 | 9.35E+02 | 9.35E+02 | 3.30E+02 | 4.24E+03 | 4.90E+03 | 5.40E+03 | 4.90E+03 |
| | Benzoic acid | Not Tested | 2 | 7 | 29 | 1.60E+03 | 1.70E+03 | 1.60E+02 | 1.70E+02 | 6.40E+02 | 6.40E+02 | 1.60E+03 | 1.70E+03 | 1.70E+03 | 1.93E+03 | 1.70E+02 |
| | Beryllium | Gamma | 10 | 10 | 100 | N/A | N/A | 3.30E-01 | 3.57E+00 | 1.08E+00 | 1.08E+00 | 9.70E-01 | 3.34E+00 | 3.57E+00 | 1.75E+00 | 1.75E+00 |
| | Cadmium | Not Tested | 5 | 11 | 45 | 5.00E-01 | 1.01E+00 | 2.90E-01 | 9.72E-01 | 4.42E-01 | 4.42E-01 | 5.00E-01 | 1.00E+00 | 1.01E+00 | 9.00E-01 | 9.00E-01 |
| | Calcium | Gamma | 10 | 10 | 100 | N/A | N/A | 1.00E+04 | 6.88E+04 | 2.98E+04 | 2.98E+04 | 1.92E+04 | 6.77E+04 | 6.88E+04 | 4.44E+04 | 4.44E+04 |
| | Chromium | Normal | 11 | 11 | 100 | N/A | N/A | 5.90E+00 | 4.90E+01 | 2.05E+01 | 2.05E+01 | 1.57E+01 | 4.73E+01 | 4.90E+01 | 2.81E+01 | 2.81E+01 |
| | Chrysene | Gamma | 7 | 11 | 64 | 3.30E+02 | 3.30E+02 | 6.50E+01 | 5.10E+03 | 1.27E+03 | 1.27E+03 | 5.50E+02 | 4.68E+03 | 5.10E+03 | 8.22E+03 | 5.10E+03 |
| | Cobalt | Normal | 7 | 7 | 100 | N/A | N/A | 2.40E+00 | 8.40E+00 | 5.58E+00 | 5.58E+00 | 4.65E+00 | 8.40E+00 | 8.40E+00 | 7.27E+00 | 7.27E+00 |
| | Copper | Normal | 11 | 11 | 100 | N/A | N/A | 1.02E+01 | 3.79E+01 | 2.29E+01 | 2.29E+01 | 2.17E+01 | 3.68E+01 | 3.79E+01 | 2.75E+01 | 2.75E+01 |
| | Cyanide | Not Tested | 1 | 7 | 14 | 1.00E+00 | 1.00E+00 | 1.00E+00 | 1.00E+00 | 5.71E-01 | 5.71E-01 | 1.00E+00 | 1.00E+00 | 1.00E+00 | 1.26E+00 | 1.00E+00 |
| | Dibenz[a,h]anthracene | Not Tested | 1 | 11 | 9 | 3.30E+02 | 7.00E+02 | 1.00E+03 | 1.00E+03 | 2.75E+02 | 2.75E+02 | 3.30E+02 | 9.40E+02 | 1.00E+03 | 7.15E+02 | 7.15E+02 |
| DC-2 | Dibenzofuran | Not Tested | 2 | 10 | 20 | 3.30E+02 | 7.90E+02 | 2.80E+01 | 2.00E+02 | 2.15E+02 | 2.15E+02 | 3.30E+02 | 7.81E+02 | 7.90E+02 | 5.96E+02 | 2.00E+02 |
| | Endrin ketone | Not Tested | 2 | 7 | 29 | 3.30E+00 | 3.30E+01 | 3.60E-01 | 2.50E+00 | 5.83E+00 | 5.83E+00 | 3.30E+00 | 3.30E+01 | 3.30E+01 | 2.97E+01 | 2.50E+00 |
| | Fluoranthene | Gamma | 10 | 11 | 91 | 3.30E+02 | 3.30E+02 | 6.70E+01 | 9.80E+03 | 2.64E+03 | 2.64E+03 | 9.70E+02 | 9.46E+03 | 9.80E+03 | 6.30E+03 | 6.30E+03 |
| | Fluorene | Not Tested | 2 | 11 | 18 | 3.30E+02 | 7.90E+02 | 2.20E+01 | 3.80E+02 | 2.26E+02 | 2.26E+02 | 3.30E+02 | 7.72E+02 | 7.90E+02 | 5.79E+02 | 3.80E+02 |
| | Heptachlor epoxide | Not Tested | 1 | 10 | 10 | 1.60E+00 | 1.60E+01 | 1.40E+00 | 1.40E+00 | 3.14E+00 | 3.14E+00 | 4.10E+00 | 1.60E+01 | 1.60E+01 | 1.13E+01 | 1.40E+00 |
| | Indeno[1,2,3-cd]pyrene | Lognormal | 6 | 11 | 55 | 3.30E+02 | 3.30E+02 | 5.80E+01 | 4.00E+03 | 7.41E+02 | 7.41E+02 | 3.30E+02 | 3.46E+03 | 4.00E+03 | 3.81E+03 | 3.81E+03 |
| | Iron | Gamma | 11 | 11 | 100 | N/A | N/A | 5.07E+03 | 3.07E+04 | 1.44E+04 | 1.44E+04 | 1.12E+04 | 2.98E+04 | 3.07E+04 | 1.97E+04 | 1.97E+04 |
| | Lead | Gamma | 11 | 11 | 100 | N/A | N/A | 1.13E+01 | 6.50E+01 | 2.78E+01 | 2.78E+01 | 2.08E+01 | 6.32E+01 | 6.50E+01 | 4.04E+01 | 4.04E+01 |
| | Magnesium | Gamma | 10 | 10 | 100 | N/A | N/A | 2.30E+03 | 1.66E+04 | 6.54E+03 | 6.54E+03 | 4.29E+03 | 1.60E+04 | 1.66E+04 | 9.83E+03 | 9.83E+03 |
| | Manganese | Normal | 10 | 10 | 100 | N/A | N/A | 1.16E+02 | 4.70E+02 | 2.43E+02 | 2.43E+02 | 1.92E+02 | 4.64E+02 | 4.70E+02 | 3.20E+02 | 3.20E+02 |
| | Mercury | Not Tested | 4 | 10 | 40 | 8.00E-02 | 1.00E-01 | 4.00E-02 | 9.80E-02 | 5.36E-02 | 5.36E-02 | 8.00E-02 | 9.98E-02 | 1.00E-01 | 1.02E-01 | 9.80E-02 |
| | Methoxychlor | Not Tested | 1 | 10 | 10 | 6.60E+00 | 1.60E+02 | 3.10E+00 | 3.10E+00 | 2.06E+01 | 2.06E+01 | 1.60E+01 | 1.60E+02 | 1.60E+02 | 1.08E+02 | 3.10E+00 |
| | Methylene chloride | Not Tested | 1 | 8 | 12 | 2.00E+00 | 1.30E+01 | 4.18E+01 | 4.18E+01 | 8.04E+00 | 8.04E+00 | 5.00E+00 | 4.18E+01 | 4.18E+01 | 3.03E+01 | 3.03E+01 |
| | Naphthalene | Not Tested | 2 | 11 | 18 | 3.30E+02 | 7.90E+02 | 1.50E+01 | 7.60E+01 | 1.98E+02 | 1.98E+02 | 3.30E+02 | 7.72E+02 | 7.90E+02 | 5.58E+02 | 7.60E+01 |
| | Nickel | Normal | 10 | 11 | 91 | 2.80E+01 | 2.80E+01 | 6.00E+00 | 4.21E+01 | 2.09E+01 | 2.09E+01 | 1.79E+01 | 4.01E+01 | 4.21E+01 | 2.71E+01 | 2.71E+01 |
| | Phenanthrene | Gamma | 6 | 11 | 55 | 4.50E+01 | 3.30E+02 | 4.10E+02 | 3.70E+03 | 1.13E+03 | 1.13E+03 | 4.10E+02 | 3.68E+03 | 3.70E+03 | 1.04E+04 | 3.70E+03 |
| | Potassium | Lognormal | 11 | 11 | 100 | N/A | N/A | 3.64E+02 | 9.48E+03 | 2.27E+03 | 2.27E+03 | 1.03E+03 | 8.72E+03 | 9.48E+03 | 5.26E+03 | 5.26E+03 |
| | Pyrene | Gamma | 8 | 11 | 73 | 3.30E+02 | 3.30E+02 | 6.10E+01 | 8.00E+03 | 1.92E+03 | 1.92E+03 | 6.30E+02 | 7.34E+03 | 8.00E+03 | 1.35E+04 | 8.00E+03 |
| | Selenium | Not Tested | 4 | 11 | 36 | 5.00E-01 | 1.00E+01 | 1.45E+00 | 4.13E+00 | 3.26E+00 | 3.26E+00 | 4.13E+00 | 1.00E+01 | 1.00E+01 | 8.72E+00 | 4.13E+00 |
| | Sodium | Nonparametric | 7 | 10 | 70 | 3.02E+03 | 3.95E+03 | 1.18E+02 | 2.48E+02 | 6.64E+02 | 6.64E+02 | 2.38E+02 | 3.91E+03 | 3.95E+03 | 2.75E+03 | 2.48E+02 |

**TABLE 5**
**SEDIMENT SPECIFIC SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS**
**FOR INDIVIDUAL REACHES OF DUCK CREEK**
**HUMAN HEALTH RISK ASSESSMENT**
**DUCK AND OTTER CREEKS**
**TOLEDO AND OREGON**

| | Chemical | Distribution[1] | Number of Samples | | Detection Frequency (Percent) | Censored Data | | Detected Data | | All Data | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Arithmetic Mean | Geometric Mean | Nonparametric Percentiles | | | UCL[2] | EPC |
| | | | Detected | Total | | Min | Max | Min | Max | | | 50th | 90th | 95th | | |
| | Strontium | Not Tested | 3 | 3 | 100 | N/A | N/A | 1.52E+02 | 2.16E+02 | 1.74E+02 | 1.74E+02 | 1.54E+02 | 2.16E+02 | 2.16E+02 | N/A | 2.16E+02 |
| | Vanadium | Normal | 7 | 7 | 100 | N/A | N/A | 1.36E+01 | 4.06E+01 | 2.61E+01 | 2.61E+01 | 2.76E+01 | 4.06E+01 | 4.06E+01 | 3.35E+01 | 3.35E+01 |
| | Zinc | Gamma | 12 | 12 | 100 | N/A | N/A | 3.49E+01 | 3.60E+02 | 1.03E+02 | 1.03E+02 | 6.10E+01 | 3.11E+02 | 3.60E+02 | 1.62E+02 | 1.62E+02 |
| | alpha-Chlordane | Not Tested | 1 | 8 | 12 | 1.60E+00 | 1.60E+01 | 2.90E+00 | 2.90E+00 | 3.91E+00 | 3.91E+00 | 6.85E+00 | 1.60E+01 | 1.60E+01 | 1.36E+01 | 2.90E+00 |
| | bis(2-Ethylhexyl)phthalate | Not Tested | 2 | 11 | 18 | 7.70E+01 | 7.90E+02 | 8.30E+02 | 9.80E+02 | 3.09E+02 | 3.09E+02 | 3.30E+02 | 9.50E+02 | 9.80E+02 | 7.93E+02 | 7.93E+02 |
| | gamma-Chlordane | Not Tested | 2 | 8 | 25 | 1.30E+00 | 1.60E+01 | 1.20E+00 | 1.80E+00 | 3.80E+00 | 3.80E+00 | 6.85E+00 | 1.60E+01 | 1.60E+01 | 1.39E+01 | 1.80E+00 |
| | 3 & 4-Methylphenol | Not Tested | 4 | 12 | 33 | 6.70E+02 | 1.00E+03 | 9.40E+02 | 1.20E+03 | 6.16E+02 | 6.16E+02 | 8.40E+02 | 1.17E+03 | 1.20E+03 | 1.14E+03 | 1.14E+03 |
| | 4,4'-DDD | Gamma | 13 | 13 | 100 | N/A | N/A | 7.60E+01 | 1.98E+03 | 5.20E+02 | 5.20E+02 | 3.20E+02 | 1.72E+03 | 1.98E+03 | 8.86E+02 | 8.86E+02 |
| | 4,4'-DDE | Gamma | 13 | 13 | 100 | N/A | N/A | 4.55E+01 | 9.49E+02 | 2.35E+02 | 2.35E+02 | 1.37E+02 | 7.99E+02 | 9.49E+02 | 4.02E+02 | 4.02E+02 |
| | 4,4'-DDT | Gamma | 9 | 13 | 69 | 7.30E+00 | 8.60E+00 | 1.32E+01 | 1.49E+02 | 3.71E+01 | 3.71E+01 | 2.38E+01 | 1.17E+02 | 1.49E+02 | 2.87E+02 | 1.49E+02 |
| | Acenaphthene | Not Tested | 2 | 13 | 15 | 6.70E+02 | 1.00E+03 | 1.20E+03 | 1.90E+03 | 5.78E+02 | 5.78E+02 | 8.20E+02 | 1.62E+03 | 1.90E+03 | 1.25E+03 | 1.25E+03 |
| | Aluminum | Normal | 13 | 13 | 100 | N/A | N/A | 6.52E+03 | 4.60E+04 | 3.46E+04 | 3.46E+04 | 3.72E+04 | 4.58E+04 | 4.60E+04 | 4.04E+04 | 4.04E+04 |
| | Anthracene | Not Tested | 3 | 13 | 23 | 6.70E+02 | 1.00E+03 | 8.00E+02 | 4.90E+03 | 9.28E+02 | 9.28E+02 | 8.20E+02 | 3.86E+03 | 4.90E+03 | 2.57E+03 | 2.57E+03 |
| | Arsenic | Normal | 13 | 13 | 100 | N/A | N/A | 1.45E+01 | 2.88E+01 | 2.17E+01 | 2.17E+01 | 2.17E+01 | 2.76E+01 | 2.88E+01 | 2.37E+01 | 2.37E+01 |
| | Barium | Nonparametric | 13 | 25 | 52 | 6.70E-01 | 1.00E+00 | 7.60E+01 | 2.62E+02 | 1.07E+02 | 1.07E+02 | 7.60E+01 | 2.52E+02 | 2.61E+02 | 2.04E+02 | 2.04E+02 |
| | Benzo[a]anthracene | Not Tested | 1 | 1 | 100 | N/A | N/A | 2.30E+03 | 2.30E+03 | N/A | N/A | N/A | N/A | N/A | N/A | 2.30E+03 |
| | Benzo[a]pyrene | Gamma | 8 | 13 | 62 | 7.10E+02 | 8.80E+02 | 9.20E+02 | 8.20E+03 | 1.94E+03 | 1.94E+03 | 9.80E+02 | 7.72E+03 | 8.20E+03 | 1.04E+04 | 8.20E+03 |
| | Benzo[b]fluoranthene | Gamma | 8 | 13 | 62 | 7.10E+02 | 8.80E+02 | 9.20E+02 | 8.10E+03 | 1.84E+03 | 1.84E+03 | 1.10E+03 | 7.22E+03 | 8.10E+03 | 9.81E+03 | 8.10E+03 |
| | Benzo[g,h,i]perylene | Gamma | 8 | 13 | 62 | 7.10E+02 | 8.80E+02 | 7.20E+02 | 5.50E+03 | 1.39E+03 | 1.39E+03 | 8.80E+02 | 5.02E+03 | 5.50E+03 | 6.88E+03 | 5.50E+03 |
| | Benzo[k]fluoranthene | Gamma | 8 | 13 | 62 | 7.10E+02 | 8.80E+02 | 6.80E+02 | 7.00E+03 | 1.87E+03 | 1.87E+03 | 9.20E+02 | 6.52E+03 | 7.00E+03 | 1.04E+04 | 7.00E+03 |
| | Beryllium | Normal | 13 | 13 | 100 | N/A | N/A | 8.04E-01 | 1.58E+00 | 1.34E+00 | 1.34E+00 | 1.36E+00 | 1.57E+00 | 1.58E+00 | 1.45E+00 | 1.45E+00 |
| | Cadmium | Normal | 13 | 13 | 100 | N/A | N/A | 4.20E-01 | 1.44E+00 | 1.05E+00 | 1.05E+00 | 1.04E+00 | 1.42E+00 | 1.44E+00 | 1.20E+00 | 1.20E+00 |
| | Calcium | Normal | 12 | 12 | 100 | N/A | N/A | 3.31E+04 | 1.36E+05 | 8.41E+04 | 8.41E+04 | 8.32E+04 | 1.28E+05 | 1.36E+05 | 9.73E+04 | 9.73E+04 |
| | Chromium | Normal | 13 | 13 | 100 | N/A | N/A | 2.03E+01 | 6.10E+01 | 4.56E+01 | 4.56E+01 | 4.40E+01 | 6.02E+01 | 6.10E+01 | 5.16E+01 | 5.16E+01 |
| | Chrysene | Gamma | 10 | 13 | 77 | 7.10E+02 | 8.80E+02 | 8.50E+02 | 1.20E+04 | 2.55E+03 | 2.55E+03 | 1.40E+03 | 1.00E+04 | 1.20E+04 | 1.25E+04 | 1.20E+04 |
| | Copper | Gamma | 13 | 13 | 100 | N/A | N/A | 2.89E+01 | 5.83E+01 | 3.81E+01 | 3.81E+01 | 3.54E+01 | 5.73E+01 | 5.83E+01 | 4.26E+01 | 4.26E+01 |
| | Dibenz[a,h]anthracene | Not Tested | 2 | 13 | 15 | 6.70E+02 | 1.00E+03 | 1.30E+03 | 1.60E+03 | 5.63E+02 | 5.63E+02 | 8.20E+02 | 1.48E+03 | 1.60E+03 | 1.17E+03 | 1.17E+03 |
| DC-3 | Dibenzofuran | Not Tested | 1 | 13 | 8 | 6.70E+02 | 1.00E+03 | 1.20E+03 | 1.20E+03 | 4.67E+02 | 4.67E+02 | 8.20E+02 | 1.12E+03 | 1.20E+03 | 9.42E+02 | 9.42E+02 |
| | Endrin | Not Tested | 1 | 13 | 8 | 6.80E+00 | 9.90E+00 | 4.07E+00 | 4.07E+00 | 4.06E+00 | 4.06E+00 | 7.70E+00 | 9.74E+00 | 9.90E+00 | 8.11E+00 | 4.07E+00 |
| | Fluoranthene | Gamma | 12 | 13 | 92 | 8.80E+02 | 8.80E+02 | 7.20E+02 | 3.30E+04 | 5.53E+03 | 5.53E+03 | 2.80E+03 | 2.54E+04 | 3.30E+04 | 1.10E+04 | 1.10E+04 |
| | Fluorene | Not Tested | 2 | 13 | 15 | 6.70E+02 | 1.00E+03 | 1.50E+03 | 2.80E+03 | 6.70E+02 | 6.70E+02 | 8.20E+02 | 2.28E+03 | 2.80E+03 | 1.62E+03 | 1.62E+03 |
| | Indeno[1,2,3-cd]pyrene | Gamma | 7 | 13 | 54 | 7.10E+02 | 8.80E+02 | 7.60E+02 | 5.60E+03 | 1.45E+03 | 1.45E+03 | 8.20E+02 | 5.28E+03 | 5.60E+03 | 7.64E+03 | 5.60E+03 |
| | Iron | Nonparametric | 13 | 13 | 100 | N/A | N/A | 1.92E+04 | 7.24E+04 | 3.11E+04 | 3.11E+04 | 2.88E+04 | 5.66E+04 | 7.24E+04 | 3.76E+04 | 3.76E+04 |
| | Lead | Normal | 11 | 13 | 85 | 3.20E+01 | 4.10E+01 | 3.00E+01 | 1.04E+02 | 4.92E+01 | 4.92E+01 | 4.40E+01 | 9.36E+01 | 1.04E+02 | 6.14E+01 | 6.14E+01 |
| | Magnesium | Normal | 12 | 12 | 100 | N/A | N/A | 9.86E+03 | 1.54E+04 | 1.31E+04 | 1.31E+04 | 1.36E+04 | 1.53E+04 | 1.54E+04 | 1.41E+04 | 1.41E+04 |
| | Manganese | Normal | 12 | 12 | 100 | N/A | N/A | 3.33E+02 | 6.71E+02 | 5.09E+02 | 5.09E+02 | 5.35E+02 | 6.46E+02 | 6.71E+02 | 5.59E+02 | 5.59E+02 |
| | Mercury | Gamma | 13 | 13 | 100 | N/A | N/A | 8.30E-02 | 5.49E-01 | 1.59E-01 | 1.59E-01 | 1.20E-01 | 4.12E-01 | 5.49E-01 | 2.16E-01 | 2.16E-01 |
| | Methoxychlor | Not Tested | 1 | 13 | 8 | 6.80E+00 | 9.90E+00 | 3.97E+01 | 3.97E+01 | 6.80E+00 | 6.80E+00 | 8.00E+00 | 2.78E+01 | 3.97E+01 | 1.98E+01 | 1.98E+01 |
| | Naphthalene | Not Tested | 6 | 13 | 46 | 6.00E+01 | 1.00E+03 | 7.70E+02 | 3.90E+03 | 8.65E+02 | 8.65E+02 | 8.20E+02 | 2.78E+03 | 3.90E+03 | 2.09E+03 | 2.09E+03 |
| | Nickel | Gamma | 8 | 13 | 62 | 2.80E+01 | 4.10E+01 | 2.57E+01 | 6.60E+01 | 2.98E+01 | 2.98E+01 | 3.40E+01 | 5.60E+01 | 6.60E+01 | 1.26E+02 | 6.60E+01 |
| | Phenanthrene | Lognormal | 8 | 13 | 62 | 7.10E+02 | 8.80E+02 | 8.20E+02 | 2.50E+04 | 3.56E+03 | 3.56E+03 | 1.30E+03 | 1.82E+04 | 2.50E+04 | 1.92E+04 | 1.92E+04 |
| | Potassium | Normal | 12 | 12 | 100 | N/A | N/A | 4.34E+03 | 1.27E+04 | 9.25E+03 | 9.25E+03 | 1.01E+04 | 1.23E+04 | 1.27E+04 | 1.05E+04 | 1.05E+04 |
| | Pyrene | Gamma | 12 | 13 | 92 | 8.80E+02 | 8.80E+02 | 8.20E+02 | 2.60E+04 | 4.65E+03 | 4.65E+03 | 2.20E+03 | 2.04E+04 | 2.60E+04 | 8.74E+03 | 8.74E+03 |
| | Selenium | Normal | 11 | 13 | 85 | 7.24E-01 | 1.45E+00 | 1.76E+00 | 3.83E+00 | 2.22E+00 | 2.22E+00 | 2.18E+00 | 3.60E+00 | 3.83E+00 | 2.70E+00 | 2.70E+00 |
| | Sodium | Not Tested | 1 | 13 | 8 | 3.35E+03 | 5.18E+03 | 3.62E+02 | 3.62E+02 | 1.85E+03 | 1.85E+03 | 3.62E+03 | 5.14E+03 | 5.18E+03 | 3.98E+03 | 3.62E+02 |
| | Strontium | Normal | 13 | 13 | 100 | N/A | N/A | 1.01E+02 | 3.21E+02 | 2.13E+02 | 2.13E+02 | 2.10E+02 | 3.05E+02 | 3.21E+02 | 2.46E+02 | 2.46E+02 |
| | Zinc | Normal | 13 | 13 | 100 | N/A | N/A | 1.22E+02 | 2.47E+02 | 1.66E+02 | 1.66E+02 | 1.56E+02 | 2.31E+02 | 2.47E+02 | 1.84E+02 | 1.84E+02 |
| | bis(2-Ethylhexyl)phthalate | Not Tested | 3 | 13 | 23 | 6.70E+02 | 1.00E+03 | 8.20E+02 | 1.20E+03 | 5.53E+02 | 5.53E+02 | 8.20E+02 | 1.16E+03 | 1.20E+03 | 1.05E+03 | 1.05E+03 |
| | delta-BHC | Not Tested | 1 | 13 | 8 | 6.80E+00 | 9.90E+00 | 4.11E+00 | 4.11E+00 | 4.06E+00 | 4.06E+00 | 7.70E+00 | 9.74E+00 | 9.90E+00 | 8.07E+00 | 4.11E+00 |
| | 2-Methylnaphthalene | Not Tested | 2 | 6 | 33 | 7.00E+02 | 8.30E+02 | 8.00E+02 | 9.00E+02 | 5.43E+02 | 5.43E+02 | 8.00E+02 | 9.00E+02 | 9.00E+02 | 1.17E+03 | 9.00E+02 |
| | 3 & 4-Methylphenol | Not Tested | 3 | 3 | 100 | N/A | N/A | 9.00E+02 | 1.90E+03 | 1.26E+03 | 1.26E+03 | 9.90E+02 | 1.90E+03 | 1.90E+03 | N/A | 1.90E+03 |
| | 4,4'-DDD | Normal | 5 | 5 | 100 | N/A | N/A | 2.74E+01 | 4.50E+02 | 2.73E+02 | 2.73E+02 | 3.55E+02 | 4.50E+02 | 4.50E+02 | 4.46E+02 | 4.46E+02 |
| | 4,4'-DDE | Normal | 5 | 5 | 100 | N/A | N/A | 2.10E+01 | 4.30E+02 | 2.13E+02 | 2.13E+02 | 2.19E+02 | 4.30E+02 | 4.30E+02 | 3.76E+02 | 3.76E+02 |
| | 4,4'-DDT | Not Tested | 2 | 5 | 40 | 8.00E+00 | 8.80E+00 | 3.70E+01 | 4.49E+01 | 1.89E+01 | 1.89E+01 | 8.80E+00 | 4.49E+01 | 4.49E+01 | 5.97E+01 | 4.49E+01 |
| | 4-Methylphenol | Not Tested | 1 | 3 | 33 | 7.00E+02 | 7.00E+02 | 1.10E+03 | 1.10E+03 | 6.00E+02 | 6.00E+02 | 7.00E+02 | 1.10E+03 | 1.10E+03 | N/A | 1.10E+03 |
| | Acenaphthene | Not Tested | 1 | 9 | 11 | 3.30E+02 | 8.30E+02 | 2.10E+03 | 2.10E+03 | 5.00E+02 | 5.00E+02 | 7.00E+02 | 2.10E+03 | 2.10E+03 | 1.49E+03 | 1.49E+03 |
| | Acenaphthylene | Not Tested | 1 | 9 | 11 | 3.30E+02 | 8.30E+02 | 1.50E+03 | 1.50E+03 | 4.33E+02 | 4.33E+02 | 7.00E+02 | 1.50E+03 | 1.50E+03 | 1.16E+03 | 1.16E+03 |
| | Aluminum | Normal | 5 | 5 | 100 | N/A | N/A | 5.76E+03 | 3.07E+04 | 1.88E+04 | 1.88E+04 | 2.52E+04 | 3.07E+04 | 3.07E+04 | 3.00E+04 | 3.00E+04 |
| | Anthracene | Not Tested | 2 | 9 | 22 | 3.30E+02 | 8.30E+02 | 8.00E+02 | 1.00E+04 | 1.43E+03 | 1.43E+03 | 7.80E+02 | 1.00E+04 | 1.00E+04 | 6.15E+03 | 6.15E+03 |
| | Aroclor 1248 | Normal | 3 | 5 | 60 | 3.28E+01 | 4.00E+01 | 1.05E+02 | 1.68E+02 | 8.55E+01 | 8.55E+01 | 1.05E+02 | 1.68E+02 | 1.68E+02 | 1.49E+02 | 1.49E+02 |
| | Aroclor 1254 | Not Tested | 1 | 5 | 20 | 3.28E+01 | 4.43E+01 | 1.80E+02 | 1.80E+02 | 5.19E+01 | 5.19E+01 | 4.17E+01 | 1.80E+02 | 1.80E+02 | 1.95E+02 | 1.80E+02 |
| | Aroclor 1260 | Normal | 3 | 5 | 60 | 3.28E+01 | 4.00E+01 | 6.65E+01 | 1.40E+02 | 6.45E+01 | 6.45E+01 | 6.65E+01 | 1.40E+02 | 1.40E+02 | 1.14E+02 | 1.14E+02 |
| | Arsenic | Normal | 8 | 8 | 100 | N/A | N/A | 7.11E+00 | 2.44E+01 | 1.74E+01 | 1.74E+01 | 1.81E+01 | 2.44E+01 | 2.44E+01 | 2.12E+01 | 2.12E+01 |
| | Barium | Normal | 8 | 11 | 73 | 7.80E-01 | 8.30E-01 | 4.03E+01 | 3.16E+02 | 1.00E+02 | 1.00E+02 | 1.10E+02 | 2.86E+02 | 3.16E+02 | 1.52E+02 | 1.52E+02 |
| | Benzo[a]anthracene | Not Tested | 2 | 6 | 33 | 3.30E+02 | 7.00E+02 | 2.30E+03 | 1.87E+04 | 3.64E+03 | 3.64E+03 | 5.15E+02 | 1.87E+04 | 1.87E+04 | 1.69E+04 | 1.69E+04 |
| | Benzo[a]pyrene | Not Tested | 2 | 9 | 22 | 3.30E+02 | 8.30E+02 | 1.90E+03 | 1.95E+04 | 2.61E+03 | 2.61E+03 | 7.80E+02 | 1.95E+04 | 1.95E+04 | 1.19E+04 | 1.19E+04 |
| | Benzo[b]fluoranthene | Not Tested | 2 | 9 | 22 | 3.30E+02 | 8.30E+02 | 1.30E+03 | 1.67E+04 | 2.23E+03 | 2.23E+03 | 7.80E+02 | 1.67E+04 | 1.67E+04 | 1.02E+04 | 1.02E+04 |
| | Benzo[g,h,i]perylene | Not Tested | 2 | 9 | 22 | 3.30E+02 | 8.30E+02 | 1.40E+03 | 1.24E+04 | 1.76E+03 | 1.76E+03 | 7.80E+02 | 1.24E+04 | 1.24E+04 | 7.63E+03 | 7.63E+03 |
| | Benzo[k]fluoranthene | Not Tested | 2 | 9 | 22 | 3.30E+02 | 8.30E+02 | 3.90E+03 | 1.52E+04 | 2.35E+03 | 2.35E+03 | 7.80E+02 | 1.52E+04 | 1.52E+04 | 9.60E+03 | 9.60E+03 |
| | Beryllium | Normal | 5 | 5 | 100 | N/A | N/A | 3.89E-01 | 1.81E+00 | 1.05E+00 | 1.05E+00 | 1.03E+00 | 1.81E+00 | 1.81E+00 | 1.55E+00 | 1.55E+00 |
| | Cadmium | Normal | 8 | 8 | 100 | N/A | N/A | 4.20E-01 | 1.89E+00 | 1.21E+00 | 1.21E+00 | 1.31E+00 | 1.89E+00 | 1.89E+00 | 1.59E+00 | 1.59E+00 |
| | Calcium | Not Tested | 3 | 3 | 100 | N/A | N/A | 1.88E+04 | 7.61E+04 | 5.26E+04 | 5.26E+04 | 6.30E+04 | 7.61E+04 | 7.61E+04 | N/A | 7.61E+04 |
| | Chromium | Normal | 7 | 8 | 88 | 2.00E+01 | 2.00E+01 | 1.81E+01 | 4.90E+01 | 2.84E+01 | 2.84E+01 | 2.12E+01 | 4.90E+01 | 4.90E+01 | 3.85E+01 | 3.85E+01 |
| | Chrysene | Not Tested | 4 | 9 | 44 | 3.30E+02 | 8.00E+02 | 1.10E+03 | 2.16E+04 | 3.13E+03 | 3.13E+03 | 8.00E+02 | 2.16E+04 | 2.16E+04 | 1.33E+04 | 1.33E+04 |
| | Copper | Normal | 8 | 8 | 100 | N/A | N/A | 1.34E+01 | 8.26E+01 | 4.78E+01 | 4.78E+01 | 4.14E+01 | 8.26E+01 | 8.26E+01 | 6.32E+01 | 6.32E+01 |
| | Dibenz[a,h]anthracene | Not Tested | 1 | 9 | 11 | 3.30E+02 | 8.30E+02 | 3.80E+03 | 3.80E+03 | 6.89E+02 | 6.89E+02 | 7.00E+02 | 3.80E+03 | 3.80E+03 | 2.46E+03 | 2.46E+03 |
| | Dibenzofuran | Not Tested | 1 | 6 | 17 | 7.00E+02 | 8.30E+02 | 1.50E+03 | 1.50E+03 | 5.68E+02 | 5.68E+02 | 7.90E+02 | 1.50E+03 | 1.50E+03 | 1.52E+03 | 1.50E+03 |
| DC-4 | Diethylphthalate | Not Tested | 1 | 9 | 11 | 3.30E+02 | 8.30E+02 | 1.90E+03 | 1.90E+03 | 4.83E+02 | 4.83E+02 | 7.80E+02 | 1.90E+03 | 1.90E+03 | 1.38E+03 | 1.38E+03 |

**TABLE 5**
**SEDIMENT SPECIFIC SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS**
**FOR INDIVIDUAL REACHES OF DUCK CREEK**
**HUMAN HEALTH RISK ASSESSMENT**
**DUCK AND OTTER CREEKS**
**TOLEDO AND OREGON**

| Reach | Chemical | Distribution[1] | Number of Samples | | Detection Frequency (Percent) | Censored Data | | Detected Data | | All Data | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Detected | Total | | Min | Max | Min | Max | Arithmetic Mean | Geometric Mean | Nonparametric Percentiles 50th | 90th | 95th | UCL[2] | EPC |
| | Endrin | Not Tested | 1 | 5 | 20 | 8.00E+00 | 8.80E+00 | 4.07E+00 | 4.07E+00 | 4.12E+00 | 4.12E+00 | 8.00E+00 | 8.80E+00 | 8.80E+00 | 1.05E+01 | 4.07E+00 |
| | Fluoranthene | Lognormal | 6 | 9 | 67 | 3.30E+02 | 3.30E+02 | 8.00E+02 | 4.79E+04 | 6.54E+03 | 6.54E+03 | 8.20E+02 | 4.79E+04 | 4.79E+04 | 3.72E+04 | 3.72E+04 |
| | Fluorene | Not Tested | 1 | 9 | 11 | 3.30E+02 | 8.30E+02 | 3.50E+03 | 3.50E+03 | 6.56E+02 | 6.56E+02 | 7.00E+02 | 3.50E+03 | 3.50E+03 | 2.29E+03 | 2.29E+03 |
| | Indeno[1,2,3-cd]pyrene | Not Tested | 2 | 9 | 22 | 3.30E+02 | 8.30E+02 | 1.80E+03 | 1.40E+04 | 1.98E+03 | 1.98E+03 | 7.80E+02 | 1.40E+04 | 1.40E+04 | 8.61E+03 | 8.61E+03 |
| | Iron | Gamma | 8 | 8 | 100 | N/A | N/A | 6.91E+03 | 7.24E+04 | 2.52E+04 | 2.52E+04 | 2.10E+04 | 7.24E+04 | 7.24E+04 | 4.15E+04 | 4.15E+04 |
| | Lead | Normal | 7 | 8 | 88 | 2.60E+01 | 2.60E+01 | 3.50E+01 | 2.50E+02 | 8.81E+01 | 8.81E+01 | 6.86E+01 | 2.50E+02 | 2.50E+02 | 1.39E+02 | 1.39E+02 |
| | Magnesium | Not Tested | 3 | 3 | 100 | N/A | N/A | 3.36E+03 | 1.72E+04 | 1.02E+04 | 1.02E+04 | 9.96E+03 | 1.72E+04 | 1.72E+04 | N/A | 1.72E+04 |
| | Manganese | Not Tested | 3 | 3 | 100 | N/A | N/A | 1.42E+02 | 4.43E+02 | 3.40E+02 | 3.40E+02 | 4.36E+02 | 4.43E+02 | 4.43E+02 | N/A | 4.43E+02 |
| | Mercury | Normal | 7 | 7 | 100 | N/A | N/A | 8.80E-02 | 2.00E-01 | 1.50E-01 | 1.50E-01 | 1.47E-01 | 2.00E-01 | 2.00E-01 | 1.78E-01 | 1.78E-01 |
| | Methoxychlor | Not Tested | 2 | 5 | 40 | 8.00E+00 | 8.80E+00 | 3.97E+01 | 3.70E+02 | 8.45E+01 | 8.45E+01 | 8.80E+00 | 3.70E+02 | 3.70E+02 | 3.97E+02 | 3.70E+02 |
| | Naphthalene | Normal | 4 | 8 | 50 | 3.30E+02 | 8.00E+02 | 8.20E+02 | 1.20E+03 | 6.27E+02 | 6.27E+02 | 8.10E+02 | 1.20E+03 | 1.20E+03 | 9.71E+02 | 9.71E+02 |
| | Nickel | Normal | 6 | 8 | 75 | 2.60E+01 | 3.20E+01 | 2.57E+01 | 7.47E+01 | 3.84E+01 | 3.84E+01 | 3.10E+01 | 7.47E+01 | 7.47E+01 | 5.48E+01 | 5.48E+01 |
| | Phenanthrene | Not Tested | 4 | 9 | 44 | 3.30E+02 | 8.00E+02 | 1.30E+03 | 3.37E+04 | 4.65E+03 | 4.65E+03 | 8.00E+02 | 3.37E+04 | 3.37E+04 | 2.06E+04 | 2.06E+04 |
| | Potassium | Not Tested | 3 | 3 | 100 | N/A | N/A | 1.34E+03 | 8.20E+03 | 5.63E+03 | 5.63E+03 | 7.36E+03 | 8.20E+03 | 8.20E+03 | N/A | 8.20E+03 |
| | Pyrene | Gamma | 6 | 9 | 67 | 3.30E+02 | 3.30E+02 | 8.30E+02 | 3.82E+04 | 5.48E+03 | 5.48E+03 | 1.00E+03 | 3.82E+04 | 3.82E+04 | 3.43E+04 | 3.43E+04 |
| | Selenium | Not Tested | 2 | 8 | 25 | 5.00E-01 | 1.34E+00 | 2.21E+00 | 2.62E+00 | 9.00E-01 | 9.00E-01 | 9.47E-01 | 2.62E+00 | 2.62E+00 | 2.47E+00 | 2.47E+00 |
| | Silver | Not Tested | 3 | 3 | 100 | N/A | N/A | 4.40E-01 | 6.60E-01 | 5.53E-01 | 5.53E-01 | 5.60E-01 | 6.60E-01 | 6.60E-01 | . | 6.60E-01 |
| | Sodium | Not Tested | 1 | 5 | 20 | 2.93E+03 | 4.09E+03 | 3.62E+02 | 3.62E+02 | 1.46E+03 | 1.46E+03 | 3.36E+03 | 4.09E+03 | 4.09E+03 | N/A | 3.62E+02 |
| | Strontium | Normal | 5 | 5 | 100 | N/A | N/A | 6.70E+01 | 4.82E+02 | 2.18E+02 | 2.18E+02 | 2.12E+02 | 4.82E+02 | 4.82E+02 | 3.73E+02 | 3.73E+02 |
| | Zinc | Normal | 7 | 7 | 100 | N/A | N/A | 6.84E+01 | 3.76E+02 | 2.38E+02 | 2.38E+02 | 2.47E+02 | 3.76E+02 | 3.76E+02 | 3.19E+02 | 3.19E+02 |
| | bis(2-Ethylhexyl)phthalate | Gamma | 5 | 9 | 56 | 3.30E+02 | 7.00E+02 | 1.10E+03 | 1.80E+03 | 9.61E+02 | 9.61E+02 | 1.10E+03 | 1.80E+03 | 1.80E+03 | 7.38E+03 | 1.80E+03 |
| | delta-BHC | Not Tested | 1 | 5 | 20 | 8.00E+00 | 8.80E+00 | 4.11E+00 | 4.11E+00 | 4.13E+00 | 4.13E+00 | 8.00E+00 | 8.80E+00 | 8.80E+00 | 1.05E+01 | 4.11E+00 |
| | gamma-Chlordane | Not Tested | 1 | 4 | 25 | 8.00E+00 | 8.80E+00 | 9.30E+00 | 9.30E+00 | 5.46E+00 | 5.46E+00 | 8.55E+00 | 9.30E+00 | 9.30E+00 | N/A | 9.30E+00 |
| DC-5 | 2-Methylnaphthalene | Not Tested | 3 | 15 | 20 | 5.00E+02 | 8.00E+02 | 7.00E+02 | 1.30E+03 | 4.77E+02 | 4.77E+02 | 7.00E+02 | 1.24E+03 | 1.30E+03 | 9.41E+02 | 9.41E+02 |
| | 4,4'-DDD | Not Tested | 1 | 1 | 100 | N/A | N/A | 2.66E+01 | 2.66E+01 | N/A | N/A | N/A | N/A | N/A | N/A | 2.66E+01 |
| | 4,4'-DDE | Not Tested | 1 | 1 | 100 | N/A | N/A | 1.78E+01 | 1.78E+01 | N/A | N/A | N/A | N/A | N/A | N/A | 1.78E+01 |
| | 4-Methylphenol | Not Tested | 1 | 15 | 7 | 5.00E+02 | 8.00E+02 | 8.00E+02 | 8.00E+02 | 3.67E+02 | 3.67E+02 | 7.00E+02 | 8.00E+02 | 8.00E+02 | 7.00E+02 | 7.00E+02 |
| | Aluminum | Not Tested | 1 | 1 | 100 | N/A | N/A | 8.78E+03 | 8.78E+03 | N/A | N/A | N/A | N/A | N/A | N/A | 8.78E+03 |
| | Aroclor 1254 | Not Tested | 1 | 1 | 100 | N/A | N/A | 6.91E+01 | 6.91E+01 | N/A | N/A | N/A | N/A | N/A | N/A | 6.91E+01 |
| | Arsenic | Not Tested | 2 | 2 | 100 | N/A | N/A | 2.04E+01 | 4.76E+01 | 3.40E+01 | 3.40E+01 | 3.40E+01 | 4.76E+01 | 4.76E+01 | N/A | 4.76E+01 |
| | Barium | Not Tested | 2 | 2 | 100 | N/A | N/A | 6.38E+01 | 1.29E+02 | 9.64E+01 | 9.64E+01 | 9.64E+01 | 1.29E+02 | 1.29E+02 | N/A | 1.29E+02 |
| | Benzo[a]anthracene | Not Tested | 2 | 15 | 13 | 5.00E+02 | 8.00E+02 | 9.00E+02 | 9.00E+02 | 4.13E+02 | 4.13E+02 | 7.00E+02 | 9.00E+02 | 9.00E+02 | 7.84E+02 | 7.84E+02 |
| | Benzo[a]pyrene | Not Tested | 1 | 15 | 7 | 5.00E+02 | 8.00E+02 | 7.00E+02 | 7.00E+02 | 3.63E+02 | 3.63E+02 | 7.00E+02 | 8.00E+02 | 8.00E+02 | 6.87E+02 | 6.87E+02 |
| | Benzo[b]fluoranthene | Not Tested | 1 | 14 | 7 | 5.00E+02 | 8.00E+02 | 7.00E+02 | 7.00E+02 | 3.61E+02 | 3.61E+02 | 7.00E+02 | 8.00E+02 | 8.00E+02 | 6.96E+02 | 6.96E+02 |
| | Beryllium | Not Tested | 1 | 1 | 100 | N/A | N/A | 7.22E-01 | 7.22E-01 | N/A | N/A | N/A | N/A | N/A | N/A | 7.22E-01 |
| | Cadmium | Not Tested | 2 | 2 | 100 | N/A | N/A | 1.52E+00 | 2.09E+00 | 1.81E+00 | 1.81E+00 | 1.81E+00 | 2.09E+00 | 2.09E+00 | N/A | 2.09E+00 |
| | Chromium | Not Tested | 2 | 2 | 100 | N/A | N/A | 3.91E+01 | 7.50E+01 | 5.71E+01 | 5.71E+01 | 5.71E+01 | 7.50E+01 | 7.50E+01 | N/A | 7.50E+01 |
| | Chrysene | Not Tested | 4 | 15 | 27 | 6.00E+02 | 8.00E+02 | 6.00E+02 | 1.90E+03 | 5.57E+02 | 5.57E+02 | 7.00E+02 | 1.48E+03 | 1.90E+03 | 1.14E+03 | 1.14E+03 |
| | Copper | Not Tested | 2 | 2 | 100 | N/A | N/A | 3.66E+01 | 3.84E+01 | 3.75E+01 | 3.75E+01 | 3.75E+01 | 3.84E+01 | 3.84E+01 | N/A | 3.84E+01 |
| | Diethylphthalate | Not Tested | 6 | 15 | 40 | 5.00E+02 | 8.00E+02 | 1.30E+03 | 2.70E+03 | 1.05E+03 | 1.05E+03 | 8.00E+02 | 2.70E+03 | 2.70E+03 | 2.15E+03 | 2.15E+03 |
| | Fluoranthene | Not Tested | 7 | 15 | 47 | 6.00E+02 | 8.00E+02 | 7.00E+02 | 1.70E+03 | 6.73E+02 | 6.73E+02 | 7.00E+02 | 1.46E+03 | 1.70E+03 | 1.22E+03 | 1.22E+03 |
| | Iron | Not Tested | 2 | 2 | 100 | N/A | N/A | 1.90E+00 | 1.92E+04 | 9.60E+03 | 9.60E+03 | 9.60E+03 | 1.92E+04 | 1.92E+04 | N/A | 1.92E+04 |
| | Lead | Not Tested | 2 | 2 | 100 | N/A | N/A | 7.98E+01 | 9.86E+01 | 8.92E+01 | 8.92E+01 | 8.92E+01 | 9.86E+01 | 9.86E+01 | N/A | 9.86E+01 |
| | Mercury | Not Tested | 2 | 2 | 100 | N/A | N/A | 6.41E-02 | 1.14E-01 | 8.91E-02 | 8.91E-02 | 8.91E-02 | 1.14E-01 | 1.14E-01 | N/A | 1.14E-01 |
| | Naphthalene | Normal | 8 | 15 | 53 | 7.00E+01 | 7.00E+02 | 7.00E+02 | 1.20E+03 | 6.12E+02 | 6.12E+02 | 7.00E+02 | 1.08E+03 | 1.20E+03 | 8.13E+02 | 8.13E+02 |
| | Nickel | Not Tested | 2 | 2 | 100 | N/A | N/A | 3.83E+01 | 4.72E+01 | 4.28E+01 | 4.28E+01 | 4.28E+01 | 4.72E+01 | 4.72E+01 | N/A | 4.72E+01 |
| | Phenanthrene | Not Tested | 3 | 15 | 20 | 5.00E+02 | 8.00E+02 | 8.00E+02 | 1.40E+03 | 4.93E+02 | 4.93E+02 | 7.00E+02 | 1.28E+03 | 1.40E+03 | 9.80E+02 | 9.80E+02 |
| | Polychlorinated biphenyls | Not Tested | 1 | 1 | 100 | N/A | N/A | 8.00E+02 | 8.00E+02 | N/A | N/A | N/A | N/A | N/A | N/A | 8.00E+02 |
| | Polynuclear aromatic hydrocarbons | Not Tested | 1 | 1 | 100 | N/A | N/A | 5.97E+01 | 5.97E+01 | N/A | N/A | N/A | N/A | N/A | N/A | 5.97E+01 |
| | Pyrene | Gamma | 9 | 15 | 60 | 6.00E+02 | 8.00E+02 | 7.00E+02 | 1.80E+03 | 7.87E+02 | 7.87E+02 | 8.00E+02 | 1.74E+03 | 1.80E+03 | 3.69E+03 | 1.80E+03 |
| | Selenium | Not Tested | 1 | 1 | 100 | N/A | N/A | 9.18E-01 | 9.18E-01 | N/A | N/A | N/A | N/A | N/A | N/A | 9.18E-01 |
| | Sodium | Not Tested | 1 | 1 | 100 | N/A | N/A | 3.83E+02 | 3.83E+02 | N/A | N/A | N/A | N/A | N/A | N/A | 3.83E+02 |
| | Strontium | Not Tested | 1 | 1 | 100 | N/A | N/A | 2.63E+02 | 2.63E+02 | N/A | N/A | N/A | N/A | N/A | N/A | 2.63E+02 |
| | Zinc | Not Tested | 2 | 2 | 100 | N/A | N/A | 1.91E+02 | 2.59E+02 | 2.25E+02 | 2.25E+02 | 2.25E+02 | 2.59E+02 | 2.59E+02 | N/A | 2.59E+02 |
| | alpha-BHC | Not Tested | 1 | 1 | 100 | N/A | N/A | 1.01E+00 | 1.01E+00 | N/A | N/A | N/A | N/A | N/A | N/A | 1.01E+00 |
| | bis(2-Ethylhexyl)phthalate | Gamma | 8 | 15 | 53 | 5.00E+02 | 8.00E+02 | 7.00E+02 | 4.00E+03 | 9.87E+02 | 9.87E+02 | 7.00E+02 | 2.86E+03 | 4.00E+03 | 5.27E+03 | 4.00E+03 |
| | delta-BHC | Not Tested | 1 | 1 | 100 | N/A | N/A | 3.19E+00 | 3.19E+00 | N/A | N/A | N/A | N/A | N/A | N/A | 3.19E+00 |

**Notes:** Units are milligrams per kilogram for metals and micrograms per kilogram for other chemicals.
One-half the detection limit was substituted for censored (nondetect) measurements in calculations of the mean and percentiles
1 Tested for all chemicals with at least 5 samples and detection frequencies greater than or equal to 50 percent using the Shapiro-Wilk W test (a 5 percent level of significance was used for all tests).
2 Calculated for all chemicals with at least 5 samples. For detection frequencies of at least 85 percent, one-half the detection limit was substituted for censored measurements and calculations were performed following the protocols described in EPA's ProUCL software package (EPA 2004). For detection frequencies less than 85 percent, the UCL was calculated using stochastic methods following the "bounding" approach described in EPA (2002).
EPC Exposure point concentration, defined as the lesser of the UCL and the maximum detected concentration
Min Minimum concentration
Max Maximum concentration
N/A Not applicable
UCL One-sided upper confidence limit of the mean. Following EPA (2004), this can either be a 95, 97.5, or 99 percent UCL.

**References**


U.S. Environmental Protection Agency (EPA). 2002. "Calculating exposure point concentrations at hazardous waste sites." OSWER 9285.6-10. Office of Emergency and Remedial Response. Washington, DC. December.

EPA. 2004. "ProUCL Version 3.0 User Guide." Prepared by Singh, A., Singh, A.K. and R.W. Maichle for the U.S. Environmental Protection Agency, Technical Support Center, Las Vegas, NV. April.

**TABLE 6**
**SEDIMENT - SPECIFIC SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR INDIVIDUAL RECHES OF OTTER CREEK**
**HUMAN HEALTH RISK ASSESSMENT**
**DUCK AND OTTER CREEKS**
**TOLEDO AND OREGON, OHIO**

| Stream Reach | Chemical | Distribution[1] | Number of Samples | | Detection Frequency (Percent) | Censored Data | | Detected Data | | All Data | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Arithmetic Mean | Geometric Mean | Nonparametric Percentiles | | | UCL[2] | EPC |
| | | | Detected | Total | | Min | Max | Min | Max | | | 50th | 90th | 95th | | |
| OC-1 | 2-Butanone | Not Tested | 1 | 1 | 100 | N/A | N/A | 4.90E+01 | 4.90E+01 | N/A | N/A | N/A | N/A | N/A | N/A | 4.90E+01 |
| | 4,4'-DDE | Not Tested | 1 | 4 | 25 | 6.10E-01 | 6.90E+00 | 3.49E+00 | 3.49E+00 | 2.54E+00 | 2.54E+00 | 4.65E+00 | 6.90E+00 | 6.90E+00 | N/A | 3.49E+00 |
| | 4,4'-DDT | Not Tested | 1 | 4 | 25 | 1.82E+00 | 6.90E+00 | 2.52E+00 | 2.52E+00 | 2.45E+00 | 2.45E+00 | 4.16E+00 | 6.90E+00 | 6.90E+00 | N/A | 2.52E+00 |
| | Acetone | Not Tested | 1 | 1 | 100 | N/A | N/A | 1.50E+02 | 1.50E+02 | N/A | N/A | N/A | N/A | N/A | N/A | 1.50E+02 |
| | Aluminum | Not Tested | 4 | 4 | 100 | N/A | N/A | 1.29E+04 | 2.55E+04 | 1.82E+04 | 1.82E+04 | 1.72E+04 | 2.55E+04 | 2.55E+04 | N/A | 2.55E+04 |
| | Aroclor 1254 | Not Tested | 1 | 4 | 25 | 2.90E+01 | 6.90E+01 | 7.61E+01 | 7.61E+01 | 3.51E+01 | 3.51E+01 | 4.96E+01 | 7.61E+01 | 7.61E+01 | N/A | 7.61E+01 |
| | Aroclor 1260 | Not Tested | 1 | 4 | 25 | 2.90E+01 | 6.90E+01 | 3.91E+01 | 3.91E+01 | 2.58E+01 | 2.58E+01 | 3.47E+01 | 6.90E+01 | 6.90E+01 | N/A | 3.91E+01 |
| | Arsenic | Not Tested | 4 | 4 | 100 | N/A | N/A | 8.70E+00 | 3.02E+01 | 1.47E+01 | 1.47E+01 | 9.97E+00 | 3.02E+01 | 3.02E+01 | N/A | 3.02E+01 |
| | Barium | Not Tested | 4 | 4 | 100 | N/A | N/A | 1.25E+02 | 1.55E+02 | 1.40E+02 | 1.40E+02 | 1.39E+02 | 1.55E+02 | 1.55E+02 | N/A | 1.55E+02 |
| | Benzo[a]anthracene | Not Tested | 2 | 4 | 50 | 6.00E+02 | 6.90E+02 | 1.30E+03 | 1.60E+03 | 8.86E+02 | 8.86E+02 | 9.95E+02 | 1.60E+03 | 1.60E+03 | N/A | 1.60E+03 |
| | Benzo[a]pyrene | Not Tested | 2 | 4 | 50 | 6.00E+02 | 6.90E+02 | 1.50E+03 | 1.90E+03 | 1.01E+03 | 1.01E+03 | 1.10E+03 | 1.90E+03 | 1.90E+03 | N/A | 1.90E+03 |
| | Benzo[g,h,i]perylene | Not Tested | 2 | 4 | 50 | 6.00E+02 | 6.90E+02 | 1.70E+03 | 1.80E+03 | 1.04E+03 | 1.04E+03 | 1.20E+03 | 1.80E+03 | 1.80E+03 | N/A | 1.80E+03 |
| | Benzo[k]fluoranthene | Not Tested | 2 | 4 | 50 | 6.00E+02 | 6.90E+02 | 4.00E+03 | 4.60E+03 | 2.31E+03 | 2.31E+03 | 2.35E+03 | 4.60E+03 | 4.60E+03 | N/A | 4.60E+03 |
| | Beryllium | Not Tested | 3 | 4 | 75 | 1.00E+00 | 1.00E+00 | 5.91E-01 | 1.13E+00 | 8.08E-01 | 8.08E-01 | 1.01E+00 | 1.13E+00 | 1.13E+00 | N/A | 1.13E+00 |
| | Cadmium | Not Tested | 3 | 4 | 75 | 1.00E+00 | 1.00E+00 | 3.17E-01 | 1.82E+00 | 9.00E-01 | 9.00E-01 | 9.82E-01 | 1.82E+00 | 1.82E+00 | N/A | 1.82E+00 |
| | Calcium | Not Tested | 1 | 1 | 100 | N/A | N/A | 2.29E+04 | 2.29E+04 | N/A | N/A | N/A | N/A | N/A | N/A | 2.29E+04 |
| | Chromium | Not Tested | 4 | 4 | 100 | N/A | N/A | 2.61E+01 | 4.71E+01 | 3.52E+01 | 3.52E+01 | 3.38E+01 | 4.71E+01 | 4.71E+01 | N/A | 4.71E+01 |
| | Chrysene | Not Tested | 2 | 4 | 50 | 6.00E+02 | 6.90E+02 | 2.50E+03 | 2.60E+03 | 1.44E+03 | 1.44E+03 | 1.60E+03 | 2.60E+03 | 2.60E+03 | N/A | 2.60E+03 |
| | Cobalt | Not Tested | 1 | 1 | 100 | N/A | N/A | 1.12E+01 | 1.12E+01 | N/A | N/A | N/A | N/A | N/A | N/A | 1.12E+01 |
| | Copper | Not Tested | 4 | 4 | 100 | N/A | N/A | 2.20E+01 | 5.38E+01 | 3.81E+01 | 3.81E+01 | 3.82E+01 | 5.38E+01 | 5.38E+01 | N/A | 5.38E+01 |
| | Dibenz[a,h]anthracene | Not Tested | 1 | 4 | 25 | 6.00E+02 | 7.00E+02 | 6.00E+02 | 6.00E+02 | 3.99E+02 | 3.99E+02 | 6.45E+02 | 7.00E+02 | 7.00E+02 | N/A | 6.00E+02 |
| | Fluoranthene | Not Tested | 3 | 4 | 75 | 6.00E+02 | 6.00E+02 | 9.40E+02 | 5.40E+03 | 2.89E+03 | 2.89E+03 | 2.92E+03 | 5.40E+03 | 5.40E+03 | N/A | 5.40E+03 |
| | Indeno[1,2,3-cd]pyrene | Not Tested | 2 | 4 | 50 | 6.00E+02 | 6.90E+02 | 2.00E+03 | 2.10E+03 | 1.19E+03 | 1.19E+03 | 1.35E+03 | 2.10E+03 | 2.10E+03 | N/A | 2.10E+03 |
| | Iron | Not Tested | 4 | 4 | 100 | N/A | N/A | 2.15E+04 | 3.67E+04 | 2.84E+04 | 2.84E+04 | 2.77E+04 | 3.67E+04 | 3.67E+04 | N/A | 3.67E+04 |
| | Lead | Not Tested | 4 | 4 | 100 | N/A | N/A | 3.00E+01 | 9.70E+01 | 5.15E+01 | 5.15E+01 | 3.94E+01 | 9.70E+01 | 9.70E+01 | N/A | 9.70E+01 |
| | Magnesium | Not Tested | 1 | 1 | 100 | N/A | N/A | 9.78E+03 | 9.78E+03 | N/A | N/A | N/A | N/A | N/A | N/A | 9.78E+03 |
| | Manganese | Not Tested | 1 | 1 | 100 | N/A | N/A | 4.31E+02 | 4.31E+02 | N/A | N/A | N/A | N/A | N/A | N/A | 4.31E+02 |
| | Mercury | Not Tested | 3 | 4 | 75 | 2.10E-01 | 2.10E-01 | 6.20E-02 | 1.36E-01 | 9.30E-02 | 9.30E-02 | 1.03E-01 | 2.10E-01 | 2.10E-01 | N/A | 1.36E-01 |
| | Nickel | Not Tested | 3 | 4 | 75 | 2.40E+01 | 2.40E+01 | 3.45E+01 | 5.54E+01 | 3.46E+01 | 3.46E+01 | 3.55E+01 | 5.54E+01 | 5.54E+01 | N/A | 5.54E+01 |
| | Phenanthrene | Not Tested | 2 | 4 | 50 | 6.00E+02 | 6.90E+02 | 2.30E+03 | 2.30E+03 | 1.31E+03 | 1.31E+03 | 1.50E+03 | 2.30E+03 | 2.30E+03 | N/A | 2.30E+03 |
| | Potassium | Not Tested | 1 | 1 | 100 | N/A | N/A | 2.04E+03 | 2.04E+03 | N/A | N/A | N/A | N/A | N/A | N/A | 2.04E+03 |
| | Pyrene | Not Tested | 3 | 4 | 75 | 6.00E+02 | 6.00E+02 | 9.80E+02 | 4.10E+03 | 2.25E+03 | 2.25E+03 | 2.29E+03 | 4.10E+03 | 4.10E+03 | N/A | 4.10E+03 |
| | Selenium | Not Tested | 2 | 4 | 50 | 1.00E+00 | 1.22E+00 | 1.27E+00 | 1.69E+00 | 1.02E+00 | 1.02E+00 | 1.25E+00 | 1.69E+00 | 1.69E+00 | N/A | 1.69E+00 |
| | Sodium | Not Tested | 1 | 4 | 25 | 2.53E+02 | 3.05E+03 | 3.74E+02 | 3.74E+02 | 6.36E+02 | 6.36E+02 | 7.07E+02 | 3.05E+03 | 3.05E+03 | N/A | 3.74E+02 |
| | Strontium | Not Tested | 3 | 3 | 100 | N/A | N/A | 8.90E+01 | 7.87E+02 | 4.73E+02 | 4.73E+02 | 5.44E+02 | 7.87E+02 | 7.87E+02 | N/A | 7.87E+02 |
| | Vanadium | Not Tested | 1 | 1 | 100 | N/A | N/A | 3.25E+01 | 3.25E+01 | N/A | N/A | N/A | N/A | N/A | N/A | 3.25E+01 |
| | Zinc | Not Tested | 4 | 4 | 100 | N/A | N/A | 8.10E+01 | 3.11E+02 | 2.00E+02 | 2.00E+02 | 2.04E+02 | 3.11E+02 | 3.11E+02 | N/A | 3.11E+02 |
| | bis(2-Ethylhexyl)phthalate | Not Tested | 2 | 4 | 50 | 6.00E+02 | 6.90E+02 | 1.00E+03 | 3.30E+03 | 1.24E+03 | 1.24E+03 | 8.45E+02 | 3.30E+03 | 3.30E+03 | N/A | 3.30E+03 |
| OC-2 | 4,4'-DDE | Not Tested | 1 | 1 | 100 | N/A | N/A | 3.49E+00 | 3.49E+00 | N/A | N/A | N/A | N/A | N/A | N/A | 3.49E+00 |
| | 4,4'-DDT | Not Tested | 1 | 1 | 100 | N/A | N/A | 2.52E+00 | 2.52E+00 | N/A | N/A | N/A | N/A | N/A | N/A | 2.52E+00 |
| | Aluminum | Not Tested | 1 | 1 | 100 | N/A | N/A | 1.29E+04 | 1.29E+04 | N/A | N/A | N/A | N/A | N/A | N/A | 1.29E+04 |
| | Aroclor 1254 | Not Tested | 1 | 1 | 100 | N/A | N/A | 7.61E+01 | 7.61E+01 | N/A | N/A | N/A | N/A | N/A | N/A | 7.61E+01 |
| | Aroclor 1260 | Not Tested | 1 | 1 | 100 | N/A | N/A | 3.91E+01 | 3.91E+01 | N/A | N/A | N/A | N/A | N/A | N/A | 3.91E+01 |
| | Arsenic | Not Tested | 1 | 1 | 100 | N/A | N/A | 3.02E+01 | 3.02E+01 | N/A | N/A | N/A | N/A | N/A | N/A | 3.02E+01 |
| | Barium | Not Tested | 1 | 1 | 100 | N/A | N/A | 1.25E+02 | 1.25E+02 | N/A | N/A | N/A | N/A | N/A | N/A | 1.25E+02 |
| | Benzo[a]anthracene | Not Tested | 1 | 1 | 100 | N/A | N/A | 1.60E+03 | 1.60E+03 | N/A | N/A | N/A | N/A | N/A | N/A | 1.60E+03 |
| | Benzo[a]pyrene | Not Tested | 1 | 1 | 100 | N/A | N/A | 1.50E+03 | 1.50E+03 | N/A | N/A | N/A | N/A | N/A | N/A | 1.50E+03 |
| | Benzo[k]fluoranthene | Not Tested | 1 | 1 | 100 | N/A | N/A | 4.00E+03 | 4.00E+03 | N/A | N/A | N/A | N/A | N/A | N/A | 4.00E+03 |
| | Beryllium | Not Tested | 1 | 1 | 100 | N/A | N/A | 5.91E-01 | 5.91E-01 | N/A | N/A | N/A | N/A | N/A | N/A | 5.91E-01 |
| | Cadmium | Not Tested | 1 | 1 | 100 | N/A | N/A | 1.82E+00 | 1.82E+00 | N/A | N/A | N/A | N/A | N/A | N/A | 1.82E+00 |
| | Chromium | Not Tested | 1 | 1 | 100 | N/A | N/A | 4.71E+01 | 4.71E+01 | N/A | N/A | N/A | N/A | N/A | N/A | 4.71E+01 |
| | Chrysene | Not Tested | 1 | 1 | 100 | N/A | N/A | 2.60E+03 | 2.60E+03 | N/A | N/A | N/A | N/A | N/A | N/A | 2.60E+03 |
| | Copper | Not Tested | 1 | 1 | 100 | N/A | N/A | 5.38E+01 | 5.38E+01 | N/A | N/A | N/A | N/A | N/A | N/A | 5.38E+01 |
| | Fluoranthene | Not Tested | 1 | 1 | 100 | N/A | N/A | 5.40E+03 | 5.40E+03 | N/A | N/A | N/A | N/A | N/A | N/A | 5.40E+03 |
| | Indeno[1,2,3-cd]pyrene | Not Tested | 1 | 1 | 100 | N/A | N/A | 2.00E+03 | 2.00E+03 | N/A | N/A | N/A | N/A | N/A | N/A | 2.00E+03 |
| | Iron | Not Tested | 1 | 1 | 100 | N/A | N/A | 2.96E+04 | 2.96E+04 | N/A | N/A | N/A | N/A | N/A | N/A | 2.96E+04 |
| | Lead | Not Tested | 1 | 1 | 100 | N/A | N/A | 9.70E+01 | 9.70E+01 | N/A | N/A | N/A | N/A | N/A | N/A | 9.70E+01 |
| | Mercury | Not Tested | 1 | 1 | 100 | N/A | N/A | 1.36E-01 | 1.36E-01 | N/A | N/A | N/A | N/A | N/A | N/A | 1.36E-01 |
| | Nickel | Not Tested | 1 | 1 | 100 | N/A | N/A | 5.54E+01 | 5.54E+01 | N/A | N/A | N/A | N/A | N/A | N/A | 5.54E+01 |
| | Phenanthrene | Not Tested | 1 | 1 | 100 | N/A | N/A | 2.30E+03 | 2.30E+03 | N/A | N/A | N/A | N/A | N/A | N/A | 2.30E+03 |
| | Pyrene | Not Tested | 1 | 1 | 100 | N/A | N/A | 4.10E+03 | 4.10E+03 | N/A | N/A | N/A | N/A | N/A | N/A | 4.10E+03 |
| | Selenium | Not Tested | 1 | 1 | 100 | N/A | N/A | 1.69E+00 | 1.69E+00 | N/A | N/A | N/A | N/A | N/A | N/A | 1.69E+00 |
| | Sodium | Not Tested | 1 | 1 | 100 | N/A | N/A | 3.74E+02 | 3.74E+02 | N/A | N/A | N/A | N/A | N/A | N/A | 3.74E+02 |
| | Strontium | Not Tested | 1 | 1 | 100 | N/A | N/A | 7.87E+02 | 7.87E+02 | N/A | N/A | N/A | N/A | N/A | N/A | 7.87E+02 |
| | Zinc | Not Tested | 1 | 1 | 100 | N/A | N/A | 3.11E+02 | 3.11E+02 | N/A | N/A | N/A | N/A | N/A | N/A | 3.11E+02 |
| | bis(2-Ethylhexyl)phthalate | Not Tested | 1 | 1 | 100 | N/A | N/A | 3.30E+03 | 3.30E+03 | N/A | N/A | N/A | N/A | N/A | N/A | 3.30E+03 |
| | 4,4'-DDD | Not Tested | 3 | 4 | 75 | 1.67E+00 | 1.67E+00 | 6.57E+00 | 2.12E+01 | 9.90E+00 | 9.90E+00 | 8.79E+00 | 2.12E+01 | 2.12E+01 | N/A | 2.12E+01 |
| | 4,4'-DDE | Not Tested | 2 | 4 | 50 | 5.60E-01 | 6.60E+00 | 3.51E+00 | 1.31E+01 | 5.05E+00 | 5.05E+00 | 5.06E+00 | 1.31E+01 | 1.31E+01 | N/A | 1.31E+01 |

**TABLE 6**
**SEDIMENT - SPECIFIC SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR INDIVIDUAL RECHES OF OTTER CREEK**
**HUMAN HEALTH RISK ASSESSMENT**
**DUCK AND OTTER CREEKS**
**TOLEDO AND OREGON, OHIO**

| | Chemical | Distribution[1] | Number of Samples | | Detection Frequency (Percent) | Censored Data | | Detected Data | | All Data | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Arithmetic Mean | Geometric Mean | Nonparametric Percentiles | | | UCL[2] | EPC |
| | | | Detected | Total | | Min | Max | Min | Max | | | 50th | 90th | 95th | | |
| | Aluminum | Normal | 5 | 5 | 100 | N/A | N/A | 8.87E+03 | 3.27E+04 | 1.95E+04 | 1.95E+04 | 1.31E+04 | 3.27E+04 | 3.27E+04 | 3.00E+04 | 3.00E+04 |
| | Aroclor 1254 | Not Tested | 4 | 4 | 100 | N/A | N/A | 9.69E+01 | 1.60E+02 | 1.16E+02 | 1.16E+02 | 1.04E+02 | 1.60E+02 | 1.60E+02 | N/A | 1.60E+02 |
| | Aroclor 1260 | Not Tested | 3 | 4 | 75 | 4.68E+01 | 4.68E+01 | 3.52E+01 | 6.80E+01 | 4.11E+01 | 4.11E+01 | 4.23E+01 | 6.80E+01 | 6.80E+01 | N/A | 6.80E+01 |
| | Arsenic | Normal | 6 | 6 | 100 | N/A | N/A | 8.27E+00 | 3.65E+01 | 2.53E+01 | 2.53E+01 | 2.81E+01 | 3.65E+01 | 3.65E+01 | 3.32E+01 | 3.32E+01 |
| | Barium | Normal | 6 | 7 | 86 | 9.40E-01 | 9.40E-01 | 9.07E+01 | 2.30E+02 | 1.25E+02 | 1.25E+02 | 1.19E+02 | 2.30E+02 | 2.30E+02 | 1.81E+02 | 1.81E+02 |
| | Benzo[a]anthracene | Not Tested | 3 | 4 | 75 | 6.60E+02 | 6.60E+02 | 1.30E+03 | 2.10E+03 | 1.38E+03 | 1.38E+03 | 1.55E+03 | 2.10E+03 | 2.10E+03 | N/A | 2.10E+03 |
| | Benzo[a]pyrene | Normal | 4 | 5 | 80 | 6.60E+02 | 6.60E+02 | 1.30E+03 | 2.60E+03 | 1.73E+03 | 1.73E+03 | 2.00E+03 | 2.60E+03 | 2.60E+03 | 2.66E+03 | 2.60E+03 |
| | Benzo[b]fluoranthene | Not Tested | 2 | 3 | 67 | 6.60E+02 | 6.60E+02 | 2.80E+03 | 3.00E+03 | 2.04E+03 | 2.04E+03 | 2.80E+03 | 3.00E+03 | 3.00E+03 | N/A | 3.00E+03 |
| | Benzo[g,h,i]perylene | Normal | 4 | 5 | 80 | 6.60E+02 | 6.60E+02 | 1.40E+03 | 2.80E+03 | 1.63E+03 | 1.63E+03 | 1.70E+03 | 2.80E+03 | 2.80E+03 | 2.52E+03 | 2.52E+03 |
| | Benzo[k]fluoranthene | Normal | 4 | 5 | 80 | 6.60E+02 | 6.60E+02 | 1.70E+03 | 4.30E+03 | 2.33E+03 | 2.33E+03 | 2.20E+03 | 4.30E+03 | 4.30E+03 | 3.78E+03 | 3.78E+03 |
| | Beryllium | Normal | 5 | 5 | 100 | N/A | N/A | 5.60E-01 | 1.58E+00 | 9.90E-01 | 9.90E-01 | 7.83E-01 | 1.58E+00 | 1.58E+00 | 1.41E+00 | 1.41E+00 |
| | Cadmium | Normal | 6 | 6 | 100 | N/A | N/A | 6.05E-01 | 1.29E+00 | 9.67E-01 | 9.67E-01 | 9.70E-01 | 1.29E+00 | 1.29E+00 | 1.15E+00 | 1.15E+00 |
| | Calcium | Not Tested | 1 | 1 | 100 | N/A | N/A | 3.93E+04 | 3.93E+04 | N/A | N/A | N/A | N/A | N/A | N/A | 3.93E+04 |
| | Chromium | Normal | 6 | 6 | 100 | N/A | N/A | 7.78E+01 | 1.63E+02 | 1.11E+02 | 1.11E+02 | 1.06E+02 | 1.63E+02 | 1.63E+02 | 1.36E+02 | 1.36E+02 |
| | Chrysene | Normal | 4 | 5 | 80 | 6.60E+02 | 6.60E+02 | 2.10E+03 | 4.20E+03 | 2.49E+03 | 2.49E+03 | 2.80E+03 | 4.20E+03 | 4.20E+03 | 3.89E+03 | 3.89E+03 |
| OC-3 | Copper | Normal | 6 | 6 | 100 | N/A | N/A | 4.47E+01 | 1.39E+02 | 9.26E+01 | 9.26E+01 | 9.40E+01 | 1.39E+02 | 1.39E+02 | 1.20E+02 | 1.20E+02 |
| | Dibenz[a,h]anthracene | Not Tested | 1 | 5 | 20 | 6.00E+02 | 9.40E+02 | 7.00E+02 | 7.00E+02 | 4.30E+02 | 4.30E+02 | 7.00E+02 | 9.40E+02 | 9.40E+02 | 1.11E+03 | 7.00E+02 |
| | Endrin | Not Tested | 1 | 4 | 25 | 5.58E+00 | 9.30E+00 | 5.80E+00 | 5.80E+00 | 4.14E+00 | 4.14E+00 | 6.20E+00 | 9.30E+00 | 9.30E+00 | N/A | 5.80E+00 |
| | Fluoranthene | Normal | 5 | 5 | 100 | N/A | N/A | 7.00E+02 | 6.20E+03 | 4.06E+03 | 4.06E+03 | 4.80E+03 | 6.20E+03 | 6.20E+03 | 6.05E+03 | 6.05E+03 |
| | Indeno[1,2,3-cd]pyrene | Normal | 4 | 5 | 80 | 6.60E+02 | 6.60E+02 | 1.50E+03 | 2.70E+03 | 1.69E+03 | 1.69E+03 | 1.70E+03 | 2.70E+03 | 2.70E+03 | 2.59E+03 | 2.59E+03 |
| | Iron | Normal | 6 | 6 | 100 | N/A | N/A | 1.35E+04 | 2.99E+04 | 2.17E+04 | 2.17E+04 | 2.22E+04 | 2.99E+04 | 2.99E+04 | 2.80E+04 | 2.80E+04 |
| | Lead | Normal | 6 | 6 | 100 | N/A | N/A | 6.13E+01 | 1.89E+02 | 1.24E+02 | 1.24E+02 | 1.24E+02 | 1.89E+02 | 1.89E+02 | 1.63E+02 | 1.63E+02 |
| | Magnesium | Not Tested | 1 | 1 | 100 | N/A | N/A | 1.65E+04 | 1.65E+04 | N/A | N/A | N/A | N/A | N/A | N/A | 1.65E+04 |
| | Manganese | Not Tested | 1 | 1 | 100 | N/A | N/A | 4.17E+02 | 4.17E+02 | N/A | N/A | N/A | N/A | N/A | N/A | 4.17E+02 |
| | Mercury | Normal | 5 | 6 | 83 | 1.00E-01 | 1.00E-01 | 1.39E-01 | 5.50E-01 | 2.46E-01 | 2.46E-01 | 2.12E-01 | 5.50E-01 | 5.50E-01 | 3.89E-01 | 3.89E-01 |
| | Methoxychlor | Not Tested | 1 | 4 | 25 | 9.30E+00 | 2.85E+01 | 2.10E+01 | 2.10E+01 | 1.35E+01 | 1.35E+01 | 2.44E+01 | 2.85E+01 | 2.85E+01 | N/A | 2.10E+01 |
| | Nickel | Normal | 6 | 6 | 100 | N/A | N/A | 1.86E+01 | 5.00E+01 | 4.04E+01 | 4.04E+01 | 4.26E+01 | 5.00E+01 | 5.00E+01 | 4.96E+01 | 4.96E+01 |
| | Phenanthrene | Normal | 4 | 5 | 80 | 6.60E+02 | 6.60E+02 | 1.30E+03 | 3.00E+03 | 1.95E+03 | 1.95E+03 | 2.10E+03 | 3.00E+03 | 3.00E+03 | 3.08E+03 | 3.00E+03 |
| | Potassium | Not Tested | 1 | 1 | 100 | N/A | N/A | 9.14E+03 | 9.14E+03 | N/A | N/A | N/A | N/A | N/A | N/A | 9.14E+03 |
| | Pyrene | Normal | 5 | 5 | 100 | N/A | N/A | 1.10E+03 | 6.40E+03 | 4.00E+03 | 4.00E+03 | 4.40E+03 | 6.40E+03 | 6.40E+03 | 5.92E+03 | 5.92E+03 |
| | Selenium | Normal | 5 | 6 | 83 | 5.00E-01 | 5.00E-01 | 2.99E+00 | 8.23E+00 | 3.60E+00 | 3.60E+00 | 3.23E+00 | 8.23E+00 | 8.23E+00 | 5.74E+00 | 5.74E+00 |
| | Silver | Not Tested | 1 | 1 | 100 | N/A | N/A | 3.40E-01 | 3.40E-01 | N/A | N/A | N/A | N/A | N/A | N/A | 3.40E-01 |
| | Sodium | Normal | 3 | 5 | 60 | 3.32E+03 | 4.57E+03 | 2.09E+02 | 4.75E+02 | 1.00E+03 | 1.00E+03 | 4.75E+02 | 4.57E+03 | 4.57E+03 | 3.19E+03 | 4.75E+02 |
| | Strontium | Normal | 5 | 5 | 100 | N/A | N/A | 1.94E+02 | 3.71E+02 | 2.73E+02 | 2.73E+02 | 2.57E+02 | 3.71E+02 | 3.71E+02 | 3.36E+02 | 3.36E+02 |
| | Toluene | Not Tested | 1 | 4 | 25 | 1.00E+01 | 6.00E+01 | 3.00E+02 | 3.00E+02 | 9.00E+01 | 9.00E+01 | 5.50E+01 | 3.00E+02 | 3.00E+02 | N/A | 3.00E+02 |
| | Zinc | Normal | 6 | 6 | 100 | N/A | N/A | 1.86E+02 | 3.81E+02 | 2.86E+02 | 2.86E+02 | 3.08E+02 | 3.81E+02 | 3.81E+02 | 3.52E+02 | 3.52E+02 |
| | alpha-Chlordane | Not Tested | 2 | 4 | 50 | 2.79E+00 | 2.85E+00 | 9.60E+00 | 1.61E+01 | 7.13E+00 | 7.13E+00 | 6.23E+00 | 1.61E+01 | 1.61E+01 | N/A | 1.61E+01 |
| | bis(2-Ethylhexyl)phthalate | Normal | 4 | 5 | 80 | 6.60E+02 | 6.60E+02 | 1.00E+03 | 3.50E+03 | 1.93E+03 | 1.93E+03 | 1.70E+03 | 3.50E+03 | 3.50E+03 | 3.24E+03 | 3.24E+03 |
| | gamma-Chlordane | Not Tested | 2 | 4 | 50 | 2.79E+00 | 2.85E+00 | 9.60E+00 | 1.58E+01 | 7.06E+00 | 7.06E+00 | 6.23E+00 | 1.58E+01 | 1.58E+01 | N/A | 1.58E+01 |
| | 2,4,5-TP | Not Tested | 2 | 8 | 25 | 1.00E+01 | 1.00E+01 | 1.22E+01 | 2.13E+01 | 7.93E+00 | 7.93E+00 | 1.00E+01 | 2.13E+01 | 2.13E+01 | 1.85E+01 | 1.85E+01 |
| | 2,4-Dimethylphenol | Not Tested | 2 | 39 | 5 | 3.30E+02 | 1.90E+04 | 9.00E+02 | 9.00E+02 | 9.49E+02 | 9.49E+02 | 7.00E+02 | 5.50E+03 | 9.35E+03 | 3.34E+03 | 9.00E+02 |
| | 2-Butanone | Not Tested | 8 | 22 | 36 | 2.10E+01 | 2.00E+03 | 1.40E+01 | 2.26E+02 | 9.95E+01 | 9.95E+01 | 7.10E+01 | 2.08E+02 | 1.73E+03 | 5.08E+02 | 2.26E+02 |
| | 2-Methylnaphthalene | Not Tested | 16 | 35 | 46 | 5.60E+02 | 8.70E+03 | 1.90E+02 | 4.50E+03 | 1.26E+03 | 1.26E+03 | 7.00E+02 | 4.82E+03 | 6.14E+03 | 2.72E+03 | 2.72E+03 |
| | 2-Methylphenol | Not Tested | 1 | 35 | 3 | 5.60E+02 | 1.90E+04 | 1.30E+02 | 1.30E+02 | 9.97E+02 | 9.97E+02 | 7.10E+02 | 6.78E+03 | 1.13E+04 | 3.70E+03 | 1.30E+02 |
| | 3 & 4-Methylphenol | Gamma | 8 | 11 | 73 | 5.60E+02 | 6.20E+02 | 6.60E+02 | 4.10E+03 | 1.39E+03 | 1.39E+03 | 1.50E+03 | 3.68E+03 | 4.10E+03 | 6.97E+03 | 4.10E+03 |
| | 4,4'-DDD | Gamma | 17 | 26 | 65 | 5.30E+00 | 1.40E+01 | 8.20E+00 | 6.72E+01 | 1.77E+01 | 1.77E+01 | 1.46E+01 | 4.60E+01 | 6.72E+01 | 8.06E+01 | 6.72E+01 |
| | 4,4'-DDE | Not Tested | 10 | 26 | 38 | 5.30E+00 | 1.01E+01 | 1.80E+00 | 2.99E+01 | 8.76E+00 | 8.76E+00 | 8.60E+00 | 2.40E+01 | 2.81E+01 | 1.63E+01 | 1.63E+01 |
| | 4,4'-DDT | Not Tested | 9 | 26 | 35 | 5.30E+00 | 1.01E+01 | 2.15E+00 | 2.14E+01 | 7.43E+00 | 7.43E+00 | 8.05E+00 | 2.04E+01 | 2.11E+01 | 1.36E+01 | 1.36E+01 |
| | 4-Methylphenol | Nonparametric | 12 | 24 | 50 | 6.60E+02 | 8.70E+03 | 1.50E+02 | 6.80E+03 | 1.93E+03 | 1.93E+03 | 9.05E+02 | 6.20E+03 | 8.23E+03 | 4.28E+03 | 4.28E+03 |
| | Acenaphthene | Not Tested | 2 | 39 | 5 | 3.30E+02 | 1.90E+04 | 8.10E+01 | 1.30E+02 | 9.12E+02 | 9.12E+02 | 6.60E+02 | 5.50E+03 | 9.35E+03 | 3.29E+03 | 1.30E+02 |
| | Acetone | Gamma | 13 | 21 | 62 | 5.00E+01 | 2.00E+03 | 7.40E+01 | 1.23E+03 | 3.74E+02 | 3.74E+02 | 2.40E+02 | 1.15E+03 | 1.92E+03 | 2.39E+03 | 1.23E+03 |
| | Acetonitrile | Not Tested | 3 | 8 | 38 | 5.00E+01 | 5.00E+01 | 3.03E+02 | 3.73E+03 | 7.40E+02 | 7.40E+02 | 5.00E+01 | 3.73E+03 | 3.73E+03 | 2.82E+03 | 2.82E+03 |
| | Aldrin | Not Tested | 5 | 26 | 19 | 2.70E+00 | 1.01E+01 | 1.90E+00 | 1.96E+01 | 5.06E+00 | 5.06E+00 | 8.05E+00 | 1.24E+01 | 1.90E+01 | 9.74E+00 | 9.74E+00 |
| | Aluminum | Lognormal | 21 | 21 | 100 | N/A | N/A | 5.73E+03 | 4.73E+04 | 1.69E+04 | 1.69E+04 | 1.07E+04 | 3.45E+04 | 4.60E+04 | 2.28E+04 | 2.28E+04 |
| | Anthracene | Not Tested | 6 | 39 | 15 | 3.30E+02 | 1.90E+04 | 1.90E+02 | 1.10E+03 | 9.61E+02 | 9.61E+02 | 7.00E+02 | 5.50E+03 | 9.35E+03 | 3.40E+03 | 1.10E+03 |
| | Antimony | Not Tested | 3 | 17 | 18 | 2.50E-01 | 1.59E+01 | 9.90E-01 | 1.40E+00 | 1.76E+00 | 1.76E+00 | 9.90E-01 | 1.35E+01 | 1.59E+01 | 6.89E+00 | 1.40E+00 |
| | Aroclor 1254 | Lognormal | 16 | 26 | 62 | 4.74E+01 | 1.40E+02 | 5.90E+01 | 1.76E+03 | 3.29E+02 | 3.29E+02 | 1.34E+02 | 1.05E+03 | 1.53E+03 | 1.88E+03 | 1.76E+03 |
| | Aroclor 1260 | Not Tested | 8 | 26 | 31 | 2.76E+01 | 1.40E+02 | 4.62E+01 | 2.14E+02 | 6.11E+01 | 6.11E+01 | 9.35E+01 | 1.43E+02 | 1.91E+02 | 1.12E+02 | 1.12E+02 |
| | Arsenic | Gamma | 33 | 33 | 100 | N/A | N/A | 8.27E+00 | 3.06E+01 | 1.59E+01 | 1.59E+01 | 1.40E+01 | 2.52E+01 | 3.03E+01 | 1.78E+01 | 1.78E+01 |
| | Barium | Nonparametric | 33 | 44 | 75 | 5.60E-01 | 1.00E+00 | 6.80E+01 | 2.14E+02 | 9.61E+01 | 9.61E+01 | 1.10E+02 | 1.78E+02 | 1.98E+02 | 1.38E+02 | 1.38E+02 |
| | Benzene | Not Tested | 3 | 20 | 15 | 5.00E+00 | 5.00E+01 | 3.00E+00 | 2.07E+01 | 6.62E+00 | 6.62E+00 | 8.20E+00 | 2.57E+01 | 4.88E+01 | 1.85E+01 | 1.85E+01 |
| | Benzo[a]anthracene | Not Tested | 4 | 28 | 14 | 3.30E+02 | 1.90E+04 | 1.90E+02 | 2.00E+03 | 1.21E+03 | 1.21E+03 | 6.60E+02 | 8.77E+03 | 1.47E+04 | 4.53E+03 | 2.00E+03 |
| | Benzo[a]pyrene | Not Tested | 12 | 39 | 31 | 3.30E+02 | 1.90E+04 | 1.80E+02 | 2.40E+03 | 1.04E+03 | 1.04E+03 | 8.00E+02 | 5.30E+03 | 8.70E+03 | 3.32E+03 | 2.40E+03 |
| | Benzo[b]fluoranthene | Not Tested | 11 | 39 | 28 | 3.30E+02 | 1.90E+04 | 2.40E+02 | 2.20E+03 | 9.93E+02 | 9.93E+02 | 7.90E+02 | 5.30E+03 | 8.70E+03 | 3.30E+03 | 2.20E+03 |
| | Benzo[g,h,i]perylene | Not Tested | 9 | 39 | 23 | 3.30E+02 | 1.90E+04 | 1.50E+01 | 1.60E+03 | 9.32E+02 | 9.32E+02 | 7.10E+02 | 5.30E+03 | 8.70E+03 | 3.24E+03 | 1.60E+03 |
| | Benzo[k]fluoranthene | Not Tested | 10 | 39 | 26 | 3.30E+02 | 1.90E+04 | 9.80E+01 | 2.00E+03 | 9.64E+02 | 9.64E+02 | 8.00E+02 | 5.30E+03 | 8.70E+03 | 3.24E+03 | 2.00E+03 |
| | Beryllium | Normal | 23 | 29 | 79 | 5.00E-02 | 1.30E+00 | 2.13E-01 | 1.49E+00 | 6.06E-01 | 6.06E-01 | 6.00E-01 | 1.22E+00 | 1.40E+00 | 7.49E-01 | 7.49E-01 |
| | Cadmium | Normal | 27 | 33 | 82 | 1.55E-01 | 1.30E+00 | 5.00E-01 | 1.70E+00 | 8.10E-01 | 8.10E-01 | 8.00E-01 | 1.41E+00 | 1.54E+00 | 9.48E-01 | 9.48E-01 |

**TABLE 6**
**SEDIMENT - SPECIFIC SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR INDIVIDUAL RECHES OF OTTER CREEK**
**HUMAN HEALTH RISK ASSESSMENT**
**DUCK AND OTTER CREEKS**
**TOLEDO AND OREGON, OHIO**

| | Chemical | Distribution[1] | Number of Samples | | Detection Frequency (Percent) | Censored Data | | Detected Data | | All Data | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | Arithmetic Mean | Geometric Mean | Nonparametric Percentiles | | | UCL[2] | EPC |
| | | | Detected | Total | | Min | Max | Min | Max | | | 50th | 90th | 95th | | |
| OC-4 | Calcium | Normal | 20 | 20 | 100 | N/A | N/A | 2.97E+04 | 2.23E+05 | 1.14E+05 | 1.14E+05 | 1.08E+05 | 2.09E+05 | 2.22E+05 | 1.36E+05 | 1.36E+05 |
| | Carbon disulfide | Not Tested | 4 | 21 | 19 | 5.00E+00 | 2.00E+03 | 3.00E+00 | 5.31E+01 | 6.47E+01 | 6.47E+01 | 1.10E+01 | 1.00E+02 | 1.81E+03 | 4.99E+02 | 5.31E+01 |
| | Chromium | Gamma | 33 | 33 | 100 | N/A | N/A | 3.20E+01 | 2.97E+02 | 1.13E+02 | 1.13E+02 | 9.87E+01 | 1.84E+02 | 2.32E+02 | 1.29E+02 | 1.29E+02 |
| | Chrysene | Gamma | 22 | 39 | 56 | 3.30E+02 | 1.90E+04 | 3.90E+02 | 3.50E+03 | 1.63E+03 | 1.63E+03 | 1.20E+03 | 5.30E+03 | 8.70E+03 | 6.47E+03 | 3.50E+03 |
| | Cobalt | Not Tested | 5 | 17 | 29 | 2.50E+00 | 1.32E+01 | 2.90E+00 | 7.20E+00 | 3.38E+00 | 3.38E+00 | 2.90E+00 | 1.12E+01 | 1.32E+01 | 7.43E+00 | 7.20E+00 |
| | Copper | Gamma | 33 | 33 | 100 | N/A | N/A | 4.20E+01 | 1.97E+02 | 9.07E+01 | 9.07E+01 | 9.03E+01 | 1.34E+02 | 1.65E+02 | 1.00E+02 | 1.00E+02 |
| | Cyanide | Lognormal | 8 | 14 | 57 | 8.00E-01 | 1.30E+00 | 2.00E-01 | 1.45E+00 | 4.98E-01 | 4.98E-01 | 7.90E-01 | 1.38E+00 | 1.45E+00 | 1.79E+00 | 1.45E+00 |
| | Dieldrin | Not Tested | 2 | 26 | 8 | 2.90E+00 | 1.01E+01 | 1.70E+00 | 3.25E+00 | 3.82E+00 | 3.82E+00 | 7.60E+00 | 1.00E+01 | 1.01E+01 | 6.89E+00 | 3.25E+00 |
| | Endosulfan sulfate | Not Tested | 1 | 26 | 4 | 5.30E+00 | 1.40E+01 | 3.15E+00 | 3.15E+00 | 4.15E+00 | 4.15E+00 | 8.20E+00 | 1.00E+01 | 1.26E+01 | 7.44E+00 | 3.15E+00 |
| | Endrin | Not Tested | 1 | 26 | 4 | 5.30E+00 | 1.40E+01 | 3.13E+00 | 3.13E+00 | 4.15E+00 | 4.15E+00 | 8.20E+00 | 1.00E+01 | 1.26E+01 | 7.47E+00 | 3.13E+00 |
| | Endrin aldehyde | Not Tested | 1 | 26 | 4 | 5.30E+00 | 1.40E+01 | 4.85E+00 | 4.85E+00 | 4.21E+00 | 4.21E+00 | 8.20E+00 | 1.00E+01 | 1.26E+01 | 7.48E+00 | 4.85E+00 |
| | Endrin ketone | Not Tested | 2 | 6 | 33 | 5.30E+00 | 8.70E+00 | 3.60E+00 | 7.70E+00 | 4.10E+00 | 4.10E+00 | 6.30E+00 | 8.70E+00 | 8.70E+00 | 9.84E+00 | 7.70E+00 |
| | Fluoranthene | Nonparametric | 20 | 39 | 51 | 3.30E+02 | 8.70E+03 | 4.60E+02 | 1.10E+04 | 1.45E+03 | 1.45E+03 | 8.30E+02 | 5.30E+03 | 8.70E+03 | 3.19E+03 | 3.19E+03 |
| | Fluorene | Not Tested | 11 | 39 | 28 | 3.30E+02 | 1.90E+04 | 1.20E+02 | 2.60E+03 | 1.02E+03 | 1.02E+03 | 7.00E+02 | 5.30E+03 | 8.70E+03 | 3.30E+03 | 2.60E+03 |
| | Heptachlor epoxide | Not Tested | 2 | 26 | 8 | 2.70E+00 | 1.01E+01 | 2.58E+00 | 3.40E+00 | 3.74E+00 | 3.74E+00 | 7.60E+00 | 1.00E+01 | 1.01E+01 | 6.86E+00 | 3.40E+00 |
| | Indeno[1,2,3-cd]pyrene | Not Tested | 7 | 39 | 18 | 3.30E+02 | 1.90E+04 | 1.80E+01 | 1.40E+03 | 9.48E+02 | 9.48E+02 | 9.90E+02 | 5.30E+03 | 8.70E+03 | 3.25E+03 | 1.40E+03 |
| | Iron | Normal | 25 | 25 | 100 | N/A | N/A | 6.92E+03 | 2.92E+04 | 1.66E+04 | 1.66E+04 | 1.52E+04 | 2.64E+04 | 2.85E+04 | 1.88E+04 | 1.88E+04 |
| | Lead | Nonparametric | 33 | 33 | 100 | N/A | N/A | 3.10E+01 | 4.85E+03 | 2.60E+02 | 2.60E+02 | 9.90E+01 | 2.47E+02 | 1.63E+03 | 8.87E+02 | 8.87E+02 |
| | Magnesium | Gamma | 20 | 20 | 100 | N/A | N/A | 6.80E+03 | 1.57E+04 | 9.49E+03 | 9.49E+03 | 9.12E+03 | 1.22E+04 | 1.55E+04 | 1.03E+04 | 1.03E+04 |
| | Manganese | Gamma | 20 | 20 | 100 | N/A | N/A | 2.40E+02 | 6.33E+02 | 3.81E+02 | 3.81E+02 | 3.69E+02 | 5.43E+02 | 6.29E+02 | 4.16E+02 | 4.16E+02 |
| | Mercury | Normal | 28 | 33 | 85 | 1.00E-01 | 4.30E-01 | 2.30E-01 | 6.30E-01 | 3.13E-01 | 3.13E-01 | 3.04E-01 | 4.87E-01 | 5.67E-01 | 3.49E-01 | 3.49E-01 |
| | Methoxychlor | Not Tested | 6 | 26 | 23 | 5.50E+00 | 4.50E+01 | 5.60E+00 | 1.53E+01 | 7.88E+00 | 7.88E+00 | 1.00E+01 | 3.13E+01 | 4.20E+01 | 1.70E+01 | 1.53E+01 |
| | Methylene chloride | Not Tested | 2 | 22 | 9 | 5.00E+00 | 2.00E+03 | 4.00E+00 | 4.00E+00 | 5.11E+01 | 5.11E+01 | 8.20E+00 | 4.28E+01 | 1.71E+03 | 4.65E+02 | 4.00E+00 |
| | Naphthalene | Not Tested | 5 | 39 | 13 | 5.00E+01 | 1.90E+04 | 1.90E+02 | 2.40E+03 | 9.97E+02 | 9.97E+02 | 6.60E+02 | 5.50E+03 | 9.35E+03 | 3.42E+03 | 2.40E+03 |
| | Nickel | Nonparametric | 29 | 33 | 88 | 1.72E+01 | 3.00E+01 | 2.01E+01 | 1.26E+02 | 3.15E+01 | 3.15E+01 | 2.70E+01 | 5.37E+01 | 8.93E+01 | 3.78E+01 | 3.78E+01 |
| | Phenanthrene | Nonparametric | 22 | 39 | 56 | 3.30E+02 | 1.90E+04 | 4.00E+02 | 1.10E+04 | 2.03E+03 | 2.03E+03 | 1.10E+03 | 5.70E+03 | 1.10E+04 | 4.66E+03 | 4.66E+03 |
| | Phenol | Not Tested | 2 | 39 | 5 | 3.30E+02 | 1.90E+04 | 8.20E+02 | 9.00E+02 | 9.49E+02 | 9.49E+02 | 7.10E+02 | 5.50E+03 | 9.35E+03 | 3.35E+03 | 9.00E+02 |
| | Polychlorinated biphenyls | Lognormal | 5 | 8 | 62 | 1.00E+02 | 1.00E+02 | 1.33E+02 | 9.31E+02 | 2.59E+02 | 2.59E+02 | 1.34E+02 | 9.31E+02 | 9.31E+02 | 1.76E+03 | 9.31E+02 |
| | Potassium | Gamma | 19 | 20 | 95 | 1.32E+03 | 1.32E+03 | 4.97E+00 | 8.10E+03 | 2.90E+03 | 2.90E+03 | 1.64E+03 | 6.81E+03 | 8.04E+03 | 4.46E+03 | 4.46E+03 |
| | Pyrene | Lognormal | 26 | 39 | 67 | 3.30E+02 | 8.70E+03 | 2.90E+02 | 1.30E+04 | 2.19E+03 | 2.19E+03 | 1.70E+03 | 5.40E+03 | 8.70E+03 | 1.00E+04 | 1.00E+04 |
| | Selenium | Gamma | 24 | 33 | 73 | 5.00E-01 | 2.02E+00 | 1.20E+00 | 6.40E+00 | 2.20E+00 | 2.20E+00 | 1.89E+00 | 5.88E+00 | 6.40E+00 | 1.00E+01 | 6.40E+00 |
| | Silver | Not Tested | 6 | 21 | 29 | 2.30E-01 | 2.60E+00 | 3.40E-01 | 8.70E-01 | 4.59E-01 | 4.59E-01 | 5.00E-01 | 2.06E+00 | 2.56E+00 | 1.10E+00 | 8.70E-01 |
| | Sodium | Not Tested | 2 | 21 | 10 | 5.77E+02 | 5.06E+03 | 5.05E+02 | 6.19E+02 | 1.19E+03 | 1.19E+03 | 2.64E+03 | 4.68E+03 | 5.04E+03 | 2.69E+03 | 6.19E+02 |
| | Strontium | Normal | 12 | 12 | 100 | N/A | N/A | 1.27E+02 | 4.04E+02 | 2.44E+02 | 2.44E+02 | 2.29E+02 | 3.81E+02 | 4.04E+02 | 2.82E+02 | 2.82E+02 |
| | Sulfide | Normal | 8 | 8 | 100 | N/A | N/A | 1.87E+02 | 1.70E+03 | 6.11E+02 | 6.11E+02 | 4.95E+02 | 1.70E+03 | 1.70E+03 | 9.48E+02 | 9.48E+02 |
| | Thallium | Not Tested | 1 | 17 | 6 | 2.00E-01 | 2.60E+00 | 1.30E+00 | 1.30E+00 | 4.92E-01 | 4.92E-01 | 9.90E-01 | 2.24E+00 | 2.60E+00 | 1.37E+00 | 1.30E+00 |
| | Tin | Normal | 8 | 8 | 100 | N/A | N/A | 3.70E+00 | 1.30E+01 | 6.65E+00 | 6.65E+00 | 5.15E+00 | 1.30E+01 | 1.30E+01 | 8.75E+00 | 8.75E+00 |
| | Toluene | Not Tested | 7 | 22 | 32 | 5.00E+00 | 2.00E+03 | 5.68E+00 | 4.37E+01 | 5.77E+01 | 5.77E+01 | 1.59E+01 | 4.81E+01 | 1.71E+03 | 4.72E+02 | 4.37E+01 |
| | Vanadium | Normal | 16 | 17 | 94 | 1.25E+00 | 1.25E+00 | 1.70E+01 | 3.95E+01 | 2.29E+01 | 2.29E+01 | 2.15E+01 | 3.83E+01 | 3.95E+01 | 2.66E+01 | 2.66E+01 |
| | Zinc | Normal | 33 | 33 | 100 | N/A | N/A | 9.60E+01 | 2.70E+02 | 1.77E+02 | 1.77E+02 | 1.68E+02 | 2.51E+02 | 2.70E+02 | 1.91E+02 | 1.91E+02 |
| | alpha-Chlordane | Not Tested | 3 | 18 | 17 | 2.70E+00 | 1.01E+01 | 2.28E+00 | 9.30E+00 | 3.71E+00 | 3.71E+00 | 6.40E+00 | 9.92E+00 | 1.01E+01 | 7.33E+00 | 7.33E+00 |
| | bis(2-Ethylhexyl)phthalate | Not Tested | 14 | 39 | 36 | 3.30E+02 | 8.70E+03 | 2.10E+02 | 7.10E+04 | 3.08E+03 | 3.08E+03 | 8.00E+02 | 5.50E+03 | 2.02E+04 | 1.14E+04 | 1.14E+04 |
| | gamma-Chlordane | Not Tested | 6 | 18 | 33 | 2.70E+00 | 1.01E+01 | 2.00E+00 | 2.59E+01 | 5.63E+00 | 5.63E+00 | 6.30E+00 | 1.56E+01 | 2.59E+01 | 1.26E+01 | 1.26E+01 |
| | 1,1,2,2-Tetrachloroethane | Not Tested | 1 | 4 | 25 | 5.00E+00 | 2.00E+02 | 1.70E+02 | 1.70E+02 | 9.31E+01 | 9.31E+01 | 1.85E+02 | 2.00E+02 | 2.00E+02 | N/A | 1.70E+02 |
| | 2,4-Dimethylphenol | Not Tested | 1 | 71 | 1 | 6.60E+02 | 2.30E+04 | 1.00E+03 | 1.00E+03 | 6.90E+02 | 6.90E+02 | 1.10E+03 | 1.30E+03 | 1.34E+03 | 2.15E+03 | 1.00E+03 |
| | 2-Butanone | Not Tested | 2 | 3 | 67 | 2.00E+02 | 2.00E+02 | 3.34E+01 | 1.60E+02 | 9.78E+01 | 9.78E+01 | 1.60E+02 | 2.00E+02 | 2.00E+02 | N/A | 1.60E+02 |
| | 2-Methylnaphthalene | Normal | 64 | 71 | 90 | 6.60E+02 | 1.30E+03 | 1.60E+02 | 1.04E+04 | 2.82E+03 | 2.82E+03 | 2.60E+03 | 5.34E+03 | 7.00E+03 | 3.20E+03 | 3.20E+03 |
| | 4,4'-DDD | Not Tested | 3 | 4 | 75 | 1.30E+01 | 1.30E+01 | 7.17E+00 | 5.50E+01 | 2.00E+01 | 2.00E+01 | 1.22E+01 | 5.50E+01 | 5.50E+01 | N/A | 5.50E+01 |
| | 4,4'-DDE | Not Tested | 3 | 4 | 75 | 1.30E+01 | 1.30E+01 | 1.00E+01 | 2.00E+01 | 1.30E+01 | 1.30E+01 | 1.42E+01 | 2.00E+01 | 2.00E+01 | N/A | 2.00E+01 |
| | 4,4'-DDT | Not Tested | 3 | 4 | 75 | 1.30E+01 | 1.30E+01 | 3.57E+00 | 1.52E+01 | 7.44E+00 | 7.44E+00 | 8.75E+00 | 1.52E+01 | 1.52E+01 | N/A | 1.52E+01 |
| | 4-Methylphenol | Nonparametric | 67 | 71 | 94 | 6.60E+02 | 8.00E+02 | 5.40E+02 | 1.05E+04 | 4.37E+03 | 4.37E+03 | 4.30E+03 | 7.42E+03 | 9.16E+03 | 5.51E+03 | 5.51E+03 |
| | Acenaphthene | Not Tested | 3 | 71 | 4 | 6.60E+02 | 2.30E+04 | 9.00E+02 | 2.70E+03 | 7.42E+02 | 7.42E+02 | 1.10E+03 | 1.30E+03 | 1.76E+03 | 2.22E+03 | 2.22E+03 |
| | Acenaphthylene | Not Tested | 1 | 71 | 1 | 6.60E+02 | 2.30E+04 | 5.40E+01 | 5.40E+01 | 6.77E+02 | 6.77E+02 | 1.10E+03 | 1.30E+03 | 1.34E+03 | 2.16E+03 | 5.40E+01 |
| | Acetone | Not Tested | 1 | 3 | 33 | 7.60E+02 | 1.00E+03 | 1.96E+02 | 1.96E+02 | 3.59E+02 | 3.59E+02 | 7.60E+02 | 1.00E+03 | 1.00E+03 | N/A | 1.96E+02 |
| | Aldrin | Not Tested | 1 | 4 | 25 | 6.00E-01 | 1.00E+01 | 7.00E+00 | 7.00E+00 | 3.93E+00 | 3.93E+00 | 6.90E+00 | 1.00E+01 | 1.00E+01 | N/A | 7.00E+00 |
| | Aluminum | Not Tested | 4 | 4 | 100 | N/A | N/A | 9.47E+03 | 2.56E+04 | 1.47E+04 | 1.47E+04 | 1.18E+04 | 2.56E+04 | 2.56E+04 | N/A | 2.56E+04 |
| | Anthracene | Not Tested | 4 | 71 | 6 | 6.60E+02 | 2.30E+04 | 2.20E+02 | 3.90E+03 | 7.39E+02 | 7.39E+02 | 1.10E+03 | 1.30E+03 | 1.40E+03 | 2.19E+03 | 2.19E+03 |
| | Antimony | Not Tested | 2 | 3 | 67 | 2.50E-01 | 2.50E-01 | 1.00E+00 | 1.40E+00 | 8.42E-01 | 8.42E-01 | 1.00E+00 | 1.40E+00 | 1.40E+00 | N/A | 1.40E+00 |
| | Aroclor 1254 | Not Tested | 2 | 4 | 50 | 1.30E+02 | 1.60E+02 | 1.23E+02 | 3.71E+02 | 1.60E+02 | 1.60E+02 | 1.45E+02 | 3.71E+02 | 3.71E+02 | N/A | 3.71E+02 |
| | Aroclor 1260 | Not Tested | 1 | 4 | 25 | 1.00E+02 | 1.60E+02 | 8.60E+01 | 8.60E+01 | 7.02E+01 | 7.02E+01 | 1.15E+02 | 1.60E+02 | 1.60E+02 | N/A | 8.60E+01 |
| | Arsenic | Normal | 6 | 6 | 100 | N/A | N/A | 1.20E+01 | 2.46E+01 | 1.64E+01 | 1.64E+01 | 1.51E+01 | 2.46E+01 | 2.46E+01 | 2.01E+01 | 2.01E+01 |
| | Barium | Normal | 6 | 6 | 100 | N/A | N/A | 8.50E+01 | 1.48E+02 | 1.24E+02 | 1.24E+02 | 1.30E+02 | 1.48E+02 | 1.48E+02 | 1.42E+02 | 1.42E+02 |
| | Benzene | Not Tested | 1 | 2 | 50 | 9.00E+01 | 9.00E+01 | 1.01E+01 | 1.01E+01 | 2.76E+01 | 2.76E+01 | 5.01E+01 | 9.00E+01 | 9.00E+01 | N/A | 1.01E+01 |
| | Benzo[a]anthracene | Not Tested | 16 | 71 | 23 | 6.60E+02 | 2.30E+04 | 3.00E+02 | 1.13E+04 | 1.04E+03 | 1.04E+03 | 1.10E+03 | 1.88E+03 | 2.64E+03 | 2.65E+03 | 2.65E+03 |
| | Benzo[a]pyrene | Not Tested | 10 | 71 | 14 | 6.60E+02 | 1.40E+03 | 2.30E+02 | 8.30E+03 | 7.87E+02 | 7.87E+02 | 1.10E+03 | 1.40E+03 | 2.40E+03 | 1.39E+03 | 1.39E+03 |
| | Benzo[b]fluoranthene | Not Tested | 8 | 70 | 11 | 6.60E+02 | 1.40E+03 | 4.10E+02 | 9.10E+03 | 7.38E+02 | 7.38E+02 | 1.10E+03 | 1.30E+03 | 1.69E+03 | 1.36E+03 | 1.36E+03 |
| | Benzo[g,h,i]perylene | Not Tested | 7 | 71 | 10 | 6.60E+02 | 1.40E+03 | 5.70E+01 | 3.60E+03 | 6.94E+02 | 6.94E+02 | 1.10E+03 | 1.40E+03 | 2.60E+03 | 1.09E+03 | 1.09E+03 |
| | Benzo[k]fluoranthene | Not Tested | 3 | 71 | 4 | 6.60E+02 | 2.30E+04 | 1.50E+02 | 6.60E+03 | 8.08E+02 | 8.08E+02 | 1.10E+03 | 1.30E+03 | 2.24E+03 | 2.35E+03 | 2.35E+03 |

**TABLE 6**
**SEDIMENT - SPECIFIC SUMMARY STATISTICS AND EXPOSURE POINT CONCENTRATIONS FOR INDIVIDUAL RECHES OF OTTER CREEK**
**HUMAN HEALTH RISK ASSESSMENT**
**DUCK AND OTTER CREEKS**
**TOLEDO AND OREGON, OHIO**

| | Chemical | Distribution[1] | Number of Samples | | Detection Frequency (Percent) | Censored Data | | Detected Data | | All Data | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Detected | Total | | Min | Max | Min | Max | Arithmetic Mean | Geometric Mean | Nonparametric Percentiles 50th | 90th | 95th | UCL[2] | EPC |
| | Beryllium | Normal | 5 | 5 | 100 | N/A | N/A | 5.00E-01 | 1.00E+00 | 7.48E-01 | 7.48E-01 | 7.20E-01 | 1.00E+00 | 1.00E+00 | 9.64E-01 | 9.64E-01 |
| | Cadmium | Normal | 4 | 6 | 67 | 4.90E-01 | 7.70E-01 | 7.76E-01 | 1.65E+00 | 9.16E-01 | 9.16E-01 | 8.38E-01 | 1.65E+00 | 1.65E+00 | 1.42E+00 | 1.42E+00 |
| | Calcium | Not Tested | 2 | 2 | 100 | N/A | N/A | 1.30E+05 | 1.42E+05 | 1.36E+05 | 1.36E+05 | 1.36E+05 | 1.42E+05 | 1.42E+05 | N/A | 1.42E+05 |
| | Carbon disulfide | Not Tested | 1 | 3 | 33 | 5.00E+00 | 2.00E+02 | 2.80E+01 | 2.80E+01 | 4.35E+01 | 4.35E+01 | 2.80E+01 | 2.00E+02 | 2.00E+02 | N/A | 2.80E+01 |
| | Chromium | Normal | 6 | 6 | 100 | N/A | N/A | 5.72E+01 | 2.00E+02 | 1.15E+02 | 1.15E+02 | 1.13E+02 | 2.00E+02 | 2.00E+02 | 1.60E+02 | 1.60E+02 |
| | Chrysene | Nonparametric | 52 | 71 | 73 | 6.60E+02 | 1.40E+03 | 5.20E+02 | 1.10E+04 | 1.82E+03 | 1.82E+03 | 1.40E+03 | 3.22E+03 | 6.02E+03 | 2.87E+03 | 2.87E+03 |
| | Cobalt | Not Tested | 2 | 3 | 67 | 2.50E+00 | 2.50E+00 | 7.40E+00 | 7.60E+00 | 5.42E+00 | 5.42E+00 | 7.40E+00 | 7.60E+00 | 7.60E+00 | N/A | 7.60E+00 |
| | Copper | Normal | 6 | 6 | 100 | N/A | N/A | 6.87E+01 | 1.32E+02 | 1.03E+02 | 1.03E+02 | 1.04E+02 | 1.32E+02 | 1.32E+02 | 1.21E+02 | 1.21E+02 |
| | Cyanide | Not Tested | 1 | 3 | 33 | 9.50E-01 | 1.20E+00 | 1.40E-01 | 1.40E-01 | 4.05E-01 | 4.05E-01 | 9.50E-01 | 1.20E+00 | 1.20E+00 | N/A | 1.40E-01 |
| OC-5 | Dibenz[a,h]anthracene | Not Tested | 5 | 71 | 7 | 6.60E+02 | 2.30E+04 | 8.00E+02 | 1.60E+03 | 7.37E+02 | 7.37E+02 | 1.10E+03 | 1.30E+03 | 1.44E+03 | 2.18E+03 | 1.60E+03 |
| | Dieldrin | Not Tested | 2 | 4 | 50 | 1.00E+01 | 1.60E+01 | 3.70E+00 | 8.73E+00 | 6.36E+00 | 6.36E+00 | 9.37E+00 | 1.60E+01 | 1.60E+01 | N/A | 8.73E+00 |
| | Endosulfan I | Not Tested | 1 | 4 | 25 | 6.00E+00 | 1.00E+01 | 1.00E+01 | 1.00E+01 | 5.35E+00 | 5.35E+00 | 8.40E+00 | 1.00E+01 | 1.00E+01 | N/A | 1.00E+01 |
| | Endosulfan II | Not Tested | 1 | 4 | 25 | 1.00E+01 | 1.60E+01 | 1.28E+01 | 1.28E+01 | 8.07E+00 | 8.07E+00 | 1.29E+01 | 1.60E+01 | 1.60E+01 | N/A | 1.28E+01 |
| | Endosulfan sulfate | Not Tested | 1 | 4 | 25 | 1.00E+01 | 6.00E+01 | 1.40E+01 | 1.40E+01 | 1.42E+01 | 1.42E+01 | 1.50E+01 | 6.00E+01 | 6.00E+01 | N/A | 1.40E+01 |
| | Endrin | Not Tested | 1 | 4 | 25 | 1.00E+01 | 1.60E+01 | 1.25E+01 | 1.25E+01 | 8.01E+00 | 8.01E+00 | 1.28E+01 | 1.60E+01 | 1.60E+01 | N/A | 1.25E+01 |
| | Endrin aldehyde | Not Tested | 1 | 4 | 25 | 1.00E+01 | 1.80E+01 | 5.60E+00 | 5.60E+00 | 6.52E+00 | 6.52E+00 | 1.15E+01 | 1.80E+01 | 1.80E+01 | N/A | 5.60E+00 |
| | Endrin ketone | Not Tested | 1 | 2 | 50 | 1.30E+01 | 1.30E+01 | 2.60E+00 | 2.60E+00 | 4.55E+00 | 4.55E+00 | 7.80E+00 | 1.30E+01 | 1.30E+01 | N/A | 2.60E+00 |
| | Fluoranthene | Not Tested | 15 | 71 | 21 | 6.60E+02 | 1.40E+03 | 7.00E+02 | 1.90E+04 | 9.80E+02 | 9.80E+02 | 1.10E+03 | 1.58E+03 | 1.92E+03 | 2.18E+03 | 2.18E+03 |
| | Fluorene | Not Tested | 34 | 71 | 48 | 6.60E+02 | 1.40E+03 | 4.20E+02 | 2.50E+03 | 1.03E+03 | 1.03E+03 | 1.20E+03 | 1.90E+03 | 2.14E+03 | 1.39E+03 | 1.39E+03 |
| | Indeno[1,2,3-cd]pyrene | Not Tested | 4 | 71 | 6 | 7.00E+02 | 2.30E+04 | 5.00E+01 | 3.90E+03 | 7.58E+02 | 7.58E+02 | 1.10E+03 | 1.30E+03 | 1.52E+03 | 2.24E+03 | 2.24E+03 |
| | Iron | Normal | 5 | 5 | 100 | N/A | N/A | 2.13E+00 | 3.11E+04 | 1.89E+04 | 1.89E+04 | 2.07E+04 | 3.11E+04 | 3.11E+04 | 2.99E+04 | 2.99E+04 |
| | Lead | Normal | 6 | 6 | 100 | N/A | N/A | 4.23E+01 | 1.41E+02 | 9.80E+01 | 9.80E+01 | 9.85E+01 | 1.41E+02 | 1.41E+02 | 1.25E+02 | 1.25E+02 |
| | Magnesium | Not Tested | 2 | 2 | 100 | N/A | N/A | 7.58E+03 | 1.14E+04 | 9.49E+03 | 9.49E+03 | 9.49E+03 | 1.14E+04 | 1.14E+04 | N/A | 1.14E+04 |
| | Manganese | Not Tested | 2 | 2 | 100 | N/A | N/A | 3.88E+02 | 5.00E+02 | 4.44E+02 | 4.44E+02 | 4.44E+02 | 5.00E+02 | 5.00E+02 | N/A | 5.00E+02 |
| | Mercury | Normal | 4 | 6 | 67 | 1.30E-01 | 2.60E-01 | 1.64E-01 | 3.00E-01 | 1.93E-01 | 1.93E-01 | 2.31E-01 | 3.00E-01 | 3.00E-01 | 2.89E-01 | 2.89E-01 |
| | Methoxychlor | Not Tested | 2 | 4 | 50 | 1.00E+01 | 3.00E+01 | 6.80E+00 | 1.00E+01 | 9.20E+00 | 9.20E+00 | 1.00E+01 | 3.00E+01 | 3.00E+01 | N/A | 1.00E+01 |
| | Naphthalene | Not Tested | 20 | 71 | 28 | 9.00E+01 | 2.30E+04 | 9.80E+01 | 1.06E+04 | 1.33E+03 | 1.33E+03 | 1.10E+03 | 2.68E+03 | 6.56E+03 | 3.05E+03 | 3.05E+03 |
| | Nickel | Normal | 6 | 6 | 100 | N/A | N/A | 1.99E+01 | 4.36E+01 | 2.98E+01 | 2.98E+01 | 2.82E+01 | 4.36E+01 | 4.36E+01 | 3.77E+01 | 3.77E+01 |
| | Phenanthrene | Gamma | 67 | 71 | 94 | 6.60E+02 | 1.20E+03 | 4.00E+02 | 9.90E+03 | 3.08E+03 | 3.08E+03 | 2.60E+03 | 5.58E+03 | 7.06E+03 | 3.51E+03 | 3.51E+03 |
| | Phenol | Not Tested | 5 | 71 | 7 | 6.60E+02 | 2.30E+04 | 9.00E+02 | 1.20E+03 | 7.30E+02 | 7.30E+02 | 1.10E+03 | 1.30E+03 | 1.34E+03 | 2.20E+03 | 1.20E+03 |
| | Polychlorinated biphenyls | Not Tested | 2 | 2 | 100 | N/A | N/A | 1.23E+02 | 1.40E+03 | 7.62E+02 | 7.62E+02 | 7.62E+02 | 1.40E+03 | 1.40E+03 | N/A | 1.40E+03 |
| | Polynuclear aromatic hydrocarbons | Not Tested | 1 | 1 | 100 | N/A | N/A | 4.55E+00 | 4.55E+00 | N/A | N/A | N/A | N/A | N/A | N/A | 4.55E+00 |
| | Potassium | Not Tested | 2 | 2 | 100 | N/A | N/A | 1.29E+03 | 1.48E+03 | 1.39E+03 | 1.39E+03 | 1.39E+03 | 1.48E+03 | 1.48E+03 | N/A | 1.48E+03 |
| | Pyrene | Nonparametric | 60 | 71 | 85 | 6.60E+02 | 1.40E+03 | 2.00E+02 | 1.68E+04 | 2.38E+03 | 2.38E+03 | 2.10E+03 | 3.40E+03 | 5.28E+03 | 3.49E+03 | 3.49E+03 |
| | Selenium | Normal | 5 | 5 | 100 | N/A | N/A | 3.38E+00 | 5.10E+00 | 4.21E+00 | 4.21E+00 | 3.80E+00 | 5.10E+00 | 5.10E+00 | 4.98E+00 | 4.98E+00 |
| | Silver | Not Tested | 2 | 3 | 67 | 5.00E-01 | 5.00E-01 | 2.70E-01 | 3.40E-01 | 2.87E-01 | 2.87E-01 | 3.40E-01 | 5.00E-01 | 5.00E-01 | N/A | 3.40E-01 |
| | Sodium | Not Tested | 2 | 4 | 50 | 5.32E+02 | 5.84E+02 | 4.03E+02 | 4.59E+02 | 3.55E+02 | 3.55E+02 | 4.96E+02 | 5.84E+02 | 5.84E+02 | N/A | 4.59E+02 |
| | Strontium | Not Tested | 2 | 2 | 100 | N/A | N/A | 2.20E+02 | 2.64E+02 | 2.42E+02 | 2.42E+02 | 2.42E+02 | 2.64E+02 | 2.64E+02 | N/A | 2.64E+02 |
| | Sulfide | Not Tested | 1 | 1 | 100 | N/A | N/A | 2.47E+02 | 2.47E+02 | N/A | N/A | N/A | N/A | N/A | N/A | 2.47E+02 |
| | Tin | Not Tested | 1 | 1 | 100 | N/A | N/A | 5.10E+00 | 5.10E+00 | N/A | N/A | N/A | N/A | N/A | N/A | 5.10E+00 |
| | Toluene | Not Tested | 1 | 4 | 25 | 9.00E+01 | 2.00E+02 | 1.92E+01 | 1.92E+01 | 6.61E+01 | 6.61E+01 | 1.45E+02 | 2.00E+02 | 2.00E+02 | N/A | 1.92E+01 |
| | Vanadium | Not Tested | 3 | 3 | 100 | N/A | N/A | 2.00E+01 | 3.93E+01 | 2.92E+01 | 2.92E+01 | 2.84E+01 | 3.93E+01 | 3.93E+01 | N/A | 3.93E+01 |
| | Vinyl acetate | Not Tested | 1 | 1 | 100 | N/A | N/A | 1.06E+01 | 1.06E+01 | N/A | N/A | N/A | N/A | N/A | N/A | 1.06E+01 |
| | Xylenes | Not Tested | 1 | 3 | 33 | 2.00E+02 | 2.00E+02 | 1.05E+01 | 1.05E+01 | 7.02E+01 | 7.02E+01 | 2.00E+02 | 2.00E+02 | 2.00E+02 | N/A | 1.05E+01 |
| | Zinc | Normal | 6 | 6 | 100 | N/A | N/A | 1.50E+02 | 3.20E+02 | 2.20E+02 | 2.20E+02 | 2.02E+02 | 3.20E+02 | 3.20E+02 | 2.82E+02 | 2.82E+02 |
| | alpha-Chlordane | Not Tested | 2 | 3 | 67 | 6.80E+00 | 6.80E+00 | 5.20E+00 | 6.60E+00 | 5.07E+00 | 5.07E+00 | 6.60E+00 | 6.80E+00 | 6.80E+00 | N/A | 6.60E+00 |
| | bis(2-Ethylhexyl)phthalate | Not Tested | 25 | 71 | 35 | 6.60E+02 | 2.30E+04 | 2.70E+02 | 3.80E+03 | 1.02E+03 | 1.02E+03 | 1.20E+03 | 1.58E+03 | 2.00E+03 | 2.48E+03 | 2.48E+03 |
| | delta-BHC | Not Tested | 1 | 4 | 25 | 6.80E+00 | 1.00E+01 | 6.33E+00 | 6.33E+00 | 4.70E+00 | 4.70E+00 | 7.45E+00 | 1.00E+01 | 1.00E+01 | N/A | 6.33E+00 |
| | gamma-Chlordane | Not Tested | 1 | 3 | 33 | 3.00E+00 | 6.80E+00 | 3.60E+00 | 3.60E+00 | 2.83E+00 | 2.83E+00 | 3.60E+00 | 6.80E+00 | 6.80E+00 | N/A | 3.60E+00 |

**Notes:** Units are milligrams per kilogram for metals and micrograms per kilogram for other chemicals.
One-half the detection limit was substituted for censored (nondetect) measurements in calculations of the mean and percentiles

1 Tested for all chemicals with at least 5 samples and detection frequencies greater than or equal to 50 percent using the Shapiro-Wilk W test (a 5 percent level of significance was used for all tests).

2 Calculated for all chemicals with at least 5 samples. For detection frequencies of at least 85 percent, one-half the detection limit was substituted for censored measurements and calculations were performed following the protocols described in EPA's ProUCL software package (EPA 2004a). For detection frequencies less than 85 percent, the UCL was calculated using stochastic methods following the "bounding" approach described in EPA (2002).

EPC Exposure point concentration, defined as the lesser of the UCL and the maximum detected concentration

Min Minimum concentration

Max Maximum concentration

N/A Not applicable

UCL One-sided upper confidence limit of the mean. Following EPA (2004a), this can either be a 95, 97.5, or 99 percent UCL.

**References**


U.S. Environmental Protection Agency (EPA). 2002. "Calculating exposure point concentrations at hazardous waste sites." OSWER 9285.6-10. Office of Emergency and Remedial Response. Washington, DC. December.

EPA. 2004a. "ProUCL Version 3.0 User Guide." Prepared by Singh, A., Singh, A.K. and R.W. Maichle for the U.S. Environmental Protection Agency, Technical Support Center, Las Vegas, NV. April.

## TABLE 6a
## COMPLETE LIST OF SEDIMENT ANALYTES
## DUCK AND OTTER CREEKS
## OREGON AND TOLEDO, OHIO

1,1,1,2-Tetrachloroethane
1,1,1-Trichloroethane
1,1,2,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
1,1-Dichloropropene
1,2,3-Trichlorobenzene
1,2,3-Trichloropropane
1,2,4,5-Tetrachlorobenzene
1,2,4-Trichlorobenzene
1,2,4-Trimethylbenzene
1,2-Dibromo-3-chloropropane
1,2-Dibromoethane
1,2-Dichlorobenzene
1,2-Dichloroethane
1,2-Dichloroethene (total)
1,2-Dichloropropane
1,2-Diphenylhydrazine
1,3,5-Trimethylbenzene
1,3,5-Trinitrobenzene
1,3-Dichlorobenzene
1,3-Dichloropropane
1,3-Dichloropropene (total)
1,3-Dinitrobenzene
1,4,6-Trimethylnaphthalene
1,4-Dichlorobenzene
1,4-Dioxane
1,4-Naphthoquinone
1,6,7-Trimethylnaphthalene
1-Naphthylamine
11H-Benzo[b]fluorene
2,2-Dichloropropane
2,3,4,6-Tetrachlorophenol
2,3,5-Trimethylphenanthrene
2,3-Dimethylnaphthalene
2,4,5-T
2,4,5-TP
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol
2,4-D
2,4-Dichlorophenol
2,4-Dimethylphenol
2,4-Dinitrophenol
2,4-Dinitrotoluene
2,5-Dimethylphenanthrene
2,6,10,14-Tetramethylpentadecane
2,6,10-Trimethyldodecane
2,6-Dichlorophenol
2,6-Dinitrotoluene
2-(Phenylmethyl)naphthalene
2-Acetylaminofluorene
2-Butanone
2-Chloro-1,3-butadiene
2-Chloroethylvinyl ether
2-Chloronaphthalene
2-Chlorophenol
2-Chlorotoluene
2-Hexanone
2-Methyl-1-butene
2-Methyl-4,6-dinitrophenol
2-Methylanthracene
2-Methylnaphthalene
2-Methylphenol
2-Methylpyrene
2-Naphthylamine
2-Nitroaniline
2-Nitrophenol
2-Picoline
2-sec-Butyl-4,6-dinitrophenol
3 & 4-Methylphenol
3,3'-Dichlorobenzidine
3,3'-Dimethylbenzidine
3,3-Dichlorobenzidine
3-Chloro-1-propene
3-Methylcholanthrene
3-Methylphenol
3-Nitroaniline
4,4'-DDD
4,4'-DDE
4,4'-DDT
4,4'-Dimethylbiphenyl
4,6-Dinitro-2-methylphenol
4-Aminobiphenyl
4-Bromophenyl phenyl ether
4-Chloro-3-methylphenol
4-Chloroaniline
4-Chlorophenyl phenyl ether
4-Chlorotoluene
4-Isopropyltoluene
4-Methyl-2-pentanone
4-Methylphenol
4-Nitroaniline
4-Nitrophenol
4-Nitroquinoline-1-oxide
4H-Cyclopenta[def]phenanthrene
5-Nitro-o-toluidine
5-Propyltridecane
7,12-Dimethylbenz[a]anthracene
7H-Benzo[c]fluorene
9-Hexadecenoic acid
Acenaphthene
Acenaphthylene
Acetone
Acetonitrile
Acetophenone
Acid-volatile sulfide
Acrolein
Acrylonitrile
Aldrin
Aluminum
Aniline
Anthracene
Antimony
Aramite
Aroclor 1016
Aroclor 1221
Aroclor 1232
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260
Arsenic
Barium
Benzene
Benzidine
Benzo[a]anthracene
Benzo[a]pyrene
Benzo[b]fluoranthene
Benzo[c]phenanthrene
Benzo[e]pyrene
Benzo[g,h,i]perylene
Benzo[k]fluoranthene
Benzoic acid
Benzyl alcohol
Beryllium
Bis(2-chloroethoxy)methane
Bis(2-chloroethyl)ether
Bis(2-chloroisopropyl)ether
Bis(2-ethylhexyl)phthalate
Bromobenzene
Bromochloromethane
Bromodichloromethane
Bromoform
Bromomethane
Butylbenzylphthalate
Cadmium
Calcium
Carbazole
Carbon Tetrachloride
Carbon disulfide
Carbon tetrachloride
Chlordane
Chlorobenzene
Chlorodibromomethane
Chloroethane
Chloroform
Chloromethane
Chromium
Chrysene
Cobalt
Copper
Cyanide
Decahydro-4,4,8,9,10-pentamethylnapht
Di-n-butylphthalate
Di-n-octylphthalate
Diallate
Dibenz[a,h]anthracene
Dibenzofuran
Dibromochloromethane
Dibromomethane
Dichlorodifluoromethane
Dichloroethyl ether
Dieldrin
Diethylphthalate
Dimethoate
Dimethylphthalate
Dinoseb
Diphenylamine
Disulfoton
Docosane
Eicosane
Endosulfan I
Endosulfan II

**TABLE 6a**
**COMPLETE LIST OF SEDIMENT ANALYTES**
**DUCK AND OTTER CREEKS**
**OREGON AND TOLEDO, OHIO**

Endosulfan sulfate
Endrin
Endrin aldehyde
Endrin ketone
Ethyl Benzene
Ethyl methacrylate
Ethyl methanesulfonate
Ethylbenzene
Famphur
Fluoranthene
Fluorene
Fluoride
Heneicosane
Hentriacontane
Heptachlor
Heptachlor epoxide
Heptacosane
Heptadecane
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Hexachlorophene
Hexachloropropene
Hexadecane
Hexadecanoic acid
Indeno[1,2,3-cd]pyrene
Iodomethane
Iron
Isobutyl alcohol
Isodrin
Isophorone
Isopropylbenzene
Isosafrole
Kepone
Lead
Magnesium
Manganese
Mercury
Methacrylonitrile
Methapyrilene
Methly Ethyl Ketone
Methoxychlor
Methyl Isobutyl Ketone
Methyl methacrylate
Methyl methanesulfonate
Methyl parathion
Methylene chloride
Mirex
N-Nitrosodi-n-butylamine
N-Nitrosodi-n-propylamine
N-Nitrosodiethylamine
N-Nitrosodimethylamine
N-Nitrosodiphenylamine
N-Nitrosomethylethylamine
N-Nitrosomorpholine
N-Nitrosopiperidine
N-Nitrosopyrrolidine
Naphthalene
Nickel
Nitrobenzene
Nonacosane
Nonadecane
O,O,O-Triethylphosphorothioate
Octadecanal
Octadecane
Oil and grease
Oxychlordane
Parathion
Pentachlorobenzene
Pentachloroethane
Pentachloronitrobenzene
Pentachlorophenol
Pentacosane
Petroleum Distillates
Phenacetin
Phenanthrene
Phenol
Phorate
Polychlorinated biphenyls
Polynuclear aromatic hydrocarbons
Potassium
Pronamide
Propionitrile
Pyrene
Pyridine
Safrole
Selenium
Silver
Sodium
Solids
Strontium
Styrene
Sulfide
Sulfotepp
Tentatively Identified Compound
Tetrachloroethene
Tetrahydrofuran
Thallium
Thionazin
Tin
Toluene
Total organic carbon
Toxaphene
Trans-1,2-Dichloroethene
Trichloroethene
Trichlorofluoromethane
Tridecane
Vanadium
Vinyl acetate
Vinyl chloride
Xylenes
Zinc
alpha,alpha-Dimethylphenethylamine
alpha-BHC
alpha-Chlordane
beta-BHC
bis(2-Chloroethoxy)methane
bis(2-Chloroethyl)ether
bis(2-Chloroisopropyl)ether
bis(2-Ethylhexyl)phthalate
cis-1,2-Dichloroethene
cis-1,3-Dichloropropene
cis-Nonachlor
delta-BHC
gamma-BHC
gamma-Chlordane
gamma-Sitosterol
m & p-Xylenes
n-Butylbenzene
n-Propylbenzene
o-Toluidine
o-Xylene
p-Chlorobenzilate
p-Dimethylaminoazobenzene
p-Phenylenediamine
p-Xylene
pH
sec-Butylbenzene
tert-Butylbenzene
trans-1,2-Dichloroethene
trans-1,3-Dichloropropene
trans-1,4-Dichloro-2-butene
trans-Nonachlor

**TABLE 6b**
**COMPLETE LIST OF SURFACE WATER ANALYTES**
**DUCK AND OTTER CREEKS**
**OREGON AND TOLEDO, OHIO**

1,1,1,2-Tetrachloroethane
1,1,1-Trichloroethane
1,1,2,2-Tetrachloroethane
1,1,2-Trichloro-1,2,2-trifluoroethane
1,1,2-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
1,1-Dichloropropene
1,2,3-Trichlorobenzene
1,2,3-Trichloropropane
1,2,4,5-Tetrachlorobenzene
1,2,4-Trichlorobenzene
1,2,4-Trimethylbenzene
1,2-Dibromo-3-chloropropane
1,2-Dibromoethane
1,2-Dichlorobenzene
1,2-Dichloroethane
1,2-Dichloropropane
1,3,5-Trimethylbenzene
1,3,5-Trinitrobenzene
1,3-Dichlorobenzene
1,3-Dichloropropane
1,3-Dichloropropene (total)
1,3-Dinitrobenzene
1,4-Dichloro-2-butene
1,4-Dichlorobenzene
1,4-Dioxane
1,4-Naphthoquinone
1-Methylnaphthalene
1-Naphthylamine
2,2-Dichloropropane
2,3,4,6-Tetrachlorophenol
2,4,5-T
2,4,5-TP
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol
2,4-D
2,4-Dichlorophenol
2,4-Dimethylphenol
2,4-Dinitrophenol
2,4-Dinitrotoluene
2,6-Dichlorophenol
2,6-Dinitrotoluene
2-Acetylaminofluorene
2-Butanone
2-Chloro-1,3-butadiene
2-Chloroethylvinyl ether
2-Chloronaphthalene
2-Chlorophenol
2-Chlorotoluene
2-Hexanone
2-Methyl-4,6-dinitrophenol
2-Methylnaphthalene
2-Methylphenol
2-Naphthylamine
2-Nitroaniline
2-Nitrophenol
2-Picoline
2-sec-Butyl-4,6-dinitrophenol
3 & 4-Methylphenol
3,3'-Dichlorobenzidine
3,3'-Dimethylbenzidine
3,3-Dichlorobenzidine
3-Chloro-1-propene
3-Methylcholanthrene
3-Methylphenol
3-Nitroaniline
4,4'-DDD
4,4'-DDE
4,4'-DDT
4,6-Dinitro-2-methylphenol
4-Aminobiphenyl
4-Bromophenyl phenyl ether
4-Bromophenyl-phenylether
4-Chloro-3-methylphenol
4-Chloroaniline
4-Chlorophenyl phenyl ether
4-Chlorotoluene
4-Isopropyltoluene
4-Methyl-2-pentanone
4-Methylphenol
4-Nitroaniline
4-Nitrophenol
4-Nitroquinoline-1-oxide
4-methyl-2-pentanone
5-Nitro-o-toluidine
7,12-Dimethylbenz[a]anthracene
Acenaphthene
Acenaphthylene
Acetone
Acetonitrile
Acetophenone
Acrolein
Acrylonitrile
Aldrin
Aluminum
Ammonia
Aniline
Anthracene
Antimony
Aramite
Aroclor 1016
Aroclor 1221
Aroclor 1232
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260
Arsenic
Barium
Benzene
Benzo[a]anthracene
Benzo[a]fluoranthene
Benzo[a]pyrene
Benzo[b]fluoranthene
Benzo[g,h,i]perylene
Benzo[k]fluoranthene
Benzoic acid
Benzyl alcohol
Beryllium
Biochemical oxygen demand
Bromobenzene
Bromochloromethane
Bromodichloromethane
Bromoform
Bromomethane
Butylbenzylphthalate
Cadmium
Calcium
Carbon disulfide
Carbon tetrachloride
Chemical oxygen demand
Chlordane
Chloride
Chlorobenzene
Chlorodibromomethane
Chloroethane
Chloroform
Chloromethane
Chromium
Chrysene
Cobalt
Coliforms
Conductivity
Copper
Cyanide
Di-n-butylphthalate
Di-n-octylphthalate
Diallate
Dibenz[a,h]anthracene
Dibenzofuran
Dibromochloromethane
Dibromomethane
Dichlorodifluoromethane
Dichloroethyl ether
Dieldrin
Diethylphthalate
Dimethoate
Dimethylphthalate
Diphenylamine
Dissolved oxygen
Disulfoton
Dmiethylphthalate
E.Coli
Endosulfan I
Endosulfan II
Endosulfan sulfate
Endrin
Endrin aldehyde
Ethyl acetate
Ethyl ether
Ethyl methacrylate
Ethyl methanesulfonate
Ethylbenzene
Famphur
Fecal coliforms
Fecal streptococci
Fluoranthene
Fluorene

**TABLE 6b**
**COMPLETE LIST OF SURFACE WATER ANALYTES**
**DUCK AND OTTER CREEKS**
**OREGON AND TOLDEDO, OHIO**

Fluoride
Hardness
Heptachlor
Heptachlor epoxide
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Hexachlorophene
Hexachloropropene
Indene
Indeno[1,2,3-cd]pyrene
Iodomethane
Iron
Isobutyl alcohol
Isodrin
Isophorone
Isopropylbenzene
Isosafrole
Kepone
Lead
Magnesium
Manganese
Mercury
Methacrylonitrile
Methapyrilene
Methoxychlor
Methyl iodide
Methyl methacrylate
Methyl methanesulfonate
Methyl parathion
Methylene chloride
Mirex
N-Nitroso-di-n-propylamine
N-Nitrosodi-n-butylamine
N-Nitrosodi-n-propylamine
N-Nitrosodiethylamine
N-Nitrosodimethylamine
N-Nitrosodiphenylamine
N-Nitrosomethylethylamine
N-Nitrosopiperidine
N-Nitrosopyrrolidine
Naphthalene
Nickel
Nitrate
Nitrate+Nitrite
Nitrite
Nitrobenzene
Nitrogen
O,O,O-Triethylphosphorothioate
Oil and grease
Oxidation reduction potential
Parathion
Pentachlorobenzene
Pentachloroethane
Pentachloronitrobenzene
Pentachlorophenol
Phenacetin
Phenanthrene
Phenol
Phenolics
Phorate
Phosphates
Phosphorus
Polychlorinated biphenyls
Potassium
Pronamide
Propionitrile
Pyrene
Pyridine
Safrole
Selenium
Silver
Sodium
Styrene
Sulfide
Sulfotepp
Temperature
Tetrachloroethene
Tetrahydrofuran
Thallium
Thionazin
Tin
Toluene
Total Kjeldahl nitrogen
Total filterable residue
Total nonfilterable residue
Toxaphene
Trichloroethene
Trichlorofluoromethane
Turbidity
Vanadium
Vinyl acetate
Vinyl chloride
Xylenes
Zinc
alpha,alpha-Dimethylphenethylamine
alpha-BHC
beta-BHC
bis(2-Chloroethoxy)methane
bis(2-Chloroethyl)ether
bis(2-Chloroisopropyl)ether
bis(2-Ethylhexyl)phthalate
cis-1,2-Dichloroethene
cis-1,3-Dichloropropene
delta-BHC
gamma-BHC
m & p-Xylenes
n-Butylbenzene
n-Propylbenzene
o-Toluidine
o-Xylene
p-Chlorobenzilate
p-Dimethylaminoazobenzene
p-Phenylenediamine
pH
sec-Butylbenzene
tert-Butylbenzene
trans-1,2-Dichloroethene
trans-1,3-Dichloropropene
trans-1,4-Dichloro-2-butene

**TABLE 7**
**IDENTIFICATION OF SURFACE WATER CHEMICALS OF POTENTIAL CONCERN**
**HUMAN HEALTH RISK ASSESSMENT**
**DUCK AND OTTER CREEKS**
**TOLEDO AND OREGON, OHIO**

| Chemical | Persistent, Bioaccumulative Toxin (PBT) | DF < 5% | Maximum Detected Concentration (MDC) | Screening Value (SV) | MDC > SV | Cummulative Impact | COPC | Basis |
|---|---|---|---|---|---|---|---|---|
| 2,4-D | | | 1.395 | 70 | | | | |
| 4,4'-DDD | Y | Y | 6.00E-03 | 8.71E-02 | | | Y | Chemical is a PBT |
| 4,4'-DDE | Y | | 1.30E-02 | 2.74E-02 | | | Y | Chemical is a PBT |
| 4,4'-DDT | Y | | 1.10E-02 | 5.29E-02 | | | Y | Chemical is a PBT |
| Acetone | | | 1.14E+01 | 8.07E+02 | | | | |
| Aldrin | Y | Y | 1.00E-02 | 9.40E-04 | Y | | Y | Chemical is a PBT |
| Bromodichloromethane | | Y | 1.10E+00 | 1.03E+00 | Y | | Y | MDC > SV |
| Dieldrin | Y | | 9.00E-03 | 2.86E-03 | Y | | Y | Chemical is a PBT |
| Endosulfan I | | | 2.00E-02 | 8.89E+00 | | | | |
| Endosulfan II | | | 9.00E-03 | 8.89E+00 | | | | |
| Endosulfan sulfate | | Y | 2.40E-02 | 8.89E+00 | | | | |
| Endrin | | | 1.40E-02 | 2.00E-01 | | | | |
| Endrin aldehyde | | | 1.00E-02 | 2.00E-01 | | | | |
| Ethylbenzene | | Y | 1.00E+00 | 3.77E+01 | | | | |
| Heptachlor | | | 6.00E-03 | 4.99E-02 | | | | |
| Heptachlor epoxide | | | 9.00E-03 | 5.96E-05 | Y | | Y | MDC > SV |
| Phenolics (Phenol) | | | 3.30E+01 | 4.43E+02 | | | | |
| Toluene | | Y | 1.00E+00 | 2.13E+01 | | | | |
| alpha-BHC | | | 9.00E-03 | 9.38E-03 | | Y | Y | Contributes to cummulative risk |
| delta-BHC | | | 2.00E-02 | 2.00E-04 | Y | | Y | MDC > SV |
| gamma-BHC | | Y | 6.00E-03 | 9.38E-03 | | | | |
| Aluminum | | | 3.72E+00 | 2.06E-01 | Y | | Y | MDC > SV |
| Antimony | | Y | 1.20E-02 | 1.20E-05 | Y | | Y | MDC > SV |
| Arsenic | | | 3.30E-02 | 4.46E-05 | Y | | Y | MDC > SV |
| Barium | | | 2.93E-01 | 1.00E-01 | Y | | Y | MDC > SV |
| Beryllium | | Y | 1.00E-03 | 4.00E-03 | | | | |
| Cadmium | | Y | 1.30E-02 | 5.00E-03 | Y | | | |
| Chloroform | | | 2.90E+00 | 1.53E-01 | Y | | Y | MDC > SV |
| Chromium | | | 8.45E-02 | 1.00E-01 | | | | |
| Copper | | | 5.50E-02 | 5.63E-02 | | Y | Y | Contributes to cummulative hazard |
| Cyanide | | | 1.80E-02 | 2.00E-01 | | | | |
| Iron | | | 4.60E+03 | 4.45E-01 | Y | | Y | MDC > SV |
| Lead | | | 3.20E-01 | ND | | | | |
| Manganese | | | 1.39E-01 | 1.80E-01 | | | | |
| Mercury | Y | | 2.17E-02 | 1.33E-04 | Y | | Y | MDC > SV |
| Nickel | | | 5.50E-02 | 3.03E-02 | Y | | Y | MDC > SV |
| Selenium | | | 7.00E-02 | 5.00E-02 | Y | | Y | MDC > SV |
| Tin | | | 1.20E-02 | ND | | | | |
| Vanadium | | Y | 1.65E-02 | 1.12E-02 | Y | | Y | MDC > SV |
| Zinc | | | 1.98E-01 | 4.60E-01 | | | | |

Notes:

Units for concentrations and screening values are mg/L for metals and ug/L for organic chemicals.
COPC: Chemical of Potential Concern
DF: Detection Frequency
ND: No Date
Y: Yes

**TABLE 8**
**IDENTIFICATION OF SEDIMENT CHEMICALS OF POTENTIAL CONCERN**
**HUMAN HEALTH RISK ASSESSMENT**
**DUCK AND OTTER CREEKS**
**TOLEDO AND OREGON, OHIO**

| Chemical | Persistent, Bioaccumulative Toxin (PBT) | DF < 5% | Maximum Detected Concentration (MDC) | Screening Value (SV) | MDC > SV | Cummulative Impact | COPC | Basis |
|---|---|---|---|---|---|---|---|---|
| 1,1,2,2-Tetrachloroethane | | Y | 1.70E+02 | 410 | | Y | Y | Contributes to cummulative risk |
| 2,4,5-TP | | | 2.13E+01 | 61000 | | | | |
| 2,4-Dimethylphenol | | Y | 1.00E+03 | ND | | | | |
| 2-Butanone | | | 2.26E+02 | 2.20E+06 | | | | |
| 2-Methylnaphthalene | | | 1.04E+04 | ND | | | | |
| 2-Methylphenol | | Y | 1.30E+02 | 310000 | | | | |
| 3 & 4-Methylphenol | | | 4.10E+03 | 31000 | | | | |
| 4,4'-DDD | Y | | 2.20E+03 | 2400 | | | Y | Chemical is a PBT |
| 4,4'-DDE | Y | | 9.49E+02 | 1700 | | | Y | Chemical is a PBT |
| 4,4'-DDT | Y | | 1.49E+02 | 1700 | | | Y | Chemical is a PBT |
| 4-Methylphenol | | | 1.05E+04 | ND | | | | |
| Acenaphthene | | | 2.70E+03 | 370000 | | | | |
| Acenaphthylene | | | 1.50E+03 | 370000 | | | | |
| Acetone | | | 1.23E+03 | 1.40E+06 | | | | |
| Acetonitrile | | | 3.73E+03 | 42000 | | | | |
| Aldrin | Y | | 1.96E+01 | 2.90E-02 | Y | | Y | Chemical is a PBT |
| Aluminum | | | 4.73E+04 | 7600 | Y | | Y | MDC > SV |
| Anthracene | | | 1.00E+04 | 2.20E+06 | | | | |
| Antimony | | | 1.40E+00 | 3.1 | | Y | Y | Contributes to cummulative hazard |
| Aroclor 1248 | Y | | 1.68E+02 | 220 | | Y | Y | PCBs as a class are PBTs |
| Aroclor 1254 | Y | | 1.76E+03 | 220 | Y | | Y | PCBs as a class are PBTs |
| Aroclor 1260 | Y | | 2.14E+02 | 220 | | Y | Y | PCBs as a class are PBTs |
| Arsenic | | | 7.20E+01 | 0.39 | Y | | Y | MDC > SV |
| Barium | | | 3.16E+02 | 540 | | Y | Y | Contributes to cummulative hazard |
| Benzene | | | 2.07E+01 | 640 | | | | |
| Benzoic Acid | | | 1.70E+02 | 1.00E+05 | | | | |
| Benzo[a]anthracene | | | 1.87E+04 | 620 | Y | | Y | MDC > SV; BaP is a PBT |
| Benzo[a]pyrene | Y | | 1.95E+04 | 62 | Y | | Y | MDC > SV; BaP is a PBT |
| Benzo[b]fluoranthene | | | 1.67E+04 | 620 | Y | | Y | MDC > SV; BaP is a PBT |
| Benzo[g,h,i]perylene | | | 1.24E+04 | ND | | | | |
| Benzo[k]fluoranthene | | | 4.40E+04 | 6200 | Y | | Y | MDC > SV; BaP is a PBT |
| Beryllium | | | 3.57E+00 | 15 | | | | |
| Cadmium | | | 2.09E+00 | 3.7 | | Y | Y | Contributes to cummulative hazard |
| Carbon disulfide | | | 5.31E+01 | 36000 | | | | |
| Chromium | | | 2.97E+02 | 100000 | | | | |
| Chrysene | | | 2.80E+04 | 62000 | | | Y | BaP is a PBT |
| Cobalt | | | 1.12E+01 | 900 | | Y | Y | Contributes to cummulative hazard |
| Copper | | | 1.97E+02 | 310 | | Y | Y | Contributes to cummulative hazard |
| Cyanide | | | 1.45E+00 | 1.1 | Y | | Y | MDC > SV |
| Dibenz[a,h]anthracene | | | 3.80E+03 | 62 | Y | | Y | MDC > SV; BaP is a PBT |
| Dibenzofuran | | | 1.50E+03 | 15000 | | | | |
| Dieldrin | Y | | 8.73E+00 | 30 | | | Y | Chemical is a PBT |
| Diethylphthalate | | | 2.70E+03 | 4.90E+06 | | | | |
| Endosulfan I | | Y | 1.00E+01 | 37000 | | | | |

**TABLE 8**
**IDENTIFICATION OF SEDIMENT CHEMICALS OF POTENTIAL CONCERN**
**HUMAN HEALTH RISK ASSESSMENT**
**DUCK AND OTTER CREEKS**
**TOLEDO AND OREGON, OHIO**

| Chemical | Persistent, Bioaccumulative Toxin (PBT) | DF < 5% | Maximum Detected Concentration (MDC) | Screening Value (SV) | MDC > SV | Cummulative Impact | COPC | Basis |
|---|---|---|---|---|---|---|---|---|
| Endosulfan II | | Y | 1.28E+01 | 37000 | | | | |
| Endosulfan sulfate | | | 1.40E+01 | 37000 | | | | |
| Endrin | | | 1.25E+01 | 1800 | | | | |
| Endrin aldehyde | | | 5.60E+00 | 1800 | | | | |
| Endrin ketone | | | 7.70E+00 | 1800 | | | | |
| Fluoranthene | | | 5.90E+04 | 230000 | | Y | Y | Contributes to cummulative hazard |
| Fluorene | | | 3.50E+03 | 270000 | | | | |
| Heptachlor epoxide | | | 3.40E+00 | 53 | | | | |
| Indeno[1,2,3-cd]pyrene | | | 1.40E+04 | 620 | Y | | Y | MDC > SV; BaP is a PBT |
| Iron | | | 7.24E+04 | 2340 | Y | | Y | MDC > SV |
| Lead | | | 4.85E+03 | 125 | Y | | Y | MDC > SV |
| Manganese | | | 6.71E+02 | 180 | Y | | Y | MDC > SV |
| Mercury | Y | | 6.30E-01 | 2.3 | | | Y | Chemical is a PBT |
| Methoxychlor | | | 3.70E+02 | 31000 | | | | |
| Methylene chloride | | | 4.18E+01 | 9100 | | | | |
| Naphthalene | | | 1.06E+04 | 5600 | Y | | Y | MDC > SV |
| Nickel | | | 1.26E+02 | 160 | | Y | Y | Contributes to cummulative hazard |
| Phenanthrene | | | 3.37E+04 | ND | | | | |
| Phenol | | | 1.20E+03 | 1.80E+06 | | | | |
| Pyrene | | | 3.82E+04 | 230000 | | Y | Y | Contributes to cummulative hazard |
| Selenium | | | 8.23E+00 | 39 | | | | |
| Silver | | | 8.70E-01 | 39 | | | | |
| Strontium | | | 7.87E+02 | 4700 | | | | |
| Thallium | | | 1.30E+00 | 0.52 | Y | | Y | MDC > SV |
| Tin | | | 1.30E+01 | 4700 | | | | |
| Toluene | | | 3.00E+02 | 52000 | | | | |
| Vanadium | | | 4.06E+01 | 7.8 | Y | | Y | MDC > SV |
| Vinyl acetate | | | 1.06E+01 | 43000 | | | | |
| Xylenes | | | 1.05E+01 | 27000 | | | | |
| Zinc | | | 3.76E+02 | 2300 | | Y | Y | Contributes to cummulative hazard |
| alpha-BHC | | | 1.01E+00 | 90 | | | | |
| alpha-Chlordane | | | 1.61E+01 | 1600 | | | | |
| bis(2-Ethylhexyl)phthalate | | | 7.10E+04 | 35000 | Y | | Y | MDC > SV |
| delta-BHC | | | 6.33E+00 | 32 | | Y | Y | Contributes to cummulative risk |
| gamma-Chlordane | | | 2.59E+01 | 1600 | | | | |

Notes: Units for concentrations and screening values are mg/kg for metals and ug/kg for organic chemicals.
BaP - Benzo(a)pyrene
COPC - Chemical of Potential Concern
DF - Detection Frequency
ND - No Data
Y - Yes

## TABLE 9

## HUMAN HEALTH EXPOSURE AREAS HUMAN HEALTH RISK ASSESSMENT
## DUCK AND OTTER CREEKS
## OREGON AND TOLEDO, OHIO

| Exposure Area | Boundaries | Basis |
|---|---|---|
| **Duck Creek** | | |
| DC-1 | Hecklinger Pond | Only portion of Duck and Otter Creeks where fishing is assumed to occur. |
| DC-2 | Hecklinger Pond to Consaul Street | Portion of Duck Creek that is located closest to residential areas. Also, there are preliminary plans to develop the wetland between Hecklinger Pond and Wheeling Street as an ecological educational center. |
| DC-3 | Consaul Street to York Street | Location of Collins Golf Course; creek is accessible, but exposure is assumed to be limited due to on-going recreational activities (golf) and public safety concerns. |
| DC-4 | York Street CSX Rail Crossing | Creek passes through commercial and industrial properties; residential area immediately south and west of York Street |
| DC-5 | CSX Rail Crossing to Maumee River | Creek passes through commercial and industrial properties – most isolated portion of creek. |
| **Otter Creek** | | |
| OC-1 | South (upstream) end of creek to Brown Road | Creek passes through area with limited development and minimal residents |
| OC-2 | Brown Road to Navarre Avenue | Creek passes between east and west portions of Sun Oil Company property; residential presence increases on east side of creek north of Pickle Road |
| OC-3 | Navarre Avenue to Corduroy Road | Creek passes through largely residential area. |
| OC-4 | Corduroy Road to Millard Avenue bridge | Creek passes through area with multiple industrial and waste disposal facilities and operations |
| OC-5 | Millard Avenue bridge to Lake Erie | Creek passes through heavily industrial area with limited access potential due to elevated security |

Note:

See Figure 5 for graphic representation of human health exposure areas.

**TABLE 10**

**EXPOSURE PARAMETER VALUES**
**HUMAN HEALTH RISK ASSESSMENT**
**DUCK AND OTTER CREEKS**
**TOLEDO AND OREGON, OHIO**

| Exposure Parameter | Receptor-Specific Values | | | Source or Basis |
|---|---|---|---|---|
| | Adult Recreationalist | Youth (7 to 18) Recreationalist | Child (1 to 6) Recreationalist | |
| EPC (various) | Medium-specific | Medium-specific | Medium-specific | See Section 3.3.1[a] |
| Exposure frequency – surface water direct contact (swd) and sediment (sed) ($EF_{swd}$ and $EF_{sed}$) (days/year) | 34 | 60 | 60 | Professional judgment[b] |
| Exposure frequency – surface water incidental ingestion (swi) ($EF_{swi}$) (days/year) | 2 | 2 | 2 | Professional judgment[c] |
| ED (years) | 30 | 12 | 6 | EPA 1989 |
| BW (kg) | 70 | 47 | 15 | EPA 1989 and 1997[d] |
| Ingestion rate - sediment ($IR_{sed}$) (mg/day) | 100 | 200 | 200 | EPA 1997[e] |
| Fraction ingested (FI) (unitless) | 0.67 | 0.33 | 0.33 | EPA 1997[e] |
| Ingestion rate - surface water ($IR_{sw}$) (L/day) | 0.1 | 0.05 | 0.025 | Professional judgment[f] |
| Skin surface area - sediment ($SA_{sed}$) ($cm^2$/event) | 2,129 | 1,649 | 809 | EPA 2004b[g] |
| Skin surface area - surface water ($SA_{sw}$) ($cm^2$/event) | Exposure area-specific | Exposure area-specific | Exposure area-specific | EPA 2004b[h] |
| Adherence factor (AF) ($mg/cm^2$) | 0.6 | 0.6 | 0.6 | EPA 2004b[j] |
| Dermal absorption (ABS) (unitless) | Chemical-specific | Chemical-specific | Chemical-specific | EPA 2004b[j] |
| Absorbed dose per event ($DA_{event}$) ($mg/cm^2$-event) | Chemical-specific | Chemical-specific | Chemical-specific | See note k. |

**TABLE 10 (Continued)**

**EXPOSURE PARAMETER VALUES**
**HUMAN HEALTH RISK ASSESSMENT**
**DUCK AND OTTER CREEKS**
**OREGON AND TOLEDO, OHIO**

| Exposure Parameter | Receptor-Specific Values | | | Source or Basis |
|---|---|---|---|---|
| | Adult Recreationalist | Youth (7 to 18) Recreationalist | Child (1 to 6) Recreationalist | |
| Exposure time (ET) (hr/day) | 1 | 2 | 2 | Professional judgment[l] |
| Event frequency (EV) (event/day) | 1 | 1 | 1 | EPA 2004b |
| Conversion factor 1 (CF1) (mg/ g) | 1E-03 | 1E-03 | 1E-03 | NA |
| Conversion factor 2 (CF2) (kg/mg) | 1E-06 | 1E-06 | 1E-06 | NA |
| Averaging time - carcinogens ($AT_c$) (days) | 25,550 | 25,550 | 25,550 | EPA 1989 |
| Averaging time - noncarcinogens ($AT_{nc}$) (days) | 10,950 | 4,380 | 2,190 | EPA 1989[m] |
| Gastrointestinal absorption (GI) (unitless) | Chemical-specific | Chemical-specific | Chemical-specific | EPA 1989 and 2004b[n] |

Notes:

| | | | | | |
|---|---|---|---|---|---|
| BW | = | Body weight | L/day | = | Liter per day |
| $cm^2$ | = | Square centimeter | $mg/cm^2$ | = | Milligram per square centimeter |
| ED | = | Exposure duration | mg/day | = | Milligram per day |
| EPA | = | U.S. Environmental Protection Agency | mg/ g | = | Milligram per microgram |
| EPC | = | Exposure point concentration | NA | = | Not applicable |
| kg | = | Kilogram | SW | = | Surface water |

[a] The EPCs for organic compounds will be in units of microgram per kilogram (ug/kg) in sediment and microgram per liter (ug/L) in surface water. Inorganic compounds will be in units of milligram per kilogram (mg/kg) in sediment and milligram per liter (mg/L) in surface water.

[b] Exposure frequency for youth (age 7 to 18) and child receptors potentially exposed to sediment and to surface water (direct contact only) in Duck and Otter Creeks was calculated based on the assumption of exposure for 4 days per week for 13 weeks (June through August) and 2 days per month for 4 months (April, May, September, and October). Exposure frequency for adult receptors exposed via the same

# TABLE 10 (Continued)

## EXPOSURE PARAMETER VALUES
## HUMAN HEALTH RISK ASSESSMENT
## DUCK AND OTTER CREEKS
## OREGON AND TOLEDO, OHIO

exposure pathways was calculated based on the assumption of exposure for 2 days per week for 13 weeks (June through August) and 2 days per month for 4 months (April, May, September, and October). Also, receptors are assumed to be exposed through direct contact with surface water in Hecklinger Pond 2 days/year as a result of accidentally falling into the pond.

[c] It is assumed based on best professional judgment that twice per year receptors will ingest a mouthful of water. Ingestion is assumed to occur as a result of play activities or as a result of accidentally falling into deeper water.

[d] The body weights for adult and child receptors are the standard default adult and child body weights (EPA 1989). The body weight for the youth receptor (age 7 to 18) was calculated as the average body weight for boys and girls age 7 to 18 (EPA 1997, Table 7-3).

[e] The receptor-specific ingestion rates (IRsed) are based on soil ingestion rtes which are calculated as annual average rates assuming exposure to outdoor soil and indoor dust rather than sediment (EPA 1989, 1997). Receptors are unlikely to be exposed to soil and sediment only in Duck and Otter Creeks. Therefore, for the purpose of the screening HHRA, the fraction ingested (FI) was conservatively calculated as the fraction of time spent at Duck and Otter Creeks as compared to the total time spent outdoors. EPA (1997) notes that adult and children 3 to 11 years old spend about 1.5 and 6 hours/day outdoors, respectively. As noted elsewhere in this table, it is assumed that adult receptors spend 1 hour/day in Duck and Otter Creeks and child and youth receptors spend 2 hours/day in the creeks. Therefore, receptor-specific FI values were calculated as follows: 1 hour/day/1.5 hours/day = 0.67 (adult) and 2 hours/day/6 hours/day = 0.33 (child and youth).

[f] Adult, youth (7 to 18 years of age), and child (1 to 6 years of age) are assumed to ingest 0.1, 0.05 and 0.025 liters of water in each mouthful, respectively.

[g] All surface areas were obtained for adult and youth (age 7 to 18) receptors from EPA (2004b), Exhibit C-1. It was assumed that receptors are exposed only through their hands and feet.

[h] As discussed in Section 3.2.2, it is assumed that no swimming occurs in Duck and Otter Creeks due to the shallow water depths and warning signs (Hecklinger Pond only). The skin surface are exposed through direct contact to surface water will depend on the depth of water in the creeks and the height of the receptor. The table below summarizes the average depth of water in each creek-specific exposure area (see Section 3.2.2 and Figure 5), the body parts (or portions of body parts) assumed to be exposed, and the total skin surface area for each receptor. It should be noted that skin surface areas for youth receptors were calculated as the average of adult and child values. Details of the receptor-specific skin surface area calculations are presented in Table 11.

**TABLE 10 (Continued)**

**EXPOSURE PARAMETER VALUES**
**HUMAN HEALTH RISK ASSESSMENT**
**DUCK AND OTTER CREEKS**
**OREGON AND TOLEDO, OHIO**

[i] Sediment adherence factors were obtained from EPA (2004b). Consistent with this guidance, average or mean adherence factors associated with high end sediment contact activities were used as the basis for selecting sediment adherence factors. Geometric mean adherence factors developed for children playing in wet soil, pipe layers working in wet soil, and reed gatherers are 0.2, 0.6, and 0.3 $mg/cm^2$, respectively (EPA 2004b, Exhibit 3-3). The highest (most conservative) of these values, 0.6 $mg/cm^2$, was selected as the adherence factor for all receptors.

[j] Dermal absorption values will be obtained from EPA (2004b), Exhibit 3-4 after COPCs are determined.

[k] Chemical-specific values for absorbed dose per event (DAevent) were calculated in accordance with EPA (2004a) using Equations 3.2 and 3.3 for organic compounds and Equation 3.4 for inorganic compounds. Chemical-specific input parameters for use in these equations will also be obtained from EPA (2004a). The chemical – specific input parameters and DAevents results calculated for exposure area Otter Creek 3 (OC-3) are presented in Table 12.

[l] Table 15-67 in EPA (1997) indicates that the $95^{th}$ percentile value for time spent in freshwater swimming pools for children is 3 hours. It is assumed that Duck and Otter Creeks are somewhat less appealing as play locations as compared to freshwater swimming pools. Therefore, it was assumed that child and youth receptors would be exposed 2 hour/day. The creeks are also assumed to be even less appealing for adult recptors. Therefore, it was assumed adults would be exposed 1 hour/day (this value equals the $50^{th}$ percentile value for time spent in freshwater pools by children). Also, direct contact with surface water in Hecklinger Pond is assumed to be infrequent almost always accidental in nature largely as the result of the posting of signs indicating that the pond is unsafe for water activities (including swimming) (see Photographs 16 and 17 in the appendix). Therefore, it was assumed that all receptors would be exposed for only 0.25 hour/day in Hecklinger Pond.

[m] Based on ED x 365 days/year.

[n] Gastrointestinal absorption values will be obtained from EPA (2004b), Exhibit 4-1 after COPCs are determined.

## TABLE 11

## RECEPTOR-SPECIFIC SKIN SURFACE AREA CALCULATIONS
## HUMAN HEALTH RISK ASSESSMENT
## DUCK AND OTTER CREEKS
## OREGON AND TOLEDO, OHIO

| Exposure Area | Average Water Depth (feet)[a] | Body Parts Assumed to Contact SW[b] | | Total Skin Surface Area ($cm^2$)[c] | | Youth[d] |
|---|---|---|---|---|---|---|
| | | Adult | Child | Adult | Child | |
| DC-1 | 3 | F, L, HN | H, A, L, F, HN, 0.5T | 6,811 | 5,422 | 6,117 |
| DC-2 | 1.25 | F, 0.5LL, HN | F, 1.25LL, HN | 2,845 | 1,622 | 2,234 |
| DC-3 | 1.25 | F, 0.5LL, HN | F, 1.25LL, HN | 2,845 | 1,622 | 2,234 |
| DC-4 | 1.5 | F, LL, HN | F, LL, 0.5(L-LL), HN | 3,847 | 1,946 | 2,897 |
| DC-5 | 3 | F, L, HN | H, A, L, F, HN, 0.5T | 6,811 | 5,422 | 6,117 |
| OC-1 | 1 | F, 0.375LL, HN | F, 0.9LL, HN | 2,594 | 1,394 | 1,994 |
| OC-2 | 1.25 | F, 0.5LL, HN | F, 1.25LL, HN | 2,845 | 1,622 | 2,234 |
| OC-3 | 1.25 | F, 0.5LL, HN | F, 1.25LL, HN | 2,845 | 1,622 | 2,234 |
| OC-4 | 2.5 | F, 0.75L, HN | H, A, L, F, HN, 0.5T | 5,569 | 5,422 | 5,496 |
| OC-5 | 2.9 | F, L, HN | NA | 6,811 | NA | 6,117 |

Notes:

A = Arms
$cm^2$ = Square centimeters
DC = Duck Creek
F = Feet
H = Head
HN = Hands
L = Legs
LL = Lower Legs
OC = Otter Creek
SW = Surface water
T = Torso

a Water depths were obtained from Tetra Tech (2005c), Quanterra (1997), City of Oregon (2004a, 2005c), and OEPA (1995).

b Professional judgment.

c Body part-specific skin surface areas were obtained from EPA (1997, Table 6-4) – adults and EPA (2004b, Exhibit C-1) – children. Body part-specific skin surface areas ($cm^2$) used in the calculations: adult – F (1,048), HN (793), LL (2,005), and L (4,969) and child – A (874), F (451), H (977), HN (358), L (1,624), LL (650), and T (2,276 – calculated as total body surface area [6,560] – [A + H + HN + F + L]).

d Skin surface areas for youth receptors were calculated as the average of adult and child values.

**TABLE 12**
**CHEMICAL-SPECIFIC INPUT FACTORS FOR DERMAL EXPOSURE RESULTS**
**HUMAN HEALTH RISK ASSESSMENT**
**DUCK AND OTTER CREEKS**
**TOLEDO AND OREGON, OHIO**

| Dermal Absorbed Dose per Event for Organic Compounds - Water Contact | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chemical | FA | $K_p$ | $C_w$ | $\tau_{event}$ | $t_{event}$ (adult/youth/ch | B | t* | $t_{event} \le t^*$ $DA_{event}$ | $t_{event} \ge t^*$ $DA_{event}$ | $DA_{event}$ | ABS | $ABS_{GI}$ (percent/100)[a] |
| **Adult** | | | | | | | | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | | | | |
| Chloroform | 1 | 6.80E-03 | 2.90E-06 | 0.5 | 1 | 0 | 1.19 | 3.8541E-08 | 3.944E-08 | 3.85E-08 | 0.1 | 1.000 [b] |
| 1,1,2,2-Tetrachloroethane | 1 | 6.90E-03 | -- | 0.93 | 1 | 0 | 2.232 | -- | -- | -- | 0.1 | 1.000 [b,d] |
| **Semivolatile Organic Compounds** | | | | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | 0.8 | 2.50E-02 | -- | 16.64 | 1 | 0.2 | 39.936 | -- | -- | -- | 0.1 | 0.250 [b] |
| Bromodichloromethane | 1 | 4.60E-03 | 1.10E-06 | 0.88 | 1 | 0 | 2.112 | 1.31197E-08 | 1.3966E-08 | 1.31E-08 | 0.1 | 1.000 [b,d] |
| Benzo(a)anthracene | 1 | 4.70E-01 | -- | 2.03 | 1 | 2.8 | 8.53 | -- | -- | -- | 0.13 | 0.890 |
| Benzo(b)fluoranthene | 1 | 7.00E-01 | -- | 2.77 | 1 | 4.3 | 12.03 | -- | -- | -- | 0.13 | 0.890 |
| Benzo(k)fluoranthene | | | -- | | 1 | | 0 | -- | -- | -- | 0.13 | 0.890 |
| Benzo(g,h,i)perylene | | | -- | | 1 | | 0 | -- | -- | -- | 0.13 | 0.890 |
| Benzo(a)pyrene | 1 | 7.00E-01 | -- | 2.69 | 1 | 4.3 | 11.67 | -- | -- | -- | 0.13 | 0.890 |
| Chrysene | 1 | 4.70E-01 | -- | 2.03 | 1 | 2.8 | 8.53 | -- | -- | -- | 0.1 | 0.890 |
| Dibenzo(a,h)anthracene | 0.6 | 1.50E+00 | -- | 3.88 | 1 | 9.7 | 17.57 | -- | -- | -- | 0.13 | 0.890 |
| Fluoranthene | 1 | 2.20E-01 | -- | 1.45 | 1 | 1.2 | 5.68 | -- | -- | -- | 0.1 | 0.890 |
| Indeno(1,2,3-cd)pyrene | 0.6 | 1.00E+00 | -- | 3.78 | 1 | 6.7 | 16.83 | -- | -- | -- | 0.1 | 0.890 |
| Naphthalene | 1 | 4.70E-02 | -- | 0.56 | 1 | 0.5 | 1.344 | -- | -- | -- | 0.1 | 0.890 |
| Phenolics (Phenol) | 1.00E+00 | 4.30E-03 | 3.30E-05 | 0.36 | 1 | 0 | 0.864 | 2.35323E-07 | 2.4407E-07 | 2.44E-07 | 0.1 | 0.950 [b] |
| Pyrene | | | -- | | 1 | | 0 | -- | -- | -- | 0.1 | 0.890 |
| **Pesticides/Polychlorinated Biphenyls** | | | | | | | | | | | | |
| Aldrin | 1 | 1.40E-03 | 1.00E-08 | 11.89 | 1 | 0 | 28.536 | 1.33429E-10 | 3.4692E-10 | 1.33E-10 | 0.04 | 0.800 |
| alpha-BHC | 0.9 | 1.10E-02 | 9.00E-09 | 4.57 | 1 | 0.1 | 10.968 | 5.26461E-10 | 9.7614E-10 | 5.26E-10 | 0.04 | 0.800 |
| delta-BHC | 0.9 | 1.10E-02 | 2.00E-08 | 4.57 | 1 | 0.1 | 10.968 | 1.16991E-09 | 2.1692E-09 | 1.17E-09 | 0.04 | 0.800 |
| gamma-BHC | 0.9 | 1.10E-02 | 6.00E-09 | 4.57 | 1 | 0.1 | 10.968 | 3.50974E-10 | 6.5076E-10 | 3.51E-10 | 0.04 | 0.800 |
| gamma-Chlordane | 0.7 | 3.80E-02 | -- | 21.21 | 1 | 0.3 | 50.904 | -- | -- | -- | 0.04 | 0.800 |
| 4,4'-DDD | 0.8 | 1.80E-01 | 6.00E-09 | 6.65 | 1 | 1.2 | 25.99 | 6.15822E-09 | 2.1571E-08 | 6.16E-09 | 0.03 | 0.800 |
| 4,4'-DDE | 0.8 | 1.60E-01 | 1.30E-08 | 6.48 | 1 | 1.1 | 25.08 | 1.17077E-08 | 3.9571E-08 | 1.17E-08 | 0.03 | 0.800 |
| 4,4'-DDT | 0.7 | 2.70E-01 | 1.10E-08 | 10.45 | 1 | 1.9 | 42.51 | 1.85756E-08 | 9.1287E-08 | 1.86E-08 | 0.03 | 0.800 |
| Dieldrin | 0.8 | 1.20E-02 | 9.00E-09 | 14.62 | 1 | 0.1 | 35.088 | 9.131E-10 | 2.8554E-09 | 9.13E-10 | 0.04 | 0.800 |
| Heptachlor epoxide | 0.8 | 8.60E-03 | 9.00E-09 | 13.27 | 1 | 0.1 | 31.848 | 6.23443E-10 | 1.8626E-09 | 6.23E-10 | 0.04 | 0.800 |
| Aroclor 1254 | 0.5 | 4.30E-01 | -- | 11.29 | 1 | 3.2 | 47.9 | -- | -- | -- | 0.14 | 0.800 |
| Aroclor 1260 | 0.5 | 4.30E-01 | -- | 11.29 | 1 | 3.2 | 47.9 | -- | -- | -- | 0.14 | 0.800 |
| **Metals** | | | | | | | | | | | | |
| Aluminum | -- | | 3.88E-03 | -- | 1 | -- | -- | -- | -- | -- | | 0.010 [c] |
| Antimony | -- | 1.00E-03 | 1.20E-05 | -- | 1 | -- | -- | -- | -- | 1.20E-08 | | 0.150 |
| Arsenic | -- | 1.00E-03 | 3.30E-05 | -- | 1 | -- | -- | -- | -- | 3.30E-08 | 0.03 | 0.950 |
| Barium | -- | 1.00E-03 | 2.93E-03 | -- | 1 | -- | -- | -- | -- | 2.93E-06 | | 0.070 |
| Cadmium | -- | 1.00E-03 | 1.30E-05 | -- | 1 | -- | -- | -- | -- | 1.30E-08 | 0.001 | 0.025 |
| Cobalt | -- | | -- | -- | 1 | -- | -- | -- | -- | -- | | 0.010 [c] |
| Copper | -- | 1.00E-03 | 5.50E-05 | -- | 1 | -- | -- | -- | -- | 5.50E-08 | | 0.010 [c] |
| Cyanide | -- | 1.00E-03 | 1.80E-05 | -- | 1 | -- | -- | -- | -- | 1.80E-08 | | 1.000 [b] |
| Iron | -- | 1.00E-03 | 2.18E-02 | -- | 1 | -- | -- | -- | -- | 2.18E-05 | | 0.010 [c] |
| Lead | -- | | 3.20E-01 | -- | 1 | -- | -- | -- | -- | -- | | -- |
| Manganese | -- | 1.00E-03 | 1.39E-01 | -- | 1 | -- | -- | -- | -- | -- | | 0.040 |
| Mercury | -- | 1.00E-03 | 2.17E-05 | -- | 1 | -- | -- | -- | -- | 2.17E-08 | | 0.070 |
| Nickel | -- | 2.00E-04 | 5.50E-05 | -- | 1 | -- | -- | -- | -- | 1.10E-08 | | 0.040 |
| Selenium | -- | 1.00E-03 | 7.00E-05 | -- | 1 | -- | -- | -- | -- | 7.00E-08 | | 0.500 |
| Thallium | -- | 1.00E-03 | -- | -- | 1 | -- | -- | -- | -- | -- | | 1.000 |
| Vanadium | -- | 1.00E-03 | 1.65E-05 | -- | 1 | -- | -- | -- | -- | 1.65E-08 | | 0.026 |
| Zinc | -- | 6.00E-04 | 1.98E-01 | -- | 1 | -- | -- | -- | -- | -- | | 0.010 [c] |
| **Youth** | | | | | | | | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | | | | |
| Chloroform | 1 | 6.80E-03 | 2.90E-06 | 0.5 | 2 | 0 | 1.19 | 5.45052E-08 | 5.916E-08 | 5.92E-08 | 0.1 | 1.000 [b] |
| 1,1,2,2-Tetrachloroethane | 1 | 6.90E-03 | -- | 0.93 | 2 | 0 | 2.232 | -- | -- | -- | 0.1 | 1.000 [b,d] |
| **Semivolatile Organic Compounds** | | | | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | 0.8 | 2.50E-02 | -- | 16.64 | 2 | 0.2 | 39.936 | -- | -- | -- | 0.1 | 0.250 [b] |
| Bromodichloromethane | 1 | 4.60E-03 | 1.10E-06 | 0.88 | 2 | 0 | 2.112 | 1.8554E-08 | 1.9026E-08 | 1.86E-08 | 0.1 | 1.000 [b,d] |
| Benzo(a)anthracene | 1 | 4.70E-01 | -- | 2.03 | 2 | 2.8 | 8.53 | -- | -- | -- | 0.13 | 0.890 |
| Benzo(b)fluoranthene | 1 | 7.00E-01 | -- | 2.77 | 2 | 4.3 | 12.03 | -- | -- | -- | 0.13 | 0.890 |
| Benzo(k)fluoranthene | | | -- | | 2 | | 0 | -- | -- | -- | 0.13 | 0.890 |
| Benzo(g,h,i)perylene | | | -- | | 2 | | 0 | -- | -- | -- | 0.13 | 0.890 |
| Benzo(a)pyrene | 1 | 7.00E-01 | -- | 2.69 | 2 | 4.3 | 11.67 | -- | -- | -- | 0.13 | 0.890 |
| Chrysene | 1 | 4.70E-01 | -- | 2.03 | 2 | 2.8 | 8.53 | -- | -- | -- | 0.1 | 0.890 |
| Dibenzo(a,h)anthracene | 0.6 | 1.50E+00 | -- | 3.88 | 2 | 9.7 | 17.57 | -- | -- | -- | 0.13 | 0.890 |
| Fluoranthene | 1 | 2.20E-01 | -- | 1.45 | 2 | 1.2 | 5.68 | -- | -- | -- | 0.1 | 0.890 |
| Indeno(1,2,3-cd)pyrene | 0.6 | 1.00E+00 | -- | 3.78 | 2 | 6.7 | 16.83 | -- | -- | -- | 0.1 | 0.890 |
| Naphthalene | 1 | 4.70E-02 | -- | 0.56 | 2 | 0.5 | 1.344 | -- | -- | -- | 0.1 | 0.890 |
| Phenolics (Phenol) | 1.00E+00 | 4.30E-03 | 3.30E-05 | 0.36 | 2 | 0 | 0.864 | 3.32797E-07 | 3.8597E-07 | 3.86E-07 | 0.1 | 0.950 [b] |
| Pyrene | | | -- | | 2 | | 0 | -- | -- | -- | 0.1 | 0.890 |
| **Pesticides/Polychlorinated Biphenyls** | | | | | | | | | | | | |
| Aldrin | 1 | 1.40E-03 | 1.00E-08 | 11.89 | 2 | 0 | 28.536 | 1.88697E-10 | 3.6092E-10 | 1.89E-10 | 0.04 | 0.800 |
| alpha-BHC | 0.9 | 1.10E-02 | 9.00E-09 | 4.57 | 2 | 0.1 | 10.968 | 7.44529E-10 | 1.0571E-09 | 7.45E-10 | 0.04 | 0.800 |
| delta-BHC | 0.9 | 1.10E-02 | 2.00E-08 | 4.57 | 2 | 0.1 | 10.968 | 1.65451E-09 | 2.3492E-09 | 1.65E-09 | 0.04 | 0.800 |
| gamma-BHC | 0.9 | 1.10E-02 | 6.00E-09 | 4.57 | 2 | 0.1 | 10.968 | 4.96353E-10 | 7.0476E-10 | 4.96E-10 | 0.04 | 0.800 |
| gamma-Chlordane | 0.7 | 3.80E-02 | -- | 21.21 | 2 | 0.3 | 50.904 | -- | -- | -- | 0.04 | 0.800 |
| 4,4'-DDD | 0.8 | 1.80E-01 | 6.00E-09 | 6.65 | 2 | 1.2 | 25.99 | 8.70904E-09 | 2.1963E-08 | 8.71E-09 | 0.03 | 0.800 |
| 4,4'-DDE | 0.8 | 1.60E-01 | 1.30E-08 | 6.48 | 2 | 1.1 | 25.08 | 1.65572E-08 | 4.0363E-08 | 1.66E-08 | 0.03 | 0.800 |
| 4,4'-DDT | 0.7 | 2.70E-01 | 1.10E-08 | 10.45 | 2 | 1.9 | 42.51 | 2.62699E-08 | 9.2004E-08 | 2.63E-08 | 0.03 | 0.800 |
| Dieldrin | 0.8 | 1.20E-02 | 9.00E-09 | 14.62 | 2 | 0.1 | 35.088 | 1.29132E-09 | 2.934E-09 | 1.29E-09 | 0.04 | 0.800 |
| Heptachlor epoxide | 0.8 | 8.60E-03 | 9.00E-09 | 13.27 | 2 | 0.1 | 31.848 | 8.81682E-10 | 1.9189E-09 | 8.82E-10 | 0.04 | 0.800 |
| Aroclor 1254 | 0.5 | 4.30E-01 | -- | 11.29 | 2 | 3.2 | 47.9 | -- | -- | -- | 0.14 | 0.800 |
| Aroclor 1260 | 0.5 | 4.30E-01 | -- | 11.29 | 2 | 3.2 | 47.9 | -- | -- | -- | 0.14 | 0.800 |
| **Metals** | | | | | | | | | | | | |
| Aluminum | -- | | 3.88E-03 | -- | 2 | -- | -- | -- | -- | -- | | 0.010 [c] |
| Antimony | -- | 1.00E-03 | 1.20E-05 | -- | 2 | -- | -- | -- | -- | 2.40E-08 | | 0.150 |
| Arsenic | -- | 1.00E-03 | 3.30E-05 | -- | 2 | -- | -- | -- | -- | 6.60E-08 | 0.03 | 0.950 |
| Barium | -- | 1.00E-03 | 2.93E-03 | -- | 2 | -- | -- | -- | -- | 5.86E-06 | | 0.070 |
| Cadmium | -- | 1.00E-03 | 1.30E-05 | -- | 2 | -- | -- | -- | -- | 2.60E-08 | 0.001 | 0.025 |

**TABLE 12**
**CHEMICAL-SPECIFIC INPUT FACTORS FOR DERMAL EXPOSURE RESULTS**
**HUMAN HEALTH RISK ASSESSMENT**
**DUCK AND OTTER CREEKS**
**TOLEDO AND OREGON, OHIO**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cobalt | -- | | -- | -- | 2 | -- | -- | -- | -- | -- | | 0.010 [c] |
| Copper | -- | 1.00E-03 | 5.50E-05 | -- | 2 | -- | -- | -- | -- | 1.10E-07 | | 0.010 [c] |
| Cyanide | -- | 1.00E-03 | 1.80E-05 | -- | 2 | -- | -- | -- | -- | 3.60E-08 | | 1.000 [b] |
| Iron | -- | 1.00E-03 | 2.18E-02 | -- | 2 | -- | -- | -- | -- | 4.36E-05 | | 0.010 [c] |
| Lead | -- | | 3.20E-01 | -- | 2 | -- | -- | -- | -- | -- | | -- |
| Manganese | -- | 1.00E-03 | 1.39E-01 | -- | 2 | -- | -- | -- | -- | -- | | 0.040 |
| Mercury | -- | 1.00E-03 | 2.17E-05 | -- | 2 | -- | -- | -- | -- | 4.34E-08 | | 0.070 |
| Nickel | -- | 2.00E-04 | 5.50E-05 | -- | 2 | -- | -- | -- | -- | 2.20E-08 | | 0.040 |
| Selenium | -- | 1.00E-03 | 7.00E-05 | -- | 2 | -- | -- | -- | -- | 1.40E-07 | | 0.500 |
| Thallium | -- | 1.00E-03 | -- | -- | 2 | -- | -- | -- | -- | -- | | 1.000 |
| Vanadium | -- | 1.00E-03 | 1.65E-05 | -- | 2 | -- | -- | -- | -- | 3.30E-08 | | 0.026 |
| Zinc | -- | 6.00E-04 | 1.98E-01 | -- | 2 | -- | -- | -- | -- | -- | | 0.010 [c] |
| **Child** | | | | | | | | | | | | |
| **Volatile Organic Compounds** | | | | | | | | | | | | |
| Chloroform | 1 | 6.80E-03 | 2.90E-06 | 0.5 | 2 | 0 | 1.19 | 5.45052E-08 | 5.916E-08 | 5.92E-08 | 0.1 | 1.000 [b] |
| 1,1,2,2-Tetrachloroethane | 1 | 6.90E-03 | -- | 0.93 | 2 | 0 | 2.232 | -- | -- | -- | 0.1 | 1.000 [b,d] |
| **Semivolatile Organic Compounds** | | | | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | 0.8 | 2.50E-02 | -- | 16.64 | 2 | 0.2 | 39.936 | -- | -- | -- | 0.1 | 0.250 [b] |
| Bromodichloromethane | 1 | 4.60E-03 | 1.10E-06 | 0.88 | 2 | 0 | 2.112 | 1.8554E-08 | 1.9026E-08 | 1.86E-08 | 0.1 | 1.000 [b,d] |
| Benzo(a)anthracene | 1 | 4.70E-01 | -- | 2.03 | 2 | 2.8 | 8.53 | -- | -- | -- | 0.13 | 0.890 |
| Benzo(b)fluoranthene | 1 | 7.00E-01 | -- | 2.77 | 2 | 4.3 | 12.03 | -- | -- | -- | 0.13 | 0.890 |
| Benzo(k)fluoranthene | | | -- | | 2 | | 0 | -- | -- | -- | 0.13 | 0.890 |
| Benzo(g,h,i)perylene | | | -- | | 2 | | 0 | -- | -- | -- | 0.13 | 0.890 |
| Benzo(a)pyrene | 1 | 7.00E-01 | -- | 2.69 | 2 | 4.3 | 11.67 | -- | -- | -- | 0.13 | 0.890 |
| Chrysene | 1 | 4.70E-01 | -- | 2.03 | 2 | 2.8 | 8.53 | -- | -- | -- | 0.1 | 0.890 |
| Dibenzo(a,h)anthracene | 0.6 | 1.50E+00 | -- | 3.88 | 2 | 9.7 | 17.57 | -- | -- | -- | 0.13 | 0.890 |
| Fluoranthene | 1 | 2.20E-01 | -- | 1.45 | 2 | 1.2 | 5.68 | -- | -- | -- | 0.1 | 0.890 |
| Indeno(1,2,3-cd)pyrene | 0.6 | 1.00E+00 | -- | 3.78 | 2 | 6.7 | 16.83 | -- | -- | -- | 0.1 | 0.890 |
| Naphthalene | 1 | 4.70E-02 | -- | 0.56 | 2 | 0.5 | 1.344 | -- | -- | -- | 0.1 | 0.890 |
| Phenolics (Phenol) | 1.00E+00 | 4.30E-03 | 3.30E-05 | 0.36 | 2 | 0 | 0.864 | 3.32797E-07 | 3.8597E-07 | 3.86E-07 | 0.1 | 0.950 [b] |
| Pyrene | | | -- | | 2 | | 0 | -- | -- | -- | 0.1 | 0.890 |
| **Pesticides/Polychlorinated Biphenyls** | | | | | | | | | | | | |
| Aldrin | 1 | 1.40E-03 | 1.00E-08 | 11.89 | 2 | 0 | 28.536 | 1.88697E-10 | 3.6092E-10 | 1.89E-10 | 0.04 | 0.800 |
| alpha-BHC | 0.9 | 1.10E-02 | 9.00E-09 | 4.57 | 2 | 0.1 | 10.968 | 7.44529E-10 | 1.0571E-09 | 7.45E-10 | 0.04 | 0.800 |
| delta-BHC | 0.9 | 1.10E-02 | 2.00E-08 | 4.57 | 2 | 0.1 | 10.968 | 1.65451E-09 | 2.3492E-09 | 1.65E-09 | 0.04 | 0.800 |
| gamma-BHC | 0.9 | 1.10E-02 | 6.00E-09 | 4.57 | 2 | 0.1 | 10.968 | 4.96353E-10 | 7.0476E-10 | 4.96E-10 | 0.04 | 0.800 |
| gamma-Chlordane | 0.7 | 3.80E-02 | -- | 21.21 | 2 | 0.3 | 50.904 | -- | -- | -- | 0.04 | 0.800 |
| 4,4'-DDD | 0.8 | 1.80E-01 | 6.00E-09 | 6.65 | 2 | 1.2 | 25.99 | 8.70904E-09 | 2.1963E-08 | 8.71E-09 | 0.03 | 0.800 |
| 4,4'-DDE | 0.8 | 1.60E-01 | 1.30E-08 | 6.48 | 2 | 1.1 | 25.08 | 1.65572E-08 | 4.0363E-08 | 1.66E-08 | 0.03 | 0.800 |
| 4,4'-DDT | 0.7 | 2.70E-01 | 1.10E-08 | 10.45 | 2 | 1.9 | 42.51 | 2.62699E-08 | 9.2004E-08 | 2.63E-08 | 0.03 | 0.800 |
| Dieldrin | 0.8 | 1.20E-02 | 9.00E-09 | 14.62 | 2 | 0.1 | 35.088 | 1.29132E-09 | 2.934E-09 | 1.29E-09 | 0.04 | 0.800 |
| Heptachlor epoxide | 0.8 | 8.60E-03 | 9.00E-09 | 13.27 | 2 | 0.1 | 31.848 | 8.81682E-10 | 1.9189E-09 | 8.82E-10 | 0.04 | 0.800 |
| Aroclor 1254 | 0.5 | 4.30E-01 | -- | 11.29 | 2 | 3.2 | 47.9 | -- | -- | -- | 0.14 | 0.800 |
| Aroclor 1260 | 0.5 | 4.30E-01 | -- | 11.29 | 2 | 3.2 | 47.9 | -- | -- | -- | 0.14 | 0.800 |
| **Metals** | | | | | | | | | | | | |
| Aluminum | -- | | 3.88E-03 | -- | 2 | -- | -- | -- | -- | -- | | 0.010 [c] |
| Antimony | -- | 1.00E-03 | 1.20E-05 | -- | 2 | -- | -- | -- | -- | 2.40E-08 | | 0.150 |
| Arsenic | -- | 1.00E-03 | 3.30E-05 | -- | 2 | -- | -- | -- | -- | 6.60E-08 | 0.03 | 0.950 |
| Barium | -- | 1.00E-03 | 2.93E-03 | -- | 2 | -- | -- | -- | -- | 5.86E-06 | | 0.070 |
| Cadmium | -- | 1.00E-03 | 1.30E-05 | -- | 2 | -- | -- | -- | -- | 2.60E-08 | 0.001 | 0.025 |
| Cobalt | -- | | -- | -- | 2 | -- | -- | -- | -- | -- | | 0.010 [c] |
| Copper | -- | 1.00E-03 | 5.50E-05 | -- | 2 | -- | -- | -- | -- | 1.10E-07 | | 0.010 [c] |
| Cyanide | -- | 1.00E-03 | 1.80E-05 | -- | 2 | -- | -- | -- | -- | 3.60E-08 | | 1.000 [b] |
| Iron | -- | 1.00E-03 | 2.18E-02 | -- | 2 | -- | -- | -- | -- | 4.36E-05 | | 0.010 [c] |
| Lead | -- | | 3.20E-01 | -- | 2 | -- | -- | -- | -- | -- | | -- |
| Manganese | -- | 1.00E-03 | 1.39E-01 | -- | 2 | -- | -- | -- | -- | -- | | 0.040 |
| Mercury | -- | 1.00E-03 | 2.17E-05 | -- | 2 | -- | -- | -- | -- | 4.34E-08 | | 0.070 |
| Nickel | -- | 2.00E-04 | 5.50E-05 | -- | 2 | -- | -- | -- | -- | 2.20E-08 | | 0.040 |
| Selenium | -- | 1.00E-03 | 7.00E-05 | -- | 2 | -- | -- | -- | -- | 1.40E-07 | | 0.500 |
| Thallium | -- | 1.00E-03 | -- | -- | 2 | -- | -- | -- | -- | -- | | 1.000 |
| Vanadium | -- | 1.00E-03 | 1.65E-05 | -- | 2 | -- | -- | -- | -- | 3.30E-08 | | 0.026 |
| Zinc | -- | 6.00E-04 | 1.98E-01 | -- | 2 | -- | -- | -- | -- | -- | | 0.010 [c] |

PCB-hexachlorobiphenyl for Aroclor 1254 and Aroclor 1260
Lindane (gamma BHC) for gamma-, alpha, and delta-BHC
Heptachlor for heptachlor epoxide

Exhibit B-3 from Final RAGS Part E

a $ABS_{GI}$ values obtained from EPA (2004b), unless otherwise noted.
b Source is the Agency for Toxic Substances and Disease Registry chemical-specific toxicity profiles (ATSDR 2005).
c Source is the Ohio Environmental Protection Agency recommended default value(OEPA 2005).
d Value based on similarity to chloroform.

| Acronyms | | Units |
|---|---|---|
| FA = | Fraction Absorbed Water | dimensionless |
| $K_p$ = | Dermal Permeability Coefficient of Compound in Water | cm/hr |
| $C_w$ = | Chemical Concentration in Water | $mg/cm^3$ |
| $\tau_{event}$ = | Lag Time per Event | hr/event |
| $t_{event}$ = | Event Duration | hr/event |
| B = | Dimensionless Ration of the Permeability Coefficient of a | dimensionless |
| t* = | Time to Reach Steady State (2.4 x $\tau_{event}$) | hr |
| ABS = | Dermal Absorption | dimensionless |
| $ABS_{GI}$ = | Gastrointestinal Absorption | dimensionless |

**TABLE 13**
**MEDIUM SPECIFIC EXPOSURE POINT CONCENTRATIONS**
**HUMAN HEALTH RISK ASSESSMENT**
**DUCK AND OTTER CREEK**
**TOLEDO AND OREGON, OHIO**

| | Otter Creek - 3 /Max Detected | | Otter Creek - 4 | | Otter Creek - 5 | | Duck Creek - 1 | | Duck Creek - 2 | | Duck Creek - 3 | | Duck Creek - 4 | | Duck Creek - 5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chemicals[a] | Sediment | Surface Water | Sediment | Surface Water | Sediment | Surface Water | Sediment | Surface Water | Sediment | Surface Water | Sediment | Surface Water | Sediment | Surface Water | Sediment | Surface Water |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Chloroform | -- | 2.90E+00 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,1,2,2-Tetrachloroethane | -- | -- | -- | -- | 1.70E+02 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Semivolatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | 3.24E+03 | -- | 1.14E+04 | -- | 2.48E+03 | -- | -- | -- | 7.93E+02 | -- | 1.05E+03 | -- | 1.80E+03 | -- | 4.00E+03 | -- |
| Bromodichloromethane | -- | 1.10E+00 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | |
| Benzo(a)anthracene | 2.10E+03 | -- | 2.00E+03 | -- | 2.65E+03 | -- | -- | -- | 3.10E+03 | -- | 2.30E+03 | -- | 1.69E+04 | -- | 7.84E+02 | -- |
| Benzo(b)fluoranthene | 3.00E+03 | -- | 2.20E+03 | -- | 1.36E+03 | -- | 2.10E+03 | -- | 4.60E+03 | -- | 8.10E+03 | -- | 1.02E+04 | -- | 6.96E+02 | -- |
| Benzo(k)fluoranthene | 3.78E+03 | -- | 2.00E+03 | -- | 2.35E+03 | -- | 4.40E+04 | -- | 4.90E+03 | -- | 7.00E+03 | -- | 9.60E+03 | -- | -- | -- |
| Benzo(g,h,i)perylene | 2.52E+03 | -- | 1.60E+03 | -- | 1.09E+03 | -- | 1.70E+03 | -- | 3.70E+03 | -- | 5.50E+03 | -- | 7.63E+03 | -- | -- | -- |
| Benzo(a)pyrene | 2.60E+03 | -- | 2.40E+03 | -- | 1.39E+03 | -- | 2.20E+03 | -- | 5.50E+03 | -- | 8.20E+03 | -- | 1.19E+04 | -- | 6.87E+02 | -- |
| Chrysene | 3.89E+03 | -- | 3.50E+03 | -- | 2.87E+03 | -- | 2.80E+04 | -- | 5.10E+03 | -- | 1.20E+04 | -- | 1.33E+04 | -- | 1.14E+03 | -- |
| Dibenzo(a,h)anthracene | 7.00E+02 | -- | -- | -- | 1.60E+03 | -- | -- | -- | 7.15E+02 | -- | 1.17E+03 | -- | 2.46E+03 | -- | -- | -- |
| Fluoranthene | 6.05E+03 | -- | 3.19E+03 | -- | 2.18E+03 | -- | 5.90E+04 | -- | 6.30E+03 | -- | 1.10E+04 | -- | 3.72E+04 | -- | 1.22E+03 | -- |
| Indeno(1,2,3-cd)pyrene | 2.59E+03 | -- | 1.40E+03 | -- | 2.24E+03 | -- | 1.70E+03 | -- | 3.81E+03 | -- | 5.60E+03 | -- | 8.61E+03 | -- | -- | -- |
| Naphthalene | -- | -- | 2.40E+03 | -- | 3.05E+03 | -- | -- | -- | 7.60E+01 | -- | 2.09E+03 | -- | 9.71E+02 | -- | 8.13E+02 | -- |
| Phenolics (Phenol) | -- | 3.30E+01 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | 5.92E+03 | -- | 1.00E+04 | -- | 3.49E+03 | -- | 3.80E+03 | -- | 8.00E+03 | -- | 8.74E+03 | -- | 3.43E+04 | -- | 1.80E+03 | -- |
| **Pesticides/Polychlorinated Biphenyls** | | | | | | | | | | | | | | | | |
| Aldrin | -- | 1.00E-02 | 9.74E+00 | -- | 7.00E+00 | -- | -- | -- | 9.10E+00 | -- | -- | -- | -- | -- | -- | -- |
| alpha-BHC | -- | 9.00E-03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| delta-BHC | -- | 2.00E-02 | | -- | 6.33E+00 | -- | -- | -- | -- | -- | 4.11E+00 | -- | 4.11E+00 | -- | 3.19E+00 | -- |
| gamma-BHC | -- | 6.00E-03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlordane | 1.58E+01 | -- | 1.26E+01 | -- | 3.60E+00 | -- | -- | -- | 1.80E+00 | -- | -- | -- | 9.30E+00 | -- | -- | -- |
| 4,4'-DDD | 2.12E+01 | 6.00E-03 | 6.72E+01 | -- | 5.50E+01 | -- | 6.74E+01 | -- | 1.20E+03 | -- | 8.86E+02 | -- | 4.46E+02 | -- | 2.66E+01 | -- |
| 4,4'-DDE | 1.31E+01 | 1.30E-02 | 1.63E+01 | -- | 2.00E+01 | -- | 4.42E+01 | -- | 2.34E+02 | -- | 4.02E+02 | -- | 3.76E+02 | -- | 1.78E+01 | -- |
| 4,4'-DDT | -- | 1.10E-02 | 1.36E+01 | -- | 1.52E+01 | -- | -- | -- | 5.44E+01 | -- | 1.49E+02 | -- | 4.49E+01 | -- | -- | -- |
| Dieldrin | -- | 9.00E-03 | 3.25E+00 | -- | 8.73E+00 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Heptachlor epoxide | -- | 9.00E-03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1254 | 1.60E+02 | -- | 1.76E+03 | -- | 3.71E+02 | -- | -- | -- | -- | -- | -- | -- | 1.80E+02 | -- | 6.91E+01 | -- |
| Aroclor 1260 | 6.80E+01 | -- | 1.12E+02 | -- | 8.60E+01 | -- | -- | -- | -- | -- | -- | -- | 1.14E+02 | -- | -- | -- |
| **Metals** | | | | | | | | | | | | | | | | |
| Aluminum | 3.00E+04 | 3.88 | 2.28E+04 | -- | 2.56E+04 | -- | 2.49E+04 | -- | 2.42E+04 | -- | 4.04E+04 | -- | 3.00E+04 | -- | 8.78E+03 | -- |
| Antimony | -- | 1.20E-02 | 1.40E+00 | -- | 1.40E+00 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | 3.32E+01 | 3.30E-02 | 1.78E+01 | -- | 2.01E+01 | -- | 3.68E+01 | -- | 3.64E+01 | -- | 2.37E+01 | -- | 2.12E+01 | -- | 4.76E+01 | -- |
| Barium | 1.81E+02 | 2.93E+00 | 1.38E+02 | -- | 1.42E+02 | -- | 1.60E+02 | -- | 1.15E+02 | -- | 2.04E+02 | -- | 1.52E+02 | -- | 1.29E+02 | -- |
| Cadmium | 1.15E+00 | 1.30E-02 | 9.48E-01 | -- | 1.42E+00 | -- | 9.08E-01 | -- | 9.00E-01 | -- | 1.20E+00 | -- | 1.59E+00 | -- | 2.09E+00 | -- |
| Cobalt | -- | -- | 7.20E+00 | -- | 7.60E+00 | -- | -- | -- | 7.27E+00 | -- | -- | -- | -- | -- | -- | -- |
| Copper | 1.20E+02 | 5.50E-02 | 1.00E+02 | -- | 1.21E+02 | -- | 4.18E+01 | -- | 2.75E+01 | -- | 4.26E+01 | -- | 6.32E+01 | -- | 3.84E+01 | -- |
| Cyanide | -- | 1.80E-02 | 1.45E+00 | -- | 1.40E-01 | -- | -- | -- | 1.00E+00 | -- | -- | -- | -- | -- | -- | -- |
| Iron | 2.80E+04 | 2.18E+01 | 1.88E+04 | -- | 2.99E+04 | -- | 2.58E+04 | -- | 1.97E+04 | -- | 3.76E+04 | -- | 4.15E+04 | -- | 1.92E+04 | -- |
| Lead | 1.63E+02 | 3.20E-01 | 8.87E+02 | -- | 1.25E+02 | -- | 8.20E+01 | -- | 4.04E+01 | -- | 6.14E+01 | -- | 1.39E+02 | -- | 9.86E+01 | -- |
| Manganese | 4.17E+02 | 1.39E-01 | 4.16E+02 | -- | 5.00E+02 | -- | 5.04E+02 | -- | 3.20E+02 | -- | 5.59E+02 | -- | 4.43E+02 | -- | -- | -- |
| Mercury | 3.89E-01 | 2.17E-02 | 3.49E-01 | -- | 2.89E-01 | -- | 1.01E-01 | -- | 9.80E-02 | -- | 2.16E-01 | -- | 1.78E-01 | -- | 1.14E-01 | -- |
| Nickel | 4.96E+01 | 5.50E-02 | 3.78E+01 | -- | 3.77E+01 | -- | 3.30E+01 | -- | 2.71E+01 | -- | 6.60E+01 | -- | 5.48E+01 | -- | 4.72E+01 | -- |
| Selenium | 5.74E+00 | 7.00E-02 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Thallium | -- | -- | 1.30E+00 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Vanadium | -- | 1.65E-02 | 2.66E+01 | -- | 3.93E+01 | -- | -- | -- | 3.35E+01 | -- | -- | -- | -- | -- | -- | -- |
| Zinc | 3.52E+02 | 1.98E-01 | 1.91E+02 | -- | 2.82E+02 | -- | 1.79E+02 | -- | 1.62E+02 | -- | 1.84E+02 | -- | 3.19E+02 | -- | 2.59E+02 | -- |

**Notes**

a There are four different units of measurement used in this table. For organics and inorganics measured in sediment the concentrations are measured in ug/kg and mg/kg, respectively. For organics and inorganics measured in surface water the concentrations are measured in ug/L and mg/L, respectively.

-- not applicable

**TABLE 14**

**TOXICITY FACTORS**
**DUCK AND OTTER CREEKS**
**TOLEDO AND OREGON, OHIO**

| Chemical | Chronic Oral RfD (mg/kg-day) | Critical Effect | Source | Date Accessed | Oral SF $(mg/kg\text{-}day)^{-1}$ | Weight-of-Evidence | Source | Date Accessed |
|---|---|---|---|---|---|---|---|---|
| **Volatile Organic Compounds** | | | | | | | | |
| Chloroform | 1.00E-02 | Moderate/marked fatty cyst formation in the liver | IRIS | 7/1/2005 | 3.10E-02 | B2 | CalEPA | 7/1/2005 |
| 1,1,2,2-Tetrachloroethane | 6E-02 | Hepatocellular vacuolization and increases in absolute and relative liver weights | PPRTV | 7/1/2005 | 2.00E-01 | C | IRIS | 7/1/2005 |
| **Semivolatile Organic Compounds** | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | 2.00E-02 | Increased relative liver weight | IRIS | 7/1/2005 | 1.40E-02 | B2 | IRIS | 7/1/2005 |
| Bromodichloromethane | 2.00E-02 | Renal cytomegaly | IRIS | 7/1/2005 | 6.20E-02 | B2 | IRIS | 7/1/2005 |
| Benzo(a)anthracene | 3.00E-01 | NOEL[a] | IRIS | 7/1/2005 | 7.30E-01 | B2 | IRIS[b] | 7/1/2005 |
| Benzo(b)fluoranthene | 4.00E-02 | Nephropathy, increased liver weight[a] | IRIS | 7/1/2005 | 7.30E-01 | B2 | IRIS[b] | 7/1/2005 |
| Benzo(k)fluoranthene | 4.00E-02 | Nephropathy, increased liver weight[a] | IRIS | 7/1/2005 | 7.30E-02 | B2 | IRIS[b] | 7/1/2005 |
| Benzo(g,h,i)perylene | 3.00E-02 | Kidney effects[a] | IRIS | | -- | | | |
| Benzo(a)pyrene | 3.00E-02 | Kidney effects[a] | IRIS | 7/1/2005 | 7.30E+00 | B2 | IRIS | 7/1/2005 |
| Chrysene | 3.00E-01 | NOEL[a] | IRIS | 7/1/2005 | 7.30E-03 | B2 | IRIS[b] | 7/1/2005 |
| Dibenzo(a,h)anthracene | 3.00E-01 | NOEL[a] | IRIS | 7/1/2005 | 7.30E+00 | B2 | IRIS[b] | 7/1/2005 |
| Fluoranthene | 4.00E-02 | Nephropthay, increased liver weight | IRIS | 7/1/2005 | -- | | | |
| Indeno(1,2,3-cd)pyrene | 4.00E-02 | Nephropathy, increased liver weight[a] | IRIS | 7/1/2005 | 7.30E-01 | B2 | IRIS[b] | 7/1/2005 |
| Naphthalene | 2.00E-02 | Decreased mean terminal body weight | IRIS | 7/1/2005 | 1.20E-02 | C | CalEPA | 7/1/2005 |
| Phenolics (Phenol) | 3.00E-01 | Decreased maternal body weight | IRIS | 7/1/2005 | -- | | | |
| Pyrene | 3.00E-02 | Kidney effects | IRIS | 7/1/2005 | -- | | | |
| **Pesticides/Polychlorinated Biphenyls** | | | | | | | | |
| Aldrin | 3.00E-05 | Liver toxicity | IRIS | 7/1/2005 | 1.70E+01 | B2 | IRIS | 7/1/2005 |
| alpha-BHC | -- | | | | 6.30E+00 | B2 | IRIS | 7/1/2005 |
| delta-BHC | -- | | | | -- | | | |
| gamma-BHC | 3.00E-04 | Liver and kidney toxicity | IRIS | 7/1/2005 | 1.10E+00 | B2 | CalEPA | 7/1/2005 |
| gamma-Chlordane | 5.00E-04 | Hepatic necrosis[c] | IRIS | 7/1/2005 | 3.50E-01 | B2 | IRIS | 7/1/2005 |
| 4,4'-DDD | 5.00E-04 | Liver lesions[d] | IRIS | 7/1/2005 | 2.40E-01 | B2 | IRIS | 7/1/2005 |
| 4,4'-DDE | 5.00E-04 | Liver lesions[d] | IRIS | 7/1/2005 | 3.40E-01 | B2 | IRIS | 7/1/2005 |
| 4,4'-DDT | 5.00E-04 | Liver lesions | IRIS | 7/1/2005 | 3.40E-01 | B2 | IRIS | 7/1/2005 |
| Dieldrin | 5.00E-05 | Liver lesions | IRIS | 7/1/2005 | 1.60E+01 | B2 | IRIS | 7/1/2005 |
| Heptachlor epoxide | 1.30E-05 | Increased liver-to-body weight ratio | IRIS | 7/1/2005 | 9.10E+00 | B2 | IRIS | 7/1/2005 |
| Aroclor 1254 | 2.00E-05 | prominent Meibomian glands, | IRIS | 7/1/2005 | 2.00E+00 | B2 | IRIS | 7/1/2005 |
| Aroclor 1260 | 2.00E-05 | Immune system | ATSDR | -- | 2.00E+00 | B2 | IRIS | 7/1/2005 |
| **Metals** | | | | | | | | |
| Aluminum | -- | | | | -- | | | |
| Antimony | 4.00E-04 | Longevity, blood glucose, and cholesterol | IRIS | 7/1/2005 | -- | | | |
| Arsenic | 3.00E-04 | Hyperpigmentation, keratosis, and possible vascular complications | IRIS | 7/1/2005 | 1.50E+00 | A | IRIS | 7/1/2005 |
| Barium | 2.00E-01 | Nephropathy | IRIS | 7/1/2005 | -- | | | |
| Cadmium | 5.00E-04 | Significant proteinuria | IRIS | 7/1/2005 | -- | | | |
| Cobalt | -- | | | | -- | | | |
| Copper | -- | | | | -- | | | |
| Cyanide | 2.00E-02 | NOAEL | IRIS | 7/1/2005 | -- | | | |
| Iron | 3.00E-01 | | NCEA | | -- | | | |
| Lead | -- | | | | -- | B2 | IRIS | 7/1/2005 |
| Manganese | 1.40E-01 | CNS effects | IRIS | 7/1/2005 | -- | | | |
| Mercury | 8.60E-05 | CNS, PNS effects[e] | IRIS | 7/1/2005 | -- | | | |
| Nickel | 2.00E-02 | Decreased organ and body weights | IRIS | 7/1/2005 | -- | | | |
| Selenium | 5.00E-03 | Clinical selenosis | IRIS | 7/1/2005 | -- | | | |
| Thallium | 8.00E-05 | NOAEL[f] | IRIS | 7/1/2005 | -- | | | |
| Vanadium | -- | | | | -- | | | |
| Zinc | 3.00E-01 | Decrease in erythrocyte superoxide dismutase (ESOD) | IRIS | 7/1/2005 | -- | | | |

Notes:
-- Information not available
ATSDR Agency for Toxic Substances and Disease Registry. Values reported are minimal risk levels (MRL) and are available on-line at http://www.atsdr.cdc.gov/mrls.html
CalEPA California Environmental Protection Agency. Values reported are from CalEPA's Office of Environmental Health Hazard Assessment's *Toxicity Criteria Database* which is available on-line at http://www.oehha.ca.gov/risk/chemicalDB/index.asp
CNS Central nervous system
IRIS Integrated risk information system. Available on-line at http://www.epa.gov/iriswebp/iris/index.html
mg/kg-day Milligram per kilogram per day
NCEA National Center for Environmental Assessment. Value is as reported in U.S. Environmental Protection Agency's *Region 9 PRGs 2004 Table* -- available on-line at http://www.epa.gov/region09/waste/sfund/prg/files/04prgtable.pdf
NOAEL No observed adverse effect level
NOEL No observed effect level
PNS Peripheral nervous system
RfD Reference dose
SF Slope factor

[a] Surrogates were selected based primarily on structural similarities (see Section 4.2.3): anthracene for benzo(a)anthracene, chrysene, and dibenzo(a,h)anthracene; flouranthene for benzo(b)fluoranthene, benzo(k)flouranthene, and indeno(1,2,3-cd)pyrene; and pyrene for benzo(g,h,i)perylene and benzo(a)pyrene.

[b] Slope factor is based on the slope factor for benzo(a)pyrene and application of compound-specific toxicity equivalency factors: benzo(a)anthracene -- 0.1; benzo(b)fluoranthene -- 0.1; benzo(k)fluoranthene -- 0.01; chrysene -- 0.001; dibenzo(a,h)anthracene -- 1; and indeno(1,2,3-cd)pyrene -- 0.1 (See Section 4.1.3).

[c] Chlordane (technical) was used as a surrogate.

[d] 4,4'-DDT was used as a surrogate.

[e] Oral RfD was calculated based on this compound's reference concentration of 3E-04 milligram per cubic meter.

[f] Thallium sulfate was used as a surrogate.

**TABLE 15**
**COMPARISON OF MAXIMUM DETECTED SEDIMENT CONCENTRATIONS TO U.S. EPA REGION 9 RESIDENTIAL SOIL PRGS**
**HUMAN HEALTH RISK ASSESSMENT**
**DUCK AND OTTER CREEKS**
**TOLEDO AND OREGON, OHIO**

| COPC | Maximum Detected Concentration | | | EPA Region 9 Residential Soil PRG[a] |
|---|---|---|---|---|
| | OC-1 | OC-2 | DC-1 | |
| 4,4'-DDD | -- | -- | 6.74E+01 | 2.40E+03 |
| 4,4'-DDE | 3.49E+00 | 3.49E+00 | 4.42E+01 | 1.70E+03 |
| 4,4'-DDT | 2.52E+00 | 2.52E+00 | -- | 1.70E+03 |
| Aluminum | 2.55E+04 | 1.29E+04 | 2.49E+04 | 7.60E+04 |
| Aroclor 1254 | 7.61E+01 | 7.61E+01 | -- | 2.20E+02 |
| Aroclor 1260 | 3.91E+01 | 3.91E+01 | -- | 2.20E+02 |
| Arsenic | 3.02E+01 | 3.02E+01 | 3.68E+01 | 3.90E-01 |
| Barium | 1.55E+02 | 1.25E+02 | 1.60E+02 | 5.40E+03 |
| Benzo[a]anthracene | 1.60E+03 | 1.60E+03 | -- | 6.20E+02 |
| Benzo[a]pyrene | 1.90E+03 | 1.50E+03 | 2.20E+03 | 6.20E+01 |
| Benzo(b)fluoranthene | -- | -- | 2.10E+03 | 6.20E+02 |
| Benzo[k]fluoranthene | 4.60E+03 | 4.00E+03 | 4.40E+04 | 6.20E+03 |
| Beryllium | 1.13E+00 | 5.91E-01 | 1.63E+00 | 1.50E+02 |
| Cadmium | 1.82E+00 | 1.82E+00 | 9.08E-01 | 3.70E+01 |
| Chrysene | 2.60E+03 | 2.60E+03 | 2.80E+04 | 6.20E+04 |
| Cobalt | 1.12E+01 | -- | -- | 9.00E+02 |
| Copper | 5.38E+01 | 5.38E+01 | 4.18E+01 | 3.10E+03 |
| Dibenz[a,h]anthracene | 6.00E+02 | -- | -- | 6.20E+01 |
| Fluoranthene | 5.40E+03 | 5.40E+03 | 5.90E+04 | 2.30E+06 |
| Indeno[1,2,3-cd]pyrene | 2.10E+03 | 2.00E+03 | 1.70E+03 | 6.20E+02 |
| Iron | 3.67E+04 | 2.96E+04 | 2.58E+04 | 2.30E+04 |
| Lead | 9.70E+01 | 9.70E+01 | 8.20E+01 | 2.45E+02 |
| Manganese | 4.31E+02 | -- | 5.04E+02 | 1.80E+03 |
| Mercury | 1.36E-01 | 1.36E-01 | 1.01E-01 | 2.30E+01 |
| Nickel | 5.54E+01 | 5.54E+01 | 3.30E+01 | 1.60E+03 |
| Pyrene | 4.10E+03 | 4.10E+03 | 3.80E+03 | 2.30E+03 |
| Vanadium | 3.25E+01 | -- | -- | 7.80E+01 |
| Zinc | 3.11E+02 | 3.11E+02 | 1.79E+02 | 2.30E+04 |
| bis(2-Ethylhexyl)phthalate | 3.30E+03 | 3.30E+03 | -- | 4.10E+05 |

Notes:
The concentrations for all organics are in microgram per kilogram (ug/kg) and the concentrations of all inorganics are in units of milligram per kilogram (mg/kg).

-- = Not detected or not available.
COPC = Chemical of potential concern
DC = Duck Creek
OC = Otter Creek
PRG = Preliminary remediation goal

[a] U.S. EPA Region 9 residential soil PRGs are available on-line at http://www.epa.gov/region09/waste/sfund/prg/files/04prgtable.pdf

**TABLE 16**
**RECEPTOR-SPECIFIC EXPOSURE, HAZARD, AND RISK RESULTS:**
**EXPOSURE AREA OTTER CREEK 3 (OC-3)**
**DUCK AND OTTER CREEKS**
**TOLEDO AND OREGON, OHIO**

| Adult Receptor | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface Water (Maximum Exposure) | | | | | | | | Sediment (Otter Creek - 3) | | | | | | | |
| | Ingestion | | | | Dermal Contact | | | | Ingestion | | | | Dermal Contact | | | |
| Chemical | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Chloroform | 2.27E-08 | 2.27E-06 | 9.73E-09 | 3.02E-10 | 1.46E-07 | 1.46E-05 | 6.25E-08 | 1.94E-09 | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,1,2,2-Tetrachloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Semivolatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | -- | -- | -- | -- | -- | -- | -- | -- | 2.89E-07 | 1.45E-05 | 1.24E-07 | 1.73E-09 | 5.51E-07 | 1.10E-04 | 2.36E-07 | 1.32E-08 |
| Bromodichloromethane | 8.61E-09 | 4.31E-07 | 3.69E-09 | 2.29E-10 | 4.97E-08 | 2.48E-06 | 2.13E-08 | 1.32E-09 | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 1.87E-07 | 6.24E-07 | 8.02E-08 | 5.86E-08 | 4.64E-07 | 1.74E-06 | 1.99E-07 | 1.63E-07 |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 2.67E-07 | 6.69E-06 | 1.15E-07 | 8.37E-08 | 6.63E-07 | 1.86E-05 | 2.84E-07 | 2.33E-07 |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 3.37E-07 | 8.43E-06 | 1.45E-07 | 1.06E-08 | 8.36E-07 | 2.35E-05 | 3.58E-07 | 2.94E-08 |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | -- | -- | 2.25E-07 | 7.50E-06 | 9.64E-08 | -- | 5.58E-07 | 2.09E-05 | 2.39E-07 | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 2.32E-07 | 7.73E-06 | 9.93E-08 | 7.25E-07 | 5.75E-07 | 2.15E-05 | 2.46E-07 | 2.02E-06 |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | 3.47E-07 | 1.16E-06 | 1.49E-07 | 1.09E-09 | 6.61E-07 | 2.48E-06 | 2.83E-07 | 2.33E-09 |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 6.24E-08 | 2.08E-07 | 2.67E-08 | 1.95E-07 | 1.55E-07 | 5.79E-07 | 6.63E-08 | 5.44E-07 |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 5.40E-07 | 1.35E-05 | 2.31E-07 | -- | 1.03E-06 | 2.89E-05 | 4.41E-07 | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 2.30E-07 | 5.76E-06 | 9.88E-08 | 7.21E-08 | 4.39E-07 | 1.23E-05 | 1.88E-07 | 1.54E-07 |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Phenolics (Phenol) | 2.58E-07 | 8.61E-07 | 1.11E-07 | -- | 9.24E-07 | 3.24E-06 | 3.96E-07 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 5.27E-07 | 1.76E-05 | 2.26E-07 | -- | 1.01E-06 | 3.77E-05 | 4.31E-07 | -- |
| **Pesticides/Polychlorinated Biphenyls** | | | | | | | | | | | | | | | | |
| Aldrin | 7.83E-11 | 2.61E-06 | 3.35E-11 | 5.70E-10 | 5.05E-10 | 1.68E-05 | 2.16E-10 | 4.60E-09 | -- | -- | -- | -- | -- | -- | -- | -- |
| alpha-BHC | 7.05E-11 | -- | 3.02E-11 | 1.90E-10 | 1.99E-09 | -- | 8.54E-10 | 6.73E-09 | -- | -- | -- | -- | -- | -- | -- | -- |
| delta-BHC | 1.57E-10 | -- | 6.71E-11 | -- | 4.43E-09 | -- | 1.90E-09 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-BHC | 4.70E-11 | 1.57E-07 | 2.01E-11 | 2.21E-11 | 1.33E-09 | 4.43E-06 | 5.69E-10 | 7.83E-10 | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- | 1.41E-09 | 2.82E-06 | 6.04E-10 | 2.11E-10 | 1.07E-09 | 2.69E-06 | 4.60E-10 | 2.01E-10 |
| 4,4'-DDD | 4.70E-11 | 9.39E-08 | 2.01E-11 | 4.83E-12 | 2.33E-08 | 4.66E-05 | 9.99E-09 | 3.00E-09 | 1.89E-09 | 3.78E-06 | 8.10E-10 | 1.94E-10 | 1.08E-09 | 2.70E-06 | 4.63E-10 | 1.39E-10 |
| 4,4'-DDE | 1.02E-10 | 2.04E-07 | 4.36E-11 | 1.48E-11 | 4.43E-08 | 8.86E-05 | 1.90E-08 | 8.07E-09 | 1.17E-09 | 2.34E-06 | 5.01E-10 | 1.70E-10 | 6.68E-10 | 1.67E-06 | 2.86E-10 | 1.22E-10 |
| 4,4'-DDT | 8.61E-11 | 1.72E-07 | 3.69E-11 | 1.25E-11 | 7.03E-08 | 1.41E-04 | 3.01E-08 | 1.28E-08 | -- | -- | -- | -- | -- | -- | -- | -- |
| Dieldrin | 7.05E-11 | 1.41E-06 | 3.02E-11 | 4.83E-10 | 3.46E-09 | 6.91E-05 | 1.48E-09 | 2.96E-08 | -- | -- | -- | -- | -- | -- | -- | -- |
| Heptachlor epoxide | 7.05E-11 | 5.42E-06 | 3.02E-11 | 2.75E-10 | 2.36E-09 | 1.82E-04 | 1.01E-09 | 1.15E-08 | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1254 | -- | -- | -- | -- | -- | -- | -- | -- | 1.43E-08 | 7.13E-04 | 6.11E-09 | 1.22E-08 | 3.81E-08 | 2.38E-03 | 1.63E-08 | 4.08E-08 |
| Aroclor 1260 | -- | -- | -- | -- | -- | -- | -- | -- | 6.06E-09 | 3.03E-04 | 2.60E-09 | 5.20E-09 | 1.62E-08 | 1.01E-03 | 6.94E-09 | 1.73E-08 |
| **Metals** | | | | | | | | | | | | | | | | |
| Aluminum | 3.04E-05 | -- | 1.30E-05 | -- | -- | -- | -- | -- | 2.67E-06 | -- | 1.15E-06 | -- | -- | -- | -- | -- |
| Antimony | 9.39E-08 | 2.35E-04 | 4.03E-08 | -- | 4.54E-08 | 1.14E-04 | 1.95E-08 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | 2.58E-07 | 8.61E-04 | 1.11E-07 | 1.66E-07 | 1.25E-07 | 4.16E-04 | 5.35E-08 | 8.45E-08 | 2.96E-09 | 9.86E-06 | 1.27E-09 | 1.90E-09 | 1.69E-09 | 5.94E-06 | 7.25E-10 | 1.15E-09 |
| Barium | 2.29E-05 | 1.15E-04 | 9.83E-06 | -- | 1.11E-05 | 5.55E-05 | 4.75E-06 | -- | 1.61E-08 | 8.05E-08 | 6.90E-09 | -- | -- | -- | -- | -- |
| Cadmium | 1.02E-07 | 2.04E-04 | 4.36E-08 | -- | 4.92E-08 | 9.84E-05 | 2.11E-08 | -- | 1.02E-10 | 2.05E-07 | 4.39E-11 | -- | 1.95E-12 | 1.56E-07 | 8.36E-13 | -- |
| Cobalt | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Copper | 4.31E-07 | -- | 1.85E-07 | -- | 2.08E-07 | -- | 8.92E-08 | -- | 1.07E-08 | -- | 4.59E-09 | -- | -- | -- | -- | -- |
| Cyanide | 1.41E-07 | 7.05E-06 | 6.04E-08 | -- | 6.81E-08 | 3.41E-06 | 2.92E-08 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Iron | 1.71E-04 | 5.69E-04 | 7.31E-05 | -- | 8.25E-05 | 2.75E-04 | 3.54E-05 | -- | 2.49E-06 | 8.31E-06 | 1.07E-06 | -- | -- | -- | -- | -- |
| Lead | -- | -- | -- | -- | -- | -- | -- | -- | 1.45E-08 | -- | 6.22E-09 | -- | -- | -- | -- | -- |
| Manganese | -- | -- | -- | -- | -- | -- | -- | -- | 3.72E-08 | 2.66E-07 | 1.59E-08 | -- | -- | -- | -- | -- |
| Mercury | 1.70E-07 | 1.98E-03 | 7.28E-08 | -- | 8.22E-08 | 9.55E-04 | 3.52E-08 | -- | 3.47E-11 | 4.03E-07 | 1.49E-11 | -- | -- | -- | -- | -- |
| Nickel | 4.31E-07 | 2.15E-05 | 1.85E-07 | -- | 4.16E-08 | 2.08E-06 | 1.78E-08 | -- | 4.42E-09 | 2.21E-07 | 1.90E-09 | -- | -- | -- | -- | -- |
| Selenium | 5.48E-07 | 1.10E-04 | 2.35E-07 | -- | 2.65E-07 | 5.30E-05 | 1.14E-07 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Vanadium | 1.29E-07 | -- | 5.54E-08 | -- | 6.25E-08 | -- | 2.68E-08 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Zinc | -- | -- | -- | -- | -- | -- | -- | -- | 3.14E-08 | 1.05E-07 | 1.34E-08 | -- | -- | -- | -- | -- |
| **Total** | | 4.11E-03 | | 2.E-07 | | 2.54E-03 | | 2.E-07 | | 1.13E-03 | | 1.E-06 | | 3.68E-03 | | 3.E-06 |

**TABLE 16**
**RECEPTOR-SPECIFIC EXPOSURE, HAZARD, AND RISK RESULTS:**
**EXPOSURE AREA OTTER CREEK 3 (OC-3)**
**DUCK AND OTTER CREEKS**
**TOLEDO AND OREGON, OHIO**

| Youth Receptor | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface Water (Maximum Exposure) | | | | | | | | Sediment (Otter Creek - 3) | | | | | | | |
| | Ingestion | | | | Dermal Contact | | | | Ingestion | | | | Dermal Contact | | | |
| Chemical | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Chloroform | 6.76E-09 | 6.76E-07 | 2.90E-09 | 8.98E-11 | 1.85E-07 | 1.85E-05 | 7.92E-08 | 2.46E-09 | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,1,2,2-Tetrachloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Semivolatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | -- | -- | -- | -- | -- | -- | -- | -- | 2.99E-07 | 1.50E-05 | 1.28E-07 | 1.80E-09 | 5.80E-07 | 1.16E-04 | 1.92E-07 | 1.08E-08 |
| Bromodichloromethane | 2.56E-09 | 1.28E-07 | 1.10E-09 | 6.82E-11 | 5.80E-08 | 2.90E-06 | 2.49E-08 | 1.54E-09 | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 1.94E-07 | 6.46E-07 | 8.31E-08 | 6.07E-08 | 4.88E-07 | 1.83E-06 | 1.62E-07 | 1.33E-07 |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 2.77E-07 | 6.93E-06 | 1.19E-07 | 8.67E-08 | 6.97E-07 | 1.96E-05 | 2.31E-07 | 1.90E-07 |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 3.49E-07 | 8.74E-06 | 1.50E-07 | 1.09E-08 | 8.79E-07 | 2.47E-05 | 2.92E-07 | 2.39E-08 |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | -- | -- | 2.33E-07 | 7.77E-06 | 9.99E-08 | -- | 5.86E-07 | 2.20E-05 | 1.95E-07 | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 2.40E-07 | 8.00E-06 | 1.03E-07 | 7.51E-07 | 6.04E-07 | 2.26E-05 | 2.01E-07 | 1.64E-06 |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | 3.59E-07 | 1.20E-06 | 1.54E-07 | 1.12E-09 | 6.95E-07 | 2.60E-06 | 2.31E-07 | 1.89E-09 |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 6.46E-08 | 2.15E-07 | 2.77E-08 | 2.02E-07 | 1.63E-07 | 6.09E-07 | 5.40E-08 | 4.43E-07 |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 5.59E-07 | 1.40E-05 | 2.40E-07 | -- | 1.08E-06 | 3.04E-05 | 3.59E-07 | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 2.39E-07 | 5.97E-06 | 1.02E-07 | 7.47E-08 | 4.62E-07 | 1.30E-05 | 1.53E-07 | 1.26E-07 |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Phenolics (Phenol) | 7.69E-08 | 2.56E-07 | 3.30E-08 | -- | 1.21E-06 | 4.23E-06 | 5.17E-07 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 5.46E-07 | 1.82E-05 | 2.34E-07 | -- | 1.06E-06 | 3.96E-05 | 3.51E-07 | -- |
| **Pesticides/Polychlorinated Biphenyls** | | | | | | | | | | | | | | | | |
| Aldrin | 2.33E-11 | 7.77E-07 | 9.99E-12 | 1.70E-10 | 5.90E-10 | 2.46E-05 | 2.53E-10 | 5.37E-09 | -- | -- | -- | -- | -- | -- | -- | -- |
| alpha-BHC | 2.10E-11 | -- | 8.99E-12 | 5.67E-11 | 2.33E-09 | -- | 9.97E-10 | 7.85E-09 | -- | -- | -- | -- | -- | -- | -- | -- |
| delta-BHC | 4.66E-11 | -- | 2.00E-11 | -- | 5.17E-09 | -- | 2.22E-09 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-BHC | 1.40E-11 | 4.66E-08 | 6.00E-12 | 6.60E-12 | 1.55E-09 | 6.46E-06 | 6.65E-10 | 9.14E-10 | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- | 1.46E-09 | 2.92E-06 | 6.25E-10 | 2.19E-10 | 1.13E-09 | 2.82E-06 | 3.75E-10 | 1.64E-10 |
| 4,4'-DDD | 1.40E-11 | 2.80E-08 | 6.00E-12 | 1.44E-12 | 2.72E-08 | 6.80E-05 | 1.17E-08 | 3.50E-09 | 1.96E-09 | 3.91E-06 | 8.39E-10 | 2.01E-10 | 1.14E-09 | 2.84E-06 | 3.77E-10 | 1.13E-10 |
| 4,4'-DDE | 3.03E-11 | 6.06E-08 | 1.30E-11 | 4.42E-12 | 5.17E-08 | 1.29E-04 | 2.22E-08 | 9.43E-09 | 1.21E-09 | 2.42E-06 | 5.18E-10 | 1.76E-10 | 7.02E-10 | 1.76E-06 | 2.33E-10 | 9.91E-11 |
| 4,4'-DDT | 2.56E-11 | 5.13E-08 | 1.10E-11 | 3.74E-12 | 8.21E-08 | 2.05E-04 | 3.52E-08 | 1.50E-08 | -- | -- | -- | -- | -- | -- | -- | -- |
| Dieldrin | 2.10E-11 | 4.20E-07 | 8.99E-12 | 1.44E-10 | 4.04E-09 | 1.01E-04 | 1.73E-09 | 3.46E-08 | -- | -- | -- | -- | -- | -- | -- | -- |
| Heptachlor epoxide | 2.10E-11 | 1.61E-06 | 8.99E-12 | 8.18E-11 | 2.76E-09 | 2.65E-04 | 1.18E-09 | 1.34E-08 | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1254 | -- | -- | -- | -- | -- | -- | -- | -- | 1.48E-08 | 7.39E-04 | 6.33E-09 | 1.27E-08 | 4.00E-08 | 2.50E-03 | 1.33E-08 | 3.32E-08 |
| Aroclor 1260 | -- | -- | -- | -- | -- | -- | -- | -- | 6.28E-09 | 3.14E-04 | 2.69E-09 | 5.38E-09 | 1.70E-08 | 1.06E-03 | 5.65E-09 | 1.41E-08 |
| **Metals** | | | | | | | | | | | | | | | | |
| Aluminum | 9.05E-06 | -- | 3.88E-06 | -- | -- | -- | -- | -- | 2.77E-06 | -- | 1.19E-06 | -- | -- | -- | -- | -- |
| Antimony | 2.80E-08 | 7.00E-05 | 1.20E-08 | -- | 7.50E-08 | 1.25E-03 | 3.21E-08 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | 7.69E-08 | 2.56E-04 | 3.30E-08 | 4.95E-08 | 2.06E-07 | 7.24E-04 | 8.84E-08 | 1.40E-07 | 3.06E-09 | 1.02E-05 | 1.31E-09 | 1.97E-09 | 1.78E-09 | 6.24E-06 | 5.91E-10 | 9.33E-10 |
| Barium | 6.83E-06 | 3.42E-05 | 2.93E-06 | -- | 1.83E-05 | 1.31E-03 | 7.85E-06 | -- | 1.67E-08 | 8.34E-08 | 7.15E-09 | -- | -- | -- | -- | -- |
| Cadmium | 3.03E-08 | 6.06E-05 | 1.30E-08 | -- | 8.13E-08 | 6.50E-03 | 3.48E-08 | -- | 1.06E-10 | 2.12E-07 | 4.54E-11 | -- | 2.05E-12 | 1.64E-07 | 6.81E-13 | -- |
| Cobalt | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Copper | 1.28E-07 | -- | 5.50E-08 | -- | 3.44E-07 | -- | 1.47E-07 | -- | 1.11E-08 | -- | 4.76E-09 | -- | -- | -- | -- | -- |
| Cyanide | 4.20E-08 | 2.10E-06 | 1.80E-08 | -- | 1.13E-07 | 5.63E-06 | 4.82E-08 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Iron | 5.08E-05 | 1.69E-04 | 2.18E-05 | -- | 1.36E-04 | 4.54E-02 | 5.84E-05 | -- | 2.58E-06 | 8.61E-06 | 1.11E-06 | -- | -- | -- | -- | -- |
| Lead | -- | -- | -- | -- | -- | -- | -- | -- | 1.50E-08 | -- | 6.44E-09 | -- | -- | -- | -- | -- |
| Manganese | -- | -- | -- | -- | -- | -- | -- | -- | 3.85E-08 | 2.75E-07 | 1.65E-08 | -- | -- | -- | -- | -- |
| Mercury | 5.06E-08 | 5.88E-04 | 2.17E-08 | -- | 1.36E-07 | 2.25E-02 | 5.81E-08 | -- | 3.59E-11 | 4.18E-07 | 1.54E-11 | -- | -- | -- | -- | -- |
| Nickel | 1.28E-07 | 6.41E-06 | 5.50E-08 | -- | 6.88E-08 | 8.59E-05 | 2.95E-08 | -- | 4.58E-09 | 2.29E-07 | 1.96E-09 | -- | -- | -- | -- | -- |
| Selenium | 1.63E-07 | 3.26E-05 | 7.00E-08 | -- | 4.38E-07 | 1.75E-04 | 1.88E-07 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Vanadium | 3.85E-08 | -- | 1.65E-08 | -- | 1.03E-07 | -- | 4.42E-08 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Zinc | -- | -- | -- | -- | -- | -- | -- | -- | 3.25E-08 | 1.08E-07 | 1.39E-08 | -- | -- | -- | -- | -- |
| **Total** | | 1.22E-03 | | 5.E-08 | | 7.88E-02 | | 2.E-07 | | 1.17E-03 | | 1.E-06 | | 3.87E-03 | | 3.E-06 |

**TABLE 16**
**RECEPTOR-SPECIFIC EXPOSURE, HAZARD, AND RISK RESULTS:**
**EXPOSURE AREA OTTER CREEK 3 (OC-3)**
**DUCK AND OTTER CREEKS**
**TOLEDO AND OREGON, OHIO**

| Child Receptor | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface Water (Maximum Exposure) | | | | | | | | Sediment (Otter Creek - 3) | | | | | | | |
| | Ingestion | | | | Dermal Contact | | | | Ingestion | | | | Dermal Contact | | | |
| Chemical | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Chloroform | 5.30E-09 | 5.30E-07 | 2.27E-09 | 7.04E-11 | 2.10E-07 | 2.10E-05 | 9.01E-08 | 2.79E-09 | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,1,2,2-Tetrachloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Semivolatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | -- | -- | -- | -- | -- | -- | -- | -- | 4.69E-07 | 2.35E-05 | 2.01E-07 | 2.81E-09 | 3.45E-07 | 6.90E-05 | 1.48E-07 | 8.28E-09 |
| Bromodichloromethane | 2.01E-09 | 1.00E-07 | 8.61E-10 | 5.34E-11 | 6.60E-08 | 3.30E-06 | 2.83E-08 | 1.75E-09 | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 3.04E-07 | 1.01E-06 | 1.30E-07 | 9.50E-08 | 2.90E-07 | 1.09E-06 | 1.24E-07 | 1.02E-07 |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 4.34E-07 | 1.08E-05 | 1.86E-07 | 1.36E-07 | 4.15E-07 | 1.17E-05 | 1.78E-07 | 1.46E-07 |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 5.47E-07 | 1.37E-05 | 2.35E-07 | 1.71E-08 | 5.23E-07 | 1.47E-05 | 2.24E-07 | 1.84E-08 |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | -- | -- | 3.65E-07 | 1.22E-05 | 1.56E-07 | -- | 3.49E-07 | 1.31E-05 | 1.50E-07 | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 3.76E-07 | 1.25E-05 | 1.61E-07 | 1.18E-06 | 3.60E-07 | 1.35E-05 | 1.54E-07 | 1.26E-06 |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | 5.63E-07 | 1.88E-06 | 2.41E-07 | 1.76E-09 | 4.14E-07 | 1.55E-06 | 1.77E-07 | 1.46E-09 |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 1.01E-07 | 3.38E-07 | 4.34E-08 | 3.17E-07 | 9.68E-08 | 3.63E-07 | 4.15E-08 | 3.40E-07 |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 8.76E-07 | 2.19E-05 | 3.75E-07 | -- | 6.44E-07 | 1.81E-05 | 2.76E-07 | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 3.74E-07 | 9.35E-06 | 1.60E-07 | 1.17E-07 | 2.75E-07 | 7.73E-06 | 1.18E-07 | 9.67E-08 |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Phenolics (Phenol) | 6.03E-08 | 2.01E-07 | 2.58E-08 | -- | 1.37E-06 | 4.81E-06 | 5.88E-07 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 8.56E-07 | 2.85E-05 | 3.67E-07 | -- | 6.29E-07 | 2.36E-05 | 2.70E-07 | -- |
| **Pesticides/Polychlorinated Biphenyls** | | | | | | | | | | | | | | | | |
| Aldrin | 1.83E-11 | 6.09E-07 | 7.83E-12 | 1.33E-10 | 6.71E-10 | 2.80E-05 | 2.87E-10 | 6.11E-09 | -- | -- | -- | -- | -- | -- | -- | -- |
| alpha-BHC | 1.64E-11 | -- | 7.05E-12 | 4.44E-11 | 2.65E-09 | -- | 1.13E-09 | 8.93E-09 | -- | -- | -- | -- | -- | -- | -- | -- |
| delta-BHC | 3.65E-11 | -- | 1.57E-11 | -- | 5.88E-09 | -- | 2.52E-09 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-BHC | 1.10E-11 | 3.65E-08 | 4.70E-12 | 5.17E-12 | 1.76E-09 | 7.35E-06 | 7.56E-10 | 1.04E-09 | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- | 2.29E-09 | 4.57E-06 | 9.80E-10 | 3.43E-10 | 6.72E-10 | 1.68E-06 | 2.88E-10 | 1.26E-10 |
| 4,4'-DDD | 1.10E-11 | 2.19E-08 | 4.70E-12 | 1.13E-12 | 3.10E-08 | 7.74E-05 | 1.33E-08 | 3.98E-09 | 3.07E-09 | 6.13E-06 | 1.31E-09 | 3.15E-10 | 6.77E-10 | 1.69E-06 | 2.90E-10 | 8.70E-11 |
| 4,4'-DDE | 2.37E-11 | 4.75E-08 | 1.02E-11 | 3.46E-12 | 5.89E-08 | 1.47E-04 | 2.52E-08 | 1.07E-08 | 1.90E-09 | 3.79E-06 | 8.12E-10 | 2.76E-10 | 4.18E-10 | 1.05E-06 | 1.79E-10 | 7.62E-11 |
| 4,4'-DDT | 2.01E-11 | 4.02E-08 | 8.61E-12 | 2.93E-12 | 9.34E-08 | 2.33E-04 | 4.00E-08 | 1.70E-08 | -- | -- | -- | -- | -- | -- | -- | -- |
| Dieldrin | 1.64E-11 | 3.29E-07 | 7.05E-12 | 1.13E-10 | 4.59E-09 | 1.15E-04 | 1.97E-09 | 3.93E-08 | -- | -- | -- | -- | -- | -- | -- | -- |
| Heptachlor epoxide | 1.64E-11 | 1.26E-06 | 7.05E-12 | 6.41E-11 | 3.13E-09 | 3.01E-04 | 1.34E-09 | 1.53E-08 | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1254 | -- | -- | -- | -- | -- | -- | -- | -- | 2.31E-08 | 1.16E-03 | 9.92E-09 | 1.98E-08 | 2.38E-08 | 1.49E-03 | 1.02E-08 | 2.55E-08 |
| Aroclor 1260 | -- | -- | -- | -- | -- | -- | -- | -- | 9.84E-09 | 4.92E-04 | 4.22E-09 | 8.43E-09 | 1.01E-08 | 6.33E-04 | 4.34E-09 | 1.09E-08 |
| **Metals** | | | | | | | | | | | | | | | | |
| Aluminum | 7.09E-06 | -- | 3.04E-06 | -- | -- | -- | -- | -- | 4.34E-06 | -- | 1.86E-06 | -- | -- | -- | -- | -- |
| Antimony | 2.19E-08 | 5.48E-05 | 9.39E-09 | -- | 8.53E-08 | 1.42E-03 | 3.66E-08 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | 6.03E-08 | 2.01E-04 | 2.58E-08 | 3.87E-08 | 2.35E-07 | 8.23E-04 | 1.01E-07 | 1.59E-07 | 4.80E-09 | 1.60E-05 | 2.06E-09 | 3.09E-09 | 1.06E-09 | 3.72E-06 | 4.54E-10 | 7.17E-10 |
| Barium | 5.35E-06 | 2.68E-05 | 2.29E-06 | -- | 2.08E-05 | 1.49E-03 | 8.93E-06 | -- | 2.61E-08 | 1.31E-07 | 1.12E-08 | -- | -- | -- | -- | -- |
| Cadmium | 2.37E-08 | 4.75E-05 | 1.02E-08 | -- | 9.24E-08 | 7.39E-03 | 3.96E-08 | -- | 1.66E-10 | 3.32E-07 | 7.12E-11 | -- | 1.22E-12 | 9.77E-08 | 5.23E-13 | -- |
| Cobalt | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Copper | 1.00E-07 | -- | 4.31E-08 | -- | 3.91E-07 | -- | 1.68E-07 | -- | 1.74E-08 | -- | 7.45E-09 | -- | -- | -- | -- | -- |
| Cyanide | 3.29E-08 | 1.64E-06 | 1.41E-08 | -- | 1.28E-07 | 6.40E-06 | 5.48E-08 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Iron | 3.98E-05 | 1.33E-04 | 1.71E-05 | -- | 1.55E-04 | 5.17E-02 | 6.64E-05 | -- | 4.05E-06 | 1.35E-05 | 1.73E-06 | -- | -- | -- | -- | -- |
| Lead | -- | -- | -- | -- | -- | -- | -- | -- | 2.36E-08 | -- | 1.01E-08 | -- | -- | -- | -- | -- |
| Manganese | -- | -- | -- | -- | -- | -- | -- | -- | 6.03E-08 | 4.31E-07 | 2.59E-08 | -- | -- | -- | -- | -- |
| Mercury | 3.96E-08 | 4.61E-04 | 1.70E-08 | -- | 1.54E-07 | 2.56E-02 | 6.61E-08 | -- | 5.63E-11 | 6.54E-07 | 2.41E-11 | -- | -- | -- | -- | -- |
| Nickel | 1.00E-07 | 5.02E-06 | 4.31E-08 | -- | 7.82E-08 | 9.78E-05 | 3.35E-08 | -- | 7.18E-09 | 3.59E-07 | 3.08E-09 | -- | -- | -- | -- | -- |
| Selenium | 1.28E-07 | 2.56E-05 | 5.48E-08 | -- | 4.98E-07 | 1.99E-04 | 2.13E-07 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Vanadium | 3.01E-08 | -- | 1.29E-08 | -- | 1.17E-07 | -- | 5.03E-08 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Zinc | -- | -- | -- | -- | -- | -- | -- | -- | 5.09E-08 | 1.70E-07 | 2.18E-08 | -- | -- | -- | -- | -- |
| **Total** | | 9.59E-04 | | 4.E-08 | | 8.97E-02 | | 3.E-07 | | 1.83E-03 | | 2.E-06 | | 2.30E-03 | | 2.E-06 |

| Total Risk = Total Risk (Adult) + Total Risk (Child) | | | | |
|---|---|---|---|---|
| | Surface Water | | Sediment | |
| | Ingestion | Dermal Contact | Ingestion | Dermal Contact |
| **Total Risk** | 2.E-07 | 4.E-07 | 3.E-06 | 5.E-06 |

TABLE 17
RECEPTOR-SPECIFIC EXPOSURE, HAZARD, AND RISK RESULTS:
EXPOSURE AREA OTTER CREEK 4 (OC-4)
DUCK AND OTTER CREEKS

| Adult Receptor | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface Water | | | | | | | | Sediment | | | | | | | |
| | Ingestion | | | | Dermal Contact | | | | Ingestion | | | | Dermal Contact | | | |
| Chemical | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Semivolatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | -- | -- | -- | -- | -- | -- | -- | -- | 1.01E-06 | 5.06E-05 | 4.34E-07 | 6.07E-09 | 1.93E-06 | 3.86E-04 | 8.27E-07 | 4.63E-08 |
| Bromodichloromethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 1.78E-07 | 5.94E-07 | 7.64E-08 | 5.58E-08 | 4.42E-07 | 1.66E-06 | 1.89E-07 | 1.55E-07 |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 1.96E-07 | 4.90E-06 | 8.41E-08 | 6.14E-08 | 4.86E-07 | 1.37E-05 | 2.08E-07 | 2.E-07 |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 1.78E-07 | 4.46E-06 | 7.64E-08 | 5.58E-09 | 4.42E-07 | 1.24E-05 | 1.89E-07 | 1.55E-08 |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | -- | -- | 1.43E-07 | 4.76E-06 | 6.11E-08 | -- | 3.54E-07 | 1.32E-05 | 1.52E-07 | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 2.14E-07 | 7.13E-06 | 9.17E-08 | 6.69E-07 | 5.30E-07 | 1.99E-05 | 2.27E-07 | 1.86E-06 |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | 3.12E-07 | 1.04E-06 | 1.34E-07 | 9.76E-10 | 5.95E-07 | 2.23E-06 | 2.55E-07 | 2.09E-09 |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 2.85E-07 | 7.12E-06 | 1.22E-07 | -- | 5.43E-07 | 1.52E-05 | 2.33E-07 | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 1.25E-07 | 3.12E-06 | 5.35E-08 | 3.91E-08 | 2.38E-07 | 6.68E-06 | 1.02E-07 | 8.37E-08 |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | 2.14E-07 | 1.07E-05 | 9.17E-08 | 1.10E-09 | 4.08E-07 | 2.29E-05 | 1.75E-07 | 2.36E-09 |
| Phenolics (Phenol) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 8.93E-07 | 2.98E-05 | 3.83E-07 | -- | 1.70E-06 | 6.37E-05 | 7.29E-07 | -- |
| **Pesticides/Polychlorinated Biphenyls** | | | | | | | | | | | | | | | | |
| Aldrin | -- | -- | -- | -- | -- | -- | -- | -- | 8.69E-10 | 2.90E-05 | 3.72E-10 | 6.33E-09 | 6.63E-10 | 2.76E-05 | 2.84E-10 | 6.03E-09 |
| alpha-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| delta-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- | 1.13E-09 | 2.25E-06 | 4.82E-10 | 1.69E-10 | 8.58E-10 | 2.15E-06 | 3.68E-10 | 1.61E-10 |
| 4,4'-DDD | -- | -- | -- | -- | -- | -- | -- | -- | 5.99E-09 | 1.20E-05 | 2.57E-09 | 6.16E-10 | 3.43E-09 | 8.57E-06 | 1.47E-09 | 4.41E-10 |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- | -- | -- | 1.46E-09 | 2.91E-06 | 6.24E-10 | 2.12E-10 | 8.33E-10 | 2.08E-06 | 3.57E-10 | 1.52E-10 |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- | -- | -- | 1.22E-09 | 2.43E-06 | 5.22E-10 | 1.77E-10 | 6.96E-10 | 1.74E-06 | 2.98E-10 | 1.27E-10 |
| Dieldrin | -- | -- | -- | -- | -- | -- | -- | -- | 2.90E-10 | 5.80E-06 | 1.24E-10 | 1.99E-09 | 2.21E-10 | 5.52E-06 | 9.47E-11 | 1.89E-09 |
| Heptachlor epoxide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1254 | -- | -- | -- | -- | -- | -- | -- | -- | 1.57E-07 | 7.85E-03 | 6.73E-08 | 1.35E-07 | 4.19E-07 | 2.62E-02 | 1.80E-07 | 4.49E-07 |
| Aroclor 1260 | -- | -- | -- | -- | -- | -- | -- | -- | 1.00E-08 | 5.00E-04 | 4.29E-09 | 8.57E-09 | 2.67E-08 | 1.67E-03 | 1.14E-08 | 2.86E-08 |
| **Metals** | | | | | | | | | | | | | | | | |
| Aluminum | -- | -- | -- | -- | -- | -- | -- | -- | 2.03E-06 | -- | 8.71E-07 | -- | -- | -- | -- | -- |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- | 1.25E-10 | 3.12E-07 | 5.35E-11 | -- | -- | -- | -- | -- |
| Arsenic | -- | -- | -- | -- | -- | -- | -- | -- | 1.58E-09 | 5.28E-06 | 6.79E-10 | 1.02E-09 | 9.06E-10 | 3.18E-06 | 3.88E-10 | 6.13E-10 |
| Barium | -- | -- | -- | -- | -- | -- | -- | -- | 1.23E-08 | 6.15E-08 | 5.27E-09 | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | -- | 8.45E-11 | 1.69E-07 | 3.62E-11 | -- | 1.61E-12 | 1.29E-07 | 6.91E-13 | -- |
| Cobalt | -- | -- | -- | -- | -- | -- | -- | -- | 6.42E-10 | -- | 2.75E-10 | -- | -- | -- | -- | -- |
| Copper | -- | -- | -- | -- | -- | -- | -- | -- | 8.95E-09 | -- | 3.83E-09 | -- | -- | -- | -- | -- |
| Cyanide | -- | -- | -- | -- | -- | -- | -- | -- | 1.29E-10 | 6.46E-09 | 5.54E-11 | -- | -- | -- | -- | -- |
| Iron | -- | -- | -- | -- | -- | -- | -- | -- | 1.67E-06 | 5.58E-06 | 7.17E-07 | -- | -- | -- | -- | -- |
| Lead | -- | -- | -- | -- | -- | -- | -- | -- | 7.90E-08 | -- | 3.39E-08 | -- | -- | -- | -- | -- |
| Manganese | -- | -- | -- | -- | -- | -- | -- | -- | 3.71E-08 | 2.65E-07 | 1.59E-08 | -- | -- | -- | -- | -- |
| Mercury | -- | -- | -- | -- | -- | -- | -- | -- | 3.11E-11 | 3.61E-07 | 1.33E-11 | -- | -- | -- | -- | -- |
| Nickel | -- | -- | -- | -- | -- | -- | -- | -- | 3.37E-09 | 1.68E-07 | 1.44E-09 | -- | -- | -- | -- | -- |
| Selenium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | 1.16E-10 | 1.45E-06 | 4.97E-11 | -- | -- | -- | -- | -- |
| Vanadium | -- | -- | -- | -- | -- | -- | -- | -- | 2.37E-09 | -- | 1.02E-09 | -- | -- | -- | -- | -- |
| Zinc | -- | -- | -- | -- | -- | -- | -- | -- | 1.70E-08 | 5.68E-08 | 7.30E-09 | -- | -- | -- | -- | -- |
| **Total** | | 0.00E+00 | | 0.E+00 | | 0.00E+00 | | 0.E+00 | | 8.54E-03 | | 1.E-06 | | 2.85E-02 | | 3.E-06 |

TABLE 17
RECEPTOR-SPECIFIC EXPOSURE, HAZARD, AND RISK RESULTS:
EXPOSURE AREA OTTER CREEK 4 (OC-4)
DUCK AND OTTER CREEKS

| Youth Receptor | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface Water | | | | | | | | Sediment | | | | | | | |
| | Ingestion | | | | Dermal Contact | | | | Ingestion | | | | Dermal Contact | | | |
| Chemical | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Semivolatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | -- | -- | -- | -- | -- | -- | -- | -- | 1.05E-06 | 5.24E-05 | 4.49E-07 | 6.29E-09 | 2.03E-06 | 4.06E-04 | 6.74E-07 | 3.77E-08 |
| Bromodichloromethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 1.85E-07 | 6.16E-07 | 7.91E-08 | 5.78E-08 | 4.65E-07 | 1.74E-06 | 1.54E-07 | 1.27E-07 |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 2.03E-07 | 5.08E-06 | 8.71E-08 | 6.36E-08 | 5.11E-07 | 1.44E-05 | 1.70E-07 | 1.39E-07 |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 1.85E-07 | 4.62E-06 | 7.91E-08 | 5.78E-09 | 4.65E-07 | 1.31E-05 | 1.54E-07 | 1.27E-08 |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | -- | -- | 1.48E-07 | 4.92E-06 | 6.33E-08 | -- | 3.72E-07 | 1.39E-05 | 1.23E-07 | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 2.22E-07 | 7.39E-06 | 9.50E-08 | 6.93E-07 | 5.58E-07 | 2.09E-05 | 1.85E-07 | 1.52E-06 |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | 3.23E-07 | 1.08E-06 | 1.39E-07 | 1.01E-09 | 6.25E-07 | 2.34E-06 | 2.08E-07 | 1.70E-09 |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 2.95E-07 | 7.37E-06 | 1.26E-07 | -- | 5.71E-07 | 1.60E-05 | 1.89E-07 | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 1.29E-07 | 3.23E-06 | 5.54E-08 | 4.04E-08 | 2.50E-07 | 7.03E-06 | 8.31E-08 | 6.81E-08 |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | 2.22E-07 | 1.11E-05 | 9.50E-08 | 1.14E-09 | 4.29E-07 | 2.41E-05 | 1.42E-07 | 1.92E-09 |
| Phenolics (Phenol) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 9.24E-07 | 3.08E-05 | 3.96E-07 | -- | 1.79E-06 | 6.70E-05 | 5.94E-07 | -- |
| **Pesticides/Polychlorinated Biphenyls** | | | | | | | | | | | | | | | | |
| Aldrin | -- | -- | -- | -- | -- | -- | -- | -- | 9.00E-10 | 3.00E-05 | 3.86E-10 | 6.56E-09 | 6.97E-10 | 2.90E-05 | 2.31E-10 | 4.91E-09 |
| alpha-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| delta-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- | 1.17E-09 | 2.33E-06 | 4.99E-10 | 1.75E-10 | 9.02E-10 | 2.26E-06 | 2.99E-10 | 1.31E-10 |
| 4,4'-DDD | -- | -- | -- | -- | -- | -- | -- | -- | 6.20E-09 | 1.24E-05 | 2.66E-09 | 6.38E-10 | 3.60E-09 | 9.01E-06 | 1.20E-09 | 3.59E-10 |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- | -- | -- | 1.51E-09 | 3.02E-06 | 6.46E-10 | 2.20E-10 | 8.75E-10 | 2.19E-06 | 2.91E-10 | 1.23E-10 |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- | -- | -- | 1.26E-09 | 2.52E-06 | 5.40E-10 | 1.84E-10 | 7.32E-10 | 1.83E-06 | 2.43E-10 | 1.03E-10 |
| Dieldrin | -- | -- | -- | -- | -- | -- | -- | -- | 3.00E-10 | 6.00E-06 | 1.29E-10 | 2.06E-09 | 2.32E-10 | 5.81E-06 | 7.71E-11 | 1.54E-09 |
| Heptachlor epoxide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1254 | -- | -- | -- | -- | -- | -- | -- | -- | 1.63E-07 | 8.13E-03 | 6.96E-08 | 1.39E-07 | 4.40E-07 | 2.75E-02 | 1.46E-07 | 3.65E-07 |
| Aroclor 1260 | -- | -- | -- | -- | -- | -- | -- | -- | 1.04E-08 | 5.18E-04 | 4.44E-09 | 8.88E-09 | 2.81E-08 | 1.75E-03 | 9.31E-09 | 2.33E-08 |
| **Metals** | | | | | | | | | | | | | | | | |
| Aluminum | -- | -- | -- | -- | -- | -- | -- | -- | 2.11E-06 | -- | 9.02E-07 | -- | -- | -- | -- | -- |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- | 1.29E-10 | 3.23E-07 | 5.54E-11 | -- | -- | -- | -- | -- |
| Arsenic | -- | -- | -- | -- | -- | -- | -- | -- | 1.64E-09 | 5.47E-06 | 7.03E-10 | 1.05E-09 | 9.53E-10 | 3.34E-06 | 3.16E-10 | 4.99E-10 |
| Barium | -- | -- | -- | -- | -- | -- | -- | -- | 1.27E-08 | 6.37E-08 | 5.46E-09 | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | -- | 8.76E-11 | 1.75E-07 | 3.75E-11 | -- | 1.69E-12 | 1.36E-07 | 5.62E-13 | -- |
| Cobalt | -- | -- | -- | -- | -- | -- | -- | -- | 6.65E-10 | -- | 2.85E-10 | -- | -- | -- | -- | -- |
| Copper | -- | -- | -- | -- | -- | -- | -- | -- | 9.27E-09 | -- | 3.97E-09 | -- | -- | -- | -- | -- |
| Cyanide | -- | -- | -- | -- | -- | -- | -- | -- | 1.34E-10 | 6.69E-09 | 5.74E-11 | -- | -- | -- | -- | -- |
| Iron | -- | -- | -- | -- | -- | -- | -- | -- | 1.73E-06 | 5.77E-06 | 7.42E-07 | -- | -- | -- | -- | -- |
| Lead | -- | -- | -- | -- | -- | -- | -- | -- | 8.19E-08 | -- | 3.51E-08 | -- | -- | -- | -- | -- |
| Manganese | -- | -- | -- | -- | -- | -- | -- | -- | 3.84E-08 | 2.75E-07 | 1.65E-08 | -- | -- | -- | -- | -- |
| Mercury | -- | -- | -- | -- | -- | -- | -- | -- | 3.22E-11 | 3.74E-07 | 1.38E-11 | -- | -- | -- | -- | -- |
| Nickel | -- | -- | -- | -- | -- | -- | -- | -- | 3.49E-09 | 1.74E-07 | 1.50E-09 | -- | 0.00E+00 | 0.00E+00 | 0.00E+00 | -- |
| Selenium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | 1.20E-10 | 1.50E-06 | 5.14E-11 | -- | -- | -- | -- | -- |
| Vanadium | -- | -- | -- | -- | -- | -- | -- | -- | 2.46E-09 | -- | 1.05E-09 | -- | -- | -- | -- | -- |
| Zinc | -- | -- | -- | -- | -- | -- | -- | -- | 1.76E-08 | 5.88E-08 | 7.56E-09 | -- | -- | -- | -- | -- |
| **Total** | | 0.00E+00 | | 0.E+00 | | 0.00E+00 | | 0.E+00 | | 8.84E-03 | | 1.E-06 | | 2.99E-02 | | 2.E-06 |

TABLE 17
RECEPTOR-SPECIFIC EXPOSURE, HAZARD, AND RISK RESULTS:
EXPOSURE AREA OTTER CREEK 4 (OC-4)
DUCK AND OTTER CREEKS

| Child Receptor | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface Water | | | | | | | | Sediment | | | | | | | |
| | Ingestion | | | | Dermal Contact | | | | Ingestion | | | | Dermal Contact | | | |
| **Chemical** | **ADD** | **Hazard** | **LADD** | **Risk** | **ADD** | **Hazard** | **LADD** | **Risk** | **ADD** | **Hazard** | **LADD** | **Risk** | **ADD** | **Hazard** | **LADD** | **Risk** |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Semivolatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | -- | -- | -- | -- | -- | -- | -- | -- | 1.64E-06 | 8.21E-05 | 7.04E-07 | 9.85E-09 | 1.21E-06 | 2.42E-04 | 5.18E-07 | 2.90E-08 |
| Bromodichloromethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 2.89E-07 | 9.64E-07 | 1.24E-07 | 9.05E-08 | 2.77E-07 | 1.04E-06 | 1.19E-07 | 9.72E-08 |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 3.18E-07 | 7.96E-06 | 1.36E-07 | 9.96E-08 | 3.04E-07 | 8.55E-06 | 1.30E-07 | 1.07E-07 |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 2.89E-07 | 7.23E-06 | 1.24E-07 | 9.05E-09 | 2.77E-07 | 7.77E-06 | 1.19E-07 | 9.72E-09 |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | -- | -- | 2.31E-07 | 7.72E-06 | 9.92E-08 | -- | 2.21E-07 | 8.29E-06 | 9.48E-08 | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 3.47E-07 | 1.16E-05 | 1.49E-07 | 1.09E-06 | 3.32E-07 | 1.24E-05 | 1.42E-07 | 1.17E-06 |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | 5.06E-07 | 1.69E-06 | 2.17E-07 | 1.58E-09 | 3.72E-07 | 1.39E-06 | 1.60E-07 | 1.31E-09 |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 4.62E-07 | 1.15E-05 | 1.98E-07 | -- | 3.40E-07 | 9.54E-06 | 1.46E-07 | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 2.03E-07 | 5.06E-06 | 8.68E-08 | 6.34E-08 | 1.49E-07 | 4.18E-06 | 6.38E-08 | 5.24E-08 |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | 3.47E-07 | 1.74E-05 | 1.49E-07 | 1.79E-09 | 2.55E-07 | 1.43E-05 | 1.09E-07 | 1.48E-09 |
| Phenolics (Phenol) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 1.45E-06 | 4.83E-05 | 6.21E-07 | -- | 1.07E-06 | 3.99E-05 | 4.56E-07 | -- |
| **Pesticides/Polychlorinated Biphenyls** | | | | | | | | | | | | | | | | |
| Aldrin | -- | -- | -- | -- | -- | -- | -- | -- | 1.41E-09 | 4.70E-05 | 6.04E-10 | 1.03E-08 | 4.15E-10 | 1.73E-05 | 1.78E-10 | 3.78E-09 |
| alpha-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| delta-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- | 1.83E-09 | 3.65E-06 | 7.82E-10 | 2.74E-10 | 5.37E-10 | 1.34E-06 | 2.30E-10 | 1.01E-10 |
| 4,4'-DDD | -- | -- | -- | -- | -- | -- | -- | -- | 9.72E-09 | 1.94E-05 | 4.17E-09 | 1.00E-09 | 2.14E-09 | 5.36E-06 | 9.19E-10 | 2.76E-10 |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- | -- | -- | 2.36E-09 | 4.72E-06 | 1.01E-09 | 3.44E-10 | 5.21E-10 | 1.30E-06 | 2.23E-10 | 9.49E-11 |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- | -- | -- | 1.97E-09 | 3.95E-06 | 8.46E-10 | 2.88E-10 | 4.36E-10 | 1.09E-06 | 1.87E-10 | 7.93E-11 |
| Dieldrin | -- | -- | -- | -- | -- | -- | -- | -- | 4.70E-10 | 9.40E-06 | 2.01E-10 | 3.22E-09 | 1.38E-10 | 3.46E-06 | 5.93E-11 | 1.19E-09 |
| Heptachlor epoxide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1254 | -- | -- | -- | -- | -- | -- | -- | -- | 2.55E-07 | 1.27E-02 | 1.09E-07 | 2.18E-07 | 2.62E-07 | 1.64E-02 | 1.12E-07 | 2.81E-07 |
| Aroclor 1260 | -- | -- | -- | -- | -- | -- | -- | -- | 1.62E-08 | 8.11E-04 | 6.95E-09 | 1.39E-08 | 1.67E-08 | 1.04E-03 | 7.16E-09 | 1.79E-08 |
| **Metals** | | | | | | | | | | | | | | | | |
| Aluminum | -- | -- | -- | -- | -- | -- | -- | -- | 3.30E-06 | -- | 1.41E-06 | -- | -- | -- | -- | -- |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- | 2.03E-10 | 5.06E-07 | 8.68E-11 | -- | -- | -- | -- | -- |
| Arsenic | -- | -- | -- | -- | -- | -- | -- | -- | 2.57E-09 | 8.57E-06 | 1.10E-09 | 1.65E-09 | 5.67E-10 | 1.99E-06 | 2.43E-10 | 3.84E-10 |
| Barium | -- | -- | -- | -- | -- | -- | -- | -- | 1.99E-08 | 9.97E-08 | 8.55E-09 | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | -- | 1.37E-10 | 2.74E-07 | 5.88E-11 | -- | 1.01E-12 | 8.07E-08 | 4.32E-13 | -- |
| Cobalt | -- | -- | -- | -- | -- | -- | -- | -- | 1.04E-09 | -- | 4.46E-10 | -- | -- | -- | -- | -- |
| Copper | -- | -- | -- | -- | -- | -- | -- | -- | 1.45E-08 | -- | 6.22E-09 | -- | -- | -- | -- | -- |
| Cyanide | -- | -- | -- | -- | -- | -- | -- | -- | 2.10E-10 | 1.05E-08 | 8.99E-11 | -- | -- | -- | -- | -- |
| Iron | -- | -- | -- | -- | -- | -- | -- | -- | 2.71E-06 | 9.05E-06 | 1.16E-06 | -- | -- | -- | -- | -- |
| Lead | -- | -- | -- | -- | -- | -- | -- | -- | 1.28E-07 | -- | 5.50E-08 | -- | -- | -- | -- | -- |
| Manganese | -- | -- | -- | -- | -- | -- | -- | -- | 6.02E-08 | 4.30E-07 | 2.58E-08 | -- | -- | -- | -- | -- |
| Mercury | -- | -- | -- | -- | -- | -- | -- | -- | 5.04E-11 | 5.86E-07 | 2.16E-11 | -- | -- | -- | -- | -- |
| Nickel | -- | -- | -- | -- | -- | -- | -- | -- | 5.47E-09 | 2.73E-07 | 2.34E-09 | -- | -- | -- | -- | -- |
| Selenium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | 1.88E-10 | 2.35E-06 | 8.06E-11 | -- | -- | -- | -- | -- |
| Vanadium | -- | -- | -- | -- | -- | -- | -- | -- | 3.85E-09 | -- | 1.65E-09 | -- | -- | -- | -- | -- |
| Zinc | -- | -- | -- | -- | -- | -- | -- | -- | 2.76E-08 | 9.22E-08 | 1.18E-08 | -- | -- | -- | -- | -- |
| **Total** | | 0.00E+00 | | 0.E+00 | | 0.00E+00 | | 0.E+00 | | 1.39E-02 | | 2.E-06 | | 1.78E-02 | | 2.E-06 |

| Total Risk = Total Risk (Adult) + Total Risk (Child) | | | | |
|---|---|---|---|---|
| | Surface Water | | Sediment | |
| | **Ingestion** | **Dermal Contact** | **Ingestion** | **Dermal Contact** |
| **Total Risk** | 0.E+00 | 0.E+00 | 3.E-06 | 5.E-06 |

TABLE 18
RECEPTOR-SPECIFIC EXPOSURE, HAZARD, AND RISK RESULTS:
EXPOSURE AREA OTTER CREEK 5 (OC-5)
DUCK AND OTTER CREEKS
TOLEDO AND OREGON, OHIO

| | Adult Receptor | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface Water | | | | | | | | Sediment | | | | | | | |
| | Ingestion | | | | Dermal Contact | | | | Ingestion | | | | Dermal Contact | | | |
| Chemical | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | -- | -- | -- | -- | -- | -- | -- | -- | 1.52E-08 | 2.53E-07 | 6.50E-09 | 1.30E-09 | 2.89E-08 | 4.82E-07 | 1.24E-08 | 2.48E-09 |
| **Semivolatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | -- | -- | -- | -- | -- | -- | -- | -- | 2.22E-07 | 1.11E-05 | 9.49E-08 | 1.33E-09 | 4.22E-07 | 8.45E-05 | 1.81E-07 | 1.E-08 |
| Bromodichloromethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 2.36E-07 | 7.87E-07 | 1.01E-07 | 7.39E-08 | 5.85E-07 | 2.19E-06 | 2.51E-07 | 2.06E-07 |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 1.22E-07 | 3.04E-06 | 5.21E-08 | 3.80E-08 | 3.01E-07 | 8.47E-06 | 1.29E-07 | 1.06E-07 |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 2.09E-07 | 5.24E-06 | 8.98E-08 | 6.55E-09 | 5.19E-07 | 1.46E-05 | 2.23E-07 | 1.83E-08 |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | -- | -- | 9.76E-08 | 3.25E-06 | 4.18E-08 | -- | 2.42E-07 | 9.06E-06 | 1.04E-07 | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 1.24E-07 | 4.14E-06 | 5.32E-08 | 3.88E-07 | 3.08E-07 | 1.15E-05 | 1.32E-07 | 1.08E-06 |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | 2.56E-07 | 8.52E-07 | 1.10E-07 | 8.00E-10 | 4.87E-07 | 1.83E-06 | 2.09E-07 | 1.71E-09 |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 1.43E-07 | 4.76E-07 | 6.11E-08 | 4.46E-07 | 3.54E-07 | 1.32E-06 | 1.52E-07 | 1.24E-06 |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 1.95E-07 | 4.87E-06 | 8.34E-08 | -- | 3.71E-07 | 1.04E-05 | 1.59E-07 | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 2.00E-07 | 4.99E-06 | 8.56E-08 | 6.25E-08 | 3.81E-07 | 1.07E-05 | 1.63E-07 | 1.34E-07 |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | 2.72E-07 | 1.36E-05 | 1.17E-07 | 1.40E-09 | 5.18E-07 | 2.91E-05 | 2.22E-07 | 3.00E-09 |
| Phenolics (Phenol) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 3.11E-07 | 1.04E-05 | 1.33E-07 | -- | 5.93E-07 | 2.22E-05 | 2.54E-07 | -- |
| **Pesticides/Polychlorinated Biphenyls** | | | | | | | | | | | | | | | | |
| Aldrin | -- | -- | -- | -- | -- | -- | -- | -- | 6.24E-10 | 2.08E-05 | 2.67E-10 | 4.55E-09 | 4.76E-10 | 1.98E-05 | 2.04E-10 | 4.33E-09 |
| alpha-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| delta-BHC | -- | -- | -- | -- | -- | -- | -- | -- | 5.64E-10 | -- | 2.42E-10 | -- | 4.30E-10 | -- | 1.84E-10 | -- |
| gamma-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- | 3.21E-10 | 6.42E-07 | 1.38E-10 | 4.81E-11 | 2.45E-10 | 6.12E-07 | 1.05E-10 | 4.59E-11 |
| 4,4'-DDD | -- | -- | -- | -- | -- | -- | -- | -- | 4.90E-09 | 9.81E-06 | 2.10E-09 | 5.04E-10 | 2.80E-09 | 7.01E-06 | 1.20E-09 | 3.61E-10 |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- | -- | -- | 1.78E-09 | 3.57E-06 | 7.64E-10 | 2.60E-10 | 1.02E-09 | 2.55E-06 | 4.37E-10 | 1.86E-10 |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- | -- | -- | 1.35E-09 | 2.71E-06 | 5.80E-10 | 1.97E-10 | 7.74E-10 | 1.93E-06 | 3.32E-10 | 1.41E-10 |
| Dieldrin | -- | -- | -- | -- | -- | -- | -- | -- | 7.78E-10 | 1.56E-05 | 3.34E-10 | 5.34E-09 | 5.94E-10 | 1.48E-05 | 2.54E-10 | 5.09E-09 |
| Heptachlor epoxide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1254 | -- | -- | -- | -- | -- | -- | -- | -- | 3.31E-08 | 1.65E-03 | 1.42E-08 | 2.83E-08 | 8.82E-08 | 5.51E-03 | 3.78E-08 | 9.45E-08 |
| Aroclor 1260 | -- | -- | -- | -- | -- | -- | -- | -- | 7.66E-09 | 3.83E-04 | 3.28E-09 | 6.57E-09 | 2.05E-08 | 1.28E-03 | 8.77E-09 | 2.19E-08 |
| **Metals** | | | | | | | | | | | | | | | | |
| Aluminum | -- | -- | -- | -- | -- | -- | -- | -- | 2.28E-06 | -- | 9.78E-07 | -- | -- | -- | -- | -- |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- | 1.25E-10 | 3.12E-07 | 5.35E-11 | -- | -- | -- | -- | -- |
| Arsenic | -- | -- | -- | -- | -- | -- | -- | -- | 1.79E-09 | 5.96E-06 | 7.66E-10 | 1.15E-09 | 1.02E-09 | 3.59E-06 | 4.38E-10 | 6.92E-10 |
| Barium | -- | -- | -- | -- | -- | -- | -- | -- | 1.27E-08 | 6.33E-08 | 5.42E-09 | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | -- | 1.26E-10 | 2.53E-07 | 5.42E-11 | -- | 2.41E-12 | 1.93E-07 | 1.03E-12 | -- |
| Cobalt | -- | -- | -- | -- | -- | -- | -- | -- | 6.78E-10 | -- | 2.90E-10 | -- | -- | -- | -- | -- |
| Copper | -- | -- | -- | -- | -- | -- | -- | -- | 1.08E-08 | -- | 4.64E-09 | -- | -- | -- | -- | -- |
| Cyanide | -- | -- | -- | -- | -- | -- | -- | -- | 1.25E-11 | 6.24E-10 | 5.35E-12 | -- | -- | -- | -- | -- |
| Iron | -- | -- | -- | -- | -- | -- | -- | -- | 2.67E-06 | 8.89E-06 | 1.14E-06 | -- | -- | -- | -- | -- |
| Lead | -- | -- | -- | -- | -- | -- | -- | -- | 1.12E-08 | -- | 4.79E-09 | -- | -- | -- | -- | -- |
| Manganese | -- | -- | -- | -- | -- | -- | -- | -- | 4.46E-08 | 3.18E-07 | 1.91E-08 | -- | -- | -- | -- | -- |
| Mercury | -- | -- | -- | -- | -- | -- | -- | -- | 2.58E-11 | 3.00E-07 | 1.10E-11 | -- | -- | -- | -- | -- |
| Nickel | -- | -- | -- | -- | -- | -- | -- | -- | 3.36E-09 | 1.68E-07 | 1.44E-09 | -- | -- | -- | -- | -- |
| Selenium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Vanadium | -- | -- | -- | -- | -- | -- | -- | -- | 3.50E-09 | -- | 1.50E-09 | -- | -- | -- | -- | -- |
| Zinc | -- | -- | -- | -- | -- | -- | -- | -- | 2.52E-08 | 8.39E-08 | 1.08E-08 | -- | -- | -- | -- | -- |
| **Total** | | 0.00E+00 | | 0.E+00 | | 0.00E+00 | | 0.E+00 | | 2.17E-03 | | 1.E-06 | | 7.05E-03 | | 3.E-06 |

TABLE 18
RECEPTOR-SPECIFIC EXPOSURE, HAZARD, AND RISK RESULTS:
EXPOSURE AREA OTTER CREEK 5 (OC-5)
DUCK AND OTTER CREEKS
TOLEDO AND OREGON, OHIO

| Youth Receptor | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface Water | | | | | | | | Sediment | | | | | | | |
| | Ingestion | | | | Dermal Contact | | | | Ingestion | | | | Dermal Contact | | | |
| Chemical | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | -- | -- | -- | -- | -- | -- | -- | -- | 1.57E-08 | 2.62E-07 | 6.73E-09 | 1.35E-09 | 3.04E-08 | 5.06E-07 | 1.01E-08 | 2.02E-09 |
| **Semivolatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | -- | -- | -- | -- | -- | -- | -- | -- | 2.29E-07 | 1.15E-05 | 9.83E-08 | 1.38E-09 | 4.44E-07 | 8.88E-05 | 1.47E-07 | 8.25E-09 |
| Bromodichloromethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 2.44E-07 | 8.15E-07 | 1.05E-07 | 7.65E-08 | 6.15E-07 | 2.30E-06 | 2.04E-07 | 1.67E-07 |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 1.26E-07 | 3.15E-06 | 5.40E-08 | 3.94E-08 | 3.17E-07 | 8.90E-06 | 1.05E-07 | 8.63E-08 |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 2.17E-07 | 5.42E-06 | 9.30E-08 | 6.79E-09 | 5.46E-07 | 1.53E-05 | 1.81E-07 | 1.49E-08 |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | -- | -- | 1.01E-07 | 3.37E-06 | 4.33E-08 | -- | 2.54E-07 | 9.52E-06 | 8.44E-08 | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 1.29E-07 | 4.29E-06 | 5.51E-08 | 4.02E-07 | 3.24E-07 | 1.21E-05 | 1.07E-07 | 8.81E-07 |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | 2.65E-07 | 8.83E-07 | 1.13E-07 | 8.28E-10 | 5.12E-07 | 1.92E-06 | 1.70E-07 | 1.40E-09 |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 1.48E-07 | 4.92E-07 | 6.33E-08 | 4.62E-07 | 3.72E-07 | 1.39E-06 | 1.23E-07 | 1.01E-06 |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 2.02E-07 | 5.04E-06 | 8.64E-08 | -- | 3.90E-07 | 1.10E-05 | 1.30E-07 | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 2.07E-07 | 5.17E-06 | 8.86E-08 | 6.47E-08 | 4.00E-07 | 1.12E-05 | 1.33E-07 | 1.09E-07 |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | 2.82E-07 | 1.41E-05 | 1.21E-07 | 1.45E-09 | 5.45E-07 | 3.06E-05 | 1.81E-07 | 2.44E-09 |
| Phenolics (Phenol) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 3.22E-07 | 1.07E-05 | 1.38E-07 | -- | 6.24E-07 | 2.34E-05 | 2.07E-07 | -- |
| **Pesticides/Polychlorinated Biphenyls** | | | | | | | | | | | | | | | | |
| Aldrin | -- | -- | -- | -- | -- | -- | -- | -- | 6.46E-10 | 2.15E-05 | 2.77E-10 | 4.71E-09 | 5.00E-10 | 2.08E-05 | 1.66E-10 | 3.53E-09 |
| alpha-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| delta-BHC | -- | -- | -- | -- | -- | -- | -- | -- | 5.84E-10 | -- | 2.50E-10 | -- | 4.52E-10 | -- | 1.50E-10 | -- |
| gamma-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- | 3.32E-10 | 6.65E-07 | 1.42E-10 | 4.99E-11 | 2.57E-10 | 6.43E-07 | 8.54E-11 | 3.74E-11 |
| 4,4'-DDD | -- | -- | -- | -- | -- | -- | -- | -- | 5.08E-09 | 1.02E-05 | 2.18E-09 | 5.22E-10 | 2.95E-09 | 7.37E-06 | 9.79E-10 | 2.94E-10 |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- | -- | -- | 1.85E-09 | 3.69E-06 | 7.91E-10 | 2.69E-10 | 1.07E-09 | 2.68E-06 | 3.56E-10 | 1.51E-10 |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- | -- | -- | 1.40E-09 | 2.80E-06 | 6.00E-10 | 2.04E-10 | 8.13E-10 | 2.03E-06 | 2.70E-10 | 1.15E-10 |
| Dieldrin | -- | -- | -- | -- | -- | -- | -- | -- | 8.06E-10 | 1.61E-05 | 3.45E-10 | 5.53E-09 | 6.24E-10 | 1.56E-05 | 2.07E-10 | 4.14E-09 |
| Heptachlor epoxide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1254 | -- | -- | -- | -- | -- | -- | -- | -- | 3.42E-08 | 1.71E-03 | 1.47E-08 | 2.93E-08 | 9.28E-08 | 5.80E-03 | 3.08E-08 | 7.70E-08 |
| Aroclor 1260 | -- | -- | -- | -- | -- | -- | -- | -- | 7.94E-09 | 3.97E-04 | 3.40E-09 | 6.80E-09 | 2.15E-08 | 1.34E-03 | 7.14E-09 | 1.78E-08 |
| **Metals** | | | | | | | | | | | | | | | | |
| Aluminum | -- | -- | -- | -- | -- | -- | -- | -- | 2.36E-06 | -- | 1.01E-06 | -- | -- | -- | -- | -- |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- | 1.29E-10 | 3.23E-07 | 5.54E-11 | -- | -- | -- | -- | -- |
| Arsenic | -- | -- | -- | -- | -- | -- | -- | -- | 1.85E-09 | 6.17E-06 | 7.94E-10 | 1.19E-09 | 1.08E-09 | 3.77E-06 | 3.57E-10 | 5.64E-10 |
| Barium | -- | -- | -- | -- | -- | -- | -- | -- | 1.31E-08 | 6.55E-08 | 5.62E-09 | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | -- | 1.31E-10 | 2.62E-07 | 5.61E-11 | -- | 2.53E-12 | 2.03E-07 | 8.41E-13 | -- |
| Cobalt | -- | -- | -- | -- | -- | -- | -- | -- | 7.02E-10 | -- | 3.01E-10 | -- | -- | -- | -- | -- |
| Copper | -- | -- | -- | -- | -- | -- | -- | -- | 1.12E-08 | -- | 4.80E-09 | -- | -- | -- | -- | -- |
| Cyanide | -- | -- | -- | -- | -- | -- | -- | -- | 1.29E-11 | 6.46E-10 | 5.54E-12 | -- | -- | -- | -- | -- |
| Iron | -- | -- | -- | -- | -- | -- | -- | -- | 2.76E-06 | 9.21E-06 | 1.18E-06 | -- | -- | -- | -- | -- |
| Lead | -- | -- | -- | -- | -- | -- | -- | -- | 1.16E-08 | -- | 4.96E-09 | -- | -- | -- | -- | -- |
| Manganese | -- | -- | -- | -- | -- | -- | -- | -- | 4.62E-08 | 3.30E-07 | 1.98E-08 | -- | -- | -- | -- | -- |
| Mercury | -- | -- | -- | -- | -- | -- | -- | -- | 2.67E-11 | 3.10E-07 | 1.14E-11 | -- | -- | -- | -- | -- |
| Nickel | -- | -- | -- | -- | -- | -- | -- | -- | 3.48E-09 | 1.74E-07 | 1.49E-09 | -- | -- | -- | -- | -- |
| Selenium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Vanadium | -- | -- | -- | -- | -- | -- | -- | -- | 3.63E-09 | -- | 1.56E-09 | -- | -- | -- | -- | -- |
| Zinc | -- | -- | -- | -- | -- | -- | -- | -- | 2.61E-08 | 8.69E-08 | 1.12E-08 | -- | -- | -- | -- | -- |
| **Total** | | 0.00E+00 | | 0.E+00 | | 0.00E+00 | | 0.E+00 | | 2.25E-03 | | 1.E-06 | | 7.41E-03 | | 2.E-06 |

TABLE 18
RECEPTOR-SPECIFIC EXPOSURE, HAZARD, AND RISK RESULTS:
EXPOSURE AREA OTTER CREEK 5 (OC-5)
DUCK AND OTTER CREEKS
TOLEDO AND OREGON, OHIO

| Child Receptor | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface Water | | | | | | | | Sediment | | | | | | | |
| | Ingestion | | | | Dermal Contact | | | | Ingestion | | | | Dermal Contact | | | |
| Chemical | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | -- | -- | -- | -- | -- | -- | -- | -- | 2.46E-08 | 4.10E-07 | 1.05E-08 | 2.11E-09 | 1.81E-08 | 3.01E-07 | 7.75E-09 | 1.55E-09 |
| **Semivolatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | -- | -- | -- | -- | -- | -- | -- | -- | 3.59E-07 | 1.80E-05 | 1.54E-07 | 2.16E-09 | 2.64E-07 | 5.29E-05 | 1.13E-07 | 6.34E-09 |
| Bromodichloromethane | -- | -- | -- | -- | NA | NA | NA | NA | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 3.83E-07 | 1.28E-06 | 1.64E-07 | 1.20E-07 | 3.66E-07 | 1.37E-06 | 1.57E-07 | 1.29E-07 |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 1.97E-07 | 4.93E-06 | 8.45E-08 | 6.17E-08 | 1.89E-07 | 5.30E-06 | 8.08E-08 | 6.63E-08 |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 3.40E-07 | 8.50E-06 | 1.46E-07 | 1.06E-08 | 3.25E-07 | 9.13E-06 | 1.39E-07 | 1.14E-08 |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | -- | -- | 1.58E-07 | 5.28E-06 | 6.79E-08 | -- | 1.51E-07 | 5.67E-06 | 6.49E-08 | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 2.01E-07 | 6.72E-06 | 8.63E-08 | 6.30E-07 | 1.93E-07 | 7.21E-06 | 8.25E-08 | 6.77E-07 |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | 4.15E-07 | 1.38E-06 | 1.78E-07 | 1.30E-09 | 3.05E-07 | 1.14E-06 | 1.31E-07 | 1.07E-09 |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 2.31E-07 | 7.72E-07 | 9.92E-08 | 7.24E-07 | 2.21E-07 | 8.29E-07 | 9.48E-08 | 7.78E-07 |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 3.16E-07 | 7.90E-06 | 1.35E-07 | -- | 2.32E-07 | 6.53E-06 | 9.96E-08 | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 3.24E-07 | 8.10E-06 | 1.39E-07 | 1.01E-07 | 2.38E-07 | 6.69E-06 | 1.02E-07 | 8.38E-08 |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | 4.41E-07 | 2.21E-05 | 1.89E-07 | 2.27E-09 | 3.25E-07 | 1.82E-05 | 1.39E-07 | 1.88E-09 |
| Phenolics (Phenol) | -- | -- | -- | -- | NA | NA | NA | NA | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 5.05E-07 | 1.68E-05 | 2.16E-07 | -- | 3.71E-07 | 1.39E-05 | 1.59E-07 | -- |
| **Pesticides/Polychlorinated Biphenyls** | | | | | | | | | | | | | | | | |
| Aldrin | -- | -- | -- | -- | NA | NA | NA | NA | 1.01E-09 | 3.38E-05 | 4.34E-10 | 7.38E-09 | 2.98E-10 | 1.24E-05 | 1.28E-10 | 2.71E-09 |
| alpha-BHC | -- | -- | -- | -- | NA | NA | NA | NA | -- | -- | -- | -- | -- | -- | -- | -- |
| delta-BHC | -- | -- | -- | -- | NA | NA | NA | NA | 9.16E-10 | -- | 3.92E-10 | -- | 2.69E-10 | -- | 1.15E-10 | -- |
| gamma-BHC | -- | -- | -- | -- | NA | NA | NA | NA | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- | 5.21E-10 | 1.04E-06 | 2.23E-10 | 7.81E-11 | 1.53E-10 | 3.83E-07 | 6.57E-11 | 2.87E-11 |
| 4,4'-DDD | -- | -- | -- | -- | NA | NA | NA | NA | 7.96E-09 | 1.59E-05 | 3.41E-09 | 8.18E-10 | 1.76E-09 | 4.39E-06 | 7.52E-10 | 2.26E-10 |
| 4,4'-DDE | -- | -- | -- | -- | NA | NA | NA | NA | 2.89E-09 | 5.79E-06 | 1.24E-09 | 4.22E-10 | 6.38E-10 | 1.60E-06 | 2.74E-10 | 1.16E-10 |
| 4,4'-DDT | -- | -- | -- | -- | NA | NA | NA | NA | 2.19E-09 | 4.39E-06 | 9.40E-10 | 3.20E-10 | 4.84E-10 | 1.21E-06 | 2.08E-10 | 8.82E-11 |
| Dieldrin | -- | -- | -- | -- | NA | NA | NA | NA | 1.26E-09 | 2.53E-05 | 5.41E-10 | 8.66E-09 | 3.72E-10 | 9.29E-06 | 1.59E-10 | 3.18E-09 |
| Heptachlor epoxide | -- | -- | -- | -- | NA | NA | NA | NA | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1254 | -- | -- | -- | -- | -- | -- | -- | -- | 5.36E-08 | 2.68E-03 | 2.30E-08 | 4.60E-08 | 5.52E-08 | 3.45E-03 | 2.37E-08 | 5.92E-08 |
| Aroclor 1260 | -- | -- | -- | -- | -- | -- | -- | -- | 1.24E-08 | 6.22E-04 | 5.33E-09 | 1.07E-08 | 1.28E-08 | 8.00E-04 | 5.49E-09 | 1.37E-08 |
| **Metals** | | | | | | | | | | | | | | | | |
| Aluminum | -- | -- | -- | -- | NA | NA | NA | NA | 3.70E-06 | -- | 1.59E-06 | -- | -- | -- | -- | -- |
| Antimony | -- | -- | -- | -- | NA | NA | NA | NA | 2.03E-10 | 5.06E-07 | 8.68E-11 | -- | -- | -- | -- | -- |
| Arsenic | -- | -- | -- | -- | NA | NA | NA | NA | 2.90E-09 | 9.67E-06 | 1.24E-09 | 1.87E-09 | 6.40E-10 | 2.25E-06 | 2.74E-10 | 4.33E-10 |
| Barium | -- | -- | -- | -- | NA | NA | NA | NA | 2.05E-08 | 1.03E-07 | 8.80E-09 | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | NA | NA | NA | NA | 2.05E-10 | 4.10E-07 | 8.79E-11 | -- | 1.51E-12 | 1.21E-07 | 6.47E-13 | -- |
| Cobalt | -- | -- | -- | -- | -- | -- | -- | -- | 1.10E-09 | -- | 4.71E-10 | -- | -- | -- | -- | -- |
| Copper | -- | -- | -- | -- | NA | NA | NA | NA | 1.75E-08 | -- | 7.52E-09 | -- | -- | -- | -- | -- |
| Cyanide | -- | -- | -- | -- | NA | NA | NA | NA | 2.03E-11 | 1.01E-09 | 8.68E-12 | -- | -- | -- | -- | -- |
| Iron | -- | -- | -- | -- | -- | -- | -- | -- | 4.33E-06 | 1.44E-05 | 1.86E-06 | -- | -- | -- | -- | -- |
| Lead | -- | -- | -- | -- | -- | -- | -- | -- | 1.81E-08 | -- | 7.77E-09 | -- | -- | -- | -- | -- |
| Manganese | -- | -- | -- | -- | -- | -- | -- | -- | 7.23E-08 | 5.17E-07 | 3.10E-08 | -- | -- | -- | -- | -- |
| Mercury | -- | -- | -- | -- | NA | NA | NA | NA | 4.18E-11 | 4.86E-07 | 1.79E-11 | -- | -- | -- | -- | -- |
| Nickel | -- | -- | -- | -- | NA | NA | NA | NA | 5.45E-09 | 2.73E-07 | 2.34E-09 | -- | -- | -- | -- | -- |
| Selenium | -- | -- | -- | -- | NA | NA | NA | NA | -- | -- | -- | -- | -- | -- | -- | -- |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Vanadium | -- | -- | -- | -- | -- | -- | -- | -- | 5.69E-09 | -- | 2.44E-09 | -- | -- | -- | -- | -- |
| Zinc | -- | -- | -- | -- | -- | -- | -- | -- | 4.09E-08 | 1.36E-07 | 1.75E-08 | -- | -- | -- | -- | -- |
| **Total** | | 0.00E+00 | | 0.E+00 | | 0.00E+00 | | 0.E+00 | | 3.52E-03 | | 2.E-06 | | 4.41E-03 | | 2.E-06 |

| Total Risk = Total Risk (Adult) + Total Risk (Child) | | | | |
|---|---|---|---|---|
| | Surface Water | | Sediment | |
| | Ingestion | Dermal Contact | Ingestion | Dermal Contact |
| **Total Risk** | 0.E+00 | 0.E+00 | 3.E-06 | 5.E-06 |

TABLE 19
RECEPTOR-SPECIFIC EXPOSURE, HAZARD, AND RISK RESULTS:
EXPOSURE AREA DUCK CREEK 2 (DC-2)
DUCK AND OTTER CREEKS
TOLEDO AND OREGON, OHIO

| | Adult Receptor | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface Water | | | | | | | | Sediment | | | | | | | |
| | Ingestion | | | | Dermal Contact | | | | Ingestion | | | | Dermal Contact | | | |
| **Chemical** | **ADD** | **Hazard** | **LADD** | **Risk** | **ADD** | **Hazard** | **LADD** | **Risk** | **ADD** | **Hazard** | **LADD** | **Risk** | **ADD** | **Hazard** | **LADD** | **Risk** |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Semivolatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | -- | -- | -- | -- | -- | -- | -- | -- | 7.07E-08 | 3.54E-06 | 3.03E-08 | 4.24E-10 | 1.35E-07 | 2.70E-05 | 5.78E-08 | 3.24E-09 |
| Bromodichloromethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 2.76E-07 | 9.21E-07 | 1.18E-07 | 8.65E-08 | 6.85E-07 | 2.57E-06 | 2.94E-07 | 2.41E-07 |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 4.10E-07 | 1.03E-05 | 1.76E-07 | 1.28E-07 | 1.02E-06 | 2.86E-05 | 4.36E-07 | 3.57E-07 |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 4.37E-07 | 1.09E-05 | 1.87E-07 | 1.37E-08 | 1.08E-06 | 3.04E-05 | 4.64E-07 | 3.81E-08 |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | -- | -- | 3.30E-07 | 1.10E-05 | 1.41E-07 | -- | 8.18E-07 | 3.06E-05 | 3.50E-07 | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 4.90E-07 | 1.63E-05 | 2.10E-07 | 1.53E-06 | 1.22E-06 | 4.55E-05 | 5.21E-07 | 4.27E-06 |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | 4.55E-07 | 1.52E-06 | 1.95E-07 | 1.42E-09 | 8.67E-07 | 3.25E-06 | 3.72E-07 | 3.05E-09 |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 6.38E-08 | 2.13E-07 | 2.73E-08 | 1.99E-07 | 1.58E-07 | 5.92E-07 | 6.77E-08 | 5.55E-07 |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 5.62E-07 | 1.40E-05 | 2.41E-07 | -- | 1.07E-06 | 3.01E-05 | 4.59E-07 | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 3.40E-07 | 8.50E-06 | 1.46E-07 | 1.06E-07 | 6.48E-07 | 1.82E-05 | 2.78E-07 | 2.28E-07 |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | 6.78E-09 | 3.39E-07 | 2.90E-09 | 3.48E-11 | 1.29E-08 | 7.26E-07 | 5.54E-09 | 7.47E-11 |
| Phenolics (Phenol) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 7.13E-07 | 2.38E-05 | 3.06E-07 | -- | 1.36E-06 | 5.09E-05 | 5.83E-07 | -- |
| **Pesticides/Polychlorinated Biphenyls** | | | | | | | | | | | | | | | | |
| Aldrin | -- | -- | -- | -- | -- | -- | -- | -- | 8.11E-10 | 2.70E-05 | 3.48E-10 | 5.91E-09 | 6.19E-10 | 2.58E-05 | 2.65E-10 | 5.64E-09 |
| alpha-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| delta-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- | 1.60E-10 | 3.21E-07 | 6.88E-11 | 2.41E-11 | 1.22E-10 | 3.06E-07 | 5.25E-11 | 2.29E-11 |
| 4,4'-DDD | -- | -- | -- | -- | -- | -- | -- | -- | 1.07E-07 | 2.14E-04 | 4.58E-08 | 1.10E-08 | 6.11E-08 | 1.53E-04 | 2.62E-08 | 7.86E-09 |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- | -- | -- | 2.09E-08 | 4.18E-05 | 8.95E-09 | 3.04E-09 | 1.19E-08 | 2.99E-05 | 5.12E-09 | 2.18E-09 |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- | -- | -- | 4.85E-09 | 9.70E-06 | 2.08E-09 | 7.07E-10 | 2.77E-09 | 6.94E-06 | 1.19E-09 | 5.05E-10 |
| Dieldrin | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Heptachlor epoxide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1254 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1260 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Metals** | | | | | | | | | | | | | | | | |
| Aluminum | -- | -- | -- | -- | -- | -- | -- | -- | 2.16E-06 | -- | 9.25E-07 | -- | -- | -- | -- | -- |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | -- | -- | -- | -- | -- | -- | -- | -- | 3.25E-09 | 1.08E-05 | 1.39E-09 | 2.09E-09 | 1.86E-09 | 6.52E-06 | 7.96E-10 | 1.26E-09 |
| Barium | -- | -- | -- | -- | -- | -- | -- | -- | 1.03E-08 | 5.14E-08 | 4.40E-09 | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | -- | 8.03E-11 | 1.61E-07 | 3.44E-11 | -- | 1.53E-12 | 1.22E-07 | 6.56E-13 | -- |
| Cobalt | -- | -- | -- | -- | -- | -- | -- | -- | 6.48E-10 | -- | 2.78E-10 | -- | -- | -- | -- | -- |
| Copper | -- | -- | -- | -- | -- | -- | -- | -- | 2.45E-09 | -- | 1.05E-09 | -- | -- | -- | -- | -- |
| Cyanide | -- | -- | -- | -- | -- | -- | -- | -- | 8.92E-11 | 4.46E-09 | 3.82E-11 | -- | -- | -- | -- | -- |
| Iron | -- | -- | -- | -- | -- | -- | -- | -- | 1.75E-06 | 5.84E-06 | 7.51E-07 | -- | -- | -- | -- | -- |
| Lead | -- | -- | -- | -- | -- | -- | -- | -- | 3.61E-09 | -- | 1.55E-09 | -- | -- | -- | -- | -- |
| Manganese | -- | -- | -- | -- | -- | -- | -- | -- | 2.85E-08 | 2.04E-07 | 1.22E-08 | -- | -- | -- | -- | -- |
| Mercury | -- | -- | -- | -- | -- | -- | -- | -- | 8.74E-12 | 1.02E-07 | 3.74E-12 | -- | -- | -- | -- | -- |
| Nickel | -- | -- | -- | -- | -- | -- | -- | -- | 2.42E-09 | 1.21E-07 | 1.04E-09 | -- | -- | -- | -- | -- |
| Selenium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Vanadium | -- | -- | -- | -- | -- | -- | -- | -- | 2.99E-09 | -- | 1.28E-09 | -- | -- | -- | -- | -- |
| Zinc | -- | -- | -- | -- | -- | -- | -- | -- | 1.44E-08 | 4.81E-08 | 6.18E-09 | -- | -- | -- | -- | -- |
| **Total** | | 0.00E+00 | | 0.E+00 | | 0.00E+00 | | 0.E+00 | | 4.11E-04 | | 2.E-06 | | 4.91E-04 | | 6.E-06 |

TABLE 19
RECEPTOR-SPECIFIC EXPOSURE, HAZARD, AND RISK RESULTS:
EXPOSURE AREA DUCK CREEK 2 (DC-2)
DUCK AND OTTER CREEKS
TOLEDO AND OREGON, OHIO

| Youth Receptor | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface Water | | | | | | | | Sediment | | | | | | | |
| | Ingestion | | | | Dermal Contact | | | | Ingestion | | | | Dermal Contact | | | |
| Chemical | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Semivolatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | -- | -- | -- | -- | -- | -- | -- | -- | 7.32E-08 | 3.66E-06 | 3.14E-08 | 4.39E-10 | 1.42E-07 | 2.84E-05 | 4.71E-08 | 2.64E-09 |
| Bromodichloromethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 2.86E-07 | 9.54E-07 | 1.23E-07 | 8.96E-08 | 7.20E-07 | 2.70E-06 | 2.39E-07 | 1.96E-07 |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 4.25E-07 | 1.06E-05 | 1.82E-07 | 1.33E-07 | 1.07E-06 | 3.00E-05 | 3.55E-07 | 2.91E-07 |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 4.52E-07 | 1.13E-05 | 1.94E-07 | 1.42E-08 | 1.14E-06 | 3.20E-05 | 3.78E-07 | 3.10E-08 |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | -- | -- | 3.42E-07 | 1.14E-05 | 1.46E-07 | -- | 8.60E-07 | 3.22E-05 | 2.85E-07 | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 5.08E-07 | 1.69E-05 | 2.18E-07 | 1.59E-06 | 1.28E-06 | 4.79E-05 | 4.24E-07 | 3.48E-06 |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | 4.71E-07 | 1.57E-06 | 2.02E-07 | 1.47E-09 | 9.11E-07 | 3.41E-06 | 3.03E-07 | 2.48E-09 |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 6.60E-08 | 2.20E-07 | 2.83E-08 | 2.07E-07 | 1.66E-07 | 6.22E-07 | 5.51E-08 | 4.52E-07 |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 5.82E-07 | 1.45E-05 | 2.49E-07 | -- | 1.13E-06 | 3.16E-05 | 3.74E-07 | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 3.52E-07 | 8.80E-06 | 1.51E-07 | 1.10E-07 | 6.81E-07 | 1.91E-05 | 2.26E-07 | 1.85E-07 |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | 7.02E-09 | 3.51E-07 | 3.01E-09 | 3.61E-11 | 1.36E-08 | 7.63E-07 | 4.51E-09 | 6.08E-11 |
| Phenolics (Phenol) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 7.39E-07 | 2.46E-05 | 3.17E-07 | -- | 1.43E-06 | 5.35E-05 | 4.75E-07 | -- |
| **Pesticides/Polychlorinated Biphenyls** | | | | | | | | | | | | | | | | |
| Aldrin | -- | -- | -- | -- | -- | -- | -- | -- | 8.40E-10 | 2.80E-05 | 3.60E-10 | 6.12E-09 | 6.51E-10 | 2.71E-05 | 2.16E-10 | 4.59E-09 |
| alpha-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| delta-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- | 1.66E-10 | 3.32E-07 | 7.12E-11 | 2.49E-11 | 1.29E-10 | 3.22E-07 | 4.27E-11 | 1.87E-11 |
| 4,4'-DDD | -- | -- | -- | -- | -- | -- | -- | -- | 1.11E-07 | 2.21E-04 | 4.74E-08 | 1.14E-08 | 6.42E-08 | 1.61E-04 | 2.13E-08 | 6.40E-09 |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- | -- | -- | 2.16E-08 | 4.33E-05 | 9.27E-09 | 3.15E-09 | 1.26E-08 | 3.14E-05 | 4.17E-09 | 1.77E-09 |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- | -- | -- | 5.02E-09 | 1.00E-05 | 2.15E-09 | 7.32E-10 | 2.92E-09 | 7.29E-06 | 9.68E-10 | 4.12E-10 |
| Dieldrin | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Heptachlor epoxide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1254 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1260 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Metals** | | | | | | | | | | | | | | | | |
| Aluminum | -- | -- | -- | -- | -- | -- | -- | -- | 2.24E-06 | -- | 9.58E-07 | -- | -- | -- | -- | -- |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | -- | -- | -- | -- | -- | -- | -- | -- | 3.36E-09 | 1.12E-05 | 1.44E-09 | 2.16E-09 | 1.95E-09 | 6.85E-06 | 6.48E-10 | 1.02E-09 |
| Barium | -- | -- | -- | -- | -- | -- | -- | -- | 1.06E-08 | 5.32E-08 | 4.56E-09 | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | -- | 8.31E-11 | 1.66E-07 | 3.56E-11 | -- | 1.61E-12 | 1.29E-07 | 5.34E-13 | -- |
| Cobalt | -- | -- | -- | -- | -- | -- | -- | -- | 6.71E-10 | -- | 2.88E-10 | -- | -- | -- | -- | -- |
| Copper | -- | -- | -- | -- | -- | -- | -- | -- | 2.54E-09 | -- | 1.09E-09 | -- | -- | -- | -- | -- |
| Cyanide | -- | -- | -- | -- | -- | -- | -- | -- | 9.23E-11 | 4.62E-09 | 3.96E-11 | -- | -- | -- | -- | -- |
| Iron | -- | -- | -- | -- | -- | -- | -- | -- | 1.82E-06 | 6.05E-06 | 7.78E-07 | -- | -- | -- | -- | -- |
| Lead | -- | -- | -- | -- | -- | -- | -- | -- | 3.73E-09 | -- | 1.60E-09 | -- | -- | -- | -- | -- |
| Manganese | -- | -- | -- | -- | -- | -- | -- | -- | 2.96E-08 | 2.11E-07 | 1.27E-08 | -- | -- | -- | -- | -- |
| Mercury | -- | -- | -- | -- | -- | -- | -- | -- | 9.05E-12 | 1.05E-07 | 3.88E-12 | -- | -- | -- | -- | -- |
| Nickel | -- | -- | -- | -- | -- | -- | -- | -- | 2.50E-09 | 1.25E-07 | 1.07E-09 | -- | -- | -- | -- | -- |
| Selenium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Vanadium | -- | -- | -- | -- | -- | -- | -- | -- | 3.10E-09 | -- | 1.33E-09 | -- | -- | -- | -- | -- |
| Zinc | -- | -- | -- | -- | -- | -- | -- | -- | 1.49E-08 | 4.98E-08 | 6.40E-09 | -- | -- | -- | -- | -- |
| **Total** | | 0.00E+00 | | 0.E+00 | | 0.00E+00 | | 0.E+00 | | 4.26E-04 | | 2.E-06 | | 5.16E-04 | | 5.E-06 |

TABLE 19
RECEPTOR-SPECIFIC EXPOSURE, HAZARD, AND RISK RESULTS:
EXPOSURE AREA DUCK CREEK 2 (DC-2)
DUCK AND OTTER CREEKS
TOLEDO AND OREGON, OHIO

| **Child Receptor** | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Surface Water** | | | | | | | | **Sediment** | | | | | | | |
| | **Ingestion** | | | | **Dermal Contact** | | | | **Ingestion** | | | | **Dermal Contact** | | | |
| **Chemical** | **ADD** | **Hazard** | **LADD** | **Risk** | **ADD** | **Hazard** | **LADD** | **Risk** | **ADD** | **Hazard** | **LADD** | **Risk** | **ADD** | **Hazard** | **LADD** | **Risk** |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Semivolatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | -- | -- | -- | -- | -- | -- | -- | -- | 1.15E-07 | 5.74E-06 | 4.92E-08 | 6.88E-10 | 8.44E-08 | 1.69E-05 | 3.62E-08 | 2.03E-09 |
| Bromodichloromethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 4.48E-07 | 1.49E-06 | 1.92E-07 | 1.40E-07 | 4.29E-07 | 1.61E-06 | 1.84E-07 | 1.51E-07 |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 6.65E-07 | 1.66E-05 | 2.85E-07 | 2.08E-07 | 6.36E-07 | 1.79E-05 | 2.73E-07 | 2.24E-07 |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 7.09E-07 | 1.77E-05 | 3.04E-07 | 2.22E-08 | 6.78E-07 | 1.90E-05 | 2.90E-07 | 2.38E-08 |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | -- | -- | 5.35E-07 | 1.78E-05 | 2.29E-07 | -- | 5.12E-07 | 1.92E-05 | 2.19E-07 | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 7.96E-07 | 2.65E-05 | 3.41E-07 | 2.49E-06 | 7.61E-07 | 2.85E-05 | 3.26E-07 | 2.67E-06 |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | 7.38E-07 | 2.46E-06 | 3.16E-07 | 2.31E-09 | 5.43E-07 | 2.03E-06 | 2.33E-07 | 1.91E-09 |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 1.03E-07 | 3.45E-07 | 4.43E-08 | 3.24E-07 | 9.89E-08 | 3.70E-07 | 4.24E-08 | 3.48E-07 |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 9.12E-07 | 2.28E-05 | 3.91E-07 | -- | 6.70E-07 | 1.88E-05 | 2.87E-07 | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 5.51E-07 | 1.38E-05 | 2.36E-07 | 1.73E-07 | 4.06E-07 | 1.14E-05 | 1.74E-07 | 1.43E-07 |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | 1.10E-08 | 5.50E-07 | 4.71E-09 | 5.65E-11 | 8.09E-09 | 4.54E-07 | 3.47E-09 | 4.67E-11 |
| Phenolics (Phenol) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 1.16E-06 | 3.86E-05 | 4.96E-07 | -- | 8.51E-07 | 3.19E-05 | 3.65E-07 | -- |
| **Pesticides/Polychlorinated Biphenyls** | | | | | | | | | | | | | | | | |
| Aldrin | -- | -- | -- | -- | -- | -- | -- | -- | 1.32E-09 | 4.39E-05 | 5.64E-10 | 9.59E-09 | 3.87E-10 | 1.61E-05 | 1.66E-10 | 3.53E-09 |
| alpha-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| delta-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- | 2.60E-10 | 5.21E-07 | 1.12E-10 | 3.91E-11 | 7.66E-11 | 1.92E-07 | 3.28E-11 | 1.44E-11 |
| 4,4'-DDD | -- | -- | -- | -- | -- | -- | -- | -- | 1.73E-07 | 3.47E-04 | 7.43E-08 | 1.78E-08 | 3.82E-08 | 9.56E-05 | 1.64E-08 | 4.92E-09 |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- | -- | -- | 3.39E-08 | 6.78E-05 | 1.45E-08 | 4.94E-09 | 7.48E-09 | 1.87E-05 | 3.20E-09 | 1.36E-09 |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- | -- | -- | 7.87E-09 | 1.57E-05 | 3.37E-09 | 1.15E-09 | 1.74E-09 | 4.34E-06 | 7.44E-10 | 3.16E-10 |
| Dieldrin | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Heptachlor epoxide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1254 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1260 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Metals** | | | | | | | | | | | | | | | | |
| Aluminum | -- | -- | -- | -- | -- | -- | -- | -- | 3.50E-06 | -- | 1.50E-06 | -- | -- | -- | -- | -- |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | -- | -- | -- | -- | -- | -- | -- | -- | 5.27E-09 | 1.76E-05 | 2.26E-09 | 3.39E-09 | 1.16E-09 | 4.08E-06 | 4.98E-10 | 7.87E-10 |
| Barium | -- | -- | -- | -- | -- | -- | -- | -- | 1.67E-08 | 8.34E-08 | 7.15E-09 | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | -- | 1.30E-10 | 2.61E-07 | 5.58E-11 | -- | 9.58E-13 | 7.66E-08 | 4.11E-13 | -- |
| Cobalt | -- | -- | -- | -- | -- | -- | -- | -- | 1.05E-09 | -- | 4.51E-10 | -- | -- | -- | -- | -- |
| Copper | -- | -- | -- | -- | -- | -- | -- | -- | 3.98E-09 | -- | 1.70E-09 | -- | -- | -- | -- | -- |
| Cyanide | -- | -- | -- | -- | -- | -- | -- | -- | 1.45E-10 | 7.23E-09 | 6.20E-11 | -- | -- | -- | -- | -- |
| Iron | -- | -- | -- | -- | -- | -- | -- | -- | 2.84E-06 | 9.48E-06 | 1.22E-06 | -- | -- | -- | -- | -- |
| Lead | -- | -- | -- | -- | -- | -- | -- | -- | 5.85E-09 | -- | 2.51E-09 | -- | -- | -- | -- | -- |
| Manganese | -- | -- | -- | -- | -- | -- | -- | -- | 4.63E-08 | 3.31E-07 | 1.98E-08 | -- | -- | -- | -- | -- |
| Mercury | -- | -- | -- | -- | -- | -- | -- | -- | 1.42E-11 | 1.65E-07 | 6.08E-12 | -- | -- | -- | -- | -- |
| Nickel | -- | -- | -- | -- | -- | -- | -- | -- | 3.92E-09 | 1.96E-07 | 1.68E-09 | -- | -- | -- | -- | -- |
| Selenium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Vanadium | -- | -- | -- | -- | -- | -- | -- | -- | 4.85E-09 | -- | 2.08E-09 | -- | -- | -- | -- | -- |
| Zinc | -- | -- | -- | -- | -- | -- | -- | -- | 2.34E-08 | 7.80E-08 | 1.00E-08 | -- | -- | -- | -- | -- |
| **Total** | | 0.00E+00 | | 0.E+00 | | 0.00E+00 | | 0.E+00 | | 6.67E-04 | | 3.E-06 | | 3.03E-04 | | 4.E-06 |

| **Total Risk = Total Risk (Adult) + Total Risk (Child)** | | | | |
|---|---|---|---|---|
| | **Surface Water** | | **Sediment** | |
| | **Ingestion** | **Dermal Contact** | **Ingestion** | **Dermal Contact** |
| **Total Risk** | 0.E+00 | 0.E+00 | 5.E-06 | 9.E-06 |

TABLE 20
RECEPTOR-SPECIFIC EXPOSURE, HAZARD, AND RISK RESULTS:
EXPOSURE AREA DUCK CREEK 3 (DC-3)
DUCK AND OTTER CREEKS
TOLEDO AND OREGON, OHIO

| Adult Receptor | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface Water | | | | | | | | Sediment | | | | | | | |
| | Ingestion | | | | Dermal Contact | | | | Ingestion | | | | Dermal Contact | | | |
| **Chemical** | **ADD** | **Hazard** | **LADD** | **Risk** | **ADD** | **Hazard** | **LADD** | **Risk** | **ADD** | **Hazard** | **LADD** | **Risk** | **ADD** | **Hazard** | **LADD** | **Risk** |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Semivolatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | -- | -- | -- | -- | -- | -- | -- | -- | 9.37E-08 | 4.68E-06 | 4.01E-08 | 5.62E-10 | 1.79E-07 | 3.57E-05 | 7.65E-08 | 4.29E-09 |
| Bromodichloromethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 2.05E-07 | 6.84E-07 | 8.79E-08 | 6.42E-08 | 5.08E-07 | 1.90E-06 | 2.18E-07 | 1.79E-07 |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 7.22E-07 | 1.81E-05 | 3.10E-07 | 2.26E-07 | 1.79E-06 | 5.03E-05 | 7.67E-07 | 6.29E-07 |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 6.24E-07 | 1.56E-05 | 2.67E-07 | 1.95E-08 | 1.55E-06 | 4.35E-05 | 6.63E-07 | 5.44E-08 |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | -- | -- | 4.90E-07 | 1.63E-05 | 2.10E-07 | -- | 1.22E-06 | 4.55E-05 | 5.21E-07 | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 7.31E-07 | 2.44E-05 | 3.13E-07 | 2.29E-06 | 1.81E-06 | 6.79E-05 | 7.77E-07 | 6.37E-06 |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | 1.07E-06 | 3.57E-06 | 4.59E-07 | 3.35E-09 | 2.04E-06 | 7.64E-06 | 8.74E-07 | 7.17E-09 |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 1.04E-07 | 3.48E-07 | 4.48E-08 | 3.27E-07 | 2.59E-07 | 9.70E-07 | 1.11E-07 | 9.10E-07 |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 9.77E-07 | 2.44E-05 | 4.19E-07 | -- | 1.86E-06 | 5.23E-05 | 7.98E-07 | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 4.99E-07 | 1.25E-05 | 2.14E-07 | 1.56E-07 | 9.52E-07 | 2.67E-05 | 4.08E-07 | 3.35E-07 |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | 1.86E-07 | 9.31E-06 | 7.98E-08 | 9.57E-10 | 3.55E-07 | 1.99E-05 | 1.52E-07 | 2.05E-09 |
| Phenolics (Phenol) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 7.79E-07 | 2.60E-05 | 3.34E-07 | -- | 1.49E-06 | 5.56E-05 | 6.37E-07 | -- |
| **Pesticides/Polychlorinated Biphenyls** | | | | | | | | | | | | | | | | |
| Aldrin | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| alpha-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| delta-BHC | -- | -- | -- | -- | -- | -- | -- | -- | 3.66E-10 | -- | 1.57E-10 | -- | 2.79E-10 | -- | 1.20E-10 | -- |
| gamma-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-DDD | -- | -- | -- | -- | -- | -- | -- | -- | 7.90E-08 | 1.58E-04 | 3.38E-08 | 8.12E-09 | 4.52E-08 | 1.13E-04 | 1.94E-08 | 5.81E-09 |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- | -- | -- | 3.58E-08 | 7.17E-05 | 1.54E-08 | 5.22E-09 | 2.05E-08 | 5.12E-05 | 8.78E-09 | 3.73E-09 |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- | -- | -- | 1.33E-08 | 2.66E-05 | 5.69E-09 | 1.94E-09 | 7.60E-09 | 1.90E-05 | 3.26E-09 | 1.38E-09 |
| Dieldrin | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Heptachlor epoxide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1254 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1260 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Metals** | | | | | | | | | | | | | | | | |
| Aluminum | -- | -- | -- | -- | -- | -- | -- | -- | 3.60E-06 | -- | 1.54E-06 | -- | -- | -- | -- | -- |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | -- | -- | -- | -- | -- | -- | -- | -- | 2.11E-09 | 7.03E-06 | 9.04E-10 | 1.36E-09 | 1.21E-09 | 4.23E-06 | 5.17E-10 | 8.16E-10 |
| Barium | -- | -- | -- | -- | -- | -- | -- | -- | 1.82E-08 | 9.09E-08 | 7.79E-09 | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | -- | 1.07E-10 | 2.14E-07 | 4.58E-11 | -- | 2.04E-12 | 1.63E-07 | 8.73E-13 | -- |
| Cobalt | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Copper | -- | -- | -- | -- | -- | -- | -- | -- | 3.80E-09 | -- | 1.63E-09 | -- | -- | -- | -- | -- |
| Cyanide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Iron | -- | -- | -- | -- | -- | -- | -- | -- | 3.35E-06 | 1.12E-05 | 1.44E-06 | -- | -- | -- | -- | -- |
| Lead | -- | -- | -- | -- | -- | -- | -- | -- | 5.47E-09 | -- | 2.35E-09 | -- | -- | -- | -- | -- |
| Manganese | -- | -- | -- | -- | -- | -- | -- | -- | 4.98E-08 | 3.56E-07 | 2.14E-08 | -- | -- | -- | -- | -- |
| Mercury | -- | -- | -- | -- | -- | -- | -- | -- | 1.93E-11 | 2.24E-07 | 8.25E-12 | -- | -- | -- | -- | -- |
| Nickel | -- | -- | -- | -- | -- | -- | -- | -- | 5.88E-09 | 2.94E-07 | 2.52E-09 | -- | -- | -- | -- | -- |
| Selenium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Vanadium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Zinc | -- | -- | -- | -- | -- | -- | -- | -- | 1.64E-08 | 5.47E-08 | 7.03E-09 | -- | -- | -- | -- | -- |
| **Total** | | 0.00E+00 | | 0.E+00 | | 0.00E+00 | | 0.E+00 | | 4.31E-04 | | 3.E-06 | | 5.96E-04 | | 9.E-06 |

TABLE 20
RECEPTOR-SPECIFIC EXPOSURE, HAZARD, AND RISK RESULTS:
EXPOSURE AREA DUCK CREEK 3 (DC-3)
DUCK AND OTTER CREEKS
TOLEDO AND OREGON, OHIO

| Youth Receptor | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface Water | | | | | | | | Sediment | | | | | | | |
| | Ingestion | | | | Dermal Contact | | | | Ingestion | | | | Dermal Contact | | | |
| Chemical | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Semivolatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | -- | -- | -- | -- | -- | -- | -- | -- | 9.70E-08 | 4.85E-06 | 4.16E-08 | 5.82E-10 | 1.88E-07 | 3.75E-05 | 6.23E-08 | 3.49E-09 |
| Bromodichloromethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 2.12E-07 | 7.08E-07 | 9.10E-08 | 6.64E-08 | 5.34E-07 | 2.00E-06 | 1.77E-07 | 1.45E-07 |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 7.48E-07 | 1.87E-05 | 3.21E-07 | 2.34E-07 | 1.88E-06 | 5.29E-05 | 6.25E-07 | 5.12E-07 |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 6.46E-07 | 1.62E-05 | 2.77E-07 | 2.02E-08 | 1.63E-06 | 4.57E-05 | 5.40E-07 | 4.43E-08 |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | -- | -- | 5.08E-07 | 1.69E-05 | 2.18E-07 | -- | 1.28E-06 | 4.79E-05 | 4.24E-07 | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 7.57E-07 | 2.52E-05 | 3.24E-07 | 2.37E-06 | 1.91E-06 | 7.13E-05 | 6.32E-07 | 5.19E-06 |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | 1.11E-06 | 3.69E-06 | 4.75E-07 | 3.47E-09 | 2.14E-06 | 8.03E-06 | 7.12E-07 | 5.84E-09 |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 1.08E-07 | 3.61E-07 | 4.64E-08 | 3.39E-07 | 2.72E-07 | 1.02E-06 | 9.04E-08 | 7.41E-07 |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 1.01E-06 | 2.53E-05 | 4.33E-07 | -- | 1.96E-06 | 5.50E-05 | 6.50E-07 | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 5.17E-07 | 1.29E-05 | 2.22E-07 | 1.62E-07 | 1.00E-06 | 2.81E-05 | 3.32E-07 | 2.72E-07 |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | 1.93E-07 | 9.64E-06 | 8.26E-08 | 9.92E-10 | 3.73E-07 | 2.10E-05 | 1.24E-07 | 1.67E-09 |
| Phenolics (Phenol) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 8.07E-07 | 2.69E-05 | 3.46E-07 | -- | 1.56E-06 | 5.85E-05 | 5.18E-07 | -- |
| **Pesticides/Polychlorinated Biphenyls** | | | | | | | | | | | | | | | | |
| Aldrin | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| alpha-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| delta-BHC | -- | -- | -- | -- | -- | -- | -- | -- | 3.79E-10 | -- | 1.63E-10 | -- | 2.94E-10 | -- | 9.75E-11 | -- |
| gamma-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-DDD | -- | -- | -- | -- | -- | -- | -- | -- | 8.18E-08 | 1.64E-04 | 3.51E-08 | 8.41E-09 | 4.75E-08 | 1.19E-04 | 1.58E-08 | 4.73E-09 |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- | -- | -- | 3.71E-08 | 7.42E-05 | 1.59E-08 | 5.41E-09 | 2.15E-08 | 5.39E-05 | 7.15E-09 | 3.04E-09 |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- | -- | -- | 1.38E-08 | 2.75E-05 | 5.90E-09 | 2.00E-09 | 7.99E-09 | 2.00E-05 | 2.65E-09 | 1.13E-09 |
| Dieldrin | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Heptachlor epoxide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1254 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1260 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Metals** | | | | | | | | | | | | | | | | |
| Aluminum | -- | -- | -- | -- | -- | -- | -- | -- | 3.73E-06 | -- | 1.60E-06 | -- | -- | -- | -- | -- |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | -- | -- | -- | -- | -- | -- | -- | -- | 2.18E-09 | 7.28E-06 | 9.36E-10 | 1.40E-09 | 1.27E-09 | 4.45E-06 | 4.21E-10 | 6.65E-10 |
| Barium | -- | -- | -- | -- | -- | -- | -- | -- | 1.88E-08 | 9.41E-08 | 8.07E-09 | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | -- | 1.11E-10 | 2.21E-07 | 4.74E-11 | -- | 2.14E-12 | 1.71E-07 | 7.11E-13 | -- |
| Cobalt | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Copper | -- | -- | -- | -- | -- | -- | -- | -- | 3.94E-09 | -- | 1.69E-09 | -- | -- | -- | -- | -- |
| Cyanide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Iron | -- | -- | -- | -- | -- | -- | -- | -- | 3.47E-06 | 1.16E-05 | 1.49E-06 | -- | -- | -- | -- | -- |
| Lead | -- | -- | -- | -- | -- | -- | -- | -- | 5.67E-09 | -- | 2.43E-09 | -- | -- | -- | -- | -- |
| Manganese | -- | -- | -- | -- | -- | -- | -- | -- | 5.16E-08 | 3.69E-07 | 2.21E-08 | -- | -- | -- | -- | -- |
| Mercury | -- | -- | -- | -- | -- | -- | -- | -- | 1.99E-11 | 2.32E-07 | 8.55E-12 | -- | -- | -- | -- | -- |
| Nickel | -- | -- | -- | -- | -- | -- | -- | -- | 6.09E-09 | 3.05E-07 | 2.61E-09 | -- | -- | -- | -- | -- |
| Selenium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Vanadium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Zinc | -- | -- | -- | -- | -- | -- | -- | -- | 1.70E-08 | 5.66E-08 | 7.28E-09 | -- | -- | -- | -- | -- |
| **Total** | | 0.00E+00 | | 0.E+00 | | 0.00E+00 | | 0.E+00 | | 4.47E-04 | | 3.E-06 | | 6.26E-04 | | 7.E-06 |

TABLE 20
RECEPTOR-SPECIFIC EXPOSURE, HAZARD, AND RISK RESULTS:
EXPOSURE AREA DUCK CREEK 3 (DC-3)
DUCK AND OTTER CREEKS
TOLEDO AND OREGON, OHIO

| Child Receptor | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface Water | | | | | | | | Sediment | | | | | | | |
| | Ingestion | | | | Dermal Contact | | | | Ingestion | | | | Dermal Contact | | | |
| **Chemical** | **ADD** | **Hazard** | **LADD** | **Risk** | **ADD** | **Hazard** | **LADD** | **Risk** | **ADD** | **Hazard** | **LADD** | **Risk** | **ADD** | **Hazard** | **LADD** | **Risk** |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Semivolatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | -- | -- | -- | -- | -- | -- | -- | -- | 1.52E-07 | 7.60E-06 | 6.51E-08 | 9.12E-10 | 1.12E-07 | 2.24E-05 | 4.79E-08 | 2.68E-09 |
| Bromodichloromethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 3.33E-07 | 1.11E-06 | 1.43E-07 | 1.04E-07 | 3.18E-07 | 1.19E-06 | 1.36E-07 | 1.12E-07 |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 1.17E-06 | 2.93E-05 | 5.02E-07 | 3.67E-07 | 1.12E-06 | 3.15E-05 | 4.80E-07 | 3.94E-07 |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 1.01E-06 | 2.53E-05 | 4.34E-07 | 3.17E-08 | 9.68E-07 | 2.72E-05 | 4.15E-07 | 3.40E-08 |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | -- | -- | 7.96E-07 | 2.65E-05 | 3.41E-07 | -- | 7.61E-07 | 2.85E-05 | 3.26E-07 | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 1.19E-06 | 3.95E-05 | 5.08E-07 | 3.71E-06 | 1.13E-06 | 4.25E-05 | 4.86E-07 | 3.99E-06 |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | 1.74E-06 | 5.79E-06 | 7.44E-07 | 5.43E-09 | 1.28E-06 | 4.78E-06 | 5.47E-07 | 4.49E-09 |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 1.70E-07 | 5.65E-07 | 7.27E-08 | 5.30E-07 | 1.62E-07 | 6.07E-07 | 6.95E-08 | 5.70E-07 |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 1.58E-06 | 3.96E-05 | 6.79E-07 | -- | 1.17E-06 | 3.27E-05 | 4.99E-07 | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 8.10E-07 | 2.03E-05 | 3.47E-07 | 2.53E-07 | 5.96E-07 | 1.67E-05 | 2.55E-07 | 2.09E-07 |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | 3.02E-07 | 1.51E-05 | 1.29E-07 | 1.55E-09 | 2.22E-07 | 1.25E-05 | 9.52E-08 | 1.28E-09 |
| Phenolics (Phenol) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 1.26E-06 | 4.21E-05 | 5.42E-07 | -- | 9.30E-07 | 3.48E-05 | 3.98E-07 | -- |
| **Pesticides/Polychlorinated Biphenyls** | | | | | | | | | | | | | | | | |
| Aldrin | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| alpha-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| delta-BHC | -- | -- | -- | -- | -- | -- | -- | -- | 5.95E-10 | -- | 2.55E-10 | -- | 1.75E-10 | -- | 7.50E-11 | -- |
| gamma-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-DDD | -- | -- | -- | -- | -- | -- | -- | -- | 1.28E-07 | 2.56E-04 | 5.49E-08 | 1.32E-08 | 2.83E-08 | 7.07E-05 | 1.21E-08 | 3.63E-09 |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- | -- | -- | 5.81E-08 | 1.16E-04 | 2.49E-08 | 8.47E-09 | 1.28E-08 | 3.21E-05 | 5.50E-09 | 2.34E-09 |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- | -- | -- | 2.16E-08 | 4.31E-05 | 9.24E-09 | 3.14E-09 | 4.76E-09 | 1.19E-05 | 2.04E-09 | 8.66E-10 |
| Dieldrin | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Heptachlor epoxide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1254 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1260 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Metals** | | | | | | | | | | | | | | | | |
| Aluminum | -- | -- | -- | -- | -- | -- | -- | -- | 5.84E-06 | -- | 2.50E-06 | -- | -- | -- | -- | -- |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | -- | -- | -- | -- | -- | -- | -- | -- | 3.42E-09 | 1.14E-05 | 1.47E-09 | 2.20E-09 | 7.55E-10 | 2.65E-06 | 3.24E-10 | 5.11E-10 |
| Barium | -- | -- | -- | -- | -- | -- | -- | -- | 2.95E-08 | 1.47E-07 | 1.26E-08 | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | -- | 1.73E-10 | 3.47E-07 | 7.43E-11 | -- | 1.28E-12 | 1.02E-07 | 5.46E-13 | -- |
| Cobalt | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Copper | -- | -- | -- | -- | -- | -- | -- | -- | 6.17E-09 | -- | 2.64E-09 | -- | -- | -- | -- | -- |
| Cyanide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Iron | -- | -- | -- | -- | -- | -- | -- | -- | 5.43E-06 | 1.81E-05 | 2.33E-06 | -- | -- | -- | -- | -- |
| Lead | -- | -- | -- | -- | -- | -- | -- | -- | 8.88E-09 | -- | 3.81E-09 | -- | -- | -- | -- | -- |
| Manganese | -- | -- | -- | -- | -- | -- | -- | -- | 8.09E-08 | 5.78E-07 | 3.47E-08 | -- | -- | -- | -- | -- |
| Mercury | -- | -- | -- | -- | -- | -- | -- | -- | 3.13E-11 | 3.63E-07 | 1.34E-11 | -- | -- | -- | -- | -- |
| Nickel | -- | -- | -- | -- | -- | -- | -- | -- | 9.55E-09 | 4.77E-07 | 4.09E-09 | -- | -- | -- | -- | -- |
| Selenium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Vanadium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Zinc | -- | -- | -- | -- | -- | -- | -- | -- | 2.66E-08 | 8.87E-08 | 1.14E-08 | -- | -- | -- | -- | -- |
| **Total** | | 0.00E+00 | | 0.E+00 | | 0.00E+00 | | 0.E+00 | | 7.00E-04 | | 5.E-06 | | 3.73E-04 | | 5.E-06 |

| Total Risk = Total Risk (Adult) + Total Risk (Child) | | | | |
|---|---|---|---|---|
| | Surface Water | | Sediment | |
| | **Ingestion** | **Dermal Contact** | **Ingestion** | **Dermal Contact** |
| **Total Risk** | 0.E+00 | 0.E+00 | 8.E-06 | 1.E-05 |

TABLE 21
RECEPTOR-SPECIFIC EXPOSURE, HAZARD, AND RISK RESULTS:
EXPOSURE AREA DUCK CREEK 4 (DC-4)
DUCK AND OTTER CREEKS
TOLEDO AND OREGON, OHIO

| Adult Receptor | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface Water | | | | | | | | Sediment | | | | | | | |
| | Ingestion | | | | Dermal Contact | | | | Ingestion | | | | Dermal Contact | | | |
| Chemical | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Semivolatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | -- | -- | -- | -- | -- | -- | -- | -- | 1.60E-07 | 8.02E-06 | 6.88E-08 | 9.63E-10 | 3.06E-07 | 6.12E-05 | 1.31E-07 | 7.34E-09 |
| Bromodichloromethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 1.50E-06 | 5.01E-06 | 6.44E-07 | 4.70E-07 | 3.73E-06 | 1.40E-05 | 1.60E-06 | 1.31E-06 |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 9.07E-07 | 2.27E-05 | 3.89E-07 | 2.84E-07 | 2.25E-06 | 6.31E-05 | 9.63E-07 | 7.90E-07 |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 8.56E-07 | 2.14E-05 | 3.67E-07 | 2.68E-08 | 2.12E-06 | 5.96E-05 | 9.09E-07 | 7.45E-08 |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | -- | -- | 6.80E-07 | 2.27E-05 | 2.91E-07 | -- | 1.69E-06 | 6.31E-05 | 7.22E-07 | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 1.06E-06 | 3.53E-05 | 4.54E-07 | 3.32E-06 | 2.63E-06 | 9.84E-05 | 1.13E-06 | 9.23E-06 |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | 1.19E-06 | 3.95E-06 | 5.08E-07 | 3.71E-09 | 2.26E-06 | 8.47E-06 | 9.69E-07 | 7.95E-09 |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 2.20E-07 | 7.32E-07 | 9.41E-08 | 6.87E-07 | 5.44E-07 | 2.04E-06 | 2.33E-07 | 1.91E-06 |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 3.32E-06 | 8.29E-05 | 1.42E-06 | -- | 6.32E-06 | 1.78E-04 | 2.71E-06 | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 7.68E-07 | 1.92E-05 | 3.29E-07 | 2.40E-07 | 1.46E-06 | 4.11E-05 | 6.28E-07 | 5.15E-07 |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | 8.66E-08 | 4.33E-06 | 3.71E-08 | 4.45E-10 | 1.65E-07 | 9.28E-06 | 7.08E-08 | 9.54E-10 |
| Phenolics (Phenol) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 3.06E-06 | 1.02E-04 | 1.31E-06 | -- | 5.83E-06 | 2.18E-04 | 2.50E-06 | -- |
| **Pesticides/Polychlorinated Biphenyls** | | | | | | | | | | | | | | | | |
| Aldrin | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| alpha-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| delta-BHC | -- | -- | -- | -- | -- | -- | -- | -- | 3.66E-10 | -- | 1.57E-10 | -- | 2.79E-10 | -- | 1.20E-10 | -- |
| gamma-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- | 8.29E-10 | 1.66E-06 | 3.55E-10 | 1.24E-10 | 6.32E-10 | 1.58E-06 | 2.71E-10 | 1.19E-10 |
| 4,4'-DDD | -- | -- | -- | -- | -- | -- | -- | -- | 3.98E-08 | 7.95E-05 | 1.70E-08 | 4.09E-09 | 2.27E-08 | 5.68E-05 | 9.75E-09 | 2.92E-09 |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- | -- | -- | 3.35E-08 | 6.71E-05 | 1.44E-08 | 4.89E-09 | 1.92E-08 | 4.79E-05 | 8.22E-09 | 3.49E-09 |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- | -- | -- | 4.00E-09 | 8.00E-06 | 1.72E-09 | 5.83E-10 | 2.29E-09 | 5.72E-06 | 9.81E-10 | 4.17E-10 |
| Dieldrin | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Heptachlor epoxide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1254 | -- | -- | -- | -- | -- | -- | -- | -- | 1.60E-08 | 8.02E-04 | 6.88E-09 | 1.38E-08 | 4.28E-08 | 2.68E-03 | 1.84E-08 | 4.59E-08 |
| Aroclor 1260 | -- | -- | -- | -- | -- | -- | -- | -- | 1.01E-08 | 5.07E-04 | 4.34E-09 | 8.68E-09 | 2.70E-08 | 1.69E-03 | 1.16E-08 | 2.90E-08 |
| **Metals** | | | | | | | | | | | | | | | | |
| Aluminum | -- | -- | -- | -- | -- | -- | -- | -- | 2.68E-06 | -- | 1.15E-06 | -- | -- | -- | -- | -- |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | -- | -- | -- | -- | -- | -- | -- | -- | 1.89E-09 | 6.30E-06 | 8.11E-10 | 1.22E-09 | 1.08E-09 | 3.80E-06 | 4.64E-10 | 7.32E-10 |
| Barium | -- | -- | -- | -- | -- | -- | -- | -- | 1.35E-08 | 6.76E-08 | 5.79E-09 | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | -- | 1.42E-10 | 2.83E-07 | 6.07E-11 | -- | 2.70E-12 | 2.16E-07 | 1.16E-12 | -- |
| Cobalt | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Copper | -- | -- | -- | -- | -- | -- | -- | -- | 5.64E-09 | -- | 2.42E-09 | -- | -- | -- | -- | -- |
| Cyanide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Iron | -- | -- | -- | -- | -- | -- | -- | -- | 3.70E-06 | 1.23E-05 | 1.59E-06 | -- | -- | -- | -- | -- |
| Lead | -- | -- | -- | -- | -- | -- | -- | -- | 1.24E-08 | -- | 5.32E-09 | -- | -- | -- | -- | -- |
| Manganese | -- | -- | -- | -- | -- | -- | -- | -- | 3.95E-08 | 2.82E-07 | 1.69E-08 | -- | -- | -- | -- | -- |
| Mercury | -- | -- | -- | -- | -- | -- | -- | -- | 1.59E-11 | 1.84E-07 | 6.79E-12 | -- | -- | -- | -- | -- |
| Nickel | -- | -- | -- | -- | -- | -- | -- | -- | 4.89E-09 | 2.44E-07 | 2.10E-09 | -- | -- | -- | -- | -- |
| Selenium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Vanadium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Zinc | -- | -- | -- | -- | -- | -- | -- | -- | 2.84E-08 | 9.47E-08 | 1.22E-08 | -- | -- | -- | -- | -- |
| **Total** | | 0.00E+00 | | 0.E+00 | | 0.00E+00 | | 0.E+00 | | 1.81E-03 | | 5.E-06 | | 5.30E-03 | | 1.E-05 |

TABLE 21
RECEPTOR-SPECIFIC EXPOSURE, HAZARD, AND RISK RESULTS:
EXPOSURE AREA DUCK CREEK 4 (DC-4)
DUCK AND OTTER CREEKS
TOLEDO AND OREGON, OHIO

| Youth Receptor | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface Water | | | | | | | | Sediment | | | | | | | |
| | Ingestion | | | | Dermal Contact | | | | Ingestion | | | | Dermal Contact | | | |
| Chemical | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Semivolatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | -- | -- | -- | -- | -- | -- | -- | -- | 1.66E-07 | 8.31E-06 | 7.12E-08 | 9.97E-10 | 3.22E-07 | 6.43E-05 | 1.07E-07 | 5.98E-09 |
| Bromodichloromethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 1.56E-06 | 5.19E-06 | 6.67E-07 | 4.87E-07 | 3.92E-06 | 1.47E-05 | 1.30E-06 | 1.07E-06 |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 9.39E-07 | 2.35E-05 | 4.03E-07 | 2.94E-07 | 2.36E-06 | 6.64E-05 | 7.84E-07 | 6.43E-07 |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 8.86E-07 | 2.22E-05 | 3.80E-07 | 2.77E-08 | 2.23E-06 | 6.26E-05 | 7.40E-07 | 6.07E-08 |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | -- | -- | 7.04E-07 | 2.35E-05 | 3.02E-07 | -- | 1.77E-06 | 6.64E-05 | 5.88E-07 | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 1.10E-06 | 3.66E-05 | 4.70E-07 | 3.43E-06 | 2.76E-06 | 1.03E-04 | 9.17E-07 | 7.52E-06 |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | 1.23E-06 | 4.09E-06 | 5.26E-07 | 3.84E-09 | 2.38E-06 | 8.90E-06 | 7.89E-07 | 6.47E-09 |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 2.27E-07 | 7.58E-07 | 9.75E-08 | 7.12E-07 | 5.72E-07 | 2.14E-06 | 1.90E-07 | 1.56E-06 |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 3.43E-06 | 8.59E-05 | 1.47E-06 | -- | 6.65E-06 | 1.87E-04 | 2.21E-06 | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 7.95E-07 | 1.99E-05 | 3.41E-07 | 2.49E-07 | 1.54E-06 | 4.32E-05 | 5.11E-07 | 4.19E-07 |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | 8.97E-08 | 4.48E-06 | 3.84E-08 | 4.61E-10 | 1.74E-07 | 9.75E-06 | 5.76E-08 | 7.77E-10 |
| Phenolics (Phenol) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 3.16E-06 | 1.05E-04 | 1.36E-06 | -- | 6.13E-06 | 2.29E-04 | 2.03E-06 | -- |
| **Pesticides/Polychlorinated Biphenyls** | | | | | | | | | | | | | | | | |
| Aldrin | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| alpha-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| delta-BHC | -- | -- | -- | -- | -- | -- | -- | -- | 3.79E-10 | -- | 1.63E-10 | -- | 2.94E-10 | -- | 9.75E-11 | -- |
| gamma-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- | 8.59E-10 | 1.72E-06 | 3.68E-10 | 1.29E-10 | 6.65E-10 | 1.66E-06 | 2.21E-10 | 9.65E-11 |
| 4,4'-DDD | -- | -- | -- | -- | -- | -- | -- | -- | 4.12E-08 | 8.23E-05 | 1.76E-08 | 4.23E-09 | 2.39E-08 | 5.98E-05 | 7.94E-09 | 2.38E-09 |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- | -- | -- | 3.47E-08 | 6.94E-05 | 1.49E-08 | 5.06E-09 | 2.02E-08 | 5.04E-05 | 6.69E-09 | 2.84E-09 |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- | -- | -- | 4.14E-09 | 8.29E-06 | 1.78E-09 | 6.04E-10 | 2.41E-09 | 6.02E-06 | 7.99E-10 | 3.40E-10 |
| Dieldrin | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Heptachlor epoxide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1254 | -- | -- | -- | -- | -- | -- | -- | -- | 1.66E-08 | 8.31E-04 | 7.12E-09 | 1.42E-08 | 4.50E-08 | 2.81E-03 | 1.49E-08 | 3.74E-08 |
| Aroclor 1260 | -- | -- | -- | -- | -- | -- | -- | -- | 1.05E-08 | 5.25E-04 | 4.50E-09 | 8.99E-09 | 2.84E-08 | 1.78E-03 | 9.44E-09 | 2.36E-08 |
| **Metals** | | | | | | | | | | | | | | | | |
| Aluminum | -- | -- | -- | -- | -- | -- | -- | -- | 2.77E-06 | -- | 1.19E-06 | -- | -- | -- | -- | -- |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | -- | -- | -- | -- | -- | -- | -- | -- | 1.96E-09 | 6.53E-06 | 8.39E-10 | 1.26E-09 | 1.14E-09 | 3.99E-06 | 3.78E-10 | 5.96E-10 |
| Barium | -- | -- | -- | -- | -- | -- | -- | -- | 1.40E-08 | 7.00E-08 | 6.00E-09 | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | -- | 1.47E-10 | 2.93E-07 | 6.28E-11 | -- | 2.84E-12 | 2.27E-07 | 9.42E-13 | -- |
| Cobalt | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Copper | -- | -- | -- | -- | -- | -- | -- | -- | 5.84E-09 | -- | 2.50E-09 | -- | -- | -- | -- | -- |
| Cyanide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Iron | -- | -- | -- | -- | -- | -- | -- | -- | 3.83E-06 | 1.28E-05 | 1.64E-06 | -- | -- | -- | -- | -- |
| Lead | -- | -- | -- | -- | -- | -- | -- | -- | 1.28E-08 | -- | 5.51E-09 | -- | -- | -- | -- | -- |
| Manganese | -- | -- | -- | -- | -- | -- | -- | -- | 4.09E-08 | 2.92E-07 | 1.75E-08 | -- | -- | -- | -- | -- |
| Mercury | -- | -- | -- | -- | -- | -- | -- | -- | 1.64E-11 | 1.91E-07 | 7.04E-12 | -- | -- | -- | -- | -- |
| Nickel | -- | -- | -- | -- | -- | -- | -- | -- | 5.06E-09 | 2.53E-07 | 2.17E-09 | -- | -- | -- | -- | -- |
| Selenium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Vanadium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Zinc | -- | -- | -- | -- | -- | -- | -- | -- | 2.94E-08 | 9.81E-08 | 1.26E-08 | -- | -- | -- | -- | -- |
| **Total** | | 0.00E+00 | | 0.E+00 | | 0.00E+00 | | 0.E+00 | | 1.88E-03 | | 5.E-06 | | 5.57E-03 | | 1.E-05 |

TABLE 21
RECEPTOR-SPECIFIC EXPOSURE, HAZARD, AND RISK RESULTS:
EXPOSURE AREA DUCK CREEK 4 (DC-4)
DUCK AND OTTER CREEKS
TOLEDO AND OREGON, OHIO

| Child Receptor | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface Water | | | | | | | | Sediment | | | | | | | |
| | Ingestion | | | | Dermal Contact | | | | Ingestion | | | | Dermal Contact | | | |
| Chemical | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Semivolatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | -- | -- | -- | -- | -- | -- | -- | -- | 2.60E-07 | 1.30E-05 | 1.12E-07 | 1.56E-09 | 1.92E-07 | 3.83E-05 | 8.21E-08 | 4.60E-09 |
| Bromodichloromethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 2.44E-06 | 8.13E-06 | 1.05E-06 | 7.63E-07 | 2.33E-06 | 8.73E-06 | 9.99E-07 | 8.20E-07 |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 1.47E-06 | 3.68E-05 | 6.31E-07 | 4.60E-07 | 1.41E-06 | 3.95E-05 | 6.03E-07 | 4.95E-07 |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 1.39E-06 | 3.47E-05 | 5.95E-07 | 4.34E-08 | 1.33E-06 | 3.73E-05 | 5.69E-07 | 4.67E-08 |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | -- | -- | 1.10E-06 | 3.68E-05 | 4.73E-07 | -- | 1.05E-06 | 3.95E-05 | 4.52E-07 | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 1.72E-06 | 5.73E-05 | 7.37E-07 | 5.38E-06 | 1.64E-06 | 6.16E-05 | 7.04E-07 | 5.78E-06 |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | 1.92E-06 | 6.41E-06 | 8.25E-07 | 6.02E-09 | 1.42E-06 | 5.30E-06 | 6.07E-07 | 4.97E-09 |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 3.56E-07 | 1.19E-06 | 1.53E-07 | 1.12E-06 | 3.41E-07 | 1.28E-06 | 1.46E-07 | 1.20E-06 |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 5.38E-06 | 1.35E-04 | 2.31E-06 | -- | 3.96E-06 | 1.11E-04 | 1.70E-06 | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 1.25E-06 | 3.12E-05 | 5.34E-07 | 3.90E-07 | 9.16E-07 | 2.57E-05 | 3.93E-07 | 3.22E-07 |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | 1.41E-07 | 7.03E-06 | 6.02E-08 | 7.23E-10 | 1.03E-07 | 5.81E-06 | 4.43E-08 | 5.97E-10 |
| Phenolics (Phenol) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 4.96E-06 | 1.65E-04 | 2.12E-06 | -- | 3.65E-06 | 1.37E-04 | 1.56E-06 | -- |
| **Pesticides/Polychlorinated Biphenyls** | | | | | | | | | | | | | | | | |
| Aldrin | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| alpha-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| delta-BHC | -- | -- | -- | -- | -- | -- | -- | -- | 5.95E-10 | -- | 2.55E-10 | -- | 1.75E-10 | -- | 7.50E-11 | -- |
| gamma-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- | 1.35E-09 | 2.69E-06 | 5.77E-10 | 2.02E-10 | 3.96E-10 | 9.89E-07 | 1.70E-10 | 7.42E-11 |
| 4,4'-DDD | -- | -- | -- | -- | -- | -- | -- | -- | 6.45E-08 | 1.29E-04 | 2.76E-08 | 6.63E-09 | 1.42E-08 | 3.56E-05 | 6.10E-09 | 1.83E-09 |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- | -- | -- | 5.44E-08 | 1.09E-04 | 2.33E-08 | 7.93E-09 | 1.20E-08 | 3.00E-05 | 5.14E-09 | 2.19E-09 |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- | -- | -- | 6.49E-09 | 1.30E-05 | 2.78E-09 | 9.46E-10 | 1.43E-09 | 3.58E-06 | 6.14E-10 | 2.61E-10 |
| Dieldrin | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Heptachlor epoxide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1254 | -- | -- | -- | -- | -- | -- | -- | -- | 2.60E-08 | 1.30E-03 | 1.12E-08 | 2.23E-08 | 2.68E-08 | 1.68E-03 | 1.15E-08 | 2.87E-08 |
| Aroclor 1260 | -- | -- | -- | -- | -- | -- | -- | -- | 1.64E-08 | 8.22E-04 | 7.05E-09 | 1.41E-08 | 1.69E-08 | 1.06E-03 | 7.25E-09 | 1.81E-08 |
| **Metals** | | | | | | | | | | | | | | | | |
| Aluminum | -- | -- | -- | -- | -- | -- | -- | -- | 4.34E-06 | -- | 1.86E-06 | -- | -- | -- | -- | -- |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | -- | -- | -- | -- | -- | -- | -- | -- | 3.07E-09 | 1.02E-05 | 1.32E-09 | 1.97E-09 | 6.77E-10 | 2.38E-06 | 2.90E-10 | 4.58E-10 |
| Barium | -- | -- | -- | -- | -- | -- | -- | -- | 2.19E-08 | 1.10E-07 | 9.40E-09 | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | -- | 2.30E-10 | 4.59E-07 | 9.84E-11 | -- | 1.69E-12 | 1.35E-07 | 7.24E-13 | -- |
| Cobalt | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Copper | -- | -- | -- | -- | -- | -- | -- | -- | 9.15E-09 | -- | 3.92E-09 | -- | -- | -- | -- | -- |
| Cyanide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Iron | -- | -- | -- | -- | -- | -- | -- | -- | 6.01E-06 | 2.00E-05 | 2.57E-06 | -- | -- | -- | -- | -- |
| Lead | -- | -- | -- | -- | -- | -- | -- | -- | 2.01E-08 | -- | 8.63E-09 | -- | -- | -- | -- | -- |
| Manganese | -- | -- | -- | -- | -- | -- | -- | -- | 6.41E-08 | 4.58E-07 | 2.75E-08 | -- | -- | -- | -- | -- |
| Mercury | -- | -- | -- | -- | -- | -- | -- | -- | 2.57E-11 | 2.99E-07 | 1.10E-11 | -- | -- | -- | -- | -- |
| Nickel | -- | -- | -- | -- | -- | -- | -- | -- | 7.93E-09 | 3.97E-07 | 3.40E-09 | -- | -- | -- | -- | -- |
| Selenium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Vanadium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Zinc | -- | -- | -- | -- | -- | -- | -- | -- | 4.61E-08 | 1.54E-07 | 1.98E-08 | -- | -- | -- | -- | -- |
| **Total** | | 0.00E+00 | | 0.E+00 | | 0.00E+00 | | 0.E+00 | | 2.94E-03 | | 8.E-06 | | 3.32E-03 | | 9.E-06 |

| Total Risk = Total Risk (Adult) + Total Risk (Child) | | | | |
|---|---|---|---|---|
| | Surface Water | | Sediment | |
| | Ingestion | Dermal Contact | Ingestion | Dermal Contact |
| **Total Risk** | 0.E+00 | 0.E+00 | 1.E-05 | 2.E-05 |

TABLE 22
RECEPTOR-SPECIFIC EXPOSURE, HAZARD, AND RISK RESULTS:
EXPOSURE AREA DUCK CREEK 5 (DC-5)
DUCK AND OTTER CREEKS
TOLEDO AND OREGON, OHIO

| Adult Receptor | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface Water | | | | | | | | Sediment | | | | | | | |
| | Ingestion | | | | Dermal Contact | | | | Ingestion | | | | Dermal Contact | | | |
| Chemical | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Semivolatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | -- | -- | -- | -- | -- | -- | -- | -- | 3.57E-07 | 1.78E-05 | 1.53E-07 | 2.14E-09 | 6.80E-07 | 1.36E-04 | 2.91E-07 | 1.63E-08 |
| Bromodichloromethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 6.99E-08 | 2.33E-07 | 2.99E-08 | 2.19E-08 | 1.73E-07 | 6.49E-07 | 7.42E-08 | 6.09E-08 |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 6.21E-08 | 1.55E-06 | 2.66E-08 | 1.94E-08 | 1.54E-07 | 4.32E-06 | 6.59E-08 | 5.41E-08 |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 6.12E-08 | 2.04E-06 | 2.62E-08 | 1.92E-07 | 1.52E-07 | 5.68E-06 | 6.50E-08 | 5.34E-07 |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | 1.01E-07 | 3.38E-07 | 4.34E-08 | 3.17E-10 | 1.93E-07 | 7.23E-07 | 8.28E-08 | 6.79E-10 |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 1.08E-07 | 2.71E-06 | 4.65E-08 | -- | 2.07E-07 | 5.81E-06 | 8.87E-08 | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | 7.25E-08 | 3.62E-06 | 3.11E-08 | 3.73E-10 | 1.38E-07 | 7.76E-06 | 5.92E-08 | 7.99E-10 |
| Phenolics (Phenol) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 1.60E-07 | 5.35E-06 | 6.88E-08 | -- | 3.06E-07 | 1.15E-05 | 1.31E-07 | -- |
| **Pesticides/Polychlorinated Biphenyls** | | | | | | | | | | | | | | | | |
| Aldrin | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| alpha-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| delta-BHC | -- | -- | -- | -- | -- | -- | -- | -- | 2.84E-10 | -- | 1.22E-10 | -- | 2.17E-10 | -- | 9.30E-11 | -- |
| gamma-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-DDD | -- | -- | -- | -- | -- | -- | -- | -- | 2.38E-09 | 4.75E-06 | 1.02E-09 | 2.44E-10 | 1.36E-09 | 3.40E-06 | 5.82E-10 | 1.75E-10 |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- | -- | -- | 1.59E-09 | 3.18E-06 | 6.81E-10 | 2.32E-10 | 9.09E-10 | 2.27E-06 | 3.90E-10 | 1.66E-10 |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dieldrin | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Heptachlor epoxide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1254 | -- | -- | -- | -- | -- | -- | -- | -- | 6.16E-09 | 3.08E-04 | 2.64E-09 | 5.28E-09 | 1.64E-08 | 1.03E-03 | 7.05E-09 | 1.76E-08 |
| Aroclor 1260 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Metals** | | | | | | | | | | | | | | | | |
| Aluminum | -- | -- | -- | -- | -- | -- | -- | -- | 7.83E-07 | -- | 3.35E-07 | -- | -- | -- | -- | -- |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | -- | -- | -- | -- | -- | -- | -- | -- | 4.24E-09 | 1.41E-05 | 1.82E-09 | 2.73E-09 | 2.43E-09 | 8.52E-06 | 1.04E-09 | 1.64E-09 |
| Barium | -- | -- | -- | -- | -- | -- | -- | -- | 1.15E-08 | 5.75E-08 | 4.93E-09 | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | -- | 1.86E-10 | 3.73E-07 | 7.99E-11 | -- | 3.55E-12 | 2.84E-07 | 1.52E-12 | -- |
| Cobalt | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Copper | -- | -- | -- | -- | -- | -- | -- | -- | 3.42E-09 | -- | 1.47E-09 | -- | -- | -- | -- | -- |
| Cyanide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Iron | -- | -- | -- | -- | -- | -- | -- | -- | 1.71E-06 | 5.71E-06 | 7.34E-07 | -- | -- | -- | -- | -- |
| Lead | -- | -- | -- | -- | -- | -- | -- | -- | 8.79E-09 | -- | 3.77E-09 | -- | -- | -- | -- | -- |
| Manganese | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Mercury | -- | -- | -- | -- | -- | -- | -- | -- | 1.02E-11 | 1.18E-07 | 4.36E-12 | -- | -- | -- | -- | -- |
| Nickel | -- | -- | -- | -- | -- | -- | -- | -- | 4.21E-09 | 2.10E-07 | 1.80E-09 | -- | -- | -- | -- | -- |
| Selenium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Vanadium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Zinc | -- | -- | -- | -- | -- | -- | -- | -- | 2.31E-08 | 7.70E-08 | 9.90E-09 | -- | -- | -- | -- | -- |
| **Total** | | 0.00E+00 | | 0.E+00 | | 0.00E+00 | | 0.E+00 | | 3.70E-04 | | 2.E-07 | | 1.21E-03 | | 7.E-07 |

TABLE 22
RECEPTOR-SPECIFIC EXPOSURE, HAZARD, AND RISK RESULTS:
EXPOSURE AREA DUCK CREEK 5 (DC-5)
DUCK AND OTTER CREEKS
TOLEDO AND OREGON, OHIO

| Youth Receptor | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface Water | | | | | | | | Sediment | | | | | | | |
| | Ingestion | | | | Dermal Contact | | | | Ingestion | | | | Dermal Contact | | | |
| Chemical | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Semivolatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | -- | -- | -- | -- | -- | -- | -- | -- | 3.69E-07 | 1.85E-05 | 1.58E-07 | 2.22E-09 | 7.15E-07 | 1.43E-04 | 2.37E-07 | 1.33E-08 |
| Bromodichloromethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 7.24E-08 | 2.41E-07 | 3.10E-08 | 2.26E-08 | 1.82E-07 | 6.82E-07 | 6.04E-08 | 4.96E-08 |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 6.43E-08 | 1.61E-06 | 2.75E-08 | 2.01E-08 | 1.62E-07 | 4.54E-06 | 5.37E-08 | 4.40E-08 |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 6.34E-08 | 2.11E-06 | 2.72E-08 | 1.98E-07 | 1.60E-07 | 5.98E-06 | 5.30E-08 | 4.34E-07 |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | 1.05E-07 | 3.50E-07 | 4.50E-08 | 3.28E-10 | 2.03E-07 | 7.61E-07 | 6.74E-08 | 5.53E-10 |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 1.12E-07 | 2.81E-06 | 4.82E-08 | -- | 2.17E-07 | 6.11E-06 | 7.22E-08 | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | 7.51E-08 | 3.75E-06 | 3.22E-08 | 3.86E-10 | 1.45E-07 | 8.16E-06 | 4.82E-08 | 6.50E-10 |
| Phenolics (Phenol) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 1.66E-07 | 5.54E-06 | 7.12E-08 | -- | 3.22E-07 | 1.20E-05 | 1.07E-07 | -- |
| **Pesticides/Polychlorinated Biphenyls** | | | | | | | | | | | | | | | | |
| Aldrin | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| alpha-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| delta-BHC | -- | -- | -- | -- | -- | -- | -- | -- | 2.95E-10 | -- | 1.26E-10 | -- | 2.28E-10 | -- | 7.57E-11 | -- |
| gamma-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-DDD | -- | -- | -- | -- | -- | -- | -- | -- | 2.46E-09 | 4.92E-06 | 1.05E-09 | 2.53E-10 | 1.43E-09 | 3.57E-06 | 4.74E-10 | 1.42E-10 |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- | -- | -- | 1.65E-09 | 3.29E-06 | 7.06E-10 | 2.40E-10 | 9.56E-10 | 2.39E-06 | 3.17E-10 | 1.35E-10 |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dieldrin | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Heptachlor epoxide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1254 | -- | -- | -- | -- | -- | -- | -- | -- | 6.38E-09 | 3.19E-04 | 2.73E-09 | 5.47E-09 | 1.73E-08 | 1.08E-03 | 5.74E-09 | 1.43E-08 |
| Aroclor 1260 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Metals** | | | | | | | | | | | | | | | | |
| Aluminum | -- | -- | -- | -- | -- | -- | -- | -- | 8.11E-07 | -- | 3.47E-07 | -- | -- | -- | -- | -- |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | -- | -- | -- | -- | -- | -- | -- | -- | 4.40E-09 | 1.47E-05 | 1.88E-09 | 2.83E-09 | 2.55E-09 | 8.95E-06 | 8.47E-10 | 1.34E-09 |
| Barium | -- | -- | -- | -- | -- | -- | -- | -- | 1.19E-08 | 5.96E-08 | 5.10E-09 | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | -- | 1.93E-10 | 3.86E-07 | 8.27E-11 | -- | 3.74E-12 | 2.99E-07 | 1.24E-12 | -- |
| Cobalt | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Copper | -- | -- | -- | -- | -- | -- | -- | -- | 3.55E-09 | -- | 1.52E-09 | -- | -- | -- | -- | -- |
| Cyanide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Iron | -- | -- | -- | -- | -- | -- | -- | -- | 1.77E-06 | 5.91E-06 | 7.60E-07 | -- | -- | -- | -- | -- |
| Lead | -- | -- | -- | -- | -- | -- | -- | -- | 9.10E-09 | -- | 3.90E-09 | -- | -- | -- | -- | -- |
| Manganese | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Mercury | -- | -- | -- | -- | -- | -- | -- | -- | 1.05E-11 | 1.22E-07 | 4.51E-12 | -- | -- | -- | -- | -- |
| Nickel | -- | -- | -- | -- | -- | -- | -- | -- | 4.36E-09 | 2.18E-07 | 1.87E-09 | -- | -- | -- | -- | -- |
| Selenium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Vanadium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Zinc | -- | -- | -- | -- | -- | -- | -- | -- | 2.39E-08 | 7.97E-08 | 1.02E-08 | -- | -- | -- | -- | -- |
| **Total** | | 0.00E+00 | | 0.E+00 | | 0.00E+00 | | 0.E+00 | | 3.78E-04 | | 3.E-07 | | 1.28E-03 | | 6.E-07 |

TABLE 22
RECEPTOR-SPECIFIC EXPOSURE, HAZARD, AND RISK RESULTS:
EXPOSURE AREA DUCK CREEK 5 (DC-5)
DUCK AND OTTER CREEKS
TOLEDO AND OREGON, OHIO

| Child Receptor | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface Water | | | | | | | | Sediment | | | | | | | |
| | Ingestion | | | | Dermal Contact | | | | Ingestion | | | | Dermal Contact | | | |
| Chemical | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk | ADD | Hazard | LADD | Risk |
| **Volatile Organic Compounds** | | | | | | | | | | | | | | | | |
| 1,1,2,2-Tetrachloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Semivolatile Organic Compounds** | | | | | | | | | | | | | | | | |
| Bis(2-ethylhexyl)phthalate | -- | -- | -- | -- | -- | -- | -- | -- | 5.79E-07 | 2.89E-05 | 2.48E-07 | 3.47E-09 | 4.26E-07 | 8.51E-05 | 1.82E-07 | 1.02E-08 |
| Bromodichloromethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | 1.13E-07 | 3.78E-07 | 4.86E-08 | 3.55E-08 | 1.08E-07 | 4.06E-07 | 4.65E-08 | 3.81E-08 |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 1.01E-07 | 2.52E-06 | 4.32E-08 | 3.15E-08 | 9.63E-08 | 2.70E-06 | 4.13E-08 | 3.38E-08 |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 9.94E-08 | 3.31E-06 | 4.26E-08 | 3.11E-07 | 9.50E-08 | 3.56E-06 | 4.07E-08 | 3.34E-07 |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | 1.64E-07 | 5.48E-07 | 7.04E-08 | 5.14E-10 | 1.21E-07 | 4.53E-07 | 5.18E-08 | 4.25E-10 |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | 1.76E-07 | 4.40E-06 | 7.54E-08 | -- | 1.29E-07 | 3.64E-06 | 5.55E-08 | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Naphthalene | -- | -- | -- | -- | -- | -- | -- | -- | 1.18E-07 | 5.88E-06 | 5.04E-08 | 6.05E-10 | 8.65E-08 | 4.86E-06 | 3.71E-08 | 5.00E-10 |
| Phenolics (Phenol) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | -- | -- | 2.60E-07 | 8.68E-06 | 1.12E-07 | -- | 1.92E-07 | 7.17E-06 | 8.21E-08 | -- |
| **Pesticides/Polychlorinated Biphenyls** | | | | | | | | | | | | | | | | |
| Aldrin | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| alpha-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| delta-BHC | -- | -- | -- | -- | -- | -- | -- | -- | 4.61E-10 | -- | 1.98E-10 | -- | 1.36E-10 | -- | 5.82E-11 | -- |
| gamma-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlordane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-DDD | -- | -- | -- | -- | -- | -- | -- | -- | 3.85E-09 | 7.71E-06 | 1.65E-09 | 3.96E-10 | 8.50E-10 | 2.13E-06 | 3.64E-10 | 1.09E-10 |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- | -- | -- | 2.58E-09 | 5.16E-06 | 1.11E-09 | 3.76E-10 | 5.69E-10 | 1.42E-06 | 2.44E-10 | 1.04E-10 |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dieldrin | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Heptachlor epoxide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor 1254 | -- | -- | -- | -- | -- | -- | -- | -- | 1.00E-08 | 5.00E-04 | 4.28E-09 | 8.57E-09 | 1.03E-08 | 6.43E-04 | 4.41E-09 | 1.10E-08 |
| Aroclor 1260 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **Metals** | | | | | | | | | | | | | | | | |
| Aluminum | -- | -- | -- | -- | -- | -- | -- | -- | 1.27E-06 | -- | 5.44E-07 | -- | -- | -- | -- | -- |
| Antimony | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | -- | -- | -- | -- | -- | -- | -- | -- | 6.89E-09 | 2.30E-05 | 2.95E-09 | 4.43E-09 | 1.52E-09 | 5.33E-06 | 6.51E-10 | 1.03E-09 |
| Barium | -- | -- | -- | -- | -- | -- | -- | -- | 1.87E-08 | 9.33E-08 | 8.00E-09 | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | -- | -- | -- | -- | -- | -- | 3.02E-10 | 6.05E-07 | 1.30E-10 | -- | 2.22E-12 | 1.78E-07 | 9.53E-13 | -- |
| Cobalt | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Copper | -- | -- | -- | -- | -- | -- | -- | -- | 5.55E-09 | -- | 2.38E-09 | -- | -- | -- | -- | -- |
| Cyanide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Iron | -- | -- | -- | -- | -- | -- | -- | -- | 2.78E-06 | 9.26E-06 | 1.19E-06 | -- | -- | -- | -- | -- |
| Lead | -- | -- | -- | -- | -- | -- | -- | -- | 1.43E-08 | -- | 6.11E-09 | -- | -- | -- | -- | -- |
| Manganese | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Mercury | -- | -- | -- | -- | -- | -- | -- | -- | 1.65E-11 | 1.92E-07 | 7.07E-12 | -- | -- | -- | -- | -- |
| Nickel | -- | -- | -- | -- | -- | -- | -- | -- | 6.83E-09 | 3.41E-07 | 2.93E-09 | -- | -- | -- | -- | -- |
| Selenium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Vanadium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Zinc | -- | -- | -- | -- | -- | -- | -- | -- | 3.75E-08 | 1.25E-07 | 1.61E-08 | -- | -- | -- | -- | -- |
| **Total** | | 0.00E+00 | | 0.E+00 | | 0.00E+00 | | 0.E+00 | | 6.01E-04 | | 4.E-07 | | 7.60E-04 | | 4.E-07 |

| Total Risk = Total Risk (Adult) + Total Risk (Child) | | | | |
|---|---|---|---|---|
| | Surface Water | | Sediment | |
| | Ingestion | Dermal Contact | Ingestion | Dermal Contact |
| **Total Risk** | 0.E+00 | 0.E+00 | 6.E-07 | 1.E-06 |

**TABLE 23**
**SUMMARY OF EXPOSEURE AREA-, RECEPTOR-, AND EXPOSURE PATHWAY - SPECIFIC AND TOTAL RISKS AND HAZARDS**
**HUMAN HEALTH RISK ASSESSMENT**
**DUCK AND OTTER CREEK**
**TOLEDO AND OREGON, OHIO**

| | OC-3 | | OC-4 | | OC-5 | | DC-2 | | DC-3 | | DC-4 | | DC-5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Exposure Pathway** | **Hazard** | **Risk** | **Hazard** | **Risk** | **Hazard** | **Risk** | **Hazard** | **Risk** | **Hazard** | **Risk** | **Hazard** | **Risk** | **Hazard** | **Risk** |
| **Adult Receptors** | | | | | | | | | | | | | | |
| Surface Water - Ingestion | 4.1E-03 | 2E-07 | 4.1E-03 | 2E-07 | 4.1E-03 | 2E-07 | 4.1E-03 | 2E-07 | 4.1E-03 | 2E-07 | 4.1E-03 | 2E-07 | 4.1E-03 | 2E-07 |
| Surface Water - Dermal | 2.5E-03 | 2E-07 | 2.5E-03 | 2E-07 | 2.5E-03 | 2E-07 | 2.5E-03 | 2E-07 | 2.5E-03 | 2E-07 | 2.5E-03 | 2E-07 | 2.5E-03 | 2E-07 |
| Sediment - Ingestion | 1.1E-03 | 1E-06 | 8.5E-03 | 1E-06 | 2.2E-03 | 1E-06 | 4.1E-04 | 2E-06 | 4.3E-04 | 3E-06 | 1.8E-03 | 5E-06 | 3.7E-04 | 2E-07 |
| Sediment - Dermal | 3.7E-03 | 3E-06 | 2.9E-02 | 3E-06 | 7.1E-03 | 3E-06 | 4.9E-04 | 6E-06 | 6.0E-04 | 9E-06 | 5.3E-03 | 1E-05 | 1.2E-03 | 7E-07 |
| Totals | 1.1E-02 | 4E-06 | 4.4E-02 | 4E-06 | 1.6E-02 | 4E-06 | 7.5E-03 | 8E-06 | 7.6E-03 | 1E-05 | 1.4E-02 | 2E-05 | 8.2E-03 | 1E-06 |
| **Youth Receptors** | | | | | | | | | | | | | | |
| Surface Water - Ingestion | 1.2E-03 | 5E-08 | 1.2E-03 | 5E-08 | 1.2E-03 | 5E-08 | 1.2E-03 | 5E-08 | 1.2E-03 | 5E-08 | 1.2E-03 | 5E-08 | 1.2E-03 | 5E-08 |
| Surface Water - Dermal | 7.9E-02 | 2E-07 | 7.9E-02 | 2E-07 | 7.9E-02 | 2E-07 | 7.9E-02 | 2E-07 | 7.9E-02 | 2E-07 | 7.9E-02 | 2E-07 | 7.9E-02 | 2E-07 |
| Sediment - Ingestion | 1.2E-03 | 1E-06 | 8.8E-03 | 1E-06 | 2.3E-03 | 1E-06 | 4.3E-04 | 2E-06 | 4.5E-04 | 3E-06 | 1.9E-03 | 5E-06 | 3.8E-04 | 3E-07 |
| Sediment - Dermal | 3.9E-03 | 3E-06 | 3.0E-02 | 2E-06 | 7.4E-03 | 2E-06 | 5.2E-04 | 5E-06 | 5.2E-04 | 7E-06 | 5.6E-03 | 1E-05 | 1.3E-03 | 6E-07 |
| Totals | 8.5E-02 | 5E-06 | 1.2E-01 | 3E-06 | 9.0E-02 | 3E-06 | 8.1E-02 | 7E-06 | 8.1E-02 | 1E-05 | 8.8E-02 | 2E-05 | 8.2E-02 | 1E-06 |
| **Child Receptors** | | | | | | | | | | | | | | |
| Surface Water - Ingestion | 9.6E-04 | 4E-08 | 9.6E-04 | 4E-08 | 9.6E-04 | 4E-08 | 9.6E-04 | 4E-08 | 9.6E-04 | 4E-08 | 9.6E-04 | 4E-08 | 9.6E-04 | 4E-08 |
| Surface Water - Dermal | 9.0E-02 | 3E-07 | 9.0E-02 | 3E-07 | 9.0E-02 | 3E-07 | 9.0E-02 | 3E-07 | 9.0E-02 | 3E-07 | 9.0E-02 | 3E-07 | 9.0E-02 | 3E-07 |
| Sediment - Ingestion | 1.8E-03 | 2E-06 | 1.4E-02 | 2E-06 | 3.5E-03 | 2E-06 | 6.7E-04 | 3E-06 | 7.0E-04 | 5E-06 | 2.9E-03 | 8E-06 | 6.0E-04 | 4E-07 |
| Sediment - Dermal | 2.3E-03 | 2E-06 | 1.8E-02 | 2E-06 | 4.4E-03 | 2E-06 | 3.0E-04 | 4E-06 | 3.7E-04 | 5E-06 | 3.2E-03 | 9E-06 | 7.6E-04 | 4E-07 |
| Totals | 9.5E-02 | 4E-06 | 1.2E-01 | 3E-06 | 9.9E-02 | 4E-06 | 9.2E-02 | 8E-06 | 9.2E-02 | 1E-05 | 9.7E-02 | 2E-05 | 9.2E-02 | 1E-06 |
| **Total - Adult and Child** | | | | | | | | | | | | | | |
| Surface Water - Ingestion | -- | 4E-08 | -- | 4E-08 | -- | 4E-08 | -- | 4E-08 | -- | 4E-08 | -- | 4E-08 | -- | 4E-08 |
| Surface Water - Dermal | -- | 2E-08 | -- | 2E-08 | -- | 2E-08 | -- | 2E-08 | -- | 2E-08 | -- | 2E-08 | -- | 2E-08 |
| Sediment - Ingestion | -- | 3E-06 | -- | 3E-06 | -- | 3E-06 | -- | 5E-06 | -- | 8E-06 | -- | 1E-05 | -- | 6E-07 |
| Sediment - Dermal | -- | 5E-06 | -- | 5E-06 | -- | 5E-06 | -- | 9E-06 | -- | 1E-05 | -- | 2E-05 | -- | 1E-06 |
| Totals | -- | 8E-06 | | 8E-06 | | 8E-06 | | 1E-05 | | 2E-05 | | 3E-05 | | 2E-06 |

NOTES:
DC - Duck Creek
OC - Otter Creek
-- not calculated

**APPENDIX A**

**PHOTOGRAPHIC LOG, DUCK AND OTTER CREEK SITE VISIT, FEBRUARY 2 AND 3, 2005**

(34 Pages)


Photograph No. 1 Location: Otter Creek (1)
Orientation: North Date: February 2, 2005
Description: Otter Creek at CSX Transportation; west of point where Otter Creek Road becomes Bayshore Road.



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in “location” refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 2 Location: Otter Creek (1)
Orientation: South Date: February 2, 2005
Description: Otter Creek at CSX Transportation; west of point where Otter Creek Road becomes Bayshore Road.



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in "location" refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 3 Location: Otter Creek (2)
Orientation: North Date: February 2, 2005
Description: Otter Creek at Millard Avenue bridge; note large number of rail tracks and two sets of pipes crossing creek.



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in "location" refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 4 Location: Otter Creek (2)
Orientation: South Date: February 2, 2005
Description: Otter Creek at Millard Avenue bridge; note wells associated with Westover Landfill above east bank at top of photo.



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in "location" refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 5
Orientation: North
Description: Duck Creek at Millard Avenue bridge

Location: Duck Creek (3)
Date: February 2, 2005



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in “location” refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 6 Location: Duck Creek (3)
Orientation: South Date: February 2, 2005
Description: Duck Creek at Millard Avenue bridge. Note wetland plants on both sides of creek.



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in “location” refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 7 Location: Otter Creek (4)
Orientation: North Date: February 2, 2005
Description: Otter Creek at York Street; note two pipelines crossing creek



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in “location” refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 8 Location: Otter Creek (4)
Orientation: South Date: February 2, 2005
Description: Otter Creek at York Street; note single pipeline crossing creek



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in "location" refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 9 Location: Duck Creek (5)
Orientation: North Date: February 2, 2005
Description: Duck Creek at York Street; Duck Creek enters Collins Park Golf Course immediately south of York Street.



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in “location” refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 10 Location: Duck Creek (6)
Orientation: North Date: February 2, 2005
Description: Duck Creek at Consaul Street; Consaul Street is the southern boundary of Collins Park Golf Course. Note: (1) pipeline and 55-gallon drum frozen in creek and (2) tunnel in background through which Duck Creek goes underground as it flows north.



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in "location" refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 11 Location: Duck Creek (6)
Orientation: North Date: February 2, 2005
Description: Duck Creek at Consaul Street; close-up of tunnel in Photograph No. 10



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in "location" refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 12
Orientation: North
Description: Otter Creek at Consaul Street and Torch Drive

Location: Otter Creek (7)
Date: February 2, 2005



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in "location" refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 13
Orientation: South
Description: Otter Creek at Consaul Street and Torch Drive

Location: Otter Creek (7)
Date: February 2, 2005



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in “location” refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 14 Location: Duck Creek (8)
Orientation: West-Southwest Date: February 2, 2005
Description: Duck Creek at Wheeling Street; this is the likely location of wetland restoration project


Photograph No. 15 Location: Duck Creek (8)
Orientation: West Date: February 2, 2005
Description: Duck Creek at Wheeling Street; this is the likely location of wetland restoration project



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in "location" refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 16 Location: Duck Creek (9)
Orientation: Southwest Date: February 2, 2005
Description: Hecklinger Pond – headwaters of Duck Creek; note warning signs.


Photograph No. 17 Location: Duck Creek (9)
Orientation: South-Southwest Date: February 2, 2005
Description: Hecklinger Pond; close-up of warning signs



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in “location” refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 18 | Location: Duck Creek (9)
Orientation: West | Date: February 2, 2005
Description: Hecklinger Pond; note steep bank of north shore and storm water drain (small rectangular shape) at far (west) end of pond.



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in “location” refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 19 Location: Otter Creek (10)
Orientation: North Date: February 2, 2005
Description: Otter Creek at Wheeling Street; houses are located along east side of creek at this point



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in "location" refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 20
Orientation: South
Description: Otter Creek at Wheeling Street

Location: Otter Creek (10)
Date: February 2, 2005



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in "location" refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 21 Location: Otter Creek (11)
Orientation: North Date: February 2, 2005
Description: Otter Creek at Starr Avenue near east side of Church of the Nazarene school parking lot. Note ladder used as bridge across creek and adjacent homes.



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in "location" refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 22 | Location: Otter Creek (11)
Orientation: South | Date: February 2, 2005
Description: Otter Creek at Starr Avenue near east side of Church of the Nazarene school parking lot.



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in "location" refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 23 Location: Otter Creek (12)
Orientation: North Date: February 2, 2005
Description: Otter Creek at Earlwood Avenue; Highway 280 is immediately adjacent to the south



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in "location" refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 24 Location: Otter Creek (13)
Orientation: North Date: February 2, 2005
Description: Otter Creek at Navarre Road; note Auto Max store on east side above creek



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in "location" refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 25 | Location: Otter Creek (14)
Orientation: North | Date: February 2, 2005
Description: Otter Creek at Willow Cemetery, north of Pickle Road; note debris trapped at entrance to tunnel going beneath Sunoco property


Photograph No. 26 | Location: Otter Creek (14)
Orientation: South | Date: February 2, 2005
Description: Otter Creek at Willow Cemetery; note Sunoco operations above creek on east side



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in “location” refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 27 Location: Otter Creek (15)
Orientation: East Date: February 3, 2005
Description: Otter Creek at Yarrow Street


Photograph No. 28 Location: Otter Creek (16)
Orientation: West Date: February 3, 2005
Description: Otter Creek at Taylor Road; note 4-wheel track used to access area along north side of creek.



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in "location" refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 29
Orientation: East
Description: Otter Creek at Taylor Road

Location: Otter Creek (16)
Date: February 3, 2005



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in “location” refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 30 Location: Otter Creek (17)
Orientation: East Date: February 3, 2005
Description: Otter Creek at Whittlesey Avenue and Worth Street; note 4-wheel tracks heading east toward creek. Note creek at tree line.



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in "location" refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 31 Location: Otter Creek (17)
Orientation: East Date: February 3, 2005
Description: Otter Creek at Whittlesey Avenue and Worth Street; note 4-wheel tracks heading east toward creek. Note creek at tree line.



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in "location" refers to the location at which the photograph was taken, as shown in the figures.

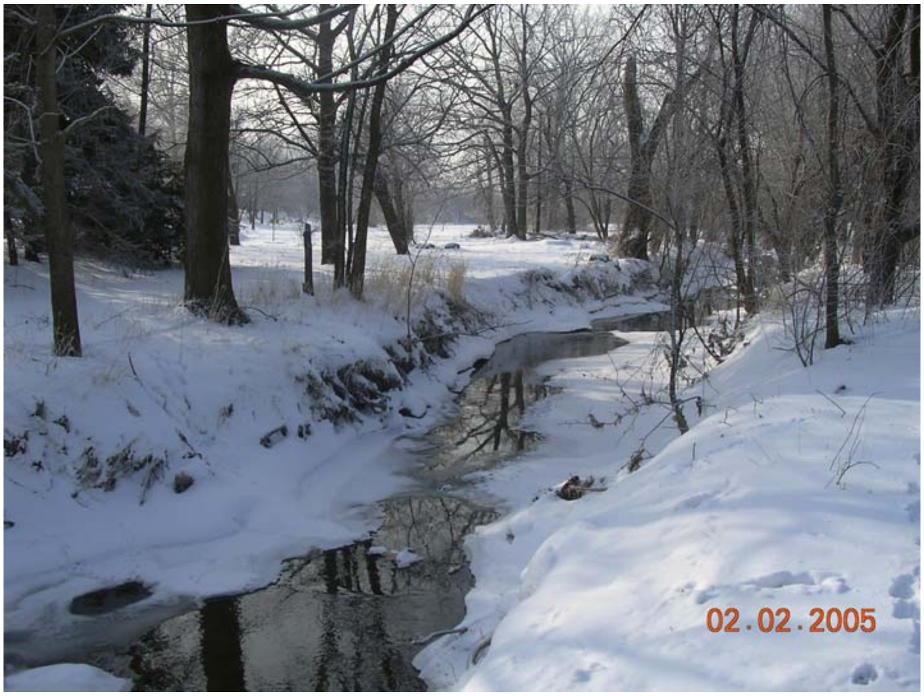

Photograph No. 32 Location: Otter Creek (17)
Orientation: East Date: February 3, 2005
Description: Otter Creek at Whittlesey Avenue and Worth Street; note new storm drain


Photograph No. 33 Location: Otter Creek (18)
Orientation: East Date: February 3, 2005
Description: Otter Creek at Grasser Street and Ridgeway Drive. Creek is in depression near center of photo. Area across (east) of creek is used for paintball games.



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in "location" refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 34 Location: Otter Creek (19)
Orientation: South Date: February 3, 2005
Description: Otter Creek at Starr Avenue; note culvert and open water 6 inches to 1 foot deep




Photograph No. 35 Location: Otter Creek (20)
Orientation: South Date: February 3, 2005
Description: Otter Creek at Pickle Road; note open land east of creek



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in "location" refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 36
Orientation: South
Description: Otter Creek at Oakdale Avenue

Location: Otter Creek (21)
Date: February 3, 2005



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in "location" refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 37 Location: Otter Creek (21)
Orientation: South Date: February 3, 2005
Description: Otter Creek at Oakdale Avenue; note wetland vegetation west of creek


Photograph No. 38 Location: Duck Creek (22)
Orientation: North Date: February 3, 2005
Description: Duck Creek at Ravine Park, west of Wheeling Street and north of Lutheran Housing Service; note likely location of wetland restoration project



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in "location" refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 39 Location: Duck Creek (8)
Orientation: West Date: February 3, 2005
Description: View of likely wetland restoration project – north side (Ridgeway Community trailer park at top of bank)


Photograph No. 40 Location: Duck Creek (8)
Orientation: West Date: February 3, 2005
Description: View of likely wetland restoration project – north side (trailer park at top of bank); note Lutheran Housing Service at far left



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in "location" refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 41 Location: Otter Creek (23)
Orientation: North Date: February 3, 2005
Description: Otter Creek at Starr Avenue; path going into paintball area east of creek


Photograph No. 42 Location: Otter Creek (23)
Orientation: North Date: February 3, 2005
Description: Otter Creek at Starr Avenue; paintball area (creek is going from left to right) is about 80% up from bottom of photo.



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in "location" refers to the location at which the photograph was taken, as shown in the figures.


Photograph No. 43 Location: Otter Creek (23)
Orientation: North Date: February 3, 2005
Description: Otter Creek north of Starr Avenue; paintball area on east side of the creek at this location


Photograph No. 44 Location: Otter Creek (24)
Orientation: North Date: February 3, 2005
Description: Headwaters of Otter Creek at Tracy Road and Wales Road. Turner Vault Co. (casket makers) just to the west of photo location. Ditch south of Wales Road drains field south of Wales Road and feeds into Otter Creek.



Note: Disregard the date on the actual photograph, as it was off by one day. All photographs indicating 02.01.2005 were taken on 02/02/05 and photographs indicating 02.02.2005 were taken on 02/03/05. The dates in the text are correct. Also, the parenthetical number in "location" refers to the location at which the photograph was taken, as shown in the figures.

# APPENDIX B

## ANALYTICAL RESULTS

(Not included here – are included as part of project database)