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EE/CA and RI/FS Support Sampling Plan

Sauget Area 1

Sauget and Cahokia, Illinois

Volume 1B

Human Health Risk Assessment Work Plan

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Sauget Area 1 EE/CA and RI/FS Support Sampling Plan Volume 1B

Human Health Risk Assessment Workplan, Sauget Area 1, Sauget and Cahokia, Illinois

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LIST OF ACRONYMS

AAF	Absorption Adjustment Factors
ACGIH	American Conference of Governmental Industrial Hygienists
AOC	Administrative Order by Consent
ASTM	American Society for Testing and Materials
ATSDR	Agency for Toxic Substances and Disease Registry
AWQC	Ambient Water Quality Criteria
bgs	below ground surface
CADD	Chronic Average Daily Dose
CAS	Chemical Abstracts Service
COC	Constituents of Concern
COPC	Constituents of Potential Concern
CS	Creek Segment
CSF	Cancer Slope Factor
CSM	Conceptual Site Model
DQL	Data Quality Levels
EE/CA	Engineering Evaluation and Cost Analysis
EFH	Exposure Factors Handbook
ELCR	Excess Lifetime Cancer Risk
HEAST	Health Effects Assessment Summary Tables
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
IEPA	Illinois Environmental Protection Agency
IRIS	Integrated Risk Information System
LADD	Lifetime Average Daily Dose
MLE	Most Likely Exposure
MRL	Minimum Risk Level
NCEA	National Center for Environmental Assessment
NCP	National Contingency Plan
NIOSH	National Institute of Occupational Safety and Health
NOAA	National Oceanographic and Atmospheric Administration
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyls
PQL	Practical Quantitation Limit
PRG	Preliminary Remediation Goal
QAPP	Quality Assurance Project Plan
RAGS	Risk Assessment Guidance for Superfund
RBC	Risk-Based Concentration

LIST OF ACRONYMS

RfC	Reference Concentration
RfD	Reference Dose
RG	Remedial Goal
RI/FS	Remedial Investigation and Feasibility Study
RME	Reasonable Maximum Exposure
SOW	Scope of Work
SSL	Soil Screening Level
SSP	Support Sampling Plan
SVOC	Semi-Volatile Organic Compounds
TACO	Tiered Approach to Corrective Action Objectives
TCDD	Tetrachlorodibenzo-p-dioxin
TEF	Toxic Equivalence Factor
TEQ	Toxic Equivalence Concentration
TPH	Total Petroleum Hydrocarbons
UCL	Upper Confidence Limit
USEPA	U.S. Environmental Protection Agency
VOC	Volatile Organic Compounds
WHO	World Health Organization

1.0 INTRODUCTION

This document presents a workplan for conducting a streamlined evaluation of short-term exposures, as well as for performing a baseline human health risk assessment (HHRA) for Sauget Area 1 located in Sauget and Cahokia, IL. This workplan has been developed to support the Engineering Evaluation and Cost Analysis (EE/CA) for the Sauget Area 1 source areas and potentially impacted portions of Area 1, and for the Remedial Investigation and Feasibility Study (RI/FS) for Sauget Area 1 groundwater. In addition, this workplan has been developed to satisfy the Scope of Work (SOW) for the EE/CA and RI/FS, provided as an attachment to the Administrative Order by Consent (AOC) entered into by the U.S. Environmental Protection Agency (USEPA) and Solutia Inc. (Solutia), as well as to be compliant with the National Contingency Plan (NCP).

Streamlined Short-Term Risk Assessment

In some situations, short-term exposures (e.g., subchronic daily intakes) may be important. An evaluation of short-term exposures is not normally included as part of the baseline risk assessment. However, since an EE/CA is being performed, an evaluation of the potential for unacceptable health risks after short-term exposures will be conducted. If an identified release is predicted to pose unacceptable health risks after short-term exposure, accelerated response actions to address any potential imminent and substantial endangerment to human health or the environment (i.e., principal threats) may be warranted. According to USEPA (1989a) guidance, the following factors should be considered when deciding whether to evaluate short-term exposures for the purposes of addressing the need for time-critical removal actions:

- The toxicological characteristics of the chemicals of potential concern;
- The occurrence of high chemical concentrations or the potential for a large release;
- Persistence of the chemicals in the environment; and
- The characteristics of the population that influence the duration of exposure.

The above factors will be evaluated and discussed in the EE/CA report. Additionally, if the average concentration of any constituent detected during the investigations exceeds the screening level for that constituent by greater than 100-fold (MADEP, 1995), a short-term exposure scenario evaluation will be performed for that constituent. Since this type of short-term health evaluation is not a standard component of most hazardous waste site health evaluations, limited guidance exists for performing these types of evaluations. Short-term exposures generally pose less of a health risk than longer-term exposures to the same concentration of a chemical. In recognition of this fact, USEPA generally establishes subchronic toxicity criteria at ten fold higher concentrations than chronic toxicity criteria. When available, USEPA-approved acute and subchronic toxicity criteria will be used to evaluate short-term exposures. Both reasonable maximum exposure (RME) and most likely exposure (MLE)

scenarios will be included in the evaluation, utilizing upper bound and average media concentrations, respectively.

In the absence of USEPA criteria, short-term air exposures will be evaluated based on guidance provided by USEPA (1993c). As outlined by USEPA (1993c), the primary reference source for obtaining short-term air action levels will be the most recent version of the Texas Air Control Board Effects Screening Level List. Secondary sources of information will include, but will not be limited to, short-term exposure limits derived by the American Conference of Governmental Industrial Hygienists (ACGIH), the National Institute for Occupational Safety and Health (NIOSH), and the Occupational Safety and Health Administration (OSHA).

For soils, acute and intermediate duration minimal risk levels (MRLs) available from ATSDR will be used. If MRLs for soil are not available for a chemical evaluated for potential short-term health effects, acute and/or intermediate exposure duration health criteria will be derived by qualified toxicologists, for review by USEPA Region V and/or IEPA. A condition of imminent endangerment will be considered to exist if target risks exceed 10^{-4} or a hazard index for chemicals with similar target endpoints exceeds 1. Due to the need for time-critical removal actions when an imminent endangerment is identified, USEPA and IEPA will be notified within 30 days if any potential short-term health hazards are identified during the course of the investigations.

Baseline Risk Assessment

The HHRA will follow Task 4, Section 2.5, and Task 5, Section 2 of the SOW. In addition, the HHRA will also comply with USEPA guidance for conducting a risk assessment including, but not limited to, the following:

- Risk Assessment Guidance for Superfund (RAGS): Volume 1 - Human Health Evaluation Manual (Parts A and D) (USEPA, 1989a and 1998a).
- USEPA Soil Screening Guidance: Technical Background Document (USEPA, 1996a).
- Human Health Evaluation Manual Supplemental Guidance; Standard Default Exposure Factors. (USEPA, 1991a).
- Exposure Factors Handbook (USEPA, 1997a).
- Land Use in CERCLA Remedy Selection Process (USEPA, 1995).

The baseline risk assessment will evaluate potential health effects after chronic daily exposures and will be conducted using the four step paradigm as identified by the USEPA (USEPA, 1989a). The steps are:

- Data Evaluation and Hazard Identification
- Toxicity Assessment
- Exposure Assessment
- Risk Characterization

This workplan is organized into the following sections:

- Site Characterization – Section 2.0 of this workplan discusses the site and its environs, and presents a conceptual site model describing source areas, potential migration pathways, and potentially impacted media.

- Hazard Identification – Section 3.0 of this workplan presents a discussion of how site data will be summarized, and a description of the process for the selection of constituents of potential concern (COPC) to be evaluated quantitatively in the risk assessment.

- Dose-Response Assessment – Section 4.0 of this workplan presents a discussion of the dose-response assessment process. The dose-response assessment evaluates the relationship between the magnitude of exposure (dose) and the potential for occurrence of specific health effects (response) for each COPC. Both potential carcinogenic and noncarcinogenic effects will be considered. The most current USEPA verified dose-response values will be used when available.

- Exposure Assessment - Section 5.0 of this workplan presents a discussion of the exposure assessment process. The purpose of the exposure assessment is to provide a quantitative estimate of the magnitude and frequency of potential exposure to COPC by a receptor. Potentially exposed individuals, and the pathways through which those individuals may be exposed to COPC are identified based on the physical characteristics of the site, as well as the current and reasonably foreseeable future uses of the site and surrounding area. The extent of a receptor's exposure is estimated by constructing exposure scenarios that describe the potential pathways of exposure to COPC and the activities and behaviors of individuals that might lead to contact with COPC in the environment.

- Risk Characterization – Section 6.0 of this workplan presents a discussion of the risk characterization process and uncertainties associated with the risk assessment process. Risk characterization combines the results of the exposure assessment and the toxicity assessment to derive site-specific estimates of potentially carcinogenic and noncarcinogenic risks resulting from both current and reasonably foreseeable potential human exposures to COPC. The results of the risk characterization will be used to identify constituents of concern (COC), which are the subset of those COPC whose risks result in an exceedance of the target risk range of 10^{-6} to 10^{-4} for potential carcinogens and a target Hazard Index of 1 for

noncarcinogens (that act on the same target organ), as defined in the AOC SOW and by the Illinois Environmental Protection Agency (IEPA) (1998).

Within any of the steps of the risk assessment process described above, assumptions must be made due to a lack of absolute scientific knowledge. Some of the assumptions are supported by considerable scientific evidence, while others have less support. The assumptions that introduce the greatest amount of uncertainty in this risk evaluation will be discussed in Section 6.0 of the HHRA report.

- Summary and Conclusions – Section 7.0 of this workplan will discuss how the results of the HHRA will be summarized in the final report.

Each of these steps is discussed in the sections that follow. References are provided in Section 8.0 of this workplan. The sections of the HHRA report submitted as part of the EE/CA and RI/FS will be organized following this same format.

2.0 SITE CHARACTERIZATION

This workplan addresses the areas of Sauget Area 1 as identified in the AOC. Specifically, the EE/CA for Sauget Area 1 will address the following areas:

- Fill areas (Sites G, H, I, L, M, and N), and
- Potentially impacted areas:
  - Dead Creek Segments (CS): CS-B, CS-C, CS-D, CS-E, and CS-F
  - Commercial, residential and/or undeveloped properties adjacent to these creek segments

The RI/FS for Sauget Area 1 will address groundwater in the following areas:

- Fill areas and areas downgradient of the source areas
- Groundwater in the area of, and private wells identified along, Walnut Street and Judith Lane in Cahokia, IL

To guide identification of appropriate exposure pathways for evaluation in the risk assessment, a conceptual site model (CSM) for human health has been developed. The purpose of the CSM is to identify fill areas, potential migration pathways of constituents from fill areas to media where exposure can occur, and to identify potential human receptors. Potential exposure pathways and potential receptors are discussed in Section 5.0.

Conceptual Site Model

At Sauget Area 1, the fill areas are identified as Sites G, H, I, L, M, and N. Constituents in the fill areas may leach to underlying groundwater. Volatile organic compounds (VOCs) in groundwater may volatilize into outdoor air and may infiltrate into air in overlying buildings. Constituents in groundwater may discharge to Dead Creek and subsequently be transported downstream to the lower reaches of Dead Creek and into the Borrow Pit Lake. Fish in the Borrow Pit Lake may have accumulated constituents present in surface water and/or sediments. In addition, it is possible that Dead Creek flooding events and/or windblown dust may have resulted in the distribution of constituents to soils on the properties adjacent to the creek. Figure 2-1 presents a CSM for Sauget Area 1. The CSM identifies sources, environmental release mechanisms, potential exposure pathways, potential exposure routes, and potential human receptors. Those potentially complete exposure pathways to be considered for further evaluation in the risk assessment are identified. Receptors and pathways are discussed in more detail in Section 5.0.

The Support Sampling Plan (SSP) sampling program has been developed to address these potential migration pathways. Sampling to be conducted in support of the HHRA include the following. Fill area surface soil and wastes will be sampled and characterized. Groundwater in the source areas,

downgradient of the source areas, and southwest of the source areas will be sampled and characterized. Shallow groundwater and domestic wells in the vicinity of Walnut Street and Judith Lane will also be characterized. Surface and subsurface soils in the undeveloped and residential areas of the residential/commercial/undeveloped properties adjacent to Dead Creek will be sampled. Surface water and sediments in Dead Creek and the Borrow Pit Lake will be sampled. In addition, fish tissue samples from the Borrow Pit Lake will be analyzed.

The CSM is meant to be a "living" model that can be updated and modified as additional data become available. The exposure scenarios proposed for quantitative evaluation in the risk assessment (see Section 5.0) have been identified based on this current CSM. However, the CSM will be reviewed and modified as necessary once the analytical data from the SSP program have become available. Any substantial changes in the CSM and, subsequently, the pathways for quantitative evaluation, will be discussed with USEPA prior to conduct of the risk assessment.

3.0 HAZARD IDENTIFICATION

The purpose of the hazard identification process is two-fold: 1) to evaluate the nature and extent of release of constituents present at the site; and 2) to select a subset of constituents of potential concern (COPC) for quantitative evaluation in the risk assessment. This step of the risk assessment will involve compiling and summarizing SSP data for the risk assessment, and selecting COPC based on a series of screening criteria.

3.1 Data Compilation

For Sauget Area 1, existing data are available from previously conducted investigations. New data will be available from the field activities specified in the SSP. The HHRA will include a section that compiles all of the valid data collected from the site in support of the SSP.

3.1.1 Areas and Media

The SSP for Sauget Area 1 is designed to investigate the source areas, Dead Creek and its environs, and the residential/commercial/undeveloped areas adjacent to Dead Creek. Of the data to be collected for the SSP, analytical data for use in the HHRA will be available for the following media:

- Source area shallow groundwater;
- Source area downgradient alluvial groundwater;
- Shallow groundwater southwest of source areas;
- Shallow groundwater in the vicinity of Walnut Street and Judith Lane;
- Groundwater from private wells in the vicinity of Walnut Street and Judith Lane;
- Source area surface soil;
- Source area subsurface waste;
- Residential area surface soil (0-0.5 feet below ground surface (bgs));
- Residential area subsurface soil (0.5-6 feet bgs);
- Dead Creek sediment;
- Borrow Pit Lake sediment;
- Dead Creek surface water;
- Borrow Pit Lake surface water;
- Fish tissue from Borrow Pit Lake (if populations are present); and
- 24-hour air samples at Sites G, H, I, and L.

Analytical data for use in the HHRA from background or reference locations will be available for the following media:

- Surface soil;

- Subsurface soil;
- Groundwater;
- Surface water;
- Sediment;
- Fish tissue; and
- Upwind air.

3.1.2 Analytes

The SSP identifies the suites of analytes for each medium. For ease of discussion here, the analytes to be included in the risk evaluation are identified as follows:

- Full suite of analytes – VOCs, semi-volatile organic compounds (SVOCs), metals, mercury, cyanide, polychlorinated biphenyls (PCBs), pesticides, and herbicides;
- Dioxins – dioxins and furans; and
- Industry-specific analytes – PCBs, total petroleum hydrocarbons (TPH), copper, zinc, fluorides, phosphorous and ortho-phosphate. [Note - only PCBs, copper, zinc, fluorides, and phosphorous will be quantitatively evaluated in the HHRA. Fluorides, phosphorous, and ortho-phosphate will be analyzed for only in surface water.]

All analytical data collected in support of the SSP will be compiled and tabulated in a database for statistical analysis. Summary statistics tables will be developed for each medium in each area, and will present for each constituent the minimum and maximum detected values, the arithmetic mean, the 95th percentile upper confidence limit (UCL) on the arithmetic mean (USEPA, 1992a), and the frequency of detection. Constituents analyzed for but never detected in a particular medium will not be included in the summary statistics for that medium. For constituents detected at least once in a particular medium, samples reported as "non-detect" by the laboratory will be assigned a value of one-half the sample quantitation limit in calculating summary statistics (USEPA, 1989a; IEPA, 1998). Duplicate sample results will be averaged and treated as a single sample result when compiling summary statistics.

3.1.3 Sample Collection by Area and Medium

Data sets for each medium are described below. Sample collection strategy based on human health risk assessment needs is discussed in conjunction with the potential exposure scenarios in Section 5.2.

3.1.3.1 Groundwater

Fill Areas - Data for shallow groundwater samples from wells located in the fill areas, the downgradient alluvial aquifers, and shallow groundwater southwest of the fill areas, as identified in the SSP, will be evaluated in the risk assessment. These data will include the full suite of analytes and dioxins.

Residential Area - Analytical data for shallow groundwater in the Walnut Street/Judith Lane residential area, as well as for four domestic wells in this area will be evaluated in the risk assessment. These data will include the full suite of analytes and dioxins.

3.1.3.2 Fill Area Wastes

Sediment samples will be collected from Site M and analyzed for the full suite of analytes and dioxins. Subsurface waste samples will be collected from Sites G, H, I, L, and N and analyzed for the full suite of analytes and dioxins. These data will be used in the risk assessment. As described in Section 5.2, the VOC sample will be a discrete sample taken along the depth of the waste at the location having the highest PID/FID (Photo/flame Ionization Detector) reading. The remaining analyses will be conducted on a sample composited from material collected throughout the depth of the waste (note - non-waste materials will not be included in this composite). Compositing is being conducted to ensure that the sample collected is representative of all the wastes, not just a single stratum within the wastes. Composite samples are not generally regarded as the best descriptor with which to calculate the upper bound concentrations for a data set (USEPA, 1989a). In this case, because the sample is collected from waste materials only, the detected analytes are more likely to be representative of the heterogeneity of the wastes than those from a single sample collected at a discrete location within the wastes.

3.1.3.3 Soil

Fill area - Surface soil (0-0.5 feet bgs) samples will be collected, colocated with the fill area waste sampling locations. These samples will be analyzed for the full suite of analytes and dioxins. These data will be used in the risk assessment.

Residential/Commercial/Undeveloped Area - Surface (0-0.5 feet bgs) and subsurface (0.5-6 feet bgs) soil samples will be collected from undeveloped areas along seven transects as identified in the SSP in the residential/commercial/undeveloped area adjacent to Dead Creek and analyzed for the full suite of analytes and dioxins. Based on the transect analytical results, surface and subsurface soil samples will be collected from three residences along each of Transects 1 through 6 and two residences along Transect 7 and analyzed for the full suite of analytes and dioxins. These data will be used in the risk assessment.

3.1.3.4 Surface Water

Surface water samples will be collected from Dead Creek and Borrow Pit Lake, and analyzed for the full suite of analytes and dioxins. These data will be used in the risk assessment. Dead Creek and Borrow Pit Lake will be evaluated separately in the risk assessment. Depending on the distribution of analytical results, the sections of Dead Creek may be evaluated separately or in combination in the risk assessment.

3.1.3.5 Sediment

Sediment samples will be collected from Dead Creek and Borrow Pit Lake. Data for the full suite of analytes and dioxins will be available for approximately 20 percent of these samples, and data for the industry-specific analytes will be available for approximately 80 percent of these samples. Depending on the distribution of analytical results, the sections of Dead Creek may be evaluated separately or in combination in the risk assessment.

3.1.3.6 Fish Tissue

Fish tissue samples will be collected from Borrow Pit Lake and analyzed for the full suite of analytes (with the exception of VOCs) and dioxins. The determination of the applicability of the fish ingestion pathway for this waterbody is discussed in the Exposure Assessment (Section 5.3.5). If the fish ingestion pathway is included for quantitative evaluation in the HHRA, whole fish data will be used. Sample compositing will occur only where necessary to achieve a sufficient sample size for analysis. Predator, bottom feeding and forage fish will be collected as available. Expected types to be encountered include bass, crappie, catfish and/or bluegill.

3.1.3.7 Air

Air samples will be collected in the vicinity of Sites G, H, I, and L and analyzed for VOCs, SVOCs, PCBs, dioxin, and metals. Because these are 24-hour air samples collected at a single time point, they will not be used in the calculation of risks in the HHRA. However, the data will be compared to chronic and, if appropriate, to subchronic or acute criteria as discussed in Section 1.0. Initial comparison will be made to USEPA Region 9 Preliminary Remediation Goals for air (USEPA, 1998c).

3.2 Selection of Constituents of Potential Concern

COPCs are a subset of the complete list of constituents detected in site media that are carried through the quantitative risk assessment process. Selection of COPCs focuses the analysis on the most likely risk "drivers." As stated in USEPA guidance (USEPA, 1993a):

"Most risk assessments are dominated by a few compounds and a few routes of exposure. Inclusion of all detected compounds at a site in the risk assessment has minimal influence on the total risk. Moreover, quantitative risk calculations using data from environmental media that may contain compounds present at concentrations too low to adversely affect public health have no effect on the overall risk estimate for the site. The use of a toxicity screen allows the risk assessment to focus on the compounds and media that may make significant contributions to overall risk."

Several factors are typically considered in selecting COPCs for a site, including natural background, frequency of detection, and toxicity, including essential nutrient status. Risk calculations will be conducted using the COPCs identified in this step.

Constituents of concern (COC) will be identified in Section 6.0 of the HHRA as those constituents whose risks result in an exceedance of the target risk range of 10^{-6} to 10^{-4} for potential carcinogens and a target Hazard Index of 1 for noncarcinogens (that act on the same target organ), as defined in the AOC SOW and by IEPA (1998). Remedial goals will be developed for COCs based on the exposure pathways evaluated in the risk assessment.

The steps to be used to identify COPC are presented below.

3.2.1 Evaluation of Frequency of Detection and Essential Nutrient Status

A frequency of detection screen will be conducted on each medium (e.g., sediment, surface soil, etc.). Constituents that are detected in fewer than 5% of samples, provided 20 samples are available, will not be included as COPCs. However, some of these constituents may be retained as COPC based on professional judgment, considering factors such as the presence of a hotspot. In addition to the frequency of detection screen, essential nutrients (i.e., calcium, iron, magnesium, sodium and potassium) will not be included as COPCs (USEPA, 1989a).

3.2.2 Comparison to Background

Background samples to be collected in the vicinity of the site present information on naturally-occurring levels of constituents typical for the local area. The purpose of comparing site conditions to local background is to determine if site concentrations of constituents are representative of background concentrations, which, therefore, should not be included in risk calculations. Background comparisons will be conducted for each medium using site-specific background data and background concentrations for rural and urban areas of Illinois published by IEPA (1998).

Groundwater, surface water and sediment samples collected in upgradient locations, if available, will provide site-specific background data for these media. Soil samples collected at appropriate off-site

locations, as described in the SSP, will provide site-specific background data for the soil media. See SSP Sections 6.8, 7.6, and 11.4 for a discussion of background locations.

The procedure for determining whether a constituent concentration is consistent with background will follow that developed by USEPA Region 4 (USEPA, 1996b). Maximum detected concentrations of constituents in environmental media at the site will be compared against two times the arithmetic mean site-specific background concentration. USEPA Region 4 states that although RAGS (USEPA, 1989a) allows the use of statistics in data evaluation, statistics may not be sufficiently conservative at this stage of the risk evaluation; and in most cases, there are not a sufficient number of samples for conducting a statistical analysis. Therefore, if maximum concentrations of inorganic constituents in an area are found to be less than two times the average background concentrations, then those constituents can be eliminated from quantitative evaluation in the risk assessment. Constituents whose concentrations are found to be above typical local background levels will be retained for evaluation in the next step of the hazard identification process (Toxicity Screen).

3.2.3 Toxicity Screen

A toxicity screen will be performed in accordance with USEPA Region 5 guidance (USEPA, 1998b) and IEPA regulations (IEPA, 1998). USEPA Region 5 guidance identifies the following three sources as appropriate screening levels for soil, in order of preference:

1) Most recent generic soil screening levels (SSLs) developed and presented in Appendix A of the Soil Screening Guidance (USEPA, 1996a). The SSLs are based on ingestion and inhalation (direct contact) and soil-to-groundwater exposure pathways for a residential scenario.

2) Site-specific SSLs derived using the methodology outlined in the above reference.

3) Most recent USEPA Region 9 Preliminary Remediation Goals (PRGs; USEPA, 1998c).

The IEPA Tiered Approach to Corrective Action (TACO) (IEPA, 1998) is very similar to that outlined in the SSL guidance (USEPA, 1996a) in that it provides Tier I criteria based on direct contact (ingestion and inhalation) and the soil-to-groundwater pathway. In fact, the TACO Tier I criteria have been developed based on the USEPA SSL guidance. However, the TACO Tier I criteria are more comprehensive because values are provided for a longer list of constituents, and Tier I criteria are available for both residential and industrial scenarios.

Therefore, IEPA TACO Tier I criteria will be used for the identification of COPC for soil and groundwater for quantitative evaluation in the risk assessment. Where IEPA TACO Tier I criteria (IEPA, 1998) are not available, USEPA Region 9 PRGs (1998c) will be used. Residential values will

be used to identify COPC for residential soils and sediments and all groundwater, and industrial values will be used to evaluate source area soils and waste.

Following IEPA guidance, the criteria for groundwater will be adjusted for cumulative effects for both potential carcinogens and noncarcinogens. Per the TACO program guidance, Tier I criteria for soils are not adjusted for cumulative effects (IEPA, 1998).

IEPA TACO Tier I values are not available for surface water, fish tissue, or air. Hence, surface water data will be compared with the lower of screening values identified for groundwater and the promulgated human health Ambient Water Quality Criteria (AWQCs) for fish ingestion (USEPA, 1998d). Fish tissue data will be compared to the USEPA Region 3 Risk-Based Concentrations (RBCs) for fish (USEPA, 1998e). Modeled air concentrations will be compared to USEPA Region 9 PRGs (USEPA, 1998c).

These criteria were used to develop data quality levels (DQLs) to be used to identify appropriate practical quantitation limits (PQLs) for laboratory methods for the analytical program. The DQLs and PQLs are discussed in greater detail in the Quality Assurance Project Plans (QAPPs) for the site (see Volumes 2B and 3B of the SSP). The DQLs for the HHRA are presented in Appendix A.

Per USEPA request, the current TACO Tier I values are presented in Appendix B, the current USEPA Region 9 PRGs are presented in Appendix C, the current USEPA Region 3 RBCs are presented in Appendix D, and the current AWQCs are presented in Appendix E. The PRGs and RBCs are periodically updated by USEPA. The most current criteria available will be used in the selection of COPC.

Constituents with maximum concentrations less than or equal to the screening criteria will not be included as COPC. If no COPC are identified for a medium, that medium will not be evaluated quantitatively in the HHRA.

Tables presenting the results of each screening step will be presented in the risk assessment report. The final list of COPC for inclusion in the risk assessment will also be presented in the risk assessment and included in all subsequent risk calculations.

4.0 DOSE-RESPONSE ASSESSMENT

The purpose of the dose-response assessment is to identify the types of adverse health effects a constituent may potentially cause, and to define the relationship between the dose of a constituent and the likelihood or magnitude of an adverse effect (response).

Adverse effects are defined by USEPA as potentially carcinogenic or noncarcinogenic (i.e., potential effects other than cancer). Dose-response relationships are defined by USEPA. The dose-response values for potentially carcinogenic effects are termed Cancer Slope Factors (CSFs) or Unit Risk Factors, and dose-response values for noncarcinogenic effects are termed Reference Doses (RfDs) or Reference Concentrations (RfCs). These values are available from USEPA sources, such as USEPA's Integrated Risk Information System (IRIS), an on-line computer database (USEPA, 1999), and the Health Effects Assessment Summary Tables (HEAST) (USEPA, 1997b). Both sets of potential health effects will be evaluated in the risk assessment. The USEPA National Center for Environmental Assessment (NCEA) will be consulted if a constituent does not have a dose-response value in either IRIS or HEAST. Appropriate criteria may also be derived by qualified toxicologists using current USEPA-approved methodologies.

Dose-response values used in the risk assessment will be presented in tabular format. For each constituent the table will present the Chemical Abstracts Service (CAS) number, dose-response value, source, study animal, study method, and where appropriate, target organ, critical effect, uncertainty factors, and confidence level.

Dose-response values are available for inhalation and oral exposures. Oral dose-response values will be used to evaluate dermal exposures, provided appropriate dermal absorption values are available. COPC will be evaluated quantitatively for the dermal exposure pathway. For inhalation pathways, reference concentrations (in units of mg/m^3) will be converted to reference doses (in units of mg/kg-day) for calculating risk for systemic toxicants. For direct acting toxicants, the oral, dermal, and inhalation pathways will be evaluated separately.

4.1 PCB Dose-Response

Risks from potential exposures to PCBs will be calculated using the most current guidance available from USEPA. Currently, USEPA-approved guidance is provided in IRIS (USEPA, 1999). Total PCB concentrations will be calculated by summing the separate homolog concentrations. The total PCB concentrations will be multiplied by the verified cancer slope factors listed in IRIS (USEPA, 1999). Guidance provided in IRIS specifies three tiers of human slope factors for environmental PCBs: high risk and persistence, low risk and persistence, and lowest risk and persistence. The choice of slope factors for use depends on the medium of exposure and PCB chlorine content, as outlined in IRIS

(USEPA, 1999). Thus, a slightly differing approach to calculating potential cancer risks will be taken for different media.

Non-cancer risks from potential exposures to PCBs will be calculated using the most conservative RfD for a PCB mixture. In addition, uncertainty surrounding the use of USEPA-verified toxicity criteria will be discussed.

4.2 Dioxin Dose-Response

The potential carcinogenic effects associated with exposure to dioxin and furan congeners in environmental media will be assessed in accordance with the approach developed by USEPA (1989b). Risks will be calculated for 2,3,7,8-TCDD and the dioxin and furan congeners using the cancer slope factor for 2,3,7,8-TCDD listed in HEAST and using the TEFs provided in USEPA (1989b). The TEFs are fractions that equate the potential toxicity of each congener to that of 2,3,7,8-TCDD. The World Health Organization (WHO) (Van den Berg et al., 1998) has assigned a TEF to each of the dioxin and furan congeners that slightly differ from the USEPA-approved values. The TEFs provided by USEPA (1989b) and proposed by Van den Berg et al. (1998) are listed in Table 4-1. The exposure point concentration for each dioxin and furan congener will be multiplied by its TEF, resulting in a TCDD toxic equivalence concentration (TCDD-TEQ). The TCDD-TEQ values for each of the congeners will then be added together. The cancer slope factor for 2,3,7,8-TCDD will then be used to calculate potential carcinogenic risks resulting from potential exposure to 2,3,7,8-TCDD, and the dioxin and furan congeners.

5.0 EXPOSURE ASSESSMENT

The purpose of the exposure assessment is to predict the magnitude and frequency of potential human exposure to each of the COPC retained for quantitative evaluation in the HHRA. The first step in the exposure assessment process is the characterization of the setting of the site and surrounding area. Current and potential future site uses and potential receptors (i.e., people who may contact the impacted environmental media of interest) are then identified. Potential exposure scenarios appropriate to current and potential future site uses and receptors are then developed. Those potential exposure pathways for which COPC are identified and are judged to be complete will be evaluated quantitatively in the risk assessment. Reasonable maximum exposure (RME) assumptions, and most likely exposure (MLE) assumptions based on appropriate USEPA guidance, will be employed in the quantitative risk assessment.

5.1 Identification of Potential Exposure Scenarios

Exposure scenarios are developed on the basis of the CSM for a site. The CSM for Sauget Area 1 was presented in Section 2.0 (Figure 2-1). The CSM was used to develop the potential exposure scenarios identified below and in Table 5-1. Table 5-1 provides a more detailed presentation of receptors and pathways by exposure area to be evaluated in the risk assessment.

Sauget Area 1 fill areas have been used for industrial purposes for many years (since the 1930s or earlier) and use of these areas is expected to remain industrial. The fill areas within Sauget Area 1 are zoned commercial/industrial and it is likely that the fill areas will continue to be used well into the reasonably foreseeable future for commercial/industrial purposes.

As discussed in Sections 1.0 and 2.0 of the SSP, Sites G, H, I, L, M and N contain wastes that came from a wide variety of municipal and industrial sources. Site M is a fenced former sand borrow pit that is now filled with water and is hydrologically connected to Dead Creek. Site G is a fill area stabilized by USEPA in an emergency response that solidified organic wastes, placed a temporary soil cover over the site, and controlled site access by the installation of a fence. Recent inspection indicates that the site and fence are still stable. Recent inspection of Site H indicated that the site is stable with a vegetative cover and no exposed wastes at the surface. Site L also appears to be stable. It is covered with cinders and is located in a vegetated field. Site N reportedly contains construction rubble. Site I was originally used as a sand and gravel pit that received industrial and municipal wastes. The site is currently graded and covered with crushed stone and used for equipment and truck parking.

Because these source areas are generally covered and stable with no evidence of exposed wastes at the surface, sampling in these areas is focused on collection of waste samples. Although wastes are not present at the surface, surface soil sampling will also be conducted.

An on-site outdoor industrial worker and a trespassing teen will be evaluated for potential exposure to COPC where identified in surface soil, and to COPC that may volatilize into outdoor air from underlying groundwater and wastes.

Because the wastes are at depth, a construction/utility worker will be evaluated for potential exposure to constituents in the waste. Construction/utility work is assumed to occur only up to depths of 12 to 15 feet bgs, however, to be conservative, analytical data from waste samples composited throughout the depth of the fill material will be used in the risk assessment (see discussion in Section 3.1.3.2). Due to the shallow depth of groundwater, the construction/utility worker may contact groundwater during excavation.

Due to the presence of a plume of VOCs in groundwater in the source areas and wastes present in the subsurface; an on-site indoor industrial worker will be evaluated for potential exposure to COPC via inhalation of volatile constituents present in indoor air due to vapor intrusion from groundwater and/or wastes. Analytical data collected from shallow groundwater from the existing wells at the sites and analytical data from subsurface waste samples will be used in the risk assessment. If VOCs are detected in shallow groundwater in other groundwater areas of the site, an indoor industrial worker receptor will be evaluated.

Dead Creek bisects Sauget Area 1, passing through areas of commercial land use, areas of open land, and areas of residential land use, and eventually discharges to Borrow Pit Lake and Prairie DuPont Creek. As such, Dead Creek serves as a potential migration pathway for COPC from the impacted fill areas. It is possible that windblown dust or periods of overbank flow (i.e., flooding) have resulted in the deposition of site-related COPC on soil of the adjacent residential/commercial/undeveloped areas. Therefore, it is possible that residents in the vicinity of Dead Creek may be exposed to site-related COPC in soil. Recent inspection indicates that some residences have vegetable gardens. Site-related COPC may be taken up by plant material and subsequently ingested. If VOCs are present in shallow groundwater and/or subsurface soils in these areas, they may infiltrate into indoor air and outdoor air. If these are complete exposure pathways, they will be evaluated in the HHRA.

In addition, a construction/utility worker may contact COPC in surface and subsurface soil and shallow groundwater in the residential/commercial/undeveloped area. The major potential COPC migration pathway is overbank flow. Due to this migration pathway, COPC are expected to occur at the surface. If COPC are located at depth in this area, it would be due to infiltration from the surface. Such infiltration is not expected to move COPC to great depths; thus, the purpose for collecting subsurface soils in the 0.5-6 foot interval. Although construction and utility work may proceed to depths of 12 to 15 bgs, COPC concentrations in the 0.5 to 6 foot interval are expected to be higher than for deeper intervals. Therefore, these data will be used to evaluate potential exposure to COPC in subsurface soil, which will provide a conservative estimate of risk for this pathway.

An indoor industrial or commercial worker in the residential/commercial/undeveloped area may be exposed to COPC in indoor air via inhalation due to volatilization of COPC from underlying soil and/or groundwater in this area. Similarly, an outdoor industrial or commercial worker may be exposed to COPC in surface soil via incidental ingestion, dermal contact and inhalation of volatiles and particulates. Inhalation of COPC volatilizing from groundwater and/or subsurface soil may also occur.

As access to Dead Creek is generally uncontrolled, it is possible that recreational receptors (i.e., trespassing children/teenagers) could be exposed to COPC in surface water and sediment of Dead Creek and Site M while wading. Although access to Borrow Pit Lake is uncontrolled, it is located on private property, and access is very difficult due to its setting. However, recreational teenagers could be exposed to COPC in surface water and sediment of Borrow Pit Lake while wading or swimming. Again, although access is difficult, recreational fishing may occur in Borrow Pit Lake.

Groundwater is not used as a source of drinking water in the area. However, there are some private wells in the area that may be used for outdoor household activities. Therefore, residents may be exposed to COPC in groundwater in these areas via incidental ingestion and dermal contact. If it is determined that groundwater is being used as a sole source of drinking water for any of the residences downgradient of the fill areas, a drinking water scenario will be added to the HHRA.

Final receptor selection will be made once site analytical data have been evaluated and COPCs identified. If no COPCs are identified in a particular medium (e.g., fish), and/or the potential exposure pathway, upon further investigation, is judged to be incomplete (e.g., recreational fishing), then the exposure scenarios associated with that medium/pathway will not be quantitatively evaluated in the HHRA. The potential receptors and their associated exposure scenarios are discussed below and summarized in Table 5-1.

5.2 Sample Collection Strategy

Table 5-2 presents a summary of the sampling strategy for each environmental medium and identifies the number of samples to be collected. In addition, the exposure areas, receptor(s) and potential exposure route(s) to be evaluated using the data are identified, based on the CSM developed for the site (see Figure 2-1, and Table 5-1). Sample collection in residential areas has been focused on areas adjacent to Dead Creek upstream of Route 3, as these areas are closer to the fill areas than those downstream of Route 3.

5.3 Receptor Identification

The following subsections discuss the parameters that will be used to evaluate each of the potential receptors in the HHRA. Both RME and MLE scenarios will be evaluated for each receptor. Exposure factors common to several of the receptors are discussed in Section 5.4.

5.3.1 Indoor Industrial Worker

Exposure assumptions for the indoor industrial worker under the RME and MLE scenarios are shown in Table 5-3. Given the relatively shallow depth of groundwater, it is possible an indoor industrial worker may be exposed indirectly to groundwater via inhalation of volatile COPC migrating from groundwater and the subsurface to indoor air of an industrial/commercial building. The indoor industrial worker receptor will be evaluated for the fill areas and the residential/commercial/undeveloped areas of Sauget Area 1.

5.3.2 Outdoor Industrial Worker

Exposure assumptions for the outdoor industrial worker under the RME and MLE scenarios are shown in Table 5-4. The outdoor industrial worker may contact COPC in surface soil via incidental ingestion and dermal contact, and may inhale COPC via volatilization from the surface and subsurface and via particulate emissions from the surface.

5.3.3 Trespassing Teenager

Exposure assumptions for the trespassing teenager under the RME and MLE scenarios are shown in Table 5-5. It is assumed that this receptor can be exposed to COPC in surface soil in the fill areas via accidental ingestion, dermal contact, and inhalation of volatiles and particulates, and can be exposed to COPC in subsurface wastes and/or groundwater via inhalation of volatiles.

5.3.4 Construction/Utility Worker

Exposure assumptions for the construction/utility worker under the RME and MLE scenarios are shown in Table 5-6. Exposure media of interest in the evaluation of potential risk to a future construction/utility worker will potentially include surface soil, subsurface soil/wastes and groundwater. Exposure could occur via incidental ingestion of and dermal contact with soil/waste and shallow groundwater and via inhalation of fugitive dust and/or vapors from soil and groundwater. A construction/utility worker receptor will be evaluated for the fill areas and the residential/commercial/undeveloped areas of Sauget Area 1. The soil ingestion rate listed in Table 5-6 for the construction worker under the MLE scenario is discussed in Section 5.4.

5.3.5 Resident

Given the potential for migration of site-related COPC from the fill areas to a residential area, it is possible that a resident may be exposed to COPC in environmental media. The exposure media of interest are surface soil, subsurface soil, plant tissue, and groundwater. A resident may potentially be exposed directly to COPC in soil via incidental ingestion, dermal contact, and inhalation of volatiles and particulates. Indirect exposure to COPC in soil may occur and through ingestion of produce grown in

impacted residential soil. Public water is provided to residential areas; however, some private wells exist. Residents could be exposed to COPC in groundwater in these areas via incidental ingestion and dermal contact during outdoor household use. In addition, if VOCs are present in groundwater and/or subsurface soil in this area, residents could be exposed via inhalation of vapors migrating to indoor air. Table 5-7 presents the exposure assumptions for evaluation of a child resident (0 to 6 yrs of age) and an adult resident under RME and MLE scenarios. Because several of the Dead Creek segments are adjacent to the residential areas under evaluation, the recreational teenager (below) and residential receptor risks will be evaluated both separately and in total, as indicated in Table 5-1. In addition, a future residential exposure scenario will be evaluated for areas M and N. Because area M is a lagoon, the future exposure pathway to be evaluated will be inhalation of sediment–derived dusts by residential receptors in transects 1 and 2, assuming the lagoon could be drained and dried in the future.

5.3.6 Recreational Teenager

It is assumed that an adolescent could access Dead Creek and Borrow Pit Lake surface water and sediment for recreational purposes. Therefore, it is possible that a receptor (aged 7 to 18 years) (referred to here as a recreational teenager for ease of discussion) could be exposed to COPC present in surface water and sediment of Dead Creek and Borrow Pit Lake while wading or swimming, respectively. Exposure assumptions for the recreational teenager under the RME and MLE scenarios are shown in Table 5-8.

5.3.7 Recreational Fisher

Recreational fishing may take place at Borrow Pit Lake. As Dead Creek may serve as a potential migration pathway for COPC from the source areas, fish in Borrow Pit Lake may contain COPC in their tissue. Therefore, a recreational fisher has the potential to be exposed to site-related COPC through ingestion of fish from Borrow Pit Lake. This receptor may also contact COPC in surface water and sediment while fishing. The exposure assumptions for the recreational fish ingestion pathway for the RME and MLE receptors are summarized in Table 5-9. To determine if this pathway is complete, two field surveys will be conducted. An ecological evaluation of the Borrow Pit Lake will be used to determine if it can sustain a recreational fishery. In addition, a creel survey will be conducted to determine if Borrow Pit Lake is fished and what fish may be caught.

5.4 Exposure Parameters

5.4.1 Soil Ingestion Rate – Adult Construction Worker

Incidental soil ingestion occurs at all ages as a result of hand-to-mouth activities. Currently, there are little or no reliable quantitative data available for estimating adult soil ingestion rates. USEPA risk assessment guidance suggests a soil ingestion rate of 100 mg/day for adults in a residential scenario (USEPA, 1989a, 1991a), and a soil ingestion rate of 50 mg/day for adults in an industrial scenario (USEPA, 1991a).

USEPA presented an estimate of a soil ingestion rate for adults doing yard work of 480 mg/day in their supporting evidence for the commercial/industrial soil ingestion rate of 50 mg/day in the "Standard Default Exposure Factors" Directive (USEPA, 1991a); the 480 mg/day value was not presented in the table of default exposure factors. The Agency states: "For certain outdoor activities in the commercial/industrial setting (e.g., construction or landscaping), a soil ingestion rate of 480 mg/day may be used; however, this type of work is usually short-term and is often dictated by the weather. Thus, exposure frequency would generally be less than one year and exposure duration would vary according to site-specific construction/maintenance plans." However, some regions and state agencies have stipulated the use of this value to evaluate a construction worker exposure scenario. The Hawley (1985) study, which is the basis for the soil ingestion rate of 480 mg/day, was recently reviewed by the USEPA (USEPA, 1997a), which stated that, "Given the lack of supporting measurements, these estimates must be considered conjectural."

In the Hawley (1985) study, the author assumed that soil adheres to the surface area of the hands at a loading of 3.5 mg/cm^2. This value was based on a layer of soil on skin assumed to be 0.005 cm deep, a soil density of 1.5 g/cm^2, and 50% void space. Using the author's derived soil-to-skin adherence loading of 3.5 mg/cm^2 and assuming that the amount of soil covering a fraction of the hands (approximately 70 cm^2) is ingested twice a day, Hawley calculated a soil ingestion rate of 480 mg/day.

Hawley's 1985 analysis was one of the first published health risk assessments and was performed before any of the quantitative fecal tracer soil ingestion studies for either children or adults were conducted (Calabrese et al., 1989; Davis et al., 1990; Clausing et al., 1987; Calabrese et al., 1990). Thus, the estimate of 480 mg/day predates all of our current knowledge about soil ingestion among both children and adults, as well as recent published data on soil-to-skin adherence rates.

In 1993, USEPA sponsored a workshop to evaluate soil-to-skin adherence data. As a result, a study to determine a more accurate characterization of soil-to-skin adherence was sponsored by the USEPA and conducted by John C. Kissel and associates at the University of Washington (Kissel et al., 1996; Holmes et al., 1998). The intent of this study was to resolve uncertainties and develop more accurate measures of soil-to-skin loading rates for individuals involved in various occupational and recreational activities. As reported in the Exposure Factors Handbook (EFH) (USEPA ,1997a), soil loading on skin surfaces as a result of various occupational and recreational activities was directly measured. This study indicates that soil loadings vary with the type of activity and the body parts contacted. As one would expect, adherence appears to be greatest during outdoor activities such as farming and gardening, and more soil/dust tends to adhere to the hands and knees than to other areas of the body.

Average hand soil loading factors are as presented in the EFH (USEPA, 1997a) for the adult outdoor workers evaluated by Kissel and Holmes. In every case, soil adherence during occupational exposure was measured to be considerably lower than Hawley's estimate of 3.5 mg/cm^2. The range of soil adherence loadings measured by Kissel and Holmes falls within the USEPA range of 0.2 to 1.0 mg/cm^2 (USEPA, 1992b).

For this evaluation, the construction worker receptor is assumed to be exposed to COPC in surface and subsurface soils during excavation activity. Based on this exposure scenario, the "farmer" receptor provided in the EFH is considered to provide an upper-bound estimate of soil adherence. A soil ingestion rate can be calculated by substituting the soil adherence value for the receptor for the estimated value derived by Hawley (1985), as follows:

$$\frac{480\ mg/day}{3.5\ mg/cm^2} = \frac{ingestion\ rate\ (mg/day)}{soil\ adherence\ (mg/cm^2)}$$

The soil adherence value for the "farmer" is 0.47 mg/cm^2. The calculated soil ingestion value is 64 mg/day; therefore, a soil ingestion rate of 64 mg/day is used for the MLE construction worker receptor in this risk evaluation.

Additional support for this value comes from a new paper by Kissel and coworkers (Kissel et al., 1998) that presents the results of a study of the transfer of soil from hand to mouth by intentional licking. Soil was loaded onto the skin by pressing the hand onto soil, and the amount transferred to the mouth was measured. The thumb sucking, finger mouthing, and palm licking activities resulted in geometric mean soil mass transfers of 7.4 to 16 mg per event. The author concludes that "transfer of 10 mg or more of soil from a hand to the oral cavity in one event is possible, but requires moderate soil loading and more than incidental hand-to-mouth contact." However, "the fraction of soil transferred from hand to mouth that is subsequently swallowed is unknown but may be less than 100 percent." In addition, "the adult volunteers in this study reported that the presence of roughly 10 mg of soil in the mouth is readily detected (and unpleasant). Repeated unintentional ingestion of that mass of soil by adults therefore seems unlikely. In light of this observation, the 480 mg per day estimate [of Hawley, 1985] would require hundreds or perhaps thousands of hand-to-mouth contacts that resulted in soil transfer per day."

The 64 mg/day soil ingestion rate for the industrial and construction worker receptors recommended here is supported by this study, as 5 hand to mouth events during the course of a workday is more reasonable to assume than 48 or more.

For the RME scenario, a soil ingestion rate of 100 mg/day is assumed for the construction worker. This is the adult soil ingestion rate provided by USEPA (1991).

5.4.2 Frequency of Exposure to COPC in Soil

A meteorological factor is generally used to account for the fraction of the year during which exposure to constituents in soils may occur (Sheehan et al., 1991; USEPA, 1989a). It is reasonable to assume that direct contact with soil or intrusive activities will not occur for residential receptors during inclement weather, i.e., when it is raining or snowing, when the ground is wet or frozen, or when snow or ice (32

degrees F) are covering the ground. Thus the frequency of contact with potentially impacted soil is adjusted for these site-specific meteorological conditions (USEPA, 1989a).

There are only a few metrics that can be used to describe the fraction of the year when meteorological conditions are likely to limit exposure. These include temperature and the amount of precipitation per day and per year, which includes rain, snow and ice. While measures are collected hourly, the National Weather Service reports the number of days when precipitation is greater than 0.01 inches (one one-hundredth), greater than 0.1 inches (one tenth), and greater than 1 inch in their annual summary data. The number of days with precipitation greater than 0.1 inches is selected as the best representation of when exposure is likely to be limited by snow, rain, or ice. The National Oceanographic and Atmospheric Administration (NOAA) provides daily temperature data. It is assumed that exposure to soils is limited by temperatures less than 32 degrees F. Therefore, limiting the assumption of exposure to soils to those days with less than 0.1 inch of precipitation and temperatures above 32 degrees F is reasonable.

Based on ten years of meteorological data (1986-1995) provided by NOAA (1996), a meteorological factor is derived for use in the exposure equations. On the average, 66 days/year in this area receive 0.1 or greater inches of precipitation, and there are typically 27 days/year with a mean temperature of 32 degrees F or below. Accounting for days when both events occur (assumed to be 10% of the rain days or 6 days/year), the number of inclement days, 87, can be calculated (27 + 66 – 6 = 87). It is assumed that these days are evenly spaced throughout the course of the year. The meteorological factor is then calculated (87/365 = 24%). Thus it is assumed that exposure to soils will not occur for the "receptor" 24% of the assumed days of exposure (exposure frequency) due to weather restrictions.

The choice of a precipitation target of 0.1 inches is in keeping with guidance provided in the Compilation of Air Pollution Emission Factors, which assumes that soil suspension will not occur on days with more than 0.01 inches of precipitation (USEPA, 1995b). It is probable, however, that this metric both over- and under-estimates the potential exposure in some conditions. For, example, it is possible that some exposure to soils may occur on days when it rains just over 0.1 inches in the early morning and then the ground dries during the course of the day. Alternatively, significant rainfall, such as greater than 1 inch, is likely to saturate the soil for consecutive days, and several inches of snow (which may fall all on one day with one storm) may cover the ground and inhibit direct contact for several days. With both of these considerations in mind, it is likely that a meteorological factor based on inclement days defined as precipitation greater than 0.1 inches and average temperatures less than 32 degrees F is reasonable.

5.5 Quantification of Potential Exposures

To estimate the potential risk to human health that may be posed by the presence of COPC at the site, it is first necessary to estimate the potential exposure dose of each COPC. The exposure dose is estimated for each constituent via each exposure pathway by which the receptor is assumed to be

exposed. Exposure dose equations combine the estimates of constituent concentration in the environmental medium of interest with assumptions regarding the type and magnitude of each receptor's potential exposure to provide a numerical estimate of the exposure dose. The exposure dose is defined as the amount of COPC taken into the receptor and is expressed in units of milligrams of COPC per kilogram of body weight per day (mg/kg-day).

Exposure doses are defined differently for potential carcinogenic and noncarcinogenic effects. The Chronic Average Daily Dose (CADD) is used to estimate a receptor's potential intake from exposure to a COPC with noncarcinogenic effects. According to USEPA (1989a), the CADD should be calculated by averaging the dose over the period of time for which the receptor is assumed to be exposed. Therefore, the averaging period is the same as the exposure duration. For COPC with potential carcinogenic effects, however, the Lifetime Average Daily Dose (LADD) is employed to estimate potential exposures. In accordance with USEPA (1989a) guidance, the LADD is calculated by averaging exposure over the receptor's assumed lifetime (70 years). Therefore, the averaging period is the same as the receptor's assumed lifetime. The standardized equations for estimating a receptor's average daily dose (both lifetime and chronic) are presented below, followed by descriptions of receptor-specific exposure parameters and constituent-specific parameters.

5.5.1 Estimating Potential Exposure from Ingestion of and Dermal Contact with Soil or Sediment

Both incidental ingestion of, and dermal contact with, soil and/or sediment are assumed to occur for many of the receptors. The following equations are used to calculate the estimated exposure.

Average Daily Dose (Lifetime and Chronic) Following Incidental Ingestion of Soil or Sediment (mg/kg-day):

$$ADD = \frac{CS \times IR \times EF \times ED \times AAF_o \times CF}{BW \times AT}$$

where:

ADD	=	Average Daily Dose (mg/kg-day)
CS	=	Soil concentration (mg/kg soil)
IR	=	Ingestion rate (mg soil/day)
EF	=	Exposure frequency (days)
ED	=	Exposure duration (year)
AAF_o	=	Oral-Soil Absorption Adjustment Factor (AAF) (unitless)
CF	=	Unit conversion factor (kg soil/10^6 mg soil)
BW	=	Body weight (kg)
AT	=	Averaging time (days)

Average Daily Dose (Lifetime and Chronic) Following Dermal Contact with Soil or Sediment (mg/kg-day):

$$ADD = \frac{CS \times SA \times AF \times EF \times ED \times AAF_d \times CF}{BW \times AT}$$

where:

ADD	=	Average Daily Dose (mg/kg-day)
CS	=	Soil concentration (mg/kg soil)
SA	=	Exposed skin surface area (cm^2/day)
AF	=	Soil to skin adherence factor (mg soil/cm^2)
EF	=	Exposure frequency (days)
ED	=	Exposure duration (year)
AAF_d	=	Dermal-Soil AAF (unitless)
CF	=	Unit conversion factor (kg soil/10^6 mg soil)
BW	=	Body weight (kg)
AT	=	Averaging time (days)

5.5.2 Estimating Potential Exposure via Inhalation

Exposure to COPC migrating from soil to air is assumed to occur for many of the potential receptors. The equation used to estimate exposure to COPC via inhalation is as follows:

Average Daily Dose (Lifetime and Chronic) Following Inhalation of COPC (mg/kg-day):

$$ADD = \frac{CA \times IR \times AAF_i \times ET \times EF \times ED}{BW \times AT}$$

where:

ADD	=	Average Daily Dose (mg/kg-day)
CA	=	Air concentration (mg/m^3)
IR	=	Inhalation rate (m^3 /hr)
AAF_i	=	Inhalation AAF (unitless)
ET	=	Exposure time (hours/day)
EF	=	Exposure frequency (days)
ED	=	Exposure duration (year)
BW	=	Body weight (kg)
AT	=	Averaging time (days)

5.5.3 Estimating Potential Exposure from Groundwater/Surface Water

A potential construction worker may contact COPC in groundwater during soil excavation. The risk assessment assumes that the recreational teenager will come in contact with surface waters of Dead Creek and Borrow Pit Lake. In addition, residents could contact groundwater via outdoor use of private well water. The equation used to estimate a receptor's potential exposure via incidental ingestion of groundwater/surface water is:

Average Daily Dose (Lifetime and Chronic) Following Ingestion of Water (mg/kg-day):

$$ADD = \frac{CW \times IR \times EF \times ED \times AAF_o \times CF}{BW \times AT}$$

where:

ADD	=	Average Daily Dose (mg/kg-day)
CW	=	Water concentration (mg/L)
IR	=	Water ingestion rate (L/day)
EF	=	Exposure frequency (days)
ED	=	Exposure duration (year)
AAF_o	=	Oral-water AAF (unitless)
BW	=	Body weight (kg)
AT	=	Averaging time (days)

The equation used to estimate a receptor's potential exposure via dermal contact with groundwater/surface water is as follows:

Average Daily Dose (Lifetime and Chronic) Following Dermal Contact with Water (mg/kg-day):

$$ADD = \frac{CW \times SA \times PC \times ET \times EF \times ED \times AAF_d \times CF}{BW \times AT}$$

where:

ADD	=	Average Daily Dose (mg/kg-day)
CW	=	Water concentration (mg/L)
SA	=	Exposed skin surface area (cm^2/day)
PC	=	Dermal permeability constant (cm/hr)
ET	=	Exposure time (hours/day)
EF	=	Days exposed per year (day/365 day)
ED	=	Years exposed (year)

indoor air, and generation of fugitive dust and volatiles from undisturbed soils as well as during construction activities.

The model to be used to predict indoor air concentrations of VOCs will be the model of Johnson and Ettinger recommended by the USEPA (1996a and 1997c) to predict concentrations of COPC migrating from groundwater or soil to indoor air of an overlying building. Concentrations of volatile COPC in outdoor air due to migration from subsurface soil and/or groundwater will be estimated using the methodology recommended by the American Society for Testing and Materials (ASTM, 1995).

The calculation of concentrations of inorganic and semivolatile organic COPC bound to soil in fugitive dust involves multiplying the soil exposure point concentrations by the concentration of dust in air as follows:

1) Ambient Air:

   COPC concentration in ambient air (mg/m^3) = Exposure point concentration in soil (mg/kg soil) x Dust concentration ($kg\ soil/m^3$)

   The dust concentration in air to be used in the evaluation of ambient outdoor air pathways in this risk evaluation is the inverse of the particulate emission factor derived in accordance with USEPA guidance (USEPA, 1996a).

2) Excavation Air (i.e., during construction activities):

   COPC concentration in excavation air (mg/m^3) = Exposure point concentration in soil (mg/kg soil) x Dust concentration ($mg\ soil/m^3$) x Unit correction factor ($1\ kg/10^6\ mg$)

   The dust concentration in air to be used in the evaluation of excavation air pathways in this risk evaluation is 60 mg/m^3. This value is the recommended concentration of respirable particulate with a mean diameter of 10 microns or less (PM10) for excavation activities (MADEP, 1995).

COPC concentrations in homegrown produce are dependent upon the potential for direct uptake of COPC from soil through plant roots and will be estimated via the following equation:

COPC Concentration in Produce (mg COPC/kg plant tissue) = Concentration of COPC in soil (mg COPC/kg Soil) x Root Uptake Factor (unitless)

The root uptake factor accounts for uptake from soil to the homegrown produce. As appropriate, chemical-specific root uptake factors will be identified from sources such as Baes et al. (1984) for use in the risk assessment.

TABLE 5-1
RECEPTOR-AREA MATRIX
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

Receptor / Medium / Secondary Medium (Pathways)	Exposure Areas: Fill Area/Sites G	H	I	L	M (lagoon)	N	Creek Segments: Ref Area	CS-B	CS-C	CS-D	CS-E	CS-F	Residential/Commercial/Undeveloped Transects: 1	2	3	4	5	6	7	Total Receptors*
Indoor Industrial Worker (IW)																				
Fill Area: Subsurface Waste	IW-RME-G	IW-RME-H	IW-RME-I	IW-RME-L		IW-RME-N							IW-RME-C/R-1	IW-RME-C/R-2	IW-RME-C/R-3	IW-RME-C/R-4	IW-RME-C/R-5	IW-RME-C/R-6	IW-RME-C/R-7	12
Indoor Air (inh)	IW-MLE-G	IW-MLE-H	IW-MLE-I	IW-MLE-L		IW-MLE-N							IW-MLE-C/R-1	IW-MLE-C/R-2	IW-MLE-C/R-3	IW-MLE-C/R-4	IW-MLE-C/R-5	IW-MLE-C/R-6	IW-MLE-C/R-7	12
Transects: Subsurface Soi																				
Indoor Air (inh)																				
Groundwater																				
Indoor Air (inh)																				
Outdoor Industrial Worker (OW)																				
Surface Soil (ing/derm																				
Outdoor Air (inh)																				
Fill Area: Subsurface Waste	OW-RME-G	OW-RME-H	OW-RME-I	OW-RME-L		OW-RME-N							OW-RME-C/R-1	OW-RME-C/R-2	OW-RME-C/R-3	OW-RME-C/R-4	OW-RME-C/R-5	OW-RME-C/R-6	OW-RME-C/R-7	12
Outdoor Air (inh)	OW-MLE-G	OW-MLE-H	OW-MLE-I	OW-MLE-L		OW-MLE-N							OW-MLE-C/R-1	OW-MLE-C/R-2	OW-MLE-C/R-3	OW-MLE-C/R-4	OW-MLE-C/R-5	OW-MLE-C/R-6	OW-MLE-C/R-7	12
Transects: Subsurface Soi																				
Outdoor Air (inh)																				
Groundwater																				
Outdoor Air (inh)																				
Construction Worker (CW)																				
Surface Soil (ing/derm																				
Outdoor Air (inh)																				
Fill Area: Subsurface Waste (ing/derm)	CW-RME-G	CW-RME-H	CW-RME-I	CW-RME-L		CW-RME-N							CW-RME-C/R-1	CW-RME-C/R-2	CW-RME-C/R-3	CW-RME-C/R-4	CW-RME-C/R-5	CW-RME-C/R-6	CW-RME-C/R-7	12
Outdoor Air (inh)	CW-MLE-G	CW-MLE-H	CW-MLE-I	CW-MLE-L		CW-MLE-N							CW-MLE-C/R-1	CW-MLE-C/R-2	CW-MLE-C/R-3	CW-MLE-C/R-4	CW-MLE-C/R-5	CW-MLE-C/R-6	CW-MLE-C/R-7	12
Transects: Subsurface Soil (ing/derm)																				
Outdoor Air (inh)																				
Groundwater (ing/derm																				
Outdoor Air (inh)																				
Trespassing Teenager (TT)																				
Surface Soil (ing/derm																				
Outdoor Air (inh)																				
Subsurface Waste	TT-RME-G	TT-RME-H	TT-RME-I	TT-RME-L		TT-RME-N														5
Outdoor Air (inh)	TT-MLE-G	TT-MLE-H	TT-MLE-I	TT-MLE-L		TT-MLE-N														5
Groundwater																				
Outdoor Air (inh)																				
Recreational Teen (RT)																				
Sediment (ing/derm)					*			*	**	**	***									
Surface Water (ing/derm)					RT-RME-M		RT-RME-REF	RT-RME-CS-B	RT-RME-CS-C	RT-RME-CS-D	RT-RME-CS-E	RT-RME-CS-F								7
					RT-MLE-M		RT-MLE-REF	RT-MLE-CS-B	RT-MLE-CS-C	RT-MLE-CS-D	RT-MLE-CS-E	RT-MLE-CS-F								7
Recreational Fisher (RF)																				
Sediment (ing/derm																				
Surface Water (ing/derm)							RF-RME-REF					RF-RME-F								2
Fish Tissue (ing)							RF-MLE-REF					RF-MLE-F								2
Resident (RES)																				
Surface Soil (ing/derm																				
Outdoor Air (inh)																				
Subsurface Soil (or Waste in Site N)																				
Indoor/Outdoor Air (inh)													*	*	**	**	**	***	***	
Groundwater (ing/derm					RES-RME-M	RES-RME-N							RES-RME-C/R-1	RES-RME-C/R-2	RES-RME-C/R-3	RES-RME-C/R-4	RES-RME-C/R-5	RES-RME-C/R-6	RES-RME-C/R-7	9
Indoor/Outdoor Air (inh)					RES-MLE-M (a	RES-MLE-N							RES-MLE-C/R-1	RES-MLE-C/R-2	RES-MLE-C/R-3	RES-MLE-C/R-4	RES-MLE-C/R-5	RES-MLE-C/R-6	RES-MLE-C/R-7	9
Produce (ing)																				****
Total Receptors	8	8	8	8	4	10	4	2	2	2	2	4	4	4	4	4	4	4	4	**118**

Notes
RME - Reasonable Maximum Exposure
MLE - Most Likely Exposure
ing - ingestion
derm - dermal contact
inh - inhalation

* In addition to separate risk calculations, due to proximity, risks for residential receptors for transects 1 and 2 will be added to risks for the recreational teen in CS-B and site M.
** In addition to separate risk calculations, due to proximity, risks for residential receptors for transects 3,4 and 5 will be added to risks for the recreational teen in CS-C and CS-D.
*** In addition to separate risk calculations, due to proximity, risks for residential receptors for transects 6 and 7 will be added to risks for the recreational teen in CS-E.
****There are 116 receptors - each is evaluated for several exposure pathways.
(a) - The residential scenario for area M will consider inhalation of sediment derived dust by nearby residential receptors (i.e., transects 1 and 2) should the lagoon be drained and dried in the future

TABLE 5-2
SAMPLING IN SUPPORT OF THE HUMAN HEALTH RISK ASSESSMENT
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

Receptor / Exposure Route	Environmental Medium	Sampling Strategy	Number of Samples
Indoor Industrial Worker Inhalation of Indoor Air	Fill Area Waste	At Sites G,H,I,L and N: Collect 1 sample from each of 4 borings at each site.	20 samples
Outdoor Industrial Worker Inhalation of Outdoor Air			
Teenage Trespasser Inhalation of Outdoor Air			
Construction/Utility Worker • Incidental Ingestion of and Dermal Contact with Waste • Inhalation of Particulates and Volatiles			
Outdoor Industrial Worker • Incidental Ingestion of and Dermal Contact with Soil • Inhalation of Particulates and Volatiles	Fill Area Surface Soil (0-0.5 ft bgs)	At Sites G,H,I,L and N: Collect 1 sample from each of 4 borings at each site.	20 samples
Teenage Trespasser • Incidental Ingestion of and Dermal Contact with Soil • Inhalation of Particulates and Volatiles			
Construction/Utility Worker • Incidental Ingestion of and Dermal Contact with Soil • Inhalation of Particulates and Volatiles			

TABLE 5-2
SAMPLING IN SUPPORT OF THE HUMAN HEALTH RISK ASSESSMENT
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

Receptor / Exposure Route	Environmental Medium	Sampling Strategy	Number of Samples
Indoor Industrial Worker Inhalation of Indoor Air	Fill Area Groundwater	Indoor air concentrations of VOCs will be modeled based on shallow groundwater concentrations of VOCs.	• Fill Area shallow groundwater - 19 samples from 19 wells. • Downgradient shallow alluvial aquifer
Outdoor Industrial Worker Inhalation of Outdoor Air		Outdoor air concentrations of VOCs will be modeled based on shallow groundwater concentrations of VOCs.	
Construction/Utility Worker Inhalation of Outdoor Air			
Recreational Teenager Inhalation of Outdoor Air			
Construction/Utility Worker Incidental Ingestion of and Dermal Contact with Groundwater		Sample Shallow groundwater. Excavation is generally not expected to exceed 15 ft bgs; however, most shallow samples from each well will be used.	1) Sites G,H, and L: 3-6 samples from 3 locations. 2) Site I: 3-6 samples from 3 locations. 3) Areas southwest of sites G,H, and L: 3-6 samples from 3 wells.
Indoor Industrial Worker Inhalation of Indoor Air	Residential Area Groundwater	Indoor air concentrations of VOCs will be modeled based on shallow groundwater concentrations of VOCs.	Developed and Undeveloped Areas in Dead Creek Floodplain closest to source areas:
Resident Inhalation of Indoor Air			
Outdoor Industrial Worker Inhalation of Outdoor Air		Outdoor air concentrations of VOCs will be modeled based on shallow groundwater concentrations of VOCs.	
Construction/Utility Worker Inhalation of Outdoor Air			
Resident Inhalation of Outdoor Air			
Construction/Utility Worker Incidental Ingestion of and Dermal Contact with Groundwater		Sample Shallow groundwater. Excavation is generally not expected to exceed 15 ft bgs; however, most shallow samples from each well will be used.	6 samples from 2 wells at water table (Walnut St. and Judith Ln.)
Resident Incidental Ingestion of and Dermal Contact with Groundwater		Sample groundwater in the developed and undeveloped areas of the Dead Creek Floodplain.	4 samples from yet to be identified private wells in the Walnut St. and Judith Ln. area.

TABLE 5-2
SAMPLING IN SUPPORT OF THE HUMAN HEALTH RISK ASSESSMENT
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

Receptor / Exposure Route	Environmental Medium	Sampling Strategy	Number of Samples
Construction/Utility Worker • Incidental Ingestion of and Dermal Contact with Soil • Inhalation of Particulates and Volatiles	Residential Area Surface Soils (0-0.5 ft bgs)	Seven transects in undeveloped areas sampled at 200 ft. intervals. Three residences along each of Transects 1-6, and two residences along Transect 7.	45 samples 20 samples
Outdoor Industrial Worker • Incidental Ingestion of and Dermal Contact with Soil • Inhalation of Particulates and Volatiles			
Resident • Incidental Ingestion of and Dermal Contact with Soil • Inhalation of Particulates and Volatiles in Outdoor Air			
Resident • Produce Ingestion		Produce constituent concentrations will be modeled based on surface soil data collected along undeveloped area transects and at residences.	
Construction/Utility Worker • Incidental Ingestion of and Dermal Contact with Soil • Inhalation of Particulates and Volatiles	Residential Area Subsurface Soils (0.5- 6 ft bgs)	Seven transects in undeveloped areas sampled at 200 ft. intervals. Three residences along each of Transects 1-6, and two residences along Transect 7.	45 samples 20 samples
Outdoor Industrial Worker • Inhalation of Volatiles			
Resident • Inhalation of Volatiles			
Indoor Industrial Worker • Inhalation of Volatiles			

TABLE 5-2
SAMPLING IN SUPPORT OF THE HUMAN HEALTH RISK ASSESSMENT
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

Receptor / Exposure Route	Environmental Medium	Sampling Strategy	Number of Samples
Recreational Teenager Incidental Ingestion of and Dermal Contact with Sediment while Wading	Dead Creek Sediment *	Sample undeveloped areas of Dead Creek (CS-B and CS-F) at 200 ft. intervals for industry-specific constituents.	50 samples
		Sample developed areas of Dead Creek (CS-C,D and E) at 150 ft. intervals for industry-specific constituents.	47 samples
		Sample entire length of Dead Creek at 1000 ft. intervals for full suite of analytes.	20 samples
	Site M sediment	Sample Site M sediments.	4 samples
Recreational Teenager Incidental Ingestion of and Dermal Contact with Sediment while Swimming	Borrow Pit Lake Sediment North of Dead Creek Discharge *	Sample Borrow Pit Lake at 400 ft. intervals for industry-specific constituents.	8 samples
Recreational Fisher Incidental Ingestion of and Dermal Contact with Sediment while Wading			
Recreational Teenager Incidental Ingestion of and Dermal Contact with Surface Water while Wading	Dead Creek Surface Water	Sample Dead Creek Surface Water at approximately 1000 ft. intervals for full suite of analytes.	18 samples
Recreational Teenager Incidental Ingestion of and Dermal Contact with Surface Water while Swimming	Borrow Pit Lake Surface Water North of Dead Creek Discharge	Sample Borrow Pit Lake Surface Water at approximately 1000 ft. intervals for site-specific constituents.	2 samples
Recreational Fisher Incidental Ingestion of and Dermal Contact with Surface Water while Wading			
Recreational Fisher Fish Ingestion	Various Fish in Borrow Pit Lake	9 predator fish, 9 bottom feeding fish and 9 forage fish whole fish samples will be collected. Compositing will be conducted as necessary to achieve appropriate sample size. Data from game fish will be used in the HHRA.	27 samples

Notes:
bgs - below ground surface.
ft - feet.
* In addition, sediment sampling conducted in support of the ecological risk assessment will be used in the human heath risk assessment.

TABLE 5-3

SUMMARY OF POTENTIAL EXPOSURE ASSUMPTIONS - INDOOR INDUSTRIAL WORKER
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

Parameter		RME On-Site Indoor Worker		MLE On-Site Indoor Worker	
Parameters Used in the Indoor Air Pathway					
	Exposure Time (hr/day)	8	(a)	8	(a)
	Exposure Frequency (days/year)	250	(b)	250	(b)
	Exposure Duration (yr)	25	(b)	7	(c)
	Inhalation Rate (m^3/hour)	1.6	(d)	1.0	(e)
	Body Weight (kg)	70	(b)	70	(b)

Notes:
MLE - Most Likely Exposure.
RME - Reasonable Maximum Exposure.
(a) - USEPA, 1997a. Exposure Factors Handbook. 50th percentile time spent at work, males and females, all ages. Table 15-68.
(b) - USEPA, 1991a. Standard Default Exposure Factors.
(c) - USEPA, 1997a. Exposure Factors Handbook. Recommended value for occupational tenure listed in Table 1-2.
(d) - USEPA, 1997a. Exposure Factors Handbook. Inhalation rate for moderate activity.
(e) - USEPA, 1997a. Exposure Factors Handbook. Inhalation rate for light activity.

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TABLE 5-4
SUMMARY OF POTENTIAL EXPOSURE ASSUMPTIONS - OUTDOOR INDUSTRIAL WORKER
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

Parameter	RME Future Outdoor Industrial Worker		MLE Future Outdoor Industrial Worker	
Parameters Used in the Outdoor Air Pathway				
Exposure Time (hr/day)	8	(a)	8	(a)
Exposure Frequency (days/year)	190	(i)	190	(i)
Exposure Duration (yr)	25	(b)	7	(c)
Inhalation Rate (m^3/hour)	1.6	(d)	1	(e)
Body Weight (kg)	70	(b)	70	(b)
Parameters Used in the Surface Soil Pathway				
Exposure Frequency (days/year)	190	(i)	190	(i)
Exposure Duration (yr)	25	(b)	7	(c)
Soil Ingestion Rate (mg/day)	50	(f)	30	(j)
Skin Contacting Medium (cm^2)	3339	(g)	3339	(g)
Soil on Skin (mg/cm^2)	0.02	(h)	0.02	(h)
Body Weight (kg)	70	(b)	70	(b)

Notes:
MLE - Most Likely Exposure.
RME - Reasonable Maximum Exposure.
(a) - USEPA, 1997a. Exposure Factors Handbook. 50th percentile time spent at work, males and females, all ages. Table 15-68.
(b) - USEPA, 1991a. Standard Default Exposure Factors.
(c) - USEPA, 1997a. Exposure Factors Handbook. Recommended value for occupational tenure listed in Table 1-2.
(d) - USEPA, 1997a. Exposure Factors Handbook. Inhalation rate for moderate activity.
(e) - USEPA, 1997a. Exposure Factors Handbook. Inhalation rate for light activity.
(f) - USEPA, 1997a. Exposure Factors Handbook. Average soil ingestion rates listed in Table 1-2.
(g) - USEPA, 1997a. Exposure Factors Handbook. Represents 50th percentile values for males and females based on hands, forearms, and face.
(h) - USEPA, 1997a. Exposure Factors Handbook. See Table 5-10 for calculation.
(i) - Exposure frequency of 250 days (USEPA, 1991a) adjusted for percentage of days with inclement weather (24%), [250-(250*0.24) = 190]; see text.
(j) - Calabrese, E.J., et. al. 1990. Preliminary adult soil ingestion estimates; results of a pilot study. Regul. Toxicol. Pharmacol. 12L88-95. As cited in USEPA, 1997a. Exposure Factors Handbook. Low end of range.

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TABLE 5-5
SUMMARY OF POTENTIAL EXPOSURE ASSUMPTIONS - TRESPASSING TEENAGER
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

Parameter	RME Trespassing Teenager (7 to 18 yrs)		MLE Trespassing Teenager (7 to 18 yrs)	
Parameters Used in the Surface Soil Pathway				
Exposure Frequency (days/year)	26	(a)	13	(b)
Exposure Duration (yr)	11	(c)	11	(c)
Soil Ingestion Rate (mg/day)	100	(d)	50	(e)
Skin Contacting Medium (cm^2)	3677	(f)	3677	(f)
Soil on Skin (mg/cm^2)	0.02	(g)	0.02	(g)
Body Weight (kg)	47	(h)	47	(h)
Parameters Used in the Outdoor Air Pathway				
Exposure Time (hr/day)	2	(i)	2	(i)
Exposure Frequency (days/year)	26	(a)	13	(b)
Exposure Duration (yr)	11	(c)	11	(c)
Inhalation Rate (m^3/hour)	1.2	(j)	1	(k)
Body Weight (kg)	47	(h)	47	(h)

Notes:
MLE - Most Likely Exposure.
RME - Reasonable Maximum Exposure.
(a) - 1 day per week for 26 weeks (6 months) of the year.
(b) - 1 day per 2 weeks for 26 weeks (6 months) of the year.
(c) - Trespassing teenager is assumed to range in age from 7 to 18. Therefore, total exposure duration is 11 years.
(d) - USEPA, 1991a. Standard Default Exposure Factors.
(e) - USEPA, 1997a. Exposure Factors Handbook. Average soil ingestion rate for an adult listed in Table 1-2.
(f) - USEPA, 1997a. Exposure Factors Handbook. Average surface are of hands, forearms and lower legs of males and females aged 7 to 18.
(g) - USEPA, 1997a. Exposure Factors Handbook. See Table 5-14 for calculation.
(h) - USEPA, 1997a. Exposure Factors Handbook. Body weight is the average of males and females aged 7 to 18.
(i) - The trespassing teen is assumed to stay in the fill area for two hours.
(j) - USEPA, 1997a. Exposure Factors Handbook. Inhalation rates is the value for moderate activity (children) listed in Table 5-23.
(k) - USEPA, 1997a. Exposure Factors Handbook. Inhalation rates is the value for light activity (children) listed in Table 5-23.

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TABLE 5-6
SUMMARY OF POTENTIAL EXPOSURE ASSUMPTIONS - CONSTRUCTION WORKER
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

Parameter	RME Future Construction/Utility Worker		MLE Future Construction/Utility Worker	
Parameters Used in the Surface Soil and Subsurface Soil Inhalation Pathway				
Exposure Time (hr/day)	8	(a)	8	(a)
Exposure Frequency (days/year)	40	(b)	20	(c)
Exposure Duration (yr)	1	(d)	1	(d)
Inhalation Rate (m^3/hour)	2.5	(e)	1.5	(f)
Body Weight (kg)	70	(g)	70	(g)
Parameters Used in the Surface and Subsurface Soil Pathway				
Exposure Frequency (days/year)	40	(b)	20	(c)
Exposure Duration (yr)	1	(d)	1	(d)
Soil Ingestion Rate (mg/day)	100	(g)	64	(h)
Skin Contacting Medium (cm^2)	3339	(i)	3339	(i)
Soil on Skin (mg/cm^2)	0.19	(j)	0.19	(j)
Body Weight (kg)	70	(g)	70	(g)
Parameters Used in the Groundwater Pathway				
Exposure Time (hr/event)	1	(k)	1	(k)
Exposure Frequency (days/year)	10	(k)	5	(k)
Exposure Duration (yr)	1	(d)	1	(d)
Water Ingestion Rate (l/event)	0.005	(l)	0.005	(l)
Skin Contacting Medium (cm^2)	3339	(i)	3339	(i)
Body Weight (kg)	70	(g)	70	(g)
Parameters Used in the Groundwater Inhalation Pathway				
Exposure Time (hr/day)	8	(a)	8	(a)
Exposure Frequency (days/year)	40	(b)	20	(c)
Exposure Duration (yr)	1	(d)	1	(d)
Inhalation Rate (m^3/hour)	2.5	(e)	1.5	(f)
Body Weight (kg)	70	(g)	70	(g)

Notes:
MLE - Most Likely Exposure.
RME - Reasonable Maximum Exposure.
(a) - USEPA, 1997a. Exposure Factors Handbook. 50th percentile time spent at work, males and females, all ages. Table 15-68.
(b) - Exposure frequency is equivalent to 5 days per week for 2 months.
(c) - Exposure frequency is equivalent to five days per week for one month.
(d) - Construction activities are assumed to occur over a 1 year period.
(e) - USEPA, 1997a. Exposure Factors Handbook. Inhalation rate is the value for heavy activity for an outdoor worker listed in Table 5-23.
(f) - USEPA, 1997a. Exposure Factors Handbook. Inhalation rate is the value for moderate activity for an outdoor worker listed in Table 5-23.
(g) - USEPA, 1991a. Standard Default Exposure Factors.
(h) - ENSR-derived value; described briefly in the text.
(i) - USEPA, 1997a. Exposure Factors Handbook. Represents 50th percentile values for males and females based on hands, forearms, and face.
(j) - USEPA, 1997a. Exposure Factors Handbook. See Table 5-11 for calculation.
(k) - Assumed that contact with water occurs only for a fraction of the total exposure duration and time.
(l) - USEPA, 1989a. Risk Assessment Guidance for Superfund, Volume I. Value is one-tenth of that assumed to occur during a swimming event.

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TABLE 5-7
SUMMARY OF POTENTIAL EXPOSURE ASSUMPTIONS - RESIDENT
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

Parameter	RME Resident				MLE Resident			
	Adult		Child (0 to 6 yrs)		Adult		Child (0 to 6 yrs)	
Parameters Used in the Outdoor Air Inhalation Pathway								
Exposure Time (hr/day)	2	(a)	6	(a)	2	(a)	6	(a)
Exposure Frequency (days/year)	266	(c)	266	(c)	178	(e)	178	(e)
Exposure Duration (yr)	24	(b)	6	(b)	7	(f)	2	(f)
Inhalation Rate (m^3/hour)	1.6	(g)	1.2	(g)	0.55	(h)	0.32	(i)
Body Weight (kg)	70	(b)	15	(b)	70	(b)	15	(b)
Parameters Used in the Surface Soil Pathway								
Exposure Frequency (days/year)	266	(c)	266	(c)	178	(e)	178	(e)
Exposure Duration (yr)	24	(b)	6	(b)	7	(f)	2	(f)
Soil Ingestion Rate (mg/day)	100	(b)	200	(b)	50	(j)	100	(j)
Skin Contacting Medium (cm^2)	5729	(k)	2058	(k)	5729	(k)	2058	(k)
Soil on Skin (mg/cm^2)	0.12	(l)	0.06	(l)	0.12	(l)	0.06	(l)
Body Weight (kg)	70	(b)	15	(b)	70	(b)	15	(b)
Parameters Used in the Homegrown Produce Pathway								
Exposure Frequency (days/year)	365	(p)	365	(p)	365	(p)	365	(p)
Exposure Duration (yr)	24	(b)	6	(b)	7	(f)	2	(f)
Produce Ingestion Rate (g/day)	525	(m)	113	(m)	147	(n)	31.5	(n)
Body Weight (kg)	70	(b)	15	(b)	70	(b)	15	(b)
Parameters Used in the Indoor Air Inhalation Pathway								
Exposure Time (hr/day)	16.4	(o)	18	(o)	16.4	(o)	18	(o)
Exposure Frequency (days/year)	266	(c)	266	(c)	178	(e)	178	(e)
Exposure Duration (yr)	24	(b)	6	(b)	7	(f)	2	(f)
Inhalation Rate (m^3/hour)	1.6	(g)	1.2	(g)	0.55	(h)	0.32	(i)
Body Weight (kg)	70	(b)	15	(b)	70	(b)	15	(b)
Parameters Used in the Groundwater Pathway								
Exposure Time (hr/event)	1	(r)	1	(r)	1	(r)	1	(r)
Exposure Frequency (days/year)	26	(s)	26	(s)	13	(t)	13	(t)
Exposure Duration (yr)	24	(b)	6	(b)	7	(f)	2	(f)
Water Ingestion Rate (l/event)	0.005	(q)	0.005	(q)	0.001	(u)	0.001	(u)
Skin Contacting Medium (cm^2)	5729	(k)	2058	(k)	5729	(k)	2058	(k)
Body Weight (kg)	70	(b)	15	(b)	70	(b)	15	(b)

Notes:
MLE - Most Likely Exposure.
RME - Reasonable Maximum Exposure.
(a) - USEPA, 1997a. Exposure Factors Handbook. Values for time spent outdoors listed in Table 1-2 (average of weekends /weekdays for children).
(b) - USEPA, 1991a. Standard Default Exposure Factors.
(c) - Exposure frequency of 350 days (USEPA, 1991a) adjusted for percentage of days with inclement weather (24%), [350-(350*0.24) = 266]; See text.
(d) - USEPA, 1993b. Central tendency residential exposure frequency = 234 days.
(e) - Exposure frequency of 234 days (USEPA, 1993b) adjusted for percentage of days with inclement weather (24%), [234 - (234*0.24) = 178]; See text.
(f) - USEPA, 1997a. Exposure Factors Handbook. Recommended average for time residing in a household, Table 1-2. (9 years total, assuming 7 years as an adult and 2 as a child - assumes that the 2 years as a child can occur anywhere between the ages of 0 to 6. Therefore, exposure factors for a 0 to 6 year old child are employed).
(g) - USEPA, 1997a. Exposure Factors Handbook. Inhalation rates are the values for moderate activity listed in Table 5-23.
(h) - USEPA, 1997a. Exposure Factors Handbook. Average daily inhalation rate for men and women, Table 5-23.
(i) - USEPA, 1997a. Exposure Factors Handbook. Average of recommended inhalation rates for children age 0-6 years, Table 5-23.
(j) - USEPA, 1997a. Exposure Factors Handbook. Average soil ingestion rates listed in Table 1-2.
(k) - USEPA, 1997a. Exposure Factors Handbook. Represents average 50th percentile surface area for males and females of hands, forearms, lower legs, and feet.
(l) - USEPA, 1997a. Exposure Factors Handbook. See Tables 5-12 and 5-13 for calculation.
(m) - USEPA, 1997a. Exposure Factors Handbook. Based on recommended 95th percentile homegrown vegetable intake of 7.5 g/kg body weight-day, Table 1-2.
(n) - USEPA, 1997a. Exposure Factors Handbook. Based on average homegrown vegetable intake of 2.1 g/kg body weight-day, Table 1-2.
(o) - USEPA, 1997a. Exposure Factors Handbook. Values for time spent indoors listed in Table 1-2 (average of weekends /weekdays for children; assumes that adult spends time away from the household).
(p) - Produce ingestion rate is based on 365 days per year.
(q) - USEPA, 1989a. Risk Assessment Guidance for Superfund, Volume I. Value is one-tenth of that assumed to occur during a swimming event.
(r) - The adult and child are assumed to be in contact with groundwater outdoors for one hour per event.
(s) - Two days per week for three months.
(t) - One day per week for three months.
(u) - USEPA, 1989a. Risk Assessment Guidance for Superfund, Volume I. Value is one-fiftieth of that assumed to occur during a swimming event.

TABLE 5-8
SUMMARY OF POTENTIAL EXPOSURE ASSUMPTIONS - RECREATIONAL TEENAGER
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

Parameter	RME Recreational Teenager (7 to 18 yrs)		MLE Recreational Teenager (7 to 18 yrs)	
Parameters Used in the Dead Creek Sediment Pathway - Wading				
Exposure Frequency (days/year)	26	(a)	13	(b)
Exposure Duration (yr)	11	(c)	11	(c)
Soil Ingestion Rate (mg/day)	100	(d)	50	(e)
Skin Contacting Medium (cm^2)	2029	(f)	2029	(f)
Sediment on Skin (mg/cm^2)	1	(g)	1	(g)
Body Weight (kg)	47	(h)	47	(h)
Parameters Used in the Dead Creek Surface Water Pathway - Wading				
Exposure Frequency (days/year)	26	(a)	13	(b)
Exposure Duration (yr)	11	(c)	11	(c)
Surface Water Ingestion Rate (l/event)	0.01	(i)	0.005	(j)
Skin Contacting Medium (cm^2)	2029	(f)	2029	(f)
Body Weight (kg)	47	(h)	47	(h)
Paramaters Used in the Borrow Pit Lake Sediment Pathway - Swimming				
Exposure Frequency (days/year)	12	(k)	6	(l)
Exposure Duration (yr)	11	(c)	11	(c)
Soil Ingestion Rate (mg/day)	100	(d)	50	(e)
Skin Contacting Medium (cm^2)	2029	(f)	2029	(f)
Sediment on Skin (mg/cm^2)	1	(g)	1	(g)
Body Weight (kg)	47	(h)	47	(h)
Parameters Used in the Borrow Pit Lake Surface Water Pathway - Swimming				
Exposure Frequency (days/year)	12	(k)	6	(l)
Exposure Duration (yr)	11	(c)	11	(c)
Surface Water Ingestion Rate (l/event)	0.05	(m)	0.01	(i)
Skin Contacting Medium (cm^2)	13533	(n)	13533	(n)
Body Weight (kg)	47	(h)	47	(h)

Notes:
MLE - Most Likely Exposure.
RME - Reasonable Maximum Exposure.
(a) - 1 day per week for 26 weeks (6 months) of the year.
(b) - 1 day per 2 weeks for 26 weeks (6 months) of the year.
(c) - Recreational teenager is assumed to range in age from 7 to 18. Therefore, total exposure duration is 11 years.
(d) - USEPA, 1991a. Standard Default Exposure Factors.
(e) - USEPA, 1997a. Exposure Factors Handbook. Average soil ingestion rate for an adult listed in Table 1-2.
(f) - USEPA, 1997a. Exposure Factors Handbook. Average surface are of feet and 1/4 the legs of males and females aged 7-18.
(g) - USEPA, 1992b. Dermal Exposure Assessment: Principles and Applications.
(h) - USEPA, 1997a. Exposure Factors Handbook. Body weight is the average of males and females aged 7-18.
(i) - USEPA, 1989a. Risk Assessment Guidance for Superfund, Volume I. Value is one-fifth of that assumed to occur during a swimming event.
(j) - USEPA, 1989a. Risk Assessment Guidance for Superfund, Volume I. Value is one-tenth of that assumed to occur during a swimming event.
(k) - Two events per month for the 6 warmest months of the year.
(l) - One events per month for the 6 warmest months of the year.
(m) - USEPA, 1989a. Risk Assessment Guidance for Superfund, Volume I. Value for a swimming event.
(n) - Value represents average total body surface area of males and females aged 7 to 18. Assumed 100% of skin surface exposed while swimming.

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TABLE 5-9
SUMMARY OF POTENTIAL EXPOSURE ASSUMPTIONS - RECREATIONAL FISHER
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

Parameter		RME Adult Recreational Fisher		MLE Adult Recreational Fisher	
Parameters Used in the Fish Ingestion Pathway					
	Exposure Frequency (days/year)	365	(a)	365	(a)
	Exposure Duration (yr)	30	(b)	9	(c)
	Fish Ingestion Rate (g/day)	8	(d)	1	(e)
	Body Weight (kg)	70	(b)	70	(b)
Parameters Used in the Surface Water Pathway - Wading					
	Exposure Frequency (days/year)	22	(k)	3	(l)
	Exposure Duration (yr)	30	(b)	9	(c)
	Surface Water Ingestion Rate (l/event)	0.01	(f)	0.005	(m)
	Skin Contacting Medium (cm^2)	4500	(g)	4500	(g)
	Body Weight (kg)	70	(b)	70	(b)
Paramaters Used in the Sediment Pathway - Wading					
	Exposure Frequency (days/year)	22	(k)	3	(l)
	Exposure Duration (yr)	30	(b)	9	(c)
	Sediment Ingestion Rate (mg/day)	100	(h)	50	(i)
	Skin Contacting Medium (cm^2)	4500	(g)	4500	(g)
	Sediment on Skin (mg/cm^2)	1	(j)	1	(j)
	Body Weight (kg)	70	(b)	70	(b)

Notes:
MLE - Most Likely Exposure.
RME - Reasonable Maximum Exposure.
(a) - Fish ingestion rates are based on 365 days per year.
(b) - USEPA, 1991a. Standard Default Exposure Factors.
(c) - USEPA, 1997a. Exposure Factors Handbook. Recommended average for time residing in a household. Table 1-2.
(d) - USEPA, 1997a. Exposure Factors Handbook. 8 g/day is equivalent to approximately 22 fish meals of 129 g per year.
(e) - 1 g/day is equivalent to approximately three 129 g fish meals per year (equivalent to one fish meal per month in the three summer months).
(f) - USEPA, 1989a. Risk Assessment Guidance for Superfund, Volume I. Value is one-fifth of that assumed to occur during a swimming event.
(g) - USEPA, 1997a. Exposure Factors Handbook. Represents 50th percentile values for males and females based on hands, lower legs, and feet.
(h) - USEPA, 1991a. Standard Default Exposure Factors.
(i) - USEPA, 1997a. Exposure Factors Handbook. Average soil ingestion rates listed in Table 1-2.
(j) - USEPA, 1992b. Dermal Exposure Assessment: Principles and Applications.
(k) - One day per month for 5 months.
(l) - One day per month during the three summer months.
(m) - USEPA, 1989a. Risk Assessment Guidance for Superfund, Volume I. Value is one-tenth of that assumed to occur during a swimming event.

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TABLE 5-10
SOIL ADHERANCE FACTORS- OUTDOOR INDUSTRIAL WORKER
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

	Outdoor Industrial Worker Scenario		
Body Part	**Surface Area 50th percentile (cm^2) (a)**	**Soil Loading Groundskeeper (mg/cm^2) (b)**	**Total Soil Mass (mg)**
Head	1,205	0.005	5.543
Hands	904	0.071	64.1485
Forearms	1,230	0.009	11.1438
Total	3,339		80.8
Area-Weighted Soil Adherence factor (mg/cm2) = Soil mass/Surface area =			0.02

Notes:
(a) - Data from U.S. EPA (1997a). Tables 6-2, 6-3. Average of 50th percentile values for men and women (1/2 arm used as proxy for female forearm).
(b) - Data from U.S. EPA (1997a), Table 6-12. Average of Groundskeeper Nos. 1,2,3,4, and 5.

TABLE 5-11
SOIL ADHERANCE FACTORS- CONSTRUCTION WORKER
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

	Construction Worker Scenario		
Body Part	**Surface Area 50th percentile (cm^2) (a)**	**Soil Loading Farmer (mg/cm^2) (a)**	**Total Soil Mass (mg)**
Head	1,205	0.041	49.405
Hands	904	0.47	424.645
Forearms	1,230	0.13	159.9
Total	3,339		634.0
Area-Weighted Soil Adherence factor (mg/cm2) = Soil mass/Surface area =			0.19

Notes:
(a) - Data from U.S. EPA (1997a). Tables 6-2, 6-3. Average of 50th percentile values for men and women (1/2 arm used as proxy for female forearm).
(b) - Data from U.S. EPA (1997a), Table 6-12. Average of Farmer Nos. 1 and 2.

TABLE 5-12
SOIL ADHERENCE FACTORS- RESIDENT ADULT
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

Body Part	Adult Resident		
	Surface Area 50th percentile (a) (cm^2)	Soil Loading Gardeners (mg/cm^2) (b)	Total Soil Mass (mg)
Hands	904	0.19	171.67
Forearms	1,230	0.052	63.96
Lower legs	2,370	0.047	111.39
Feet	1,225	0.215	347.02
Total	5,729	--	694.03
Area-Weighted Soil Adherence factor (mg/cm2) = Soil mass/Surface area =			0.12

Notes:
(a) - Data from U.S. EPA (1997a). Tables 6-2, 6-3. Average of 50th percentile values for men and women (1/2 arm used as proxy for female forearm).
(b) - Data from U.S. EPA (1997a) Table 6-12. Average of gardeners Nos. 1 and 2.

TABLE 5-13
SOIL ADHERENCE FACTORS- RESIDENT CHILD
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

Body Part	Child Resident (0 to 6 years old)		
	Surface Area 50th percentile (a) (cm^2)	Soil Loading Day Care Kids (mg/cm^2) (b)	Total Soil Mass (mg)
Hands	358	0.0923	33.04
Forearms	437	0.0230	10.05
Lower legs	812	0.0195	15.83
Feet	451	0.0646	58.93
Total	2,058	--	117.86
Area-Weighted Soil Adherence factor (mg/cm2) = Soil mass/Surface area =			0.06

Notes:
(a) - Data from U.S. EPA (1997a). Based on average of boys (Table 6-6) and girls (Table 6-7) total body surface area (6,557 cm2), and mean percentages of total surface area for individual body parts Table 6-8).
(b) - Data from U.S. EPA (1997a), Table 6-12, Daycare kids Nos. #1a, #1b ,#2c, #3.

TABLE 5-14
SOIL ADHERENCE FACTORS- TRESPASSING TEENAGER (7 TO 18)
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

	Trespassing Teenager (7 to 18)		
Body Part	**Surface Area 50th percentile (a) (cm^2)**	**Soil Loading Soccer Kids (mg/cm^2) (b)**	**Total Soil Mass (mg)**
Hands	715	0.0547	39.09
Forearms	894	0.0061	5.42
Lower legs	2,068	0.0177	36.60
Total	3,677	--	
Area-Weighted Soil Adherence factor (mg/cm2) = Soil mass/Surface area =			0.02

Notes:
(a) - Data from U.S. EPA (1997a). Based on average of boys (Table 6-6) and girls (Table 6-7) total body surface area , and mean percentages of total surface area for individual body parts Table 6-8).
(b) - Data from U.S. EPA (1997a) Table 6-12. Average of Soccer Kids Nos. 1, 2, and 3.

6.0 RISK CHARACTERIZATION

The purpose of the risk characterization is to provide estimates of the potential risk to human health from exposure to COPC at or from the site by receptors at or near the site. To accomplish this objective, this section will include quantitative estimates of potential carcinogenic and noncarcinogenic risk.

The results of the exposure assessment are combined with the results of the dose-response assessment to derive quantitative estimates of risk, or the probability of adverse health effects following assumed potential exposure to the COPCs. Using the exposure point concentrations derived in the exposure assessment, each exposure pathway for each receptor will be evaluated for both potential carcinogenic and noncarcinogenic effects.

6.1 Carcinogenic Risk Characterization

The purpose of carcinogenic risk characterization is to estimate the upper-bound likelihood, over and above the background cancer rate, that a receptor will develop cancer in his or her lifetime as a result of exposure to a chemical in environmental media at the site. This likelihood is a function of the dose of a chemical (described in the Exposure Assessment) and the Cancer Slope Factor (CSF) (described in the Toxicity Assessment) for that chemical. The Excess Lifetime Cancer Risk (ELCR) is the likelihood over and above the background cancer rate, which currently in the U.S. is between 1 in 3 and 1 in 4 (Landis et al., 1998), that an individual will contract cancer in his or her lifetime. The risk value is expressed as a probability (e.g., 10^{-6}, or one in one million). The relationship between the ELCR and the estimated Lifetime Average Daily Dose (LADD) of a chemical may be expressed as:

$$ELCR = 1 - e^{-(CSF \times LADD)}$$

When the product of the CSF and the LADD is much greater than 1, the ELCR approaches 1 (i.e., 100 percent probability). When the product is less than 0.01 (one chance in 100), the equation can be closely approximated by:

$$ELCR = LADD\ (mg/kg\text{-}day) \times CSF\ (mg/kg\text{-}day)^{-1}$$

The product of the CSF and the LADD is unitless, and provides an upper-bound estimate of the potential carcinogenic risk associated with a receptor's exposure to that chemical via that pathway.

The potential carcinogenic risk for each exposure pathway will be calculated for each receptor. In current regulatory risk assessment, it is assumed that cancer risks are additive or cumulative. Pathway and area-specific risks will be summed to estimate the total site potential cancer risk for each

information that the risk manager needs to more accurately characterize risks on a site-specific basis and to communicate the nature of the risks to the public.

6.4 Cumulative Risk

Although the AOC SOW identifies separate risk evaluations for groundwater and other media, many potential receptors identified herein are assumed to be exposed to both groundwater and other media simultaneously. To account for cumulative risk, the risk assessment will be conducted for all media, and total site risks will be calculated for each receptor. COC for potentially carcinogenic and noncarcinogenic effects will be identified, and pathways that contribute significantly to target risk exceedances will be identified. RGs will be calculated for appropriate COPC in the appropriate medium. RGs will be presented for COC in groundwater in the RI/FS report, and RGs will be presented for other media in the EE/CA report.

6.5 Uncertainty Analysis

Uncertainty is introduced into the risk assessment in several places throughout the process. Every time an assumption is made, some level of uncertainty is introduced into the risk assessment. In accordance with USEPA guidance (USEPA, 1989a), the uncertainty associated with each step of the risk characterization process will be discussed in this section of the report.

There are many potential sources of uncertainty in the risk assessment process; some are more important than others. The major areas of uncertainty include: the adequacy of the sampling plan, the quality of the analytical data, assumptions about the frequency, duration, and magnitude of exposure, the receptors identified, assumptions made in the modeling performed to predict concentrations at locations where measurement data are lacking, and the availability and accuracy of dose-response data. The uncertainties will be discussed qualitatively in the report, including steps taken to compensate for uncertainty, and the impact on the risk assessment results.

7.0 SUMMARY AND CONCLUSIONS

A summary and conclusions section will contain discussions of the results of the risk assessment. The selection of final COC and the remedial goals for each COC will be presented.

8.0 REFERENCES

ASTM. 1995. Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites. ASTM-1739. American Society for Testing and Materials. Philadelphia, PA.

Baes, C.F., R.D. Sharp, A.L. Sjoreen, and R.W. Shor. 1984. Review and Analysis of Parameters and Assessing Transport of Environmentally Released Radionuclides through Agriculture. Oak Ridge NationaLLaboratory. Oak Ridge, Tennessee.

Calabrese, E.J., R. Barnes, E.J. Stanek, H. Pastides, C.E. Gilbert, P. Veneman, X. Wang, A. Lasztity, and P.T. Kostecki. 1989. How much soil do young children ingest: an epidemiological study. Regul. Toxicol. Pharmacol. 10:123-137.

Calabrese, E.J., E.J. Stanek, C.E. Gilbert, and R.M. Barnes. 1990. Preliminary Adult Soil Ingestion Estimates: Results of a Pilot Study. Reg. Tox. Pharm. 12:88-95.

Clausing, P., B. Brunekreef, and J.H. van Wijnen. 1987. A method for estimating soil ingestion by children. Int. Arch. Occup. Environ. Health. 59:73-82.

Davis, S. P. Waller, R. Buschbom, J. Balloy, and P. White. 1990. Quantitative estimates of soil ingestion in normal children between the ages of 2 and 7 years: Population-based estimates using aluminum, silicon, and titanium as soil tracer elements. Arch. of Environ. Health 45(2):112-122.

Hawley, J.K. 1985. Assessment of health risk from exposure to contaminated soil. Risk Analysis. 5(4):289-302.

Holmes, K.K., J.I. Shirai, K.Y. Richter, and J.C.. Kissel. 1998. Field Measurement of Dermal Soil Loadings in Occupational and Recreational Activities. Environmental Research. In Press.

IEPA. 1998. Tiered Approach to Corrective Action Objectives. Title 35, Subtitle G, Chapter I, Subchapter J, Part 742. As amended June 8, 1998. Illinois Environmental Protection Agency.

Kissel, J.C., K.Y. Richter, and R.A. Fenske. 1996. Field measurement of dermal soil loading attributable to various activities: Implication for exposure assessment. Risk Analysis. 16(1):115-125.

Kissel, J.C., J.H. Shirai, K.Y. Richter, and R.A. Fenske. 1998. Empirical Investigation of Hand-to-Mouth Transfer of Soil. Bull. Environ. Contam. Toxicol. 60:379-386.

Landis, S.H., T. Murray, S. Bolden, and P.A. Wingo. 1998. Cancer Statistics, 1998. CA Cancer J. Clin. 48:6-29. [URL: http://www.ca-journal.org/frames/articles/articles-1998/48_006-029.html]

MADEP. 1995. Guidance for Disposal Site Risk Characterization – In Support of the Massachusetts Contingency Plan. Interim Final. Massachusetts Department of Environmental Protection. Bureau of Waste Site Cleanup and Office of Research and Standards.

NOAA. 1996. Climatic Averages and Extremes for U.S. Cities. National Oceanographic and Atmospheric Administration. June 1996.

NWS. 1986-1995 data on precipitation measured at St. Louis, MO. National Weather Service.

Sheehan, P.J., D.M. Meyer, M.M. Sauer, and D.J. Paustenbach. 1991. Assessment of the Human Health Risks Posed by Exposure to Chromium-Contaminated Soils. J. Toxicol. Environ. Health. 32:161-201.

USEPA. 1989a. Risk Assessment Guidance for Superfund: Volume I. Human Health Evaluation Manual (Part A). Interim Final. Office of Emergency and Remedial Response. U.S. Environmental Protection Agency, Washington, D.C. EPA 540/1-89/002.

USEPA. 1989b. Interim Procedures for Estimating Risk Associated with Mixtures of Chlorinated Dibenzo-p-dioxins and Chlorinated Dibenzofurans (CDDs and CDFs) and 1989 Update. EPA/625/3-89/016. U.S. Environmental Protection Agency, Risk Assessment Forum, Washington, DC.

USEPA. 1991a. Human Health Exposure Manual, Supplemental Guidance; Standard Default Exposure Factors. OSWER Directive No. 9285.6-03. U.S. Environmental Protection Agency, Washington, D.C.

USEPA. 1992a. Supplemental Guidance to RAGS: Calculating the Concentration Term. Office of Solid Waste and Emergency Response. OSWER Directive No. 9285.7-081. U.S. Environmental Protection Agency, Washington, D.C.

USEPA. 1992b. Dermal Exposure Assessment: Principles and Applications. Office of Research and Development, Washington, D.C. EPA/600/8-91/011B.

USEPA. 1993a. Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening. EPA/903/R-93-001. United States Environmental Protection Agency, Region III. Hazardous Waste Management Division. Office of Superfund Programs.

USEPA. 1993b. Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure. Preliminary Review Draft. 5/5/93. U.S. Environmental Protection Agency.

USEPA. 1993c. Air/Superfund national Technical Guidance Study Series: Evaluation of Short-term Air Action Levels for Superfund Sites, EPA-451/R-93-009.

USEPA. 1995a. Land Use in the CERCLA Remedy Selection Process. OSWER Directive No. 9355.7-04. U.S. Environmental Protection Agency. Washington, DC.

USEPA. 1995b. Compilation of Air Pollutant Emission Factors. Volume I: Stationary Point and the Area Source. 4th Edition. PB86-124906.

USEPA. 1996a. Soil Screening Guidance: Technical Background Document. EPA/540/R-95/128. Office of Solid Waste and Emergency Response. U.S. Environmental Protection Agency, Washington DC.

USEPA. 1996b. Office of Technical Service Supplemental Guidance to RAGS: Region 4 Bulletins. United States Environmental Protection Agency, Region 4. Waste Management Division. Atlanta, GA.

USEPA. 1997a. Exposure Factors Handbook, Volumes I, II and III. EPA/600/P-95/002F. Office of Research and Development. U.S. Environmental Protection Agency, Washington, D.C.

USEPA. 1997b. Health Effects Assessment Summary Tables (HEAST). EPA 540-R-94-020. Office of Research and Development. U.S. Environmental Protection Agency, Washington, D.C.

USEPA. 1997c. User's Guide for the Johnson and Ettinger (1991) Model for Subsurface Vapor Intrusion into Buildings. Prepared By Environmental Quality Management, Inc. for E.H. Pechan and Associates, Inc. for Submittal to Janine Dinan, Work Assignment Manager. Office of Emergency and Remedial Response. Toxics Integration Branch. U.S. Environmental Protection Agency, Washington, D.C.

USEPA. 1998a. Risk Assessment Guidance for Superfund: Volume I. Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments). Interim. 9285.7-01D. Office of Emergency and Remedial Response. U.S. Environmental Protection Agency. Washington, DC.

USEPA. 1998b. U.S. Environmental Protection Agency Region 5, Model QAPP (Quality Assurance and Project Plan). May, 1998.

USEPA. 1998c. Preliminary Remediation Goals (PRGs). Waste Programs, U.S. Environmental Protection Agency, Region 9. San Francisco, California. June 3, 1998. [URL: www.epa.gov/region09/waste/sfund/prg/index.html]

USEPA, 1998d. National Recommended Water Quality Criteria. Federal Register, Vol. 63, No. 237 pages 68354-68364. Thursday December 10, 1998.

USEPA. 1998e. Risk-Based Concentration Table. Superfund Technical Support Section. U.S Environmental Protection Agency, Region III, Philadelphia, PA. October 1998. [URL: http:\\www.epa.gov/reg3hwmd/riskmenu.htm]

USEPA. 1998f. Disposal of Polychlorinated Biphenyls (PCBs); Final Rule. FR63(124):35384-35474. June 29; 1998.

USEPA. 1998g. Approach for Addressing Dioxin in Soil at CERCLA and RCRA Sites. OSWER Directive 9200.4-26. April 13, 1998. U.S. Environmental Protection Agency, Washington, D.C.

USEPA. 1999. Integrated Risk Information System (IRIS). Environmental Criteria and Assessment Office. U.S. Environmental Protection Agency, Cincinnati, OH.
[URL: http:\\www.epa.gov/ngispgm3/iris]

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

APPENDIX A

DATA QUALITY LEVELS FOR HUMAN HEALTH RISK ASSESSMENT

TABLE 1
DATA QUALITY LIMITS (DQLs) FOR SOIL AND SEDIMENT
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

CONSTITUENT	CAS NO.	DQL (mg/kg) (q)		Basis
TCL Volatiles				
1,1,1-Trichloroethane	71-55-6	2.00E+00		A
1,1,2,2-Tetrachloroethane	79-34-5	3.60E-01		F
1,1,2-Trichloroethane	79-00-5	2.00E-02		A
1,1-Dichloroethane	75-34-3	1.77E+00		B
1,1-Dichloroethylene	75-35-4	4.62E-03		B
1,2-Dichloroethane	107-06-2	2.00E-02		A
1,2-Dichloroethylene (total)	540-59-0	3.64E-02		B
1,2-Dichloropropane	78-87-5	1.00E-02		B
2-Butanone	78-93-3	6.90E+03		E
2-Hexanone	591-78-6	7.50E+02	(m)	E
4-Methyl-2-pentanone	108-10-1	7.50E+02		E
Acetone	67-64-1	1.23E+00		B
Benzene	71-43-2	3.00E-02		A
Bromodichloromethane	75-27-4	6.00E-01		A
Bromoform	75-25-2	8.00E-01		A
Bromomethane	74-83-9	3.80E+00		E
Carbon Disulfide	75-15-0	4.57E+00		B
Carbon tetrachloride	56-23-5	7.00E-02		A
Chlorobenzene	108-90-7	7.69E-02		B
Chloroethane	75-00-3	1.53E+02	(p)	F
Chloroform	67-66-3	3.00E-01		C
Chloromethane	74-87-3	1.20E+00		F
cis-1,3-Dichloropropene	10061-01-5	4.00E-03		A
Dibromochloromethane	124-48-1	4.00E-01		A
Ethyl Benzene	100-41-4	1.00E+00		B
Methylene chloride	75-09-2	2.00E-02		A
Styrene	100-42-5	3.08E-01		B
Tetrachloroethene	127-18-4	6.00E-02		A
Toluene	108-88-3	9.23E-01		B
Total Xylenes	1330-20-7	2.11E+01	(d)	B
trans-1,3-Dichloropropene	10061-02-6	4.00E-03		A
Trichloroethene	79-01-6	6.00E-02		A
Vinyl chloride	75-01-4	1.00E-02		A
TCL Semi-Volatiles				
1,2,4-Trichlorobenzene	120-82-1	2.50E+00		B
1,2-Dichlorobenzene	95-50-1	1.70E+01		A
1,3-Dichlorobenzene	541-73-1	2.00E+00	(e)	A
1,4-Dichlorobenzene	106-46-7	2.00E+00		A
2,2'-oxybis(1-Chloropropane)	108-60-1	2.54E+00		F
2,4,5-Trichlorophenol	95-95-4	6.40E+01		H
2,4,6-Trichlorophenol	88-06-2	7.00E-02		H
2,4-Dichlorophenol	120-83-2	6.90E-01		H
2,4-Dimethylphenol	105-67-9	9.00E-01		B
2,4-Dinitrophenol	51-28-5	1.10E+02		E
2,4-Dinitrotoluene	121-14-2	8.00E-04		A
2,6-Dinitrotoluene	606-20-2	7.00E-04		A
2-Chloronaphthalene	91-58-7	3.70E+03		E
2-Chlorophenol	95-57-8	3.10E+00		H
2-Methylnaphthalene	91-57-6	8.40E+01		A
2-Methylphenol	95-48-7	1.67E+00		B
2-Nitroaniline	88-74-4	3.30E+00		E
2-Nitrophenol	88-75-5	3.40E+03	(n)	E
3,3'-Dichlorobenzidine	91-94-1	7.00E-03		A
3-Nitroaniline	99-09-2	3.30E+00	(o)	E
4,6-Dinitro-2-methylphenol	534-52-1	NA		K
4-Bromophenyl phenyl ether	101-55-3	NA		K

TABLE 1
DATA QUALITY LIMITS (DQLs) FOR SOIL AND SEDIMENT
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

CONSTITUENT	CAS NO.	DQL (mg/kg) (q)		Basis
4-Chloraniline	106-47-8	3.50E-01		B
4-Chloro-3-methylphenol	59-50-7	NA		K
4-Chlorophenol phenyl ether	7005-72-3	NA		K
4-Methylphenol	106-44-5	1.67E+00	(g)	B
4-Nitroaniline	100-01-6	3.30E+00	(o)	E
4-Nitrophenol	100-02-7	3.40E+03		E
Acenaphthene	83-32-9	4.38E+01		B
Acenaphthylene	208-96-8	4.38E+01	(h)	B
Anthracene	120-12-7	1.20E+04		A
Benz[a]anthracene	56-55-3	9.00E-01		D
Benzo[a]pyrene	50-32-8	9.00E-02		D
Benzo[b]fluoranthene	205-99-2	9.00E-01		D
Benzo[g,h,i]perylene	191-24-2	1.77E+02	(a)	B,D
Benzo[k]fluoranthene	207-08-9	9.00E+00		D
bis(2-Chloroethoxy)methane	111-91-1	NA		K
bis(2-Chloroethyl)ether	111-44-4	4.00E-04		A
bis(2-Ethylhexyl)phthalate	117-81-7	4.60E+01		A
Butyl benzyl phthalate	85-68-7	9.30E+02		A
Carbazole	86-74-8	6.00E-01		A
Chrysene	218-01-9	8.80E+01		D
Dibenz[a,h]anthracene	53-70-3	9.00E-02		D
Dibenzofuran	132-64-9	2.10E+02		E
Diethylphthalate	84-66-2	4.70E+02		A
Dimethyl phthalate	131-11-3	1.00E+05		G
Di-n-butyl phthalate	84-74-2	2.30E+03		A
Di-n-octyl phthalate	117-84-0	1.23E+02		B,D
Fluoranthene	206-44-0	2.38E+02		B,D
Fluorene	86-73-7	5.60E+01		B
Hexachlorobenzene	118-74-1	7.00E-02		D
Hexachlorobutadiene	87-68-3	5.70E+00		F
Hexachlorocyclopentadiene	77-47-4	3.33E+00		B,C
Hexachloroethane	67-72-1	5.00E-01		A
Indeno[1,2,3-cd]pyrene	193-39-5	9.00E-01		D
Isophorone	78-59-1	8.00E+00		A
Naphthalene	91-20-3	8.40E+01		
Nitrobenzene	98-95-3	7.69E-03		B
N-Nitroso-di-n-propylamine	621-64-7	5.00E-05		A
N-Nitrosodiphenylamine	86-30-6	1.00E+00		A
Pentachlorophenol	87-86-5	2.00E-02		H
Phenanthrene	85-01-8	1.20E+04	(b)	A
Phenol	108-95-2	1.43E+01		B
Pyrene	129-00-0	1.77E+02		B,D
TAL Metals				
Aluminum	7429-90-5	7.50E+04		E
Antimony	7440-36-0	5.00E+00		H
Arsenic	7440-38-2	4.00E-01		D
Barium	7440-39-3	2.60E+02		H
Beryllium	7440-41-7	1.00E-01		D
Cadmium	7440-43-9	1.00E+00		H
Calcium	7440-70-2	NA		J
Chromium	7440-47-3	2.80E+01	(c)	H
Cobalt	7440-48-4	4.70E+03		D

TABLE 1
DATA QUALITY LIMITS (DQLs) FOR SOIL AND SEDIMENT
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

CONSTITUENT	CAS NO.	DQL (mg/kg) (q)		Basis
Iron	7439-89-6	2.20E+04		E
Lead	7439-92-1	4.00E+02		D
Magnesium	7439-95-4	NA		J
Manganese	7439-96-5	4.11E+02		D
Mercury	7439-97-6	1.00E-01		H
Nickel	7440-02-0	2.00E+01		C
Potassium	7440-09-7	NA		J
Selenium	7782-49-2	2.40E+00		H
Silver	7440-22-4	2.40E-01		H
Sodium	7440-23-5	NA		J
Thallium	7440-28-0	1.60E+00		H
Vanadium	7440-62-2	5.50E+02		D
Copper	7440-50-8	3.30E+02		H
Zinc	7440-66-6	1.00E+03		H
Cyanide	57-12-5	4.00E+01		H
Pesticides				
Alpha-BHC	319-84-6	5.00E-04		A
Beta-BHC	319-85-7	5.00E-04	(j)	A
Delta-BHC	319-86-8	5.00E-04	(j)	A
Gamma-BHC (Lindane)	58-89-9	9.00E-03		A
Aldrin	309-00-2	4.00E-02		D
alpha-Chlordane	5103-71-9	5.00E-01	(i)	D
gamma-Chlordane	5103-74-2	5.00E-01	(i)	D
Chlordane	57-74-9	5.00E-01		D
Chlorobenzilate	510-15-6	1.60E+00		F
1,2-Dibromo-3-Chloropropane	96-12-8	2.00E-03		A
4,4'-DDD	72-54-8	3.00E+00		D

TABLE 1
DATA QUALITY LIMITS (DQLs) FOR SOIL AND SEDIMENT
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

CONSTITUENT	CAS NO.	DQL (mg/kg) (q)		Basis
4,4'-DDE	72-55-9	2.00E+00		D
4,4'-DDT	50-29-3	2.00E+00		D
Diallate	2303-16-4	7.30E+00		F
Dieldrin	60-57-1	4.00E-03		A
Endosulfan I	959-98-8	1.38E+00	(k)	B
Endosulfan II	33213-65-9	1.38E+00	(k)	B
Endosulfan sulfate	1031-07-8	1.38E+00	(k)	B
Endrin	72-20-8	7.69E-02		B
Endrin aldehyde	7421-93-4	7.69E-02	(l)	B
Endrin Ketone	53494-70-5	7.69E-02	(l)	B
Heptachlor	76-44-8	1.00E-01		C,D
Heptachlor epoxide	1024-57-3	7.00E-02		D
Hexachlorobenzene	118-74-1	4.00E-01		D
Hexachlorocyclopentadiene	77-47-4	3.33E+00		B,C
Isodrin	465-73-6	— NA		K
Methoxychlor	72-43-5	2.29E+01		B
Toxaphene	8001-35-2	6.00E-01		D
Herbicides				
2,4-D	94-75-7	1.36E-01		B
2,4-DB	94-82-6	4.40E+02		E
2,4,5-TP	93-72-1	1.10E+01		H
2,4,5-T	93-76-5	7.82E+02	(p)	E
Dalapon	75-99-0	6.54E-02		B
Dicamba	1918-00-9	1.60E+03		E
Dichloroprop	120-36-5	NA		K
Dinoseb	88-85-7	2.50E-01		H
MCPA	94-74-6	3.91E+01	(p)	E
MCPP	93-65-2	7.82E+01	(p)	E
4-Nitrophenol	100-02-7	3.40E+03		E
Pentachlorophenol	87-86-5	2.00E-02		H
Dioxins and Furans				
2,3,7,8-TCDD	1746-01-6	1.00E-03		I
1,2,3,7,8-PentaCDD	40321-76-4	1.00E-03		I
1,2,3,4,7,8-HexaCDD	39227-28-6	1.00E-03		I
1,2,3,6,7,8-HexaCDD	57653-85-7	1.00E-03		I
1,2,3,7,8,9-HexaCDD	19408-74-3	1.00E-03		I
1,2,3,4,6,7,8-HeptaCDD	35822-39-4	1.00E-03		I
OctaCDD	3268-87-9	1.00E-03		I
2,3,7,8-TetraCDF	51207-31-9	1.00E-03		I
1,2,3,7,8-PentaCDF	57117-41-6	1.00E-03		I
2,3,4,7,8-PentaCDF	57117-31-4	1.00E-03		I
1,2,3,4,7,8-HexaCDF	70648-26-9	1.00E-03		I
1,2,3,6,7,8-HexaCDF	57117-44-9	1.00E-03		I
1,2,3,7,8,9-HexaCDF	72918-21-9	1.00E-03		I
2,3,4,6,7,8-HexaCDF	60851-34-5	1.00E-03		I
1,2,3,4,6,7,8-HeptaCDF	67562-39-4	1.00E-03		I
1,2,3,4,7,8,9-HeptaCDF	55673-89-7	1.00E-03		I
OctaCDF	39001-02-0	1.00E-03		I

TABLE 1
DATA QUALITY LIMITS (DQLs) FOR SOIL AND SEDIMENT
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

CONSTITUENT	CAS NO.	DQL (mg/kg) (q)	Basis
TPH			
GRO	NA	5.00E+00	L
DRO	NA	4.00E+00	L
Additional (added 4/17/99)			
Copper,method 7211	7440-50-8	3.30E+02	H
Zinc, method 7151	7440-66-6	1.00E+03	H
TOC, method 9060	NA	NA	K
TPH, method 8015B	NA	5.00E+00	L
Naphthalene	91-20-3	8.40E+01	B
Total PCBs	NA	1.00E+00	M

Notes:
(a) Due to structural similarities, the value for Pyrene was used.
(b) Due to structural similarities, the value for Anthracene was used.
(c) Value for Chromium IV.
(d) Value for o-Xylene.
(e) IEPA, 1998, No Appendix Table B value available, therefore, due to structural similarities, value for 1,2-Dichlorobenene used.
(f) Due to structural similarities, the value for Naphthalene was used.
(g) Due to structural similarities, the value for 2-Methylphenol was used.
(h) Due to structural similarities, the value for Acenaphthene was used.
(i) Due to structural similarities, the value for Chlordane was used.
(j) Due to structural similarities, the value for alpha-BHC was used.
(k) Due to structural similarities, the value for Endosulfan was used.
(l) Due to structural similarities, the value for Endrin was used.
(m) Due to structural similarities, the value for 4-Methyl 2-Pentanone was used.
(n) Due to structural similarities, the value for 4-Nitrophenol was used.
(o) Due to structural similarities, the value for 2-Nitroaniline was used.
(p) PRG calculated based on equations in PRG table.
(q) - The following hierarchy was used to determine the appropriate DQL:
1. The lower of Illinois Tiered Approach to Corrective Action (TACO) Program Tier 1 values from Appendix B, Table C or Appendix B, Table A, with adjustmentsmade for additivity for noncarcinogens.
2. For constituents not listed on Appendix B, Table A, Region IX PRGs for residential soil were used.

CAS = Chemical Abstracts Service.
CB = Chlorobiphenyl.
CDD = Chlorodibenzodioxin.
CDF = Chlorodibenzofuran.
DQL = Data Quality Limit.
NA - Not Available.
PCB = Polychlorinated Biphenyl.
PRG = USEPA Region 9 Preliminary Remediation Goal (USEPA, 1998c).
TAL = Target Analyte List.
TCL = Target Compound List.
TPH = Total Petroleum Hydrocarbons.
A = IEPA, 1998, Appendix B, Table A, Value for Class I Groundwater.
B = IEPA, 1998, Appendix B, Table A, Value for Class I Groundwater adjusted for additivity of noncarcinogenic effects.
C = IEPA, 1998, Appendix B, Table A, Value for Inhalation.
D = IEPA, 1998, Appendix B, Table A, Value for Ingestion.
E = Region IX PRG based on noncarcinogenic effects.
F = Region IX PRG based on carcinogenic effects.
G = Region IX PRG based on ceiling limit.
H = IEPA, 1998, Appendix B, Table C. Lowest value was selected.
I = USEPA, 1998g. Value for Dioxins.
J = No value is available as this constituent is an essential nutrient.
K = No toxicity information is available for this constituent therefore DQL was not developed.
L = Estimated data quality limits based on previous testing.
M = USEPA, 1998f. PCB Mega Rule.

TABLE 2
DATA QUALITY LIMITS (DQLs) FOR SURFACE WATER AND GROUNDWATER
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

CONSTITUENT	CAS NO.	Surface Water (m) DQL (mg/L)	Ground Water (a) DQL (mg/L)		Basis	Selected DQL (p) (mg/L)
TCL Volatiles						
1,1,1-Trichloroethane	71-55-6	NA	0.2		B	2.00E-01
1,1,2,2-Tetrachloroethane	79-34-5	0.011	0.000055		C (ca)	5.50E-05
1,1,2-Trichloroethane	79-00-5	0.042	0.005		B	5.00E-03
1,1-Dichloroethane	75-34-3	NA	0.7		B	7.00E-01
1,1-Dichloroethylene	75-35-4	0.0032	0.007		B	3.20E-03
1,2-Dichloroethane	107-06-2	0.099	0.00003		A	3.00E-05
1,2-Dichloroethylene (total)	540-59-0	140	0.07	(c)	B	7.00E-02
1,2-Dichloropropane	78-87-5	0.039	0.005		B	5.00E-03
2-Butanone	78-93-3	NA	1.9		C (nc)	1.90E+00
2-Hexanone	591-78-6	NA	0.16	(g)	C (nc)	1.60E-01
4-Methyl-2-pentanone	108-10-1	NA	0.16		C (nc)	1.60E-01
Acetone	67-64-1	NA	0.7		B	7.00E-01
Benzene	71-43-2	0.071	0.005		B	5.00E-03
Bromodichloromethane	75-27-4	0.046	0.00002		B	2.00E-05
Bromoform	75-25-2	0.36	0.0002		B	2.00E-04
Bromomethane	74-83-9	NA	0.0098		B	9.80E-03
Carbon Disulfide	75-15-0	NA	0.7		B	7.00E-01
Carbon tetrachloride	56-23-5	0.0044	0.00003		A	3.00E-05
Chlorobenzene	108-90-7	21	0.1		B	1.00E-01
Chloroethane	75-00-3	NA	1.26E+01	(o)	C (ca)	1.26E+01
Chloroform	67-66-3	0.47	0.00002		B	2.00E-05
Chloromethane	74-87-3	NA	0.0015		C (ca)	1.50E-03
cis-1,3-Dichloropropene	10061-01-5	1.7	0.001		B	1.00E-03
Dibromochloromethane	124-48-1	0.034	0.14		B	3.40E-02
Ethyl Benzene	100-41-4	29	0.7		B	7.00E-01
Methylene chloride	75-09-2	1.6	0.005		B	5.00E-03
Styrene	100-42-5	NA	0.1		B	1.00E-01
Tetrachloroethene	127-18-4	0.00885	0.00001		A	1.00E-05
Toluene	108-88-3	200	1		B	1.00E+00
Total Xylenes	1330-20-7	NA	10		B	1.00E+01
trans-1,3-Dichloropropene	10061-02-6	1.7	0.001		B	1.00E-03
Trichloroethene	79-01-6	0.081	0.005		B	5.00E-03
Vinyl chloride	75-01-4	0.525	0.00006		A	6.00E-05
TCL Semi-Volatiles						
1,2,4-Trichlorobenzene	120-82-1	0.94	0.07		B	7.00E-02
1,2-Dichlorobenzene	95-50-1	17	0.6		B	6.00E-01
1,3-Dichlorobenzene	541-73-1	2.6	0.075		B	7.50E-02
1,4-Dichlorobenzene	106-46-7	2.6	0.075		B	7.50E-02
2,2'-oxybis(1-Chloropropane)	108-60-1	170	0.00027		C (ca)	2.70E-04
2,4,5-Trichlorophenol	95-95-4	9.8	0.7		B	7.00E-01
2,4,6-Trichlorophenol	88-06-2	0.0065	0.0064		B	6.40E-03
2,4-Dichlorophenol	120-83-2	0.79	0.021		B	2.10E-02
2,4-Dimethylphenol	105-67-9	2.3	0.14		B	1.40E-01
2,4-Dinitrophenol	51-28-5	14	0.014		B	1.40E-02
2,4-Dinitrotoluene	121-14-2	0.0091	0.00002		B	2.00E-05
2,6-Dinitrotoluene	606-20-2	NA	0.0001		B	1.00E-04
2-Chloronaphthalene	91-58-7	4.3	0.49		C (nc)	4.90E-01
2-Chlorophenol	95-57-8	0.4	0.035		B	3.50E-02
2-Methylnaphthalene	91-57-6	NA	0.025	(d)	B	2.50E-02
2-Methylphenol	95-48-7	NA	0.35		B	3.50E-01
2-Nitroaniline	88-74-4	NA	2.2		C (nc)	2.20E+00
2-Nitrophenol	88-75-5	NA	2.3	(h)	C (nc)	2.30E+00
3,3'-Dichlorobenzidine	91-94-1	0.000077	0.02		A	7.70E-05
3-Nitroaniline	99-09-2	NA	0.0022	(i)	C (nc)	2.20E-03

TABLE 2
DATA QUALITY LIMITS (DQLs) FOR SURFACE WATER AND GROUNDWATER
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

CONSTITUENT	CAS NO.	Surface Water (m) DQL (mg/L)	Ground Water (a) DQL (mg/L)	Basis	Selected DQL (p) (mg/L)
4,6-Dinitro-2-methylphenol	534-52-1	0.765	NA	E	7.65E-01
4-Bromophenyl phenyl ether	101-55-3	NA	NA	E	NA
4-Chloraniline	106-47-8	NA	0.028	B	2.80E-02
4-Chloro-3-methylphenol	59-50-7	NA	NA	E	NA
4-Chlorophenol phenyl ether	7005-72-3	NA	NA	E	NA
4-Methylphenol	106-44-5	NA	0.35	B	3.50E-01
4-Nitroaniline	100-01-6	NA	0.0022 (i)	C (nc)	2.20E-03
4-Nitrophenol	100-02-7	NA	2.3	C (nc)	2.30E+00
Acenaphthene	83-32-9	2.7	0.42	B	4.20E-01
Acenaphthylene	208-96-8	2.7 (b)	0.42 (b)	B	4.20E-01
Anthracene	120-12-7	110	2.1	B	2.10E+00
Benz[a]anthracene	56-55-3	0.000049	0.00013	B	4.90E-05
Benzo[a]pyrene	50-32-8	0.000049	0.00023	A	4.90E-05
Benzo[b]fluoranthene	205-99-2	0.000049	0.00018	B	4.90E-05
Benzo[g,h,i]perylene	191-24-2	NA	0.21 (e)	B	2.10E-01
Benzo[k]fluoranthene	207-08-9	0.000049	0.00017	B	4.90E-05
bis(2-Chloroethoxy)methane	111-91-1	NA	NA	E	NA
bis(2-Chloroethyl)ether	111-44-4	0.0014	0.01	A	1.40E-03
bis(2-Ethylhexyl)phthalate	117-81-7	0.0059	0.006	B	5.90E-03
Butyl benzyl phthalate	85-68-7	5.2	1.4	B	1.40E+00
Carbazole	86-74-8	NA	0.0034	C (ca)	3.40E-03
Chrysene	218-01-9	0.000049	0.0015	B	4.90E-05
Dibenz[a,h]anthracene	53-70-3	0.000049	0.0003	A	4.90E-05
Dibenzofuran	132-64-9	NA	0.024	C (nc)	2.40E-02
Diethylphthalate	84-66-2	120	5.6	B	5.60E+00
Dimethyl phthalate	131-11-3	2900	370	C (nc)	3.70E+02
Di-n-butyl phthalate	84-74-2	12	0.7	B	7.00E-01
Di-n-octyl phthalate	117-84-0	NA	0.14	B	1.40E-01
Fluoranthene	206-44-0	0.37	0.28	B	2.80E-01
Fluorene	86-73-7	14	0.28	B	2.80E-01
Hexachlorobenzene	118-74-1	0.00000077	0.00006	A	7.70E-07
Hexachlorobutadiene	87-68-3	0.05	0.00086	C (ca)	8.60E-04
Hexachlorocyclopentadiene	77-47-4	17	0.05	B	5.00E-02
Hexachloroethane	67-72-1	0.0089	0.007	B	7.00E-03
Indeno[1,2,3-cd]pyrene	193-39-5	0.000049	0.00043	B	4.90E-05
Isophorone	78-59-1	2.6	1.4	B	1.40E+00
Naphthalene	91-20-3	NA	0.025	B	2.50E-02
Nitrobenzene	98-95-3	1.9	0.0035	B	3.50E-03
N-Nitroso-di-n-propylamine	621-64-7	0.0014	0.01	A	1.40E-03
N-Nitrosodiphenylamine	86-30-6	0.016	0.01	B	1.00E-02
Pentachlorophenol	87-86-5	0.0082	0.001	A	1.00E-03
Phenanthrene	85-01-8	110 (f)	2.1 (f)	B	2.10E+00
Phenol	108-95-2	4600	0.1	B	1.00E-01
Pyrene	129-00-0	11	0.21	B	2.10E-01

TABLE 2
DATA QUALITY LIMITS (DQLs) FOR SURFACE WATER AND GROUNDWATER
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

CONSTITUENT	CAS NO.	Surface Water (m) DQL (mg/L)	Ground Water (a) DQL (mg/L)	Basis	Selected DQL (p) (mg/L)
TAL Metals					
Aluminum	7429-90-5	NA	37	C (nc)	3.70E+01
Antimony	7440-36-0	4.3	0.006	B	6.00E-03
Arsenic	7440-38-2	0.00014	0.001	A	1.40E-04
Barium	7440-39-3	NA	2	B	2.00E+00
Beryllium	7440-41-7	NA	0.004	A	4.00E-03
Cadmium	7440-43-9	NA	0.005	B	5.00E-03
Calcium	7440-70-2	NA	NA	F	NA
Chromium	7440-47-3	NA	0.1	B	1.00E-01
Cobalt	7440-48-4	NA	1	B	1.00E+00
Iron	7439-89-6	NA	5	B	5.00E+00
Lead	7439-92-1	NA	0.0075	B	7.50E-03
Magnesium	7439-95-4	NA	NA	F	NA
Manganese	7439-96-5	0.1	0.15	B	1.00E-01
Nickel	7440-02-0	4.6	0.1	B	1.00E-01
Potassium	7440-09-7	NA	NA	F	NA
Selenium	7782-49-2	11	0.05	B	5.00E-02
Silver	7440-22-4	NA	0.05	B	5.00E-02
Sodium	7440-23-5	NA	NA	F	NA
Thallium	7440-28-0	0.0063	0.002	B	2.00E-03
Vanadium	7440-62-2	NA	0.049	B	4.90E-02
Mercury	7439-97-6	0.000051	0.002	B	5.10E-05
Copper	7440-50-8	NA	0.65	B	6.50E-01
Zinc	7440-66-6	69	5	B	5.00E+00
Cyanide	57-12-5	220	0.2	B	2.00E-01
Pesticides					
Alpha-BHC	319-84-6	0.000013	0.00003	A	1.30E-05
Beta-BHC	319-85-7	0.000046	0.00003 (n)	A	3.00E-05
Delta-BHC	319-86-8	NA	0.00003 (n)	A	3.00E-05
Gamma-BHC (Lindane)	58-89-9	0.000063	0.0002	B	6.30E-05
Aldrin	309-00-2	0.00000014	0.00004	A	1.40E-07
alpha-Chlordane	5103-71-9	0.0000022 (j)	0.00014 (j)	A	2.20E-06
gamma-Chlordane	5103-74-2	0.0000022 (j)	0.00014 (j)	A	2.20E-06
Chlordane	57-74-9	0.0000022	0.00014	A	2.20E-06
Chlorobenzilate	510-15-6	NA	0.00025	C (ca)	2.50E-04
1,2-Dibromo-3-Chloropropane (DBCP)	96-12-8	NA	0.002	A	2.00E-03
4,4'-DDD	72-54-8	0.00000084	0.00011	B	8.40E-07
4,4'-DDE	72-55-9	0.00000059	0.00004	B	5.90E-07
4,4'-DDT	50-29-3	0.00000059	0.00012	B	5.90E-07
Diallate	2303-16-4	NA	0.0011	C (ca)	1.10E-03
Dieldrin	60-57-1	0.00000014	0.00002	A	1.40E-07
Endosulfan I	959-98-8	0.24	0.042 (k)	B	4.20E-02
Endosulfan II	33213-65-9	0.24	0.042 (k)	B	4.20E-02
Endosulfan sulfate	1031-07-8	0.24	0.042 (k)	B	4.20E-02
Endrin	72-20-8	0.00081	0.002	B	8.10E-04
Endrin aldehyde	7421-93-4	0.00081	0.002 (l)	B	8.10E-04
Endrin Ketone	53494-70-5	0.00081 (l)	0.002 (l)	B	8.10E-04
Heptachlor	76-44-8	0.00000021	0.00003	A	2.10E-07
Heptachlor epoxide	1024-57-3	0.00000011	0.00032	A	1.10E-07
Hexachlorobenzene	118-74-1	0.00000077	0.00006	A	7.70E-07
Hexachlorocyclopentadiene	77-47-4	17	0.05	B	5.00E-02
Isodrin	465-73-6	NA	NA	E	NA
Methoxychlor	72-43-5	NA	0.04	B	4.00E-02
Toxaphene	8001-35-2	0.00000075	0.00086	A	7.50E-07

TABLE 2
DATA QUALITY LIMITS (DQLs) FOR SURFACE WATER AND GROUNDWATER
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

CONSTITUENT	CAS NO.	Surface Water (m)	Ground Water (a)		Selected DQL (p) (mg/L)
		DQL (mg/L)	DQL (mg/L)	Basis	
Herbicides					
2,4-D	94-75-7	NA	0.07	B	7.00E-02
2,4-DB	94-82-6	NA	2.92E+02 (o)	C (nc)	2.92E+02
2,4,5-TP	93-72-1	NA	0.05	B	5.00E-02
2,4,5-T	93-76-5	NA	7.82E+02 (o)	C (nc)	7.82E+02
Dalapon	75-99-0	NA	0.2	B	2.00E-01
Dicamba	1918-00-9	NA	1.1	C (nc)	1.10E+00
Dichloroprop	120-36-5	NA	NA	E	NA
Dinoseb	88-85-7	NA	0.007	B	7.00E-03
MCPA	94-74-6	NA	1.83E+01 (o)	C (nc)	1.83E+01
MCPP	93-65-2	NA	3.65E+01 (o)	C (nc)	3.65E+01
4-Nitrophenol	100-02-7	NA	2.3	C (nc)	2.30E+00
Pentachlorophenol	87-86-5	0.0082	0.001	A	1.00E-03
Dioxins and Furans					
2,3,7,8-TCDD	1746-01-6	1.40E-11	4.50E-07	C	1.40E-11
1,2,3,7,8-PentaCDD	40321-76-4	1.40E-11	4.50E-07	C	1.40E-11
1,2,3,4,7,8-HexaCDD	39227-28-6	1.40E-11	4.50E-07	C	1.40E-11
1,2,3,6,7,8-HexaCDD	57653-85-7	1.40E-11	4.50E-07	C	1.40E-11
1,2,3,7,8,9-HexaCDD	19408-74-3	1.40E-11	4.50E-07	C	1.40E-11
1,2,3,4,6,7,8-HeptaCDD	35822-39-4	1.40E-11	4.50E-07	C	1.40E-11
OctaCDD	3268-87-9	1.40E-11	4.50E-07	C	1.40E-11
2,3,7,8-TetraCDF	51207-31-9	1.40E-11	4.50E-07	C	1.40E-11
1,2,3,7,8-PentaCDF	57117-41-6	1.40E-11	4.50E-07	C	1.40E-11
2,3,4,7,8-PentaCDF	57117-31-4	1.40E-11	4.50E-07	C	1.40E-11
1,2,3,4,7,8-HexaCDF	70648-26-9	1.40E-11	4.50E-07	C	1.40E-11
1,2,3,6,7,8-HexaCDF	57117-44-9	1.40E-11	4.50E-07	C	1.40E-11
1,2,3,7,8,9-HexaCDF	72918-21-9	1.40E-11	4.50E-07	C	1.40E-11
2,3,4,6,7,8-HexaCDF	60851-34-5	1.40E-11	4.50E-07	C	1.40E-11
1,2,3,4,6,7,8-HeptaCDF	67562-39-4	1.40E-11	4.50E-07	C	1.40E-11
1,2,3,4,7,8,9-HeptaCDF	55673-89-7	1.40E-11	4.50E-07	C	1.40E-11
OctaCDF	39001-02-0	1.40E-11	4.50E-07	C	1.40E-11

TABLE 2
DATA QUALITY LIMITS (DQLs) FOR SURFACE WATER AND GROUNDWATER
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

CONSTITUENT	CAS NO.	Surface Water (m)	Ground Water (a)		Selected DQL (p) (mg/L)
		DQL (mg/L)	DQL (mg/L)	Basis	
Additional (added 4/17/99)					
Copper, method 7211	7440-50-8	NA	6.50E-01	B	6.50E-01
Zinc, method 7151	7440-66-6	6.90E+01	5.00E+00	B	5.00E+00
TOC, method 9060	NA	NA	NA	E	NA
Hardness, method 130.1	NA	NA	NA	E	NA
TPH, method 8015B	NA	NA	NA	E	NA
Residue, dissolved	NA	NA	NA	E	NA
Residue, suspended	NA	NA	NA	E	NA
Total PCBs	NA	1.70E-07	5.00E-04	B	1.70E-07
Fluoride	7782-41-4	NA	(q)		NA
Phosphorous	7723-14-0	NA	(q)		NA
Ortho-phosphate	NA	NA	(q)		NA

Notes:
(a) - The following hierarchy was used to determine the appropriate DQL:
1. ADL value from Appendix A Table H from the Illinois Tiered Approach to Corrective Action (TACO) Program.
2. For constituents not on Table H, the value for Class I GW from Appendix B Table E was used.
3. For constituents with no TACO values, the Region IX PRG for tap water was used.
4. For remaining constituents, a default value equivalent to the lowest DQL for that type of constituent was used.

(b) Due to structural similarities, the value for Acenaphthene was used.
(c) Value for cis-1,2-Dichloroethylene.
(d) Due to structural similarities, the value for Naphthalene was used.
(e) Due to structural similarities, the value for Pyrene was used.
(f) Due to structural similarities, the value for Anthracene was used.
(g) Due to structural similarities, the value for 4-Methyl-2-Pentanone was used.
(h) Due to structural similarities, the value for 4-Nitrophenol was used.
(i) Due to structural similarities, the value for 2-Nitroaniline was used.
(j) Due to structural similarities, the value for Chlordane was used.
(k) Due to structural similarities, the value for Endosulfan was used.
(l) Due to structural similarities, the value for Endrin was used.
(m) Surface Water Values were obtained from Federal Register, Vol. 63, No. 237. Value for Human Health Consumption of Organisms.
(n) Due to structural similarities, the value for alpha-BHC was used.
(o) PRG calculated based on equations in PRG table.
(p) - Selected DQL is the lower of the surface water and groundwater DQLs.
(q) - Constituent will not be analyzed for in groundwater.
nc - Based on noncarcinogenic effects.
ca - Based on carcinogenic effects.
CAS = Chemical Abstracts Service.
CB = Chlorobiphenyl.
CDD = Chlorodibenzodioxin.
CDF = Chlorodibenzofuran.
DQL = Data Quality Limit.
NA = Not available.
PCB = Polychlorinated Biphenyl.
PRG = USEPA Region 9 Preliminary Remediation Goal (USEPA, 1998c).
TAL = Target Analyte List.
TCL = Target Compound List.
A = IEPA, 1998, Appendix A, Table H, Acceptable Detection Limit (ADL) Value.
B = IEPA, 1998, Appendix B, Table E, Value for Class I Groundwater.
C = Region IX PRG.
D = Default Value based on lowest DQL.
E = No toxicity information is available for this constituent therefore DQL was not developed.
F = No value is available as this constituent is an essential nutrient.

TABLE 3
DATA QUALITY LIMITS (DQLs) FOR FISH TISSUE
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

CONSTITUENT	CAS NO.	DQL (mg/kg) (n)	Basis
TCL Semi-Volatiles			
1,2,4-Trichlorobenzene	120-82-1	14	N
1,2-Dichlorobenzene	95-50-1	120	N
1,3-Dichlorobenzene	541-73-1	41	N
1,4-Dichlorobenzene	106-46-7	0.13	C
2,2'-oxybis(1-Chloropropane)	108-60-1	0.045 (m)	C
2,4,5-Trichlorophenol	95-95-4	140	N
2,4,6-Trichlorophenol	88-06-2	0.29	C
2,4-Dichlorophenol	120-83-2	4.1	N
2,4-Dimethylphenol	105-67-9	27	N
2,4-Dinitrophenol	51-28-5	2.7	N
2,4-Dinitrotoluene	121-14-2	2.7	N
2,6-Dinitrotoluene	606-20-2	1.4	N
2-Chloronaphthalene	91-58-7	110	N
2-Chlorophenol	95-57-8	6.8	N
2-Methylnaphthalene	91-57-6	27	N
2-Methylphenol	95-48-7	68	N
2-Nitroaniline	88-74-4	NA	O
2-Nitrophenol	88-75-5	11 (a)	N
3,3'-Dichlorobenzidine	91-94-1	0.007	C
3-Nitroaniline	99-09-2	NA	O
4,6-Dinitro-2-methylphenol	534-52-1	NA	D
4-Bromophenyl phenyl ether	101-55-3	NA	D
4-Chloraniline	106-47-8	5.4	N
4-Chloro-3-methylphenol	59-50-7	NA	D
4-Chlorophenol phenyl ether	7005-72-3	NA	D
4-Methylphenol	106-44-5	6.8	N
4-Nitroaniline	100-01-6	NA	O
4-Nitrophenol	100-02-7	11	N
Acenaphthene	83-32-9	81	N
Acenaphthylene	208-96-8	81 (b)	N
Anthracene	120-12-7	410	N
Benz[a]anthracene	56-55-3	0.0043	C
Benzo[a]pyrene	50-32-8	0.00043	C
Benzo[b]fluoranthene	205-99-2	0.0043	C
Benzo[g,h,i]perylene	191-24-2	41 (c)	N
Benzo[k]fluoranthene	207-08-9	0.043	C
bis(2-Chloroethoxy)methane	111-91-1	NA	D
bis(2-Chloroethyl)ether	111-44-4	0.0029	C
bis(2-Ethylhexyl)phthalate	117-81-7	0.23	C
Butyl benzyl phthalate	85-68-7	270	N
Carbazole	86-74-8	0.16	C
Chrysene	218-01-9	0.43	C
Dibenz[a,h]anthracene	53-70-3	0.00043	C
Dibenzofuran	132-64-9	5.4	N
Diethylphthalate	84-66-2	1100	N

TABLE 3
DATA QUALITY LIMITS (DQLs) FOR FISH TISSUE
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

CONSTITUENT	CAS NO.	DQL (mg/kg)	(n)	Basis
Dimethyl phthalate	131-11-3	14000		N
Di-n-butyl phthalate	84-74-2	140		N
Di-n-octyl phthalate	117-84-0	27		N
Fluoranthene	206-44-0	54		N
Fluorene	86-73-7	54		N
Hexachlorobenzene	118-74-1	0.002		C
Hexachlorobutadiene	87-68-3	0.04		C
Hexachlorocyclopentadiene	77-47-4	9.5		N
Hexachloroethane	67-72-1	0.23		C
Indeno[1,2,3-cd]pyrene	193-39-5	0.0043		C
Isophorone	78-59-1	3.3		C
Naphthalene	91-20-3	27		N
Nitrobenzene	98-95-3	0.68		N
N-Nitroso-di-n-propylamine	621-64-7	0.00045		C
N-Nitrosodiphenylamine	86-30-6	0.64		C
Pentachlorophenol	87-86-5	0.026		C
Phenanthrene	85-01-8	410	(d)	N
Phenol	108-95-2	810		N
Pyrene	129-00-0	41		N
TAL Metals				
Aluminum	7429-90-5	1400		N
Antimony	7440-36-0	0.54		N
Arsenic	7440-38-2	0.0021		C
Barium	7440-39-3	95		N
Beryllium	7440-41-7	2.7		N
Cadmium	7440-43-9	1.4	(f)	N
Calcium	7440-70-2	NA		B
Chromium	7440-47-3	4.1	(g)	N
Cobalt	7440-48-4	81		N
Iron	7439-89-6	410		N
Lead	7439-92-1	NA		O
Magnesium	7439-95-4	NA		B
Manganese	7439-96-5	190	(h)	N
Nickel	7440-02-0	27		N
Potassium	7440-09-7	NA		B
Selenium	7782-49-2	6.8		N
Silver	7440-22-4	6.8		N
Sodium	7440-23-5	NA		B
Thallium	7440-28-0	0.095		N
Vanadium	7440-62-2	9.5		N
Mercury	7439-97-6	0.14	(e)	N
Copper	7440-50-8	54		N
Zinc	7440-66-6	410		N
Cyanide	57-12-5	27		N

TABLE 3
DATA QUALITY LIMITS (DQLs) FOR FISH TISSUE
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

CONSTITUENT	CAS NO.	DQL (mg/kg) (n)	Basis
PCBs			
Total PCBs	NA	0.0016	C
Pesticides			
Alpha-BHC	319-84-6	0.0005	C
Beta-BHC	319-85-7	0.0018	C
Delta-BHC	319-86-8	0.0018 (i)	C
Gamma-BHC (Lindane)	58-89-9	0.0024	C
Aldrin	309-00-2	0.00019	C
alpha-Chlordane	5103-71-9	0.009 (j)	C
gamma-Chlordane	5103-74-2	0.009 (j)	C
Chlordane	57-74-9	0.009	C
Chlorobenzilate	510-15-6	0.012	C
1,2-Dibromo-3-Chloropropane (DBCP)	96-12-8	0.0023	C
4,4'-DDD	72-54-8	0.013	C
4,4'-DDE	72-55-9	0.0093	C
4,4'-DDT	50-29-3	0.0093	C
Diallate	2303-16-4	NA	O
Dieldrin	60-57-1	0.0002	C
Endosulfan I	959-98-8	8.1 (k)	N
Endosulfan II	33213-65-9	8.1 (k)	N
Endosulfan sulfate	1031-07-8	8.1 (k)	N
Endrin	72-20-8	0.41	N
Endrin aldehyde	7421-93-4	0.41 (l)	N
Endrin Ketone	53494-70-5	0.41 (l)	N
Heptachlor	76-44-8	0.0007	C
Heptachlor epoxide	1024-57-3	0.00035	C
Hexachlorobenzene	118-74-1	0.002	C
Hexachlorocyclopentadiene	77-47-4	9.5	N
Isodrin	465-73-6	NA	D
Methoxychlor	72-43-5	6.8	N
Toxaphene	8001-35-2	0.0029	C
Herbicides			
2,4-D	94-75-7	14	N
2,4-DB	94-82-6	NA	O
2,4,5-TP	93-72-1	NA	O
2,4,5-T	93-76-5	14	N
Dalapon	75-99-0	41	N
Dicamba	1918-00-9	41	N
Dichloroprop	120-36-5	NA	O
Dinoseb	88-85-7	1.4	N
MCPA	94-74-6	NA	O
MCPP	93-65-2	NA	O
4-Nitrophenol	100-02-7	11	N
Pentachlorophenol	87-86-5	0.026	C

TABLE 3
DATA QUALITY LIMITS (DQLs) FOR FISH TISSUE
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

CONSTITUENT	CAS NO.	DQL (mg/kg) (n)	Basis
Dioxins and Furans			
2,3,7,8-TCDD	1746-01-6	2.10E-08	C
1,2,3,7,8-PentaCDD	40321-76-4	2.10E-08	C
1,2,3,4,7,8-HexaCDD	39227-28-6	2.10E-08	C
1,2,3,6,7,8-HexaCDD	57653-85-7	2.10E-08	C
1,2,3,7,8,9-HexaCDD	19408-74-3	2.10E-08	C
1,2,3,4,6,7,8-HeptaCDD	35822-39-4	2.10E-08	C
OctaCDD	3268-87-9	2.10E-08	C
2,3,7,8-TetraCDF	51207-31-9	2.10E-08	C
1,2,3,7,8-PentaCDF	57117-41-6	2.10E-08	C
2,3,4,7,8-PentaCDF	57117-31-4	2.10E-08	C
1,2,3,4,7,8-HexaCDF	70648-26-9	2.10E-08	C
1,2,3,6,7,8-HexaCDF	57117-44-9	2.10E-08	C
1,2,3,7,8,9-HexaCDF	72918-21-9	2.10E-08	C

TABLE 3
DATA QUALITY LIMITS (DQLs) FOR FISH TISSUE
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

CONSTITUENT	CAS NO.	DQL (mg/kg) (n)	Basis
2,3,4,6,7,8-HexaCDF	60851-34-5	2.10E-08	C
1,2,3,4,6,7,8-HeptaCDF	67562-39-4	2.10E-08	C
1,2,3,4,7,8,9-HeptaCDF	55673-89-7	2.10E-08	C
OctaCDF	39001-02-0	2.10E-08	C

Notes:
B = No value is available as this constituent is an essential nutrient.
C = USEPA, 1998e, Based on carcinogenic USEPA Region 3 RBC value.
D = No toxicological value available, therefore, no DQL was developed.
N = USEPA, 1998e, Based on non-carcinogenic USEPA Region 3 RBC value.
O = No RBC available; therefore, no DQL developed.
CAS = Chemical Abstracts Service.
CB = Chlorobiphenyl.
CDD = Chlorodibenzodioxin.
CDF = Chlorodibenzofuran.
DQL = Data Quality Limit.
NA = Not Available.
PCB = Polychlorinated Biphenyl.
PRG = USEPA Region 9 Preliminary Remediation Goal (USEPA, 1998c).
RBC = USEPA Region 3 Risk Based Concentration (USEPA, 1998e).
TAL = Target Analyte List.
TCL = Target Compound List.
(a) Due to structural similarities, the value for 4-Nitrophenol was used.
(b) Due to structural similarities, the value for Acenaphthene was used.
(c) Due to structural similarities, the value for Pyrene was used.
(d) Due to structural similarities, the value for Anthracene was used.
(e) Value for Methyl Mercury.
(f) Value for Cadmium-food.
(g) Value for Chromium IV.
(h) Value for Manganese-food.
(i) Due to structural similarities, the value for Beta BHC was used.
(j) Due to structural similarities, the value for Chlordane was used.
(k) Due to structural similarities, the value for Endosulfan was used.
(l) Due to structural similarities, the value for Endrin was used.
(m) Due to structural similarities, the value for Bis(2-Chloroisopropyl) ether was used.
(n) DQLs for Fish Tissue based on USEPA Region 3 RBCs (USEPA, 1998e).

TABLE 4
DATA QUALITY LIMITS (DQLs) FOR AIR
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

CONSTITUENT	CAS NO.	DQL (ug/m^3) (a)	Basis
TCL Volatiles			
1,1,1-Trichloroethane	71-55-6	1000	A
1,1,2,2-Tetrachloroethane	79-34-5	0.033	B
1,1,2-Trichloroethane	79-00-5	0.12	B
1,1-Dichloroethane	75-34-3	520	A
1,1-Dichloroethylene	75-35-4	0.038	B
1,2-Dichloroethane	107-06-2	0.074	B
1,2-Dichloroethylene (total)	540-59-0	37 (c)	A
1,2-Dichloropropane	78-87-5	0.099	B
2-Butanone	78-93-3	1000	A
2-Hexanone	591-78-6	83 (d)	A
4-Methyl-2-pentanone	108-10-1	83	A
Acetone	67-64-1	370	A
Benzene	71-43-2	0.23	B
Bromodichloromethane	75-27-4	0.11	B
Bromoform	75-25-2	1.7	B
Bromomethane	74-83-9	5.2	A
Carbon Disulfide	75-15-0	730	A
Carbon tetrachloride	56-23-5	0.13	B
Chlorobenzene	108-90-7	21	A
Chloroethane	75-00-3	NA	D
Chloroform	67-66-3	0.084	B
Chloromethane	74-87-3	1.1	B
cis-1,3-Dichloropropene	10061-01-5	0.052 (e)	B
Dibromochloromethane	124-48-1	0.08	B
Ethyl Benzene	100-41-4	1100	A
Methylene chloride	75-09-2	4.1	B
Styrene	100-42-5	1100	A
Tetrachloroethene	127-18-4	3.3	B
Toluene	108-88-3	400	A
Total Xylenes	1330-20-7	730	A
trans-1,3-Dichloropropene	10061-02-6	0.052 (e)	B
Trichloroethene	79-01-6	1.1	B
Vinyl chloride	75-01-4	0.022	B
TCL Semi-Volatiles			
1,2,4-Trichlorobenzene	120-82-1	210	A
1,2-Dichlorobenzene	95-50-1	210	A
1,3-Dichlorobenzene	541-73-1	8.4	A
1,4-Dichlorobenzene	106-46-7	0.28	B
2,2'-oxybis(1-Chloropropane)	108-60-1	0.19 (b)	B
2,4,5-Trichlorophenol	95-95-4	370	A
2,4,6-Trichlorophenol	88-06-2	0.62	B
2,4-Dichlorophenol	120-83-2	11	A
2,4-Dimethylphenol	105-67-9	73	A
2,4-Dinitrophenol	51-28-5	7.3	A
2,4-Dinitrotoluene	121-14-2	7.3	A
2,6-Dinitrotoluene	606-20-2	3.7	A
2-Chloronaphthalene	91-58-7	290	A
2-Chlorophenol	95-57-8	18	A

TABLE 4
DATA QUALITY LIMITS (DQLs) FOR AIR
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

CONSTITUENT	CAS NO.	DQL (ug/m^3) (a)		Basis
2-Methylnaphthalene	91-57-6	3.1	(f)	A
2-Methylphenol	95-48-7	180		A
2-Nitroaniline	88-74-4	0.21		A
2-Nitrophenol	88-75-5	230	(g)	A
3,3'-Dichlorobenzidine	91-94-1	0.015		B
3-Nitroaniline	99-09-2	0.21	(h)	A
4,6-Dinitro-2-methylphenol	534-52-1	NA		C
4-Bromophenyl phenyl ether	101-55-3	NA		C
4-Chloraniline	106-47-8	15		A
4-Chloro-3-methylphenol	59-50-7	NA		C
4-Chlorophenol phenyl ether	7005-72-3	NA		C
4-Methylphenol	106-44-5	18		A
4-Nitroaniline	100-01-6	0.21	(h)	A
4-Nitrophenol	100-02-7	230		A
Acenaphthene	83-32-9	220		A
Acenaphthylene	208-96-8	220	(i)	A
Anthracene	120-12-7	1100		A
Benz[a]anthracene	56-55-3	0.022		B
Benzo[a]pyrene	50-32-8	0.0022		B
Benzo[b]fluoranthene	205-99-2	0.022		B
Benzo[g,h,i]perylene	191-24-2	110	(j)	A
Benzo[k]fluoranthene	207-08-9	0.22		B
bis(2-Chloroethoxy)methane	111-91-1	NA		C
bis(2-Chloroethyl)ether	111-44-4	0.0058		B
bis(2-Ethylhexyl)phthalate	117-81-7	0.48		B
Butyl benzyl phthalate	85-68-7	730		A
Carbazole	86-74-8	0.34		B
Chrysene	218-01-9	2.2		B
Dibenz[a,h]anthracene	53-70-3	0.0022		B
Dibenzofuran	132-64-9	15		A
Diethylphthalate	84-66-2	2900		A
Dimethyl phthalate	131-11-3	37000		B
Di-n-butyl phthalate	84-74-2	370		A
Di-n-octyl phthalate	117-84-0	73		A
Fluoranthene	206-44-0	150		A
Fluorene	86-73-7	150		A
Hexachlorobenzene	118-74-1	0.0042		B
Hexachlorobutadiene	87-68-3	0.087		B
Hexachlorocyclopentadiene	77-47-4	0.073		A
Hexachloroethane	67-72-1	0.48		B
Indeno[1,2,3-cd]pyrene	193-39-5	0.022		B
Isophorone	78-59-1	7.1		B
Naphthalene	91-20-3	3.1		A
Nitrobenzene	98-95-3	2.1		A
N-Nitroso-di-n-propylamine	621-64-7	0.00096		B
N-Nitrosodiphenylamine	86-30-6	1.4		B
Pentachlorophenol	87-86-5	0.056		B
Phenanthrene	85-01-8	1100	(k)	A
Phenol	108-95-2	2200		A
Pyrene	129-00-0	110		A

TABLE 4
DATA QUALITY LIMITS (DQLs) FOR AIR
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

CONSTITUENT	CAS NO.	DQL (ug/m^3) (a)	Basis
TAL Metals			
Aluminum	7429-90-5	NA	
Antimony	7440-36-0	NA	
Arsenic	7440-38-2	0.00045	B
Barium	7440-39-3	0.52	A
Beryllium	7440-41-7	0.0008	B
Cadmium	7440-43-9	0.0011	B
Calcium	7440-70-2	NA	
Chromium	7440-47-3	0.000023 (l)	B
Cobalt	7440-48-4	0.021	A
Iron	7439-89-6	NA	
Lead	7439-92-1	NA	
Magnesium	7439-95-4	NA	
Manganese	7439-96-5	0.051	A
Nickel	7440-02-0	0.008 (m)	B
Potassium	7440-09-7	NA	
Selenium	7782-49-2	NA	
Silver	7440-22-4	NA	
Sodium	7440-23-5	NA	
Thallium	7440-28-0	NA	
Vanadium	7440-62-2	NA	
Mercury	7439-97-6	0.31	A
Copper	7440-50-8	NA	
Zinc	7440-66-6	NA	
Cyanide	57-12-5	NA	
PCBs			
Total PCBs	NA	0.0034	B

TABLE 4
DATA QUALITY LIMITS (DQLs) FOR AIR
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

CONSTITUENT	CAS NO.	DQL (ug/m^3) (a)	Basis
Dioxins and Furans			
2,3,7,8-TCDD	1746-01-6	4.50E-08	B
1,2,3,7,8-PentaCDD	40321-76-4	4.50E-08	B
1,2,3,4,7,8-HexaCDD	39227-28-6	4.50E-08	B
1,2,3,6,7,8-HexaCDD	57653-85-7	4.50E-08	B
1,2,3,7,8,9-HexaCDD	19408-74-3	4.50E-08	B
1,2,3,4,6,7,8-HeptaCDD	35822-39-4	4.50E-08	B
OctaCDD	3268-87-9	4.50E-08	B
2,3,7,8-TetraCDF	51207-31-9	4.50E-08	B
1,2,3,7,8-PentaCDF	57117-41-6	4.50E-08	B
2,3,4,7,8-PentaCDF	57117-31-4	4.50E-08	B
1,2,3,4,7,8-HexaCDF	70648-26-9	4.50E-08	B
1,2,3,6,7,8-HexaCDF	57117-44-9	4.50E-08	B
1,2,3,7,8,9-HexaCDF	72918-21-9	4.50E-08	B
2,3,4,6,7,8-HexaCDF	60851-34-5	4.50E-08	B
1,2,3,4,6,7,8-HeptaCDF	67562-39-4	4.50E-08	B
1,2,3,4,7,8,9-HeptaCDF	55673-89-7	4.50E-08	B
OctaCDF	39001-02-0	4.50E-08	B
Additional (added 4/17/99)			
Benzyl Alcohol	100-51-6	1.1E+03	A
Bis(2-chloroisopropyl)ether (2,2'-oxyb	108-60-1	1.9E-01 (b)	B
Dichlorodifluoromethane	75-71-8	2.1E+02 -	A
Trichlorofluoromethane	75-69-4	7.3E+02	A
1,1-Dichloroethene	75-35-4	3.8E-02	B
Trans-1,2-dichloroethene	156-60-5	7.3E+01	A
2,2-Dichloropropane	594-20-7	NA	C
Cis-1,2-dichloroethene	156-59-2	3.7E+01	A
Bromochloromethane	74-97-5	NA	C
1,1-Dichloropropylene	563-58-6	NA	C
Dibromomethane	74-95-3	3.7E+01	A
1,3-Dichloropropane	142-28-9	NA	C
1,2-Dibromomethane	106-93-4	8.7E-03	B
1,1,1,2-Tetrachloroethane	630-20-6	2.6E-01	B
M & p xylenes	108-38-3	7.3E+02	A
o-xylene	95-47-6	7.3E+02	A
isopropylbenzene	104-5-18	3.7E+01	A
1,2,3,-trichloropropane	96-18-4	9.6E-04	B
n-proplybenzene	104-51-8	3.7E+01	A
Bromobenzene	108-86-1	1.0E+01	A
1,3,5-Trimethylbenzene	108-67-8	6.2E+00	A
2-Chlorotoluene	95-49-8	7.3E+01	A
4-Chlorotoluene	106-43-4	7.3E+01 (n)	A
t-Butylbenzene	104-5-18	3.7E+01	A
1,2,4-Trimethylbenzene	95-63-6	6.2E+00	A
s-Butylbenzene	135-9-88	3.7E+01	A
p-Isopropyltoluene	99-87-6	NA	C
n-Butylbenzene	104-51-8	3.7E+01	A
1,2-Dibromo-3-chloropropane	96-12-8	2.1E-01	A

TABLE 4
DATA QUALITY LIMITS (DQLs) FOR AIR
SAUGET AREA 1 EE/CA AND RI/FS
SAUGET AND CAHOKIA, ILLINOIS
SOLUTIA, INC.

CONSTITUENT	CAS NO.	DQL (ug/m^3) (a)	Basis
1,2,3-Trichlorobenzene	87-61-6	NA	C
Vinyl acetate	108-05-4	2.1E+02	A

Notes:
CAS = Chemical Abstracts Service.
CB = Chlorobiphenyl.
CDD = Chlorodibenzodioxin.
CDF = Chlorodibenzofuran.
DQL = Data Quality Limit.
NA = Not available.
PCB = Polychlorinated Biphenyl.
PRG = Preliminary Remedial Goal.
TAL = Target Analyte List.
TCL = Target Compound List.
(a) Air DQLs are based on USEPA Region IX PRG Table. (USEPA, 1998c)
(b) Synonym of Bis(2-Chloroisopropyl ether)
(c) Value for cis-1,2-Dichloroethylene used.
(d) Due to structural similarities, the value for 4-Methyl-2-Pentanone was used.
(e) Value for 1,3-Dichloropropene.
(f) Due to structural similarities, the value for Naphthalene was used.
(g) Due to structural similarities, the value for 4-Nitrophenol was used.
(h) Due to structural similarities, the value for 2-Nitroaniline was used.
(i) Due to structural similarities, the value for Acenaphthene was used.
(j) Due to structural similarities, the value for Pyrene was used.
(k) Due to structural similarities, the value for Anthracene was used.
(l) Value for Chromium IV.
(m) Value for Nickel Refinery Dust.
(n) - Due to structural similarities, the value for 2-Chlorotoluene was used.
A = Region IX PRG, based on non-carcinogenic effects.
B = Region IX PRG, based on carcinogenic effects.
C = No Toxicological value available.

APPENDIX B

TACO TIER I CRITERIA

Section 742.APPENDIX B: Tier 1 Tables and Illustrations

Section 742.TABLE A: Tier 1 Soil Remediation Objectives[a] for Residential Properties

		Exposure Route-Specific Values for Soils		Soil Component of the Groundwater Ingestion Exposure Route Values		
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
83-32-9	Acenaphthene	4,700[b]	---[c]	570[b]	2,900	*
67-64-1	Acetone	7,800[b]	100,000[d]	16[b]	16	*
15972-60-8	Alachlor[o]	8[e]	---[c]	0.04	0.2	NA
116-06-3	Aldicarb[o]	78[b]	---[c]	0.013	0.07	NA
309-00-2	Aldrin	0.04[e]	3[e]	0.5[e]	2.5	*
120-12-7	Anthracene	23,000[b]	---[c]	12,000[b]	59,000	*
1912-24-9	Atrazine[o]	2700[b]	---[c]	0.066	0.33	NA
71-43-2	Benzene	22[e]	0.8[e]	0.03	0.17	*
56-55-3	Benzo(*a*)anthracene	0.9[e]	---[c]	2	8	*
205-99-2	Benzo(*b*)fluoranthene	0.9[e]	---[c]	5	25	*

		Exposure Route-Specific Values for Soils		Soil Component of the Groundwater Ingestion Exposure Route Values		
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
207-08-9	Benzo(*k*)fluroanthene	9[e]	---[c]	49	250	*
50-32-8	Benzo(*a*)pyrene	0.09[e,f]	---[c]	8	82	*
111-44-4	Bis(2-chloroethyl)ether	0.6[e]	0.2[e,f]	0.0004[e,f]	0.0004	0.66
117-81-7	Bis(2-ethylhexyl)phthalate	46[e]	31,000[d]	3,600	31,000[d]	*
75-27-4	Bromodichloromethane (Dichlorobromomethane)	10[e]	3,000[d]	0.6	0.6	*
75-25-2	Bromoform	81[e]	53[e]	0.8	0.8	*
71-36-3	Butanol	7,800[b]	10,000[d]	17[b]	17	NA
85-68-7	Butyl benzyl phthalate	16,000[b]	930[d]	930[d]	930[d]	*
86-74-8	Carbazole	32[e]	---[c]	0.6[e]	2.8	NA
1563-66-2	Carbofuran[o]	390[b]	---[c]	0.22	1.1	NA
75-15-0	Carbon disulfide	7,800[b]	720[d]	32[b]	160	*

		Exposure Route-Specific Values for Soils		Soil Component of the Groundwater Ingestion Exposure Route Values		
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
56-23-5	Carbon tetrachloride	5[e]	0.3[e]	0.07	0.33	*
57-74-9	Chlordane	0.5[e]	20[e]	10	48	*
106-47-8	4-Chloroaniline (*p*-Chloroaniline)	310[b]	---[c]	0.7[b]	0.7	1.3
108-90-7	Chlorobenzene (Monochlorobenzene)	1,600[b]	130[b]	1	6.5	*
124-48-1	Chlorodibromomethane (Dibromochloromethane)	1,600[b]	1,300[d]	0.4	0.4	*
67-66-3	Chloroform	100[e]	0.3[e]	0.6	2.9	*
218-01-9	Chrysene	88[e]	---[c]	160	800	*
94-75-7	2,4-D	780[b]	---[c]	1.5	7.7	*
75-99-0	Dalapon	2,300[b]	---[c]	0.85	8.5	1.2
72-54-8	DDD	3[e]	---[c]	16[e]	80	*
72-55-9	DDE	2[e]	---[c]	54[e]	270	*

		Exposure Route-Specific Values for Soils		Soil Component of the Groundwater Ingestion Exposure Route Values		
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
50-29-3	DDT	2[e]	---[g]	32[e]	160	*
53-70-3	Dibenzo(*a,h*)anthracene	0.09[e,f]	---[c]	2	7.6	*
96-12-8	1,2-Dibromo-3-chloropropane	0.46[e]	11[b]	0.002	0.002	*
106-93-4	1,2-Dibromoethane (Ethylene dibromide)	0.0075[e]	0.17[e]	0.0004	0.004	0.005
84-74-2	Di-*n*-butyl phthalate	7,800[b]	2,300[d]	2,300[d]	2,300[d]	*
95-50-1	1,2-Dichlorobenzene (*o* - Dichlorobenzene)	7,000[b]	560[d]	17	43	*
106-46-7	1,4-Dichlorobenzene (*p* - Dichlorobenzene)	---[c]	---[g]	2	11	*
91-94-1	3,3'-Dichlorobenzidine	1[e]	---[c]	0.007[e,f]	0.033	1.3
75-34-3	1,1-Dichloroethane	7,800[b]	1,300[b]	23[b]	110	*

		Exposure Route-Specific Values for Soils		Soil Component of the Groundwater Ingestion Exposure Route Values		
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
107-06-2	1,2-Dichloroethane (Ethylene dichloride)	7[e]	0.4[e]	0.02	0.1	*
75-35-4	1,1-Dichloroethylene	700[b]	1,500[d]	0.06	0.3	*
156-59-2	*cis*-1,2-Dichloroethylene	780[b]	1,200[d]	0.4	1.1	*
156-60-5	*trans*-1,2-Dichloroethylene	1,600[b]	3,100[d]	0.7	3.4	*
78-87-5	1,2-Dichloropropane	9[e]	15[b]	0.03	0.15	*
542-75-6	1,3-Dichloropropene (1,3-Dichloropropylene, *cis* + *trans*)	4[e]	0.1[e]	0.004[e]	0.02	0.005
60-57-1	Dieldrin[n]	0.04[e]	1[e]	0.004[e]	0.02	*
84-66-2	Diethyl phthalate	63,000[b]	2,000[d]	470[b]	470	*
105-67-9	2,4-Dimethylphenol	1,600[b]	---[c]	9[b]	9	*
121-14-2	2,4-Dinitrotoluene	0.9[e]	---[c]	0.0008[e,f]	0.0008	0.013

		Exposure Route-Specific Values for Soils		Soil Component of the Groundwater Ingestion Exposure Route Values		
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
606-20-2	2,6-Dinitrotoluene	0.9[e]	---[c]	0.0007[e,f]	0.0007	0.0067
117-84-0	Di-*n*-octyl phthalate	1,600[b]	10,000[d]	10,000[d]	10,000[d]	*
115-29-7	Endosulfan	470[b]	---[c]	18[b]	90	*
145-73-3	Endothall[o]	1,600[b]	---[c]	0.4	0.4	NA
72-20-8	Endrin	23[b]	---[c]	1	5	*
100-41-4	Ethylbenzene	7,800[b]	400[d]	13	19	*
206-44-0	Fluoranthene	3,100[b]	---[c]	4,300[b]	21,000	*
86-73-7	Fluorene	3,100[b]	---[c]	560[b]	2,800	*
76-44-8	Heptachlor	0.1[e]	0.1[e]	23	110	*
1024-57-3	Heptachlor epoxide	0.07[e]	5[e]	0.7	3.3	*
118-74-1	Hexachlorobenzene	0.4[e]	1[e]	2	11	*
319-84-6	*alpha*-HCH (*alpha*-BHC)	0.1[e]	0.8[e]	0.0005[e,f]	0.003	0.002

		Exposure Route-Specific Values for Soils		Soil Component of the Groundwater Ingestion Exposure Route Values		
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
58-89-9	*gamma*-HCH (Lindane)[n]	0.5[e]	---[c]	0.009	0.047	*
77-47-4	Hexachlorocyclopentadiene	550[b]	10[b]	400	2,200[d]	*
67-72-1	Hexachloroethane	78[b]	---[c]	0.5[b]	2.6	*
193-39-5	Indeno(1,2,3-*c,d*)pyrene	0.9[e]	---[c]	14	69	*
78-59-1	Isophorone	15,600[b]	4,600[d]	8[b]	8	*
72-43-5	Methoxychlor	390[b]	---[c]	160	780	*
74-83-9	Methyl bromide (Bromomethane)	110[b]	10[b]	0.2[b]	1.2	*
75-09-2	Methylene chloride (Dichloromethane)	85[e]	13[e]	0.02[e]	0.2	*
95-48-7	2-Methylphenol (*o* - Cresol)	3,900[b]	---[c]	15[b]	15	*
91-20-3	Naphthalene	3,100[b]	---[c]	84[b]	420	*
98-95-3	Nitrobenzene	39[b]	92[b]	0.1[b,f]	0.1	0.26

		Exposure Route-Specific Values for Soils		Soil Component of the Groundwater Ingestion Exposure Route Values		
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
86-30-6	*N*-Nitrosodiphenylamine	130[f]	---[c]	1[e]	5.6	*
621-64-7	*N*-Nitrosodi-*n*-propylamine	0.09[e,f]	---[c]	0.00005[e,f]	0.00005	0.66
108-95-2	Phenol	47,000[b]	---[c]	100[b]	100	*
1918-02-1	Picloram[o]	5,500[b]	---[c]	2	20	NA
1336-36-3	Polychlorinated biphenyls (PCBs)[n]	1; 10[h]	---[c,h]	---[h]	---[h]	*
129-00-0	Pyrene	2,300[b]	---[c]	4,200[b]	21,000	*
122-34-9	Simazine[o]	390[b]	---[c]	0.04	0.37	NA
100-42-5	Styrene	16,000[b]	1,500[d]	4	18	*
127-18-4	Tetrachloroethylene (Perchloroethylene)	12[e]	11[e]	0.06	0.3	*
108-88-3	Toluene	16,000[b]	650[d]	12	29	*

		Exposure Route-Specific Values for Soils		Soil Component of the Groundwater Ingestion Exposure Route Values		
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
8001-35-2	Toxaphene[n]	0.6[e]	89[e]	31	150	*
120-82-1	1,2,4-Trichlorobenzene	780[b]	3,200[b]	5	53	*
71-55-6	1,1,1-Trichloroethane	---[c]	1,200[d]	2	9.6	*
79-00-5	1,1,2-Trichloroethane	310[b]	1,800[d]	0.02	0.3	*
79-01-6	Trichloroethylene	58[e]	5[e]	0.06	0.3	*
108-05-4	Vinyl acetate	78,000[b]	1,000[b]	170[b]	170	*
75-01-4	Vinyl chloride	0.3[e]	0.03[e]	0.01[f]	0.07	*
108-38-3	m-Xylene	160,000[b]	420[d]	210	210	*
95-47-6	o-Xylene	160,000[b]	410[d]	190	190	*
106-42-3	p-Xylene	160,000[b]	460[d]	200	200	*

		Exposure Route-Specific Values for Soils		Soil Component of the Groundwater Ingestion Exposure Route Values		
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
1330-20-7	Xylenes (total)	160,000[b]	410[d]	150	150	*
	Ionizable Organics					
65-85-0	Benzoic Acid	310,000[b]	---[c]	400[b,i]	400[i]	*
95-57-8	2-Chlorophenol	390[b]	53,000[d]	4[b,i]	4[i]	*
120-83-2	2,4-Dichlorophenol	230[b]	---[c]	1[b,i]	1[i]	*
51-28-5	2,4-Dinitrophenol	160[b]	---[c]	0.2[b,f]	0.2	3.3
88-85-7	Dinoseb[o]	78[b]	---[c]	0.34[b,i]	3.4[i]	*
87-86-5	Pentachlorophenol	3[e,j]	---[c]	0.03[f,i]	0.14[i]	2.4
93-72-1	2,4,5-TP (Silvex)	630[b]	---[c]	11[i]	55[i]	*
95-95-4	2,4,5-Trichlorophenol	7,800[b]	---[c]	270[b,i]	1,400[i]	*
88-06-2	2,4,6 Trichlorophenol	58[e]	200[e]	0.2[e,f,i]	0.77[i]	0.43

		Exposure Route-specific Values for Soils		Soil Component of the Groundwater Ingestion Exposure Route Values		
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/L)	Class II (mg/L)	ADL (mg/kg)
	Inorganics					
7440-36-0	Antimony	31[b]	---[c]	0.006[m]	0.024[m]	*
7440-38-2	Arsenic[l,n]	0.4[e,t]	750[e]	0.05[m]	0.2[m]	*
7440-39-3	Barium	5,500[b]	690,000[b]	2.0[m]	2.0[m]	*
7440-41-7	Beryllium	0.1[e,t]	1,300[e]	0.004[m]	0.5[m]	*
7440-42-8	Boron	7,000[b]	---[g]	2.0[m]	2.0[m]	*
7440-43-9	Cadmium[l,n]	78[b, r]	1,800[e]	0.005[m]	0.05[m]	*
16887-00-6	Chloride	---[c]	---[c]	200[m]	200[m]	*
7440-47-3	Chromium, total	390[b]	270[e]	0.1[m]	1.0[m]	*
16065-83-1	Chromium, ion, trivalent	78,000[b]	---[c]	---[g]	---[g]	*
18540-29-9	Chromium, ion, hexavalent	390[b]	270[e]	---	---	*
7440-48-4	Cobalt	4,700[b]	---[c]	1.0[m]	1.0[m]	*

		Exposure Route-specific Values for Soils		Soil Component of the Groundwater Ingestion Exposure Route Values		
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/L)	Class II (mg/L)	ADL (mg/kg)
7440-50-8	Copper[n]	2,900[b]	---[c]	0.65[m]	0.65[m]	*
57-12-5	Cyanide (amenable)	1,600[b]	---[c]	0.2[q]	0.6[q]	*
7782-41-4	Fluoride	4,700[b]	---[c]	4.0[m]	4.0[m]	*
15438-31-0	Iron	---[c]	---[c]	5.0[m]	5.0[m]	*
7439-92-1	Lead	400[k]	---[c]	0.0075[m]	0.1[m]	*
7439-96-5	Manganese	3,700[b]	69,000[b]	0.15[m]	10.0[m]	*
7439-97-6	Mercury[l,n]	23[b,s]	10[b,i]	0.002[m]	0.01[m]	*
7440-02-0	Nickel[l]	1,600[b]	13,000[e]	0.1[m]	2.0[m]	*
14797-55-8	Nitrate as N[p]	130,000[b]	---[c]	10.0[q]	100[q]	*
7782-49-2	Selenium[l,n]	390[b]	---[c]	0.05[m]	0.05[m]	*

		Exposure Route-specific Values for Soils		Soil Component of the Groundwater Ingestion Exposure Route Values		
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/L)	Class II (mg/L)	ADL (mg/kg)
7440-22-4	Silver	390[b]	---[c]	0.05[m]	---	*
14808-79-8	Sulfate	---[c]	---[c]	400[m]	400[m]	*
7440-28-0	Thallium	6.3[b,u]	---[c]	0.002[m]	0.02[m]	*
7440-62-2	Vanadium	550[b]	---[c]	0.049[m]	---	*
7440-66-6	Zinc[l]	23,000[b]	---[c]	5.0[m]	10[m]	*

"*" indicates that the ADL is less than or equal to the specified remediation objective.
NA means not available; no PQL or EQL available in USEPA analytical methods.

Chemical Name and Soil Remediation Objective Notations

[a] Soil remediation objectives based on human health criteria only.
[b] Calculated values correspond to a target hazard quotient of 1.
[c] No toxicity criteria available for the route of exposure.
[d] Soil saturation concentration ($C_{[sat]}$) = the concentration at which the absorptive limits of the soil particles, the solubility limits of the available soil moisture, and saturation of soil pore air have been reached. Above the soil saturation concentration, the assumptions regarding vapor transport to air and/or dissolved phase transport to groundwater (for chemicals which are liquid at ambient soil temperatures) have been violated, and alternative modeling approaches are required.
[e] Calculated values correspond to a cancer risk level of 1 in 1,000,000.
[f] Level is at or below Contract Laboratory Program required quantitation limit for Regular Analytical Services (RAS).
[g] Chemical-specific properties are such that this route is not of concern at any soil contaminant concentration.
[h] A preliminary goal of 1 ppm has been set for PCBs based on *Guidance on Remedial Actions for Superfund Sites with PCB Contamination*, EPA/540G-90/007, and on USEPA efforts to manage PCB contamination. See 40 CFR 761.120 - USEPA "PCB Spill Cleanup Policy." This regulation goes on to say that the remediation goal for an unrestricted area is 10 ppm and 25 ppm for a restricted area, provided both have at least 10 inches of clean cover.
[i] Soil remediation objective for pH of 6.8. If soil pH is other than 6.8, refer to Appendix B, Tables C and D of this Part.
[j] Ingestion soil remediation objective adjusted by a factor of 0.5 to account for dermal route.
[k] A preliminary remediation goal of 400 mg/kg has been set for lead based on *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities*, OSWER Directive #9355.4-12.
[l] Potential for soil-plant-human exposure.
[m] The person conducting the remediation has the option to use: 1) TCLP or SPLP test results to compare with the remediation objectives listed in this Table; or 2) the total amount of contaminant in the soil sample results to compare with pH specific remediation objectives listed in Appendix B, Table C or D of this Part. (See Section 742.510.) If the person conducting the remediation wishes to calculate soil remediation objectives based on background concentrations, this should be done in accordance with Subpart D of this Part.
[n] The Agency reserves the right to evaluate the potential for remaining contaminant concentrations to pose significant threats to crops, livestock, or wildlife.
[o] For agrichemical facilities, remediation objectives for surficial soils which are based on field application rates may be more appropriate for currently registered pesticides. Consult the Agency for further information.
[p] For agrichemical facilities, soil remediation objectives based on site-specific background concentrations of Nitrate as N may be more appropriate. Such determinations shall be conducted in accordance with the procedures set forth in Subparts D and I of this Part.
[q] The TCLP extraction must be done using water at a pH of 7.0.
[r] Value based on dietary Reference Dose.
[s] Value based on Reference Dose for Mercuric chloride (CAS No. 7487-94-7).
[t] Note that Table value is likely to be less than background concentration for this chemical; screening or remediation concentrations using the procedures of Subpart D of this Part may be more appropriate.

[u] Value based on Reference Dose for thallium sulfate (CAS No. 7446-18-6).

Section 742.APPENDIX B: Tier 1 Tables and Illustrations

Section 742.Table B: Tier 1 Soil Remediation Objectives[a] for Industrial/Commercial Properties

		Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route Values		
		Industrial-Commercial		Construction Worker				
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	ClassII (mg/kg)	ADL (mg/kg)
83-32-9	Acenaphthene	120,000[b]	-----[c]	120,000[b]	-----[c]	570[b]	2,900	*
67-64-1	Acetone	200,000[b]	100,000[d]	200,000[b]	100,000[d]	16[b]	16	*
15972-60-8	Alachlor[o]	72[e]	-----[c]	1,600[e]	-----[c]	0.04	0.2	NA
116-06-3	Aldicarb[o]	2,000[b]	-----[c]	200[b]	-----[c]	0.013	0.07	NA
309-00-2	Aldrin	0.3[e]	6.6[e]	6.1[b]	9.3[e]	0.5[e]	2.5	*
120-12-7	Anthracene	610,000[b]	-----[c]	610,000[b]	-----[c]	12,000[b]	59,000	*
1912-24-9	Atrazine[o]	72,000[b]	-----[c]	7,100[b]	-----[c]	0.066	0.33	NA
71-43-2	Benzene	200[e]	1.5[e]	4,300[e]	2.1[e]	0.03	0.17	*

		Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route Values		
		Industrial-Commercial		Construction Worker				
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
56-55-3	Benzo(*a*)anthracene	8[e]	-----[c]	170[e]	-----[c]	2	8	*
205-99-2	Benzo(*b*)fluoranthene	8[e]	-----[c]	170[e]	-----[c]	5	25	*
207-08-9	Benzo(*k*)fluroanthene	78[e]	-----[c]	1,700[e]	-----[c]	49	250	*
50-32-8	Benzo(*a*)pyrene	0.8[e]	-----[c]	17[e]	-----[c]	8	82	*
111-44-4	Bis(2-chloroethyl)ether	5[e]	0.47[e]	75[e]	0.66[e]	0.0004[e,f]	0.0004	0.66
117-81-7	Bis(2-ethylhexyl)phthalate	410[e]	31,000[d]	4,100[b]	31,000[d]	3,600	31,000[d]	*
75-27-4	Bromodichloromethane (Dichlorobromomethane)	92[e]	3,000[d]	2,000[e]	3,000[d]	0.6	0.6	*
75-25-2	Bromoform	720[e]	100[e]	16,000[e]	140[e]	0.8	0.8	*
71-36-3	Butanol	200,000[b]	10,000[d]	200,000[b]	10,000[d]	17[b]	17	NA
85-68-7	Butyl benzyl phthalate	410,000[b]	930[d]	410,000[b]	930[d]	930[d]	930[d]	*
86-74-8	Carbazole	290[e]	-----[c]	6,200[e]	-----[c]	0.6[e]	2.8	NA

		Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route Values		
		Industrial-Commercial		Construction Worker				
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
1563-66-2	Carbofuran[o]	10,000[b]	-----[c]	1,000[b]	-----[c]	0.22	1.1	NA
75-15-0	Carbon disulfide	200,000[b]	720[d]	20,000[b]	9.0[b]	32[b]	160	*
56-23-5	Carbon tetrachloride	44[e]	0.64[e]	410[b]	0.90[e]	0.07	0.33	*
57-74-9	Chlordane	4[e]	38[e]	12[b]	53[e]	10	48	*
106-47-8	4 - Chloroaniline (*p*-Chloroaniline)	8,200[b]	-----[c]	820[b]	-----[c]	0.7[b]	0.7	1.3
108-90-7	Chlorobenzene (Monochlorobenzene)	41,000[b]	210[b]	4,100[b]	1.3[b]	1	6.5	*
124-48-1	Chlorodibromomethane (Dibromochloromethane)	41,000[b]	1,300[d]	41,000[b]	1,300[d]	0.4	0.4	*
67-66-3	Chloroform	940[e]	0.54[e]	2,000[b]	0.76[e]	0.6	2.9	*
218-01-9	Chrysene	780[e]	-----[c]	17,000[e]	-----[e]	160	800	*
94-75-7	2,4-D	20,000[b]	-----[c]	2,000[b]	-----[c]	1.5	7.7	*

		Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route Values		
		Industrial-Commercial		Construction Worker				
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
75-99-0	Dalapon	61,000[b]	-----[c]	6,100[b]	-----[c]	0.85	8.5	1.2
72-54-8	DDD	24[e]	-----[c]	520[e]	-----[c]	16[e]	80	*
72-55-9	DDE	17[e]	-----[c]	370[e]	-----[c]	54[e]	270	*
50-29-3	DDT	17[e]	1,500[e]	100[b]	2,100[e]	32[e]	160	*
53-70-3	Dibenzo(*a,h*)anthracene	0.8[e]	-----[c]	17[e]	-----[c]	2	7.6	*
96-12-8	1,2-Dibromo-3-chloropropane	4[e]	17[b]	89[e]	0.11[b]	0.002	0.002	*
106-93-4	1,2-Dibromoethane (Ethylene dibromide)	0.07[e]	0.32[e]	1.5[e]	0.45[e]	0.0004	0.004	0.005
84-74-2	Di-*n*-butyl phthalate	200,000[b]	2,300[d]	200,000[b]	2,300[d]	2,300[d]	2,300[d]	*
95-50-1	1,2-Dichlorobenzene (*o* - Dichlorobenzene)	180,000[b]	560[d]	18,000[b]	310[b]	17	43	*
106-46-7	1,4-Dichlorobenzene (*p* - Dichlorobenzene)	-----[c]	17,000[b]	-----[c]	340[b]	2	11	*

		Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route Values		
		Industrial-Commercial		Construction Worker				
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
91-94-1	3,3'-Dichlorobenzidine	13[e]	-----[c]	280[e]	-----[c]	0.007[e,f]	0.033	1.3
75-34-3	1,1-Dichloroethane	200,000[b]	1,700[d]	200,000[b]	130[b]	23[b]	110	*
107-06-2	1,2-Dichloroethane (Ethylene dichloride)	63[e]	0.70[e]	1,400[e]	0.99[e]	0.02	0.1	*
75-35-4	1,1-Dichloroethylene	18,000[b]	1,500[d]	1,800[b]	1,500[d]	0.06	0.3	*
156-59-2	*cis*-1,2-Dichloroethylene	20,000[b]	1,200[d]	20,000[b]	1,200[d]	0.4	1.1	*
156-60-5	*trans*-1,2-Dichloroethylene	41,000[b]	3,100[d]	41,000[b]	3,100[d]	0.7	3.4	*
78-87-5	1,2-Dichloropropane	84[e]	23[b]	1,800[e]	0.50[b]	0.03	0.15	*
542-75-6	1,3-Dichloropropene (1,3-Dichloropropylene, *cis* + *trans*)	33[e]	0.23[e]	610[b]	0.33[e]	0.004[e]	0.02	0.005
60-57-1	Dieldrin[n]	0.4[e]	2.2[e]	7.8[e]	3.1[e]	0.004[e]	0.02	0.0013
84-66-2	Diethyl phthalate	1,000,000[b]	2,000[d]	1,000,000[b]	2,000[d]	470[b]	470	*

		Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route Values		
		Industrial-Commercial		Construction[l] Worker				
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
105-67-9	2,4-Dimethylphenol	41,000[b]	-----[c]	41,000[b]	-----[c]	9[b]	9	*
121-14-2	2,4-Dinitrotoluene	8.4[e]	-----[c]	180[e]	-----[c]	0.0008[e,f]	0.0008	0.013
606-20-2	2,6-Dinitrotoluene	8.4[e]	-----[c]	180[e]	-----[c]	0.0007[e,f]	0.0007	0.0067
117-84-0	Di-*n*-octyl phthalate	41,000[e]	10,000[d]	4,100[b]	10,000[d]	10,000[d]	10,000[d]	*
115-29-7	Endosulfan	12,000[b]	-----[c]	1,200[b]	-----[c]	18[b]	90	*
145-73-3	Endothall[o]	41,000[c]	-----[c]	4,100[b]	-----[c]	0.4	0.4	NA
72-20-8	Endrin	610[b]	-----[c]	61[b]	-----[c]	1	5	*
100-41-4	Ethylbenzene	200,000[b]	400[d]	20,000[b]	58[b]	13	19	*
206-44-0	Fluoranthene	82,000[b]	-----[c]	82,000[b]	-----[c]	4,300[b]	21,000	*
86-73-7	Fluorene	82,000[b]	-----[c]	82,000[b]	-----[c]	560[b]	2,800	*
76-44-8	Heptachlor	1[e]	11[e]	28[e]	16[e]	23	110	*

		Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route Values		
		Industrial-Commercial		Construction Worker				
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
105-67-9	2,4-Dimethylphenol	41,000[b]	-----[c]	41,000[b]	-----[c]	9[b]	9	*
121-14-2	2,4-Dinitrotoluene	8.4[e]	-----[c]	180[e]	-----[c]	0.0008[e,f]	0.0008	0.013
606-20-2	2,6-Dinitrotoluene	8.4[e]	-----[c]	180[e]	-----[c]	0.0007[e,f]	0.0007	0.0067
117-84-0	Di-*n*-octyl phthalate	41,000[e]	10,000[d]	4,100[b]	10,000[d]	10,000[d]	10,000[d]	*
115-29-7	Endosulfan	12,000[b]	-----[c]	1,200[b]	-----[c]	18[b]	90	*
145-73-3	Endothall[o]	41,000[c]	-----[c]	4,100[b]	-----[c]	0.4	0.4	NA
72-20-8	Endrin	610[b]	-----[c]	61[b]	-----[c]	1	5	*
100-41-4	Ethylbenzene	200,000[b]	400[d]	20,000[b]	58[b]	13	19	*
206-44-0	Fluoranthene	82,000[b]	-----[c]	82,000[b]	-----[c]	4,300[b]	21,000	*
86-73-7	Fluorene	82,000[b]	-----[c]	82,000[b]	-----[c]	560[b]	2,800	*
76-44-8	Heptachlor	1[c]	11[c]	28[e]	16[c]	23	110	*

CAS No.	Chemical Name	Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route Values		
		Industrial-Commercial		Construction Worker				
		Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
1024-57-3	Heptachlor epoxide	0.6[e]	9.2[e]	2.7[b]	13[e]	0.7	3.3	*
118-74-1	Hexachlorobenzene	4[e]	1.8[e]	78[e]	2.6[e]	2	11	*
319-84-6	*alpha*-HCH (*alpha*-BHC)	0.9[e]	1.5[e]	20[e]	2.1[e]	0.0005[e,f]	0.003	0.002
58-89-9	*gamma*-HCH (Lindane)[n]	4[e]	-----[c]	96[e]	-----[c]	0.009	0.047	*
77-47-4	Hexachlorocyclopentadiene	14,000[b]	16[b]	14,000[b]	1.1[b]	400	2,200[d]	*
67-72-1	Hexachloroethane	2,000[b]	-----[c]	2,000[b]	-----[c]	0.5[b]	2.6	*
193-39-5	Indeno(1,2,3-*c,d*)pyrene	8[e]	-----[c]	170[e]	-----[c]	14	69	*
78-59-1	Isophorone	410,000[b]	4,600[d]	410,000[b]	4,600[d]	8[b]	8	*
72-43-5	Methoxychlor	10,000[b]	-----[c]	1,000[b]	-----[c]	160	780	*
74-83-9	Methyl bromide (Bromomethane)	2,900[b]	15[b]	1,000[b]	3.9[b]	0.2[b]	1.2	*

		Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route Values		
		Industrial-Commercial		Construction Worker				
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
75-09-2	Methylene chloride (Dichloromethane)	760[e]	24[e]	12,000[b]	34[e]	0.02[e]	0.2	*
95-48-7	2-Methylphenol (*o* - Cresol)	100,000[b]	-----[c]	100,000[b]	-----[c]	15[b]	15	*
86-30-6	*N*-Nitrosodiphenylamine	1,200[e]	-----[c]	25,000[e]	-----[c]	1[e]	5.6	0.66
621-64-7	*N*-Nitrosodi-*n*-propylamine	0.8[e]	-----[c]	18[e]	-----[c]	0.00005[e,f]	0.00005	0.66
91-20-3	Naphthalene	82,000[b]	-----[c]	8,200[b]	-----[c]	84[b]	420	*
98-95-3	Nitrobenzene	1,000[b]	140[b]	1,000[b]	9.4[b]	0.1[b,f]	0.1	0.26
108-95-2	Phenol	1,000,000[b]	-----[c]	120,000[b]	-----[c]	100[b]	100	*
1918-02-1	Picloram[o]	140,000[b]	-----[c]	14,000[b]	-----[c]	2	20	NA
1336-36-3	Polychlorinated biphenyls (PCBs)[n]	1; 10; 25[h]	-----[c,h]	1[h]	-----[c,h]	-----[h]	-----[h]	*
129-00-0	Pyrene	61,000[b]	-----[c]	61,000[b]	-----[c]	4,200[b]	21,000	*

		Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route Values		
		Industrial-Commercial		Construction Worker				
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
122-34-9	Simazine[o]	10,000[b]	-----[c]	1,000[b]	-----[c]	0.04	0.37	NA
100-42-5	Styrene	410,000[b]	1,500[d]	41,000[b]	430[b]	4	18	*
127-18-4	Tetrachloroethylene (Perchloroethylene)	110[e]	20[e]	2,400[e]	28[e]	0.06	0.3	*
108-88-3	Toluene	410,000[b]	650[d]	410,000[b]	42[b]	12	29	*
8001-35-2	Toxaphene[n]	5.2[e]	170[e]	110[e]	240[e]	31	150	*
120-82-1	1,2,4-Trichlorobenzene	20,000[b]	3,200[d]	2,000[b]	920[b]	5	53	*
71-55-6	1,1,1-Trichloroethane	-----[c]	1,200[d]	-----[c]	1,200[d]	2	9.6	*
79-00-5	1,1,2-Trichloroethane	8,200[b]	1,800[d]	8,200[b]	1,800[d]	0.02	0.3	*
79-01-6	Trichloroethylene	520[e]	8.9[e]	1,200[b]	12[e]	0.06	0.3	*
108-05-4	Vinyl acetate	1,000,000[b]	1,600[b]	200,000[b]	10[b]	170[b]	170	*

		Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route Values		
		Industrial-Commercial		Construction Worker				
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
75-01-4	Vinyl chloride	3[e]	0.06[e]	65[e]	0.08[e]	0.01[f]	0.07	*
108-38-3	m-Xylene	1,000,000	420[d]	410,000[b]	420[d]	210	210	*
95-47-6	o-Xylene	1,000,000	410[d]	410,000[b]	410[d]	190	190	*
106-42-3	p-Xylene	1,000,000	460[d]	410,000[b]	460[d]	200	200	*
1330-20-7	Xylenes (total)	1,000,000[b]	410[d]	410,000[b]	410[d]	150	150	*
	Ionizable Organics							
65-85-0	Benzoic Acid	1,000,000[b]	-----[c]	820,000[b]	-----[c]	400[b,i]	400[i]	*
95-57-8	2-Chlorophenol	10,000[b]	53,000[d]	10,000[b]	53,000[d]	4[b,i]	20[i]	*
120-83-2	2,4-Dichlorophenol	6,100[b]	-----[c]	610[b]	-----[c]	1[b,i]	1[i]	*
51-28-5	2,4-Dinitrophenol	4,100[b]	-----[c]	410[b]	-----[c]	0.2[b,f,i]	0.2[i]	3.3
88-85-7	Dinoseb[o]	2,000[b]	-----[c]	200[b]	-----[c]	0.34[b,i]	3.4[i]	*

		Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route Values		
		Industrial-Commercial		Construction Worker				
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/kg)	Class II (mg/kg)	ADL (mg/kg)
87-86-5	Pentachlorophenol	24[e,j]	-----[c]	520[e,j]	-----[c]	0.03[f,i]	0.14[i]	2.4
93-72-1	2,4,5-TP (Silvex)	16,000[b]	-----[c]	1,600[b]	-----[c]	11[i]	55[i]	*
95-95-4	2,4,5-Trichlorophenol	200,000[b]	-----[c]	200,000[b]	-----[c]	270[b,i]	1,400[i]	*
88-06-2	2,4,6- Trichlorophenol	520[e]	390[e]	11,000[e]	540[e]	0.2[e,f,i]	0.77[i]	0.43

		Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route Values		
		Industrial-Commercial		Construction Worker				
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/L)	Class II (mg/L)	
	Inorganics							
7440-36-0	Antimony	820[b]	-----[c]	82[b]	-----[c]	0.006[m]	0.024[m]	*
7440-38-2	Arsenic[l,n]	3[e,t]	1,200[e]	61[b]	25,000[e]	0.05[m]	0.2[m]	
7440-39-3	Barium	140,000[b]	910,000[b]	14,000[b]	870,000[b]	2.0[m]	2.0[m]	*
7440-41-7	Beryllium	1[e,t]	2,100[e]	29[e]	44,000[e]	0.004[m]	0.5[m]	*
7440-42-8	Boron	180,000[b]	1,000,000	18,000[b]	1,000,000	2.0[m]	2.0[m]	*
7440-43-9	Cadmium[l,n]	2,000[b,r]	2,800[e]	200[b,r]	59,000[e]	0.005[m]	0.05[m]	*
16887-00-6	Chloride	-------[c]	-----[c]	-----[c]	-----[c]	200[m]	200[m]	*
7440-47-3	Chromium, total	10,000[b]	420[e]	4,100[b]	8,800[e]	0.1[m]	1.0[m]	*
16065-83-1	Chromium, ion, trivalent	1,000,000[b]	-----[c]	330,000[b]	-----[c]	-----[g]	-----[g]	*
18540-29-9	Chromium, ion, hexavalent	10,000[b]	420[e]	4,100[b]	8,800[e]	-----	-----	*

CAS No.	Chemical Name	Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route Values		
		Industrial-Commercial		Construction Worker				
		Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/L)	Class II (mg/L)	
7440-48-4	Cobalt	120,000[b]	-----[c]	12,000[b]	-----[c]	1.0[m]	1.0[m]	*
7440-50-8	Copper[n]	82,000[b]	-----[c]	8,200[b]	-----[c]	0.65[m]	0.65[m]	*
57-12-5	Cyanide (amenable)	41,000[b]	-----[c]	4,100[b]	-----[c]	0.2[q]	0.6[q]	*
7782-41-4	Fluoride	120,000[b]	-----[c]	12,000[b]	-----[c]	4.0[m]	4.0[m]	*
15438-31-0	Iron	-----[c]	-----[c]	-----[c]	-----[c]	5.0[m]	5.0[m]	*
7439-92-1	Lead	400[k]	-----[c]	400[k]	-----[c]	0.0075[m]	0.1[m]	*
7439-96-5	Manganese	96,000[b]	91,000[b]	9,600[b]	8,700[b]	0.15[m]	10.0[m]	*
7439-97-6	Mercury[l,n]	610[b]	540,000[b]	61[b,s]	52,000[b]	0.002[m]	0.01[m]	*
7440-02-0	Nickel[l]	41,000[b]	21,000[e]	4,100[b]	440,000[e]	0.1[m]	2.0[m]	*
14797-55-8	Nitrate as N[p]	1,000,000[b]	-----[c]	330,000[b]	-----[c]	10.0[q]	100[q]	*
7782-49-2	Selenium[l,n]	10,000[b]	-----[c]	1,000[b]	-----[c]	0.05[m]	0.05[m]	*

		Exposure Route-Specific Values for Soils				Soil Component of the Groundwater Ingestion Exposure Route Values		
		Industrial-Commercial		Construction Worker				
CAS No.	Chemical Name	Ingestion (mg/kg)	Inhalation (mg/kg)	Ingestion (mg/kg)	Inhalation (mg/kg)	Class I (mg/L)	Class II (mg/L)	
7440-22-4	Silver	10,000[b]	-----[c]	1,000[b]	-----[c]	0.05[m]	-----	*
14808-79-8	Sulfate	-----[c]	-----[c]	-----[c]	-----[c]	400[m]	400[m]	*
7440-28-0	Thallium	160[b,u]	-----[c]	160[b,u]	-----[c]	0.002[m]	0.02[m]	*
7440-62-2	Vanadium	14,000[b]	-----[c]	1,400[b]	-----[c]	0.049[m]	-----	*
7440-66-6	Zinc[l]	610,000[b]	-----[c]	61,000[b]	-----[c]	5.0[m]	10[m]	*

"*" indicates that the ADL is less than or equal to the specified remediation objective.

NA means Not Available; no PQL or EQL available in USEPA analytical methods.

Chemical Name and Soil Remediation Objective Notations (2nd, 5th thru 8th Columns)

[a] Soil remediation objectives based on human health criteria only.
[b] Calculated values correspond to a target hazard quotient of 1.
[c] No toxicity criteria available for this route of exposure.
[d] Soil saturation concentration ($C_{[sat]}$) = the concentration at which the absorptive limits of the soil particles, the solubility limits of the available soil moisture, and saturation of soil pore air have been reached. Above the soil saturation concentration, the assumptions regarding vapor transport to air and/or dissolved phase transport to groundwater (for chemicals which are liquid at ambient soil temperatures) have been violated, and alternative modeling approaches are required.
[e] Calculated values correspond to a cancer risk level of 1 in 1,000,000.
[f] Level is at or below Contract Laboratory Program required quantitation limit for Regular Analytical Services (RAS).
[g] Chemical-specific properties are such that this route is not of concern at any soil contaminant concentration.
[h] A preliminary goal of 1 ppm has been set for PCBs based on *Guidance on Remedial Actions for Superfund Sites with PCB Contamination*, EPA/540G-90/007, and on USEPA efforts to manage PCB contamination. See 40 CFR 761.120 for USEPA "PCB Spill Cleanup Policy." This regulation goes on to say that the remediation goal for an unrestricted area is 10 ppm and 25 ppm for a restricted area, provided both have at least 10 inches of clean cover.
[i] Soil remediation objective for pH of 6.8. If soil pH is other than 6.8, refer to Appendix B, Tables C and D in this Part.
[j] Ingestion soil remediation objective adjusted by a factor of 0.5 to account for dermal route.
[k] A preliminary remediation goal of 400 mg/kg has been set for lead based on *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities*, OSWER Directive #9355.4-12.
[l] Potential for soil-plant-human exposure.
[m] The person conducting the remediation has the option to use: (1) TCLP or SPLP test results to compare with the remediation objectives listed in this Table; or (2) the total amount of contaminant in the soil sample results to compare with pH specific remediation objectives listed in Appendix B, Table C or D of this Part. (See Section 742.510.) If the person conducting the remediation wishes to calculate soil remediation objectives based on background concentrations, this should be done in accordance with Subpart D of this Part.
[n] The Agency reserves the right to evaluate the potential for remaining contaminant concentrations to pose significant threats to crops, livestock, or wildlife.
[o] For agrichemical facilities, remediation objectives for surficial soils which are based on field application rates may be more appropriate for currently registered pesticides. Consult the Agency for further information.
[p] For agrichemical facilities, soil remediation objectives based on site-specific background concentrations of Nitrate as N may be more appropriate. Such determinations shall be conducted in accordance with the located in Subparts D and I of this Part.
[q] The TCLP extraction must be done using water at a pH of 7.0.
r Value based on dietary Reference Dose.
s Value based on Reference Dose for Mercuric chloride (CAS No. 7487-94-7).
t Note that Table value is likely to be less than background concentration for this chemical; screening or remediation concentrations using the procedures of Subpart D of this Part.

[u] Value based on Reference Dose for thallium sulfate (CAS No. 7446-18-6).

Section 742.APPENDIX B: Tier 1 Tables and Illustrations

Section 742.Table C: pH Specific Soil Remediation Objectives for Inorganics and Ionizing Organics for the Soil Component of the Groundwater Ingestion Route (Class I Groundwater)

Chemical (totals) (mg/kg)	pH 4.5 to 4.74	pH 4.75 to 5.24	pH 5.25 to 5.74	pH 5.75 to 6.24	pH 6.25 to 6.64	pH 6.65 to 6.89	pH 6.9 to 7.24	pH 7.25 to 7.74	pH 7.75 to 8.0
Inorganics									
Antimony	5	5	5	5	5	5	5	5	5
Arsenic	25	26	27	28	29	29	29	30	31
Barium	260	490	850	1,200	1,500	1,600	1,700	1,800	2,100
Beryllium	1.1	2.1	3.4	6.6	22	63	140	1,000	8,000
Cadmium	1.0	1.7	2.7	3.7	5.2	7.5	11	59	430
Chromium (+6)	70	62	54	46	40	38	36	32	28
Copper	330	580	2,100	11,000	59,000	130,000	200,000	330,000	330,000
Cyanide	40	40	40	40	40	40	40	40	40
Mercury	0.01	0.01	0.03	0.15	0.89	2.1	3.3	6.4	8.0
Nickel	20	36	56	76	100	130	180	700	3,800
Selenium	24	17	12	8.8	6.3	5.2	4.5	3.3	2.4
Silver	0.24	0.33	0.62	1.5	4.4	8.5	13	39	110

Chemical (totals) (mg/kg)	pH 4.5 to 4.74	pH 4.75 to 5.24	pH 5.25 to 5.74	pH 5.75 to 6.24	pH 6.25 to 6.64	pH 6.65 to 6.89	pH 6.9 to 7.24	pH 7.25 to 7.74	pH 7.75 to 8.0
Thallium	1.6	1.8	2.0	2.4	2.6	2.8	3.0	3.4	3.8
Vanadium	980	980	980	980	980	980	980	980	980
Zinc	1,000	1,800	2,600	3,600	5,100	6,200	7,500	16,000	53,000
Organics									
Benzoic Acid	440	420	410	400	400	400	400	400	400
2-Chlorophenol	4.0	4.0	4.0	4.0	3.9	3.9	3.9	3.6	3.1
2,4-Dichlorophenol	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.86	0.69
Dinoseb	8.4	4.5	1.9	0.82	0.43	0.34	0.31	0.27	0.25
Pentachlorophenol	0.54	0.32	0.15	0.07	0.04	0.03	0.02	0.02	0.02
2,4,5-TP (Silvex)	26	16	12	11	11	11	11	11	11
2,4,5-Trichlorophenol	400	390	390	370	320	270	230	130	64
2,4,6-Trichlorophenol	0.37	0.36	0.34	0.29	0.20	0.15	0.13	0.09	0.07

SOURCE: Amended at 22 Ill. Reg. 10874, effective June 8, 1998.

Section 742.APPENDIX B Tier I Tables and Illustrations

Section 742.Table D: pH Specific Soil Remediation Objectives for Inorganics and Ionizing Organics for the Soil Component of the Groundwater Ingestion Route (Class II Groundwater)

Chemical (totals) (mg/kg)	pH 4.5 to 4.74	pH 4.75 to 5.24	pH 5.25 to 5.74	pH 5.75 to 6.24	pH 6.25 to 6.64	pH 6.65 to 6.89	pH 6.9 to 7.24	pH 7.25 to 7.74	pH 7.75 to 8.0
Inorganics									
Antimony	20	20	20	20	20	20	20	20	20
Arsenic	100	100	100	110	110	120	120	120	120
Barium	260	490	850	1,200	1,500	1,600	1,700	1,800	2,100
Beryllium	140	260	420	820	2,800	7,900	17,000	130,000	1,000,000
Cadmium	10	17	27	37	52	75	110	590	4,300
Chromium (+6)	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
Copper	330	580	2,100	11,000	59,000	130,000	200,000	330,000	330,000
Cyanide	120	120	120	120	120	120	120	120	120
Mercury	0.05	0.06	0.14	0.75	4.4	10	16	32	40
Nickel	400	730	1,100	1,500	2,000	2,600	3,500	14,000	76,000
Selenium	24	17	12	8.8	6.3	5.2	4.5	3.3	2.4
Thallium	16	18	20	24	26	28	30	34	38
Zinc	2,000	3,600	5,200	7,200	10,000	12,000	15,000	32,000	110,000

Chemical (totals) (mg/kg)	pH 4.5 to 4.74	pH 4.75 to 5.24	pH 5.25 to 5.74	pH 5.75 to 6.24	pH 6.25 to 6.64	pH 6.65 to 6.89	pH 6.9 to 7.24	pH 7.25 to 7.74	pH 7.75 to 8.0
Organics									
Benzoic Acid	440	420	410	400	400	400	400	400	400
2-Chlorophenol	20	20	20	20	20	20	19	3.6	3.1
2,4-Dichlorophenol	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.86	0.69
Dinoseb	84	45	19	8.2	4.3	3.4	3.1	2.7	2.5
Pentachlorophenol	2.7	1.6	0.75	0.33	0.18	0.15	0.12	0.11	0.10
2,4,5-TP (Silvex)	130	79	62	57	55	55	55	55	55
2,4,5-Trichlorophenol	2,000	2,000	1,900	1,800	1,600	1,400	1,200	640	64
2,4,6-Trichlorophenol	1.9	1.8	1.7	1.4	1.0	0.77	0.13	0.09	0.07

SOURCE: Amended at 22 Ill. Reg. 10847, effective, June 8, 1998.

Section 742.APPENDIX B
Section 742.Table D: pH Specific Soil Remediation Objectives for Inorganics and Ionizing Organics for the Soil Component of the Groundwater Ingestion Route (Class II Groundwater)

Chemical (totals) (mg/kg)	pH 4.5 to 4.74	pH 4.75 to 5.24	pH 5.25 to 5.74	pH 5.75 to 6.24	pH 6.25 to 6.64	pH 6.65 to 6.89	pH 6.9 to 7.24	pH 7.25 to 7.74	pH 7.75 to 8.0
Inorganics									
Antimony	20	20	20	20	20	20	20	20	20
Arsenic	100	100	100	110	110	120	120	120	120
Barium	260	490	850	1,200	1,500	1,600	1,700	1,800	2,100
Beryllium	140	260	420	820	2,800	7,900	17,000	130,000	1,000,000

Cadmium	10	17	27	37	52	75	110	590	4,300
Chromium (+6)	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
Copper	330	580	2,100	11,000	59,000	130,000	200,000	330,000	330,000
Cyanide	120	120	120	120	120	120	120	120	120
Mercury	0.05	0.06	0.14	0.75	4.4	10	16	32	40
Nickel	400	730	1,100	1,500	2,000	2,600	3,500	14,000	76,000
Selenium	24	17	12	8.8	6.3	5.2	4.5	3.3	2.4
Thallium	16	18	20	24	26	28	30	34	38
Zinc	2,000	3,600	5,200	7,200	10,000	12,000	15,000	32,000	110,000

Chemical (totals) (mg/kg)	pH 4.5 to 4.74	pH 4.75 to 5.24	pH 5.25 to 5.74	pH 5.75 to 6.24	pH 6.25 to 6.64	pH 6.65 to 6.89	pH 6.9 to 7.24	pH 7.25 to 7.74	pH 7.75 to 8.0
Organics									
Benzoic Acid	440	420	410	400	400	400	400	400	400
2-Chlorophenol	20	20	20	20	20	20	19	3.6	3.1
2,4-Dichlorophenol	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.86	0.69
Dinoseb	84	45	19	8.2	4.3	3.4	3.1	2.7	2.5
Pentachlorophenol	2.7	1.6	0.75	0.33	0.18	0.15	0.12	0.11	0.10
2,4,5-TP (Silvex)	130	79	62	57	55	55	55	55	55
2,4,5-Trichlorophenol	2,000	2,000	1,900	1,800	1,600	1,400	1,200	640	64
2,4,6-Trichlorophenol	0.37	0.36	0.34	0.26	0.20	0.15	0.13	0.09	0.07

Section 742.APPENDIX B: Tier 1 Tables and Illustrations

Section 742.TABLE E: Tier 1 Groundwater Remediation Objectives for the Groundwater Component of the Groundwater Ingestion Route

		Groundwater Remediation Objective	
CAS No.	Chemical Name	Class I (mg/L)	Class II (mg/L)
83-32-9	Acenaphthene	0.42	2.1
67-64-1	Acetone	0.7	0.7
15972-60-8	Alachlor	0.002[c]	0.01[c]
116-06-3	Aldicarb	0.003[c]	0.015[c]
309-00-2	Aldrin	0.00004[a]	0.0002
120-12-7	Anthracene	2.1	10.5
1912-24-9	Atrazine	0.003[c]	0.015[c]
71-43-2	Benzene	0.005[c]	0.025[c]
56-55-3	Benzo(*a*)anthracene	0.00013[a]	0.00065
205-99-2	Benzo(*b*)fluoranthene	0.00018[a]	0.0009
207-08-9	Benzo(*k*)fluroanthene	0.00017[a]	0.00085
50-32-8	Benzo(*a*)pyrene	0.0002[a,c]	0.002[c]
111-44-4	Bis(2-chloroethyl)ether	0.01[a]	0.01
117-81-7	Bis(2-ethylhexyl)phthalate	0.006[a,c]	0.06[c]
75-27-4	Bromodichloromethane (Dichlorobromomethane)	0.00002[a]	0.00002
75-25-2	Bromoform	0.0002[a]	0.0002
71-36-3	Butanol	0.7	0.7
85-68-7	Butyl benzyl phthalate	1.4	7.0
86-74-8	Carbazole	---	---
1563-66-2	Carbofuran	0.04[c]	0.2[c]
75-15-0	Carbon disulfide	0.7	3.5
56-23-5	Carbon tetrachloride	0.005[c]	0.025[c]
57-74-9	Chlordane	0.002[c]	0.01[c]

CAS No.	Chemical Name	Groundwater Remediation Objective	
		Class I (mg/L)	Class II (mg/L)
108-90-7	Chlorobenzene (Monochlorobenzene)	0.1[c]	0.5[c]
124-48-1	Chlorodibromomethane (Dibromochloromethane)	0.14	0.14
67-66-3	Chloroform	0.00002[a]	0.0001
218-01-9	Chrysene	0.0015[a]	0.0075
94-75-7	2,4-D	0.07[c]	0.35[c]
75-99-0	Dalapon	0.2[c]	2.0[c]
72-54-8	DDD	0.00011[a]	0.00055
72-55-9	DDE	0.00004[a]	0.0002
50-29-3	DDT	0.00012[a]	0.0006
53-70-3	Dibenzo(*a,h*)anthracene	0.0003[a]	0.0015
96-12-8	1,2-Dibromo-3-chloropropane	0.0002[c]	0.0002[c]
106-93-4	1,2-Dibromoethane (Ethylene dibromide)	0.00005[a,c]	0.0005[c]
84-74-2	Di-*n*-butyl phthalate	0.7	3.5
95-50-1	1,2-Dichlorobenzene (*o* - Dichlorobenzene)	0.6[c]	1.5[c]
106-46-7	1,4-Dichlorobenzene (*p* - Dichlorobenzene)	0.075[c]	0.375[c]
91-94-1	3,3'-Dichlorobenzidine	0.02[a]	0.1
75-34-3	1,1-Dichloroethane	0.7	3.5
107-06-2	1,2-Dichloroethane (Ethylene dichloride)	0.005[c]	0.025[c]
75-35-4	1,1-Dichloroethylene[b]	0.007[c]	0.035[c]
156-59-2	*cis*-1,2-Dichloroethylene	0.07[c]	0.2[c]
156-60-5	*trans*-1,2-Dichloroethylene	0.1[c]	0.5[c]
78-87-5	1,2-Dichloropropane	0.005[c]	0.025[c]
542-75-6	1,3-Dichloropropene (1,3-Dichloropropylene, *cis* + *trans*)	0.001[a]	0.005

CAS No.	Chemical Name	Groundwater Remediation Objective	
		Class I (mg/L)	Class II (mg/L)
60-57-1	Dieldrin	0.00002[a]	0.0001
84-66-2	Diethyl phthalate	5.6	5.6
121-14-2	2,4-Dinitrotoluene[a]	0.00002	0.00002
606-20-2	2,6-Dinitrotoluene[a]	0.0001	0.0001
88-85-7	Dinoseb	0.007[c]	0.07[c]
117-84-0	Di-*n*-octyl phthalate	0.14	0.7
115-29-7	Endosulfan	0.042	0.21
145-73-3	Endothall	0.1[c]	0.1[c]
72-20-8	Endrin	0.002[c]	0.01[c]
100-41-4	Ethylbenzene	0.7[c]	1.0[c]
206-44-0	Fluoranthene	0.28	1.4
86-73-7	Fluorene	0.28	1.4
76-44-8	Heptachlor	0.0004[c]	0.002[c]
1024-57-3	Heptachlor epoxide	0.0002[c]	0.001[c]
118-74-1	Hexachlorobenzene	0.00006[a]	0.0003
319-84-6	*alpha*-HCH (*alpha*-BHC)	0.00003[a]	0.00015
58-89-9	*gamma*-HCH (Lindane)	0.0002[c]	0.001[c]
77-47-4	Hexachlorocyclopentadiene	0.05[c]	0.5[c]
67-72-1	Hexachloroethane	0.007	0.035
193-39-5	Indeno(1,2,3-*c,d*)pyrene	0.00043[a]	0.00215
78-59-1	Isophorone	1.4	1.4
72-43-5	Methoxychlor	0.04[c]	0.2[c]
74-83-9	Methyl bromide (Bromomethane)	0.0098	0.049
75-09-2	Methylene chloride (Dichloromethane)	0.005[c]	0.05[c]
91-20-3	Naphthalene[2]	0.025	0.039
98-95-3	Nitrobenzene[2]	0.0035	0.0035

CAS No.	Chemical Name	Groundwater Remediation Objective	
		Class I (mg/L)	Class II (mg/L)
1918-02-1	Picloram	0.5[c]	5.0[c]
1336-36-3	Polychlorinated biphenyls (PCBs)[n]	0.0005[c]	0.0025[c]
129-00-0	Pyrene	0.21	1.05
122-34-9	Simazine	0.004[c]	0.04[c]
100-42-5	Styrene	0.1[c]	0.5[c]
93-72-1	2,4,5-TP (Silvex)	0.05[c]	0.25[c]
127-18-4	Tetrachloroethylene (Perchloroethylene)	0.005[c]	0.025[c]
108-88-3	Toluene	1.0[c]	2.5[c]
8001-35-2	Toxaphene	0.003[c]	0.015[c]
120-82-1	1,2,4-Trichlorobenzene	0.07[c]	0.7[c]
71-55-6	1,1,1-Trichloroethane[2]	0.2[c]	1.0[c]
79-00-5	1,1,2-Trichloroethane	0.005[c]	0.05[c]
79-01-6	Trichloroethylene	0.005[c]	0.025[c]
108-05-4	Vinyl acetate	7.0	7.0
75-01-4	Vinyl chloride	0.002[c]	0.01[c]
1330-20-7	Xylenes (total)	10.0[c]	10.0[c]
	Ionizable Organics		
65-85-0	Benzoic Acid	28	28
106-47-8	4-Chloroaniline (*p*-Chloroaniline)	0.028	0.028
95-57-8	2-Chlorophenol	0.035	0.175
120-83-2	2,4-Dichlorophenol	0.021	0.021
105-67-9	2,4-Dimethylphenol	0.14	0.14
51-28-5	2,4-Dinitrophenol	0.014	0.014
95-48-7	2-Methylphenol (*o* - Cresol)	0.35	0.35
86-30-6	*N*-Nitrosodiphenylamine	0.01[a]	0.05

CAS No.	Chemical Name	Groundwater Remediation Objective	
		Class I (mg/L)	Class II (mg/L)
621-64-7	*N*-Nitrosodi-*n*-propylamine	0.01[a]	0.01
87-86-5	Pentachlorophenol	0.001[a,c]	0.005[c]
108-95-2	Phenol	0.1[c]	0.1[c]
95-95-4	2,4,5-Trichlorophenol	0.7	3.5
88-06-2	2,4,6 Trichlorophenol	0.0064[a]	0.032
	Inorganics		
7440-36-0	Antimony	0.006[c]	0.024[c]
7440-38-2	Arsenic	0.05[c]	0.2[c]
7440-39-3	Barium	2.0[c]	2.0[c]
7440-41-7	Beryllium	0.004[c]	0.5[c]
7440-42-8	Boron	2.0[c]	2.0[c]
7440-43-9	Cadmium	0.005[c]	0.05[c]
16887-00-6	Chloride	200[c]	200[c]
7440-47-3	Chromium, total	0.1[c]	1.0[c]
18540-29-9	Chromium, ion, hexavalent	---	---
7440-48-4	Cobalt	1.0[c]	1.0[c]
7440-50-8	Copper	0.65[c]	0.65[c]
57-12-5	Cyanide	0.2[c]	0.6[c]
7782-41-4	Fluoride	4.0[c]	4.0[c]
15438-31-0	Iron	5.0[c]	5.0[c]
7439-92-1	Lead	0.0075[c]	0.1[c]
7439-96-5	Manganese	0.15[c]	10.0[c]
7439-97-6	Mercury	0.002[c]	0.01[c]
7440-02-0	Nickel	0.1[c]	2.0[c]
14797-55-8	Nitrate as N	10.0[c]	100[c]
7782-49-2	Selenium	0.05[c]	0.05[c]
7440-22-4	Silver	0.05[c]	---
14808-79-8	Sulfate	400[c]	400[c]

CAS No.	Chemical Name	Groundwater Remediation Objective	
		Class I (mg/L)	Class II (mg/L)
7440-28-0	Thallium	0.002[c]	0.02[c]
7440-62-2	Vanadium[2]	0.049	---
7440-66-6	Zinc	5.0[c]	10[c]

Chemical Name and Groundwater Remediation Objective Notations

[a] The groundwater Health Advisory concentration is equal to ADL for carcinogens.

[b] Oral Reference Dose and/or Reference Concentration under review by USEPA. Listed values subject to change.

[c] Value listed is also the Groundwater Quality Standard for this chemical pursuant to 35 Ill. Adm. Code 620.410 for Class I Groundwater or 35 Ill. Adm. Code 620.420 for Class II Groundwater.

Section 742.APPENDIX B: Tier 1 Tables and Illustrations

Section 742.TABLE F: Values Used to Calculate the Tier 1 Soil Remediation Objectives for the Soil Component of the Groundwater Ingestion Route

		GW_{obj} Concentration used to Calculate Tier 1 Soil Rememdiation Objectives[a]	
CAS No.	Chemical Name	Class I (mg/L)	Class II (mg/L)
83-32-9	Acenaphthene	2.0[b]	10
67-64-1	Acetone	4.0[b]	4.0
15972-60-8	Alachlor	0.002[c]	0.01[c]
116-06-3	Aldicarb	0.003[c]	0.015[c]
309-00-2	Aldrin	5.0E-6[b]	2.5E-5
120-12-7	Anthracene	10[b]	50
1912-24-9	Atrazine	0.003[c]	0.015[c]
71-43-2	Benzene	0.005[c]	0.025[c]
56-55-3	Benzo(*a*)anthracene	0.0001[b]	0.0005
205-99-2	Benzo(*b*)fluoranthene	0.0001[b]	0.0005
207-08-9	Benzo(*k*)fluroanthene	0.001[b]	0.005
50-32-8	Benzo(*a*)pyrene	0.0002[a,c]	0.002[c]
111-44-4	Bis(2-chloroethyl)ether	8.0E-5[b]	8.0E-5
117-81-7	Bis(2-ethylhexyl)phthalate	0.006[a,c]	0.06[c]
75-27-4	Bromodichloromethane (Dichlorobromomethane)	0.1[b]	0.1
75-25-2	Bromoform	0.1[b]	0.01
71-36-3	Butanol	4.0[b]	4.0
85-68-7	Butyl benzyl phthalate	7.0[b]	35
86-74-8	Carbazole	0.004[b]	0.02
1563-66-2	Carbofuran	0.04[c]	0.2[c]
75-15-0	Carbon disulfide	4.0[b]	20
56-23-5	Carbon tetrachloride	0.005[c]	0.025[c]
57-74-9	Chlordane	0.002[c]	0.01[c]

CAS No.	Chemical Name	GW_{obj} Concentration used to Calculate Tier 1 Soil Rememdiation Objectives[a]	
		Class I (mg/L)	Class II (mg/L)
108-90-7	Chlorobenzene (Monochlorobenzene)	0.1[c]	0.5[c]
124-48-1	Chlorodibromomethane (Dibromochloromethane)	0.06[b]	0.06
67-66-3	Chloroform	0.1[b]	0.5
218-01-9	Chrysene	0.1[b]	0.05
94-75-7	2,4-D	0.07[c]	0.35[c]
75-99-0	Dalapon	0.2[c]	2.0[c]
72-54-8	DDD	0.0004[b]	0.002
72-55-9	DDE	0.0003[b]	0.0015
50-29-3	DDT	0.0003[b]	0.0015
53-70-3	Dibenzo(*a,h*)anthracene	1.0E-5[b]	5.0E-5
96-12-8	1,2-Dibromo-3-chloropropane	0.0002[c]	0.0002[c]
106-93-4	1,2-Dibromoethane (Ethylene dibromide)	0.00005[a,c]	0.0005[c]
84-74-2	Di-*n*-butyl phthalate	4.0[b]	20
95-50-1	1,2-Dichlorobenzene (*o* - Dichlorobenzene)	0.6[c]	1.5[c]
106-46-7	1,4-Dichlorobenzene (*p* - Dichlorobenzene)	0.075[c]	0.375[c]
91-94-1	3,3'-Dichlorobenzidine	0.0002[b]	0.001
75-34-3	1,1-Dichloroethane	4.0[b]	20
107-06-2	1,2-Dichloroethane (Ethylene dichloride)	0.005[c]	0.025[c]
75-35-4	1,1-Dichloroethylene	0.007[c]	0.035[c]
156-59-2	*cis*-1,2-Dichloroethylene	0.07[c]	0.2[c]
156-60-5	*trans*-1,2-Dichloroethylene	0.1[c]	0.5[c]
78-97-5	1,2-Dichloropropane	0.005[c]	0.025[c]
542-75-6	1,3-Dichloropropene (1,3-Dichloropropylene, *cis* + *trans*)	0.0005[b]	0.0025

CAS No.	Chemical Name	GW_{obj} Concentration used to Calculate Tier 1 Soil Rememdiation Objectives[a]	
		Class I (mg/L)	Class II (mg/L)
60-57-1	Dieldrin	5.0E-6[b]	2.5E-5
84-66-2	Diethyl phthalate	30[b]	30
121-14-2	2,4-Dinitrotoluene	0.0001[b]	0.0001
606-20-2	2,6-Dinitrotoluene	0.0001	0.0001
88-85-7	Dinoseb	0.007[c]	0.07[c]
117-84-0	Di-*n*-octyl phthalate	0.7[b]	3.5
115-29-7	Endosulfan	0.2[b]	1.0
145-73-3	Endothall	0.1[c]	0.1[c]
72-20-8	Endrin	0.002[c]	0.01[c]
100-41-4	Ethylbenzene	0.7[c]	1.0[c]
206-44-0	Fluoranthene	1.0[b]	5.0
86-73-7	Fluorene	1.0[b]	5.0
76-44-8	Heptachlor	0.0004[c]	0.002[c]
1024-57-3	Heptachlor epoxide	0.0002[c]	0.001[c]
118-74-1	Hexachlorobenzene	0.001[b]	0.005
319-84-6	*alpha*-HCH (*alpha*-BHC)	1.0E-5[b]	5.0E-5
58-89-9	*gamma*-HCH (Lindane)	0.0002[c]	0.001[c]
77-47-4	Hexachlorocyclopentadiene	0.05[c]	0.5[c]
67-72-1	Hexachloroethane	0.007	0.035
193-39-5	Indeno(1,2,3-*c,d*)pyrene	0.0001[b]	0.0005
78-59-1	Isophorone	1.4	1.4
72-43-5	Methoxychlor	0.04[c]	0.2[c]
74-83-9	Methyl bromide (Bromomethane)	0.05[b]	0.25
75-09-2	Methylene chloride (Dichloromethane)	0.005[c]	0.05[c]
91-20-3	Naphthalene	1.0[b]	5.0
98-95-3	Nitrobenzene	0.02[b]	0.02

CAS No.	Chemical Name	GW_{obj} Concentration used to Calculate Tier 1 Soil Rememdiation Objectives[a]	
		Class I (mg/L)	Class II (mg/L)
1918-02-1	Picloram	0.5[c]	5.0[c]
1336-36-3	Polychlorinated biphenyls (PCBs)	---	---
129-00-0	Pyrene	1.0[b]	5.0
122-34-9	Simazine	0.004[c]	0.04[c]
100-42-5	Styrene	0.1[c]	0.5[c]
93-72-1	2,4,5-TP (Silvex)	0.05[c]	0.25[c]
127-18-4	Tetrachloroethylene (Perchloroethylene)	0.005[c]	0.025[c]
108-88-3	Toluene	1.0[c]	2.5[c]
8001-35-2	Toxaphene	0.003[c]	0.015[c]
120-82-1	1,2,4-Trichlorobenzene	0.07[c]	0.7[c]
71-55-6	1,1,1-Trichloroethane[2]	0.2[c]	1.0[c]
79-00-5	1,1,2-Trichloroethane	0.005[c]	0.05[c]
79-01-6	Trichloroethylene	0.005[c]	0.025[c]
108-05-4	Vinyl acetate	40[b]	40
75-01-4	Vinyl chloride	0.002[c]	0.01[c]
1330-20-7	Xylenes (total)	10.0[c]	10.0[c]
	Ionizable Organics		
65-85-0	Benzoic Acid	100[b]	100
106-47-8	4-Chloroaniline (*p*-Chloroaniline)	0.1[b]	0.1
95-57-8	2-Chlorophenol	0.2[b]	1.0
120-83-2	2,4-Dichlorophenol	0.1[b]	0.1
105-67-9	2,4-Dimethylphenol	0.7[b]	0.7
51-28-5	2,4-Dinitrophenol	0.04[b]	0.04
95-48-7	2-Methylphenol (*o* - Cresol)	2.0[b]	2.0
86-30-6	*N*-Nitrosodiphenylamine	0.02[b]	0.1

CAS No.	Chemical Name	GW_{obj} Concentration used to Calculate Tier 1 Soil Rememdiation Objectives[a]	
		Class I (mg/L)	Class II (mg/L)
621-64-7	*N*-Nitrosodi-*n*-propylamine	1.0E-5[b]	1.0E-5
87-86-5	Pentachlorophenol	0.001[a,c]	0.005[c]
108-95-2	Phenol	0.1[c]	0.1[c]
95-95-4	2,4,5-Trichlorophenol	4.0[b]	20
88-06-2	2,4,6-Trichlorophenol	0.008[b]	0.04
	Inorganics		
7440-36-0	Antimony	0.006[c]	0.024[c]
7440-38-2	Arsenic	0.05[c]	0.2[c]
7440-39-3	Barium	2.0[c]	2.0[c]
7440-41-7	Beryllium	0.004[c]	0.5[c]
7440-42-8	Boron	2.0[c]	2.0[c]
7440-43-9	Cadmium	0.005[c]	0.05[c]
16887-00-6	Chloride	200[c]	200[c]
7440-47-3	Chromium, total	0.1[c]	1.0[c]
18540-29-9	Chromium, ion, hexavalent	---	---
7440-48-4	Cobalt	1.0[c]	1.0[c]
7440-50-8	Copper	0.65[c]	0.65[c]
57-12-5	Cyanide	0.2[c]	0.6[c]
7782-41-4	Fluoride	4.0[c]	4.0[c]
15438-31-0	Iron	5.0[c]	5.0[c]
7439-92-1	Lead	0.0075[c]	0.1[c]
7439-96-5	Manganese	0.15[c]	10.0[c]
7439-97-6	Mercury	0.002[c]	0.01[c]
7440-02-0	Nickel	0.1[c]	2.0[c]
14797-55-8	Nitrate as N	10.0[c]	100[c]
7782-49-2	Selenium	0.05[c]	0.05[c]
7440-22-4	Silver	0.05[c]	---
14808-79-8	Sulfate	400[c]	400[c]

CAS No.	Chemical Name	GW_{obj} Concentration used to Calculate Tier 1 Soil Remendiation Objectives[a]	
		Class I (mg/L)	Class II (mg/L)
7440-28-0	Thallium	0.002[c]	0.02[c]
7440-62-2	Vanadium	0.049	---
7440-66-6	Zinc	5.0[c]	10[c]

Chemical Name and Groundwater Remediation Objective Notations

[a] The Equation S17 is used to calculate the Soil Remediation Objective for the Soil Component of the Groundwater Ingestion Route; this equation requires calculation of the Target Soil Leachate Concentration (C_w) from Equation S18: $C_w = DF \times GW_{obj}$.

[b] Value listed is the Water Health Based Limit (HBL) for this chemical from Soil Screening Guidance: User's Guide, incorporated by reference at Section 742.210; for carcinogens, the HBL is equal to a cancer risk of 1.0E-6, and for noncarcinogens is equal to a Hazard Quotient of 1.0. NOTE: These GW_{obj} concentrations are not equal to the Tier 1 Groundwater Remediation Objectives for the Direct Ingestion of Groundwater Component of the Groundwater Ingestion Route, listed in Section 742.Appendix B, Table E.

[c] Value listed is also the Groundwater Quality Standard for this chemical pursuant to 35 Ill. Adm. Code 620.410 for Class I Groundwater or 35 Ill. Adm. Code 620.420 for Class II Groundwater.

APPENDIX C

USEPA REGION 9 PRELIMINARY REMEDIATION GOALS

Key: i=IRIS, h=HEAST, n=NCEA, x=WITHDRAWN, o=Other EPA DOCUMENTS, r=ROUTE EXTRAPOLATION, ca=CANCER PRG, nc=NONCANCER PRG, sat=SOIL SATURATION, max=CEILING LIMIT, *(where: nc < 100X ca), **(where: nc < 10X ca)

FOR PLANNING PURPOSES

TOXICITY INFORMATION						CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)				SOIL SCREENING LEVELS	
				V	skin						Migration to Ground Water	
SFo	RfDo	SFi	RfDi	O	abs.	CAS No.	Residential	Industrial	Ambient Air	Tap Water	DAF 20	DAF 1
1/(mg/kg-d)	(mg/kg-d)	1/(mg/kg-d)	(mg/kg-d)	C	soils		Soil (mg/kg)	Soil (mg/kg)	(ug/m^3)	(ug/l)	(mg/kg)	(mg/kg)
8.7E-03 i	4.0E-03 i	8.7E-03 r	4.0E-03 r	0	0.10	30560-19-1	Acephate	5.1E+01 ca**	3.4E+02 ca*	7.7E-01 ca*	7.7E+00 ca*		6.0E+01
7.7E-03 r	2.6E-03 r	7.7E-03 i	2.6E-03 i	1	0.10	75-07-0	Acetaldehyde	9.2E+00 ca**	2.2E+01 ca**	8.7E-01 ca*	1.5E+00 ca*		
	2.0E-02 i		2.0E-02 r	0	0.10	34256-82-1	Acetochlor	1.1E+03 nc	2.1E+04 nc	7.3E+01 nc	7.3E+02 nc		
	1.0E-01 i		1.0E-01 r	1	0.10	67-64-1	Acetone	1.4E+03 nc	6.1E+03 nc	3.7E+02 nc	6.1E+02 nc	1.6E+01	8.0E-01
	8.0E-04 h		2.9E-03 x	0	0.10	75-86-5	Acetone cyanohydrin	4.4E+01 nc	8.6E+02 nc	1.0E+01 nc	2.9E+01 nc		
	6.0E-03 i		1.4E-02 h	1	0.10	75-05-8	Acetonitrile	2.0E+02 nc	1.3E+03 nc	5.2E+01 nc	7.1E+01 nc		
	1.0E-01 i		5.7E-06 x	1	0.10	98-86-2	Acetophenone	4.9E-01 nc	1.6E+00 nc	2.1E-02 nc	4.2E-02 nc		
1.1E-01 o	1.3E-02 i	1.1E-01 r	1.3E-02 r	0	0.10	50594-66-6	**Acifluorfen**	4.0E+00 ca	2.7E+01 ca	6.1E-02 ca	6.1E-01 ca		
	2.0E-02 h		5.7E-06 i	1	0.10	107-02-8	Acrolein	1.0E-01 nc	3.4E-01 nc	2.1E-02 nc	4.2E-02 nc		
4.6E+00 i	2.0E-04 i	4.6E+00 i	2.0E-04 r	0	0.10	79-06-1	Acrylamide	9.8E-02 ca	6.6E-01 ca	1.5E-03 ca	1.5E-02 ca		
	5.0E-01 i		2.9E-04 i	0	0.10	79-10-7	Acrylic acid	2.6E+04 nc	4.2E+05 nc	1.0E+00 nc	1.8E+04 nc		
5.4E-01 i	1.0E-03 h	2.4E-01 i	5.7E-04 i	1	0.10	107-13-1	Acrylonitrile	1.9E-01 ca*	4.9E-01 ca*	2.8E-02 ca*	3.7E+00 ca*		
8.1E-02 h	1.0E-02 i	8.0E-02 r	1.0E-02 r	0	0.10	15972-60-8	Alachlor	5.5E+00 ca*	3.7E+01 ca	8.4E-02 ca	8.4E-01 ca		
	1.5E-01 i		1.5E-01 r	0	0.10	1596-84-5	Alar	8.2E+03 nc	1.6E+05 nc	5.5E+02 nc	5.5E+03 nc		
	1.0E-01 i		1.0E-03 r	0	0.10	116-06-3	Aldicarb	5.5E+01 nc	1.1E+03 nc	3.7E+00 nc	3.7E+01 nc		
	1.0E-03 i		1.0E-03 r	0	0.10	1646-88-4	Aldicarb sulfone	5.5E+01 nc	1.1E+03 nc	3.7E+00 nc	3.7E+01 nc		
1.7E+01 i	3.0E-05 i	1.7E+01 i	3.0E-05 r	0	0.10	309-00-2	Aldrin	2.6E-02 ca*	1.8E-01 ca	3.9E-04 ca	4.0E-03 ca	1.2E+04	5.9E+02
	2.5E-01 i		2.5E-01 r	0	0.10	5585-64-8	Ally	1.4E+04 nc	1.0E+05 max	9.1E+02 nc	9.1E+03 nc		
	5.0E-03 x		5.0E-03 r	0	0.10	107-18-6	Allyl alcohol	2.7E+02 nc	5.3E+03 nc	1.8E+01 nc	1.8E+02 nc		
	5.0E-02 h		2.9E-04 i	0	0.10	107-05-1	Allyl chloride	2.7E+03 nc	5.2E+04 nc	1.0E+00 nc	1.8E+03 nc		
	1.0E+00 n			0	0.01	7429-90-5	Aluminum	7.5E+04 nc	1.0E+05 max		3.7E+04 nc		
	4.0E-04 i			0	0.01	20859-73-8	Aluminum phosphide	3.0E+01 nc	7.5E+02 nc		1.5E+01 nc		
	3.0E-04 i		3.0E-04 r	0	0.10	67485-29-4	Amdro	1.6E+01 nc	3.2E+02 nc	1.1E+00 nc	1.1E+01 nc		
	9.0E-03 i		9.0E-03 r	0	0.10	834-12-8	Ametryn	4.9E+02 nc	9.6E+03 nc	3.3E+01 nc	3.3E+02 nc		
	7.0E-02 h		7.0E-02 r	0	0.10	591-27-5	m-Aminophenol	3.8E+03 nc	7.5E+04 nc	2.6E+02 nc	2.6E+03 nc		
	2.0E-05 h		2.0E-05 r	0	0.10	504-24-5	4-Aminopyridine	1.1E+00 nc	2.1E+01 nc	7.3E-02 nc	7.3E-01 nc		
	2.5E-03 i		2.5E-03 r	0	0.10	33089-61-1	Amitraz	1.4E+02 nc	2.7E+03 nc	9.1E+00 nc	9.1E+01 nc		
			2.9E-02 i	n/a	n/a	7664-41-7	Ammonia			1.0E+02 nc			
	2.0E-01 i			0	0.10	7773-06-0	Ammonium sulfamate	1.1E+04 nc	1.0E+05 max		7.3E+03 nc		
5.7E-03 i	7.0E-03 n	5.7E-03 r	2.9E-04 i	0	0.10	62-53-3	**Aniline**	7.8E+01 ca**	5.3E+02 ca*	1.0E+00 nc	1.2E+01 ca*		
	4.0E-04 i			0	0.01	7440-36-0	Antimony and compounds	3.0E+01 nc	7.5E+02 nc		1.5E+01 nc	5.0E+00	3.0E-01
	5.0E-04 h			0	0.01	1314-60-9	Antimony pentoxide	3.7E+01 nc	9.4E+02 nc		1.8E+01 nc		
	9.0E-04 h			0	0.01	28300-74-5	Antimony potassium tartrate	6.7E+01 nc	1.7E+03 nc		3.3E+01 nc		
	4.0E-04 h			0	0.01	1332-81-6	Antimony tetroxide	3.0E+01 nc	7.5E+02 nc		1.5E+01 nc		
	4.0E-04 h			0	0.01	1309-64-4	Antimony trioxide	3.0E+01 nc	7.5E+02 nc		1.5E+01 nc		
	1.3E-02 i		1.3E-02 r	0	0.10	74115-24-5	Apollo	7.1E+02 nc	1.4E+04 nc	4.7E+01 nc	4.7E+02 nc		
2.5E-02 i	5.0E-02 h	2.5E-02 i	5.0E-02 r	0	0.10	140-57-8	Aramite	1.8E+01 ca	1.2E+02 ca	2.7E-01 ca	2.7E+00 ca		
	3.0E-04 i			0	0.03	7440-38-2	Arsenic (noncancer endpoint)	2.1E+01 nc	4.8E+02 nc				
1.5E+00 i	3.0E-04 i	1.5E+01 i		0	0.03	7440-38-2	Arsenic (cancer endpoint)	3.8E-01 ca*	3.0E+00 ca	4.5E-04 ca	4.5E-02 ca	2.9E+01	1.0E+00
			1.4E-05 i	n/a	n/a	7784-42-1	Arsine (see arsenic for cancer endpoint)			5.2E-02 nc			
	9.0E-03 i		9.0E-03 r	0	0.10	76578-12-6	Assure	4.9E+02 nc	9.6E+03 nc	3.3E+01 nc	3.3E+02 nc		
	5.0E-02 i		5.0E-02 r	0	0.10	3337-71-1	Asulam	2.7E+03 nc	5.3E+04 nc	1.8E+02 nc	1.8E+03 nc		

Key: i=IRIS h=HEAST n=NCEA x=WITHDRAWN o=Other EPA DOCUMENTS r=ROUTE EXTRAPOLATION ca=CANCER PRG nc=NONCANCER PRG sat=SOIL SATURATION max=CEILING LIMIT *(where: nc < 100X ca) **(where: nc < 10X ca)

FOR PLANNING PURPOSES

TOXICITY INFORMATION						CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)				SOIL SCREENING LEVELS	
				V	skin						Migration to Ground Water	
SFo	RfDo	SFI	RfDI	O	abs.	CAS No.	Residential	Industrial	Ambient Air	Tap Water	DAF 20	DAF 1
1/(mg/kg-d)	(mg/kg-d)	1/(mg/kg-d)	(mg/kg-d)	C	soils		Soil (mg/kg)	Soil (mg/kg)	(ug/m^3)	(ug/l)	(mg/kg)	(mg/kg)
2.2E-01 h	3.5E-02 h	2.2E-01 r	3.5E-02 h	0	0.10	1912-24-9	Atrazine	2.0E+00 ca	1.3E+01 ca	3.1E-02 ca	3.0E-01 ca		
	4.0E-04 i		4.0E-04 r	0	0.10	71751-41-2	Avermectin B1	2.2E+01 nc	4.3E+02 nc	1.5E+00 nc	1.5E+01 nc		
1.1E-01 i		1.1E-01 i		0	0.10	103-33-3	Azobenzene	4.0E+00 ca	2.7E+01 ca	6.2E-02 ca	6.1E-01 ca		
	7.0E-02 i		1.4E-04 h	0	0.01	7440-39-3	**Barium and compounds**	5.2E+03 nc	1.0E+05 max	5.2E-01 nc	2.6E+03 nc	1.6E+03	8.2E+01
	4.0E-03 i		4.0E-03 r	0	0.10	114-26-1	Baygon	2.2E+02 nc	4.3E+03 nc	1.5E+01 nc	1.5E+02 nc		
	3.0E-02 i		3.0E-02 r	0	0.10	43121-43-3	Bayleton	1.6E+03 nc	3.2E+04 nc	1.1E+02 nc	1.1E+03 nc		
	2.5E-02 i		2.5E-02 r	0	0.10	68359-37-5	Baythroid	1.4E+03 nc	2.7E+04 nc	9.1E+01 nc	9.1E+02 nc		
	3.0E-01 i		3.0E-01 r	0	0.10	1861-40-1	Benefin	1.6E+04 nc	1.0E+05 max	1.1E+03 nc	1.1E+04 nc		
	5.0E-02 i		5.0E-02 r	0	0.10	17804-35-2	Benomyl	2.7E+03 nc	5.3E+04 nc	1.8E+02 nc	1.8E+03 nc		
	3.0E-02 i		3.0E-02 r	0	0.10	25057-89-0	**Bentazon**	1.6E+03 nc	3.2E+04 nc	1.1E+02 nc	1.1E+03 nc		
	1.0E-01 i		1.0E-01 r	0	0.10	100-52-7	Benzaldehyde	5.5E+03 nc	1.1E+05 nc	3.7E+02 nc	3.7E+03 nc		
2.9E-02 i	3.0E-03 n	2.9E-02 i	1.7E-03 n	1	0.10	71-43-2	**Benzene**	6.2E-01 ca*	1.4E+00 ca*	2.3E-01 ca*	3.9E-01 ca*	3.0E-02	2.0E-03
2.3E+02 i	3.0E-03 i	2.3E+02 i	3.0E-03 r	0	0.10	92-87-5	Benzidine	1.9E-03 ca	1.3E-02 ca	2.9E-05 ca	2.9E-04 ca		
	4.0E+00 i		4.0E+00 i	0	0.10	65-85-0	Benzoic acid	1.0E+05 max	1.0E+05 max	1.5E+04 nc	1.5E+05 nc	4.0E+02	2.0E+01
1.3E+01 i		1.3E+01 r		0	0.10	98-07-7	Benzotrichloride	3.4E-02 ca	2.3E-01 ca	5.2E-04 ca	5.2E-03 ca		
	3.0E-01 h		3.0E-01 r	0	0.10	100-51-6	Benzyl alcohol	1.6E+04 nc	1.0E+05 max	1.1E+03 nc	1.1E+04 nc		
1.7E-01 i		1.7E-01 r		1	0.10	100-44-7	Benzyl chloride	8.1E-01 ca	2.2E+00 ca	4.0E-02 ca	6.6E-02 ca		
	2.0E-03 i	8.4E+00 i	5.7E-06 i	0	0.01	7440-41-7	**Beryllium and compounds**	1.5E+02 nc	3.4E+03 nc	8.0E-04 ca*	7.3E+01 nc	6.3E+01	3.0E+00
	1.0E-04 i		1.0E-04 r	0	0.10	141-66-2	Bidrin	5.5E+00 nc	1.0E+00 nc	3.7E-01 nc	3.7E+00 nc		
	1.5E-02 i		1.5E-02 r	0	0.10	82657-04-3	Biphenthrin (Talstar)	8.2E+02 nc	1.6E+04 nc	5.5E+01 nc	5.5E+02 nc		
	5.0E-02 i		5.0E-02 r	1	0.10	92-52-4	**1,1-Biphenyl**	2.3E+03 nc	2.4E+04 nc	1.8E+02 nc	3.0E+02 nc		
1.1E+00 i		1.2E+00 i		1	0.10	111-44-4	Bis(2-chloroethyl)ether	1.8E-01 ca	5.6E-01 ca	5.8E-03 ca	9.8E-03 ca	4.0E-04	2.0E-05
7.0E-02 h	4.0E-02 i	3.5E-02 h	4.0E-02 r	1	0.10	39638-32-9	Bis(2-chloroisopropyl)ether	2.5E+00 ca	7.4E+00 ca	1.9E-01 ca	2.7E-01 ca		
2.2E+02 i		2.2E+02 i		1	0.10	542-88-1	Bis(chloromethyl)ether	1.9E-04 ca	4.3E-04 ca	3.1E-05 ca	5.2E-05 ca		
7.0E-02 h		3.5E-02 h		0	0.10	108-60-1	Bis(2-chloro-1-methylethyl)ether	6.3E+00 ca	4.3E+01 ca	1.9E-01 ca	9.6E-01 ca		
1.4E-02 i	2.0E-02 i	1.4E-02 r	2.2E-02 r	0	0.10	117-81-7	Bis(2-ethylhexyl)phthalate (DEHP)	3.2E+01 ca*	2.1E+02 ca	4.8E-01 ca	4.8E+00 ca		
	5.0E-02 i		5.0E-02 r	0	0.10	80-05-7	Bisphenol A	2.7E+03 nc	5.3E+04 nc	1.8E+02 nc	1.8E+03 nc		
	9.0E-02 i		5.7E-03 h	0	0.10	7440-42-8	Boron	4.9E+03 nc	9.6E+04 nc	2.1E+01 nc	3.3E+03 nc		
			2.0E-04 h	0	0.10	7637-07-2	Boron trifluoride			7.3E-01 nc			
	2.0E-02 n		2.9E-03 n	1	0.10	SU 108-86-1	**Bromobenzene**	2.8E+01 nc	9.2E+01 nc	1.0E+01 nc	2.0E+01 nc		
6.2E-02 i	2.0E-02 i	6.2E-02 r	2.0E-02 r	1	0.10	75-27-4	Bromodichloromethane	9.8E-01 ca	2.3E+00 ca	1.1E-01 ca	1.8E-01 ca	6.0E-01	3.0E-02
7.9E-03 i	2.0E-02 i	3.9E-03 i	2.0E-02 r	0	0.10	75-25-2	Bromoform (tribromomethane)	5.6E+01 ca*	3.8E+02 ca*	1.7E+00 ca*	8.5E+00 ca*	8.0E-01	4.0E-02
	1.4E-03 i		1.4E-03 i	1	0.10	74-83-9	Bromomethane (Methyl bromide)	3.8E+00 nc	1.3E+01 nc	5.2E+00 nc	8.7E+00 nc	2.0E-01	1.0E-02
				0	0.10	101-55-3	4-Bromophenyl phenyl ether						
	5.0E-03 h		5.0E-03 r	0	0.10	2104-96-3	Bromophos	2.7E+02 nc	5.3E+03 nc	1.8E+01 nc	1.8E+02 nc		
	2.0E-02 i		2.0E-02 r	0	0.10	1689-84-5	Bromoxynil	1.1E+03 nc	2.1E+04 nc	7.3E+01 nc	1.8E+02 nc		
	2.0E-02 i		2.0E-02 r	0	0.10	1689-99-2	Bromoxynil octanoate	1.1E+03 nc	2.1E+04 nc	7.3E+01 nc	7.3E+02 nc		
9.8E-01 r		9.8E-01 i		1	0.10	106-99-0	1,3-Butadiene	6.5E-03 ca	1.4E-02 ca	6.9E-03 ca	1.1E-02 ca		
	1.0E-01 i		1.0E-01 r	0	0.10	71-36-3	1-Butanol	5.5E+03 nc	1.1E+05 nc	3.7E+02 nc	3.7E+03 nc	1.7E+01	9.0E-01
	5.0E-02 i		5.0E-02 r	0	0.10	2008-41-5	Butylate	2.7E+03 nc	5.3E+04 nc	1.8E+02 nc	1.8E+03 nc		
	1.0E-02 n		1.0E-02 r	1	0.10	104-51-8	**n-Butylbenzene**	1.3E+02 nc	5.5E+02 nc	3.7E+01 nc	6.1E+01 nc		
	1.0E-02 n		1.0E-02 r	1	0.10	135-9-88	**sec-Butylbenzene**	1.0E+02 nc	4.1E+02 nc	3.7E+01 nc	6.1E+01 nc		

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FOR PLANNING PURPOSES

TOXICITY INFORMATION							CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)				SOIL SCREENING LEVELS	
				V	skin							Migration to Ground Water	
SFo	RfDo	SFi	RfDi	O	abs.	CAS No.		Residential	Industrial	Ambient Air	Tap Water	DAF 20	DAF 1
1/(mg/kg-d)	(mg/kg-d)	1/(mg/kg-d)	(mg/kg-d)	C	soils			Soil (mg/kg)	Soil (mg/kg)	(ug/m^3)	(ug/l)	(mg/kg)	(mg/kg)
	1.0E-02 n		1.0E-02 r	1	0.10	104-5-18	**tert-Butylbenzene**	1.2E+02 nc	4.9E+02 nc	3.7E+01 nc	6.1E+01 nc		
	2.0E-01 i		2.0E-01 r	0	0.10	85-68-7	Butyl benzyl phthalate	9.3E+02 sat	9.3E+02 sat	7.3E+02 nc	7.3E+03 nc	9.3E+02	8.1E+02
	1.0E+00 i		1.0E+00 r	0	0.10	85-70-1	Butylphthalyl butylglycolate	5.5E+04 nc	1.0E+05 max	3.7E+03 nc	3.7E+04 nc		
	3.0E-03 h		3.0E-03 r	0	0.10	75-60-5	Cacodylic acid	1.6E+02 nc	3.2E+03 nc	1.1E+01 nc	1.1E+02 nc		
	5.0E-04 i	6.3E+00 i	5.7E-05 x	0	0.01	7440-43-9	Cadmium and compounds	3.7E+01 nc	9.3E+02 nc	1.1E-03 ca	1.8E+01 nc	8.0E+00	4.0E-01
							"CAL-Modified PRG" (PEA, 1994)	**9.0E+00**					
	5.0E-01 i		5.0E-01 r	0	0.10	105-60-2	Caprolactam	2.7E+04 nc	1.0E+05 max	1.8E+03 nc	1.8E+04 nc		
8.6E-03 h	2.0E-03 i	8.6E-03 r	2.0E-03 r	0	0.10	2425-06-1	Captafol	5.2E+01 ca**	3.5E+02 ca**	7.8E-01 ca*	7.8E+00 ca*		
3.5E-03 h	1.3E-01 i	3.5E-03 r	1.3E-01 r	0	0.10	133-06-2	Captan	1.3E+02 ca*	8.6E+02 ca	1.9E+00 ca	1.9E+01 ca		
	1.0E-01 i		1.1E-01 r	0	0.10	63-25-2	Carbaryl	5.5E+03 nc	1.1E+05 nc	4.0E+02 nc	3.7E+03 nc		
2.0E-02 h		2.0E-02 r		0	0.10	86-74-8	Carbazole	2.2E+01 ca	1.5E+02 ca	3.4E-01 ca	3.4E+00 ca	6.0E-01	3.0E-02
	5.0E-03 i		5.0E-03 r	0	0.10	1563-66-2	Carbofuran	2.7E+02 nc	5.3E+03 nc	1.8E+01 nc	1.8E+02 nc		
	1.0E-01 i		2.0E-01 i	1	0.10	75-15-0	**Carbon disulfide**	3.5E+02 nc	1.2E+03 nc	7.3E+02 nc	1.0E+03 nc	3.2E+01	2.0E+00
1.3E-01 i	7.0E-04 i	5.3E-02 i	5.7E-04 x	1	0.10	56-23-5	Carbon tetrachloride	2.3E-01 ca**	5.2E-01 ca*	1.3E-01 ca*	1.7E-01 ca*	7.0E-02	3.0E-03
	1.0E-02 i		1.0E-02 r	0	0.10	55285-14-8	Carbosulfan	5.5E+02 nc	1.1E+04 nc	3.7E+01 nc	3.7E+02 nc		
	1.0E-01 i		1.0E-01 r	0	0.10	5234-68-4	Carboxin	5.5E+03 nc	1.1E+05 nc	3.7E+02 nc	3.7E+03 nc		
	2.0E-03 i		2.0E-03 r	0	0.10	302-17-0	Chloral	1.1E+02 nc	2.1E+03 nc	7.3E+00 nc	7.3E+01 nc		
	1.5E-02 i		1.5E-02 r	0	0.10	133-90-4	Chloramben	8.2E+02 nc	1.6E+04 nc	5.5E+01 nc	5.5E+02 nc		
4.0E-01 h		4.0E-01 r		0	0.10	118-75-2	Chloranil	1.1E+00 ca	7.4E+00 ca	1.7E-02 ca	1.7E-01 ca		
3.5E-01 i	5.0E-04 i	3.5E-01 i	2.3E-05 i	0	0.04	57-74-9	**Chlordane**	1.6E+00 ca*	1.2E+01 ca*	1.9E-02 ca**	1.9E-01 ca*	1.0E+01	5.0E-01
	2.0E-02 i		2.0E-02 r	0	0.10	90982-32-4	Chlorimuron-ethyl	1.1E+03 nc	2.1E+04 nc	7.3E+01 nc	7.3E+02 nc		
	1.0E-01 i			0	0.01	7782-50-5	Chlorine				3.7E+03 nc		
			5.7E-05 i	n/a	n/a	10049-04-4	Chlorine dioxide			2.1E-01 nc			
				1	0.10	107-20-0	Chloroacetaldehyde						
	2.0E-03 h		2.0E-03 r	0	0.10	79-11-8	Chloroacetic acid	1.1E+02 nc	2.1E+03 nc	7.3E+00 nc	7.3E+01 nc		
	8.6E-06 r		8.6E-06 i	1	0.10	SU 532-27-4	2-Chloroacetophenone	3.2E-02 nc	1.1E-01 nc	3.1E-02 nc	5.2E-02 nc		
	4.0E-03 i		4.0E-03 r	0	0.10	106-47-8	4-Chloroaniline	2.2E+02 nc	4.3E+03 nc	1.5E+01 nc	1.5E+02 nc	7.0E-01	3.0E-02
	2.0E-02 i		5.7E-03 h	1	0.10	108-90-7	Chlorobenzene	5.4E+01 nc	1.8E+02 nc	2.1E+01 nc	3.9E+01 nc	1.0E+00	7.0E-02
2.7E-01 h	2.0E-02 i	2.7E-01 h	2.0E-02 r	0	0.10	510-15-6	Chlorobenzilate	1.6E+00 ca	1.1E+01 ca	2.5E-02 ca	2.5E-01 ca		
	2.0E-01 h		2.0E-01 r	0	0.10	74-11-3	p-Chlorobenzoic acid	1.1E+04 nc	1.0E+05 max	7.3E+02 nc	7.3E+03 nc		
	2.0E-02 h		2.0E-02 r	0	0.10	98-56-6	4-Chlorobenzotrifluoride	1.1E+03 nc	2.1E+04 nc	7.3E+01 nc	7.3E+02 nc		
	2.0E-02 h		2.0E-03 h	1	0.10	126-99-8	2-Chloro-1,3-butadiene	3.6E+00 nc	1.2E+01 nc	7.3E+00 nc	1.4E+01 nc		
	4.0E-01 h		4.0E-01 r	1	0.10	SU 109-69-3	1-Chlorobutane	4.8E+02 sat	4.8E+02 sat	1.5E+03 nc	2.4E+03 nc		
	1.4E+01 r		1.4E+01 i	1	0.10	SU 75-68-3	1-Chloro-1,1-difluoroethane (HCFC-142b)	3.4E+02 sat	3.4E+02 sat	5.2E+04 nc	8.7E+04 nc		
	1.4E+01 r		1.4E+01 i	1	0.10	SU 75-45-6	Chlorodifluoromethane	3.4E+02 sat	3.4E+02 sat	5.1E+04 nc	8.5E+04 nc		
				1	0.10	110-75-8	2-Chloroethyl vinyl ether						
6.1E-03 i	1.0E-02 i	8.1E-02 i	1.0E-02 r	1	0.10	67-66-3	Chloroform	2.4E-01 ca	5.2E-01 ca	8.4E-02 ca	1.6E-01 ca	6.0E-01	3.0E-02
1.3E-02 h		6.3E-03 h		1	0.10	74-87-3	Chloromethane	1.2E+00 ca	2.6E+00 ca	1.1E+00 ca	1.5E+00 ca		
5.8E-01 h		5.8E-01 r		0	0.10	95-69-2	4-Chloro-2-methylaniline	7.7E-01 ca	5.2E+00 ca	1.2E-02 ca	1.2E-01 ca		
4.6E-01 h		4.6E-01 r		0	0.10	3165-93-3	4-Chloro-2-methylaniline hydrochloride	9.7E-01 ca	6.5E+00 ca	1.5E-02 ca	1.5E-01 ca		
	8.0E-02 i		8.0E-02 r	1	0.10	91-58-7	**beta-Chloronaphthalene**	3.7E+03 nc	2.4E+04 nc	2.9E+02 nc	4.9E+02 nc		
2.5E-02 h		2.5E-02 r	r	0	0.10	88-73-3	o-Chloronitrobenzene	1.8E+01 ca	1.2E+02 ca	2.7E-01 ca	2.7E+00 ca		

Key: I=IRIS, h=HEAST, n=NCEA, x=WITHDRAWN, o=Other EPA DOCUMENTS, r=ROUTE EXTRAPOLATION, ca=CANCER PRG, nc=NONCANCER PRG, sat=SOIL SATURATION, max=CEILING LIMIT, *(where nc < 100X ca), **(where nc < 10X ca)

FOR PLANNING PURPOSES

TOXICITY INFORMATION						CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)				SOIL SCREENING LEVELS	
				V	skin						Migration to Ground Water	
SFo	RfDo	SFI	RfDI	O	abs.	CAS No.	Residential	Industrial	Ambient Air	Tap Water	DAF 20	DAF 1
1/(mg/kg-d)	(mg/kg-d)	1/(mg/kg-d)	(mg/kg-d)	C	soils		Soil (mg/kg)	Soil (mg/kg)	(ug/m^3)	(ug/l)	(mg/kg)	(mg/kg)
1.8E-02 h		1.8E-02 r	r	0	0.10	100-00-5	p-Chloronitrobenzene	2.5E+01 ca	1.7E+02 ca	3.7E-01 ca	3.7E+00 ca		
	5.0E-03 i		5.0E-03 r	1	0.10	95-57-8	2-Chlorophenol	5.9E+01 nc	2.4E+02 nc	1.8E+01 nc	3.8E+01 nc	4.0E+00	2.0E-01
	2.9E-02 r		2.9E-02 h	1	0.10	SU 75-29-6	2-Chloropropane	1.6E+02 nc	5.9E+02 nc	1.0E+02 nc	1.7E+02 nc		
1.1E-02 h	1.5E-02 i	1.1E-02 r	1.5E-02 r	0	0.10	1897-45-6	Chlorothalonil	4.0E+01 ca*	2.7E+02 ca*	6.1E-01 ca*	6.1E+00 ca*		
	2.0E-02 i		2.0E-02 r	1	0.10	SU 95-49-8	o-Chlorotoluene	1.5E+02 nc	5.6E+02 nc	7.3E+01 nc	1.2E+02 nc		
	2.0E-01 i		2.0E-01 r	0	0.10	101-21-3	Chlorpropham	1.1E+04 nc	1.0E+05 max	7.3E+02 nc	7.3E+03 nc		
	3.0E-03 i		3.0E-03 r	0	0.10	2921-88-2	Chlorpyrifos	1.6E+02 nc	3.2E+03 nc	1.1E+01 nc	1.1E+02 nc		
	1.0E-02 h		1.0E-02 r	0	0.10	5598-13-0	Chlorpyrifos-methyl	5.5E+02 nc	1.1E+04 nc	3.7E+01 nc	3.7E+02 nc		
	5.0E-02 i		5.0E-02 r	0	0.10	64902-72-3	Chlorsulfuron	2.7E+03 nc	5.3E+04 nc	1.8E+02 nc	1.8E+03 nc		
	8.0E-04 h		8.0E-04 r	0	0.10	60238-56-4	Chlorthiophos	4.4E+01 nc	8.6E+02 nc	2.9E+00 nc	2.9E+01 nc		
		4.2E+01 i		0	0.01	n/a	Total Chromium (1/6 ratio Cr VI/Cr III)	2.1E+02 ca	4.5E+02 ca	1.6E-04 ca		3.8E+01	2.0E+00
	5.0E-03 i	2.9E+02 i		0	0.01	7440-47-3	Chromium VI	3.0E+01 ca*	6.4E+01 ca	2.3E-05 ca	1.8E+02 nc	3.8E+01	2.0E+00
							"CAL-Modified PRG" (PEA, 1994)	**2.0E-01**			**1.6E-01**		
	6.0E-02 x		5.7E-06 x	0	0.01	7440-48-4	Cobalt	3.3E+03 nc	2.9E+04 nc	2.1E-02 nc	2.2E+03 nc		
		2.2E+00 i		0	0.01	8007-45-2	Coke Oven Emissions			3.1E-03 ca			
	3.7E-02 h			0	0.01	7440-50-8	Copper and compounds	2.8E+03 nc	7.0E+04 nc		1.4E+03 nc		
1.9E+00 h	1.0E-02 x	1.9E+00 x	1.0E-02 r	1	0.10	SU 123-73-9	Crotonaldehyde	5.3E-03 ca	1.1E-02 ca	3.5E-03 ca	5.9E-03 ca		
	1.0E-01 i		1.1E-01 i	1	0.10	98-82-8	**Cumene (Isopropylbenzene)**	1.6E+02 nc	5.2E+02 nc	4.0E+02 nc	6.6E+02 nc		
8.4E-01 h	2.0E-03 h	8.4E-01 r	2.0E-03 r	0	0.10	21725-46-2	Cyanazine	5.3E-01 ca	3.6E+00 ca	8.0E-03 ca	8.0E-02 ca		
						n/a	Cyanides						
	1.0E-01 h			0	0.10	542-62-1	Barium cyanide	5.5E+03 nc	1.0E+05 max		3.7E+03 nc		
	4.0E-02 i			0	0.10	592-01-8	Calcium cyanide	2.2E+03 nc	4.3E+04 nc		1.5E+03 nc		
	5.0E-03 i			0	0.10	544-92-3	Copper cyanide	2.7E+02 nc	5.3E+03 nc		1.8E+02 nc		
	4.0E-02 i			0	0.10	460-19-5	Cyanogen	2.2E+03 nc	4.3E+04 nc		1.5E+03 nc		
	9.0E-02 i			0	0.10	506-68-3	Cyanogen bromide	4.9E+03 nc	1.0E+05 max		3.3E+03 nc		
	5.0E-02 i			0	0.10	506-77-4	Cyanogen chloride	2.7E+03 nc	5.3E+04 nc		1.8E+03 nc		
	2.0E-02 i			0	0.10	57-12-5	Free cyanide	1.1E+03 nc	2.1E+04 nc		7.3E+02 nc	4.0E+01	2.0E+00
	2.0E-02 i		8.6E-04 i	1	0.10	74-90-8	Hydrogen cyanide	1.1E+01 nc	3.5E+01 nc	3.1E+00 nc	6.2E+00 nc		
	5.0E-02 i			0	0.10	151-50-8	Potassium cyanide	2.7E+03 nc	5.3E+04 nc		1.8E+03 nc		
	2.0E-01 i			0	0.10	506-61-6	Potassium silver cyanide	1.1E+04 nc	1.0E+05 max		7.3E+03 nc		
	1.0E-01 i			0	0.10	506-64-9	Silver cyanide	5.5E+03 nc	1.1E+05 nc		3.7E+03 nc		
	4.0E-02 i			0	0.10	143-33-9	Sodium cyanide	2.2E+03 nc	4.3E+04 nc		1.5E+03 nc		
	5.0E-02 i			0	0.10	557-21-1	Zinc cyanide	2.7E+03 nc	5.3E+04 nc		1.8E+03 nc		
	5.0E+00 i		5.0E+00 r	0	0.10	108-94-1	Cyclohexanone	1.0E+05 max	1.0E+05 max	1.8E+04 nc	1.8E+05 nc		
	2.0E-01 i		2.0E-01 r	0	0.10	108-91-8	Cyclohexylamine	1.1E+04 nc	1.0E+05 max	7.3E+02 nc	7.3E+03 nc		
	5.0E-03 i		5.0E-03 r	0	0.10	68085-85-8	Cyhalothrin/Karate	2.7E+02 nc	5.3E+03 nc	1.8E+01 nc	1.8E+02 nc		
	1.0E-02 i		1.0E-02 r	0	0.10	52315-07-8	Cypermethrin	5.5E+02 nc	1.1E+04 nc	3.7E+01 nc	3.7E+02 nc		
	7.5E-03 i		7.5E-03 r	0	0.10	66215-27-8	Cyromazine	4.1E+02 nc	8.0E+03 nc	2.7E+01 nc	2.7E+02 nc		
	1.0E-02 i		1.0E-02 r	0	0.10	1861-32-1	Dacthal	5.5E+02 nc	1.1E+04 nc	3.7E+01 nc	3.7E+02 nc		
	3.0E-02 i		3.0E-02 r	0	0.10	75-99-0	Dalapon	1.6E+03 nc	3.2E+04 nc	1.1E+02 nc	1.1E+03 nc		
	2.5E-02 i		2.5E-02 r	0	0.10	39515-41-8	Danitol	1.4E+03 nc	2.7E+04 nc	9.1E+01 nc	9.1E+02 nc		
2.4E-01 i		2.4E-01 r		0	0.03	72-54-8	DDD	2.4E+00 ca	1.9E+01 ca	2.8E-02 ca	2.8E-01 ca	1.6E+01	8.0E-01

Key: i=IRIS h=HEAST n=NCEA x=WITHDRAWN o=Other EPA DOCUMENTS r=ROUTE EXTRAPOLATION ca=CANCER PRG nc=NONCANCER PRG sat=SOIL SATURATION max=CEILING LIMIT *(where: nc < 100X ca) **(where: nc < 10X ca)

FOR PLANNING PURPOSES

TOXICITY INFORMATION						CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)				SOIL SCREENING LEVELS	
				V	skin						Migration to Ground Water	
SFo	RfDo	SFI	RfDI	O	abs.	CAS No.	Residential	Industrial	Ambient Air	Tap Water	DAF 20	DAF 1
1/(mg/kg-d)	(mg/kg-d)	1/(mg/kg-d)	(mg/kg-d)	C	soils		Soil (mg/kg)	Soil (mg/kg)	(ug/m^3)	(ug/l)	(mg/kg)	(mg/kg)
3.4E-01 i		3.4E-01 r		0	0.03	72-55-9	DDE	1.7E+00 ca	1.3E+01 ca	2.0E-02 ca	2.0E-01 ca	5.4E+01	3.0E+00
3.4E-01 i	5.0E-04 i	3.4E-01 i	5.0E-04 r	0	0.03	50-29-3	DDT	1.7E+00 ca*	1.3E+01 ca*	2.0E-02 ca*	2.0E-01 ca*	3.2E+01	2.0E+00
	1.0E-02 i		1.0E-02 r	0	0.10	1163-19-5	Decabromodiphenyl ether	5.5E+02 nc	1.1E+04 nc	3.7E+01 nc	3.7E+02 nc		
	4.0E-05 i		4.0E-05 r	0	0.10	8065-48-3	Demeton	2.2E+00 nc	4.3E+01 nc	1.5E-01 nc	1.5E+00 nc		
6.1E-02 h		6.1E-02 r		0	0.10	2303-16-4	Diallate	7.3E+00 ca	4.9E+01 ca	1.1E-01 ca	1.1E+00 ca		
	9.0E-04 h		9.0E-04 r	0	0.10	333-41-5	Diazinon	4.9E+01 nc	9.6E+02 nc	3.3E+00 nc	3.3E+01 nc		
	4.0E-03 x		4.0E-03 r	1	0.10	132-64-9	**Dibenzofuran**	2.1E+02 nc	3.2E+03 nc	1.5E+01 nc	2.4E+01 nc		
	1.0E-02 i		1.0E-02 r	0	0.10	106-37-6	1,4-Dibromobenzene	5.5E+02 nc	1.1E+04 nc	3.7E+01 nc	3.7E+02 nc		
8.4E-02 i	2.0E-02 i	8.4E-02 r	2.0E-02 r	0	0.10	124-48-1	Dibromochloromethane	5.3E+00 ca	3.6E+01 ca	8.0E-02 ca	1.0E+00 ca	4.0E-01	2.0E-02
1.4E+00 h	5.7E-05 r	2.4E-03 h	5.7E-05 i	0	0.10	96-12-8	1,2-Dibromo-3-chloropropane	3.2E-01 ca**	2.1E+00 ca*	2.1E-01 nc	4.8E-02 ca*		
							"CAL-Modified PRG" (PEA, 1994)	**6.0E-02**		**9.6E-04**	**4.7E-03**		
8.5E+01 i	5.7E-05 r	7.7E-01 i	5.7E-05 h	1	0.10	106-93-4	1,2-Dibromoethane	4.9E-03 ca	2.9E-02 ca*	8.7E-03 ca*	7.6E-04 ca		
	1.0E-01 i		1.0E-01 r	0	0.10	84-74-2	Dibutyl phthalate	5.5E+03 nc	1.1E+05 nc	3.7E+02 nc	3.7E+03 nc	2.3E+03	2.7E+02
	3.0E-02 i		3.0E-02 r	0	0.10	1918-00-9	Dicamba	1.6E+03 nc	3.2E+04 nc	1.1E+02 nc	1.1E+03 nc		
	9.0E-02 i		5.7E-02 h	1	0.10	95-50-1	1,2-Dichlorobenzene	3.7E+02 sat	3.7E+02 sat	2.1E+02 nc	3.7E+02 nc	1.7E+01	9.0E-01
	3.0E-02 n		2.3E-03 n	1	0.10	541-73-1	**1,3-Dichlorobenzene**	4.1E+01 nc	1.4E+02 nc	8.4E+00 nc	1.7E+01 nc		
2.4E-02 h	2.0E-01 n	2.4E-02 r	2.3E-01 i	1	0.10	106-46-7	1,4-Dichlorobenzene	3.0E+00 ca	7.3E+00 ca	2.8E-01 ca	4.7E-01 ca	2.0E+00	1.0E-01
4.5E-01 i		4.5E-01 r		0	0.10	91-94-1	3,3-Dichlorobenzidine	9.9E-01 ca	6.7E+00 ca	1.5E-02 ca	1.5E-01 ca	7.0E-03	3.0E-04
9.3E+00 r		9.3E+00 h		1	0.10	764-41-0	1,4-Dichloro-2-butene	7.5E-03 ca	1.8E-02 ca	7.2E-04 ca	1.2E-03 ca		
	2.0E-01 i		5.7E-02 h	1	0.10	75-71-8	Dichlorodifluoromethane	9.4E+01 nc	3.1E+02 nc	2.1E+02 nc	3.9E+02 nc		
	1.0E-01 h		1.4E-01 h	1	0.10	75-34-3	1,1-Dichloroethane	5.7E+02 nc	2.0E+03 nc	5.2E+02 nc	8.1E+02 nc	2.3E+01	1.0E+00
9.1E-02 i	2.9E-03 i	9.1E-02 i	2.9E-03 x	1	0.10	107-06-2	**1,2-Dichloroethane (EDC)**	3.4E-01 ca*	7.6E-01 ca*	7.4E-02 ca	1.2E-01 ca	2.0E-02	1.0E-03
6.0E-01 i	9.0E-03 i	1.8E-01 i	9.0E-03 r	1	0.10	75-35-4	1,1-Dichloroethylene	5.2E-02 ca	1.2E-01 ca	3.8E-02 ca	4.6E-02 ca	6.0E-02	3.0E-03
	1.0E-02 h		1.0E-02 r	1	0.10	156-59-2	1,2-Dichloroethylene (cis)	4.2E+01 nc	1.5E+02 nc	3.7E+01 nc	6.1E+01 nc	4.0E-01	2.0E-02
	2.0E-02 i		2.0E-02 r	1	0.10	156-60-5	1,2-Dichloroethylene (trans)	6.2E+01 nc	2.1E+02 nc	7.3E+01 nc	1.2E+02 nc	7.0E-01	3.0E-02
	3.0E-03 i		3.0E-03 r	0	0.10	120-83-2	2,4-Dichlorophenol	1.6E+02 nc	3.2E+03 nc	1.1E+01 nc	1.1E+02 nc	1.0E+00	5.0E-02
	8.0E-03 i		8.0E-03 r	0	0.10	94-82-6	4-(2,4-Dichlorophenoxy)butyric Acid (2,4-DB)	4.4E+02 nc	8.6E+03 nc	2.9E+01 nc	2.9E+02 nc		
	1.0E-02 i		1.0E-02 r	0	0.05	94-75-7	2,4-Dichlorophenoxyacetic Acid (2,4-D)	6.4E+02 nc	1.4E+04 nc	3.7E+01 nc	3.7E+02 nc		
6.8E-02 h	1.1E-03 r	6.8E-02 r	1.1E-03 i	1	0.10	78-87-5	1,2-Dichloropropane	3.4E-01 ca*	7.6E-01 ca*	9.9E-02 ca*	1.6E-01 ca*	3.0E-02	1.0E-03
1.8E-01 h	3.0E-04 i	1.3E-01 h	5.7E-03 i	1	0.10	542-75-6	1,3-Dichloropropene	8.1E-02 ca*	1.8E-01 ca	5.2E-02 ca	8.1E-02 ca	4.0E-03	2.0E-04
	3.0E-03 i		3.0E-03 r	0	0.10	616-23-9	2,3-Dichloropropanol	1.6E+02 nc	3.2E+03 nc	1.1E+01 nc	1.1E+02 nc		
2.9E-01 i	5.0E-04 i	2.9E-01 r	1.4E-04 i	0	0.10	62-73-7	Dichlorvos	1.5E+00 ca*	1.0E+01 ca*	2.3E-02 ca*	2.3E-01 ca*		
4.4E-01 x		4.4E-01 r		0	0.10	115-32-2	Dicofol	1.0E+00 ca	6.8E+00 ca	1.5E-02 ca	1.5E-01 ca		
	3.0E-02 h		5.7E-05 h	1	0.10	77-73-6	**Dicyclopentadiene**	5.4E-01 nc	1.8E+00 nc	2.1E-01 nc	4.2E-01 nc		
1.6E+01 i	5.0E-05 i	1.6E+01 i	5.0E-05 r	0	0.10	60-57-1	Dieldrin	2.8E-02 ca*	1.9E-01 ca	4.2E-04 ca	4.2E-03 ca	4.0E-03	2.0E-04
	5.7E-03 h		5.7E-03 x	0	0.10	112-34-5	Diethylene glycol, monobutyl ether	3.1E+02 nc	6.1E+03 nc	2.1E+01 nc	2.1E+02 nc		
	2.0E+00 h		2.0E+00 r	0	0.10	111-90-0	Diethylene glycol, monoethyl ether	1.0E+05 max	1.0E+05 max	7.3E+03 nc	7.3E+04 nc		
	1.1E-02 h		1.1E-02 r	0	0.10	617-84-5	Diethylformamide	6.0E+02 nc	1.2E+04 nc	4.0E+01 nc	4.0E+02 nc		
1.2E-03 i	6.0E-01 i	1.2E-03 r	6.0E-01 r	0	0.10	103-23-1	Di(2-ethylhexyl)adipate	3.7E+02 ca	2.5E+03 ca	5.6E+00 ca	5.6E+01 ca		
	8.0E-01 i		8.0E-01 r	0	0.10	84-66-2	Diethyl phthalate	4.4E+04 nc	1.0E+05 max	2.9E+03 nc	2.9E+04 nc		
4.7E+03 h		4.7E+03 r		0	0.10	56-53-1	Diethylstilbestrol	9.4E-05 ca	6.4E-04 ca	1.4E-06 ca	1.4E-05 ca		
	8.0E-02 i		8.0E-02 r	0	0.10	43222-48-6	Difenzoquat (Avenge)	4.4E+03 nc	8.6E+04 nc	2.9E+02 nc	2.9E+03 nc		

Key: I=IRIS, h=HEAST, n=NCEA, x=WITHDRAWN, o=Other EPA DOCUMENTS, r=ROUTE EXTRAPOLATION, ca=CANCER PRG, nc=NONCANCER PRG, sat=SOIL SATURATION, max=CEILING LIMIT, *(where: nc < 100X ca), **(where: nc < 10X ca)

FOR PLANNING PURPOSES

TOXICITY INFORMATION						CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)				SOIL SCREENING LEVELS	
				V	skin						Migration to Ground Water	
SFo 1/(mg/kg-d)	RfDo (mg/kg-d)	SFI 1/(mg/kg-d)	RfDI (mg/kg-d)	O C	abs. soils	CAS No.	Residential Soil (mg/kg)	Industrial Soil (mg/kg)	Ambient Air (ug/m^3)	Tap Water (ug/l)	DAF 20 (mg/kg)	DAF 1 (mg/kg)
	2.0E-02 i		2.0E-02 r	0	0.10	35367-38-5	Diflubenzuron	1.1E+03 nc	2.1E+04 nc	7.3E+01 nc	7.3E+02 nc	
	1.1E+01 r		1.1E+01 i	1	0.10	75-37-6	1,1-Difluoroethane			4.2E+04 nc	6.9E+04 nc	
	8.0E-02 i		8.0E-02 r	0	0.10	1445-75-6	Diisopropyl methylphosphonate	4.4E+03 nc	8.6E+04 nc	2.9E+02 nc	2.9E+03 nc	
	2.0E-02 i		2.0E-02 r	0	0.10	55290-64-7	Dimethipin	1.1E+03 nc	2.1E+04 nc	7.3E+01 nc	7.3E+02 nc	
	2.0E-04 i		2.0E-04 r	0	0.10	60-51-5	Dimethoate	1.1E+01 nc	2.1E+02 nc	7.3E-01 nc	7.3E+00 nc	
1.4E-02 h		1.4E-02 r		0	0.10	119-90-4	3,3'-Dimethoxybenzidine	3.2E+01 ca	2.1E+02 ca	4.8E-01 ca	4.8E+00 ca	
	5.7E-06 r		5.7E-06 x	1	0.10	124-40-3	Dimethylamine	6.3E-02 nc	2.5E-01 nc	2.1E-02 nc	3.5E-02 nc	
	2.0E-03 i		2.0E-03 r	0	0.10	121-69-7	N-N-Dimethylaniline	1.1E+02 nc	2.1E+03 nc	7.3E+00 nc	7.3E+01 nc	
7.5E-01 h		7.5E-01 r		0	0.10	95-68-1	2,4-Dimethylaniline	5.9E-01 ca	4.0E+00 ca	9.0E-03 ca	9.0E-02 ca	
5.8E-01 h		5.8E-01 r		0	0.10	21436-96-4	2,4-Dimethylaniline hydrochloride	7.7E-01 ca	5.2E+00 ca	1.2E-02 ca	1.2E-01 ca	
9.2E+00 h		9.2E+00 r		0	0.10	119-93-7	3,3'-Dimethylbenzidine	4.8E-02 ca	3.3E-01 ca	7.3E-04 ca	7.3E-03 ca	
2.6E+00 x		3.5E+00 x		0	0.10	57-14-7	1,1-Dimethylhydrazine	1.7E-01 ca	1.2E+00 ca	1.9E-03 ca	2.6E-02 ca	
3.7E+01 x		3.7E+01 x		0	0.10	540-73-8	1,2-Dimethylhydrazine	1.2E-02 ca	8.1E-02 ca	1.8E-04 ca	1.8E-03 ca	
	1.0E-01 h		8.6E-03 I	0	0.10	68-12-2	N,N-Dimethylformamide	5.4E+03 nc	1.1E+05 nc	3.1E+01 nc	3.7E+03 nc	
	1.0E-03 n		1.0E-03 r	0	0.10	122-09-8	**Dimethylphenethylamine**	5.5E+01 nc	1.1E+03 nc	3.7E+00 nc	3.7E+01 nc	
	2.0E-02 i		2.0E-02 r	0	0.10	105-67-9	2,4-Dimethylphenol	1.1E+03 nc	2.1E+04 nc	7.3E+01 nc	7.3E+02 nc	9.0E+00 4.0E-01
	6.0E-04 i		6.0E-04 r	0	0.10	576-26-1	2,6-Dimethylphenol	3.3E+01 nc	6.4E+02 nc	2.2E+00 nc	2.2E+01 nc	
	1.0E-03 i		1.0E-03 r	0	0.10	95-65-8	3,4-Dimethylphenol	5.5E+01 nc	1.1E+03 nc	3.7E+00 nc	3.7E+01 nc	
	1.0E+01 h		1.0E+01 r	0	0.10	131-11-3	Dimethyl phthalate	1.0E+05 max	1.0E+05 max	3.7E+04 nc	3.7E+05 nc	
	1.0E-01 i		1.0E-01 r	0	0.10	120-61-6	Dimethyl terephthalate	5.5E+03 nc	1.1E+05 nc	3.7E+02 nc	3.7E+03 nc	
	2.0E-03 i		2.0E-03 r	0	0.10	131-89-5	4,6-Dinitro-o-cyclohexyl phenol	1.1E+02 nc	2.1E+03 nc	7.3E+00 nc	7.3E+01 nc	
	4.0E-04 h		4.0E-04 r	0	0.10	528-29-0	1,2-Dinitrobenzene	2.2E+01 nc	4.3E+02 nc	1.5E+00 nc	1.5E+01 nc	
	1.0E-04 i		1.0E-04 r	0	0.10	99-65-0	1,3-Dinitrobenzene	5.5E+00 nc	1.1E+02 nc	3.7E-01 nc	3.7E+00 nc	
	4.0E-04 h		4.0E-04 r	0	0.10	100-25-4	1,4-Dinitrobenzene	2.2E+01 nc	4.3E+02 nc	1.5E+00 nc	1.5E+01 nc	
	2.0E-01 i		2.0E-03 r	0	0.10	51-28-5	2,4-Dinitrophenol	1.1E+02 nc	2.1E+03 nc	7.3E+00 nc	7.3E+01 nc	3.0E-01 1.0E-02
6.8E-01 i		6.8E-01 r		0	0.10	25321-14-6	Dinitrotoluene mixture	6.5E-01 ca	4.4E+00 ca	9.9E-03 ca	9.9E-02 ca	8.0E-04 4.0E-05
	2.0E-03 i		2.0E-03 r	0	0.10	121-14-2	2,4-Dinitrotoluene (also see Dinitrotoluene mixture)	1.1E+02 nc	2.1E+03 nc	7.3E+00 nc	7.3E+01 nc	8.0E-04 4.0E-05
	1.0E-03 h		1.0E-03 r	0	0.10	606-20-2	2,6-Dinitrotoluene (also see Dinitrotoluene mixture)	5.5E+01 nc	1.1E+03 nc	3.7E+00 nc	3.7E+01 nc	7.0E-04 3.0E-05
	1.0E-03 i		1.0E-03 r	0	0.10	88-85-7	Dinoseb	5.5E+01 nc	1.1E+03 nc	3.7E+00 nc	3.7E+01 nc	
	2.0E-02 h		2.0E-02 r	0	0.10	117-84-0	di-n-Octyl phthalate	1.1E+03 nc	1.0E+04 sat	7.3E+01 nc	7.3E+02 nc	1.0E+04 1.0E+04
1.1E-02 I		1.1E-02 r		0	0.10	123-91-1	**1,4-Dioxane**	4.0E+01 ca	2.7E+02 ca	6.1E-01 ca	6.1E+00 ca	
1.5E+05 h		1.5E+05 h		0	0.03	1746-01-6	Dioxin (2,3,7,8-TCDD)	3.8E-06 ca	3.0E-05 ca	4.5E-08 ca	4.5E-07 ca	
	3.0E-02 i		3.0E-02 r	0	0.10	957-51-7	Diphenamid	1.6E+03 nc	3.2E+04 nc	1.1E+02 nc	1.1E+03 nc	
	2.5E-02 i		2.5E-02 r	0	0.10	122-39-4	Diphenylamine	1.4E+03 nc	2.7E+04 nc	9.1E+01 nc	9.1E+02 nc	
8.0E-01 I		7.7E-01 I		0	0.10	122-66-7	1,2-Diphenylhydrazine	5.6E-01 ca	3.7E+00 ca	8.7E-03 ca	8.4E-02 ca	
	9.0E-03 n		9.0E-03 r	0	0.10	127-63-9	**Diphenyl sulfone**	4.9E+02 nc	9.6E+03 nc	3.3E+01 nc	3.3E+02 nc	
	2.2E-03 i		2.2E-03 r	0	0.10	85-00-7	Diquat	1.2E+02 nc	2.4E+03 nc	8.0E+00 nc	8.0E+01 nc	
8.6E+00 h		8.6E+00 r		0	0.10	1937-37-7	Direct black 38	5.2E-02 ca	3.5E-01 ca	7.8E-04 ca	7.8E-03 ca	
8.1E+00 h		8.1E+00 r		0	0.10	2602-46-2	Direct blue 6	5.5E-02 ca	3.7E-01 ca	8.3E-04 ca	8.3E-03 ca	
9.3E+00 h		9.3E+00 r		0	0.10	16071-86-6	Direct brown 95	4.8E-02 ca	3.2E-01 ca	7.2E-04 ca	7.2E-03 ca	
	4.0E-05 i		4.0E-05 r	0	0.10	298-04-4	Disulfoton	2.2E+00 nc	4.3E+01 nc	1.5E-01 nc	1.5E+00 nc	
	1.0E-02 I		1.0E-02 r	0	0.10	505-29-3	1,4-Dithiane	5.5E+02 nc	1.1E+04 nc	3.7E+01 nc	3.7E+02 nc	

Key: i=IRIS h=HEAST n=NCEA x=WITHDRAWN o=Other EPA DOCUMENTS r=ROUTE EXTRAPOLATION ca=CANCER PRG nc=NONCANCER PRG sat=SOIL SATURATION max=CEILING LIMIT *(where nc < 100X ca) **(where nc < 10X ca)

FOR PLANNING PURPOSES

TOXICITY INFORMATION						CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)				SOIL SCREENING LEVELS	
				V	skin						Migration to Ground Water	
SFo	RfDo	SFI	RfDI	O	abs.	CAS No.	Residential	Industrial	Ambient Air	Tap Water	DAF 20	DAF 1
1/(mg/kg-d)	(mg/kg-d)	1/(mg/kg-d)	(mg/kg-d)	C	soils		Soil (mg/kg)	Soil (mg/kg)	(ug/m^3)	(ug/l)	(mg/kg)	(mg/kg)
	2.0E-03 r		2.0E-03 r	0	0.10	330-54-1	Diuron	1.1E+02 nc	2.1E+03 nc	7.3E+00 nc	7.3E+01 nc		
	4.0E-03 i		4.0E-03 r	0	0.10	2439-10-3	Dodine	2.2E+02 nc	4.3E+03 nc	1.5E+01 nc	1.5E+02 nc		
	6.0E-03 i		6.0E-03 r	0	0.10	115-29-7	**Endosulfan**	3.3E+02 nc	6.4E+03 nc	2.2E+01 nc	2.2E+02 nc	1.8E+01	9.0E-01
	2.0E-02 i		2.0E-02 r	0	0.10	145-73-3	Endothall	1.1E+03 nc	2.1E+04 nc	7.3E+01 nc	7.3E+02 nc		
	3.0E-04 i		3.0E-04 r	0	0.10	72-20-8	Endrin	1.6E+01 nc	3.2E+02 nc	1.1E+00 nc	1.1E+01 nc	1.0E+00	5.0E-02
9.9E-03 i	2.0E-03 h	4.7E-03 i	2.9E-04 i	1	0.10	106-89-8	Epichlorohydrin	7.4E+00 nc	2.6E+01 nc	1.0E+00 nc	2.0E+00 nc		
	5.7E-03 r		5.7E-03 i	0	0.10	106-88-7	1,2-Epoxybutane	3.1E+02 nc	6.1E+03 nc	2.1E+01 nc	2.1E+02 nc		
	2.5E-02 i		2.5E-02 r	0	0.10	759-94-4	EPTC (S-Ethyl dipropylthiocarbamate)	1.4E+03 nc	2.7E+04 nc	9.1E+01 nc	9.1E+02 nc		
	5.0E-03 i		5.0E-03 r	0	0.10	16672-87-0	Ethephon (2-chloroethyl phosphonic acid)	2.7E+02 nc	5.3E+03 nc	1.8E+01 nc	1.8E+02 nc		
	5.0E-04 i		5.0E-04 r	0	0.10	563-12-2	Ethion	2.7E+01 nc	5.3E+02 nc	1.8E+00 nc	1.8E+01 nc		
	4.0E-01 h		5.7E-02 i	0	0.10	110-80-5	2-Ethoxyethanol	2.2E+04 nc	1.0E+05 max	2.1E+02 nc	1.5E+04 nc		
	3.0E-01 h		3.0E-01 r	0	0.10	111-15-9	2-Ethoxyethanol acetate	1.6E+04 nc	1.0E+05 max	1.1E+03 nc	1.1E+04 nc		
	9.0E-01 i		9.0E-01 r	1	0.10	141-78-6	**Ethyl acetate**	1.7E+04 nc	7.7E+04 sat	3.3E+03 nc	5.5E+03 nc		
4.8E-02 h		4.8E-02 r		1	0.10	SU 140-88-5	Ethyl acrylate	2.1E-01 ca	4.5E-01 ca	1.4E-01 ca	2.3E-01 ca		
	1.0E-01 i		2.9E-01 i	1	0.10	100-41-4	Ethylbenzene	2.3E+02 sat	2.3E+02 sat	1.1E+03 nc	1.3E+03 nc	1.3E+01	7.0E-01
	4.0E-01 n		2.9E+00 i	1	0.10	75-00-3	**Ethyl chloride**	1.6E+03 sat	1.6E+03 sat	1.0E+04 nc	8.6E+03 nc		
	3.0E-01 h		3.0E-01 r	0	0.10	109-78-4	Ethylene cyanohydrin	1.6E+04 nc	1.0E+05 max	1.1E+03 nc	1.1E+04 nc		
	2.0E-02 h		2.0E-02 r	0	0.10	107-15-3	Ethylene diamine	1.1E+03 nc	2.1E+04 nc	7.3E+01 nc	7.3E+02 nc		
	2.0E+00 i		2.0E+00 r	0	0.10	107-21-1	Ethylene glycol	1.0E+05 max	1.0E+05 max	7.3E+03 nc	7.3E+04 nc		
	5.7E-03 r		5.7E-03 h	0	0.10	111-76-2	Ethylene glycol, monobutyl ether	3.1E+02 nc	6.1E+03 nc	2.1E+01 nc	2.1E+02 nc		
1.0E+00 h		3.5E-01 h		1	0.10	75-21-8	Ethylene oxide	1.3E-01 ca	3.4E-01 ca	1.9E-02 ca	2.4E-02 ca		
1.1E-01 h	8.0E-05 i	1.1E-01 r	8.0E-05 r	0	0.10	96-45-7	**Ethylene thiourea (ETU)**	4.0E+00 ca**	2.7E+01 ca**	6.1E-02 ca**	6.1E-01 ca**		
	2.0E-01 i		2.0E-01 r	1	0.10	SU 60-29-7	Ethyl ether	1.8E+03 sat	1.8E+03 sat	7.3E+02 nc	1.2E+03 nc		
	9.0E-02 h		9.0E-02 r	1	0.10	SU 97-63-2	Ethyl methacrylate	1.4E+02 sat	1.4E+02 sat	3.3E+02 nc	5.5E+02 nc		
	1.0E-05 i		1.0E-05 r	0	0.10	2104-64-5	Ethyl p-nitrophenyl phenylphosphorothioate	5.5E-01 nc	1.1E+01 nc	3.7E-02 nc	3.7E-01 nc		
	3.0E+00 i		3.0E+00 r	0	0.10	84-72-0	Ethylphthalyl ethyl glycolate	1.0E+05 max	1.0E+05 max	1.1E+04 nc	1.1E+05 nc		
	8.0E-03 i		8.0E-03 r	0	0.10	101200-48-0	Express	4.4E+02 nc	8.6E+03 nc	2.9E+01 nc	2.9E+02 nc		
	2.5E-04 i		2.5E-04 r	0	0.10	22224-92-6	Fenamiphos	1.4E+01 nc	2.7E+02 nc	9.1E-01 nc	9.1E+00 nc		
	1.3E-02 i		1.3E-02 r	0	0.10	2164-17-2	Fluometuron	7.1E+02 nc	1.4E+04 nc	4.7E+01 nc	4.7E+02 nc		
	6.0E-02 i			0	0.10	16984-48-8	Flouride (soluble)	3.3E+03 nc	6.4E+04 nc		2.2E+03 nc		
	8.0E-02 i		8.0E-02 r	0	0.10	59756-60-4	Fluoridone	4.4E+03 nc	8.6E+04 nc	2.9E+02 nc	2.9E+03 nc		
	2.0E-02 i		2.0E-02 r	0	0.10	56425-91-3	Flurprimidol	1.1E+03 nc	2.1E+04 nc	7.3E+01 nc	7.3E+02 nc		
	6.0E-02 i		6.0E-02 r	0	0.10	66332-96-5	Flutolanil	3.3E+03 nc	6.4E+04 nc	2.2E+02 nc	2.2E+03 nc		
	1.0E-02 i		1.0E-02 r	0	0.10	69409-94-5	Fluvalinate	5.5E+02 nc	1.1E+04 nc	3.7E+01 nc	3.7E+02 nc		
3.5E-03 i	1.0E-01 i	3.5E-03 r	1.0E-01 r	0	0.10	133-07-3	Folpet	1.3E+02 ca*	8.6E+02 ca	1.9E+00 ca	1.9E+01 ca		
1.9E-01 i		1.9E-01 r		0	0.10	72178-02-0	Fomesafen	2.3E+00 ca	1.6E+01 ca	3.5E-02 ca	3.5E-01 ca		
	2.0E-03 i		2.0E-03 r	0	0.10	944-22-9	Fonofos	1.1E+02 nc	2.1E+03 nc	7.3E+00 nc	7.3E+01 nc		
	1.5E-01 i	4.6E-02 i		0	0.10	50-00-0	Formaldehyde	8.2E+03 nc	1.0E+05 nc	1.5E-01 ca	5.5E+03 nc		
	2.0E+00 h		2.0E+00 r	0	0.10	64-18-6	Formic Acid	1.0E+05 max	1.0E+05 max	7.3E+03 nc	7.3E+04 nc		
	3.0E+00 i		3.0E+00 r	0	0.10	39148-24-8	Fosetyl-al	1.0E+05 max	1.0E+05 max	1.1E+04 nc	1.1E+05 nc		
	1.0E-03 i		1.0E-03 r	1	0.10	110-00-9	**Furan**	2.5E+00 nc	8.5E+00 nc	3.7E+00 nc	6.1E+00 nc		
3.8E+00 h		3.8E+00 r		0	0.10	67-45-8	Furazolidone	1.2E-01 ca	7.9E-01 ca	1.8E-03 ca	1.8E-02 ca		

Key: i=IRIS, h=HEAST, n=NCEA, x=WITHDRAWN, o=Other EPA DOCUMENTS, r=ROUTE EXTRAPOLATION, ca=CANCER PRG, nc=NONCANCER PRG, sat=SOIL SATURATION, max=CEILING LIMIT, *(where: nc < 100X ca), **(where: nc < 10X ca)

FOR PLANNING PURPOSES

TOXICITY INFORMATION						CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)				SOIL SCREENING LEVELS	
				V	skin						Migration to Ground Water	
SFo	RfDo	SFI	RfDI	O	abs.	CAS No.	Residential	Industrial	Ambient Air	Tap Water	DAF 20	DAF 1
1/(mg/kg-d)	(mg/kg-d)	1/(mg/kg-d)	(mg/kg-d)	C	soils		Soil (mg/kg)	Soil (mg/kg)	(ug/m^3)	(ug/l)	(mg/kg)	(mg/kg)
	3.0E-03 i		1.4E-02 h	0	0.10	98-01-1 Furfural	1.6E+02 nc	3.2E+03 nc	5.2E+01 nc	1.1E+02 nc		
5.0E+01 h		5.0E+01 r		0	0.10	531-82-8 Furium	8.9E-03 ca	6.0E-02 ca	1.3E-04 ca	1.3E-03 ca		
3.0E-02 i		3.0E-02 r		0	0.10	60568-05-0 Furmecyclox	1.5E+01 ca	1.0E+02 ca	2.2E-01 ca	2.2E+00 ca		
	4.0E-04 i		4.0E-04 r	0	0.10	77182-82-2 Glufosinate-ammonium	2.2E+01 nc	4.3E+02 nc	1.5E+00 nc	1.5E+01 nc		
	4.0E-04 i		2.9E-04 h	0	0.10	765-34-4 Glycidaldehyde	2.2E+01 nc	4.3E+02 nc	1.0E+00 nc	1.5E+01 nc		
	1.0E-01 i		1.0E-01 r	0	0.10	1071-83-6 Glyphosate	5.5E+03 nc	1.1E+05 nc	3.7E+02 nc	3.7E+03 nc		
	5.0E-05 i		5.0E-05 r	0	0.10	69806-40-2 Haloxylop-methyl	2.7E+00 nc	5.3E+01 nc	1.8E-01 nc	1.8E+00 nc		
	1.3E-02 i		1.3E-02 r	0	0.10	79277-27-3 Harmony	7.1E+02 nc	1.4E+04 nc	4.7E+01 nc	4.7E+02 nc		
4.5E+00 i	5.0E-04 i	4.6E+00 i	5.0E-04 r	0	0.10	76-44-8 Heptachlor	9.9E-02 ca	6.7E-01 ca	1.5E-03 ca	1.5E-02 ca	2.3E+01	1.0E+00
9.1E+00 i	1.3E-05 i	9.1E+00 i	1.3E-05 r	0	0.10	1024-57-3 Heptachlor epoxide	4.9E-02 ca*	3.3E-01 ca*	7.4E-04 ca*	7.4E-03 ca*	7.0E-01	3.0E-02
	2.0E-03 i		2.0E-03 r	0	0.10	87-82-1 Hexabromobenzene	1.1E+02 nc	2.1E+03 nc	7.3E+00 nc	7.3E+01 nc		
1.6E+00 i	8.0E-04 i	1.6E+00 i	8.0E-04 r	0	0.10	118-74-1 Hexachlorobenzene	2.8E-01 ca	1.9E+00 ca	4.2E-03 ca	4.2E-02 ca	2.0E+00	1.0E-01
7.8E-02 i	2.0E-04 h	7.7E-02 i	2.0E-04 r	0	0.10	87-68-3 Hexachlorobutadiene	5.7E+00 ca**	3.8E+01 ca**	8.7E-02 ca*	8.6E-01 ca*	2.0E+00	1.0E-01
6.3E+00 i		6.3E+00 i		0	0.04	319-84-6 HCH (alpha)	8.6E-02 ca	6.7E-01 ca	1.1E-03 ca	1.1E-02 ca	5.0E-04	3.0E-05
1.8E+00 i		1.8E+00 i		0	0.04	319-85-7 HCH (beta)	3.0E-01 ca	2.3E+00 ca	3.7E-03 ca	3.7E-02 ca	3.0E-03	1.0E-04
1.3E+00 h	3.0E-04 i	1.3E+00 r	3.0E-04 r	0	0.04	58-89-9 HCH (gamma) Lindane	4.2E-01 ca*	3.2E+00 ca	5.2E-03 ca	5.2E-02 ca	9.0E-03	5.0E-04
1.8E+00 i		1.8E+00 i		0	0.04	608-73-1 HCH-technical	3.0E-01 ca	2.3E+00 ca	3.8E-03 ca	3.7E-02 ca	3.0E-03	1.0E-04
	7.0E-03 i		2.0E-05 h	0	0.10	77-47-4 Hexachlorocyclopentadiene	3.8E+02 nc	7.1E+03 nc	7.3E-02 nc	2.6E+02 nc	4.0E+02	2.0E+01
6.2E+03 i		4.6E+03 i		0	0.10	19408-74-3 Hexachlorodibenzo-p-dioxin mixture (HxCDD)	7.2E-05 ca	4.8E-04 ca	1.5E-06 ca	1.1E-05 ca		
1.4E-02 i	1.0E-03 i	1.4E-02 i	1.0E-03 r	0	0.10	67-72-1 Hexachloroethane	3.2E+01 ca**	2.1E+02 ca**	4.8E-01 ca**	4.8E+00 ca**	5.0E-01	2.0E-02
	3.0E-04 i		3.0E-04 r	0	0.10	70-30-4 Hexachlorophene	1.6E+01 nc	3.2E+02 nc	1.1E+00 nc	1.1E+01 nc		
1.1E-01 r	3.0E-03 i	1.1E-01 r	3.0E-03 r	0	0.10	121-82-4 Hexahydro-1,3,5-trinitro-1,3,5-triazine	4.0E+00 ca*	2.7E+01 ca	6.1E-02 ca	6.1E-01 ca		
	2.9E-06 r		2.9E-06 i	0	0.10	822-06-0 1,6-Hexamethylene diisocyanate			1.0E-02 nc	1.0E-01 nc		
	6.0E-02 h		5.7E-02 i	1	0.10	110-54-3 n-Hexane	1.1E+02 sat	1.1E+02 sat	2.1E+02 nc	3.5E+02 nc		
	3.3E-02 i		3.3E-02 r	0	0.10	51235-04-2 Hexazinone	1.8E+03 nc	3.5E+04 nc	1.2E+02 nc	1.2E+03 nc		
3.0E+00 i		1.7E+01 i		0	0.10	302-01-2 Hydrazine, hydrazine sulfate	1.5E-01 ca	1.0E+00 ca	3.9E-04 ca	2.2E-02 ca		
			5.7E-03 i	0	0.10	7647-01-0 Hydrogen chloride			2.1E+01 nc			
	3.0E-03 i		2.9E-04 i	1	0.10	7783-06-4 Hydrogen sulfide			1.0E+00 nc	2.0E+00 nc		
	4.0E-02 h		4.0E-02 r	0	0.10	123-31-9 p-Hydroquinone	2.2E+03 nc	4.3E+04 nc	1.5E+02 nc	1.5E+03 nc		
	1.3E-02 i		1.3E-02 r	0	0.10	35554-44-0 Imazalil	7.1E+02 nc	1.4E+04 nc	4.7E+01 nc	4.7E+02 nc		
	2.5E-01 i		2.5E-01 r	0	0.10	81335-37-7 Imazaquin	1.4E+04 nc	1.0E+05 max	9.1E+02 nc	9.1E+03 nc		
	4.0E-02 i		4.0E-02 r	0	0.10	36734-19-7 Iprodione	2.2E+03 nc	4.3E+04 nc	1.5E+02 nc	1.5E+03 nc		
	3.0E-01 n			0	0.01	7439-89-6 **Iron**	2.2E+04 nc	1.0E+05 max		1.1E+04 nc		
	3.0E-01 i		3.0E-01 r	1	0.10	78-83-1 **Isobutanol**	1.0E+04 nc	4.0E+04 sat	1.1E+03 nc	1.8E+03 nc		
9.5E-04 i	2.0E-01 i	9.5E-04 r	2.0E-01 r	0	0.10	78-59-1 Isophorone	4.7E+02 ca*	3.2E+03 ca*	7.1E+00 ca	7.1E+01 ca	5.0E-01	3.0E-02
	1.5E-02 i		1.5E-02 r	0	0.10	33820-53-0 Isopropalin	8.2E+02 nc	1.6E+04 nc	5.5E+01 nc	5.5E+02 nc		
	1.0E-01 i		1.1E-01 r	0	0.10	1832-54-8 Isopropyl methyl phosphonic acid	5.5E+03 nc	1.1E+05 nc	4.0E+02 nc	3.7E+03 nc		
	5.0E-02 i		5.0E-02 r	0	0.10	82558-50-7 Isoxaben	2.7E+03 nc	5.3E+04 nc	1.8E+02 nc	1.8E+03 nc		
1.8E+01 n		1.8E+01 r		0	0.10	143-50-0 Kepone	2.5E-02 ca	1.7E-01 ca	3.7E-04 ca	3.7E-03 ca		
	2.0E-03 i		2.0E-03 r	0	0.10	77501-63-4 Lactofen	1.1E+02 nc	2.1E+03 nc	7.3E+00 nc	7.3E+01 nc		
PRGs Based on EPA Models, IEUBK (1994) and TRW (1996)						7439-92-1 Lead	4.0E+02 nc	1.0E+03 nc		4.0E+00 nc		
						"CAL-Modified PRG" (PEA, 1994)	**1.3E+02**					

Key: i=IRIS h=HEAST n=NCEA x=WITHDRAWN o=Other EPA DOCUMENTS r=ROUTE EXTRAPOLATION ca=CANCER PRG nc=NONCANCER PRG sat=SOIL SATURATION max=CEILING LIMIT *(where nc < 100X ca) **(where nc < 10X ca)

FOR PLANNING PURPOSES

TOXICITY INFORMATION							CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)				SOIL SCREENING LEVELS	
				V	skin							Migration to Ground Water	
SFo	RfDo	SFI	RfDI	O	abs.	CAS No.		Residential	Industrial	Ambient Air	Tap Water	DAF 20	DAF 1
1/(mg/kg-d)	(mg/kg-d)	1/(mg/kg-d)	(mg/kg-d)	C	soils			Soil (mg/kg)	Soil (mg/kg)	(ug/m^3)	(ug/l)	(mg/kg)	(mg/kg)
	1.0E-07 i			0	0.10	78-00-2	Lead (tetraethyl)	5.5E-03 nc	1.1E-01 nc		3.7E-03 nc		
	2.0E-03 i		2.0E-03 r	0	0.10	330-55-2	Linuron	1.1E+02 nc	2.1E+03 nc	7.3E+00 nc	7.3E+01 nc		
	2.0E-02 x			0	0.01	7439-93-2	Lithium	1.5E+03 nc	3.7E+04 nc		7.3E+02 nc		
	2.0E-01 i		2.0E-01 r	0	0.10	83055-99-6	Londax	1.1E+04 nc	1.0E+05 max	7.3E+02 nc	7.3E+03 nc		
	2.0E-02 i		2.0E-02 r	0	0.10	121-75-5	Malathion	1.1E+03 nc	2.1E+04 nc	7.3E+01 nc	7.3E+02 nc		
	1.0E-01 i		1.0E-01 r	0	0.10	108-31-6	Maleic anhydride	5.5E+03 nc	1.1E+05 nc	3.7E+02 nc	3.7E+03 nc		
	5.0E-01 i		5.0E-01 r	1	0.10	123-33-1	**Maleic hydrazide**	1.6E+03 nc	5.6E+03 nc	1.8E+03 nc	3.0E+03 nc		
	2.0E-05 h		2.0E-05 r	0	0.10	109-77-3	Malononitrile	1.1E+00 nc	2.1E+01 nc	7.3E-02 nc	7.3E-01 nc		
	3.0E-02 h		3.0E-02 r	0	0.10	8018-01-7	Mancozeb	1.6E+03 nc	3.2E+04 nc	1.1E+02 nc	1.1E+03 nc		
6.0E-02 n	5.0E-03 i	6.0E-02 r	5.0E-03 r	0	0.10	12427-38-2	**Maneb**	7.4E+00 ca*	5.0E+01 ca	1.1E-01 ca	1.1E+00 ca		
	4.7E-02 i		1.4E-05 i	0	0.01	7439-96-5	**Manganese and compounds**	3.1E+03 nc	4.5E+04 nc	5.1E-02 nc	1.7E+03 nc		
	9.0E-05 h		9.0E-05 r	0	0.10	950-10-7	Mephosfolan	4.9E+00 nc	9.6E+01 nc	3.3E-01 nc	3.3E+00 nc		
	3.0E-02 i		3.0E-02 r	0	0.10	24307-26-4	Mepiquat	1.6E+03 nc	3.2E+04 nc	1.1E+02 nc	1.1E+03 nc		
2.9E-02 n	1.0E-01 n	2.9E-02 r	1.0E-01 r	0	0.10	149-30-4	**2-Mercaptobenzothiazole**	1.5E+01 ca	1.0E+02 ca	2.3E-01 ca	2.3E+00 ca		
	3.0E-04 i			0	0.01	7487-94-7	Mercury and compounds	2.2E+01 nc	5.6E+02 nc		1.1E+01 nc		
			8.6E-05 i	n/a	n/a	7439-97-6	Mercury (elemental)			3.1E-01 nc			
	1.0E-04 i			0	0.10	22967-92-6	Mercury (methyl)	5.5E+00 nc	1.1E+02 nc		3.7E+00 nc		
	3.0E-05 i		3.0E-05 r	0	0.10	150-50-5	Merphos	1.6E+00 nc	3.2E+01 nc	1.1E-01 nc	1.1E+00 nc		
	3.0E-05 i		3.0E-05 r	0	0.10	78-48-8	Merphos oxide	1.6E+00 nc	3.2E+01 nc	1.1E-01 nc	1.1E+00 nc		
	6.0E-02 i		6.0E-02 r	0	0.10	57837-19-1	Metalaxyl	3.3E+03 nc	6.4E+04 nc	2.2E+02 nc	2.2E+03 nc		
	1.0E-04 i		2.0E-04 h	1	0.10	SU 126-98-7	Methacrylonitrile	1.8E+00 nc	8.4E+00 nc	7.3E-01 nc	1.0E+00 nc		
	5.0E-05 i		5.0E-05 r	0	0.10	10265-92-6	Methamidophos	2.7E+00 nc	5.3E+01 nc	1.8E-01 nc	1.8E+00 nc		
	5.0E-01 i		5.0E-01 r	0	0.10	67-56-1	Methanol	2.7E+04 nc	1.0E+05 max	1.8E+03 nc	1.8E+04 nc		
	1.0E-03 i		1.0E-03 r	0	0.10	950-37-8	Methidathion	5.5E+01 nc	1.1E+03 nc	3.7E+00 nc	3.7E+01 nc		
	2.5E-02 i		2.5E-02 r	1	0.10	16752-77-5	Methomyl	4.4E+01 nc	1.5E+02 nc	9.1E+01 nc	1.5E+02 nc		
	5.0E-03 i		5.0E-03 r	0	0.10	72-43-5	Methoxychlor	2.7E+02 nc	5.3E+03 nc	1.8E+01 nc	1.8E+02 nc	1.6E+02	8.0E+00
	1.0E-03 h		5.7E-03 i	0	0.10	109-86-4	2-Methoxyethanol	5.5E+01 nc	1.1E+03 nc	2.1E+01 nc	3.7E+01 nc		
	2.0E-03 h		2.0E-03 r	0	0.10	110-49-6	2-Methoxyethanol acetate	1.1E+02 nc	2.1E+03 nc	7.3E+00 nc	7.3E+01 nc		
4.6E-02 h		4.6E-02 r		0	0.10	99-59-2	2-Methoxy-5-nitroaniline	9.7E+00 ca	6.5E+01 ca	1.5E-01 ca	1.5E+00 ca		
	1.0E+00 h		1.0E+00 r	1	0.10	SU 79-20-9	Methyl acetate	2.0E+04 nc	9.2E+04 nc	3.7E+03 nc	6.1E+03 nc		
	3.0E-02 h		3.0E-02 r	1	0.10	SU 96-33-3	Methyl acrylate	6.9E+01 nc	2.3E+02 nc	1.1E+02 nc	1.8E+02 nc		
2.4E-01 h		2.4E-01 r		0	0.10	95-53-4	2-Methylaniline (o-toluidine)	1.9E+00 ca	1.2E+01 ca	2.8E-02 ca	2.8E-01 ca		
1.8E-01 h		1.8E-01 r		0	0.10	636-21-5	2-Methylaniline hydrochloride	2.5E+00 ca	1.7E+01 ca	3.7E-02 ca	3.7E-01 ca		
	1.0E+00 x		1.0E+00 r	0	0.10	79-22-1	Methyl chlorocarbonate	5.5E+04 nc	1.0E+05 max	3.7E+03 nc	3.7E+04 nc		
	5.0E-04 i		5.0E-04 r	0	0.10	94-74-6	2-Methyl-4-chlorophenoxyacetic acid	2.7E+01 nc	5.3E+02 nc	1.8E+00 nc	1.8E+01 nc		
	1.0E-02 i		1.0E-02 r	0	0.10	94-81-5	4-(2-Methyl-4-chlorophenoxy) butyric acid	5.5E+02 nc	1.1E+04 nc	3.7E+01 nc	3.7E+02 nc		
	1.0E-03 i		1.0E-03 r	0	0.10	93-65-2	2-(2-Methyl-4-chlorophenoxy) propionic acid	5.5E+01 nc	1.1E+03 nc	3.7E+00 nc	3.7E+01 nc		
	1.0E-03 i		1.0E-03 r	0	0.10	16484-77-8	2-(2-Methyl-1,4-chlorophenoxy) propionic acid	5.5E+01 nc	1.1E+03 nc	3.7E+00 nc	3.7E+01 nc		
	8.6E-01 r		8.6E-01 h	0	0.10	108-87-2	Methylcyclohexane	4.7E+04 nc	1.0E+05 max	3.1E+03 nc	3.1E+04 nc		
2.5E-01 h		2.5E-01 r		0	0.10	101-77-9	4,4'-Methylenebisbenzeneamine	1.8E+00 ca	1.2E+01 ca	2.7E-02 ca	2.7E-01 ca		
1.3E-01 h	7.0E-04 h	1.3E-01 h	7.0E-04 r	0	0.10	101-14-4	4,4'-Methylene bis(2-chloroaniline)	3.4E+00 ca*	2.3E+01 ca*	5.2E-02 ca*	5.2E-01 ca*		
4.6E-02 i		4.6E-02 r		0	0.10	101-61-1	4,4'-Methylene bis(N,N'-dimethyl)aniline	9.7E+00 ca	6.5E+01 ca	1.5E-01 ca	1.5E+00 ca		

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FOR PLANNING PURPOSES

TOXICITY INFORMATION						CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)				SOIL SCREENING LEVELS	
				V	skin						Migration to Ground Water	
SFo	RfDo	SFI	RfDI	O	abs.	CAS No.	Residential	Industrial	Ambient Air	Tap Water	DAF 20	DAF 1
1/(mg/kg-d)	(mg/kg-d)	1/(mg/kg-d)	(mg/kg-d)	C	soils		Soil (mg/kg)	Soil (mg/kg)	(ug/m^3)	(ug/l)	(mg/kg)	(mg/kg)
	1.0E-02 h		1.0E-02 r	0	0.10	74-95-3	Methylene bromide	5.5E+02 nc	1.1E+04 nc	3.7E+01 nc	3.7E+02 nc		
7.5E-03 i	6.0E-02 i	1.6E-03 i	8.6E-01 h	1	0.10	75-09-2	Methylene chloride	8.5E+00 ca	2.0E+01 ca	4.1E+00 ca	4.3E+00 ca	2.0E-02	1.0E-03
	1.7E-04 r		1.7E-04 i	0	0.10	101-68-8	**4,4'-Methylene diphenyl diisocyanate**	9.3E+00 nc	1.8E+02 nc	6.2E-01 nc	6.2E+00 nc		
	6.0E-01 i		2.9E-01 i	1	0.10	78-93-3	Methyl ethyl ketone	6.9E+03 nc	2.7E+04 nc	1.0E+03 nc	1.9E+03 nc		
1.1E+00 h		1.1E+00 r		0	0.10	60-34-4	Methyl hydrazine	4.0E-01 ca	2.7E+00 ca	6.1E-03 ca	6.1E-02 ca		
	8.0E-02 h		2.3E-02 h	1	0.10	108-10-1	**Methyl isobutyl ketone**	7.5E+02 nc	2.8E+03 nc	8.3E+01 nc	1.6E+02 nc		
	5.7E-04 r		5.7E-04 n	0	0.10	74-93-1	**Methyl Mercaptan**	3.1E+01 nc	6.1E+02 nc	2.1E+00 nc	2.1E+01 nc		
	1.4E+00 i		2.0E-01 i	1	0.10	80-62-6	**Methyl methacrylate**	2.2E+03 nc	7.3E+03 nc	7.3E+02 nc	1.4E+03 nc		
3.3E-02 h		3.3E-02 r		0	0.10	99-55-8	2-Methyl-5-nitroaniline	1.3E+01 ca	9.1E+01 ca	2.0E-01 ca	2.0E+00 ca		
	2.5E-04 i		2.5E-04 r	0	0.10	298-00-0	Methyl parathion	1.4E+01 nc	2.7E+02 nc	9.1E-01 nc	9.1E+00 nc		
	5.0E-02 x		5.0E-02 r	0	0.10	95-48-7	2-Methylphenol	2.7E+03 nc	5.3E+04 nc	1.8E+02 nc	1.8E+03 nc	1.5E+01	8.0E-01
	5.0E-02 x		5.0E-02 r	0	0.10	108-39-4	3-Methylphenol	2.7E+03 nc	5.3E+04 nc	1.8E+02 nc	1.8E+03 nc		
	5.0E-03 h		5.0E-03 r	0	0.10	106-44-5	4-Methylphenol	2.7E+02 nc	5.3E+03 nc	1.8E+01 nc	1.8E+02 nc		
	2.0E-02 n		2.0E-02 r	0	0.10	993-13-5	**Methyl phosphonic acid**	1.1E+03 nc	2.1E+04 nc	7.3E+01 nc	7.3E+02 nc		
	6.0E-03 h		1.1E-02 h	1	0.10	SU 25013-15-4	Methyl styrene (mixture)	1.2E+02 nc	5.4E+02 nc	4.2E+01 nc	6.0E+01 nc		
	7.0E-02 h		7.0E-02 r	1	0.10	SU 98-83-9	Methyl styrene (alpha)	6.8E+02 sat	6.8E+02 sat	2.6E+02 nc	4.3E+02 nc		
			8.6E-01 i	1	0.10	1634-04-4	**Methyl tertbutyl ether (MTBE)**	n/a	n/a	3.1E+03 nc	2.0E+01 nc/ca		
	1.5E-01 i		1.5E-01 r	0	0.10	51218-45-2	Metolaclor (Dual)	8.2E+03 nc	1.0E+05 max	5.5E+02 nc	5.5E+03 nc		
	2.5E-02 i		2.5E-02 r	0	0.10	21087-64-9	Metribuzin	1.4E+03 nc	2.7E+04 nc	9.1E+01 nc	9.1E+02 nc		
1.8E+00 h	2.0E-04 i	1.8E+00 r	2.0E-04 r	0	0.10	2385-85-5	Mirex	2.5E-01 ca*	1.7E+00 ca	3.7E-03 ca	3.7E-02 ca		
	2.0E-03 i		2.0E-03 r	0	0.10	2212-67-1	Molinate	1.1E+02 nc	2.1E+03 nc	7.3E+00 nc	7.3E+01 nc		
	5.0E-03 h			0	0.01	7439-98-7	Molybdenum	3.7E+02 nc	9.4E+03 nc		1.8E+02 nc		
	1.0E-01 h		1.0E-01 h	0	0.10	10599-90-3	Monochloramine	5.5E+03 nc	1.1E+05 nc	3.7E+02 nc	3.7E+03 nc		
	2.0E-03 i		2.0E-03 r	0	0.10	300-76-5	Naled	1.1E+02 nc	2.1E+03 nc	7.3E+00 nc	7.3E+01 nc		
	1.0E-01 i		1.0E-01 r	0	0.10	15299-99-7	Napropamide	5.5E+03 nc	1.1E+05 nc	3.7E+02 nc	3.7E+03 nc		
	2.0E-02 i			0	0.01	7440-02-0	Nickel (soluble salts)	1.5E+03 nc	3.7E+04 nc		7.3E+02 nc	1.3E+02	7.0E+00
							"CAL-Modified PRG" (PEA, 1994)	**1.5E+02**					
		8.4E-01 i		0	0.01	n/a	Nickel refinery dust			8.0E-03 ca			
		1.7E+00 i		0	0.01	12035-72-2	Nickel subsulfide		1.1E+04 ca	4.0E-03 ca			
	1.5E-03 x		1.5E-03 r	0	0.10	1929-82-4	Nitrapyrin	8.2E+01 nc	1.6E+03 nc	5.5E+00 nc	5.5E+01 nc		
Tap Water PRG Based on Infant NOAEL (see IRIS)						14797-55-8	Nitrate				1.0E+04 nc		
	1.0E-01 x			0	0.10	10102-43-9	Nitric Oxide	5.5E+03 nc	1.1E+05 nc		3.7E+03 nc		
Tap Water PRG Based on Infant NOAEL (see IRIS)						14797-65-0	Nitrite				1.0E+03 nc		
	6.0E-05 r		5.7E-05 h	0	0.10	88-74-4	2-Nitroaniline	3.3E+00 nc	6.4E+01 nc	2.1E-01 nc	2.2E+00 nc		
				0	0.10	99-09-2	3-Nitroaniline						
				0	0.10	100-01-6	4-Nitroaniline						
	5.0E-04 i		5.7E-04 h	1	0.10	98-95-3	**Nitrobenzene**	1.6E+01 nc	1.0E+02 nc	2.1E+00 nc	3.4E+00 nc	1.0E-01	7.0E-03
	7.0E-02 h		7.0E-02 r	0	0.10	67-20-9	Nitrofurantoin	3.8E+03 nc	7.5E+04 nc	2.6E+02 nc	2.6E+03 nc		
1.5E+00 h		9.4E+00 h		0	0.10	59-87-0	Nitrofurazone	3.0E-01 ca	2.0E+00 ca	7.2E-04 ca	4.5E-02 ca		
	1.0E+00 x			0	0.10	101102-44-1	Nitrogen dioxide						
	1.0E-01 i		1.0E-01 r	0	0.10	556-88-7	Nitroguanidine	5.5E+03 nc	1.1E+05 nc	3.7E+02 nc	3.7E+03 nc		
	6.2E-02 o		6.2E-02 r	0	0.10	100-02-7	4-Nitrophenol	3.4E+03 nc	6.6E+04 nc	2.3E+02 nc	2.3E+03 nc		

Key: i=IRIS h=HEAST n=NCEA x=WITHDRAWN o=Other EPA DOCUMENTS r=ROUTE EXTRAPOLATION ca=CANCER PRG nc=NONCANCER PRG sat=SOIL SATURATION max=CEILING LIMIT *(where: nc < 100X ca) **(where: nc < 10X ca)

FOR PLANNING PURPOSES

TOXICITY INFORMATION						CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)				SOIL SCREENING LEVELS	
				V	skin						Migration to Ground Water	
SFo	RfDo	SFI	RfDI	O	abs.	CAS No.	Residential	Industrial	Ambient Air	Tap Water	DAF 20	DAF 1
1/(mg/kg-d)	(mg/kg-d)	1/(mg/kg-d)	(mg/kg-d)	C	soils		Soil (mg/kg)	Soil (mg/kg)	(ug/m^3)	(ug/l)	(mg/kg)	(mg/kg)
9.4E+00 r	5.7E-03 r	9.4E+00 h	5.7E-03 i	1	0.10	79-46-9			7.2E-04 ca	3.5E+01 ca		
5.4E+00 i		5.6E+00 i		1	0.10	924-16-3	2.2E-02 ca	5.8E-02 ca	1.2E-03 ca	2.0E-03 ca		
2.8E+00 i		2.8E+00 r		0	0.10	1116-54-7	1.6E-01 ca	1.1E+00 ca	2.4E-03 ca	2.4E-02 ca		
1.5E+02 i		1.5E+02 i		0	0.10	55-18-5	3.0E-03 ca	2.0E-02 ca	4.5E-05 ca	4.5E-04 ca		
5.1E+01 i		4.9E+01 i		0	0.10	62-75-9	8.7E-03 ca	5.9E-02 ca	1.4E-04 ca	1.3E-03 ca		
4.9E-03 i		4.9E-03 r		0	0.10	86-30-6	9.1E+01 ca	6.1E+02 ca	1.4E+00 ca	1.4E+01 ca	1.0E+00	6.0E-02
7.0E+00 i		7.0E+00 r		0	0.10	621-64-7	6.3E-02 ca	4.3E-01 ca	9.6E-04 ca	9.6E-03 ca	5.0E-05	2.0E-06
2.2E+01 i		2.2E+01 r		0	0.10	10595-95-6	2.0E-02 ca	1.4E-01 ca	3.1E-04 ca	3.1E-03 ca		
2.1E+00 i		2.1E+00 i		0	0.10	930-55-2	2.1E-01 ca	1.4E+00 ca	3.1E-03 ca	3.2E-02 ca		
	1.0E-02 h		1.0E-02 r	0	0.10	99-08-1	5.5E+02 nc	1.1E+04 nc	3.7E+01 nc	3.7E+02 nc		
	1.0E-02 h		1.0E-02 r	0	0.10	99-08-1	5.5E+02 nc	1.1E+04 nc	3.7E+01 nc	3.7E+02 nc		
	1.0E-02 h		1.0E-02 r	0	0.10	99-99-0	5.5E+02 nc	1.1E+04 nc	3.7E+01 nc	3.7E+02 nc		
	4.0E-02 i		4.0E-02 r	0	0.10	27314-13-2	2.2E+03 nc	4.3E+04 nc	1.5E+02 nc	1.5E+03 nc		
	7.0E-04 i		7.0E-04 r	0	0.10	85509-19-9	3.8E+01 nc	7.5E+02 nc	2.6E+00 nc	2.6E+01 nc		
	3.0E-03 i		3.0E-03 r	0	0.10	32536-52-0	1.6E+02 nc	3.2E+03 nc	1.1E+01 nc	1.1E+02 nc		
	5.0E-02 i		5.0E-02 r	0	0.10	2691-41-0	2.7E+03 nc	5.3E+04 nc	1.8E+02 nc	1.8E+03 nc		
	2.0E-03 h		2.0E-03 r	0	0.10	152-16-9	1.1E+02 nc	2.1E+03 nc	7.3E+00 nc	7.3E+01 nc		
	5.0E-02 i		5.0E-02 r	0	0.10	19044-88-3	2.7E+03 nc	5.3E+04 nc	1.8E+02 nc	1.8E+03 nc		
	5.0E-03 i		5.0E-03 r	0	0.10	19666-30-9	2.7E+02 nc	5.3E+03 nc	1.8E+01 nc	1.8E+02 nc		
	2.5E-02 i		2.5E-02 r	0	0.10	23135-22-0	1.4E+03 nc	2.7E+04 nc	9.1E+01 nc	9.1E+02 nc		
	3.0E-03 i		3.0E-03 r	0	0.10	42874-03-3	1.6E+02 nc	3.2E+03 nc	1.1E+01 nc	1.1E+02 nc		
	1.3E-02 i		1.3E-02 r	0	0.10	76738-62-0	7.1E+02 nc	1.4E+04 nc	4.7E+01 nc	4.7E+02 nc		
	4.5E-03 i		4.5E-03 r	0	0.10	4685-14-7	2.5E+02 nc	4.8E+03 nc	1.6E+01 nc	1.6E+02 nc		
	6.0E-03 h		6.0E-03 r	0	0.10	56-38-2	3.3E+02 nc	6.4E+03 nc	2.2E+01 nc	2.2E+02 nc		
	5.0E-02 h		5.0E-02 r	0	0.10	1114-71-2	2.7E+03 nc	5.3E+04 nc	1.8E+02 nc	1.8E+03 nc		
	4.0E-02 i		4.0E-02 r	0	0.10	40487-42-1	2.2E+03 nc	4.3E+04 nc	1.5E+02 nc	1.5E+03 nc		
2.3E-02 h		2.3E-02 r		0	0.10	87-84-3	1.9E+01 ca	1.3E+02 ca	2.9E-01 ca	2.9E+00 ca		
	2.0E-03 i		2.0E-03 r	0	0.10	32534-81-9	1.1E+02 nc	2.1E+03 nc	7.3E+00 nc	7.3E+01 nc		
	8.0E-04 i		8.0E-04 r	0	0.10	608-93-5	4.4E+01 nc	8.6E+02 nc	2.9E+00 nc	2.9E+01 nc		
2.6E-01 h	3.0E-03 i	2.6E-01 r	3.0E-03 r	0	0.10	82-68-8	1.7E+00 ca*	1.2E+01 ca	2.6E-02 ca	2.6E-01 ca		
1.2E-01 i	3.0E-02 i	1.2E-01 r	3.0E-02 r	0	0.25	87-86-5	2.5E+00 ca	1.5E+01 ca	5.6E-02 ca	5.6E-01 ca	3.0E-02	1.0E-03
	5.0E-04 n			0	0.01	7601-90-3	**Perchlorate** 3.7E+01 nc	9.4E+02 nc		1.8E+01 nc		
	5.0E-02 i		5.0E-02 r	0	0.10	52645-53-1	2.7E+03 nc	5.3E+04 nc	1.8E+02 nc	1.8E+03 nc		
	2.5E-01 i		2.5E-01 r	0	0.10	13684-63-4	1.4E+04 nc	1.0E+05 max	9.1E+02 nc	9.1E+03 nc		
	6.0E-01 i		6.0E-01 r	0	0.10	108-95-2	3.3E+04 nc	1.0E+05 max	2.2E+03 nc	2.2E+04 nc	1.0E+02	5.0E+00
	2.0E-03 n		**2.0E-03 r**	0	0.10	92-84-2	**Phenothiazine** 1.1E+02 nc	2.1E+03 nc	7.3E+00 nc	7.3E+01 nc		
	6.0E-03 i		6.0E-03 r	0	0.10	108-45-2	3.3E+02 nc	6.4E+03 nc	2.2E+01 nc	2.2E+02 nc		
	1.9E-01 h		1.9E-01 r	0	0.10	106-50-3	1.0E+04 nc	1.0E+05 max	6.9E+02 nc	6.9E+03 nc		
	8.0E-05 i		8.0E-05 r	0	0.10	62-38-4	4.4E+00 nc	8.6E+01 nc	2.9E-01 nc	2.9E+00 nc		
1.9E-03 h		1.9E-03 r		0	0.10	90-43-7	2.3E+02 ca	1.5E+03 ca	3.5E+00 ca	3.5E+01 ca		
	2.0E-04 h		2.0E-04 r	0	0.10	298-02-2	1.1E+01 nc	2.1E+02 nc	7.3E-01 nc	7.3E+00 nc		
	2.0E-02 i		2.0E-02 r	0	0.10	732-11-6	1.1E+03 nc	2.1E+04 nc	7.3E+01 nc	7.3E+02 nc		

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FOR PLANNING PURPOSES

TOXICITY INFORMATION						CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)				SOIL SCREENING LEVELS	
				V	skin						Migration to Ground Water	
SFo	RfDo	SFI	RfDI	O	abs.	CAS No.	Residential	Industrial	Ambient Air	Tap Water	DAF 20	DAF 1
1/(mg/kg-d)	(mg/kg-d)	1/(mg/kg-d)	(mg/kg-d)	C	soils		Soil (mg/kg)	Soil (mg/kg)	(ug/m^3)	(ug/l)	(mg/kg)	(mg/kg)
	3.0E-04 h		8.6E-05 i	0	0.10	7803-51-2 Phosphine	1.6E+01 nc	3.2E+02 nc	3.1E-01 nc	1.1E+01 nc		
			2.9E-03 i	n/a	n/a	7664-38-2 Phosphoric acid			1.0E+01 nc			
	2.0E-05 i			0	0.01	7723-14-0 Phosphorus (white)	1.5E+00 nc	3.7E+01 nc		7.3E-01 nc		
	1.0E+00 h		1.0E+00 r	0	0.10	100-21-0 p-Phthalic acid	5.5E+04 nc	1.0E+05 max	3.7E+03 nc	3.7E+04 nc		
	2.0E+00 i		3.4E-02 h	0	0.10	85-44-9 Phthalic anhydride	1.0E+05 max	1.0E+05 max	1.2E+02 nc	7.3E+04 nc		
	7.0E-02 i		7.0E-02 r	0	0.10	1918-02-1 Picloram	3.8E+03 nc	7.5E+04 nc	2.6E+02 nc	2.6E+03 nc		
	1.0E-02 i		1.0E-02 r	0	0.10	23505-41-1 Pirimiphos-methyl	5.5E+02 nc	1.1E+04 nc	3.7E+01 nc	3.7E+02 nc		
8.9E+00 h	7.0E-06 h	8.9E+00 r	7.0E-06 r	0	0.10	Polybrominated biphenyls	5.0E-02 ca**	3.4E-01 ca*	7.6E-04 ca*	7.6E-03 ca*		
2.0E+00 i		2.0E+00 r		0	0.14	1336-36-3 **Polychlorinated biphenyls (PCBs)**	2.0E-01 ca**	1.3E+00 ca*	3.4E-03 ca*	3.4E-02 ca*		
	7.0E-05 i		7.0E-05 r	0	0.14	12674-11-2 Aroclor 1016 (see PCBs for cancer endpoint)	3.4E+00 nc	6.3E+01 nc	2.6E-01 nc	2.6E+00 nc		
	2.0E-05 i		2.0E-05 r	0	0.14	11097-69-1 Aroclor 1254 (see PCBs for cancer endpoint)	9.7E-01 nc	1.8E+01 nc	7.3E-02 nc	7.3E-01 nc		
					0.13	Polynuclear aromatic hydrocarbons (PAHs)						
	6.0E-02 i		6.0E-02 r	1	0.13	83-32-9 Acenaphthene	2.6E+03 nc	2.8E+04 nc	2.2E+02 nc	3.7E+02 nc	5.7E+02	2.9E+01
	3.0E-01 i		3.0E-01 r	1	0.13	120-12-7 Anthracene	1.4E+04 nc	2.2E+05 nc	1.1E+03 nc	1.8E+03 nc	1.2E+04	5.9E+02
7.3E-01 n		3.1E-01 n		0	0.13	56-55-3 **Benz[a]anthracene**	5.6E-01 ca	3.6E+00 ca	2.2E-02 ca	9.2E-02 ca	2.0E+00	8.0E-02
7.3E-01 n		3.1E-01 n		0	0.13	205-99-2 **Benzo[b]fluoranthene**	5.6E-01 ca	3.6E+00 ca	2.2E-02 ca	9.2E-02 ca	5.0E+00	2.0E-01
7.3E-02 n		3.1E-02 n		0	0.13	207-08-9 **Benzo[k]fluoranthene**	5.6E+00 ca	3.6E+01 ca	2.2E-01 ca	9.2E-01 ca	4.9E+01	2.0E+00
						"CAL-Modified PRG" (PEA, 1994)	**6.1E-01**					
7.3E+00 i		3.1E+00 n		0	0.13	50-32-8 **Benzo[a]pyrene**	5.6E-02 ca	3.6E-01 ca	2.2E-03 ca	9.2E-03 ca	8.0E+00	4.0E-01
						"CAL-Modified PRG" (PEA, 1994)				**1.5E-03**		
7.3E-03 n		3.1E-03 n		0	0.13	218-01-9 **Chrysene**	5.6E+01 ca	3.6E+02 ca	2.2E+00 ca	9.2E+00 ca	1.6E+02	8.0E+00
						"CAL-Modified PRG" (PEA, 1994)	**6.1E+00**					
7.3E+00 n		3.1E+00 n		0	0.13	53-70-3 **Dibenz[ah]anthracene**	5.6E-02 ca	3.6E-01 ca	2.2E-03 ca	9.2E-03 ca	2.0E+00	8.0E-02
	4.0E-02 i		4.0E-02 r	0	0.13	206-44-0 Fluoranthene	2.0E+03 nc	3.7E+04 nc	1.5E+02 nc	1.5E+03 nc	4.3E+03	2.1E+02
	4.0E-02 i		4.0E-02 r	1	0.13	86-73-7 Fluorene	1.8E+03 nc	2.2E+04 nc	1.5E+02 nc	2.4E+02 nc	5.6E+02	2.8E+01
7.3E-01 n		3.1E-01 n		0	0.13	193-39-5 **Indeno[1,2,3-cd]pyrene**	5.6E-01 ca	3.6E+00 ca	2.2E-02 ca	9.2E-02 ca	1.4E+01	7.0E-01
	2.0E-02 i		6.6E-04 i	1	0.13	91-20-3 **Naphthalene**	5.5E+01 nc	1.9E+02 nc	3.1E+00 nc	6.2E+00 nc	8.4E+01	4.0E+00
	3.0E-02 i		3.0E-02 r	1	0.13	129-00-0 Pyrene	1.5E+03 nc	2.6E+04 nc	1.1E+02 nc	1.8E+02 nc	4.2E+03	2.1E+02
1.5E-01 i	9.0E-03 i	1.5E-01 r	9.0E-03 r	0	0.10	67747-09-5 Prochloraz	3.0E+00 ca	2.0E+01 ca	4.5E-02 ca	3.3E+02 ca		
	6.0E-03 h		6.0E-03 r	0	0.10	26399-36-0 Profluralin	3.3E+02 nc	6.4E+03 nc	2.2E+01 nc	2.2E+02 nc		
	1.5E-02 i		1.5E-02 r	0	0.10	1610-18-0 Prometon	8.2E+02 nc	1.6E+04 nc	5.5E+01 nc	5.5E+02 nc		
	4.0E-03 i		4.0E-03 r	0	0.10	7287-19-6 Prometryn	2.2E+02 nc	4.3E+03 nc	1.5E+01 nc	1.5E+02 nc		
	7.5E-02 i		7.5E-02 r	0	0.10	23950-58-5 Pronamide	4.1E+03 nc	8.0E+04 nc	2.7E+02 nc	2.7E+03 nc		
	1.3E-02 i		1.3E-02 r	0	0.10	1918-16-7 Propachlor	7.1E+02 nc	1.4E+04 nc	4.7E+01 nc	4.7E+02 nc		
	5.0E-03 i		5.0E-03 r	0	0.10	709-98-8 Propanil	2.7E+02 nc	5.3E+03 nc	1.8E+01 nc	1.8E+02 nc		
	2.0E-02 i		2.0E-02 r	0	0.10	2312-35-8 Propargite	1.1E+03 nc	2.1E+04 nc	7.3E+01 nc	7.3E+02 nc		
	2.0E-03 i		2.0E-03 r	0	0.10	107-19-7 Propargyl alcohol	1.1E+02 nc	2.1E+03 nc	7.3E+00 nc	7.3E+01 nc		
	2.0E-02 i		2.0E-02 r	0	0.10	139-40-2 Propazine	1.1E+03 nc	2.1E+04 nc	7.3E+01 nc	7.3E+02 nc		
	2.0E-02 i		2.0E-02 r	0	0.10	122-42-9 Propham	1.1E+03 nc	2.1E+04 nc	7.3E+01 nc	7.3E+02 nc		
	1.3E-02 i		1.3E-02 r	0	0.10	60207-90-1 Propiconazole	7.1E+02 nc	1.4E+04 nc	4.7E+01 nc	4.7E+02 nc		
	1.0E-02 n		1.0E-02 r	1	0.10	SU 104-5-18 **Iso-Propylbenzene**	1.2E+02 nc	4.9E+02 nc	3.7E+01 nc	6.1E+01 nc		

Key: i=IRIS, h=HEAST, n=NCEA, x=WITHDRAWN, o=Other EPA DOCUMENTS, r=ROUTE EXTRAPOLATION, ca=CANCER PRG, nc=NONCANCER PRG, sat=SOIL SATURATION, max=CEILING LIMIT, *(where nc < 100X ca), **(where nc < 10X ca)

FOR PLANNING PURPOSES

TOXICITY INFORMATION						CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)				SOIL SCREENING LEVELS	
				V O C	skin abs. soils						Migration to Ground Water	
SFo 1/(mg/kg-d)	RfDo (mg/kg-d)	SFI 1/(mg/kg-d)	RfDI (mg/kg-d)		CAS No.		Residential Soil (mg/kg)	Industrial Soil (mg/kg)	Ambient Air (ug/m^3)	Tap Water (ug/l)	DAF 20 (mg/kg)	DAF 1 (mg/kg)
	1.0E-02 n		1.0E-02 r	1	0 10	SU 104-51-8 **n-Propylbenzene**	1.3E+02 nc	5.5E+02 nc	3.7E+01 nc	6.1E+01 nc		
	2.0E+01 h		2.0E+01 r	0	0 10	57-55-6 Propylene glycol	1.0E+05 max	1.0E+05 max	7.3E+04 nc	7.3E+05 nc		
	7.0E-01 h		7.0E-01 r	0	0 10	111-35-3 Propylene glycol, monoethyl ether	3.8E+04 nc	1.0E+05 max	2.6E+03 nc	2.6E+04 nc		
	7.0E-01 h		5.7E-01 i	0	0 10	107-98-2 Propylene glycol, monomethyl ether	3.8E+04 nc	1.0E+05 max	2.1E+03 nc	2.6E+04 nc		
2.4E-01 i	8.6E-03 r	1.3E-02 i	8.6E-03 i	1	0 10	75-56-9 Propylene oxide	1.5E+00 ca	6.8E+00 ca	5.2E-01 ca*	2.2E-01 ca		
	2.5E-01 i		2.5E-01 r	0	0 10	81335-77-5 Pursuit	1.4E+04 nc	1.0E+05 max	9.1E+02 nc	9.1E+03 nc		
	2.5E-02 i		2.5E-02 r	0	0 10	51630-58-1 Pydrin	1.4E+03 nc	2.7E+04 nc	9.1E+01 nc	9.1E+02 nc		
	1.0E-03 i		1.0E-03 r	0	0 10	110-86-1 Pyridine	5.5E+01 nc	1.1E+03 nc	3.7E+00 nc	3.7E+01 nc		
	5.0E-04 i		5.0E-04 r	0	0 10	13593-03-8 Quinalphos	2.7E+01 nc	5.3E+02 nc	1.8E+00 nc	1.8E+01 nc		
1.2E+01 h		1.2E+01 r		0	0 10	91-22-5 Quinoline	3.7E-02 ca	2.5E-01 ca	5.6E-04 ca	5.6E-03 ca		
1.1E-01 i	3.0E-03 i	1.1E-01 r	3.0E-03 r	0	0 10	121-82-4 RDX (Cyclonite)	4.0E+00 ca*	2.7E+01 ca	6.1E-02 ca	6.1E-01 ca		
	3.0E-02 i		3.0E-02 r	0	0 10	10453-86-8 Resmethrin	1.6E+03 nc	3.2E+04 nc	1.1E+02 nc	1.1E+03 nc		
	5.0E-02 h		5.0E-02 r	0	0 10	299-84-3 Ronnel	2.7E+03 nc	5.3E+04 nc	1.8E+02 nc	1.8E+03 nc		
	4.0E-03 i		4.0E-03 r	0	0 10	83-79-4 Rotenone	2.2E+02 nc	4.3E+03 nc	1.5E+01 nc	1.5E+02 nc		
	2.5E-02 i		2.5E-02 r	0	0 10	78587-05-0 Savey	1.4E+03 nc	2.7E+04 nc	9.1E+01 nc	9.1E+02 nc		
	5.0E-03 i			0	0 10	7783-00-8 Selenious Acid	2.7E+02 nc	5.3E+03 nc		1.8E+02 nc		
	5.0E-03 i			0	0 01	7782-49-2 *Selenium*	3.7E+02 nc	9.4E+03 nc		1.8E+02 nc	5.0E+00	3.0E-01
	5.0E-03 h			0	0 10	630-10-4 Selenourea	2.7E+02 nc	5.3E+03 nc		1.8E+02 nc		
	9.0E-02 i		9.0E-02 r	0	0 10	74051-80-2 Sethoxydim	4.9E+03 nc	9.6E+04 nc	3.3E+02 nc	3.3E+03 nc		
	5.0E-03 i			0	0 01	7440-22-4 Silver and compounds	3.7E+02 nc	9.4E+03 nc		1.8E+02 nc	3.4E+01	2.0E+00
1.2E-01 h	5.0E-03 i	1.2E-01 r	2.0E-03 r	0	0 10	122-34-9 Simazine	3.7E+00 ca*	2.5E+01 ca	5.6E-02 ca	5.6E-01 ca		
	4.0E-03 i		4.0E-03 r	0	0 10	26628-22-8 Sodium azide	2.2E+02 nc	4.3E+03 nc	1.5E+01 nc	1.5E+02 nc		
2.7E-01 h	3.0E-02 i	2.7E-01 r	3.0E-02 r	0	0 10	148-18-5 Sodium diethyldithiocarbamate	1.6E+00 ca	1.1E+01 ca	2.5E-02 ca	2.5E-01 ca		
	2.0E-05 i		2.0E-05 r	0	0 10	62-74-8 Sodium fluoroacetate	1.1E+00 nc	2.1E+01 nc	7.3E-02 nc	7.3E-01 nc		
	1.0E-03 h		1.0E-03 r	0	0 10	13718-26-8 Sodium metavanadate	5.5E+01 nc	1.1E+03 nc	3.7E+00 nc	3.7E+01 nc		
	6.0E-01 i			0	0 01	7440-24-6 Strontium, stable	4.5E+04 nc	1.0E+05 max		2.2E+04 nc		
	3.0E-04 i		3.0E-04 r	0	0 10	57-24-9 Strychnine	1.6E+01 nc	3.2E+02 nc	1.1E+00 nc	1.1E+01 nc		
	2.0E-01 i		2.9E-01 i	1	0 10	100-42-5 Styrene	1.7E+03 sat	1.7E+03 sat	1.1E+03 nc	1.6E+03 nc	4.0E+00	2.0E-01
	2.5E-02 i		2.5E-02 r	0	0 10	88671-89-0 Systhane	1.4E+03 nc	2.7E+04 nc	9.1E+01 nc	9.1E+02 nc		
1.5E+05 h		1.5E+05 h		0	0 03	1746-01-6 2,3,7,8-TCDD (dioxin)	3.8E-06 ca	3.0E-05 ca	4.5E-08 ca	4.5E-07 ca		
	7.0E-02 i		7.0E-02 r	0	0 10	34014-18-1 Tebuthiuron	3.8E+03 nc	7.5E+04 nc	2.6E+02 nc	2.6E+03 nc		
	2.0E-02 h		2.0E-02 r	0	0 10	3383-96-8 Temephos	1.1E+03 nc	2.1E+04 nc	7.3E+01 nc	7.3E+02 nc		
	1.3E-02 i		1.3E-02 r	0	0 10	5902-51-2 Terbacil	7.1E+02 nc	1.4E+04 nc	4.7E+01 nc	4.7E+02 nc		
	2.5E-05 h		2.5E-05 r	0	0 10	13071-79-9 Terbufos	1.4E+00 nc	2.7E+01 nc	9.1E-02 nc	9.1E-01 nc		
	1.0E-03 i		1.0E-03 r	0	0 10	886-50-0 Terbutryn	5.5E+01 nc	1.1E+03 nc	3.7E+00 nc	3.7E+01 nc		
	3.0E-04 i		3.0E-04 r	0	0 10	95-94-3 *1,2,4,5-Tetrachlorobenzene*	1.6E+01 nc	3.2E+02 nc	1.1E+00 nc	1.1E+01 nc		
2.6E-02 i	3.0E-02 i	2.6E-02 i	3.0E-02 r	1	0 10	630-20-6 1,1,1,2-Tetrachloroethane	2.8E+00 ca	6.8E+00 ca	2.6E-01 ca	4.3E-01 ca		
2.0E-01 i		2.0E-01 i		1	0 10	79-34-5 1,1,2,2-Tetrachloroethane	3.6E-01 ca	8.7E-01 ca	3.3E-02 ca	5.5E-02 ca	3.0E-03	2.0E-04
5.2E-02 n	1.0E-02 i	2.0E-03 n	1.1E-01 n	1	0 10	127-18-4 **Tetrachloroethylene (PCE)**	4.7E+00 ca*	1.6E+01 ca	3.3E+00 ca	1.1E+00 ca	6.0E-02	3.0E-03
						"CAL-Modified PRG" (PEA, 1994)			**3.2E-01**			
	3.0E-02 i		3.0E-02 r	0	0 10	58-90-2 2,3,4,6-Tetrachlorophenol	1.6E+03 nc	3.2E+04 nc	1.1E+02 nc	1.1E+03 nc		
2.0E+01 h		2.0E+01 r		0	0 10	5216-25-1 p,a,a,a-Tetrachlorotoluene	2.2E-02 ca	1.5E-01 ca	3.4E-04 ca	3.4E-03 ca		

Key: I=IRIS, h=HEAST, n=NCEA_x, WITHDRAWN, o=Other EPA DOCUMENTS, r=ROUTE EXTRAPOLATION, ca=CANCER PRG, nc=NONCANCER PRG, sat=SOIL SATURATION, max=CEILING LIMIT, *(where nc < 100X ca), **(where nc < 10X ca)

FOR PLANNING PURPOSES

TOXICITY INFORMATION						CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)				SOIL SCREENING LEVELS	
				V	skin						Migration to Ground Water	
SFo	RfDo	SFI	RfDI	O	abs	CAS No.	Residential	Industrial	Ambient Air	Tap Water	DAF 20	DAF 1
1/(mg/kg-d)	(mg/kg-d)	1/(mg/kg-d)	(mg/kg-d)	C	soils		Soil (mg/kg)	Soil (mg/kg)	(ug/m^3)	(ug/l)	(mg/kg)	(mg/kg)
2.4E-02 h	3.0E-02 r	2.4E-02 r	3.0E-02 r	0	0.10	961-11-5	Tetrachlorovinphos	1.9E+01 ca*	1.2E+02 ca	2.8E-01 ca	2.8E+00 ca		
	5.0E-04 r		5.0E-04 r	0	0.10	3689-24-5	Tetraethyldithiopyrophosphate	2.7E+01 nc	5.3E+02 nc	1.8E+00 nc	1.8E+01 nc		
	8.6E-02 r		8.6E-02 n	0	0.10	109-99-9	**Tetrahydrofuran**	4.7E+03 nc	9.2E+04 nc	3.1E+02 nc	3.1E+03 nc		
	7.0E-05 h			0	0.01	1314-32-5	Thallic oxide	5.2E+00 nc	1.3E+02 nc		2.6E+00 nc		
	9.0E-05 r			0	0.01	563-68-8	Thallium acetate	6.7E+00 nc	1.7E+02 nc		3.3E+00 nc	7.0E-01	4.0E-01
	8.0E-05 r			0	0.01	6533-73-9	Thallium carbonate	6.0E+00 nc	1.5E+02 nc		2.9E+00 nc	7.0E-01	4.0E-01
	8.0E-05 r			0	0.01	7791-12-0	Thallium chloride	6.0E+00 nc	1.5E+02 nc		2.9E+00 nc	7.0E-01	4.0E-01
	9.0E-05 r			0	0.01	10102-45-1	Thallium nitrate	6.7E+00 nc	1.7E+02 nc		3.3E+00 nc	7.0E-01	4.0E-01
	9.0E-05 r			0	0.01	12039-52-0	Thallium selenite	6.7E+00 nc	1.7E+02 nc		3.3E+00 nc	7.0E-01	4.0E-01
	8.0E-05 r			0	0.01	7446-18-6	Thallium sulfate	6.0E+00 nc	1.5E+02 nc		2.9E+00 nc	7.0E-01	4.0E-01
	1.0E-02 r		1.0E-02 r	0	0.10	28249-77-6	Thiobencarb	5.5E+02 nc	1.1E+04 nc	3.7E+01 nc	3.7E+02 nc		
	1.0E-01 n		1.0E-01 r	0	0.10	N/A	**Thiocyanate**	5.5E+03 nc	1.0E+05 max	3.7E+02 nc	3.7E+03 nc		
	3.0E-02 x		3.0E-02 r	0	0.10	21564-17-0	2-(Thiocyanomethylthio)- benzothiazole (TCMTB)	1.6E+03 nc	3.2E+04 nc	1.1E+02 nc	1.1E+03 nc		
	3.0E-04 h		3.0E-04 r	0	0.10	39196-18-4	Thiofanox	1.6E+01 nc	3.2E+02 nc	1.1E+00 nc	1.1E+01 nc		
	8.0E-02 r		8.0E-02 r	0	0.10	23564-05-8	Thiophanate-methyl	4.4E+03 nc	8.6E+04 nc	2.9E+02 nc	2.9E+03 nc		
	5.0E-03 r		5.0E-03 r	0	0.10	137-26-8	Thiram	2.7E+02 nc	5.3E+03 nc	1.8E+01 nc	1.8E+02 nc		
	6.0E-01 h			0	0.01	n/a	Tin (inorganic, see tributyltin oxide for organic tin)	4.5E+04 nc	1.0E+05 max		2.2E+04 nc		
	2.0E-01 r		1.1E-01 h	1	0.10	108-88-3	Toluene	5.2E+02 sat	5.2E+02 sat	4.0E+02 nc	7.2E+02 nc	1.2E+01	6.0E-01
3.2E+00 h		3.2E+00 r		0	0.10	95-80-7	Toluene-2,4-diamine	1.4E-01 ca	9.4E-01 ca	2.1E-03 ca	2.1E-02 ca		
	6.0E-01 h		6.0E-01 r	0	0.10	95-70-5	Toluene-2,5-diamine	3.3E+04 nc	1.0E+05 max	2.2E+03 nc	2.2E+04 nc		
	2.0E-01 h		2.0E-01 r	0	0.10	823-40-5	Toluene-2,6-diamine	1.1E+04 nc	1.0E+05 max	7.3E+02 nc	7.3E+03 nc		
1.9E-01 r		1.9E-01 r		0	0.10	106-49-0	p-Toluidine	2.3E+00 ca	1.6E+01 ca	3.5E-02 ca	3.5E-01 ca		
1.1E+00 r		1.1E+00 r		0	0.10	8001-35-2	Toxaphene	4.0E-01 ca	2.7E+00 ca	6.0E-03 ca	6.1E-02 ca	3.1E+01	2.0E+00
	7.5E-03 r		7.5E-03 r	0	0.10	66841-25-6	Tralomethrin	4.1E+02 nc	8.0E+03 nc	2.7E+01 nc	2.7E+02 nc		
	1.3E-02 r		1.3E-02 r	0	0.10	2303-17-5	Triallate	7.1E+02 nc	1.4E+04 nc	4.7E+01 nc	4.7E+02 nc		
	1.0E-02 r		1.0E-02 r	0	0.10	82097-50-5	Triasulfuron	5.5E+02 nc	1.1E+04 nc	3.7E+01 nc	3.7E+02 nc		
	5.0E-03 r		5.0E-03 r	0	0.10	615-54-3	1,2,4-Tribromobenzene	2.7E+02 nc	5.3E+03 nc	1.8E+01 nc	1.8E+02 nc		
	3.0E-04 r			0	0.10	56-35-9	**Tributyltin oxide (TBTO)**	1.6E+01 nc	3.2E+02 nc		1.1E+01 nc		
3.4E-02 h		3.4E-02 r		0	0.10	634-93-5	2,4,6-Trichloroaniline	1.3E+01 ca	8.8E+01 ca	2.0E-01 ca	2.0E+00 ca		
2.9E-02 h		2.9E-02 r		0	0.10	33663-50-2	2,4,6-Trichloroaniline hydrochloride	1.5E+01 ca	1.0E+02 ca	2.3E-01 ca	2.3E+00 ca		
	1.0E-02 r		5.7E-02 h	1	0.10	120-82-1	1,2,4-Trichlorobenzene	4.8E+02 nc	1.7E+03 sat	2.1E+02 nc	1.9E+02 nc	5.0E+00	3.0E-01
	1.5E-02 n		2.9E-01 n	1	0.10	71-55-6	1,1,1-Trichloroethane	6.8E+02 nc	1.4E+03 sat	1.0E+03 nc	7.9E+02 nc	2.0E+00	1.0E-01
5.7E-02 r	4.0E-03 r	5.6E-02 r	4.0E-03 r	1	0.10	79-00-5	1,1,2 Trichloroethane	8.2E-01 ca*	1.9E+00 ca*	1.2E-01 ca	2.0E-01 ca	2.0E-02	9.0E-04
1.1E-02 n	6.0E-03 x	6.0E-03 n	6.0E-03 r	1	0.10	79-01-6	Trichloroethylene (TCE)	2.7E+00 ca**	6.1E+00 ca*	1.1E+00 ca*	1.6E+00 ca*	6.0E-02	3.0E-03
	3.0E-01 r		2.0E-01 h	1	0.10	75-69-4	Trichlorofluoromethane	3.8E+02 nc	1.3E+03 nc	7.3E+02 nc	1.3E+03 nc		
	1.0E-01 r		1.0E-01 r	0	0.10	95-95-4	2,4,5 Trichlorophenol	5.5E+03 nc	1.1E+05 nc	3.7E+02 nc	3.7E+03 nc	2.7E+02	1.4E+01
1.1E-02 r		1.1E-02 r		0	0.10	88-06-2	2,4,6-Trichlorophenol	4.0E+01 ca	2.7E+02 ca	6.2E-01 ca	6.1E+00 ca	2.0E-01	8.0E-03
	1.0E-02 r		1.0E-02 r	0	0.10	93-76-5	2,4,5-Trichlorophenoxyacetic Acid	5.5E+02 nc	1.1E+04 nc	3.7E+01 nc	3.7E+02 nc		
	8.0E-03 r		8.0E-03 r	0	0.10	93-72-1	2-(2,4,5-Trichlorophenoxy) propionic acid	4.4E+02 nc	8.6E+03 nc	2.9E+01 nc	2.9E+02 nc		
	5.0E-03 r		5.0E-03 r	1	0.10	598-77-6	1,1,2-Trichloropropane	1.5E+01 nc	5.1E+01 nc	1.8E+01 nc	3.0E+01 nc		
7.0E+00 h	6.0E-04 r	7.0E+00 r	5.0E-03 r	1	0.10	96-18-4	1,2,3 Trichloropropane	1.4E-03 ca	3.1E-03 ca	9.6E-04 ca	1.6E-03 ca		
	5.0E-01 h		5.0E-03 r	1	0.10	50 96-19-5	1,2,3 Trichloropropene	1.1E+01 nc	3.8E+01 nc	1.8E+01 nc	3.0E+01 nc		

Key: c=IRIS, h=HEAST, n=NCEA, x=WITHDRAWN, o=Other EPA DOCUMENTS, r=ROUTE EXTRAPOLATION, ca=CANCER PRG, nc=NONCANCER PRG, sat=SOIL SATURATION, max=CEILING LIMIT, *(where nc < 100X ca), **(where nc < 10X ca)

FOR PLANNING PURPOSES

TOXICITY INFORMATION						CONTAMINANT	PRELIMINARY REMEDIAL GOALS (PRGs)				SOIL SCREENING LEVELS	
				V	skin						Migration to Ground Water	
SFo	RfDo	SFi	RfDi	O	abs.	CAS No.	Residential	Industrial	Ambient Air	Tap Water	DAF 20	DAF 1
1/(mg/kg-d)	(mg/kg-d)	1/(mg/kg-d)	(mg/kg-d)	C	soils		Soil (mg/kg)	Soil (mg/kg)	(ug/m^3)	(ug/l)	(mg/kg)	(mg/kg)
	4.0E-01 r		8.6E-01 h	1	0.10	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane	5.6E+03 sat	5.6E+03 sat	3.1E+04 nc	5.9E+04 nc		
	4.0E-04 r		3.0E-04 r	0	0.10	58138-08-2	Tridiphane	1.6E+02 nc	3.2E+03 nc	1.1E+01 nc	1.1E+02 nc		
	2.0E-03 r		2.0E-03 r	1	0.10	SU 121-44-8	Triethylamine	2.2E+01 nc	8.6E+01 nc	7.3E+00 nc	1.2E+01 nc		
7.7E-01 r	7.5E-03 r	7.7E-03 r	7.5E-03 r	0	0.10	1582-09-8	Trifluralin	5.8E+01 ca**	3.9E+02 ca*	8.7E-01 ca*	8.7E+00 ca*		
	5.0E-02 n		1.7E-03 n	1	0.10	95-63-6	**1,2,4-Trimethylbenzene**	5.1E+01 nc	1.7E+02 nc	6.2E+00 nc	1.2E+01 nc		
	5.0E-02 n		1.7E-03 n	1	0.10	108-67-8	**1,3,5-Trimethylbenzene**	2.1E+01 nc	7.0E+01 nc	6.2E+00 nc	1.2E+01 nc		
0.2E-02 h		3.7E-02 r		0	0.10	512-56-1	Trimethyl phosphate	1.2E+01 ca	8.1E+01 ca	1.8E-01 ca	1.8E+00 ca		
	3.0E-02 r		3.0E-02 r	0	0.10	99-35-4	**1,3,5-Trinitrobenzene**	1.6E+03 nc	3.2E+04 nc	1.1E+02 nc	1.1E+03 nc		
	1.0E-02 h		1.0E-02 r	0	0.10	479-45-8	Trinitrophenylmethylnitramine	5.5E+02 nc	1.1E+04 nc	3.7E+01 nc	3.7E+02 nc		
3.0E-02 r	5.0E-04 r	3.0E-02 r	5.0E-04 r	0	0.10	118-96-7	2,4,6-Trinitrotoluene	1.5E+01 ca**	1.0E+02 ca**	2.2E-01 ca**	2.2E+00 ca**		
	7.0E-03 h			0	0.01	7440-62-2	Vanadium	5.2E+02 nc	1.3E+04 nc		2.6E+02 nc	6.0E+03	3.0E+02
	9.0E-03 r			0	0.01	1314-62-1	Vanadium pentoxide	6.7E+02 nc	1.7E+04 nc		3.3E+02 nc	6.0E+03	3.0E+02
	2.0E-02 h			0	0.01	13701-70-7	Vanadium sulfate	1.5E+03 nc	3.7E+04 nc		7.3E+02 nc	6.0E+03	3.0E+02
	1.0E-04 r		1.0E-04 r	0	0.10	1929-77-7	Vernam	5.5E+01 nc	1.1E+03 nc	3.7E+00 nc	3.7E+01 nc		
	2.5E-02 r		2.5E-02 r	0	0.10	50471-44-8	Vinclozolin	1.4E+03 nc	2.7E+04 nc	9.1E+01 nc	9.1E+02 nc		
	1.0E-01 h		5.7E-02 r	1	0.10	108-05-4	Vinyl acetate	4.2E+02 nc	1.4E+03 nc	2.1E+02 nc	4.1E+02 nc	1.7E+02	8.0E+00
1.1E-01 r	8.6E-04 r	1.1E-01 h	8.6E-04 r	1	0.10	SU 593-60-2	Vinyl bromide (bromoethene)	1.9E-01 ca*	4.2E-01 ca*	6.1E-02 ca*	1.0E-01 ca*		
1.9E+00 h		3.0E-01 h		1	0.10	75-01-4	Vinyl chloride	2.1E-02 ca	4.8E-02 ca	2.2E-02 ca	2.0E-02 ca	1.0E-02	7.0E-04
	3.0E-04 r		3.0E-04 r	0	0.10	81-81-2	Warfarin	1.6E+01 nc	3.2E+02 nc	1.1E+00 nc	1.1E+01 nc		
	2.0E-01 r		2.0E-01 x	1	0.10	108-38-3	m-Xylene	2.1E+02 sat	2.1E+02 sat	7.3E+02 nc	1.4E+03 nc	2.1E+02	1.0E+01
	2.0E-01 r		2.0E-01 x	1	0.10	95-47-6	o-Xylene	2.8E+02 sat	2.8E+02 sat	7.3E+02 nc	1.4E+03 nc	1.9E+02	9.0E+00
				1	0.10	106-42-3	p-Xylene	3.7E+02 sat	3.7E+02 sat			2.0E+02	1.0E+01
	3.0E-01 x			0	0.01	7440-66-6	Zinc	2.2E+04 nc	1.0E+05 max		1.1E+04 nc	1.2E+04	6.2E+02
	1.0E-01 x			0	0.01	1314-84-7	Zinc phosphide	2.2E+01 nc	5.6E+02 nc		1.1E+01 nc		
	5.0E-02 r		5.0E-02 r	0	0.10	12122-67-7	Zineb	2.7E+03 nc	5.3E+04 nc	1.8E+02 nc	1.8E+03 nc		

APPENDIX D

USEPA REGION 3 RISK-BASED CONCENTRATIONS

Sources: I = IRIS H = HEAST A = HEAST Alternate W = Withdrawn from IRIS or HEAST
E = EPA/NCEA provisional value O = other

Basis: C = Carcinogenic effects N = Noncarcinogenic effects I = RBC at HI of 0.1 < RBC-c

Chemical	CAS	RfDo mg/kg/d		CSFo 1/mg/kg/d		RfDi mg/kg/d		CSFi 1/mg/kg/d		VOC	Risk-based concentrations: Tap water ug/l	Ambient air ug/m3	Fish mg/kg	Soil Industrial mg/kg	Residential mg/kg
ACETALDEHYDE	75070					2.57E-003	I	7.7E-003	I			8.1E-001 C			
ACETOCHLOR	34256821	2E-002	I								7.3E+002 N	7.3E+001 N	2.7E+001 N	4.1E+004 N	1.6E+003 N
ACETONE	67641	1.00E-001	I								3.7E+003 N	3.7E+002 N	1.4E+002 N	2.0E+005 N	7.8E+003 N
ACETONITRILE	75058	6.00E-003	I			1.40E-002	A				2.2E+002 N	5.1E+001 N	8.1E+000 N	1.2E+004 N	4.7E+002 N
ACETOPHENONE	98862	1.00E-001	I			5.70E-006	W			y	4.2E-002 N	2.1E-002 N	1.4E+002 N	2.0E+005 N	7.8E+003 N
ACROLEIN	107028	2.00E-002	H			5.70E-006	I			y	4.2E-002 N	2.1E-002 N	2.7E+001 N	4.1E+004 N	1.6E+003 N
ACRYLAMIDE	79061	2.00E-004	I	4.50E+000	I			4.50E+000	I		1.5E-002 C	1.4E-003 C	7.0E-004 C	1.3E+000 C	1.4E-001 C
ACRYLONITRILE	107131	1.00E-003	H	5.40E-001	I	5.70E-004	I	2.40E-001	I		1.2E-001 C	2.6E-002 C	5.8E-003 C	1.1E+001 C	1.2E+000 C
ALACHLOR	15972608	1.00E-002	I	8.00E-002	H						8.4E-001 C	7.8E-002 C	3.9E-002 C	7.2E+001 C	8.0E+000 C
ALAR	1596845	1.50E-001	I								5.5E+003 N	5.5E+002 N	2.0E+002 N	3.1E+005 N	1.2E+004 N
ALDICARB	116063	1.00E-003	I								3.7E+001 N	3.7E+000 N	1.4E+000 N	2.0E+003 N	7.8E+001 N
ALDICARB SULFONE	1646884	1.00E-003	I								3.7E+001 N	3.7E+000 N	1.4E+000 N	2.0E+003 N	7.8E+001 N
ALDRIN	309002	3.00E-005	I	1.70E+001	I			1.70E+001	I		3.9E-003 C	3.7E-004 C	1.9E-004 C	3.4E-001 C	3.8E-002 C
ALUMINUM	7429905	1.00E+000	E			1.00E-003	E				3.7E+004 N	3.7E+000 N	1.4E+003 N	2.0E+006 N	7.8E+004 N
AMINODINITROTOLUENES		6.00E-005	E								2.2E+000 N	2.2E-001 N	8.1E-002 N	1.2E+002 N	4.7E+000 N
4-AMINOPYRIDINE	504245	2.00E-005	H								7.3E-001 N	7.3E-002 N	2.7E-002 N	4.1E+001 N	1.6E+000 N
AMMONIA	7664417					2.86E-002	I			y	2.1E+002 N	1.0E+002 N			
ANILINE	62533			5.70E-003	I	2.90E-004	I			y	1.9E+000 C I	1.1E+000 N	5.5E-001 C	1.0E+003 C	1.1E+002 C
ANTIMONY	7440360	4.00E-004	I								1.5E+001 N	1.5E+000 N	5.4E-001 N	8.2E+002 N	3.1E+001 N
ANTIMONY PENTOXIDE	1314609	5.00E-004	H								1.8E+001 N	1.8E+000 N	6.8E-001 N	1.0E+003 N	3.9E+001 N
ANTIMONY TETROXIDE	1332816	4.00E-004	H								1.5E+001 N	1.5E+000 N	5.4E-001 N	8.2E+002 N	3.1E+001 N
ANTIMONY TRIOXIDE	1309644	4.00E-004	H			5.70E-005	I				1.5E+001 N	2.1E-001 N	5.4E-001 N	8.2E+002 N	3.1E+001 N
ARSENIC	7440382	3.00E-004	I	1.50E+000	I			1.51E+001	I		4.5E-002 C	4.1E-004 C	2.1E-003 C	3.8E+000 C	4.3E-001 C
ARSINE	7784421					1.40E-005	I			y	1.0E-001 N	5.1E-002 N			
ASSURE	76578148	9.00E-003	I								3.3E+002 N	3.3E+001 N	1.2E+001 N	1.8E+004 N	7.0E+002 N
ATRAZINE	1912249	3.50E-002	I	2.20E-001	H						3.0E-001 C	2.8E-002 C	1.4E-002 C	2.6E+001 C	2.9E+000 C
AZOBENZENE	103333			1.10E-001	I			1.10E-001	I		6.1E-001 C	5.7E-002 C	2.9E-002 C	5.2E+001 C	5.8E+000 C
BARIUM	7440393	7.00E-002	I			1.40E-004	A				2.6E+003 N	5.1E-001 N	9.5E+001 N	1.4E+005 N	5.5E+003 N
BAYGON	114261	4.00E-003	I								1.5E+002 N	1.5E+001 N	5.4E+000 N	8.2E+003 N	3.1E+002 N
BAYTHROID	68359375	2.50E-002	I								9.1E+002 N	9.1E+001 N	3.4E+001 N	5.1E+004 N	2.0E+003 N
BENTAZON	25057890	3.00E-002	I								1.1E+003 N	1.1E+002 N	4.1E+001 N	6.1E+004 N	2.3E+003 N
BENZALDEHYDE	100527	1.00E-001	I								3.7E+003 N	3.7E+002 N	1.4E+002 N	2.0E+005 N	7.8E+003 N
BENZENE	71432	3.00E-003	E	2.90E-002	I	1.70E-003	E	2.90E-002	I	y	3.6E-001 C	2.2E-001 C	1.1E-001 C	2.0E+002 C	2.2E+001 C
BENZENETHIOL	108985	1.00E-005	H							y	6.1E-002 N	3.7E-002 N	1.4E-002 N	2.0E+001 N	7.8E-001 N
BENZIDINE	92875	3.00E-003	I	2.30E+002	I			2.30E+002	I		2.9E-004 C	2.7E-005 C	1.4E-005 C	2.5E-002 C	2.8E-003 C
BENZOIC ACID	65850	4.00E+000	I								1.5E+005 N	1.5E+004 N	5.4E+003 N	8.2E+006 N	3.1E+005 N
BENZYL ALCOHOL	100516	3.00E-001	H								1.1E+004 N	1.1E+003 N	4.1E+002 N	6.1E+005 N	2.3E+004 N
BENZYL CHLORIDE	100447			0.17	I					y	6.2E-002 C	3.7E-002 C	1.9E-002 C	3.4E+001 C	3.8E+000 C
BERYLLIUM	7440417	2.00E-003	I			5.7E-006	I	8.40E+000	I		7.3E+001 N	7.5E-004 C	2.7E+000 N	4.1E+003 N	1.6E+002 N
BIPHENYL	92524	5.00E-002	I							y	3.0E+002 N	1.8E+002 N	6.8E+001 N	1.0E+005 N	3.9E+003 N
BIS(2-CHLOROETHYL)ETHER	111444			1.10E+000	I			1.10E+000	I		6.1E-002 C	5.7E-003 C	2.9E-003 C	5.2E+000 C	5.8E-001 C
BIS(2-CHLOROISOPROPYL)ETHER	108601	4.00E-002	I	7.00E-002	H			3.50E-002	H	y	2.6E-001 C	1.8E-001 C	4.5E-002 C	8.2E+001 C	9.1E+000 C
**BIS(CHLOROMETHYL)ETHER	542881			2.20E+002	I			2.20E+002	I	y	4.8E-005 C	2.8E-005 C	1.4E-005 C	2.6E-002 C	2.9E-003 C
**BIS(2-ETHYLHEXYL)PHTHALATE	117817	2.00E-002	I	1.40E-002	I			1.40E-002	E		4.8E+000 C	4.5E-001 C	2.3E-001 C	4.1E+002 C	4.6E+001 C
**BORON	7440428	9.00E-002	I			5.70E-003	H				3.3E+003 N	2.1E+001 N	1.2E+002 N	1.8E+005 N	7.0E+003 N

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Basis: C = Carcinogenic effects N = Noncarcinogenic effects I = RBC at HI of 0.1 < RBC-c

Chemical	CAS	RfDo mg/kg/d		CSFo 1/mg/kg/d		RfDi mg/kg/d		CSFi 1/mg/kg/d		VOC	Risk-based concentrations: Tap water ug/l		Ambient air ug/m3		Fish mg/kg		Soil Industrial mg/kg		Residential mg/kg	
BROMODICHLOROMETHANE	75274	2.00E-002	I	6.20E-002	I					y	1.7E-001	C I	1.0E-001	C	5.1E-002	C	9.2E+001	C	1.0E+001	C
**BROMOETHENE	593602					8.6E-004	I	1.10E-001	H	y	1.1E-001	C	5.7E-002	C						
BROMOFORM	75252	2.00E-002	I	7.90E-003	I			3.90E-003	I	y	2.3E+000	C	1.6E+000	C	4.0E-001	C	7.2E+002	C	8.1E+001	C
BROMOMETHANE	74839	1.40E-003	I			1.40E-003	I			y	8.5E+000	N	5.1E+000	N	1.9E+000	N	2.9E+003	N	1.1E+002	N
BROMOPHOS	2104963	5.00E-003	H							y	3.0E+001	N	1.8E+001	N	6.8E+000	N	1.0E+004	N	3.9E+002	N
1,3-BUTADIENE	106990							1.80E+000	H	y	7.0E-003	C	3.5E-003	C						
1-BUTANOL	71363	1.00E-001	I								3.7E+003	N	3.7E+002	N	1.4E+002	N	2.0E+005	N	7.8E+003	N
BUTYLBENZYLPHTHALATE	85687	2.00E-001	I								7.3E+003	N	7.3E+002	N	2.7E+002	N	4.1E+005	N	1.6E+004	N
BUTYLATE	2008415	5.00E-002	I								1.8E+003	N	1.8E+002	N	6.8E+001	N	1.0E+005	N	3.9E+003	N
N-BUTYLBENZENE	104518	1.00E-002	E							y	6.1E+001	N	3.7E+001	N	1.4E+001	N	2.0E+004	N	7.8E+002	N
SEC-BUTYLBENZENE	135988	1.00E-002	E							y	6.1E+001	N	3.7E+001	N	1.4E+001	N	2.0E+004	N	7.8E+002	N
TERT-BUTYLBENZENE	98066	1.00E-002	E							y	6.1E+001	N	3.7E+001	N	1.4E+001	N	2.0E+004	N	7.8E+002	N
CADMIUM-WATER	7440439	5.00E-004	I								1.8E+001	N	9.9E-004	C	6.8E-001	N	1.0E+003	N	3.9E+001	N
CADMIUM-FOOD	7440439	1.00E-003	I					6.30E+000	I		3.7E+001	N	9.9E-004	C	1.4E+000	N	2.0E+003	N	7.8E+001	N
CAPROLACTAM	105602	5.00E-001	I								1.8E+004	N	1.8E+003	N	6.8E+002	N	1.0E+006	N	3.9E+004	N
CARBARYL	63252	1.00E-001	I								3.7E+003	N	3.7E+002	N	1.4E+002	N	2.0E+005	N	7.8E+003	N
CARBON DISULFIDE	75150	1.00E-001	I			2.00E-001	I			y	1.0E+003	N	7.3E+002	N	1.4E+002	N	2.0E+005	N	7.8E+003	N
CARBON TETRACHLORIDE	56235	7.00E-004	I	1.30E-001	I	5.71E-004	E	5.30E-002	I	y	1.6E-001	C	1.2E-001	C	2.4E-002	C	4.4E+001	C	4.9E+000	C
CARBOSULFAN	55285148	1.00E-002	I								3.7E+002	N	3.7E+001	N	1.4E+001	N	2.0E+004	N	7.8E+002	N
CHLORAL	75876	2.00E-003	I							y	1.2E+001	N	7.3E+000	N	2.7E+000	N	4.1E+003	N	1.6E+002	N
CHLORANIL	118752			4.00E-001	H						1.7E-001	C	1.6E-002	C	7.9E-003	C	1.4E+001	C	1.6E+000	C
CHLORDANE	57749	5.00E-004	I	3.5E-001	I	2.00E-004	I	3.5E-001	I		1.9E-001	C	1.8E-002	C	9.0E-003	C	1.6E+001	C	1.8E+000	C
CHLORINE	7782505	1.00E-001	I							y	6.1E+002	N	3.7E+002	N	1.4E+002	N	2.0E+005	N	7.8E+003	N
CHLORINE DIOXIDE	10049044					5.70E-005	I			y	4.2E-001	N	2.1E-001	N						
CHLOROACETIC ACID	79118	2.00E-003	H								7.3E+001	N	7.3E+000	N	2.7E+000	N	4.1E+003	N	1.6E+002	N
4-CHLOROANILINE	106478	4.00E-003	I								1.5E+002	N	1.5E+001	N	5.4E+000	N	8.2E+003	N	3.1E+002	N
CHLOROBENZENE	108907	2.00E-002	I			5.00E-003	A			y	3.5E+001	N	1.8E+001	N	2.7E+001	N	4.1E+004	N	1.6E+003	N
CHLOROBENZILATE	510156	2.00E-002	I	2.70E-001	H			2.70E-001	H		2.5E-001	C	2.3E-002	C	1.2E-002	C	2.1E+001	C	2.4E+000	C
P-CHLOROBENZOIC ACID	74113	2.00E-001	H								7.3E+003	N	7.3E+002	N	2.7E+002	N	4.1E+005	N	1.6E+004	N
2-CHLORO-1,3-BUTADIENE	126998	2.00E-002	A			2.00E-003	H			y	1.4E+001	N	7.3E+000	N	2.7E+001	N	4.1E+004	N	1.6E+003	N
1-CHLOROBUTANE	109693	4.00E-001	H							y	2.4E+003	N	1.5E+003	N	5.4E+002	N	8.2E+005	N	3.1E+004	N
1-CHLORO-1,1-DIFLUOROETHANE	75683					1.40E+001	I			y	1.0E+005	N	5.1E+004	N						
CHLORODIFLUOROMETHANE	75456					1.40E+001	I			y	1.0E+005	N	5.1E+004	N						
CHLOROETHANE	75003	4.00E-001	E	2.90E-003	E	2.90E+000	I			y	3.6E+000	C	2.2E+000	C	1.1E+000	C	2.0E+003	C	2.2E+002	C
CHLOROFORM	67663	1.00E-002	I	6.10E-003	I	8.6E-005	E	8.10E-002	I	y	1.5E-001	C I	7.7E-002	C I	5.2E-001	C	9.4E+002	C	1.0E+002	C I
CHLOROMETHANE	74873			1.30E-002	H			6.00E-003	H	y	1.5E+000	C	1.0E+000	C	2.4E-001	C	4.4E+002	C	4.9E+001	C
4-CHLORO-2-METHYLANILINE	95692			5.80E-001	H						1.2E-001	C	1.1E-002	C	5.4E-003	C	9.9E+000	C	1.1E+000	C
BETA-CHLORONAPHTHALENE	91587	8.00E-002	I							y	4.9E+002	N	2.9E+002	N	1.1E+002	N	1.6E+005	N	6.3E+003	N
O-CHLORONITROBENZENE	88733			2.50E-002	H					y	4.2E-001	C	2.5E-001	C	1.3E-001	C	2.3E+002	C	2.6E+001	C
P-CHLORONITROBENZENE	100005			1.80E-002	H					y	5.9E-001	C	3.5E-001	C	1.8E-001	C	3.2E+002	C	3.5E+001	C
2-CHLOROPHENOL	95578	5.00E-003	I								1.8E+002	N	1.8E+001	N	6.8E+000	N	1.0E+004	N	3.9E+002	N
2-CHLOROPROPANE	75296					2.90E-002	H			y	2.1E+002	N	1.1E+002	N						
O-CHLOROTOLUENE	95498	2.00E-002	I							y	1.2E+002	N	7.3E+001	N	2.7E+001	N	4.1E+004	N	1.6E+003	N
CHLORPYRIFOS	2921882	3.00E-003	I								1.1E+002	N	1.1E+001	N	4.1E+000	N	6.1E+003	N	2.3E+002	N
CHLORPYRIFOS-METHYL	5598130	1.00E-002	H								3.7E+002	N	3.7E+001	N	1.4E+001	N	2.0E+004	N	7.8E+002	N

Sources: I = IRIS H = HEAST A = HEAST Alternate W = Withdrawn from IRIS or HEAST E EPA NCEA provisional value O = other							Basis: C = Carcinogenic effects N = Noncarcinogenic effects I = RBC at HI of 0.1 < RBC-c Risk-based concentrations				
Chemical	CAS	RfDo mg/kg/d	CSFo 1/mg/kg/d	RfDi mg/kg/d	CSFi 1/mg/kg/d	VOC	Tap water ug/l	Ambient air ug/m3	Fish mg/kg	Soil Industrial mg/kg	Residential mg/kg
**CHROMIUM III	16065831	1.50E+000 I					5.5E+004 N	5.5E+003 N	2.0E+003 N	3.1E+006 N	1.2E+005 N
**CHROMIUM VI	18540299	3.00E-003 I		3.00E-005 I	4.10E+001 H		1.1E+002 N	1.5E-004 C	4.1E+000 N	6.1E+003 N	2.3E+002 N
COBALT	7440484	6.00E-002 E					2.2E+003 N	2.2E+002 N	8.1E+001 N	1.2E+005 N	4.7E+003 N
COKE OVEN EMISSIONS (COAL TAR)	8007452				2.2 I	y	5.7E-003 C	2.8E-003 C			
COPPER	7440508	4.00E-002 H					1.5E+003 N	1.5E+002 N	5.4E+001 N	8.2E+004 N	3.1E+003 N
CROTONALDEHYDE	123739		1.90E+000 H				3.5E-002 C	3.3E-003 C	1.7E-003 C	3.0E+000 C	3.4E-001 C
CUMENE	98828	1.00E-001 I		1.10E-001 I		y	6.6E+002 N	4.0E+002 N	1.4E+002 N	2.0E+005 N	7.8E+003 N
CYANIDE (FREE)	57125	2.00E-002 I					7.3E+002 N	7.3E+001 N	2.7E+001 N	4.1E+004 N	1.6E+003 N
CALCIUM CYANIDE	592018	4E-002 I					1.5E+003 N	1.5E+002 N	5.4E+001 N	8.2E+004 N	3.1E+003 N
COPPER CYANIDE	544923	5.00E-003 I					1.8E+002 N	1.8E+001 N	6.8E+000 N	1.0E+004 N	3.9E+002 N
CYANAZINE	21725462	2.00E-003 H	8.40E-001 H				8.0E-002 C	7.5E-003 C	3.8E-003 C	6.8E+000 C	7.6E-001 C
CYANOGEN	460195	4.00E-002 I				y	2.4E+002 N	1.5E+002 N	5.4E+001 N	8.2E+004 N	3.1E+003 N
CYANOGEN BROMIDE	506683	9.00E-002 I					3.3E+003 N	3.3E+002 N	1.2E+002 N	1.8E+005 N	7.0E+003 N
CYANOGEN CHLORIDE	506774	5.00E-002 I					1.8E+003 N	1.8E+002 N	6.8E+001 N	1.0E+005 N	3.9E+003 N
HYDROGEN CYANIDE	74908	2.00E-002 I		8.60E-004 I		y	6.2E+000 N	3.1E+000 N	2.7E+001 N	4.1E+004 N	1.6E+003 N
POTASSIUM CYANIDE	151508	5.00E-002 I					1.8E+003 N	1.8E+002 N	6.8E+001 N	1.0E+005 N	3.9E+003 N
POTASSIUM SILVER CYANIDE	506616	2.00E-001 I					7.3E+003 N	7.3E+002 N	2.7E+002 N	4.1E+005 N	1.6E+004 N
SILVER CYANIDE	506649	1.00E-001 I					3.7E+003 N	3.7E+002 N	1.4E+002 N	2.0E+005 N	7.8E+003 N
SODIUM CYANIDE	143339	4.00E-002 I					1.5E+003 N	1.5E+002 N	5.4E+001 N	8.2E+004 N	3.1E+003 N
THIOCYANATE		1.00E-001 E					3.7E+003 N	3.7E+002 N	1.4E+002 N	2.0E+005 N	7.8E+003 N
ZINC CYANIDE	557211	5.00E-002 I					1.8E+003 N	1.8E+002 N	6.8E+001 N	1.0E+005 N	3.9E+003 N
CYCLOHEXANONE	108941	5.00E+000 I					1.8E+005 N	1.8E+004 N	6.8E+003 N	1.0E+007 N	3.9E+005 N
CYHALOTHRIN/KARATE	68085858	5.00E-003 I					1.8E+002 N	1.8E+001 N	6.8E+000 N	1.0E+004 N	3.9E+002 N
CYPERMETHRIN	52315078	1.00E-002 I					3.7E+002 N	3.7E+001 N	1.4E+001 N	2.0E+004 N	7.8E+002 N
DACTHAL	1861321	1.00E-002 I					3.7E+002 N	3.7E+001 N	1.4E+001 N	2.0E+004 N	7.8E+002 N
DALAPON	75990	3.00E-002 I					1.1E+003 N	1.1E+002 N	4.1E+001 N	6.1E+004 N	2.3E+003 N
DDD	72548		2.40E-001 I				2.8E-001 C	2.6E-002 C	1.3E-002 C	2.4E+001 C	2.7E+000 C
DDE	72559		3.40E-001 I				2.0E-001 C	1.8E-002 C	9.3E-003 C	1.7E+001 C	1.9E+000 C
DDT	50293	5.00E-004 I	3.40E-001 I		3.40E-001 I		2.0E-001 C	1.8E-002 C	9.3E-003 C	1.7E+001 C	1.9E+000 C
DIAZINON	333415	9.00E-004 H					3.3E+001 N	3.3E+000 N	1.2E+000 N	1.8E+003 N	7.0E+001 N
DIBENZOFURAN	132649	4.00E-003 E				y	2.4E+001 N	1.5E+001 N	5.4E+000 N	8.2E+003 N	3.1E+002 N
1,4-DIBROMOBENZENE	106376	1.00E-002 I				y	6.1E+001 N	3.7E+001 N	1.4E+001 N	2.0E+004 N	7.8E+002 N
DIBROMOCHLOROMETHANE	124481	2.00E-002 I	8.40E-002 I			y	1.3E-001 C	7.5E-002 C	3.8E-002 C	6.8E+001 C	7.6E+000 C
1,2-DIBROMO-3-CHLOROPROPANE	96128		1.40E+000 H	5.70E-005 I	2.40E-003 H	y	4.7E-002 C I	2.1E-001 N	2.3E-003 C	4.1E+000 C	4.6E-001 C
1,2-DIBROMOETHANE	106934		8.50E+001 I	5.70E-005 H	7.60E-001 I	y	7.5E-004 C	8.2E-003 C	3.7E-005 C	6.7E-002 C	7.5E-003 C
DIBUTYLPHTHALATE	84742	1.00E-001 I					3.7E+003 N	3.7E+002 N	1.4E+002 N	2.0E+005 N	7.8E+003 N
DICAMBA	1918009	3.00E-002 I					1.1E+003 N	1.1E+002 N	4.1E+001 N	6.1E+004 N	2.3E+003 N
1,2-DICHLOROBENZENE	95501	9.00E-002 I		9.00E-003 E		y	6.4E+001 N	3.3E+001 N	1.2E+002 N	1.8E+005 N	7.0E+003 N
1,3-DICHLOROBENZENE	541731	3.00E-002 E		2.00E-003 E		y	1.4E+001 N	7.3E+000 N	4.1E+001 N	6.1E+004 N	2.3E+003 N
1,4-DICHLOROBENZENE	106467	3.00E-002 E	2.40E-002 H	2.29E-001 I	2.2E-002 E	y	4.7E-001 C	2.8E-001 C	1.3E-001 C	2.4E+002 C	2.7E+001 C
3,3'-DICHLOROBENZIDINE	91941		4.50E-001 I				1.5E-001 C	1.4E-002 C	7.0E-003 C	1.3E+001 C	1.4E+000 C
1,4-DICHLORO-2-BUTENE	764410				9.30E+000 H	y	1.3E-003 C	6.7E-004 C			
DICHLORODIFLUOROMETHANE	75718	2.00E-001 I		5.00E-002 A		y	3.5E+002 N	1.8E+002 N	2.7E+002 N	4.1E+005 N	1.6E+004 N
1,1-DICHLOROETHANE	75343	1.00E-001 H		1.40E-001 A		y	8.0E+002 N	5.1E+002 N	1.4E+002 N	2.0E+005 N	7.8E+003 N
1,2-DICHLOROETHANE	107062	3.00E-002 E	9.10E-002 I	1.40E-003 E	9.10E-002 I	y	1.2E-001 C	6.9E-002 C	3.5E-002 C	6.3E+001 C	7.0E+000 C

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Basis: C = Carcinogenic effects N = Noncarcinogenic effects I = RBC at HI of 0.1 < RBC-c

Chemical	CAS	RfDo mg/kg/d		CSFo 1/mg/kg/d		RfDi mg/kg/d		CSFi 1/mg/kg/d		VOC	Risk-based concentrations: Tap water ug/l	Ambient air ug/m3	Fish mg/kg	Soil Industrial mg/kg	Residential mg/kg
1,1 DICHLOROETHENE	75354	9.00E-003	I	6.00E-001	I			1.75E-001	I	y	4.4E-002 C	3.6E-002 C	5.3E-003 C	9.5E+000 C	1.1E+000 C
CIS 1,2 DICHLOROETHENE	156592	1.00E-002	H							y	6.1E+001 N	3.7E+001 N	1.4E+001 N	2.0E+004 N	7.8E+002 N
TRANS-1,2-DICHLOROETHENE	156605	2.00E-002	I							y	1.2E+002 N	7.3E+001 N	2.7E+001 N	4.1E+004 N	1.6E+003 N
TOTAL 1,2-DICHLOROETHENE	540590	9.00E-003	H							y	5.5E+001 N	3.3E+001 N	1.2E+001 N	1.8E+004 N	7.0E+002 N
2,4 DICHLOROPHENOL	120832	3.00E-003	I								1.1E+002 N	1.1E+001 N	4.1E+000 N	6.1E+003 N	2.3E+002 N
2,4-D	94757	1.00E-002	I							y	6.1E+001 N	3.7E+001 N	1.4E+001 N	2.0E+004 N	7.8E+002 N
4-(2,4-DICHLOROPHENOXY)BUTYRIC ACID	94826	8E-003	I								2.9E+002 N	2.9E+001 N	1.1E+001 N	1.6E+004 N	6.3E+002 N
1,2-DICHLOROPROPANE	78875			6.80E-002	H	1.14E-003	I			y	1.6E-001 C	9.2E-002 C	4.6E-002 C	8.4E+001 C	9.4E+000 C
2,3-DICHLOROPROPANOL	616239	3.00E-003	I								1.1E+002 N	1.1E+001 N	4.1E+000 N	6.1E+003 N	2.3E+002 N
1,3-DICHLOROPROPENE	542756	3.00E-004	I	1.80E-001	H	5.71E-003	I	1.30E-001	H	y	7.7E-002 C	4.8E-002 C	1.8E-002 C	3.2E+001 C	3.5E+000 C I
DICHLORVOS	62737	5E-004	I	0.29	I	1.43E-004	I				2.3E-001 C	2.2E-002 C	1.1E-002 C	2.0E+001 C	2.2E+000 C
DICOFOL	115322			4.4E-001	W						1.5E-001 C	1.4E-002 C	7.2E-003 C	1.3E+001 C	1.5E+000 C
DICYCLOPENTADIENE	77736	3E-002	H			6.00E-005	A			y	4.4E-001 N	2.2E-001 N	4.1E+001 N	6.1E+004 N	2.3E+003 N
DIELDRIN	60571	5.00E-005	I	1.60E+001	I			1.60E+001	I		4.2E-003 C	3.9E-004 C	2.0E-004 C	3.6E-001 C	4.0E-002 C
DIESEL EMISSIONS						1.40E-003	I					5.1E+000 N			
DIETHYLPHTHALATE	84662	8.00E-001	I								2.9E+004 N	2.9E+003 N	1.1E+003 N	1.6E+006 N	6.3E+004 N
DIETHYLENE GLYCOL, MONOBUTYL ETHER	112345					5.70E-003	H					2.1E+001 N			
DIETHYLENE GLYCOL, MONOETHYL ETHER	111900	2.00E+000	H								7.3E+004 N	7.3E+003 N	2.7E+003 N	4.1E+006 N	1.6E+005 N
DI(2-ETHYLHEXYL)ADIPATE	103231	6.00E-001	I	1.20E-003	I						5.6E+001 C	5.2E+000 C	2.6E+000 C	4.8E+003 C	5.3E+002 C
DIETHYLSTILBESTROL	56531			4.70E+003	H						1.4E-005 C	1.3E-006 C	6.7E-007 C	1.2E-003 C	1.4E-004 C
DIFENZOQUAT (AVENGE)	43222486	8.00E-002	I								2.9E+003 N	2.9E+002 N	1.1E+002 N	1.6E+005 N	6.3E+003 N
1,1-DIFLUOROETHANE	75376					1.10E+001	I			y	8.0E+004 N	4.0E+004 N			
DIISOPROPYL METHYLPHOSPHONATE (DIMP)	1445756	8.00E-002	I								2.9E+003 N	2.9E+002 N	1.1E+002 N	1.6E+005 N	6.3E+003 N
3,3'-DIMETHOXYBENZIDINE	119904			1.40E-002	H						4.8E+000 C	4.5E-001 C	2.3E-001 C	4.1E+002 C	4.6E+001 C
DIMETHYLAMINE	124403					5.70E-006	W					2.1E-002 N			
2,4-DIMETHYLANILINE HYDROCHLORIDE	21436964			5.80E-001	H						1.2E-001 C	1.1E-002 C	5.4E-003 C	9.9E+000 C	1.1E+000 C
2,4-DIMETHYLANILINE	95681			7.50E-001	H						8.9E-002 C	8.3E-003 C	4.2E-003 C	7.6E+000 C	8.5E-001 C
N,N-DIMETHYLANILINE	121697	2.00E-003	I								7.3E+001 N	7.3E+000 N	2.7E+000 N	4.1E+003 N	1.6E+002 N
3,3'-DIMETHYLBENZIDINE	119937			9.20E+000	H						7.3E-003 C	6.8E-004 C	3.4E-004 C	6.2E-001 C	6.9E-002 C
1,1-DIMETHYLHYDRAZINE	57147			2.60E+000	W			3.50E+000	W		2.6E-002 C	1.8E-003 C	1.2E-003 C	2.2E+000 C	2.5E-001 C
1,2-DIMETHYLHYDRAZINE	540738			3.70E+001	W			3.70E+001	W		1.8E-003 C	1.7E-004 C	8.6E-005 C	1.5E-001 C	1.7E-002 C
2,4-DIMETHYLPHENOL	105679	2.00E-002	I								7.3E+002 N	7.3E+001 N	2.7E+001 N	4.1E+004 N	1.6E+003 N
2,6-DIMETHYLPHENOL	576261	6.00E-004	I								2.2E+001 N	2.2E+000 N	8.1E-001 N	1.2E+003 N	4.7E+001 N
3,4-DIMETHYLPHENOL	95658	1.00E-003	I								3.7E+001 N	3.7E+000 N	1.4E+000 N	2.0E+003 N	7.8E+001 N
DIMETHYLPHTHALATE	131113	1.00E+001	W								3.7E+005 N	3.7E+004 N	1.4E+004 N	2.0E+007 N	7.8E+005 N
1,2-DINITROBENZENE	528290	4.00E-004	H								1.5E+001 N	1.5E+000 N	5.4E-001 N	8.2E+002 N	3.1E+001 N
1,3-DINITROBENZENE	99650	1.00E-004	I								3.7E+000 N	3.7E-001 N	1.4E-001 N	2.0E+002 N	7.8E+000 N
1,4-DINITROBENZENE	100254	4.00E-004	H								1.5E+001 N	1.5E+000 N	5.4E-001 N	8.2E+002 N	3.1E+001 N
4,6-DINITRO-O-CYCLOHEXYL PHENOL	131895	2.00E-003	I								7.3E+001 N	7.3E+000 N	2.7E+000 N	4.1E+003 N	1.6E+002 N
4,6 DINITRO-2 METHYLPHENOL	534521	1.00E-004	E								3.7E+000 N	3.7E-001 N	1.4E-001 N	2.0E+002 N	7.8E+000 N
2,4 DINITROPHENOL	51285	2.00E-003	I								7.3E+001 N	7.3E+000 N	2.7E+000 N	4.1E+003 N	1.6E+002 N
DINITROTOLUENE MIX				6.80E-001	I						9.8E-002 C	9.2E-003 C	4.6E-003 C	8.4E+000 C	9.4E-001 C
2,4-DINITROTOLUENE	121142	2.00E-003	I								7.3E+001 N	7.3E+000 N	2.7E+000 N	4.1E+003 N	1.6E+002 N
2,6-DINITROTOLUENE	606202	1.00E-003	H								3.7E+001 N	3.7E+000 N	1.4E+000 N	2.0E+003 N	7.8E+001 N
DINOSEB	88857	1.00E-003	I							y	6.1E+000 N	3.7E+000 N	1.4E+000 N	2.0E+003 N	7.8E+001 N

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							Risk-based concentrations				
Chemical	CAS	RfDo mg/kg/d	CSFo 1/mg/kg/d	RfDi mg/kg/d	CSFi 1/mg/kg/d	VOC	Tap water ug/l	Ambient air ug/m3	Fish mg/kg	Soil Industrial mg/kg	Residential mg/kg
DIOCTYLPHTHALATE	117840	2.00E-002 H					7.3E+002 N	7.3E+001 N	2.7E+001 N	4.1E+004 N	1.6E+003 N
1,4-DIOXANE	123911		1.10E-002 I				6.1E+000 C	5.7E-001 C	2.9E-001 C	5.2E+002 C	5.8E+001 C
DIPHENYLAMINE	122394	2.50E-002 I					9.1E+002 N	9.1E+001 N	3.4E+001 N	5.1E+004 N	2.0E+003 N
1,2-DIPHENYLHYDRAZINE	122667		8.00E-001 I		8.00E-001 I		8.4E-002 C	7.8E-003 C	3.9E-003 C	7.2E+000 C	8.0E-001 C
DIQUAT	85007	2.20E-003 I					8.0E+001 N	8.0E+000 N	3.0E+000 N	4.5E+003 N	1.7E+002 N
DISULFOTON	298044	4.00E-005 I				y	2.4E-001 N	1.5E-001 N	6.4E-002 N	8.2E+001 N	3.1E+000 N
1,4 DITHIANE	505293	1.00E-002 I					3.7E+002 N	3.7E+001 N	1.4E+001 N	2.0E+004 N	7.8E+002 N
DIURON	330541	2.00E-003 I					7.3E+001 N	7.3E+000 N	2.7E+000 N	4.1E+003 N	1.6E+002 N
ENDOSULFAN	115297	6.00E-003 I					2.2E+002 N	2.2E+001 N	8.1E+000 N	1.2E+004 N	4.7E+002 N
ENDRIN	72208	3.00E-004 I					1.1E+001 N	1.1E+000 N	4.1E-001 N	6.1E+002 N	2.3E+001 N
EPICHLOROHYDRIN	106898	2.00E-003 H	9.90E-003 I	2.86E-004 I	4.20E-003 I		6.8E+000 C	1.0E+000 N	3.2E-001 C I	5.8E+002 C I	6.5E+001 C I
ETHION	563122	5.00E-004 I					1.8E+001 N	1.8E+000 N	6.8E-001 N	1.0E+003 N	3.9E+001 N
2-ETHOXYETHANOL	110805	4.00E-001 H		5.70E-002 I			1.5E+004 N	2.1E+002 N	6.4E+002 N	8.2E+005 N	3.1E+004 N
ETHYL ACETATE	141786	9.00E-001 I				y	5.5E+003 N	3.3E+003 N	1.2E+003 N	1.8E+006 N	7.0E+004 N
ETHYLBENZENE	100414	1.00E-001 I		2.90E-001 I		y	1.3E+003 N	1.1E+003 N	1.4E+002 N	2.0E+005 N	7.8E+003 N
ETHYLENE DIAMINE	107153	2.00E-002 H					7.3E+002 N	7.3E+001 N	2.7E+001 N	4.1E+004 N	1.6E+003 N
ETHYLENE GLYCOL	107211	2.00E+000 I					7.3E+004 N	7.3E+003 N	2.7E+003 N	4.1E+006 N	1.6E+005 N
ETHYLENE GLYCOL, MONOBUTYL ETHER	111762			5.70E-003 H				2.1E+001 N			
ETHYLENE OXIDE	75218		1.00E+000 H		3.50E-001 H		6.7E-002 C	1.8E-002 C	3.2E-003 C	5.7E+000 C	6.4E-001 C
ETHYLENE THIOUREA	96457	8.00E-005 I	1.1E-001 H				6.1E-001 C I	5.7E-002 C I	2.9E-002 C I	5.2E+001 C I	5.8E+000 C I
ETHYL ETHER	60297	2.00E-001 I				y	1.2E+003 N	7.3E+002 N	2.7E+002 N	4.1E+005 N	1.6E+004 N
ETHYL METHACRYLATE	97632	9.00E-002 H				y	5.6E+002 N	3.3E+002 N	1.2E+002 N	1.8E+005 N	7.0E+003 N
FENAMIPHOS	22224926	2.50E-004 I					9.1E+000 N	9.1E-001 N	3.4E-001 N	5.1E+002 N	2.0E+001 N
FLUOMETURON	2164172	1.30E-002 I					4.7E+002 N	4.7E+001 N	1.8E+001 N	2.7E+004 N	1.0E+003 N
FLUORINE	7782414	6.00E-002 I					2.2E+003 N	2.2E+002 N	8.1E+001 N	1.2E+005 N	4.7E+003 N
FOMESAFEN	72178020		1.90E-001 I				3.5E-001 C	3.3E-002 C	1.7E-002 C	3.0E+001 C	3.4E+000 C
FONOFOS	944229	2.00E-003 I					7.3E+001 N	7.3E+000 N	2.7E+000 N	4.1E+003 N	1.6E+002 N
FORMALDEHYDE	50000	2.00E-001 I			4.50E-002 I		7.3E+003 N	1.4E-001 C	2.7E+002 N	4.1E+005 N	1.6E+004 N
FORMIC ACID	64186	2.00E+000 H					7.3E+004 N	7.3E+003 N	2.7E+003 N	4.1E+006 N	1.6E+005 N
FURAN	110009	1.00E-003 I				y	6.1E+000 N	3.7E+000 N	1.4E+000 N	2.0E+003 N	7.8E+001 N
FURAZOLIDONE	67458		3.80E+000 H				1.8E-002 C	1.6E-003 C	8.3E-004 C	1.5E+000 C	1.7E-001 C
FURFURAL	98011	3.00E-003 I		1.00E-002 A			1.1E+002 N	3.7E+001 N	4.1E+000 N	6.1E+003 N	2.3E+002 N
GLYCIDALDEHYDE	765344	4.00E-004 I		2.90E-004 H			1.5E+001 N	1.1E+000 N	5.4E-001 N	8.2E+002 N	3.1E+001 N
GLYPHOSATE	1071836	1.00E-001 I					3.7E+003 N	3.7E+002 N	1.4E+002 N	2.0E+005 N	7.8E+003 N
HEPTACHLOR	76448	5.00E-004 I	4.50E+000 I		4.50E+000 I	y	2.3E-003 C	1.4E-003 C	7.0E-004 C	1.3E+000 C	1.4E-001 C
HEPTACHLOR EPOXIDE	1024573	1.30E-005 I	9.10E+000 I		9.10E+000 I	y	1.2E-003 C	6.9E-004 C	3.5E-004 C	6.3E-001 C	7.0E-002 C
HEXABROMOBENZENE	87821	2.00E-003 I					7.3E+001 N	7.3E+000 N	2.7E+000 N	4.1E+003 N	1.6E+002 N
HEXACHLOROBENZENE	118741	8.00E-004 I	1.60E+000 I		1.60E+000 I	y	6.6E-003 C	3.9E-003 C	2.0E-003 C	3.6E+000 C	4.0E-001 C
HEXACHLOROBUTADIENE	87683	2.00E-004 H	7.80E-002 I		7.80E-002 I	y	1.4E-001 C I	8.0E-002 C I	4.0E-002 C I	7.3E+001 C I	8.2E+000 C I
ALPHA-HCH	319846		6.30E+000 I		6.30E+000 I		1.1E-002 C	9.9E-004 C	5.0E-004 C	9.1E-001 C	1.0E-001 C
BETA-HCH	319857		1.80E+000 I		1.80E+000 I		3.7E-002 C	3.5E-003 C	1.8E-003 C	3.2E+000 C	3.5E-001 C
GAMMA-HCH (LINDANE)	58899	3.00E-004 I	1.30E+000 H				5.2E-002 C	4.8E-003 C	2.4E-003 C	4.4E+000 C	4.9E-001 C
TECHNICAL HCH	608731		1.80E+000 I		1.80E+000 I		3.7E-002 C	3.5E-003 C	1.8E-003 C	3.2E+000 C	3.5E-001 C
HEXACHLOROCYCLOPENTADIENE	77474	7.00E-003 I		2.00E-005 H		y	1.5E-001 N	7.3E-002 N	9.5E+000 N	1.4E+004 N	5.5E+002 N
HEXACHLORODIBENZODIOXIN MIX	19408743		6.20E+003 I		4.55E+003 I		1.1E-005 C	1.4E-006 C	5.1E-007 C	9.2E-004 C	1.0E-004 C

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Chemical	CAS	RfDo mg/kg/d	CSFo 1/mg/kg/d	RfDi mg/kg/d	CSFi 1/mg/kg/d	VOC	Risk-based concentrations: Tap water ug/l	Ambient air ug/m3	Fish mg/kg	Soil Industrial mg/kg	Residential mg/kg
HEXACHLOROETHANE	67721	1.00E-003 I	1.40E-002 I		1.40E-002 I	y	7.5E-001 C I	4.5E-001 C I	2.3E-001 C I	4.1E+002 C I	4.6E+001 C I
HEXACHLOROPHENE	70304	3.00E-004 I					1.1E+001 N	1.1E+000 N	4.1E-001 N	6.1E+002 N	2.3E+001 N
1,6-HEXAMETHYLENE DIISOCYANATE	822060			2.90E-006 I				1.1E-002 N			
HEXANE	110543	6.00E-002 H		5.71E-002 I		y	3.5E+002 N	2.1E+002 N	8.1E+001 N	1.2E+005 N	4.7E+003 N
2-HEXANONE	591786	4.00E-002 E		1.4E-003 E			1.5E+003 N	5.1E+000 N	5.4E+001 N	8.2E+004 N	3.1E+003 N
HEXAZINONE	51235042	3.30E-002 I					1.2E+003 N	1.2E+002 N	4.5E+001 N	6.7E+004 N	2.6E+003 N
HMX	2691410	5.00E-002 I					1.8E+003 N	1.8E+002 N	6.8E+001 N	1.0E+005 N	3.9E+003 N
HYDRAZINE	302012		3.00E+000 I		1.70E+001 I		2.2E-002 C	3.7E-004 C	1.1E-003 C	1.9E+000 C	2.1E-001 C
HYDROGEN CHLORIDE	7647010			5.70E-003 I				2.1E+001 N			
HYDROGEN SULFIDE	7783064	3.00E-003 I		2.85E-004 I			1.1E+002 N	1.0E+000 N	4.1E+000 N	6.1E+003 N	2.3E+002 N
HYDROQUINONE	123319	4.00E-002 H					1.5E+003 N	1.5E+002 N	5.4E+001 N	8.2E+004 N	3.1E+003 N
IRON	7439896	3.00E-001 E					1.1E+004 N	1.1E+003 N	4.1E+002 N	6.1E+005 N	2.3E+004 N
ISOBUTANOL	78831	3.00E-001 I				y	1.8E+003 N	1.1E+003 N	4.1E+002 N	6.1E+005 N	2.3E+004 N
ISOPHORONE	78591	2.00E-001 I	9.50E-004 I				7.0E+001 C	6.6E+000 C	3.3E+000 C	6.0E+003 C	6.7E+002 C
ISOPROPALIN	33820530	1.50E-002 I					5.5E+002 N	5.5E+001 N	2.0E+001 N	3.1E+004 N	1.2E+003 N
ISOPROPYL METHYL PHOSPHONIC ACID	1832548	1.00E-001 I					3.7E+003 N	3.7E+002 N	1.4E+002 N	2.0E+005 N	7.8E+003 N
TETRAETHYLLEAD	78002	1.00E-007 I				y	6.1E-004 N	3.7E-004 N	1.4E-004 N	2.0E-001 N	7.8E-003 N
LITHIUM	7439932	2.00E-002 E					7.3E+002 N	7.3E+001 N	2.7E+001 N	4.1E+004 N	1.6E+003 N
MALATHION	121755	2.00E-002 I					7.3E+002 N	7.3E+001 N	2.7E+001 N	4.1E+004 N	1.6E+003 N
MALEIC ANHYDRIDE	108316	1.00E-001 I					3.7E+003 N	3.7E+002 N	1.4E+002 N	2.0E+005 N	7.8E+003 N
MANGANESE NONFOOD	7439965	2.00E-002 I		1.43E-005 I			7.3E+002 N	5.2E-002 N	2.7E+001 N	4.1E+004 N	1.6E+003 N
MANGANESE-FOOD	7439965	1.40E-001 I		1.43E-005 I			5.1E+003 N	5.2E-002 N	1.9E+002 N	2.9E+005 N	1.1E+004 N
MEPHOSFOLAN	950107	9.00E-005 H					3.3E+000 N	3.3E-001 N	1.2E-001 N	1.8E+002 N	7.0E+000 N
MEPIQUAT CHLORIDE	24307264	3.00E-002 I					1.1E+003 N	1.1E+002 N	4.1E+001 N	6.1E+004 N	2.3E+003 N
MERCURIC CHLORIDE	7487947	3.00E-004 I					1.1E+001 N	1.1E+000 N	4.1E-001 N	6.1E+002 N	2.3E+001 N
MERCURY (INORGANIC)	7439976			8.60E-005 I				3.1E-001 N			
METHYLMERCURY	22967926	1.00E-004 I					3.7E+000 N	3.7E-001 N	1.4E-001 N	2.0E+002 N	7.8E+000 N
METHACRYLONITRILE	126987	1.00E-004 I		2.00E-004 A		y	1.0E+000 N	7.3E-001 N	1.4E-001 N	2.0E+002 N	7.8E+000 N
METHANOL	67561	5.00E-001 I					1.8E+004 N	1.8E+003 N	6.8E+002 N	1.0E+006 N	3.9E+004 N
METHIDATHION	950378	1.00E-003 I					3.7E+001 N	3.7E+000 N	1.4E+000 N	2.0E+003 N	7.8E+001 N
METHOXYCHLOR	72435	5.00E-003 I					1.8E+002 N	1.8E+001 N	6.8E+000 N	1.0E+004 N	3.9E+002 N
METHYL ACETATE	79209	1.00E+000 H				y	6.1E+003 N	3.7E+003 N	1.4E+003 N	2.0E+006 N	7.8E+004 N
METHYL ACRYLATE	96333	3.00E-002 A				y	1.8E+002 N	1.1E+002 N	4.1E+001 N	6.1E+004 N	2.3E+003 N
2-METHYLANILINE	95534		2.40E-001 H				2.8E-001 C	2.6E-002 C	1.3E-002 C	2.4E+001 C	2.7E+000 C
4-(2-METHYL-4 CHLOROPHENOXY) BUTYRIC ACID	94815	1.00E-002 I					3.7E+002 N	3.7E+001 N	1.4E+001 N	2.0E+004 N	7.8E+002 N
2-METHYL-4-CHLOROPHENOXYACETIC ACID (MCPA)	94746	5.00E-004 I					1.8E+001 N	1.8E+000 N	6.8E-001 N	1.0E+003 N	3.9E+001 N
2-(2-METHYL-4-CHLOROPHENOXY)PROPIONIC ACID (MCPP	93652	1.00E-003 I					3.7E+001 N	3.7E+000 N	1.4E+000 N	2.0E+003 N	7.8E+001 N
METHYLCYCLOHEXANE	108872			8.60E-001 H		y	6.3E+003 N	3.1E+003 N			
METHYLENE BROMIDE	74953	1.00E-002 A				y	6.1E+001 N	3.7E+001 N	1.4E+001 N	2.0E+004 N	7.8E+002 N
METHYLENE CHLORIDE	75092	6.00E-002 I	7.50E-003 I	8.60E-001 H	1.65E-003 I	y	4.1E+000 C	3.8E+000 C	4.2E-001 C	7.6E+002 C	8.5E+001 C
4,4'-METHYLENE BIS(2 CHLOROANILINE)	101144	7.00E-004 H	1.30E-001 H		1.30E-001 H		5.2E-001 C	4.8E-002 C	2.4E-002 C	4.4E+001 C	4.9E+000 C
4,4'-METHYLENE BIS(N,N'-DIMETHYL)ANILINE	101611		4.60E-002 I				1.5E+000 C	1.4E-001 C	6.9E-002 C	1.2E+002 C	1.4E+001 C
4,4'-METHYLENEDIPHENYL ISOCYANATE	101688			1.7E-004 I				6.2E-001 N			
METHYL ETHYL KETONE (2-BUTANONE)	78933	6.00E-001 I		2.86E-001 I		y	1.9E+003 N	1.0E+003 N	8.1E+002 N	1.2E+006 N	4.7E+004 N
METHYL HYDRAZINE	60344		1.10E+000 W				6.1E-002 C	5.7E-003 C	2.9E-003 C	5.2E+000 C	5.8E-001 C

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Chemical	CAS	RfDo mg/kg/d	CSFo 1/mg/kg/d	RfDi mg/kg/d	CSFi 1/mg/kg/d	VOC	Tap water ug/l	Ambient air ug/m3	Fish mg/kg	Soil Industrial mg/kg	Residential mg/kg
METHYL ISOBUTYL KETONE (4 METHYL-2-PENTANONE)	108101	8.00E-002 H		2.00E-002 A			2.9E+003 N	7.3E+001 N	1.1E+002 N	1.6E+005 N	6.3E+003 N
METHYL METHACRYLATE	80626	1.40E+000 I		2.00E-001 I		y	1.4E+003 N	7.3E+002 N	1.9E+003 N	2.9E+006 N	1.1E+005 N
2-METHYL-5 NITROANILINE	99558		3.30E-002 H				2.0E+000 C	1.9E-001 C	9.6E-002 C	1.7E+002 C	1.9E+001 C
METHYL PARATHION	298000	2.50E-004 I					9.1E+000 N	9.1E-001 N	3.4E-001 N	5.1E+002 N	2.0E+001 N
2-METHYLPHENOL	95487	5.00E-002 I					1.8E+003 N	1.8E+002 N	6.8E+001 N	1.0E+005 N	3.9E+003 N
3-METHYLPHENOL	108394	5.00E-002 I					1.8E+003 N	1.8E+002 N	6.8E+001 N	1.0E+005 N	3.9E+003 N
4-METHYLPHENOL	106445	5.00E-003 H					1.8E+002 N	1.8E+001 N	6.8E+000 N	1.0E+004 N	3.9E+002 N
METHYL STYRENE MIX	25013154	6.00E-003 A		1.00E-002 A		y	5.5E+001 N	3.7E+001 N	8.1E+000 N	1.2E+004 N	4.7E+002 N
ALPHA-METHYLSTYRENE	98839	7.00E-002 A				y	4.3E+002 N	2.6E+002 N	9.5E+001 N	1.4E+005 N	5.5E+003 N
METHYL TERT-BUTYL ETHER	1634044			8.57E-001 I		y	6.3E+003 N	3.1E+003 N			
METOLACHLOR (DUAL)	51218452	1.50E-001 I					5.6E+003 N	5.5E+002 N	2.0E+002 N	3.1E+005 N	1.2E+004 N
MIREX	2385855	2.00E-004 I				y	1.2E+000 N	7.3E-001 N	2.7E-001 N	4.1E+002 N	1.6E+001 N
MOLYBDENUM	7439987	5E-003 I					1.8E+002 N	1.8E+001 N	6.8E+000 N	1.0E+004 N	3.9E+002 N
MONOCHLORAMINE	10599903	1E-001 I					3.7E+003 N	3.7E+002 N	1.4E+002 N	2.0E+005 N	7.8E+003 N
NALED	300765	2E-003 I					7.3E+001 N	7.3E+000 N	2.7E+000 N	4.1E+003 N	1.6E+002 N
NICKEL REFINERY DUST					8.4E-001 I			7.5E-003 C			
NICKEL	7440020	2.00E-002 I					7.3E+002 N	7.3E+001 N	2.7E+001 N	4.1E+004 N	1.6E+003 N
NITRATE	14797558	1.60E+000 I					5.8E+004 N	5.8E+003 N	2.2E+003 N	3.3E+006 N	1.3E+005 N
NITRIC OXIDE	10102439	1.00E-001 W				y	6.1E+002 N	3.7E+002 N	1.4E+002 N	2.0E+005 N	7.8E+003 N
NITRITE	14797650	1.00E-001 I					3.7E+003 N	3.7E+002 N	1.4E+002 N	2.0E+005 N	7.8E+003 N
2-NITROANILINE	88744			5.70E-005 H				2.1E-001 N			
**NITROBENZENE	98953	5.00E-004 I		6.00E-004 A		y	3.5E+000 N	2.2E+000 N	6.8E-001 N	1.0E+003 N	3.9E+001 N
NITROFURANTOIN	67209	7.00E-002 H					2.6E+003 N	2.6E+002 N	9.5E+001 N	1.4E+005 N	5.5E+003 N
NITROFURAZONE	59870		1.50E+000 H				4.5E-002 C	4.2E-003 C	2.1E-003 C	3.8E+000 C	4.3E-001 C
NITROGEN DIOXIDE	10102440	1.00E+000 W				y	6.1E+003 N	3.7E+003 N	1.4E+003 N	2.0E+006 N	7.8E+004 N
**NITROGLYCERIN	55630		1.4E-002 E				4.8E+000 C	4.5E-001 C	2.3E-001 C	4.1E+002 C	4.6E+001 C
4-NITROPHENOL	100027	8.00E-003 E					2.9E+002 N	2.9E+001 N	1.1E+001 N	1.6E+004 N	6.3E+002 N
**2-NITROPROPANE	79469			5.70E-003 I	9.40E+000 H	y	1.3E-003 C	6.7E-004 C			
N-NITROSO-DI-N-BUTYLAMINE	924163		5.40E+000 I		5.60E+000 I		1.2E-002 C	1.1E-003 C	5.8E-004 C	1.1E+000 C	1.2E-001 C
N-NITROSODIETHANOLAMINE	1116547		2.80E+000 I				2.4E-002 C	2.2E-003 C	1.1E-003 C	2.0E+000 C	2.3E-001 C
N-NITROSODIETHYLAMINE	55185		1.50E+002 I		1.50E+002 I		4.5E-004 C	4.2E-005 C	2.1E-005 C	3.8E-002 C	4.3E-003 C
N-NITROSODIMETHYLAMINE	62759		5.10E+001 I		5.10E+001 I		1.3E-003 C	1.2E-004 C	6.2E-005 C	1.1E-001 C	1.3E-002 C
N-NITROSODIPHENYLAMINE	86306		4.90E-003 I				1.4E+001 C	1.3E+000 C	6.4E-001 C	1.2E+003 C	1.3E+002 C
N-NITROSODIPROPYLAMINE	621647		7.00E+000 I				9.6E-003 C	8.9E-004 C	4.5E-004 C	8.2E-001 C	9.1E-002 C
N-NITROSO-N-ETHYLUREA	759739		1.40E+002 H				4.8E-004 C	4.5E-005 C	2.3E-005 C	4.1E-002 C	4.6E-003 C
N-NITROSO-N-METHYLETHYLAMINE	10595956		2.20E+001 I				3.0E-003 C	2.8E-004 C	1.4E-004 C	2.6E-001 C	2.9E-002 C
N-NITROSOPYRROLIDINE	930552		2.10E+000 I		2.10E+000 I		3.2E-002 C	3.0E-003 C	1.5E-003 C	2.7E+000 C	3.0E-001 C
M-NITROTOLUENE	99081	2.00E-002 E				y	1.2E+002 N	7.3E+001 N	2.7E+001 N	4.1E+004 N	1.6E+003 N
O-NITROTOLUENE	88722	1.00E-002 H				y	6.1E+001 N	3.7E+001 N	1.4E+001 N	2.0E+004 N	7.8E+002 N
P-NITROTOLUENE	99990	1.00E-002 H				y	6.1E+001 N	3.7E+001 N	1.4E+001 N	2.0E+004 N	7.8E+002 N
**NUSTAR	85509199	7.00E-004 I					2.6E+000 N	2.6E+000 N	9.5E-001 N	1.4E+003 N	5.5E+001 N
ORYZALIN	19044883	5.00E-002 I					1.8E+003 N	1.8E+002 N	6.8E+001 N	1.0E+005 N	3.9E+003 N
OXADIAZON	19666309	5.00E-003 I					1.8E+002 N	1.8E+001 N	6.8E+000 N	1.0E+004 N	3.9E+002 N
OXAMYL	23135220	2.50E-002 I					9.1E+002 N	9.1E+001 N	3.4E+001 N	5.1E+004 N	2.0E+003 N
OXYFLUORFEN	42874033	3.00E-003 I					1.1E+002 N	1.1E+001 N	4.1E+000 N	6.1E+003 N	2.3E+002 N

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PARAQUAT DICHLORIDE	1910425	4.50E-003 I					1.6E+002 N	1.6E+001 N	6.1E+000 N	9.2E+003 N	3.5E+002 N
PARATHION	56382	6.00E-003 H					2.2E+002 N	2.2E+001 N	8.1E+000 N	1.2E+004 N	4.7E+002 N
PENTACHLOROBENZENE	608935	8.00E-004 I				y	4.9E+000 N	2.9E+000 N	1.1E+000 N	1.6E+003 N	6.3E+001 N
PENTACHLORONITROBENZENE	82688	3.00E-003 I	2.60E-001 H			y	4.1E-002 C	2.4E-002 C	1.2E-002 C	2.2E+001 C	2.6E+000 C
PENTACHLOROPHENOL	87865	3.00E-002 I	1.20E-001 I				5.6E-001 C	5.2E-002 C	2.6E-002 C	4.8E+001 C	5.3E+000 C
PERMETHRIN	52645531	5.00E-002 I					1.8E+003 N	1.8E+002 N	6.8E+001 N	1.0E+005 N	3.9E+003 N
PHENOL	108952	6.00E-001 I					2.2E+004 N	2.2E+003 N	8.1E+002 N	1.2E+006 N	4.7E+004 N
M-PHENYLENEDIAMINE	108452	6.00E-003 I					2.2E+002 N	2.2E+001 N	8.1E+000 N	1.2E+004 N	4.7E+002 N
O-PHENYLENEDIAMINE	95545		4.70E-002 H				1.4E+000 C	1.3E-001 C	6.7E-002 C	1.2E+002 C	1.4E+001 C
P-PHENYLENEDIAMINE	106503	1.90E-001 H					6.9E+003 N	6.9E+002 N	2.6E+002 N	3.9E+005 N	1.5E+004 N
2-PHENYLPHENOL	90437		1.90E-003 H				3.5E+001 C	3.3E+000 C	1.7E+000 C	3.0E+003 C	3.4E+002 C
PHOSPHINE	7803512	3.00E-004 I		8.60E-005 I			1.1E+001 N	3.1E-001 N	4.1E-001 N	6.1E+002 N	2.3E+001 N
PHOSPHORIC ACID	7664382			2.90E-003 I				1.1E+001 N			
PHOSPHORUS (WHITE)	7723140	2.00E-005 I					7.3E-001 N	7.3E-002 N	2.7E-002 N	4.1E+001 N	1.6E+000 N
P-PHTHALIC ACID	100210	1.00E+000 H					3.7E+004 N	3.7E+003 N	1.4E+003 N	2.0E+006 N	7.8E+004 N
PHTHALIC ANHYDRIDE	85449	2.00E+000 I		3.43E-002 H			7.3E+004 N	1.3E+002 N	2.7E+003 N	4.1E+006 N	1.6E+005 N
POLYBROMINATED BIPHENYLS		7.00E-006 H	8.90E+000 H				7.5E-003 C	7.0E-004 C	3.5E-004 C	6.4E-001 C	7.2E-002 C I
POLYCHLORINATED BIPHENYLS	1336363		2.00E+000 I		2.00E+000 I		3.3E-002 C	3.1E-003 C	1.6E-003 C	2.9E+000 C	3.2E-001 C
AROCLOR-1016	12674112	7.00E-005 I	7.00E-002 I		7.00E-002 I		9.6E-001 C I	8.9E-002 C I	4.5E-002 C I	8.2E+001 C I	5.5E+000 N
AROCLOR-1221	11104282		2.00E+000 I		2.00E+000 I		3.3E-002 C	3.1E-003 C	1.6E-003 C	2.9E+000 C	3.2E-001 C
AROCLOR-1232	11141165		2.00E+000 I		2.00E+000 I		3.3E-002 C	3.1E-003 C	1.6E-003 C	2.9E+000 C	3.2E-001 C
AROCLOR-1242	53469219		2.00E+000 I		2.00E+000 I		3.3E-002 C	3.1E-003 C	1.6E-003 C	2.9E+000 C	3.2E-001 C
AROCLOR-1248	12672296		2.00E+000 I		2.00E+000 I		3.3E-002 C	3.1E-003 C	1.6E-003 C	2.9E+000 C	3.2E-001 C
AROCLOR-1254	11097691	2.00E-005 I	2.00E+000 ,		2.00E+000 I		3.3E-002 C	3.1E-003 C	1.6E-003 C	2.9E+000 C	3.2E-001 C I
AROCLOR-1260	11096825		2.00E+000 I		2.00E+000 I		3.3E-002 C	3.1E-003 C	1.6E-003 C	2.9E+000 C	3.2E-001 C
POLYCHLORINATED TERPHENYLS	61788338		4.50E+000 E				1.5E-002 C	1.4E-003 C	7.0E-004 C	1.3E+000 C	1.4E-001 C
POLYNUCLEAR AROMATIC HYDROCARBONS:											
ACENAPHTHENE	83329	6.00E-002 I					2.2E+003 N	2.2E+002 N	8.1E+001 N	1.2E+005 N	4.7E+003 N
ANTHRACENE	120127	3.00E-001 I					1.1E+004 N	1.1E+003 N	4.1E+002 N	6.1E+005 N	2.3E+004 N
BENZ[A]ANTHRACENE	56553		7.30E-001 E				9.2E-002 C	8.6E-003 C	4.3E-003 C	7.8E+000 C	8.7E-001 C
BENZO[B]FLUORANTHENE	205992		7.30E-001 E				9.2E-002 C	8.6E-003 C	4.3E-003 C	7.8E+000 C	8.7E-001 C
BENZO[K]FLUORANTHENE	207089		7.30E-002 E				9.2E-001 C	8.6E-002 C	4.3E-002 C	7.8E+001 C	8.7E+000 C
BENZO[A]PYRENE	50328		7.30E+000 I		3.10E+000 E		9.2E-003 C	2.0E-003 C	4.3E-004 C	7.8E-001 C	8.7E-002 C
CARBAZOLE	86748		2.00E-002 H				3.3E+000 C	3.1E-001 C	1.6E-001 C	2.9E+002 C	3.2E+001 C
CHRYSENE	218019		7.30E-003 E				9.2E+000 C	8.6E-001 C	4.3E-001 C	7.8E+002 C	8.7E+001 C
DIBENZ[A,H]ANTHRACENE	53703		7.30E+000 E				9.2E-003 C	8.6E-004 C	4.3E-004 C	7.8E-001 C	8.7E-002 C
**DIBENZOFURAN	132649	4.00E-003 E				y	2.4E+001 N	1.5E+001 N	5.4E+000 N	8.2E+003 N	3.1E+002 N
FLUORANTHENE	206440	4.00E-002 I					1.5E+003 N	1.5E+002 N	5.4E+001 N	8.2E+004 N	3.1E+003 N
FLUORENE	86737	4.00E-002 I					1.5E+003 N	1.5E+002 N	5.4E+001 N	8.2E+004 N	3.1E+003 N
INDENO[1,2,3-C,D]PYRENE	193395		7.30E-001 E				9.2E-002 C	8.6E-003 C	4.3E-003 C	7.8E+000 C	8.7E-001 C
**2-METHYLNAPHTHALENE	91576	2.00E-002 O				y	1.2E+002 N	7.3E+001 N	2.7E+001 N	4.1E+004 N	1.6E+003 N
**NAPHTHALENE	91203	2.00E-002 I		9.00E-004 I			7.3E+002 N	3.3E+000 N	2.7E+001 N	4.1E+004 N	1.6E+003 N
PYRENE	129000	3.00E-002 I					1.1E+003 N	1.1E+002 N	4.1E+001 N	6.1E+004 N	2.3E+003 N
PROMETON	1610180	1.50E-002 I					5.5E+002 N	5.5E+001 N	2.0E+001 N	3.1E+004 N	1.2E+003 N
PROMETRYN	7287196	4.00E-003 I					1.5E+002 N	1.5E+001 N	5.4E+000 N	8.2E+003 N	3.1E+002 N

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Chemical	CAS	RfDo mg/kg/d	CSFo 1/mg/kg/d	RfDi mg/kg/d	CSFi 1/mg/kg/d	VOC	Tap water ug/l	Ambient air ug/m3	Fish mg/kg	Soil Industrial mg/kg	Residential mg/kg
PROPACHLOR	1918167	1.30E-002 I					4.7E+002 N	4.7E+001 N	1.8E+001 N	2.7E+004 N	1.0E+003 N
PROPANIL	709988	5.00E-003 I					1.8E+002 N	1.8E+001 N	6.8E+000 N	1.0E+004 N	3.9E+002 N
PROPARGITE	2312358	2.00E-002 I					7.3E+002 N	7.3E+001 N	2.7E+001 N	4.1E+004 N	1.6E+003 N
N-PROPYLBENZENE		1.00E-002 E				y	6.1E+001 N	3.7E+001 N	1.4E+001 N	2.0E+004 N	7.8E+002 N
PROPYLENE GLYCOL	57556	2.00E+001 H					7.3E+005 N	7.3E+004 N	2.7E+004 N	4.1E+007 N	1.6E+006 N
PROPYLENE GLYCOL, MONOETHYL ETHER	52125538	7.00E-001 H					2.6E+004 N	2.6E+003 N	9.5E+002 N	1.4E+006 N	5.6E+004 N
PROPYLENE GLYCOL, MONOMETHYL ETHER	107982	7.00E-001 H		5.70E-001 I			2.6E+004 N	2.1E+003 N	9.5E+002 N	1.4E+006 N	5.5E+004 N
PURSUIT	81335775	2.50E-001 I					9.1E+003 N	9.1E+002 N	3.4E+002 N	5.1E+005 N	2.0E+004 N
PYRIDINE	110861	1.00E-003 I					3.7E+001 N	3.7E+000 N	1.4E+000 N	2.0E+003 N	7.8E+001 N
QUINOLINE	91225		1.20E+001 H				5.6E-003 C	5.2E-004 C	2.6E-004 C	4.8E-001 C	5.3E-002 C
RDX	121824	3.00E-003 I	1.10E-001 I				6.1E-001 C	5.7E-002 C	2.9E-002 C	5.2E+001 C	5.8E+000 C
RESMETHRIN	10453868	3.00E-002 I					1.1E+003 N	1.1E+002 N	4.1E+001 N	6.1E+004 N	2.3E+003 N
**RONNEL	299843	5.00E-002 H				y	3.0E+002 N	1.8E+002 N	6.8E+001 N	1.0E+005 N	3.9E+003 N
ROTENONE	83794	4.00E-003 I					1.5E+002 N	1.5E+001 N	5.4E+000 N	8.2E+003 N	3.1E+002 N
SELENIOUS ACID	7783008	5.00E-003 I					1.8E+002 N	1.8E+001 N	6.8E+000 N	1.0E+004 N	3.9E+002 N
SELENIUM	7782492	5.00E-003 I					1.8E+002 N	1.8E+001 N	6.8E+000 N	1.0E+004 N	3.9E+002 N
SILVER	7440224	5.00E-003 I					1.8E+002 N	1.8E+001 N	6.8E+000 N	1.0E+004 N	3.9E+002 N
SIMAZINE	122349	5.00E-003 I	1.20E-001 H				5.6E-001 C	5.2E-002 C	2.6E-002 C	4.8E+001 C	5.3E+000 C
SODIUM AZIDE	26628228	4.00E-003 I					1.5E+002 N	1.5E+001 N	5.4E+000 N	8.2E+003 N	3.1E+002 N
SODIUM DIETHYLDITHIOCARBAMATE	148185	3.00E-002 I	2.70E-001 H				2.5E-001 C	2.3E-002 C	1.2E-002 C	2.1E+001 C	2.4E+000 C
STRONTIUM, STABLE	7440246	6.00E-001 I					2.2E+004 N	2.2E+003 N	8.1E+002 N	1.2E+006 N	4.7E+004 N
STRYCHNINE	57249	3.00E-004 I					1.1E+001 N	1.1E+000 N	4.1E-001 N	6.1E+002 N	2.3E+001 N
STYRENE	100425	2.00E-001 I		2.86E-001 I		y	1.6E+003 N	1.0E+003 N	2.7E+002 N	4.1E+005 N	1.6E+004 N
2,3,7,8 TETRACHLORODIBENZODIOXIN	1746016		1.50E+005 H		1.50E+005 H		4.5E-007 C	4.2E-008 C	2.1E-008 C	3.8E-005 C	4.3E-006 C
1,2,4,5-TETRACHLOROBENZENE	95943	3.00E-004 I				y	1.8E+000 N	1.1E+000 N	4.1E-001 N	6.1E+002 N	2.3E+001 N
1,1,1,2 TETRACHLOROETHANE	630206	3.00E-002 I	2.60E-002 I		2.60E-002 I	y	4.1E-001 C	2.4E-001 C	1.2E-001 C	2.2E+002 C	2.5E+001 C
**1,1,2,2-TETRACHLOROETHANE	79345	6.00E-002 E	2.00E-001 I		2.00E-001 I	y	5.3E-002 C	3.1E-002 C	1.6E-002 C	2.9E+001 C	3.2E+000 C
TETRACHLOROETHENE	127184	1.00E-002 I	5.20E-002 E	1.4E-001 E	2.00E-003 E	y	1.1E+000 C	3.1E+000 C	6.1E-002 C	1.1E+002 C	1.2E+001 C
2,3,4,6 TETRACHLOROPHENOL	58902	3.00E-002 I					1.1E+003 N	1.1E+002 N	4.1E+001 N	6.1E+004 N	2.3E+003 N
P,A,A,A-TETRACHLOROTOLUENE	5216251		2.00E+001 H			y	5.3E-004 C	3.1E-004 C	1.6E-004 C	2.9E-001 C	3.2E-002 C
1,1,1,2-TETRAFLUOROETHANE	811972			2.29E+001 I		y	1.7E+005 N	8.4E+004 N			
TETRYL	479458	1.00E-002 H					3.7E+002 N	3.7E+001 N	1.4E+001 N	2.0E+004 N	7.8E+002 N
THALLIC OXIDE	1314325	7.00E-005 W					2.6E+000 N	2.6E-001 N	9.5E-002 N	1.4E+002 N	5.5E+000 N
THALLIUM	7440280	7.00E-005 O					2.6E+000 N	2.6E-001 N	9.5E-002 N	1.4E+002 N	5.5E+000 N
THALLIUM ACETATE	563688	9.00E-005 I					3.3E+000 N	3.3E-001 N	1.2E-001 N	1.8E+002 N	7.0E+000 N
THALLIUM CARBONATE	6533739	8.00E-005 I					2.9E+000 N	2.9E-001 N	1.1E-001 N	1.6E+002 N	6.3E+000 N
THALLIUM CHLORIDE	7791120	8.00E-005 I					2.9E+000 N	2.9E-001 N	1.1E-001 N	1.6E+002 N	6.3E+000 N
THALLIUM NITRATE	10102451	9.00E-005 I					3.3E+000 N	3.3E-001 N	1.2E-001 N	1.8E+002 N	7.0E+000 N
THALLIUM SULFATE (2:1)	7446186	8.00E-005 I					2.9E+000 N	2.9E-001 N	1.1E-001 N	1.6E+002 N	6.3E+000 N
THIOBENCARB	28249776	1.00E-002 I					3.7E+002 N	3.7E+001 N	1.4E+001 N	2.0E+004 N	7.8E+002 N
TIN	7440315	6.00E-001 H					2.2E+004 N	2.2E+003 N	8.1E+002 N	1.2E+006 N	4.7E+004 N
TITANIUM	7440326	4.00E+000 E		8.60E-003 E			1.5E+005 N	3.1E+001 N	5.4E+003 N	8.2E+006 N	3.1E+005 N

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E = EPA NCEA provisional value, O = other

Basis: C = Carcinogenic effects, N = Noncarcinogenic effects, I = RBC at HI of 0.1 < RBC-c

Chemical	CAS	RfDo mg/kg/d	CSFo 1/mg/kg/d	RfDi mg/kg/d	CSFi 1/mg/kg/d	VOC	Risk-based concentrations: Tap water ug/l	Ambient air ug/m3	Fish mg/kg	Soil Industrial mg/kg	Residential mg/kg
TITANIUM DIOXIDE	13463677	4.00E+000 E		8.60E-003 E			1.5E+005 N	3.1E+001 N	5.4E+003 N	8.2E+006 N	3.1E+005 N
TOLUENE	108883	2.00E-001 I		1.14E-001 I		y	7.5E+002 N	4.2E+002 N	2.7E+002 N	4.1E+005 N	1.6E+004 N
TOLUENE-2,4 DIAMINE	95807		3.20E+000 H				2.1E-002 C	2.0E-003 C	9.9E-004 C	1.8E+000 C	2.0E-001 C
TOLUENE-2,5-DIAMINE	95705	6.00E-001 H					2.2E+004 N	2.2E+003 N	8.1E+002 N	1.2E+006 N	4.7E+004 N
TOLUENE-2,6-DIAMINE	823405	2.00E-001 H					7.3E+003 N	7.3E+002 N	2.7E+002 N	4.1E+005 N	1.6E+004 N
P-TOLUIDINE	106490		1.90E-001 H				3.5E-001 C	3.3E-002 C	1.7E-002 C	3.0E+001 C	3.4E+000 C
**TOXAPHENE	8001352		1.10E+000 I		1.10E+000 I	y	9.6E-003 C	5.7E-003 C	2.9E-003 C	5.2E+000 C	5.8E-001 C
1,2,4-TRIBROMOBENZENE	615543	5.00E-003 I				y	3.0E+001 N	1.8E+001 N	6.8E+000 N	1.0E+004 N	3.9E+002 N
TRIBUTYLTIN OXIDE	56359	3.00E-004 I					1.1E+001 N	1.1E+000 N	4.1E-001 N	6.1E+002 N	2.3E+001 N
2,4,6-TRICHLOROANILINE	634935		3.40E-002 H				2.0E+000 C	1.8E-001 C	9.3E-002 C	1.7E+002 C	1.9E+001 C
1,2,4-TRICHLOROBENZENE	120821	1.00E-002 I		5.70E-002 H		y	1.9E+002 N	2.1E+002 N	1.4E+001 N	2.0E+004 N	7.8E+002 N
1,1,1-TRICHLOROETHANE	71556	2.00E-002 E		2.86E-001 E		y	5.4E+002 N	1.0E+003 N	2.7E+001 N	4.1E+004 N	1.6E+003 N
1,1,2-TRICHLOROETHANE	79005	4.00E-003 I	5.70E-002 I		5.60E-002 I	y	1.9E-001 C	1.1E-001 C	5.5E-002 C	1.0E+002 C	1.1E+001 C
TRICHLOROETHENE	79016	6.00E-003 E	1.10E-002 E		6.00E-003 E	y	1.6E+000 C	1.0E+000 C	2.9E-001 C	5.2E+002 C	5.8E+001 C I
TRICHLOROFLUOROMETHANE	75694	3.00E-001 I		2.00E-001 A		y	1.3E+003 N	7.3E+002 N	4.1E+002 N	6.1E+005 N	2.3E+004 N
2,4,5-TRICHLOROPHENOL	95954	1.00E-001 I					3.7E+003 N	3.7E+002 N	1.4E+002 N	2.0E+005 N	7.8E+003 N
2,4,6-TRICHLOROPHENOL	88062		1.10E-002 I		1.00E-002 I		6.1E+000 C	6.3E-001 C	2.9E-001 C	5.2E+002 C	5.8E+001 C
2,4,5-T	93765	1.00E-002 I					3.7E+002 N	3.7E+001 N	1.4E+001 N	2.0E+004 N	7.8E+002 N
2-(2,4,5-TRICHLOROPHENOXY)PROPIONIC ACID	93721	8.00E-003 I					2.9E+002 N	2.9E+001 N	1.1E+001 N	1.6E+004 N	6.3E+002 N
1,1,2-TRICHLOROPROPANE	598776	5.00E-003 I				y	3.0E+001 N	1.8E+001 N	6.8E+000 N	1.0E+004 N	3.9E+002 N
1,2,3-TRICHLOROPROPANE	96184	6.00E-003 I	7.00E+000 H			y	1.5E-003 C	8.9E-004 C	4.5E-004 C	8.2E-001 C	9.1E-002 C
1,2,3-TRICHLOROPROPENE	96195	5.00E-003 H				y	3.0E+001 N	1.8E+001 N	6.8E+000 N	1.0E+004 N	3.9E+002 N
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76131	3.00E+001 I		8.60E+000 H		y	5.9E+004 N	3.1E+004 N	4.1E+004 N	6.1E+007 N	2.3E+006 N
1,2,4-TRIMETHYLBENZENE	95636	5.00E-002 E		1.70E-003 E		y	1.2E+001 N	6.2E+000 N	6.8E+001 N	1.0E+005 N	3.9E+003 N
1,3,5-TRIMETHYLBENZENE	108678	5.00E-002 E		1.70E-003 E		y	1.2E+001 N	6.2E+000 N	6.8E+001 N	1.0E+005 N	3.9E+003 N
TRIMETHYL PHOSPHATE	512561		3.70E-002 H				1.8E+000 C	1.7E-001 C	8.5E-002 C	1.5E+002 C	1.7E+001 C
1,3,5-TRINITROBENZENE	99354	3.00E-002 I					1.1E+003 N	1.1E+002 N	4.1E+001 N	6.1E+004 N	2.3E+003 N
2,4,6-TRINITROTOLUENE	118967	5.00E-004 I	3.00E-002 I				2.2E+000 C I	2.1E-001 C I	1.1E-001 C I	1.9E+002 C I	2.1E+001 C I
URANIUM (SOLUBLE SALTS)		3.00E-003 I					1.1E+002 N	1.1E+001 N	4.1E+000 N	6.1E+003 N	2.3E+002 N
VANADIUM	7440622	7.00E-003 H					2.6E+002 N	2.6E+001 N	9.5E+000 N	1.4E+004 N	5.5E+002 N
VANADIUM PENTOXIDE	1314621	9.00E-003 I					3.3E+002 N	3.3E+001 N	1.2E+001 N	1.8E+004 N	7.0E+002 N
VANADIUM SULFATE	16785812	2.00E-002 H					7.3E+002 N	7.3E+001 N	2.7E+001 N	4.1E+004 N	1.6E+003 N
VINCLOZOLIN	50471448	2.50E-002 I					9.1E+002 N	9.1E+001 N	3.4E+001 N	5.1E+004 N	2.0E+003 N
VINYL ACETATE	108054	1.00E+000 H		5.71E-002 I		y	4.1E+002 N	2.1E+002 N	1.4E+003 N	2.0E+006 N	7.8E+004 N
VINYL CHLORIDE	75014		1.90E+000 H		3.00E-001 H	y	1.9E-002 C	2.1E-002 C	1.7E-003 C	3.0E+000 C	3.4E-001 C
WARFARIN	81812	3.00E-004 I					1.1E+001 N	1.1E+000 N	4.1E-001 N	6.1E+002 N	2.3E+001 N
M-XYLENE	108383	2.00E+000 H				y	1.2E+004 N	7.3E+003 N	2.7E+003 N	4.1E+006 N	1.6E+005 N
O-XYLENE	95476	2.00E+000 H				y	1.2E+004 N	7.3E+003 N	2.7E+003 N	4.1E+006 N	1.6E+005 N
P-XYLENE	106423					y					
XYLENES	1330207	2.00E+000 I				y	1.2E+004 N	7.3E+003 N	2.7E+003 N	4.1E+006 N	1.6E+005 N
ZINC	7440666	3.00E-001 I					1.1E+004 N	1.1E+003 N	4.1E+002 N	6.1E+005 N	2.3E+004 N
ZINC PHOSPHIDE	1314847	3E-004 I					1.1E+001 N	1.1E+000 N	4.1E-001 N	6.1E+002 N	2.3E+001 N
ZINEB	12122677	5E-002 I					1.8E+003 N	1.8E+002 N	6.8E+001 N	1.0E+005 N	3.9E+003 N

APPENDIX E

FEDERAL AMBIENT WATER QUALITY CRITERIA

Federal Register

Thursday
December 10, 1998

Part IV

Environmental Protection Agency

National Recommended Water Quality Criteria; Notice; Republication

ENVIRONMENTAL PROTECTION AGENCY

[RL-OW-6186-6a]

National Recommended Water Quality Criteria; Republication

Editorial Note: FR Doc. 98-30272 was originally published as Part IV (63 FR 67548-67558) in the issue of Monday, December 7, 1998. At the request of the agency, due to incorrect footnote identifiers in the tables, the corrected document is being republished in its entirety.

AGENCY: Environmental Protection Agency (EPA).

ACTION: Compilation of recommended water quality criteria and notice of process for new and revised criteria.

SUMMARY: EPA is publishing a compilation of its national recommended water quality criteria for 157 pollutants, developed pursuant to section 304(a) of the Clean Water Act (CWA or the Act). These recommended criteria provide guidance for States and Tribes in adopting water quality standards under section 303(c) of the CWA. Such standards are used in implementing a number of environmental programs, including setting discharge limits in National Pollutant Discharge Elimination System (NPDES) permits. These water quality criteria are not regulations, and do not impose legally binding requirements on EPA, States, Tribes or the public.

This document also describes changes in EPA's process for deriving new and revised 304(a) criteria. Comments provided to the Agency about the content of this Notice will be considered in future publications of water quality criteria and in carrying out the process for deriving water quality criteria. With this improved process the public will have more opportunity to provide data and views for consideration by EPA. The public may send any comments or observations regarding the compilation format or the process for deriving new or revised water quality criteria to the Agency now, or anytime while the process is being implemented.

ADDRESSES: A copy of the document, "National Recommended Water Quality Criteria" is available from the U.S. EPA, National Center for Environmental Publications and Information, 11029 Kenwood Road, Cincinnati, Ohio 45242, phone (513) 489-8190. The publication is also available electronically at: http://www.epa.gov/ost. Send an original and copies of written comments to W-98-4 Comment Clerk, Water Docket, MC 4104, US EPA, 401 M Street, S.W., Washington, D.C. 20460. Comments may also be submitted electronically to OW-Docket@epamail.epa.gov. Comments should be submitted as a WP5.1, 6.1 or an ASCII file with no form of encryption. The documents cited in the compilation of recommended criteria are available for inspection from 9 to 4 p.m., Monday through Friday, excluding legal holidays, at the Water Docket, EB57, East Tower Basement, USEPA, 401 M St., S.W., Washington, D.C. 20460. For access to these materials, please call (202) 260-3027 to schedule an appointment.

FOR FURTHER INFORMATION CONTACT: Cindy A. Roberts, Health and Ecological Criteria Division (4304), U.S. EPA, 401 M. Street, S.W., Washington, D.C. 20460; (202) 260-2787; roberts.cindy@epamail.epa.gov.

SUPPLEMENTARY INFORMATION:

I. What Are Water Quality Criteria?

Section 304(a)(1) of the Clean Water Act requires EPA to develop and publish, and from time to time revise, criteria for water quality accurately reflecting the latest scientific knowledge. Water quality criteria developed under section 304(a) are based solely on data and scientific judgments on the relationship between pollutant concentrations and environmental and human health effects. Section 304(a) criteria do not reflect consideration of economic impacts or the technological feasibility of meeting the chemical concentrations in ambient water. Section 304(a) criteria provide guidance to States and Tribes in adopting water quality standards that ultimately provide a basis for controlling discharges or releases of pollutants. The criteria also provide guidance to EPA when promulgating federal regulations under section 303(c) when such action is necessary.

II. What is in the Compilation Published Today?

EPA is today publishing a compilation of its national recommended water quality criteria for 157 pollutants. This compilation is also available in hard copy at the address given above.

The compilation is presented as a summary table containing EPA's water quality criteria for 147 pollutants, and for an additional 10 pollutants, criteria solely for organoleptic effects. For each set of criteria, EPA lists a **Federal Register** citation, EPA document number or Integrated Risk Information System (IRIS) entry (www.epa.gov/ngispgm3/iris/irisdat). Specific information pertinent to the derivation of individual criteria may be found in cited references. If no criteria are listed for a pollutant, EPA does not have any national recommended water quality criteria.

These water quality criteria are the Agency's current recommended 304(a) criteria, reflecting the latest scientific knowledge. They are generally applicable to the waters of the United States. EPA recommends that States and Tribes use these water quality criteria as guidance in adopting water quality standards pursuant to section 303(c) of the Act and the implementing of federal regulations at 40 CFR part 131. Water quality criteria derived to address site-specific situations are not included; EPA recommends that States and Tribes follow EPA's technical guidance in the "Water Quality Standards Handbook—2nd Edition," EPA, August 1994, in deriving such site-specific criteria. EPA recognizes that in limited circumstances there may be regulatory voids in the absence of State or Tribal water quality standards for specific pollutants. However, States and Tribes should utilize the existing State and Tribal narrative criteria to address such situations; States and Tribes may consult EPA criteria documents and cites in the summary table for additional information.

The national recommended water quality criteria include: previously published criteria that are unchanged; criteria that have been recalculated from earlier criteria; and newly calculated criteria, based on peer-reviewed assessments, methodologies and data, that have not been previously published.

The information used to calculate the water quality criteria is not included in the summary table. Most information has been previously published by the Agency in a variety of sources, and the summary table cites those sources.

When using these 304(a) criteria as guidance in adopting water quality standards, EPA recommends States and Tribes consult the citations referenced in the summary table for additional information regarding the derivation of individual criteria.

The Agency intends to revise the compilation of national recommended water quality criteria from time to time to keep States and Tribes informed as to the most current recommended water quality criteria.

III. How Are National Recommended Water Quality Criteria Used?

Once new or revised 304(a) criteria are published by EPA, the Agency expects States and Tribes to adopt promptly new or revised numeric water quality criteria into their standards consistent with one of the three options

in 40 CFR 131.11. These options are: (1) Adopt the recommended section 304(a) criteria; (2) adopt section 304(a) criteria modified to reflect site-specific conditions; or, (3) adopt criteria derived using other scientifically defensible methods. In adopting criteria under option (2) or (3), States and Tribes must adopt water quality criteria sufficient to protect the designated uses of their waters. When establishing a numerical value based on 304(a) criteria, States and Tribes may reflect site specific conditions or use other scientifically defensible methods. However, States and Tribes should not selectively apply data or selectively use endpoints, species, risk levels, or exposure parameters in deriving criteria; this would not accurately characterize risk and would not result in criteria protective of designated uses.

EPA emphasizes that, in the course of carrying out its responsibilities under section 303(c), it reviews State and Tribal water quality standards to assess the need for new or revised water quality criteria. EPA generally believes that five years from the date of EPA's publication of new or revised water quality criteria is a reasonable time by which States and Tribes should take action to adopt new or revised water quality criteria necessary to protect the designated uses of their waters. This period is intended to accommodate those States and Tribes that have begun a triennial review and wish to complete the actions they have underway, deferring initiating adoption of new or revised section 304(a) criteria until the next triennial review.

IV. What is the Status of Existing Criteria While They Are Under Revision?

The question of the status of the existing section 304(a) criteria often arises when EPA announces that it is beginning a reassessment of existing criteria. The general answer is that water quality criteria published by EPA remain the Agency's recommended water quality criteria until EPA revises or withdraws the criteria. For example, while undertaking recent reassessments of dioxin, PCBs, and other chemicals, EPA has consistently upheld the use of the current section 304(a) criteria for these chemicals and considers them to be scientifically sound until new, peer reviewed, scientific assessments indicate changes are needed. Therefore, the criteria in today's notice are and will continue to be the Agency's national recommended water quality criteria for States and Tribes to use in adopting or revising their water quality standards until superseded by the publication of revised criteria, or withdrawn by notice in the **Federal Register**.

V. What is the Process for Developing New or Revised Criteria?

Section 304(a)(1) of the CWA requires the Agency to develop and publish, and from time to time revise, criteria for water quality accurately reflecting the latest scientific knowledge. The Agency has developed an improved process that it intends to use when deriving new criteria or conducting a major reassessment of existing criteria. The purpose of the improved process is to provide expanded opportunities for public input, and to make the process more efficient.

When deriving new criteria, or when initiating a major reassessment of existing criteria, EPA will take the following steps.

1. EPA will first undertake a comprehensive review of available data and information.

2. EPA will publish a notice in the **Federal Register** and on the Internet announcing its assessment or reassessment of the pollutant. The notice will describe the data available to the Agency, and will solicit any additional pertinent data or views that may be useful in deriving new or revised criteria. EPA is especially interested in hearing from the public regarding new data or information that was unavailable to the Agency, and scientific views as to the application of the relevant Agency methodology for deriving water quality criteria.

3. After public input is received and evaluated, EPA will then utilize information obtained from both the Agency's literature review and the public to develop draft recommended water quality criteria.

4. EPA will initiate a peer review of the draft criteria. Agency peer review consists of a documented critical review by qualified independent experts. Information about EPA peer review practices may be found in the Science Policy Council's Peer Review Handbook (EPA 100-B-98-001, www.epa.gov).

5. Concurrent with the peer review in step four, EPA will publish a notice in the **Federal Register** and on the Internet, of the availability of the draft water quality criteria and solicit views from the public on issues of science pertaining to the information used in deriving the draft criteria. The Agency believes it is important to provide the public with the opportunity to provide scientific views on the draft criteria even though we are not required to invite and respond to written comments.

6. EPA will evaluate the results of the peer review, and prepare a response document for the record in accordance with EPA's Peer Review Handbook. EPA at the same time will consider views provided by the public on issues of science. Major scientific issues will be addressed in the record whether from the peer review or the public.

7. EPA will then revise the draft criteria as necessary, and announce the availability of the final water quality criteria in the **Federal Register** and on the Internet.

VI. What is the Process for Minor Revisions to Criteria?

In addition to developing new criteria, and conducting major reassessments of existing criteria, EPA also from time to time recalculates criteria based on new information pertaining to individual components of the criteria. For example, in today's notice, EPA has recalculated a number of criteria based on new, peer-reviewed data contained in EPA's IRIS. Because such recalculations normally result in only minor changes to the criteria, do not ordinarily involve a change in the underlying scientific methodologies, and reflect peer-reviewed data, EPA will typically publish such recalculated criteria directly as the Agency's recommended water quality criteria. If it appears that a recalculation results in a significant change EPA will follow the process of peer review and public input outlined above. Further, when EPA recalculates national water quality criteria in the course of proposing or promulgating state-specific federal water quality standards pursuant to section 303(c), EPA will offer an opportunity for national public input on the recalculated criteria.

VII. How Does the Process Outlined Above Improve Public Input and Efficiency?

In the past, EPA developed draft criteria documents and announced their availability for public comment in the **Federal Register**. This led to new data and views coming to EPA's attention after draft criteria had already been developed. Responding to new data would sometimes lead to extensive revisions.

The steps outlined above improve the criteria development process in the following ways.

1. The new process is Internet-based which is in line with EPA policy for public access and dissemination of information gathered by EPA. Use of the Internet will allow the public to be more engaged in the criteria development process than previously and to more

knowledgeably follow criteria development. For new criteria or major revisions, EPA will announce its intentions to derive the new or revised criteria on the Internet and include a list of the available literature. This will give the public an opportunity to provide additional data that might not otherwise be identified by the Agency.

2. The public now has two opportunities to contribute data and views, before development and during development, instead of a single opportunity after development.

3. EPA has instituted broader and more formal peer review procedures. This independent scientific review is a more rigorous disciplinary practice to ensure technical improvements in Agency decision making. Previously, EPA used the public comment process outlined above to obtain peer review. The new process allows for both public input and a formal peer review, resulting in a more thorough and complete evaluation of the criteria.

4. Announcing the availability of the draft water quality criteria on the Internet will give the public an opportunity to provide input on issues of science in a more timely manner.

VIII. Where Can I Find More Information About Water Quality Criteria and Water Quality Standards?

For more information about water quality criteria and Water Quality Standards refer to the following: Water Quality Standards Handbook (EPA 823-B94-005a); Advanced Notice of Proposed Rule Making (ANPRM), (63 FR 36742); Water Quality Criteria and Standards Plan—Priorities for the Future (EPA 822-R-98-003); Guidelines and Methodologies Used in the Preparation of Health Effects Assessment Chapters of the Consent Decree Water Criteria Documents (45 FR 79347); Draft Water Quality Criteria Methodology Revisions: Human Health (63 FR 43755, EPA 822-Z-98-001); and Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses (EPA 822/R-85-100); National Strategy for the Development of Regional Nutrient Criteria (EPA 822-R-98-002).

These publications may also be accessed through EPA's National Center for Environmental Publications and Information (NCEPI) or on the Office of Science and Technology's Home-page (www.epa.gov/OST).

IX. What Are the National Recommended Water Quality Criteria?

The following compilation and its associated footnotes and notes presents the national recommended water quality criteria.

NATIONAL RECOMMENDED WATER QUALITY CRITERIA FOR PRIORITY TOXIC POLLUTANTS

Priority pollutant	CAS No.	Freshwater		Saltwater		Human health for consumption of:		FR cite/source
		CMC (µg/L)	CCC (µg/L)	CMC (µg/L)	CCC (µg/L)	Water + organism (µg/L)	Organism only (µg/L)	
1 Antimony	7440360					14[B,Z]	4300[B]	57 FR 60848
2 Arsenic	7440382	340[A,D,K]	150[A,D,K]	69[A,D,bb]	36[A,D,bb]			62 FR 42160
						0.018[C,M,S]	0.14[C,M,S]	57 FR 60848
3 Beryllium	7440417					J,Z	J	62 FR 42160
4 Cadmium	7440439	4.3[D,E,K]	2.2[D,E,K]	42[D,bb]	9.3[D,bb]	J,Z	J	62 FR 42160
5a Chromium III	16065831	570[D,E,K]	74[D,E,K]					EPA 820/B–96–001
						J,Z Total	J	62 FR 42160
5b Chromium VI	18540299	16[D,K]	11[D,K]	1,100[D,bb]	50[D,bb]	J,Z Total	J	62 FR 42160
6 Copper	7440508	13[D,E,K,cc]	9.0[D,E,K,cc]	4.8[D,cc,ff]	3.1[D,cc,ff]	1,300[U]		62 FR 42160
7 Lead	7439921	65[D,E,bb,gg]	2.5[D,E,bb,gg]	210[D,bb]	8.1[D,bb]	J	J	62 FR 42160
8 Mercury	7439976	1.4[D,K,hh]	0.77[D,K,hh]	1.8[D,ee,hh]	0.94[D,ee,hh]	0.050[B]	0.051[B]	62 FR 42160
9 Nickel	7440020	470[D,E,K]	52[D,E,K]	74[D,bb]	8.2[D,bb]	610[B]	4,600[B]	62 FR 42160
10 Selenium	7782492	I,R,T	5.0[T]	290[D,bb,dd]	71[D,bb,dd]			62 FR 42160
						170[Z]	11,000	IRIS 09/01/91
11 Silver	7440224	3.4[D,E,G]		1.9[D,G]				62 FR 42160
12 Thallium	7440280					1.7[B]	6.3[B]	57 FR 60848
13 Zinc	7440666	120[D,E,K]	120[D,E,K]	90[D,bb]	81[D,bb]			62 FR 42160
						9,100[U]	69,000[U]	IRIS 10/01/92
14 Cyanide	57125	22[K,Q]	5.2[K,Q]					EPA 820/B–96–001
				1[Q,bb]	1[Q,bb]	700[B,Z]	220,000[B,H]	57 FR 60848
15 Asbestos	1332214					7 million fibers/L[I]		57 FR 60848
16 2, 3, 7, 8-TCDD Dioxin	1746016					1.3E–8[C]	1.4E–8[C]	62 FR 42160
17 Acrolein	107028					320	780	57 FR 60848
18 Acrylonitrile	107131					0.059[B,C]	0.66[B,C]	57 FR 60848
19 Benzene	71432					1.2[B,C]	71[B,C]	62 FR 42160
20 Bromoform	75252					4.3[B,C]	360[B,C]	62 FR 42160
21 Carbon Tetrachloride	56235					0.25[B,C]	4.4[B,C]	57 FR 60848
22 Chlorobenzene	108907					680[B,Z]	21,000[B,H]	57 FR 60848
23 Chlorodibromomethane	124481					0.41[B,C]	34[B,C]	62 FR 42160
24 Chloroethane	75003							
25 2-Chloroethylvinyl Ether	110758							
26 Chloroform	67663					5.7[B,C]	470[B,C]	62 FR 42160
27 Dichlorobromomethane	75274					0.56[B,C]	46[B,C]	62 FR 42160
28 1,1-Dichloroethane	75343							
29 1,2-Dichloroethane	107062					0.38[B,C]	99[B,C]	57 FR 60848
30 1,1-Dichloroethylene	75354					0.057[B,C]	3.2[B,C]	57 FR 60848
31 1,2-Dichloropropane	78875					0.52[B,C]	39[B,C]	62 FR 42160
32 1,3-Dichloropropene	542756					10[B]	1,700[B]	57 FR 60848
33 Ethylbenzene	100414					3,100[B,Z]	29,000[B]	62 FR 42160
34 Methyl Bromide	74839					48[B]	4000[B]	62 FR 42160
35 Methyl Chloride	74873					J	J	62 FR 42160
36 Methylene Chloride	75092					4.7[B,C]	1600[B,C]	62 FR 42160
37 1,1,2,2-Tetrachloroethane	79345					0.17[B,C]	11[B,C]	57 FR 60848
38 Tetrachloroethylene	127184					0.8[C]	8.85[C]	57 FR 60848
39 Toluene	108883					6,800[B,Z]	200,000[B]	62 FR 42160
40 1,2-Trans-Dichloroethylene	156605					700[B,Z]	140,000[B]	62 FR 42160
41 1,1,1-Trichloroethane	71556					J,Z	J	62 FR 42160
42 1,1,2-Trichloroethane	79005					0.60[B,C]	42[B,C]	57 FR 60848
43 Trichloroethylene	79016					2.7[C]	81[C]	57 FR 60848
44 Vinyl Chloride	75014					2.0[C]	525[C]	57 FR 60848
45 2-Chlorophenol	95578					120[B,U]	400[B,U]	62 FR 42160
46 2,4-Dichlorophenol	120832					93[B,U]	790[B,U]	57 FR 60848
47 2,4-Dimethylphenol	105679					540[B,U]	2,300[B,U]	62 FR 42160
48 2-Methyl-4,6-Dinitrophenol	534521					13.4	765	57 FR 60848
49 2,4-Dinitrophenol	51285					70[B]	14,000[B]	57 FR 60848
50 2-Nitrophenol	88755							
51 4-Nitrophenol	100027							
52 3-Methyl-4-Chlorophenol	59507					U	U	

NATIONAL RECOMMENDED WATER QUALITY CRITERIA FOR PRIORITY TOXIC POLLUTANTS—Continued

	Priority pollutant	CAS No.	Freshwater		Saltwater		Human health for consumption of:		FR cite/source
			CMC (µg/L)	CCC (µg/L)	CMC (µg/L)	CCC (µg/L)	Water + organism (µg/L)	Organism only (µg/L)	
53	Pentachlorophenol	87865	19[I,K]	15[I,K]	13[bb]	7.9[bb]	0.28[B,C]	8.2[B,C,H]	62 FR 42160
54	Phenol	108952					21,000[B,U]		62 FR 42160
								4,600,000[B,H,U]	57 FR 60848
55	2,4,6-Trichlorophenol	88062					2.1[B,C,U]	6.5[B,C]	62 FR 42160
56	Acenaphthene	83329					1,200[B,U]	2,700[B,U]	62 FR 42160
57	Acenaphthylene	208968							
58	Anthracene	120127					9,600[B]	110,000[B]	62 FR 42160
59	Benzidine	92875					0.00012[B,C]	0.00054[B,C]	57 FR 60848
60	BenzoaAnthracene	56553					0.0044[B,C]	0.049[B,C]	62 FR 42160
61	BenzoaPyrene	50328					0.0044[B,C]	0.049[B,C]	62 FR 42160
62	BenzobFluoranthene	205992					0.0044[B,C]	0.049[B,C]	62 FR 42160
63	BenzoghiPerylene	191242							
64	BenzokFluoranthene	207089					0.0044[B,C]	0.049[B,C]	62 FR 42160
65	Bis2-ChloroethoxyMethane	111911							
66	Bis2 ChloroethylEther	111444					0.031[B,C]	1.4[B,C]	57 FR 60848
67	Bis2-ChloroisopropylEther	39638329					1,400[B]		62 FR 42160
								170,000[B]	57 FR 60848
68	Bis2-EthylhexylPhthalate[X]	117817					1.8[B,C]	5.9[B,C]	57 FR 60848
69	4-Bromophenyl Phenyl Ether	101553							
70	Butylbenzyl Phthalate[W]	85687					3,000[B]	5,200[B]	62 FR 42160
71	2-Chloronaphthalene	91587					1,700[B]	4,300[B]	62 FR 42160
72	4-Chlorophenyl Phenyl Ether	7005723							
73	Chrysene	218019					0.0044[B,C]	0.049[B,C]	62 FR 42160
74	Dibenzoa,hAnthracene	53703					0.0044[B,C]	0.049[B,C]	62 FR 42160
75	1,2-Dichlorobenzene	95501					2,700[B,Z]	17,000[B]	62 FR 42160
76	1,3-Dichlorobenzene	541731					400	2,600	62 FR 42160
77	1,4-Dichlorobenzene	106467					400[Z]	2,600	62 FR 42160
78	3,3'-Dichlorobenzidine	91941					0.04[B,C]	0.077[B,C]	57 FR 60848
79	Diethyl Phthalate[W]	84662					23,000[B]	120,000[B]	57 FR 60848
80	Dimethyl Phthalate[W]	131113					313,000	2,900,000	57 FR 60848
81	Di-n-Butyl Phthalate[W]	84742					2,700[B]	12,000[B]	57 FR 60848
82	2,4-Dinitrotoluene	121142					0.11[C]	9.1[C]	57 FR 60848
83	2,6 Dinitrotoluene	606202							
84	Di-n-Octyl Phthalate	117840							
85	1,2-Diphenylhydrazine	122667					0.040[B,C]	0.54[B,C]	57 FR 60848
86	Fluoranthene	206440					300[B]	370[B]	62 FR 42160
87	Fluorene	86737					1,300[B]	14,000[B]	62 FR 42160
88	Hexachlorobenzene	118741					0.00075[B,C]	0.00077[B,C]	62 FR 42160
89	Hexachlorobutadiene	87683					0.44[B,C]	50[B,C]	57 FR 60848
90	Hexachlorocyclopentadiene	77474					240[B,U,Z]	17,000[B,H,U]	57 FR 60848
91	Hexachloroethane	67721					1.9[B,C]	8.9[B,C]	57 FR 60848
92	Ideno 1,2,3-cdPyrene	193395					0.0044[B,C]	0.049[B,C]	62 FR 42160
93	Isophorone	78591					36[B,C]	2,600[B,C]	IRIS 11/01/97
94	Naphthalene	91203							
95	Nitrobenzene	98953					17[B]	1,900[B,H,U]	57 FR 60848
96	N-Nitrosodimethylamine	62759					0.00069[B,C]	8.1[B,C]	57 FR 60848
97	N-Nitrosodi-n-Propylamine	621647					0.005[B,C]	1.4[B,C]	62 FR 42160
98	N-Nitrosodiphenylamine	86306					5.0[B,C]	16[B,C]	57 FR 60848
99	Phenanthrene	85018							
100	Pyrene	129000					960[B]	11,000[B]	62 FR 42160
101	1,2,4-Trichlorobenzene	120821					260[Z]	940	IRIS 11/01/96
102	Aldrin	309002	3.0[G]		1.3[G]		0.00013[B,C]	0.00014[B,C]	62 FR 42160
103	alpha-BHC	319846					0.0039[B,C]	0.013[B,C]	62 FR 42160
104	beta-BHC	319857					0.014[B,C]	0.046[B,C]	62 FR 42160
105	gamma-BHC (Lindane)	58899	0.95[K]		0.16[G]		0.019[C]	0.063[C]	62 FR 42160
106	delta-BHC	319868							
107	Chlordane	57749	2.4[G]	0.0043[G,aa]	0.09[G]	0.004[G,aa]			62 FR 42160
							0.0021[B,C]	0.0022[B,C]	IRIS 02/07/98

108	4,4'-DDT	50293	1.1[G]	0.001[G,aa]	0.13[G]	0.001[G,aa]	0.00059[B,C]	0.00059[B,C]	62 FR 42160
109	4,4'-DDE	72559					0.00059[B,C]	0.00059[B,C]	62 FR 42160
110	4,4'-DDD	72548					0.00083[B,C]	0.00084[B,C]	62 FR 42160
111	*Dieldrin*	60571	0.24[K]	0.056[K,O]	0.71[G]	0.0019[G,aa]	0.00014[B,C]	0.00014[B,C]	62 FR 42160
112	alpha-Endosulfan	959988	0.22[G,Y]	0.056[G,Y]	0.034[G,Y]	0.0087[G,Y]	110[B]	240[B]	62 FR 42160
113	beta-Endosulfan	33213659	0.22[G,Y]	0.056[G,Y]	0.034[G,Y]	0.0087[G,Y]	110[B]	240[B]	62 FR 42160
114	Endosulfan Sulfate	1031078					110[B]	240[B]	62 FR 42160
115	Endrin	72208	0.086[K]	0.036[K,O]	0.037[G]	0.0023[G,aa]	0.76[B]	0.81[B,H]	62 FR 42160
116	Endrin Aldehyde	7421934					0.76[B]	0.81[B,H]	62 FR 42160
117	Heptachlor	76448	0.52[G]	0.0038[G,aa]	0.053[G]	0.0036[G,aa]	0.00021[B,C]	0.00021[B,C]	62 FR 42160
118	Heptachlor Epoxide	1024573	0.52[G,V]	0.0038[G,V,aa]	0.053[G,V]	0.0036[G,V,aa]	0.00010[B,C]	0.00011[B,C]	62 FR 42160
119	Polychlorinated Biphenyls PCBs			0.014[N,aa]		0.03[N,aa]			62 FR 42160
							0.00017[B,C,P]	0.00017[B,C,P]	63 FR 16182
120	Toxaphene	8001352	0.73	0.0002[aa]	0.21	0.0002[aa]	0.00073[B,C]	0.00075[B,C]	62 FR 42160

Footnotes:

[A] This recommended water quality criterion was derived from data for arsenic (III), but is applied here to total arsenic, which might imply that arsenic (III) and arsenic (V) are equally toxic to aquatic life and that their toxicities are additive. In the arsenic criteria document (EPA 440/5–84–033, January 1985), Species Mean Acute Values are given for both arsenic (III) and arsenic (V) for five species and the ratios of the SMAVs for each species range from 0.6 to 1.7. Chronic values are available for both arsenic (III) and arsenic (V) for one species; for the fathead minnow, the chronic value for arsenic (V) is 0.29 times the chronic value for arsenic (III). No data are known to be available concerning whether the toxicities of the forms of arsenic to aquatic organisms are additive.

[B] This criterion has been revised to reflect The Environmental Protection Agency's q1* or RfD, as contained in the Integrated Risk Information System (IRIS) as of April 8, 1998. The fish tissue bioconcentration factor (BCF) from the 1980 Ambient Water Quality Criteria document was retained in each case.

[C] This criterion is based on carcinogenicity of 10^{-6} risk. Alternate risk levels may be obtained by moving the decimal point (e.g., for a risk level of 10^{-5}, move the decimal point in the recommended criterion one place to the right).

[D] Freshwater and saltwater criteria for metals are expressed in terms of the dissolved metal in the water column. The recommended water quality criteria value was calculated by using the previous 304(a) aquatic life criteria expressed in terms of total recoverable metal, and multiplying it by a conversion factor (CF). The term "Conversion Factor" (CF) represents the recommended conversion factor for converting a metal criterion expressed as the total recoverable fraction in the water column to a criterion expressed as the dissolved fraction in the water column. (Conversion Factors for saltwater CCCs are not currently available. Conversion factors derived for saltwater CMCs have been used for both saltwater CMCs and CCCs.) See "Office of Water Policy and Technical Guidance on Interpretation and Implementation of Aquatic Life Metals Criteria," October 1, 1993, by Martha G. Prothro, Acting Assistant Administrator for Water, available from the Water Resource center, USEPA, 401 M St., SW, mail code RC4100, Washington, DC 20460; and 40 CFR§ 131.36(b)(1). Conversion Factors applied in the table can be found in Appendix A to the Preamble—Conversion Factors for Dissolved Metals.

[E] The freshwater criterion for this metal is expressed as a function of hardness (mg/L) in the water column. The value given here corresponds to a hardness of 100 mg/L. Criteria values for other hardness may be calculated from the following: CMC (dissolved) = exp {m_A [ln(hardness)]+b_A} (CF), or CCC (dissolved) = exp {m_C [ln (hardness)]+b_C} (CF) and the parameters specified in Appendix B to the Preamble—Parameters for Calculating Freshwater Dissolved Metals Criteria That Are Hardness-Dependent.

[F] Freshwater aquatic life values for pentachlorophenol are expressed as a function of pH, and are calculated as follows: CMD=exp(1.005(pH) – 4.869); CCC=exp(1.005 (pH) – 5.134). Values displayed in table correspond to a pH of 7.8.

[G] This Criterion is based on 304(a) aquatic life criterion issued in 1980, and was issued in one of the following documents: Aldrin/Dieldrin (EPA 440/5–80–019), Chlordane (EPA 440/5–80–027), DDT (EPA 440/5–80–038), Endosulfan (EPA 440/5–80–046), Endrin (EPA 440/5–80–047), Heptachlor (440/5–80–052), Hexachlorocyclohexane (EPA 440/5–80–054), Silver (EPA 440/5–80–071). The Minimum Data Requirements and derivation procedures were different in the 1980 Guidelines than in the 1985 Guidelines. For example, a "CMC" derived using the 1980 Guidelines was derived to be used as an instantaneous maximum. If assessment is to be done using an averaging period, the values given should be divided by 2 to obtain a value that is more comparable to a CMC derived using the 1985 Guidelines.

[H] No criterion for protection of human health from consumption of aquatic organisms excluding water was presented in the 1980 criteria document or in the 1986 Quality Criteria for Water. Nevertheless, sufficient information was presented in the 1980 document to allow the calculation of a criterion, even though the results of such a calculation were not shown in the document.

[I] This criterion for asbestos is the Maximum Contaminant Level (MCL) developed under the Safe Drinking Water Act (SDWA).

[J] EPA has not calculated human health criterion for this contaminant. However, permit authorities should address this contaminant in NPDES permit actions using the State's existing narrative criteria for toxics.

[K] This recommended criterion is based on a 304(a) aquatic life criterion that was issued in the 1995 Updates: Water Quality Criteria Documents for the Protection of Aquatic Life in Ambient Water, (EPA–820–B–96–011, September 1996). This value was derived using the GLI Guidelines (60 FR 15393–15399, March 23, 1995; 40 CFR 132 Appendix A); the difference between the 1985 Guidelines and the GLI Guidelines are explained on page iv of the 1995 Updates. None of the decisions concerning the derivation of this criterion were affected by any considerations that are specific to the Great Lakes.

[L] The CMC=1/[(f1/CMC1)=(f2/CMC2)] where f1 and f2 are the fractions of total selenium that are treated as selenite and selenate, respectively, and CMC1 and CMC2 are 185.9 µg/l and 12.83 µg/l, respectively.

[M] EPA is currently reassessing the criteria for arsenic. Upon completion of the reassessment the Agency will publish revised criteria as appropriate.

[N] PCBs are a class of chemicals which include aroclors, 1242, 1254, 1221, 1232, 1248, 1260, and 1016, CAS numbers 53469219, 11097691, 11104282, 11141165, 12672296, 11096825 and 12674112 respectively. The aquatic life criteria apply to this set of PCBs.

[O] The derivation of the CCC for this pollutant did not consider exposure through the diet, which is probably important for aquatic life occupying upper trophic levels.

[P] This criterion applies to total pcbs, i.e., the sum of all congener or all isomer analyses.

[Q] This recommended water quality criterion is expressed as µg free cyanide (as CN)/L.

[R] This value was announced (61 FR 58444–58449, November 14, 1996) as a proposed GLI 303(c) aquatic life criterion. EPA is currently working on this criterion and so this value might change substantially in the near future.

[S] This recommended water quality criterion refers to the inorganic form only.

[T] This recommended water quality criterion is expressed in terms of total recoverable metal in the water column. It is scientifically acceptable to use the conversion factor of 0.922 that was used in the GLI to convert this to a value that is expressed in terms of dissolved metal.

[U] The organoleptic effect criterion is more stringent than the value for priority toxic pollutants.

[v] This value was derived from data for heptachlor and the criteria document provides insufficient data to estimate the relative toxicities of heptachlor and heptachlor epoxide.

[w] Although EPA has not published a final criteria document for this compound it is EPA's understanding that sufficient data exist to allow calculation of aquatic criteria. It is anticipated that industry intends to publish in the peer reviewed literature draft aquatic life criteria generated in accordance with EPA Guidelines. EPA will review such criteria for possible issuance as national WQC.

[x] There is a full set of aquatic life toxicity data that show that DEHP is not toxic to aquatic organisms at or below its solubility limit.

[y] This value was derived from data for endosulfan and is most appropriately applied to the sum of alpha-endosulfan and beta-endosulfan.

[z] A more stringent MCL has been issued by EPA. Refer to drinking water regulations (40 CFR 141) or Safe Drinking Water Hotline (1–800–426–4791) for values.

[aa] This CCC is based on the Final Residue Value procedure in the 1985 Guidelines. Since the publication of the Great Lakes Aquatic Life Criteria Guidelines in 1995 (60FR 15393–15399, March 23, 1995), the Agency no longer uses the Final Residue Value procedure for deriving CCCs for new or revised 304(a) aquatic life criteria.

[bb] This water quality criterion is based on 304(a) aquatic life criterion that was derived using the 1985 Guidelines (Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses, PB85–227049, January 1985) and was issued in one of the following criteria documents: Arsenic (EPA 440/5–84–033), Cadmium (EPA 440/5–84–032), Chromium (EPA 440/5–84–029), Copper (EPA 440/5–84–031), Cyanide (EPA 400/5–84–028), Lead (EPA 440/5–84–027), Nickel (EPA 440/5–86–004), Pentachlorophenol (EPA 440/5–86–009), Toxaphene (EPA 440/5–86–006), Zinc (EPA 440/5–87–003).

[cc] When the concentration of dissolved organic carbon is elevated, copper is substantially less toxic and use of Water-Effect Ratios might be appropriate.

[dd] The selenium criteria document (EPA 440/5–87–006), September 1987) provides that if selenium is as toxic to saltwater fishes in the field as it is to freshwater fishes in the field, the status of the fish community should be monitored whenever the concentration of selenium exceeds 5.0 µg/L in salt water because the saltwater CCC does not take into account uptake via the food chain.

[ee] This recommended water quality criterion was derived on page 43 of the mercury criteria document (EPA 440/5–84–026, January 1985). The saltwater CCC of 0.025 µg/L given on page 23 of the criteria document is based on the Final Residue Value procedure in the 1985 Guidelines. Since the publication of the Great Lakes Aquatic Life Criteria Guidelines in 1995 (60FR15393–15399, March 23, 1995), the Agency no longer uses the Final Residue Value procedure for deriving CCCs for new or revised 304(a) aquatic life criteria.

[ff] This recommended water quality criterion was derived in Ambient Water Quality Criteria Saltwater Copper Addendum (Draft, April 14, 1995) and was promulgated in the Interim Final National Toxics Rule (60FR22228–222237, May 4, 1995).

[gg] EPA is actively working on this criterion and so this recommended water quality criterion may change substantially in the near future.

[hh] This recommended water quality criterion was derived from data for inorganic mercury (II), but is applied here to total mercury. If a substantial portion of the mercury in the water column is methylmercury, this criterion will probably be under protective. In addition, even though inorganic mercury is converted to methylmercury and methylmercury bioaccumulates to a great extent, this criterion does not account for uptake via the food chain because sufficient data were not available when the criteria was derived.

National Recommended Water Quality Criteria for Non Priority Pollutants

	Non priority pollutant	CAS No.	Freshwater		Saltwater		Human health for consumption of:		FR cite/source
			CMC (µg/L)	CCC (µg/L)	CMC (µg/L)	CCC (µg/L)	Water + organism (µg/L)	Organism only (µg/L)	
1	Alkalinity			20000[F]					Gold Book
2	Aluminum pH 6.5–9.0	7429905	750[G,I]	87[G,LL]					53 FR 33178
3	Ammonia	7664417	FRESHWATER CRITERIA ARE pH DEPENDENT—SEE DOCUMENT						EPA822–R–98–008
			SALTWATER CRITERIA ARE pH AND TEMPERATURE DEPENDENT[D]						EPA440/5–88–004
4	Aesthetic Qualities		NARRATIVE STATEMENT—SEE DOCUMENT						Gold Book
5	Bacteria		FOR PRIMARY RECREATION AND SHELLFISH USES—SEE DOCUMENT						Gold Book
6	Barium	7440393					1,000[A]		Gold Book
7	Boron		NARRATIVE STATEMENT—SEE DOCUMENT						Gold Book
8	Chloride	16887006	860000[G]	230000[G]					53 FR 19028
9	Chlorine	7782505	19	11	13	7.5	[C]		Gold Book
10	Chlorophenoxy Herbicide 2,4,5,-TP	93721					10[A]		Gold Book
11	Chlorophenoxy Herbicide 2,4-D	94757					100[A,C]		Gold Book
12	Chloropyrifos	2921882	0.083[G]	0.041[G]	0.011[G]	0.0056[G]			Gold Book
13	Color		NARRATIVE STATEMENT—SEE DOCUMENT[F]						Gold Book
14	Demeton	8065483		0.1[F,H]		0.1[F,H]			Gold Book
15	Ether, Bis Chloromethyl	542881					0.00013[E]	0.00078[E]	IRIS 01/01/91
16	Gases, Total Dissolved		NARRATIVE STATEMENT—SEE DOCUMENT[F]						Gold Book
17	Guthion	86500		0.01[F,H]		0.01[F,H]			Gold Book
18	Hardness		NARRATIVE STATEMENT—SEE DOCUMENT						Gold Book
19	Hexachlorocyclo-hexane-Technical	319868					0.0123	0.0414	Gold Book
20	Iron	7439896		1000[F]			300[A]		Gold Book
21	Malathion	121755		0.1[F,H]					Gold Book
22	Manganese	7439965					50[A]	100[A]	Gold Book
23	Methoxychlor	72435		0.03[F,H]		0.03[F,H]	100[A,C]		Gold Book
24	Mirex	2385855		0.001[F,H]		0.001[F,H]			Gold Book
25	Nitrates	14797558					10,000[A]		Gold Book
26	Nitrosamines						0.0008	1.24	

27	Dinitrophenols	25550587						70	14,000	Gold Book
28	Nitrosodibutylamine,N	924163						0.0064 [A]	0.587 [A]	Gold Book
29	Nitrosodiethylamine,N	55185						0.0008 [A]	1.24 [A]	Gold Book
30	Nitrosopyrrolidine,N	930552						0.016	91.9	Gold Book
31	Oil and Grease		NARRATIVE STATEMENT—SEE DOCUMENT [F]							Gold Book
32	Oxygen, Dissolved	7782447	WARMWATER AND COLDWATER MATRIX—SEE DOCUMENT [O]							Gold Book
33	Parathion	56382	0.065 [J]	0.013 [J]						Gold Book
34	Pentachlorobenzene	608935						3.5 [E]	4.1 [E]	IRIS 03/01/88
35	pH			6.5–9 [F]		6.5–8.5 [F,K]		5–9		Gold Book
36	Phosphorus Elemental	7723140				0.1 [F,K]				Gold Book
37	Phosphate Phosphorus		NARRATIVE STATEMENT—SEE DOCUMENT							Gold Book
38	Solids Dissolved and Salinity							250,000 [A]		Gold Book
39	Solids Suspended and Turbidity		NARRATIVE STATEMENT—SEE DOCUMENT [F]							Gold Book
40	Sulfide-Hydrogen Sulfide	7783064		2.0 [F,H]		2.0 [F,H]				Gold Book
41	Tainting Substances		NARRATIVE STATEMENT—SEE DOCUMENT							Gold Book
42	Temperature		SPECIES DEPENDENT CRITERIA—SEE DOCUMENT [M]							Gold Book
43	Tetrachlorobenzene,1,2,4,5-	95943						2.3 [E]	2.9 [E]	IRIS03/01/91
44	Tributyltin TBT		0.46 [N]	0.063 [N]	0.37 [N]	0.010 [N]				62 FR 42554
45	Trichlorophenol,2,4,5-	95954						2,600 [B,E]	9,800 [B,E]	IRIS 03/01/88

Footnotes:

[A] This human health criterion is the same as originally published in the Red Book which predates the 1980 methodology and did not utilize the fish ingestion BCF approach. This same criterion value is now published in the Gold Book

[B] The organoleptic effect criterion is more stringent than the value presented in the non priority pollutants table.

[C] A more stringent Maximum Contaminant Level (MCL) has been issued by EPA under the Safe Drinking Water Act. Refer to drinking water regulations 40 CFR 141 or Safe Drinking Water Hotline (1–800–426–4791) for values.

[D] According to the procedures described in the Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses, except possibly where a very sensitive species is important at a site, freshwater aquatic life should be protected if both conditions specified in Appendix C to the Preamble—Calculation of Freshwater Ammonia Criterion are satisfied.

[E] This criterion has been revised to reflect The Environmental Protection Agency's q1* or RfD, as contained in the Integrated Risk Information System (IRIS) as of April 8, 1998. The fish tissue bioconcentration factor (BCF) used to derive the original criterion was retained in each case.

[F] The derivation of this value is presented in the Red Book (EPA 440/9–76–023, July, 1976).

[G] This value is based on a 304(a) aquatic life criterion that was derived using the 1985 Guidelines (Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses, PB85–227049, January 1985) and was issued in one of the following criteria documents: Aluminum (EPA 440/5–86–008); Chloride (EPA 440/5–88–001); Chloropyrifos (EPA 440/5–86–005).

[H] This CCC is based on the Final Residue Value procedure in the 1985 Guidelines. Since the publication of the Great Lakes Aquatic Life Criteria Guidelines In 1995 (60 FR 15393–15399, March 23, 1995), the Agency no longer uses the Final Residue Value procedure for deriving CCCs for new or revised 304(a) aquatic life criteria.

[I] This value is expressed in terms of total recoverable metal in the water column.

[J] This value is based on a 304(a) aquatic life criterion that was issued in the 1995 Updates: Water Quality Criteria Documents for the Protection of Aquatic Life in Ambient Water (EPA–820–B–96–001). This value was derived using the GLI Guidelines (60 FR 15393–15399, March 23, 1995; 40 CFR 132 Appendix A); the differences between the 1985 Guidelines and the GLI Guidelines are explained on page iv of the 1995 Updates. No decision concerning this criterion was affected by any considerations that are specific to the Great Lakes.

[K] According to page 181 of the Red Book: For open ocean waters where the depth is substantially greater than the euphotic zone, the pH should not be changed more than 0.2 units from the naturally occurring variation or any case outside the range of 6.5 to 8.5. For shallow, highly productive coastal and estuarine areas where naturally occurring pH variations approach the lethal limits of some species, changes in pH should be avoided but in any case should not exceed the limits established for fresh water, i.e., 6.5–9.0.

[L] There are three major reasons why the use of Water-Effect Ratios might be appropriate. (1) The value of 87 µg/l is based on a toxicity test with the striped bass in water with pH=6.5–6.6 and hardness <10 mg/L. Data in "Aluminum Water-Effect Ratio for the 3M Plant Effluent Discharge, Middleway, West Virginia" (May 1994) indicate that aluminum is substantially less toxic at higher pH and hardness, but the effects of pH and hardness are not well quantified at this time. (2) In tests with the brook trout at low pH and hardness, effects increased with increasing concentrations of total aluminum even though the concentration of dissolved aluminum was constant, indicating that total recoverable is a more appropriate measurement than dissolved, at least when particulate aluminum is primarily aluminum hydroxide particles. In surface waters, however, the total recoverable procedure might measure aluminum associated with clay particles, which might be less toxic than aluminum associated with aluminum hydroxide. (3) EPA is aware of field data indicating that many high quality waters in the U.S. contain more than 87 µg aluminum/L, when either total recoverable or dissolved is measured.

[M] U.S. EPA. 1973. Water Quality Criteria 1972. EPA–R3–73–033. National Technical Information Service, Springfield, VA.; U.S. EPA. 1977. Temperature Criteria for Freshwater Fish: Protocol and Procedures. EPA–600/3–77–061. National Technical Information Service, Springfield, VA.

[N] This value was announced (62 FR 42554, August 7, 1997) as a proposed 304(a) aquatic life criterion. Although EPA has not responded to public comment, EPA is publishing this as a 304(a) criterion in today's notice as guidance for States and Tribes to consider when adopting water quality criteria.

[O] U.S. EPA. 1986. Ambient Water Quality Criteria for Dissolved Oxygen. EPA 440/5–86–003. National Technical Information Service, Springfield, VA.

NATIONAL RECOMMENDED WATER QUALITY CRITERIA FOR ORGANOLEPTIC EFFECTS

	Pollutant	CAS No.	Organoleptic effect criteria (µg/L)	FR cite/source
1	Acenaphthene	208968	20	Gold Book
2	Monochlorobenzene	108907	20	Gold Book
3	3-Chlorophenol	.....	0.1	Gold Book
4	4-Chlorophenol	106489	0.1	Gold Book
5	2,3-Dichlorophenol	.....	0.04	Gold Book
6	2,5-Dichlorophenol	.....	0.5	Gold Book
7	2,6-Dichlorophenol	.....	0.2	Gold Book
8	3,4-Dichlorophenol	.....	0.3	Gold Book
9	2,4,5-Trichlorophenol	95954	1	Gold Book
10	2,4,6-Trichlorophenol	88062	2	Gold Book
11	2,3,4,6-Tetrachlorophenol	.....	1	Gold Book
12	2-Methyl-4-Chlorophenol	.....	1800	Gold Book
13	3-Methyl-4-Chlorophenol	59507	3000	Gold Book
14	3-Methyl-6-Chlorophenol	.....	20	Gold Book
15	2-Chlorophenol	95578	0.1	Gold Book
16	Copper	744058	1000	Gold Book
17	2,4-Dichlorophenol	120832	0.3	Gold Book
18	2,4-Dimethylphenol	105679	400	Gold Book
19	Hexachlorocyclopentadiene	77474	1	Gold Book
20	Nitrobenzene	98953	30	Gold Book
21	Pentachlorophenol	87865	30	Gold Book
22	Phenol	108952	300	Gold Book
23	Zinc	7440666	5000	45 FR 79341

General Notes:

1. These criteria are based on organoleptic (taste and odor) effects. Because of variations in chemical nomenclature systems, this listing of pollutants does not duplicate the listing in Appendix A of 40 CFR Part 423. Also listed are the Chemical Abstracts Service (CAS) registry numbers, which provide a unique identification for each chemical.

National Recommended Water Quality Criteria

Additional Notes

1. Criteria Maximum Concentration and Criterion Continuous Concentration

The Criteria Maximum Concentration (CMC) is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed briefly without resulting in an unacceptable effect. The Criterion Continuous Concentration (CCC) is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect. The CMC and CCC are just two of the six parts of a aquatic life criterion; the other four parts are the acute averaging period, chronic averaging period, acute frequency of allowed exceedence, and chronic frequency of allowed exceedence. Because 304(a) aquatic life criteria are national guidance, they are intended to be protective of the vast majority of the aquatic communities in the United States.

2. Criteria Recommendations for Priority Pollutants, Non Priority Pollutants and Organoleptic Effects

This compilation lists all priority toxic pollutants and some non priority toxic pollutants, and both human health effect and organoleptic effect criteria issued pursuant to CWA § 304(a). Blank spaces indicate that EPA has no CWA § 304(a) criteria recommendations. For a number of non-priority toxic pollutants not listed, CWA § 304(a) "water + organism" human health criteria are not available, but, EPA has published MCLs under the SDWA that may be used in establishing water quality standards to protect water supply designated uses. Because of variations in chemical nomenclature systems, this listing of toxic pollutants does not duplicate the listing in Appendix A of 40 CFR Part 423. Also listed are the Chemical Abstracts Service CAS registry numbers, which provide a unique identification for each chemical.

3. Human Health Risk

The human health criteria for the priority and non priority pollutants are based on carcinogenicity of 10^{-6} risk. Alternate risk levels may be obtained by moving the decimal point (e.g., for a risk level of 10-5, move the decimal point in the recommended criterion one place to the right).

4. Water Quality Criteria Published Pursuant to Section 304(a) or Section 303(c) of the CWA

Many of the values in the compilation were published in the proposed California Toxics Rule (CTR, 62 FR 42160). Although such values were published pursuant to Section 303(c) of the CWA, they represent the Agency's most recent calculation of water quality criteria and thus are published today as the Agency's 304(a) criteria. Water quality criteria published in the proposed CTR may be revised when EPA takes final action on the CTR.

5. Calculation of Dissolved Metals Criteria

The 304(a) criteria for metals, shown as dissolved metals, are calculated in one of two ways. For freshwater metals criteria that are hardness-dependent, the dissolved metal criteria were calculated using a hardness of 100 mg/l as $CaCO_3$ for illustrative purposes only. Saltwater and freshwater metals' criteria that are not hardness-dependent are calculated by multiplying the total recoverable iteria before rounding by the appropriate conversion factors. The final dissolved metals' criteria in the table are rounded to two ;nificant figures. Information regarding the calculation of hardness dependent conversion factors are included in the footnotes.

6. Correction of Chemical Abstract Services Number

The Chemical Abstract Services number (CAS) for Bis(2-Chloroisopropyl) Ether, has been corrected in the table. The correct CAS number for this chemical is 39638-32-9. Previous publications listed 108-60-1 as the CAS number for this chemical.

7. Maximum Contaminant Levels

The compilation includes footnotes for pollutants with Maximum Contaminant Levels (MCLs) more stringent than the recommended water quality criteria in the compilation. MCLs for these pollutants are not included in the compilation, but can be found in the appropriate drinking water regulations (40 CFR 141.11–16 and 141.60–63), or can be accessed through the Safe Drinking Water Hotline (800–426–4791) or the Internet (http://www.epa.gov/ost/tools/dwstds-s.html).

8. Organoleptic Effects

The compilation contains 304(a) criteria for pollutants with toxicity-based criteria as well as non-toxicity based criteria. The basis for the non-toxicity based criteria are organoleptic effects (e.g., taste and odor) which would make water and edible aquatic life unpalatable but not toxic to humans. The table includes criteria for organoleptic effects for 23 pollutants. Pollutants with organoleptic effect criteria more stringent than the criteria based on toxicity (e.g., included in both the priority and non-priority pollutant tables) are footnoted as such.

9. Category Criteria

In the 1980 criteria documents, certain recommended water quality criteria were published for categories of pollutants rather than for individual pollutants within that category. Subsequently, in a series of separate actions, the Agency derived criteria for specific pollutants within a category. Therefore, in this compilation EPA is replacing criteria representing categories with individual pollutant criteria (e.g., 1,3-dichlorobenzene, 1,4-dichlorobenzene and 1,2-dichlorobenzene).

10. Specific Chemical Calculations

A. Selenium

(1) Human Health

In the 1980 Selenium document, a criterion for the protection of human health from consumption of water and organisms was calculated based on a BCF of 6.0 L/kg and a maximum water-related contribution of 35 μg Se/day. Subsequently, the EPA Office of Health and Environmental Assessment issued an errata notice (February 23, 1982), revising the BCF for selenium to 4.8 L/kg. In 1988, EPA issued an addendum (ECAO–CIN–668) revising the human health criteria for selenium. Later in the final National Toxic Rule (NTR, 57 FR 60848), EPA withdrew previously published selenium human health criteria, pending Agency review of new epidemiological data.

This compilation includes human health criteria for selenium, calculated using a BCF of 4.8 L/kg along with the current IRIS RfD of 0.005 mg/kg/day. EPA included these recommended water quality criteria in the compilation because the data necessary for calculating a criteria in accordance with EPA's 1980 human health methodology are available.

(2) Aquatic Life

This compilation contains aquatic life criteria for selenium that are the same as those published in the proposed CTR. In the CTR, EPA proposed an acute criterion for selenium based on the criterion proposed for selenium in the Water Quality Guidance for the Great Lakes System (61 FR 58444). The GLI and CTR proposals take into account data showing that selenium's two most prevalent oxidation states, selenite and selenate, present differing potentials for aquatic toxicity, as well as new data indicating that various forms of selenium are additive. The new approach produces a different selenium acute criterion concentration, or CMC, depending upon the relative proportions of selenite, selenate, and other forms of selenium that are present.

EPA notes it is currently undertaking a reassessment of selenium, and expects the 304(a) criteria for selenium will be revised based on the final reassessment (63 FR 26186). However, until such time as revised water quality criteria for selenium are published by the Agency, the recommended water quality criteria in this compilation are EPA's current 304(a) criteria.

B. 1,2,4-Trichlorobenzene and Zinc

Human health criteria for 1,2,4-trichlorobenzene and zinc have not been previously published. Sufficient information is now available for calculating water quality criteria for the protection of human health from the consumption of aquatic organisms and the consumption of aquatic organisms and water for both these compounds. Therefore, EPA is publishing criteria for these pollutants in this compilation.

C. Chromium (III)

The recommended aquatic life water quality criteria for chromium (III) included in the compilation are based on the values presented in the document titled: 1995 Updates: Water Quality Criteria Documents for the Protection of Aquatic Life in Ambient Water, however, this document contains criteria based on the total recoverable fraction. The chromium (III) criteria in this compilation were calculated by applying the conversion factors used in the Final Water Quality Guidance for the Great Lakes System (60 FR 15366) to the 1995 Update document values

D. Ether, Bis (Chloromethyl), Pentachlorobenzene, Tetrachlorobenzene 1,2,4,5- Trichlorophenol

Human health criteria for these pollutants were last published in EPA's Quality Criteria for Water 1986 or "Gold Book". Some of these criteria were calculated using Acceptable Daily Intake (ADIs) rather than RfDs. Updated q1*s and RfDs are now available in IRIS for ether, bis (chloromethyl), pentachlorobenzene, tetrachlorobenzene 1,2,4,5-, and trichlorophenol, and were used to revise the water quality criteria for these compounds. The recommended water quality criteria for ether, bis (chloromethyl) were revised using an updated q1*, while criteria for pentachlorobenzene, and tetrachlorobenzene 1,2,4,5-, and trichlorophenol were derived using an updated RfD value.

E. PCBs

In this compilation EPA is publishing aquatic life and human health criteria based on total PCBs rather than individual arochlors. These criteria replace the previous criteria for the seven individual arochlors. Thus, there are criteria for a total of 102 of the 126 priority pollutants.

Dated: October 26, 1998.

J. Charles Fox,

Assistant Administrator, Office of Water.

Appendix A—Conversion Factors for Dissolved Metals

Metal	Conversion factor freshwater CMC	Conversion factor freshwater CCC	Conversion factor saltwater CMC	Conversion factor saltwater CCC
Arsenic	1.000	1.000	1.000	1.000
Cadmium	1.138672-[(ln hardness)(0.041838)]	1.101672-[(ln hardness)(0.041838)]	0.994	0.994
Chromium III	0.316	0.860		
Chromium VI	0.982	0.962	0.993	0.993
Copper	0.960	0.960	0.83	0.83
Lead	1.46203-[(ln hardness)(0.145712)]	1.46203-[(ln hardness)(0.145712)]	0.951	0.951
Mercury	0.85	0.85	0.85	0.85
Nickel	0.998	0.997	0.990	0.990
Selenium			0.998	0.998
Silver	0.85		0.85	
Zinc	0.978	0.986	0.946	0.946

Appendix B—Parameters for Calculating Freshwater Dissolved Metals Criteria That Are Hardness-Dependent

Chemical	m_A	b_A	m_C	b_C	Freshwater conversion factors (CF)	
					Acute	Chronic
Cadmium	1.128	−3.6867	0.7852	−2.715	1.136672-[ln (hardness)(0.041838)]	1.101672-[ln (hardness)(0.041838)]
Chromium III	0.8190	3.7256	0.8190	0.6848	0.316	0.860
Copper	0.9422	−1.700	0.8545	−1.702	0.960	0.960
Lead	1.273	−1.460	1.273	−4.705	1.46203-[ln (hardness)(0.145712)]	1.46203-[ln (hardness)(0.145712)]
ickel	0.8460	2.255	0.8460	0.0584	0.998	0.997
ver	1.72	−6.52			0.85	
inc	0.8473	0.884	0.8473	0.884	0.978	0.986

Appendix C—Calculation of Freshwater Ammonia Criterion

1. The one-hour average concentration of total ammonia nitrogen (in mg N/L) does not exceed, more than once every three years on the average, the CMC calculated using the following equation:

$$CMC = \frac{0.275}{1+10^{7.204-pH}} + \frac{39.0}{1+10^{pH-7.204}}$$

In situations where salmonids do not occur, the CMC may be calculated using the following equation:

$$CMC = \frac{0.411}{1+10^{7.204-pH}} + \frac{58.4}{1+10^{pH-7.204}}$$

2. The thirty-day average concentration of total ammonia nitrogen (in mg N/L) does not exceed, more than once every three years on the average, the CCC calculated using the following equation:

$$CCC = \frac{0.0858}{1+10^{7.688-pH}} + \frac{3.70}{1+10^{pH-7.688}}$$

Editorial Note: FR Doc. 98-30272 was originally published as Part IV (63 FR 67548-67558) in the issue of Monday, December 7, 1998. At the request of the agency, due to incorrect footnote identifiers in the tables, the corrected document is being republished in its entirety.

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EE/CA and RI/FS Support Sampling Plan

Sauget Area 1

Sauget and Cahokia, Illinois

Volume 1C

Ecological Risk Assessment Work Plan

June 25, 1999

Submitted To:

U.S. Environmental Protection Agency
Chicago, Illinois

Submitted By:

Solutia Inc.
St. Louis, Missouri

ECOLOGICAL RISK ASSESSMENT WORK PLAN
FOR
SAUGET AREA I

SAUGET, ST. CLAIR COUNTY, ILLINOIS

August 11, 1999

Prepared for:

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1.0 INTRODUCTION

1.1 Goals and Objectives

This document is a workplan for a baseline ecological risk assessment at the Sauget Area I in Sauget, Illinois. The plan addresses Dead Creek Segments B, M, C, D, E, and F, and recent USEPA comments regarding the development of a baseline ecological risk assessment for this area (USEPA, 1999). It is also contingent upon a planned field reconnaissance of the subject areas. In particular, this planned reconnaissance will help to finalize sampling locations, receptors, and the location of a reference area. Observations made during the reconnaissance may necessitate alterations in the workplan. We will communicate such proposed alterations in a technical amendment to the plan, should they occur.

The plan follows current United States Environmental Protection Agency (USEPA) guidance in:

> *Ecological Risk Assessment Guidance For Superfund: Process For Designing and Conducting Ecological Risk Assessments* (USEPA, 1997a); and
>
> *Guidelines for Ecological Risk Assessment* (EPA/630/R-95/002F, April, 1998).

The USEPA 1997 guidance document provides an eight-step process. Steps 1 and 2 of this process are a screening level assessment, and Steps 3 through 7 provide guidance for a baseline assessment. The screening level assessment may conclude that site data indicate either:

> a negligible ecological risk and therefore the site requires no further study; or, there is (or might be) a risk of adverse ecological effects, and the ecological risk assessment process will continue.

Previously, the USEPA conducted a Preliminary Ecological Assessment of Dead Creek Segment F, which essentially provides the screening analyses required in Steps 1 and 2 of the guidance (USEPA, 1997b). This USEPA assessment concluded that the site warrants further investigation. Therefore this Work Plan addresses the various elements of Steps 3 through 7 of USEPA guidance for designing a baseline ecological risk assessment to Segment F, as well as Segments B, C, D, E even though they have not been subject to a prior screening level assessment. The workplan includes:

- Description of a Site Conceptual Model;
- Selection of Chemicals of Ecological Concern;
- Identification of Assessment Endpoints;
- Selection of Receptors;
- Selection of Measures of effects and their relation to assessment endpoints;
- Risk Characterization;
- Discussion of Uncertainties and Assumptions.

The workplan will explain how the baseline risk assessment will use data described in the Quality Assurance Project Plan/Field-Sampling Plan (QAPP/FSP), that has been prepared and

submitted separately. The FSP for the baseline ecological risk assessment describes the details of the field sampling effort as well as the data analysis methods and data quality objectives (DQOs). These include methods for:

conducting a field reconnaissance;

collecting vegetation and benthic organisms in Creek Sectors B to F, M, and the reference areas, and analyzing them for target analytes;

collecting forage fish, predator fish, bottom fish and crayfish in Creek Sector F and the reference areas, and analyzing them for target analytes (we will also collect these organisms in segments B,C,D,E, and, M if observed in those areas);

collecting sediments in Creek Sectors B to F, M, and the reference areas for sediment toxicity testing;

collecting sediments in Creek Sectors B to F, M, and the reference areas for benthic community analysis.

Please refer to the QAPP/FSP for details of field sampling, number of stations, and station locations, and analytical methods.

2.0 SITE CONCEPTUAL MODEL

2.1 Ecological Observations

We will conduct a reconnaissance survey to provide more details and more current information regarding ecological conditions at the various creek sectors. This section provides a description of the site as observed on 29-30 July 1996, when Menzie-Cura & Associates, Inc. personnel (David Peterson, Certified Wildlife Biologist), visited the Sauget Area 1 in Sauget and Cahokia, Illinois and conducted an evaluation of local habitats. The areas observed at that time included ecological resources along: Dead Creek, Prairie du Pont Creek, the associated wetlands, Cahokia Chute, and the Mississippi River. In addition, we contacted federal/state agencies and private conservation organizations concerning additional ecological information available about the area (see Attached List).

Potentially sensitive environments in the Dead Creek area include: Habitat Known to be Used by Federal Designated or Proposed Endangered or Threatened (T/E) Species, Habitat Known to be Used by State Designated Endangered or Threatened Species, and Wetlands.

Habitat Known to be Used by Federal Designated or Proposed Endangered or Threatened Species

According to the records of the Illinois Department of Natural Resources' Natural Heritage Inventory, the only federally endangered or threatened species in the study area is the federally threatened bald eagle (*Haliaeetus leucocephalus*). In 1993, a pair of eagles unsuccessfully attempted to nest at the southern tip of Arsenal Island, where the ditched portion of Prairie du Pont Creek enters the Mississippi River. The pair apparently was scared off the site. The next year the pair returned to the island, but no monitoring was conducted to determine if they successfully nested. During the late July 1996 survey we did not observe any eagles in the study area. Remains of a large stick nest were observed at the southern tip of Arsenal Island, but it did not appear to have been used during 1996. We will also check the State of Missouri files for State Designated Endangered or Threatened Species.

Portions of the area suitable for eagle foraging include waterbodies large enough to support large fish such as carp and catfish. The Mississippi River, the channelized section of Prairie du Pont Creek, and a borrow pond at the lower end of Dead Creek all appear to support large fish and provide enough open water for eagles to fish. No foraging eagles were observed during the site visit, nor have local people in the area seen eagles in the vicinity.

Habitat Known to be Used by State Designated Endangered or Threatened Species

The Illinois Natural Heritage Inventory did not have any records of state-listed endangered or threatened species in the study area. However a number of state-listed wading birds were observed throughout the wetlands and waterways. Illinois endangered species observed were

little blue heron (*Egretta caerulea*), snowy egret (*Egretta thula*)[1], and black-crowned night heron (*Nycticorax nycticorax*). Great egret (*Casmerodius albus*), an Illinois threatened species, was also observed. Small numbers (one to ten individuals) of these wading birds were found foraging along sections of Dead Creek, the ditched length of Prairie du Pont Creek, Cahokia Chute, and the Mississippi River. The largest concentrations of foraging herons (approximately ten individuals at a location) were observed at the confluence of Dead Creek and the ditched Prairie du Pont Creek, and where the ditched Prairie du Pont flows into the Mississippi. These areas likely support the best concentrated fishing areas for wildlife along the waterways.

No wading bird colonies were located within the study area. However, the Illinois Natural Heritage Inventory has documented two 1000-2000 nest mixed-species colonies in East St. Louis. The closest of these two colonies is approximately one mile east of the Monsanto plant near the Alton & Southern rail yards in Alorton. The second site is over two miles to the north at Audubon Avenue and 26th Street. These two colonies contain the only breeding little blue heron and snowy egret in Illinois. In addition, black-crowned night heron, great egret, cattle egret (*Bubulcus ibis*), great blue heron (*Ardea herodias*), and green-backed heron (*Butorides virescens*) nest in the colonies.

In 1988, because the region is heavily industrialized with numerous Superfund sites, the U.S. Fish & Wildlife Service (USFWS) collected black-crowned night heron and little blue heron eggs from the Alorton colony for contaminant analysis (Young, 1989 - unpublished draft). Sediment samples were also taken in areas of observed wading bird foraging around the East St. Louis region. No testing was done of sediments in the Dead Creek drainage. PCB's, DDE, and metals were detected at varying levels from the wading bird eggs.

The observed endangered and threatened wading birds forage on a wide range of aquatic organisms, such as fish, frogs, and crayfish, as well as some terrestrial species such as reptiles and insects. The USFWS study found that wading birds forage over a wide area around East St. Louis. The Dead Creek/Prairie du Pont wetlands system composes a relatively small percentage of the available wetland foraging area in the region.

Wetlands

Wetlands in the study area consist of riparian woods, shrub swamp, marsh, and wet meadow located adjacent to the area's waterways. Drainage from much of the industrial area at the head of Dead Creek is routed away from the Dead Creek drainage via the local municipal sewer system. Dead Creek begins south of an industrial zone adjacent to the Cerro property and flows slowly south through residential neighborhoods. The stream is bordered by a dense, narrow band of riparian trees and shrubs, including cottonwood, willow, mulberry, and box elder (Photo B-1). Homeowners have cleared to the creek's edge and have established lawn along several sections. Within the residential area (east of Route 3) the stream is crossed, via

[1] Also endangered in Missouri.

culverts, by seven roads. At the Judith Lane road crossing, the road culvert has been set approximately one foot higher than the observed water level, apparently to allow drainage of the channel only during high-water events. The pooled channel behind this road is connected to a small pond located at the end of Walnut Street where herons, painted turtle, wood duck, fish, and evidence of beaver (chewed trees, see Photo B-2) were observed (see Table B-1).

Downstream of the impounded channel, Dead Creek segments C and D flow south through bordering wetlands (Photo B-3, note Green Backed Heron in center of photograph). For a short section, adjacent to Parks College, the creek is routed through a culvert under a parking area. Throughout the rest of the creek's length it is bordered by either riparian vegetation (Photo B-4) or lawn (Photo B-5). Emergent and aquatic vegetation occurs along the creek's shores. Wildlife observed in and adjacent to the stream included herons, turtles, songbirds, squirrel, and raccoon. Small fish and frogs were observed throughout the creek's length.

West of Route 3, the creek flows south and west through the American Bottoms floodplain. This area contains active and abandoned agricultural land divided by levees and railroad right-of-ways. After crossing Route 3 Dead Creek flows under a railroad right-of-way and is joined by a stream draining land from the north. North of the confluence of these two waterways is a road that cuts SE to NW across the floodplain, connecting Cahokia to Fox Terminal. To the north (upstream) of this road is a gas tank farm and fields. The stream was observed to flow south under the Fox Terminal road and into Dead Creek. A second dry culvert was observed west of the stream crossing in the vicinity of the north end of the Dead Creek borrow pond. This culvert appeared to drain the land north of the Fox Terminal road during high-water events when water from the tank farm and surrounding area becomes impounded behind the roadway.

Downstream of the confluence of the two waterways, Dead Creek flows through riparian woods and shrubs and into a borrow pond. The pond appears to have been excavated during the construction of the local levee system. The United States Geological Survey (USGS) map of the area (Cahokia) indicates that the pond was dug to its current shape sometime after 1954. The pond is the largest non-flowing water body in the area. Its shore is surrounded with mature riparian trees and emergent wetland vegetation. Ducks, herons, and fish were observed in the pond.

Dead Creek forms the outlet of the pond, draining south through a pump station under the levee (Photo B-6) and into the ditched section of Prairie du Pont Creek. At the confluence and above it (Photo B-7) the ditch shore is vegetated with grasses, herbs, and small shrubs. The channel flows northwest to Arsenal Island on the Mississippi River. Arsenal Island contains areas of mature riparian woods and agricultural fields. The shoreline of the lower end of the ditch (referred to on the USGS map as Cahokia Chute) is lined with riparian woods, principally large cottonwoods and willow (Photo B-8). Large catfish, wood duck, wading birds, and turtles were observed in the channel. Cahokia Chute forms the eastern border of Arsenal Island. The waterway flows north to south, draining the region northeast of the island. It appears that during times when the Mississippi River is high, the River uses the Chute channel to flow around Arsenal Island. Any water from the Dead Creek watershed

therefore only flows through the lower half of the Cahokia Chute between the confluence with the ditched Prairie du Pont and the Mississippi River. The remains of the bald eagle nest and congregating wading birds were observed at the southern tip of Arsenal Island, where the Chute flows into the Mississippi.

Almost the entire length of the Dead Creek study area is bordered by wetlands. Most of the wetlands are confined to a narrow riparian strip adjacent to the Creek. More extensive wetlands occur west of Route 3, particularly in the vicinity of the borrow pond. The Creek's wetlands appeared healthy with no evidence of ecological stress (no chlorotic plants, no nonspecific stands of vegetation, no areas of dying or dead vegetation, observable presence of diverse pelagic communities in the stream, no observed surface water sheens or sediment staining). The wetlands also appeared to support a diverse aquatic and terrestrial wildlife community, with abundant prey species (i.e. fish, frogs, turtles) and predatory species (i.e. wading birds, waterfowl, raccoons) present. The wetlands west of Route 3 receive water from both Dead Creek and from drainages to the north, including the area around the gas tank farm.

Summary

During the field survey and subsequent contact with state and federal agencies, three categories of sensitive environments were located in the Monsanto/Dead Creek area: Habitat Known to be Used by Federal Designated or Proposed Endangered or Threatened Species, Habitat Known to be Used by State Designated Endangered or Threatened Species, and Wetlands. These three categories are interrelated with the rare species documented all utilizing wetland/waterway habitats. The rare species observed forage over a wide area, with the Dead Creek watershed forming only a small part of their available feeding territory.

The Dead Creek watershed also appears to support a diverse plant and animal community. While much of the Creek flows through residential neighborhoods, sufficient natural riparian vegetation remains to support local aquatic and terrestrial communities. No evidence of ecological stress was evident in the upper Creek, nor anywhere else along the waterway's path to the Mississippi.

2.2 Site Conceptual Model

The foundation of an ERA work plan is the site conceptual model. It integrates information from the preliminary observations at the site (usually incorporated into the screening level risk assessment). According to EPA guidance, the conceptual model addresses:

environmental setting and contaminants known or suspected to exist at the site;

contaminant fate and transport mechanisms;

mechanisms of ecotoxicity and likely categories of potentially affected receptors;

complete exposure pathways.

Figure 1C-1 provides a Preliminary Conceptual Model diagram. It illustrates potential contaminant transport from the contaminated media through the potentially affected habitats to important ecological receptors. We will revisit and, if necessary, amend this model after completion of the site reconnaissance survey.

The site conceptual model is consistent with our knowledge of the area to date as described in our 1996 survey and in the recent EPA Preliminary Risk Assessment.

Environmental Setting and Contaminants Known Or Suspected To Exist At The Site

Subsection 2.1 describes the environmental setting. The EPA Preliminary Ecological Risk Assessment describes the contaminants known or suspected to be at the site. The environmental setting is an aquatic environment with extensive wetlands, riparian woods, narrow, shallow streams, broader semi-impounded basins, and floodplain.

The likely contaminants include those addressed in the EPA assessment:

metals (arsenic, barium, cadmium, chromium, lead, mercury);

PCBs;

PAHs;

dioxin.

The eventual execution of the QAPP/FSP will analyze for a broader list of potential contaminants in sediments, surface water, and biota. We will evaluate those data within the baseline risk assessment and add contaminants as appropriate based on: frequency of occurrence within a particular media, likely bioavailabilty, evidence for bioaccumulation, toxicity to likely receptors, and comparison of concentrations to a reference area. Obviously, the addition of more contaminants of concern may require changes in the conceptual model for the baseline risk assessment depending upon the fate, transport, and biological properties of these contaminants. The EPA guidance recognizes and encourages this iterative process.

Contaminant Fate and Transport Mechanisms

In an aquatic system such as occurs over Dead Creek Sectors B through F, and M, various physical, chemical, and biological transport mechanisms will affect the fate of contaminants. All the contaminants listed in the EPA Preliminary Assessment adhere to particulate matter to varying degrees. Therefore, the conceptual model should address those mechanism affecting particle distribution in aquatic systems. These include:

particulate runoff from the watershed,

deposition in areas of sluggishly flowing waters,

erosion in faster moving stream segments, and

resuspension of particulates from the stream bed and over the floodplain.

Chemicals with lower particle affinities may be more subject to dissolution in and transport by surface water. Increasing solubility generally correlates with increasing bioavailability. In particular, various metals on the preliminary list of contaminants are subject to transport in soluble form, depending on their valence states.

The major biological mechanisms affecting fate and transport are:

biological uptake directly from environmental media; and,

bioaccumulation through ingestion of prey or media;

biomagnification through the food chain.

Several of the contaminants are subject to one or all of these biological fate and transport mechanisms.

The baseline risk assessment will describe each contaminant of concern (including any added after the next sampling rounds) in terms of the transport mechanisms most likely to affect it. The EPA Preliminary Risk Assessment provides a description of the likely transport mechanisms for each of the contaminants or classes of contaminants listed.

Mechanisms of Ecotoxicity And Likely Categories Of Potentially Affected Receptors

The EPA Preliminary Risk Assessment summarizes the ecotoxicological properties of the potential contaminants in sufficient detail to develop the first iteration of the conceptual model. As indicated in the summaries, the various contaminants may affect the survival and reproductive capacity of benthic biota, fish, invertebrates, vascular plants, and algae.

The baseline risk assessment will provide detailed ecotoxicity profiles for the final list of contaminants of concern. These will include summaries of the toxicity of these chemicals to receptors likely to occur in the Dead Creek environment (insofar as these exist), and a selection of the most appropriate toxicity factor to use in the baseline risk assessment.

The categories of likely potentially affected receptors for an aquatic system such as the Dead Creek, Sectors B through F, and M include:

The benthic macroinvertebrate community;

warm water fish (e.g., largemouth bass);

waterfowl (e.g. mallard) that feed on plants and macroinvertebrates (including crayfish);

piscivorous birds (e.g., great blue heron, bald eagle);

aquatic mammals (e.g. muskrat) that feed on plants and macroinvertebrates (including crayfish);

aquatic mammals (e.g., river otter or racoon) that feed on fish and macroinvertebrates (including crayfish).

There is also some potential for exposure to terrestrial plants and wildlife from exposure to contaminants in soil or through exposure to soil based food chains.

Complete Exposure Pathways

The USEPA guidance indicates that the risk assessment must identify complete exposure pathways before a quantitative evaluation of toxicity to allow the assessment to focus on those contaminants that can reach ecological receptors. The likely complete exposure pathways in Dead Creek, Sectors B through F, and M are:

sediment to benthic invertebrates via direct contact and ingestion;

sediment and surface water to aquatic plants via uptake;

surface water to invertebrates and fish though direct contact and ingestion;

benthic biota (including crayfish) to higher order predators (e.g. fish) through food chain;

forage fish and crayfish to piscivorous fish, mammals, or birds;

soil to soil invertebrates along the creek banks or floodplain;

soil to plants or wildlife along the creek banks or floodplain.

3.0 SELECTION OF CHEMICALS OF ECOLOGICAL CONCERN (COECs)

As indicated in subsection 2.2, the USEPA Preliminary Risk Assessment provides an initial list of contaminants of ecological concern (COECs). The QAPP/FSP includes target analytes beyond these initial COECs. These target analytes include: VOCs, metals, SVOCs, PCBs, and pesticides.

The baseline risk assessment will re-evaluate the COEC list based in the results of the proposed sampling and analysis of surface water, sediment, and biota. The criteria for final selection include:

> Comparison to Background – the baseline risk assessment will eliminate a contaminants which occurs below the maximum concentration measured at a local reference area for a given medium;
>
> Frequency of Detection – the baseline risk assessment will retain a contaminant detected in more than 5% of samples for a particular media.

For those compounds which exceed background and/or are frequently detected in a particular medium, the baseline risk assessment will add them to the final list of COECs if they exhibit any of the following characteristics:

> Toxic – exhibit toxicity (based on scientific literature) to the receptors likely to occur along the Dead Creek, Sectors B through F and M, or adjacent habitats;
>
> Bioaccumulative – are likely to bioconcentrate or biomagnify through the food chains represented in Dead Creek, Sectors B through F, and M, and adjacent habitats;
>
> Persistent – are likely to remain in environmental media over time frames that are long relative to the life spans or exposure periods of receptors likely to occur in Dead Creek, Sectors B through F, and M, and adjacent habitats.

The ERA will include a current review of toxicological information for all COECs on the final list. Where available, this information will include toxicity benchmarks that are applicable to water and sediments.

4.0 IDENTIFICATION OF RECEPTORS, ASSESSMENT ENDPOINTS, AND MEASURES OF EFFECT

4.1 Receptors

This subsection of the ecological risk assessment identifies the receptors (receptor species) and provides the rationale for their selection as representative of the species that occur or are likely to occur near the site. This subsection also provides an ecological characterization of each receptor for eventual use in developing the exposure assessment.

The selected receptors represent those types of organisms most likely to encounter the contaminants of concern at the site. They include a reasonable (although not comprehensive) cross-section of the major functional and structural components of the ecosystem under study based on:

relative abundance and ecological importance within the selected habitats;

availability and quality of applicable toxicological literature;

relative sensitivity to the contaminants of concern;

trophic status;

relative mobility and local feeding ranges;

ability to bioaccumulate contaminants of concern.

The selected species represent different feeding guilds. This representative species approach for assessing exposures for wildlife is a common practice for assessing risk. A guild is a group of animals within a habitat that use resources in the same way. Coexisting members of guilds are similar in terms of their habitat requirements, dietary habits, and functional relationships with other species in the habitat. Guilds may be organized into potential receptor groups. The use of the guild approach allows focused integration of many variables related to potential exposure. These variables include characteristics of COECs (toxicity, bioaccumulation, and mode of action), and characteristics of potential receptors (habitat, range and feeding requirements, and relationships between species). This approach evaluates potential exposures to all animals by considering the major feeding guilds found in a habitat. It is assumed that evaluation of the potential effects of COECs to the representative species will be indicative of the potential effects of COECs to individual member classes of organisms within each feeding guild.

The selected species represent the ecological community and its sensitivity to the contaminants of concern. They are: benthic invertebrates, shellfish, local fin fish, great blue heron, mallard, bald eagle, muskrat, and river otter or raccoon.

Benthic invertebrates

Benthic invertebrates are potential receptor species in Dead Creek because they:

have the greatest exposure to sediments;

provide food for bottom-feeding fish species (in the river);

are relatively immobile (sessile) in habit, and therefore their general health and condition reflects local conditions;

Warm Water Fish Species

Warm water resident fish species were selected to reflect local sediment and water quality conditions. The typical warm water fish species such as centrachids (sunfish, bass) and bottom feeding fish such as bullheads are likely and abundant local resident with a limited foraging range. These organisms are potential receptor species representing local fish because they are:

resident in this reach of the Dead Creek;

exposed to sediments as well as surface water;

represent forage fish and higher order predators feeding on smaller fish and invertebrates.

Aquatic Birds

We have selected great blue heron, mallard duck, and bald eagle to represent aquatic birds feeding in Dead Creek, Sectors B through F, and M for at least a portion of the time.

Great Blue Heron (*Ardea herodias*)

The great blue heron inhabits salt and freshwater environments, typically shallow waters and shores of lakes, flooded gravel pits, marshes and oceans. In marsh environments, the great blue heron is an opportunistic feeder; they prefer fish, but they will also eat amphibians, reptiles, crustaceans, insects, birds, and mammals. The diet varies but may include up to 100% fish. A Nova Scotia study found 6% forage fish (Atlantic silverside and mummichog), 52.6% eels, and 41.4% other fish in the diet of great blue heron (USEPA, 1993). A food ingestion rate for adult breeding birds of 0.18 g food/g body weight/day has been reported.

Great blue heron tend to forage near nesting sites (USEPA, 1993). A study in Minnesota measured the distance between nesting and foraging grounds to range from 0 to 2.7 miles. A Carolina study found the same distance to be 4 to 5 miles. The maximum distance great blue heron will fly between foraging areas is 9 to 13 miles (USEPA, 1993). The size of the feeding territory in a freshwater area in Oregon was 1.5 acres, while the feeding territory in an estuarine area was 21 acres.

These organisms are potential receptor species because they:

Consume near shore fish;

Have a foraging range about equal to the downstream area of the Dead Creek sectors;

Are a higher trophic level predator in the creek and Mississippi.

Great blue heron, therefore, represent piscivorous birds in this reach of the river.

Mallard (*Anas platyrhynchos*)

The mallard is the most common freshwater duck of the United States, found on lakes, rivers, ponds, etc. It is a dabbling duck, and feeds (usually in shallow water) by "tipping up" and eating food off the bottom of the water body. Primarily, it consumes aquatic plants and seeds (for instance, primrose willow and bulrush seeds), but it will also eat aquatic insects, other aquatic invertebrates, snails and other molluscs, tadpoles, fishes, and fish eggs. Ducklings and breeding females consume mostly aquatic invertebrates. The mallard's home range is variable, but an approximate range is 500 hectares. It prefers to nest on ground sheltered by dense grass-like vegetation, near the water.

Mallards are a potential receptor species because they:

Consume both aquatic plants and aquatic invertebrates;

Live on or near the water;

Are a lower trophic level duck in the creek and in Mississippi.

Mallards, therefore, represent waterfowl in this reach of the river.

Bald Eagle (*Haliaeetus leucocephalus*)

Bald eagles are generally found in coastal areas, near lakes or rivers. Their preferred breeding sites are in large trees near open water. They are usually found in areas with minimal human activity.

Bald eagles, although primarily carrion feeders, are opportunistic and will eat whatever is plentiful including fish, birds, and mammals. Reported food ingestion rates range from 0.064 to 0.14 g/g/day. A study of adult breeding bald eagles in Connecticut estimated a food ingestion rate of 0.12 g/g/day (USEPA, 1993). A study of bald eagle diets in Maine indicated that their diets consisted of 76.7% fish, 16.5% birds, and 6.8% mammals (USEPA, 1993).

Foraging areas vary according to season and location. The USEPA (1993) reports a foraging length of 2 to 4.5 miles along a river.

These organisms are potential receptor species because they:

Consume fish;

Are a higher trophic level predator in the river;

Are sensitive to contaminants that biomagnify in the food chain.

The bald eagle, therefore, represents predatory birds in these sectors of Dead Creek.

Aquatic Mammals

This assessment assumes that either river otter (or racoon if the site reconnaissance indicates that otter are unlikely to occur in the area) and muskrat represent aquatic mammals in Dead Creek sectors B through F.

River Otter (*Lutra canadensis*)

The river otter can be found in primarily freshwater but also saltwater environments, but seems to prefer flowing-water habitats rather than still water. It has been found in lakes, marshes, streams, and seashores. It consumes largely fish, but is opportunistic and will consume aquatic invertebrates (crabs, crayfish, etc.), aquatic insects, amphibians, birds (e.g. ducks), small or young mammals, and turtles. They may also sift through sediment for food. The otter dens in banks, in hollow logs, or similar burrow-like places. Home range varies depending on habitat and sex, but an approximate measure is 300 hectares.

River otters are a potential receptor species because they:

Consume fish and aquatic invertebrates;

Live in or near the water;

Are a higher trophic level predator in the creek and in Mississippi.

River otters, therefore, represent higher trophic level aquatic mammals in this reach of the river.

Raccoon (*Procyon lotor*)

The raccoon is likely to be present because the creek and surrounding areas consist of its most preferred types of habitat (marshes and suburban residential areas). Because the raccoon is an omnivore, it is likely to experience greater exposure to than the muskrat which is primarily a herbivore. The raccoon is known to consume aquatic invertebrates (such as crayfish), fish, insects, mollusks, annelids, bird eggs, small passerine birds, small mammals such as squirrels, and plants (Chapman and Feldhamer, 1990).

Raccoon are a potential receptor species because they:

Consume fish and aquatic invertebrates;

Live near the water;

Are a higher trophic level predator in the creek and in Mississippi.

Raccoon, therefore, represent higher trophic level aquatic mammals in this reach of the river.

Muskrat (*Ondatra zibethicus*)

The muskrat is a semiaquatic large rodent which lives near freshwater and brackish aquatic environments: marshes, ponds, creeks, lakes, etc. It feeds largely on aquatic plants, but depending on location and time of year may also consume aquatic invertebrates (crayfish, crabs, etc.), small amphibians, turtles, fish, molluscs, and even young birds. The muskrat lives quite close to the water, either on the bank of the water body or constructing a lodge in the water body. Its home range is small (0.17 hectares on average) and one study found that muskrats remain within 15 meters of their primary dwellings 50 percent of the time.

Muskrats are a potential receptor species because they:

Consume aquatic plants and aquatic invertebrates;

Live on or near the water;

Are a lower trophic level omnivore in the creek and in Mississippi.

Muskrats, therefore, represent lower trophic level aquatic mammals in this reach of the river.

Soil invertebrates

Soil invertebrates are potential receptor species in Dead Creek banks and floodplain because

they:

have the greatest exposure to soil;

provide food for birds and mammals (in the river);

are relatively immobile (sessile) in habit, and therefore their general health and condition reflects local conditions;

4.2 Assessment Endpoints

Assessment endpoints are expressions of the environmental value to be protected at a site. Assessment endpoints are often not directly measurable. Therefore, assessment employs measures of effects. These are biological or measurable ecological characteristics which reflect the assessment endpoint (USEPA, 1997). Where the assessment endpoint is not directly measurable, the use of a measure of effect may result in some uncertainty in the risk characterization. Ultimately, the selection of assessment endpoints requires the consensus of the regulators, the regulated community, and state or local concerns. This work plan proposes the following assessment endpoints for the potentially-affected aquatic receptors and their habitats:

Sustainability (survival, growth, and reproduction) of warm water fish species typical of those found in similar habitats (incorporates the assessment of benthic macroinvertebrates and crayfish);

Survival, growth, and reproduction of local populations of aquatic wildlife represented by bald eagles, mallard duck, great blue heron, muskrat, and river otter or raccoon (incorporates the assessment of benthic macroinvertebrates and crayfish).

The assessment will evaluate risk relative to these assessment endpoints in Creek, Sectors B through F and M, collectively and individually, based on prior observations and the work proposed in the QAPP/FSP.

4.3 Selection of Measures of Effects

The measures of effect direct data collection needs for the baseline ecological risk assessment. They provide the actual measurements for estimating risk. A weight-of-evidence approach (Menzie et al., 1996) weighs each of the measures of effects by considering:

strength of association between the measure of effects and assessment endpoint;

data quality; and

study design and execution.

Strength of association refers to how well a measure of effects represents an assessment endpoint. The greater the strength of association between the measurement and assessment

endpoint, the greater the weight given to that measure of effect in the risk analysis.

The weight given a measure of effect also depends on the quality of the data as well as the overall study design and execution. The QAPP/FSP describes a sampling program that will provide information adequate for evaluating each selected measure. However, the risk assessment must evaluate the performance of the sampling effort and the variability and uncertainties associated with the results following implementation. The risk characterization gives higher weight to measures of effect that are based on good quality data and are obtained using study designs that account for confounding variables.

There is considerable uncertainty associated with estimating risks, because ecological systems are complex and exhibit high natural variability. Measures of effects typically have specific strengths and weaknesses related to the factors discussed above. Therefore, it is common practice to use more than one measure of effect to evaluate each assessment endpoint. This subsection describes the measures of effects and how the baseline risk assessment will use them to evaluate risks for each of the assessment endpoints.

TABLE 1
ASSESSMENT ENDPOINTS
AND ASSOCIATED MEASURES OF EFFECTS

Assessment Endpoint 1: Sustainability of warm water fish in Creek Sector F

Measure of effect 1a: body burdens of COECs in selected fish species as a measure of exposure (compared to body burdens in fish from reference areas) and effects (compared to benchmark values).

Measure of effect 1b: COEC concentrations in surface waters as compared to applicable water quality criteria for protection of fish and wildlife.

Measure of effect 1c: sustainability of a benthic macroinvertebrate community that can serve as a prey base for fish:

Concentration of COECs in sediment;

Field assessment of benthic macroinvertebrate community structure (using EPA Rapid Bioassessment Protocol I, as described in *Rapid Bioassessment Protocols for Use in Streams and Rivers, Benthic Macroinvertebrates and Fish*, EPA/444/4-89-001.

Sediment toxicity tests.

Assessment Endpoint 2: Survival, growth, and reproduction of local populations of aquatic wildlife as represented by the bald eagle, mallard duck, great blue heron, muskrat, and river otter or raccoon in Creek Sectors B through F, and M

Measure of effect 2a: Wildlife species composition and habitat use.

Measure of effect 2b: Concentration of semi-volatile compounds (SVOCs), metals, mercury, Polychlorinated Biphenyls (PCBs), pesticides, cyanide, herbicides, and dioxin in aquatic and marsh plants for use in evaluating exposure via the food chains for mallard duck, river otter or raccoon , and muskrat.

Measure of effect 2c: Concentration of COECs in surface waters in comparison to wildlife benchmarks.

Measure of effect 2d: Concentration of COECs in forage fish and crayfish for use in evaluating exposure via the food chain for great blue heron and river otter or raccoon.

Measure of effect 2e: Concentration of SVOCs, metals, mercury, PCBs, pesticides, cyanide, herbicides, and dioxin in macroinvertebrates (including crayfish) for use in evaluating exposure via the food chain for mallard duck, river otter or raccoon and muskrat.

Measure of effect 2f: sustainability of a benthic macroinvertebrate community that can serve as a prey base for fish (includes three lines of evidence as in Assessment Endpoint 1).

Assessment Endpoint 3: Survival, growth, and reproduction of individuals within the local bald eagle population in Creek Sectors B through F, and M

Measure of effect 3a: Concentration of COECs in fish for use in evaluating exposure via the food chain.

Assessment Endpoint 4: Survival, growth, and reproduction of local populations of terrestrial wildlife along the banks and floodplain of Creek Sectors B through F, and M

Measure of effect 4a: Soil screening effect levels for the protection of wildlife, plants, and soil dwelling invertebrates.

4.3.1 Measures of Effects for Assessment Endpoint 1, Sustainability of Warm Water Fish

The COECs may exert direct effects on warm water fish through exposure in the water, sediment, or prey, and indirectly by affecting their prey, the macroinvertebrate community. The proposed measures of effects assess exposure pathways and potential effects. Some rely upon direct observations of conditions; some involve measures of toxicity; and others use literature values.

Measure of effect 1a: body burdens of COECs in selected fish species.

Purpose and Rationale. Fish exposed to bioaccumulative compounds in their diet or in water can accumulate these COECs in their tissues. Contaminants tend to accumulate in organs such as the liver and kidney to a greater degree than in the musculature. However, COEC levels in the muscle tissue and on a whole body basis are useful for evaluating risks to animals that eat fish. The assessment will use measurements of COECs in fish tissues to evaluate exposure and effects on the fish, and to provide data for use in other parts of the assessment.

Approach. The assessment will use this endpoint to evaluate exposure and effects. As a measure of exposure, it will compare body burdens of COECs in small forage fish, medium bottom-feeding fish and large piscivorous fish to those same fish species in the reference area. Therefore, the comparisons of fish body will help to assess if fish in Dead Creek are exposed to COECs in excess of those that occur in the reference area. The assessment will also use the body burden data as input to the food chain exposure models for the representative piscivores (the great blue heron, bald eagle, and the river otter or raccoon).

As a measure of effects, the assessment will compare measured body burdens to literature values at which effects have been reported. The Waterways Experiment Station (WES) of the Army Corps of Engineers provides an on-line database and The Society of Environmental Toxicology and Chemistry (Jarvinen and Ankley, 1999) provides a compilation of such residue effect levels. The assessment will query these databases. If body burdens exceed levels at which effects have been reported in the databases, it will be presumed that the measure of effect indicates the potential for effects in the selected fish species found in Dead

Creek.

Measure of effect 1b: COEC concentrations in surface waters as compared to applicable water quality criteria for protection of fish and wildlife.

Purpose and Rationale. Water concentrations provide a measure of exposure, and water quality criteria indicate levels above which effects may occur. This measure of effect will evaluate the potential for water concentrations of COECs in Dead Creek to cause adverse effects.

Approach: The assessment will compare measured concentrations of dissolved metals in surface waters to water quality criteria. Exposure of individual fish and the populations of fish in water will partly depend on the exposure field and the distribution and behavior of the fish. Thus, the area over which water quality criteria are exceeded becomes an important consideration when evaluating exposure. We will evaluate effects with respect to spatial extent and degree to which surface water concentrations exceed water quality criteria.

The USEPA has published an ECO-UPDATE entitled: "Ecotox Thresholds" that includes COEC-specific water quality benchmarks. If an Ecotox Threshold value is available for a COEC, the concentration of the COEC in water will be compared to its respective Ecotox Threshold value. When specific benchmarks are not available and when appropriate, USEPA has suggested using appropriate extrapolations between related species.

Measure of effect 1c: Sustainability of benthic macroinvertebrate communities that comprise a prey base

Purpose and Rationale. Benthic macroinvertebrates are an important source of food for many fish species. They experience direct sediment exposures due to their life histories. Exposures that result in reduced abundance, diversity, or biomass of these aquatic macroinvertebrates, could indirectly effect fish populations. Further, quantitative studies of benthic macroinvertebrates have a long history of use in water quality studies.

The assessment will use the sediment triad approach as part of a weight-of-evidence analysis to evaluate the sustainability of benthic macroinvertebrate communities in these water bodies. The sediment triad approach evaluates three elements of a benthic community:

field assessment of benthic macroinvertebrates;

sediment chemistry measurements;

sediment toxicity testing using indicator benthic macroinvertebrates.

Field assessment of benthic macroinvertebrate community

Effects will be evaluated by comparing the composition and abundance of benthic

macroinvertebrates within Dead Creek at different levels of concentrations of COECs in sediments (generally following EPA Rapid Bioassessment Level I Protocols in the field). These comparisons will help to estimate if there is a level above which effects are evident. Data from the reference areas will help to support the assessment because these reflect conditions in water bodies unaffected by site contaminants. If there are observable reductions in the abundance of benthic macroinvertebrates, we will assess the significance of this for the fish species that rely upon the macroinvertebrates for food as this is the basis for the assessment. This will be accomplished by relating the abundance and biomass of benthic macroinvertebrates to their production, and ultimately to the potential production of fish, using available production:biomass ratios from the literature.

Sediment chemical measurements

Concentrations of COECs in sediment will be compared to sediment benchmarks to judge whether adverse biological effects to benthic macroinvertebrates are plausible. The USEPA compares sediment chemical measurements to Effect Range-Low (ERL) values and Effect Range-Median (ERM) values (Long and Morgan, 1990). However, sediment concentrations which exceed ER-Ls and/or ER-Ms do not necessary indicate that adverse effects to benthic macroinvertebrates have occurred. The USEPA's sediment triad approach uses multiple lines of evidence to assess if benthic macroinvertebrates are adversely affected by sediment-associated contaminants.

The USEPA has published an ECO-UPDATE entitled: "Ecotox Thresholds" that includes COEC-specific sediment benchmarks. If an Ecotox Threshold value is available for a COEC, the concentration of the COEC in sediment will be compared its respective Ecotox Threshold value. When specific benchmarks are not available and when appropriate, USEPA has suggested that appropriate extrapolations between related species can be used.

Sediment toxicity testing

The assessment will use laboratory sediment bioassays conducted on sediments from Dead Creek and the reference area to evaluate the potential effects of whole sediment on representative benthic macroinvertebrates. The toxicity of the sediment will be compared to that of the standard control sediment used by the laboratory as part of the laboratory's standard operating procedures. Statistically significant decreases in survival and/or growth relative to controls will be considered a COEC-related effect when they can be related to exposures associated with COECs in the sediments.

4.3.2 Measures of Effects Associated with Assessment Endpoint 2

Survival, growth, and reproduction of local populations of aquatic wildlife populations represented by bald eagles, mallard duck, great blue heron, muskrat, and river otter or racoon (incorporates the assessment of benthic macroinvertebrates)

The assessment will use six measures of effects (some species-specific) to evaluate risks to the wildlife assessment endpoint. Food-chain modeling will estimate exposure to the four wildlife species.

Wildlife either sighted during prior site visits or likely to occur based on the evaluation of habitats was used to identify representative wildlife species.

Table 2. Representative Aquatic Wildlife Species Proposed for Assessing Risks of COECs to Wildlife.

Species	Feeding Guild	Primary Habitat	Use in ERA
Bald Eagle	Eats fish and other small animals	Aquatic	Evaluate exposure to COECs in aquatic food webs
Great Blue Heron	Eats fish and other small animals	Aquatic	Evaluate exposure to COECs in aquatic food webs
Mallard Duck	Eats plants and macroinvertebrates	Aquatic	Evaluate exposure to COECs in aquatic plants and macroinvertebrates
Muskrat	Eats plants and some macroinvertebrates (e.g., clams)	Aquatic	Evaluate exposure to COECs in aquatic plants and in macroinvertebrates
River otter or raccoon	Eats fish, other small animals and some macroinvertebrates	Aquatic	Evaluate exposures to COECs in fish and macroinvertebrates

The assessment will use exposure models to evaluate different routes of exposure including ingestion of water, sediment and food (plants, benthic macroinvertebrates and fish). This subsection describes the measures of effects and the general model used to evaluate exposures.

Measure of effect 2a: Wildlife species composition and habitat use.

Purpose and Rationale. The measure of effect directly examines the receptors – wildlife – to estimate if they are using the various sectors of Dead Creek. The assessment is a measure of the degree to which local and migratory wildlife use the habitat and the extent to which it supports their needs.

Approach: The assessment will compare the composition and habitat use by wildlife to observations of species composition of wildlife and their use of a reference area. A wildlife biologist will make these observations This type of survey is qualitative. The strength of the

analysis is that it indicates whether Dead Creek can support wildlife species comparable to unaffected reference areas. However, because of the qualitative nature of the observations and the high natural variability that can exist in wildlife populations, direct observations may not reveal effects.

Measure of effect 2b: Concentrations of COECs in aquatic and marsh plants.

This measure of effect will be conducted within Dead Creek Segments B to F, and M and the reference areas.

This plan recommends collecting aquatic and marsh plants for analysis of COECs because some species of wildlife using Dead Creek and wetlands eat aquatic and marsh plants. This is a potentially complete exposure pathway for wildlife. The QAPP/FSP describes the details of the aquatic and marsh plant collection and analysis.

Purpose and Rationale. The assessment will compare measures of COECs in submerged aquatic and emergent marsh vegetation within Dead Creek and a reference water body. Waterfowl graze on aquatic plants. Herbivorous mammals such as the muskrat eat aquatic and emergent vegetation in wetlands. If plants take up metals and PAHs from the water or sediments, waterfowl and herbivorous mammals could be exposed to these COECs in their diet.

As the QAPP/FSP indicates, fruiting bodies/leaves and roots from aquatic plants and emergent plants will be composited separately.

Approach: The endpoint will be evaluated in multi-pathway exposure models for the mallard and the muskrat that considers sediment, water, and food. Exposures to water fowl and herbivorous mammals within the Dead Creek sectors will be compared to: 1) appropriate NOAEL and LOAEL values, and 2) exposures that occur in reference areas. The COEC concentrations measured in submergent aquatic plants will be used to evaluate potential dietary exposures to the mallard, which graze on aquatic plants. The COEC concentrations measured in submergent and emergent plants will be used to evaluate potential dietary exposures to the muskrat, which graze on greens.

Measure of effect 2c: Concentration of COECs in surface waters.

Purpose and Rationale. Many wildlife species will use Dead Creek and associated wetlands as a drinking water source. The presence of COECs in water could be a source of exposure to these species. This measure of effect examines this potential route of exposure.

Approach: This endpoint will be evaluated in multi-pathway exposure models for the mallard and the great blue heron that considers sediment, water, and food. The assessment will compare exposures to these selected representative species within the Dead Creek sectors to: 1) appropriate NOAEL and LOAEL values, and 2) exposures that occur in reference areas.

Measure of effect 2d: Concentration of COECs in fish.

Purpose and Rationale: Some wildlife species such as the bald eagle, the great blue heron eat primarily fish. This measure of effect evaluates this potential route of exposure.

Approach. Fish will be collected and analyzed for COECs. The COEC levels measured in fish will be used in the multi-pathway exposure model for the bald eagle and the great blue heron that considers sediment, water, and food. Exposures to the bald eagle and the great blue heron within the Dead Creek Sectors will be compared to: 1) appropriate NOAEL and LOAEL values, and 2) exposures that occur in reference areas.

Measure of effect 2e: Concentration of metals and PAHs in benthic macroinvertebrates (including crayfish).

Purpose and Rationale. Waterfowl (such as the mallard) and mammals (such as the muskrat) eat benthic macroinvertebrates as a portion of their diet. This measure of effect evaluates this potential route of exposure.

Approach: Benthic macroinvertebrates and crayfish will be collected and analyzed for COECs. The COEC levels measured in benthic macroinvertebrates will be used in a multi-pathway exposure model for the mallard and for the muskrat that considers sediment, water, and food. Exposures to water-fowl and mammals within the Dead Creek Sectors will be compared to: 1) appropriate NOAEL and LOAEL values, and 2) exposures that occur in reference areas.

4.3.3 Measures of effects Associated with Assessment Endpoint 3

Assessment Endpoint 3 is survival, growth, and reproduction of individuals within the local bald eagle population in Creek Sectors B through F, and M.

Measure of effect 3a: Concentration of COECs in forage fish for use in evaluating exposure via the food chain.

Purpose and Rationale. Bald eagle may use fish in Dead Creek and associated wetlands as food. The presence of COECs in fish could be a source of exposure to this species. This measure of effect examines this potential route of exposure.

Approach: This endpoint will be evaluated in a an exposure model for the bald eagle. The assessment will compare exposures to: 1) appropriate NOAEL and LOAEL values, and 2) exposures that occur in reference areas.

4.3.4 Measures of Effect Associated with Assessment Endpoint 4

Measure of effect 4a: COEC concentrations in soil samples from Creek bank and floodplain as compared to applicable soil screening levels for protection of wildlife, plants, and soil dwelling invertebrates.

Purpose and Rationale. Soil concentrations provide a measure of exposure, and screening level criteria indicate levels above which effects may occur. This measure of effect will evaluate the potential for soil concentrations of COECs in Dead Creek banks and floodplains to cause adverse effects.

Approach: The assessment will compare measured concentrations of total contaminant concentrations in soils to existing (e.g. Oak Ridge National Laboratory Toxicological Benchmarks for Wildlife; Oak Ridge National Laboratory Toxicological Benchmarks for Screening Potential Effects on Terrestrial Plants; Oak Ridge National Laboratory Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Processes).

We will also use any terrestrial soil screening concentrations or benchmarks developed by the time the proposed work occurs.

4.4 Structure of Wildlife Exposure Models

The general form of the wildlife exposure model is:

$$\text{Exposure Dose (oral)} = [Conc_{food} * Ingest_{food}] + [RAF * Conc_{soil} * Sediment_{diet} * Ingest_{food}]$$

Where:

Exposure Dose (oral) = dose of a COEC in ug/g-day

$Conc_{food}$ = concentration of the COEC (ug/g) in the food (measured or estimated); this is the average and the 95 % CL concentration in the relevant exposure zone – an area determined by the size and locations of foraging areas. The average is the appropriate statistic because ecological receptors integrate exposure over their foraging areas. We will also use the 95% CL and calculate risk from this exposure separately.

$Ingest_{food}$ = amount of food ingested per day normalized to body weight (g/g-day) and usually expressed in terms of wet weight/wet weight

RAF – relative availability factor for COECs in sediment via incidental ingestion of sediment

$Conc_{sediment}$ = concentration ug/g in the relevant exposure zone; this is estimated as an average concentration in the exposure zone for chronic exposure and effects, and as upper bound (e.g., maximum or hot spot concentrations) for evaluation of short-term or acute exposures. The average is the appropriate statistic because ecological receptors integrate exposure over their foraging areas.

$Sediment_{diet}$ = fraction of sediment in the diet; the product of this number and $Ingest_{food}$ yields an estimate of the amount of sediment that is incidentally ingested

Sediments that are collected within shallow water (< 3 feet deep) in open water areas of Dead Creek, sediments along the bank, and soils adjacent to the creek (where available) will be used to assess incidental sediment ingestion. Sediments collected from the top 5 cm will be considered accessible to aquatic wildlife.

Because exposures to COECs associated with diet and sediment will be higher than surface water ingestion, this exposure pathway will not be estimated within the model. However, we will compare National Recommenced Water Quality Criteria for the protection of wildlife to surface water concentrations where such data and corresponding criteria are available.

Model Application

The model will be applied in several ways:

1. Acute exposure: The potential for acute exposure is considered without incorporating information on foraging area. The rationale for this is that an acute exposure involves a short-term feeding or exposure event that does not have to be averaged over the foraging area. When calculating the potential for acute exposure, maximum concentrations are used within the geographically defined local population or Threatened and Endangered species. Locations that exceed exposure concentrations that could result in acute toxic effects are identified.

2. Chronic exposure to individuals: The potential for chronic exposure to individuals is considered by determining both the maximum concentration and calculating an average concentration of food and sediments at spatial scales defined by the foraging areas of the species. For example, exposure concentrations for a species with a foraging area of 10 ha would be determined by averaging the food and sediments concentrations within this spatial scale. A species with a foraging area of 0.1 ha would have an averaging area that is 100 times less.

3. Chronic exposure to the population. The local population as defined above is made up of a number of individuals. Because the success of the local population is not dependent on the risk to any particular individual, a wildlife exposure model will also be used to estimate chronic exposures to individuals throughout the local population. These estimates take into account the spatial distribution of COECs, the foraging areas of the individuals within the species, and possible spatial distributions of these individuals within the area that defines the local population. Results are used to estimate risks as a percentage of the local population. The local population is confined to individual animals that use Dead Creek and its associated wetlands and small ponds.

4. Acute and chronic exposures to the Bald Eagle. Because the Bald eagle is rare and the risk to the individual is considered, the wildlife exposure model will also be used to estimate exposures to the individual.

5.0 RISK CHARACTERIZATION

Risk results will be presented as calculated Hazard Quotients as well as other measures (e.g., presence of toxicity). These results will be incorporated into the weight of evidence approach in the form of graphs and tables and will be explained in narratives. Graphs will be used to illustrate the four factors that contribute to the weight of evidence evaluation.

5.1 Use of Hazard Quotients

Because the Hazard Quotient will be one of the more common methods used to express results, it is explained below. The method simply involves comparisons of exposure concentrations for COECs to concentrations at which effects are judged:

$$\text{Hazard Quotient} = \frac{\text{Concentration}_{\text{exposure}}}{\text{Concentration}_{\text{effects}}}$$

where:

$\text{Concentration}_{\text{exposure}}$ = the concentration or dose to which an organism is exposed

$\text{Concentration}_{\text{effects}}$ = the concentration or dose at or above which effects may occur

If the Hazard Quotient exceeds "1", there is a potential for an effect. To some extent, the higher the number above "1", the more likely that an effect would occur. Calculations of Hazard Quotients need to take into account spatial and temporal factors inasmuch as these are related to the effect that might occur to populations of biota. The COECs may have additive effects on organisms, and these will be evaluated by summing across compounds grouped according to the specific toxicological effect they may have.

5.2 Toxicity Reference Values for Wildlife

TRVs used in the toxicity quotient's denominator represent chronic oral No Observed Adverse Effect Levels (NOAELs). A TRV will be expressed as mg of COEC / kg Body Wt. of the test animal / day. TRVs will be selected from published studies cited in the following sources:

United States Fish and Wildlife Service (USFWS) biological reports that review and summarize literature on the ecological and toxicological aspects of COECs with special reference to fish and wildlife.

Toxicological animal studies cited in: Sample, B.E., D. M. Opresko and G.W. Suter II, 1996, *Toxicological benchmarks for wildlife: 1997 revision*, Oak Ridge National Laboratory, Oak Ridge, Tennessee;

The Waterways Experimental Station on-line database;

The Society of Environmental Toxicology and Chemistry's recently published database of residual effect levels (Jarvinen and Ankley, 1999);

Computer on-line data bases, such as Toxline, Biosis, Wildlife Fisheries Review, Pollution Abstracts, and Environmental Abstracts.

When reviewing the toxicological literature and selecting the most appropriate TRV, several factors will be considered including:

- Taxonomic relationship between the test animal and the indicator species;
- Use of laboratory or domesticated animals;
- Ecological relevance of the study endpoints—Studies with chronic toxicity endpoints, such as reproductive, growth, behavior and developmental endpoints, are targeted. Sensitive endpoints, such as reproductive or developmental toxicity, are preferentially selected because they are closely related to the selected assessment endpoints (*e.g.*, population declines);
- Toxicological studies in which the chemical was administered through the diet of the test species are preferred over studies using other oral dosing methods, such as gavage; and
- Long-term studies representing chronic exposure are preferentially selected.

Dietary concentrations (mg/kg diet) cited in the reference study will be converted to mg/kg BW/day. If the daily dose reported in the selected study is a Lowest Adverse Effect Level (LOAEL), then the LOAEL will be converted to a NOAEL using a factor of 10. Interspecies correlations will be considered.

If toxicological animal studies are not available for a particular COEC, then QSAR will be considered and a surrogate chemical will be selected when possible. If the COEC can not be assessed quantitatively, then the risk to the COEC will be qualitatively discussed.

Species specific toxicity factors may not be available for all COEC. In such cases, the assessment will apply the following sequential steps to develop a toxicity factor.

- Use a toxicity value or criterion for the protection of exposed organisms, if an appropriate state or federal agency has proposed it.

- If criteria are unavailable, but appropriate data are available on NOAELs for the receptor species, use the lowest NOAEL for the receptor species.

- If an appropriate NOAEL is unavailable for the receptor species, use a NOAEL for a

species which is phylogenetically similar (within the same genera or family) and ecologically similar to the selected receptor species (e.g. from the same family of birds or mammals).

- If an appropriate NOAEL is unavailable for a phylogenetically similar species, extrapolate from an appropriate NOAEL value for other species (as closely related as possible) by dividing by 5 to account for extrapolations between families and by 10 to account for extrapolations between orders. Use the lowest appropriate NOAEL whenever several studies are available.

- In the absence of an appropriate NOAEL, if a LOAEL is available for a phylogenetically similar species, divide it by 10 to account for a LOAEL to NOAEL conversion. The LOAEL to NOAEL conversion is similar to EPA's derivation of human health RfD values, where LOAEL studies are adjusted by a factor of 10 to estimate NOAEL values.

- For calculating chronic toxicity values from data for sub-chronic tests, divide the resultant LOAEL or NOAEL by an additional factor of 10. This is consistent with the methodology used to derive human RfD values. EPA has no clear guidance on the dividing line between subchronic and chronic exposures. The present risk assessment follows recently developed guidance (Sample et al., 1996) which considers 10 weeks to be the minimum time for chronic exposure of birds and 1 year for chronic exposure of mammals. In addition to duration of exposure, the time when exposure to contaminant occurs is critical.

- In cases where NOAELs are available as a dietary concentration (e.g., mg contaminant per kg food), calculate a daily dose for birds or mammals based on standard estimates of food intake rates and body weights (USEPA, 1993c).

6.0 DISCUSSION OF UNCERTAINTIES AND EXPOSURE ASSUMPTIONS

Sources of uncertainty and variability within the ERA will be identified. The impact associated with these uncertainties will be qualitatively addressed. Sensitivity analyses will be conducted for the important exposure parameters that are used in the wildlife exposure models and for the TRVs that are used to determine risk to the representative wildlife species.

7.0 REFERENCES

Nagy, K.A., (1987). "Field Metabolic Rate and Food Requirement Scaling in Mammals and Birds". Ecological Monographs, 57(2), 1987, pp 111-128

US Environmental Protection Agency . (1993). Wildlife Exposure Factors Handbook Volume I. Washington D.C: Office of Research and Development; USEPA Report no. EPA/600/R-93/187a

Beyer, W.N., E.E. Connor, and S. Gerould. (1994). Estimates of soil ingestion by wildlife. J. Wildl. Manage. 58: 375-382.

Chapman, J.A., and G.A. Feldhamer. 1982. *Wild Mammals of North America*. Johns Hopkins University Press, Baltimore, MD and London.

Harris, C. J. (1968) Otters: a study of the recent Lutrinae. London, U.K.: Weidenfield & Nicolson.

Jarvinen, A.W. and G.T. Ankley, 1999. Linkage Effects to Tissue Residues: Development of a Comprehensive Database for Aquatic Organisms Exposed to Inorganic and Organic Chemicals. Pensacola FL, Society of Environmental Toxicology and Chemistry Press, 364pp.

Svihla, A.; Svihla, R. D. (1931) The Louisiana muskrat. J. Mammal. 12: 12 –28

U.S. Environmental Protection Agency. (1993). Wildlife Exposure Factors Handbook. U.S. EPA Office of research and Development. EPA/600/R-93/187a.