Baseline Ecological Risk Assessment for the Ogden Railyard Site Ogden, Utah

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List of Acronyms and Abbreviations

AOI	Area of Interest
BW	Body Weight
C	Concentration
COPC	Chemical Of Potential Concern
DF	Dietary Fraction
DNAPL	Dense Non-Aqueous Phase Liquid
EPC	Exposure Point Concentration
ERA	Ecological Risk Assessment
ESG	Equilibrium Partitioning Sediment Guideline
FCV	Final Chronic Value
GC-MS	Gas Chromatography - Mass Spectrometry
HI	Hazard Index
HQ	Hazard Quotient
IR	Intake Rate
LOAEL	Lowest Observed Adverse Effect Level
LOEC	Lowest Observed Effect Concentration
MATC	Maximum Acceptable Tissue Concentration
NOAEL	No Observed Adverse Effect Level
NOEC	No Observed Effect Concentration
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
RBA	Relative Bioavailability
RBP	Rapid Bioassessment Protocol
SAP	Sampling and Analysis Plan
SCM	Site Conceptual Model
SEC	Sediment Effect Concentration
SERA	Screening-Level Ecological Risk Assessment
SIM	Selective Ion Monitoring
SSTT	Site-Specific Toxicity Test
SVOC	Semi-Volatile Organic Compound
TCDD	*2,3,7,8*-Tetrachlorodibenzodioxin
TEF	Toxicity Equivalency Factor
TEQ	TCDD Equivalent Concentration
TOC	Total Organic Carbon
TRV	Toxicity Reference Value
UCL	Upper Confidence Limit
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

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EXECUTIVE SUMMARY

1.0 Introduction

This document is a baseline ecological risk assessment (ERA) for the Ogden Railyard site located in Ogden, Utah. The purpose of the ERA is to describe the likelihood, nature, and extent of adverse effects to ecological receptors resulting from exposure to chemical contaminants released from the railyard site to surrounding areas. This information, along with other relevant information, is used by risk managers to make decisions whether remedial actions are needed to protect the environment from site-related chemicals.

2.0 Site Characterization

The Ogden Railyard Site is located in Weber County, Utah, just west of the City of Ogden. The main operating portion of the railyard site (the "on-yard" area) contains no permanent water bodies, has little or no vegetation, and does not contain any habitat suitable for ecological receptors. For these reasons, no evaluation of ecological risks is needed for the on-yard portion of the site. However, there are a number of areas around the railyard site where ecological receptors might be exposed to site-related chemicals, including the following:

- The Weber River, which flows from south to north along the west edge of the site. The river has a well-vegetated riparian zone of variable width that separates the railyard from the river.
- The Ogden River, which flows from east to west along the northern end of the site.
- The 21st Street Pond, which is located near the northern edge of the site. Water in the pond is obtained from the Ogden River via sluice gates.

The Weber River, the Ogden River, and the 21st Street Pond are all suitable habitat for fish and other aquatic receptors, and the riparian areas along both rivers are suitable habitat for plants and a variety of mammalian and avian wildlife species.

3.0 Nature and Extent of Contamination

The site is of potential ecological concern because of various chemicals that have been released to the environment on the railyard site. A number of studies have been performed to characterize the nature and extent of these releases. These investigations were performed in three phases. The Phase 1 investigation focused mainly on the active on-yard area and the riparian area west of the yard, and identified the presence of a number of chemicals of potential concern in site soil, sediment, groundwater, and surface water, including:

- Diesel fuel, grease, oils, and associated petroleum hydrocarbons
- Chlorinated solvents and associated degradation products
- Metals
- Polycyclic aromatic hydrocarbons (PAHs)

The Phase 2 investigation was performed to obtain additional data for on-yard locations, as well as additional data on the nature and extent of off-yard contamination in areas of potential ecological concern. During the Phase 2 investigation, two important new concerns associated with the site were identified:

- A large plume of dense non-aqueous phase liquid (DNAPL) was discovered below the ground surface at the northern end of the site. This DNAPL zone is suspected to originate at the location of a former Pintsch Gas Process plant that produced gas from petroleum products (manufactured gas). The DNAPL zone extends towards the north, coming into direct contact with the east end of the 21st Street Pond and extending under the Ogden River.

- Polychlorinated biphenyls (PCBs) were detected in tissues of fish collected from the 21st Street Pond as well as in sediments collected from the 21st Street Pond and the Ogden River.

These two new concerns generated the need to collect additional samples specifically designed to characterize the potential risk to health and the environment from the DNAPL zone and the PCBs. This additional sampling event is referred to as the Phase 3 investigation.

Table ES-1 summarizes the number, type, and location of the samples that have been collected, and the types of chemical analyses that were performed during these three phases of investigation. All data from each phase of the site investigation were used in this ERA.

4.0 Problem Formulation

Conceptual Site Model

For the purposes of this ecological assessment, the Weber River and the Ogden River were divided into a number of reaches, including several locations that are not believed to be impacted by site-related releases and that serve as reference areas for the site. These reaches and reference areas are listed below and are shown in Figure ES-1.

Reach	**Description**
21st Street Pond	21st Street Pond (east end, west end) and surrounding areas
Buena Ventura Park Pond	Buena Ventura Park Pond and surrounding areas; this area is used as the reference area for 21st Street Pond
Ogden River - Reach A	Ogden River upstream (east) of Wall Avenue; this reach is used as the reference area for Ogden River Reaches B and C
Ogden River - Reach B	Ogden River downstream (west) of Wall Avenue to the 21st Street Pond outfall
Ogden River - Reach C	Ogden River downstream (west) of the 21st Street Pond outfall to the confluence with the Weber River
Weber River - Reach A	Weber River upstream of the Ogden Railyard site, south of Riverdale Road; this reach is used as the reference area for Weber River Reaches B, C, and D
Weber River - Reach B	Weber River from AOI 9 to 33rd Street
Weber River - Reach C	Weber River from 33rd Street to 24th Street
Weber River - Reach D	Weber River downstream (north) of 24th Street

Figure ES-2 presents the site conceptual model (SCM) that shows how contaminants from the site might reach and impact ecological receptors in the exposure areas of concern. As indicated in the SCM, although there are a number of complete exposure pathways by which ecological receptors may come into contact with site-related chemicals, not all exposure pathways are likely to be of equal concern. For the purposes of this risk assessment, each complete exposure pathway has been classified as follows:

- The pathway is considered to be of potential concern, and sufficient data exist to support a quantitative risk evaluation. These cases are indicated by boxes containing a solid circle (●). These pathways are the primary focus of this risk assessment.

- The pathway is considered to be of potential concern, but available data are too limited to support a reliable quantitative risk evaluation. These cases are shown by boxes with an open circle (❍).

- The risk posed by the pathway is likely to be minor, either on an absolute basis and/or in comparison to other exposure pathways that affect the same receptor. These cases are indicated by boxes with an "X". Because these pathways are judged to be of minor concern, they are not evaluated quantitatively in the ERA.

Management Goal

Management goals are descriptions of the basic objectives which the risk manager at a site wishes to achieve. The overall management goal identified for ecological health at the Ogden Railyard site is as follows:

> *Ensure adequate protection of ecological systems within the impacted areas of the Ogden Railyard site by protecting them from the deleterious effects of acute and chronic exposures to site-related contaminants of concern.*

Adequate protection is defined as protection of growth, reproduction, and survival of local populations. That is, the focus is on ensuring the sustainability of the local population rather than the protection of all individuals in the population. The ecological systems identified for adequate protection include terrestrial soil organisms and plant communities, aquatic life in the Weber River, Ogden River, and 21st Street Pond, aquatic and terrestrial mammal and bird populations, and any threatened and endangered species (including candidate species) and species of special concern.

Assessment and Measurement Endpoints

Assessment endpoints are explicit statements that describe the attributes of a population or community of ecological receptors that are to be protected from site-related releases. Assessment endpoints are either measured directly or are evaluated through indirect measures. Measurement endpoints represent quantifiable ecological characteristics that can be measured, interpreted, and related to the valued ecological components chosen as the assessment endpoints. Table ES-2 presents the assessment and measurement endpoints used to characterize and interpret potential ecological risks for the Ogden Railyard site. These measurement endpoints can be divided into three basic categories:

- Hazard Quotients (HQs)
- Site-specific toxicity tests (SSTTs)
- Observations of population and community demographics (Pop/Comm. Dem.)

Each of these three basic approaches is described below.

<u>Method 1: Hazard Quotients</u>

A Hazard Quotient (HQ) is the ratio of the estimated exposure of a receptor at the site to a "benchmark" exposure that does not cause any unacceptable adverse effects:

$$HQ = Exposure / Benchmark$$

If the value of an HQ is less than or equal to one, risk to the exposed individual is judged to be acceptable. If the HQ exceeds one, the exposed individual may experience an adverse effect, with the probability and/or severity of the effect tending to increase as the magnitude of the HQ increases. In cases where a receptor is exposed to the same chemical in more than one medium, the total hazard is expressed as the Hazard Index (HI), which is calculated as the sum of the HQ values added across media.

As noted above, the assessment endpoints at this site focus on the sustainability of exposed populations, and risks to some individuals in a population may be acceptable if the population is expected to remain healthy and stable. The fraction of the population that must have HQ values below a value of one in order for the population to remain stable is likely to vary from species to species. For the purposes of this evaluation, it is assumed that if at least 80% of the individuals in an exposed population have HQ values of one or less, risks to the population are likely to be minimal. Conversely, it is assumed that if more than 20% of the individuals in a population have HQ values above 1.0, then there is a potential risk to that population. It should be emphasized that this is a screening level assumption based on professional judgement, and that actual risks to populations are expected to gradually transition from "acceptable" to "unacceptable" as the frequency and magnitude of HQ values above 1.0 increases.

Method 2: Site-Specific Toxicity Tests

Site-specific toxicity tests measure the response of receptors that are exposed to site media. The chief advantage of this approach is that site-specific conditions which can influence toxicity are accounted for. A potential disadvantage is that, if toxic effects are observed to occur when test organisms are exposed to a site medium, it is usually not possible to specify which chemical or combination of chemicals is responsible for the effect. In addition, it is often difficult to test the full range of environmental conditions which may occur at the site across time and space, so these studies are not always adequate to identify the boundary between exposures that are acceptable and those that are not.

Method 3: Population Observations

A third approach for evaluating impacts of environmental contamination on ecological receptors is to make direct observations on the receptors in the field, seeking to determine whether any receptor population has unusual numbers of individuals (either lower or higher than expected), or whether the diversity (number of different species) of a particular category of receptors (e.g., plants, benthic organisms, birds) is different than expected. The chief advantage of this approach is that direct observation of population or community status does not require making the numerous assumptions and estimates needed in the HQ approach. However, interpreting the observations is often difficult, because the abundance and diversity of an ecological population depend on many site-specific factors, and it is often difficult to know what the expected (non-impacted) abundance and diversity of an ecological population should be in a particular area. This problem is generally approached by seeking an appropriate "reference area", but it is sometimes quite difficult to locate a reference area that is truly a good match for all of the important habitat variables at the site.

Because each of the basic measurement endpoints available has both advantages and limitations, conclusions based on only one method of evaluation may be misleading. Therefore, the best approach for deriving reliable conclusions is to combine the findings across all of the methods for which data are available, taking the relative strengths and weaknesses of each method into account.

5.0 Risks to Aquatic Receptors

Risks from Surface Water

One line of evidence (the HQ approach) is available to evaluate risks to aquatic receptors from direct contact exposure to surface water. The findings from this line of evidence are summarized below.

Line of Evidence	Findings
HQ calculations based on surface water concentrations in the Weber River, Ogden River and 21st Street Pond	Most HQ distributions are either below a level of population concern (at least 80% of all HQ values are ≤ 1.0), or else do not appear to be site-related. Chronic HQ distributions are of potential concern for several PAHs in the east end of the 21st Street Pond. These are likely site-related, but might reflect PAHs bound to suspended sediment rather than dissolved in surface water. If so, risks are likely to be lower than calculated.

Based on this line of evidence, it is concluded that risks to aquatic receptors from site-related chemicals in surface water are not of population-level concern to aquatic receptors except potentially at the east end of the 21st Street Pond.

Sediments

Three lines of evidence are available to evaluate risks from sediments to benthic organisms. The findings from these lines of evidence are summarized below.

Line of Evidence	Findings
HQ Calculations	Based on bulk sediment concentrations and sediment effects concentration benchmarks, risks to benthic organisms from non-PAHs in sediment do not appear to be of population-level concern except possibly for xylenes and PCBs in the east end of the 21st Street Pond and PCBs in the Ogden River Reach B. Based on bulk sediment concentrations and sediment effects concentration benchmarks, risks from PAHs are of population-level concern in multiple locations, especially the east end of the 21st Street Pond. Based on bulk sediment concentrations and equilibrium sediment guideline benchmarks, risks from PAHs are not of population-level concern at any location except possibly at the east end of the 21st Street Pond. Based on porewater measurements, risks from PAHs are not of population-level concern at any location, including the east end of the 21st Street Pond.
Site-Specific Toxicity Testing	Low toxicity (24-26% mortality) was noted at 1 location in the Weber River (near a former on-yard lagoon). Toxicity was not observed at 7 other locations in the Weber River, and not at 3 locations from the 21st Street Pond.
Population and Community Demographics	No evidence of adverse effect in the Weber River (based on Rapid Assessment Protocol). There may be some shifts in community structure in the east end of the 21st Street Pond compared to the west end, but comparison with Buena Ventura Park Pond does not reveal substantial impacts.

In summary, based on a weight of evidence approach, it is concluded that sediments are not of population-level concern to benthic organisms at most locations. At the east end of the 21st Street Pond, population-level risks may occur from xylenes, PCBs, and PAHs. PCBs may also be of concern in sediments from Ogden River Reach B. However, at both of these locations, results are mixed and no strong conclusions can be drawn.

Risks from All Pathways Combined

One line of evidence (tissue-based HQ values) is available to evaluate risks to aquatic receptors (fish) from all aquatic exposure pathways combined. The findings from this line of evidence are summarized below.

Line of Evidence	Findings
HQ calculations for fish based on tissue burdens in fish from the Weber River, the Ogden River and the 21st Street Pond	Risks from 4,4'-DDD and 4,4'-DDE are above a level of concern, but may not be site-related. Other chemicals are not in a range of population-level concern.

Based on this line of evidence, it is concluded that risks to fish from site-related chemicals are not of population-level concern.

<u>Overall Conclusion Regarding Risks to Aquatic Receptors</u>

The weight of evidence combined across all observations indicates that risks to aquatic receptors from site-related chemicals are not of concern, except possibly for risks to benthic organisms from xylenes, PCBs and PAHs in the east end of the 21st Street Pond and PCBs in the Ogden River Reach B.

6.0 Risks to Terrestrial Plant and Soil Organisms

One line of evidence (the HQ approach) is available to evaluate risks to plants and soil invertebrates from COPCs in soils. The findings from this line of evidence are summarized below:

Line of Evidence	Findings
HQ calculations based on concentrations measured in soil along the Weber River riparian zone and near the 21st Street Pond	With the exception of PCBs, HQ distributions are either below a level of population concern, or else do not appear to be site-related. Risks from PCBs in soil near the 21st Street Pond are of potential population concern.

Based on this line of evidence, it is concluded that risks from site-related chemicals in surface soil are not of population-level concern in the riparian area west of the railyard site. Risks from PCBs in soils near the 21st Street Pond (in abandoned meanders of the Ogden River) may impact local populations in those areas, but additional data (e.g., site-specific toxicity tests) would be needed to confirm this conclusion.

7.0 Risks to Wildlife Receptors

Non-PCB Chemicals

One line of evidence (the HI approach) is available to evaluate risks to wildlife receptors from non-PCB COPCs in water, soil, and the diet. The findings from this line of evidence are summarized below:

Line of Evidence	Findings
HI calculations based on non-PCB COPC concentrations measured in soil, water and diet	HI values are either below a level of concern or else do not appear to be site-related.

Based on this line of evidence, it is concluded that risks from non-PCB site-related chemicals in surface water, surface soil, and the diet are not of population-level concern to wildlife receptors either in the riparian area along the Weber River west of the railyard site or along the Ogden River (including the 21st Street Pond) north of the railyard.

PCBs

Two lines of evidence (both based on the HQ approach) are available to evaluate risks to wildlife receptors from ingestion of PCBs. The findings from these lines of evidence are summarized below:

Line of Evidence	Findings
HQ calculations based on total Aroclor concentrations in soil, sediment and the diet	Risks are below a level of concern for all receptors at all locations along the Weber River, the Ogden River and the 21st Street Pond.
HQ calculations for semi-aquatic wildlife (kingfisher, mallard, mink) based on congener-specific data in aquatic prey from the Ogden River and/or the 21st Street Pond	Depending on the toxicity benchmarks selected, risks could be of potential concern in the 21st Street Pond (kingfisher, mink) and the Ogden River near the pond (kingfisher, mallard, mink). Risk levels are likely to be low to moderate.

Based on the judgement that risks from PCBs are more reliably evaluated using the congener-specific approach than on the total Aroclor approach, it is concluded that PCBs may pose risks of adverse reproductive effects for specific individuals or family groups of semi-aquatic mammalian (mink) and avian (kingfisher, mallard) receptors residing along the Ogden River in the vicinity of the 21st Street Pond (the location where PCB levels are highest in fish and benthic macroinvertebrates). These risks to individuals are likely to be low to moderate, but because the size of the local populations may be limited, population-level risks are of potential concern.

8.0 Uncertainties

Quantitative evaluation of ecological risks is often limited by uncertainty regarding a number of important data, including exposure, toxicity, and risk factors. This lack of knowledge is usually circumvented by making estimates based on whatever limited data are available, or by making assumptions based on professional judgement when no reliable data are available. Because of these assumptions and estimates, the results of the risk calculations are themselves uncertain, and it is important for risk managers and the public to keep this in mind when interpreting the results of a risk assessment.

Table ES-3 summarizes the main sources of uncertainty in the ecological risk assessment at this site. As seen, some sources of uncertainty tend to underestimate risk, while other sources of uncertainty generally tend to overestimate risk. Thus, all of the HQ and HI values calculated and presented in this ERA section should be viewed as having substantial uncertainty. Because of the inherent conservatism in the derivation of most of the exposure estimates and the toxicity benchmarks, these HQ and HI values should generally be viewed as being more likely to be high than low, and should be interpreted in a weight-of evidence approach based on other types of available information as well.

9.0 Conclusions

Based on the available data, it is concluded that population-level risks to aquatic, terrestrial, and wildlife receptors are minimal at most locations around the Ogden Railyard Site. Exceptions to this conclusion include the following:

- The HQ approach predicts that risks to benthic organisms from PCBs in sediment are above a level of population concern in the Ogden River near the 21st Street Pond. However, there are no other lines of evidence to confirm or refute this prediction.

- The HQ approach predicts that risks to benthic organisms are above a level of concern due to PAHs and xylenes in sediment in the east end of the 21st Street Pond (in the area where the DNAPL plume has intersected the pond). The risk from PAHs is predicted using the HQ approach using one set of sediment toxicity benchmarks, but not on two other approaches. Direct toxicity testing of sediments from the 21st Street Pond did not demonstrate the sediments were toxic, but the test organisms may not have had substantial contact with the sediment.

- Risks to semi-aquatic wildlife receptors (kingfisher, mallard, mink) may be significant for individuals that ingest PCBs in aquatic prey from the 21st Street Pond and/or from the Ogden River near the pond. These risks are based on calculated HQs, and data from other lines of evidence are not available. Because the size of the exposed population may be small, population-level risks are of potential concern.

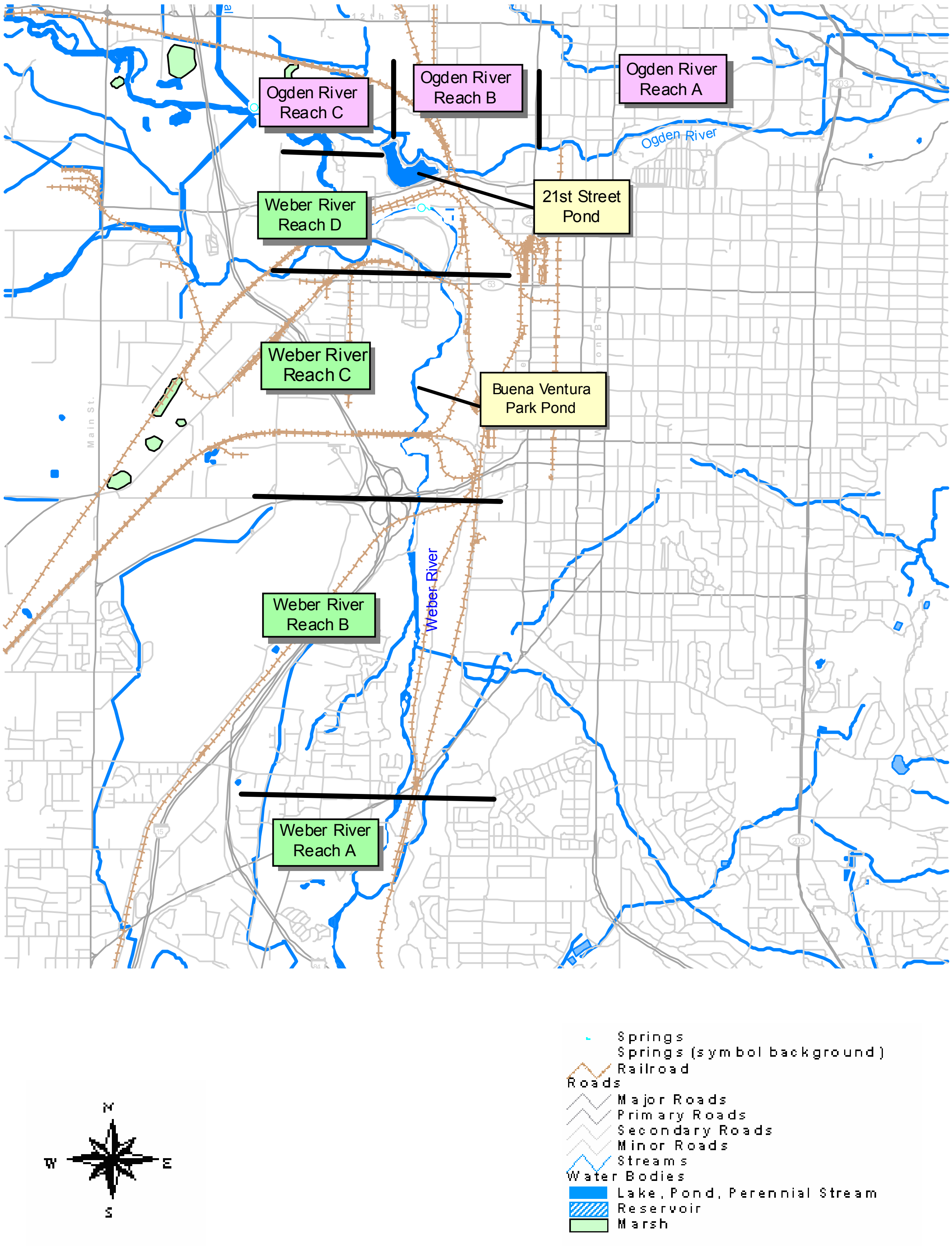

Figure ES-1
Exposure Locations for Ecological Receptors

Baseline Ecological Risk Assessment for the Ogden Railyard Site

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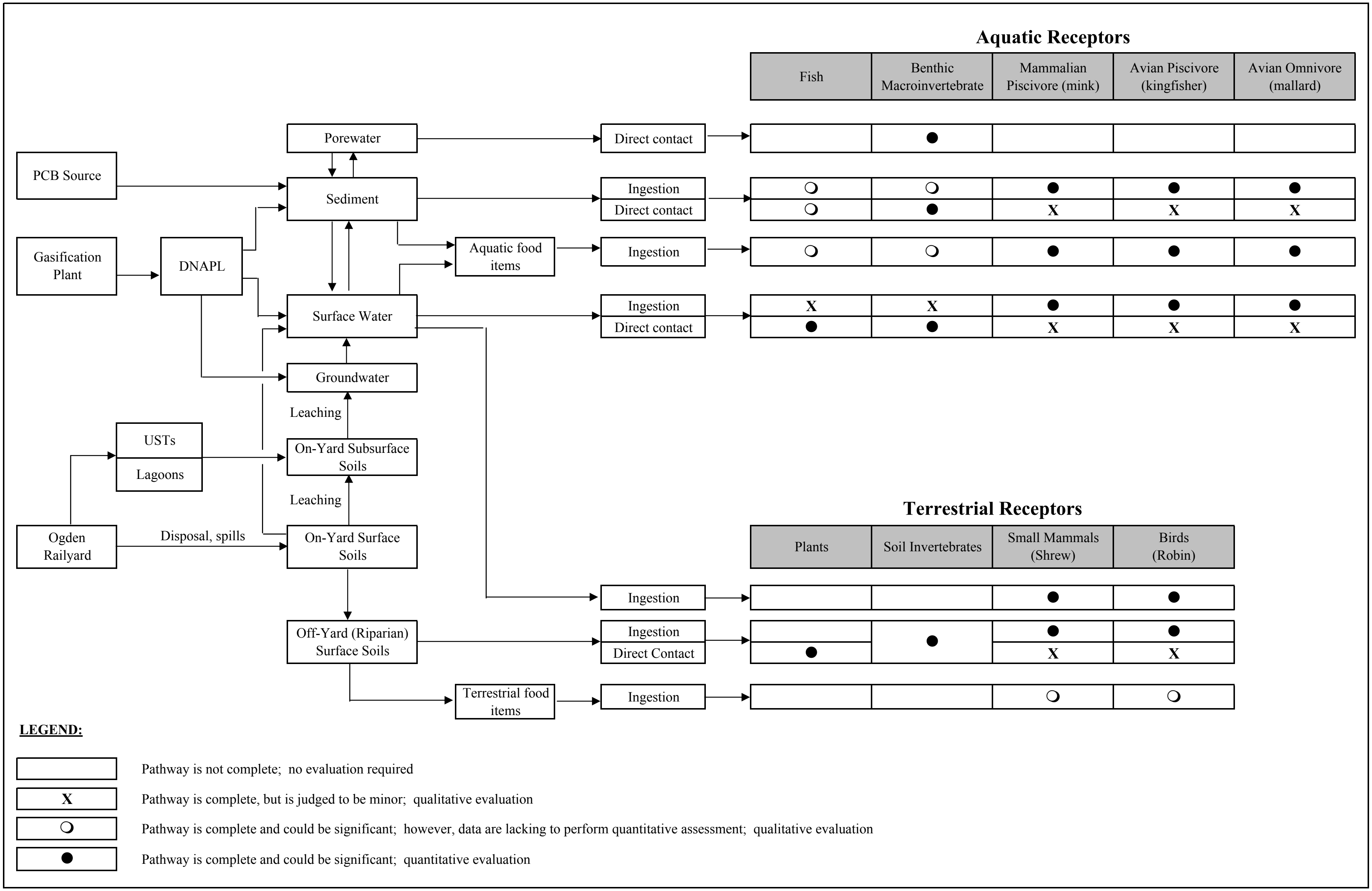

Figure ES-2
Site Conceptual Model for Ecological Exposure
Baseline Ecological Risk Assessment for the Ogden Railyard Site

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Table ES-1. Summary of Studies Performed at the Site

Phase	Study	Medium	Number and Location	Analytes
1	Safety-Kleen 1998	Surface Soil	13 samples from Weber River riparian zone 2 samples from 21st Street Pond	Metals, Pesticides, PAH, PCB (as Aroclor), TPH, SVOC, VOC
		Sediment	15 samples from Weber River 1 sample from Ogden River	Metals, Pesticides, PAH, PCB (as Aroclor), SVOC, VOC
		Surface water	3 samples from 21st St Pond 1 sample from Ogden River 14 samples from Weber River	Metals, Pesticides, PAH, PCB (as Aroclor), TPH, SVOC, VOC
2	USEPA/ERTC 2001	Surface Soil	1 sample from 21st Street Pond 9 samples from Weber River riparian zone	VOC, SVOC, Pesticides, PCB (as Aroclor), Metals
		Sediment	3 samples from 21st Street Pond (one measured directly at a bank seep) 1 sample from 33rd Street Slough 2 samples from AOI 10 Drainage Ditch 1 sample from Burch Creek 1 sample from Buena Ventura Park Pond 1 sample from Ogden River 1 sample from Roundhouse Drainage Ditch 1 sample from Strongs Creek 10 samples from Weber River	VOC, SVOC, Pesticides, PCB (as Aroclor), Metals, TOC, TPH
		Surface Water	2 samples from 21st Street Pond (one measured directly at a bank seep) 1 sample 33rd Street Slough 2 samples from Burch Creek 1 sample from Buena Ventura Park Pond 1 sample from Ogden River 1 sample from Roundhouse Drainage Ditch 3 samples from Strongs Creek 12 samples from Weber River	VOC, SVOC, Metals, Hardness, TSS, TOC, TPH
		Fish Tissue	56 samples from 21st Street Pond	SVOC, PAH, Pesticides, PCB (as Aroclor)

Table ES-3 Summary of Uncertainties in the Ecological Risk Assessment

Assessment Component	Description	Likely Direction of Error	Likely Magnitude of Error
Nature and Extent of Contamination	Samples collected may not be fully representative of variability in space or time, especially if the number of samples is small.	Unknown	Probably small
	Analytical results may be imprecise.	Unknown	Probably small
Exposure Assessment	Some exposure pathways were not evaluated.	Underestimate of risk	Probably small, except possibly for dietary ingestion by benthic organisms and direct contact of bottom-feeding fish with PAHs or PCBs in sediment
	Some chemicals were not evaluated because chemical was never detected, but detection limit was too high to detect the chemical if it were present at a level of concern.	Underestimate of risk	Usually small
	Exposure parameters for wildlife receptors are based on studies at other sites.	Unknown	Probably small
	Exposure point concentrations for wildlife receptors are based on a conservative estimate of the mean concentration in the exposure area.	Overestimate of risks	Possibly significant
	Absorption from site media is assumed to be the same as in laboratory studies.	Probably overestimate risk (especially metals)	Possibly significant
Effects (Toxicity) Assessment	Many chemicals lack reliable toxicity benchmarks for some receptors for some media; these chemicals are not evaluated.	Underestimation of risk	Probably small in most cases
	Available toxicity benchmarks are often based on limited data, and values must be extrapolated across species.	Unknown	Unknown, could be significant
	Wildlife receptors selected as representative species may not capture the full range of sensitivities in site receptors.	Unknown	Probably small
	Site-specific toxicity testing of sediments did not employ organisms that burrow into sediment.	Underestimation of risk	Could be significant
	Aquatic toxicity benchmarks are based on a wide range of species, many of which do not occur at this site.	Likely to overestimate risk	Probably small
Risk Characterization	Interactions between chemicals are difficult to account for; effects of one chemical may increase, decrease, or have no effect on other chemicals.	Unknown	Unknown, but probably small
	Estimation of population-level effects from HQ calculations is difficult; effects assumed to be unlikely when $\geq$80% or more had HQ $\leq$1, but this is an assumption and may vary from receptor to receptor.	Unknown	Unknown, probably small in most cases

Table ES-1. Summary of Studies Performed at the Site

Phase	Study	Medium	Number and Location	Analytes
2 (cont.)	Forrester Group (various reports 1998-2001)	Surface Soil	9 samples from 21st St Pond 40 samples from Weber River	Metals, PAH, SVOC, VOC
		Sediment	22 samples from 21st St Pond 3 samples from Buena Ventura Park 17 samples from Ogden River 10 samples from Weber River	Metals, PAH, PCB, SVOC, VOC
		Surface Water	19 samples from 21st St Pond 3 samples from Buena Ventura Park 6 samples from Ogden River 23 samples from Weber River	Metals, PAH, PCB, SVOC, VOC
3	USEPA 2002	Sediment	10 samples from 21st Street Pond 2 samples from Buena Ventura Park Pond 14 samples from Ogden River 5 sample from Pioneer Power Plant Aqueduct 5 samples from Weber River 2 samples from Wall Avenue Storm Drain	SVOC, PAHs (analyzed via both BNA and BNA SIM), Pesticides, PCB (as Aroclor), PCB (as congeners)
		Sediment Porewater	5 samples from 21st Street Pond 3 samples from Ogden River	SVOC, VOC, PAHs
		Soil	6 samples from 21st Street Pond (in abandoned meanders around pond)	SVOC, VOC, PAHs, Pesticides, PCB (as Aroclor)
		Fish Tissue	6 samples from 21st Street Pond 2 samples from Buena Ventura Park Pond 12 samples from Ogden River 2 samples from Weber River	PAHs, PCB and Dioxins/Furans (as congeners)
		Benthic Tissue	1 samples from Pioneer Power Plant Aqueduct 1 samples from Buena Ventura Park Pond 3 samples from Ogden River	PCB (as congeners)

Table ES-2
Summary of Assessment and Measurement Endpoints

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Receptor	Assessment Endpoint	Measurement Endpoint
Aquatic Community	Protection of aquatic invertebrates and fish from adverse effects related to exposure to chemicals in surface water and sediment.	Comparison of sampling location-specific chemical concentrations in surface water to National Ambient Water Quality Criteria (AWQC).
		Comparison of sampling location-specific chemical concentrations in sediment to benthic macroinvertebrate toxicity benchmarks.
		Comparison of sampling location-specific chemical concentrations in sediment porewater to benthic macroinvertebrate toxicity benchmarks.
		Evaluate the toxicity of site sediment to *Chironomus tenans* and *Hyalella azteca* (growth and survival) through laboratory testing.
		Benthic invertebrate community structure, including density and diversity (taxa richness) of benthic organisms.
		Comparison of chemical concentrations in fish tissue to maximum allowable tissue concentration (MATC) toxicity benchmarks for fish.
Terrestrial Community	Protection of terrestrial plants and terrestrial soil invertebrates from adverse effects related to exposure to chemicals in surface soil.	Comparison of sampling location-specific chemical concentrations in soil to toxicity screening benchmarks for terrestrial plants and terrestrial soil invertebrates.
Wildlife Community	Protection of wildlife from adverse effects to growth, reproduction, or survival related to exposure to chemicals in surface water, sediment, soil, benthic macroinvertebrates, and fish.	Comparison of the reach-specific chemical doses estimated from exposure point concentrations (EPCs) in surface water, sediment, soil, and aquatic food items to toxicity reference values (TRVs) for wildlife.

1.0 INTRODUCTION

1.1 Purpose

This document is a baseline ecological risk assessment (ERA) for the Ogden Railyard site located in Ogden, Utah (Figure 1-1). The purpose of the ERA is to describe the likelihood, nature, and extent of adverse effects to ecological receptors resulting from exposure to contaminants released from the railyard to surrounding areas as a result of past or present site activities. This information, along with other relevant information, is used by risk managers to make decisions whether remedial actions are needed to protect the environment from site-related releases. If remediation is warranted, an investigation is performed to evaluate the relative merits of a range of alternative remedial actions which might be undertaken to achieve risk management goals at the site.

An evaluation of potential risks to human receptors from site-related contamination is presented in a separate report (USEPA 2003).

1.2 Approach

This ERA was performed in accordance with current United States Environmental Protection Agency (USEPA) guidance for ecological risk assessments (USEPA 1992, 1997a, 1998). The general sequence of steps used to carry out an ERA at a Superfund site is illustrated in Figure 1-2 (USEPA 1997a). It is important to realize that the eight steps shown in Figure 1-2 are not intended to represent a linear sequence of mandatory tasks. Rather, some tasks may proceed in parallel, some tasks may be performed in a phased or iterative fashion, and some tasks may be judged to be unnecessary at certain sites.

At this site, the ecological risk assessment process was initiated by performing a screening-level ecological risk assessment (SERA) in March of 2001 (USEPA 2001b). Because a SERA normally uses a number of simplifying assumptions and approaches and is intentionally conservative, the SERA was not intended to support any final quantitative conclusions about the magnitude of the potential ecological risks. Rather, the SERA provided preliminary information on the potential for adverse effects to aquatic receptors (including benthic invertebrates and fish) exposed via direct contact to chemicals of potential concern (COPCs) in surface water and sediments; to terrestrial plants and soil invertebrates exposed via direct contact to soils; and to terrestrial wildlife receptors exposed via ingestion of surface water, sediments, soils, and dietary items. The SERA concluded that risks from site-related contaminants could not be excluded for any of these ecological receptors, and identified data that would be needed for a more detailed ecological risk evaluation.

Following completion of the SERA, additional data collection efforts were conducted by the USEPA and the Union Pacific Railroad to support a more detailed and thorough evaluation of ecological impacts at the site. These efforts included collection of additional abiotic and biotic samples, site-specific sediment toxicity testing, and an analysis of the aquatic habitat and benthic communities in potentially impacted surface waters. This report utilizes the new data along with the historical data to provide an updated and refined ecological risk evaluation for the site.

1.3 Organization

In addition to this introduction, the ERA report is organized into the following main sections.

Section 2 - This section details the location, description, environmental setting, and history of the Ogden Railyard site.

Section 3 - This section discusses the available data for the Ogden Railyard Site including a description of the nature and extent of contamination present in surface water, sediment, surface soils, and biological tissues.

Section 4 - This section presents the ecological problem formulation, including a summary of the SERA findings and conclusions, the site conceptual model, the presentation of assessment and measurement endpoints, and a description of the basic methods used in the assessment.

Section 5 - This section presents the ecological risk characterization for the aquatic receptors of concern, including fish and benthic macroinvertebrates.

Section 6 - This section presents the ecological risk characterization for terrestrial receptors of concern, including plants and soil organisms.

Section 7 - This section presents the ecological risk characterization for wildlife receptors of concern.

Section 8 - This section provides a summary of the main uncertainties that limit confidence in the risk characterization for each of the exposure areas and classes of ecological receptors evaluated at the site.

Section 9 - This section provides citations for all data, methods, studies, and reports utilized in the ERA.

2.0 SITE CHARACTERIZATION

2.1 Site Location

Ogden Railyard is located in Weber County, Utah, just west of the City of Ogden (Figure 1-1). The active railyard area extends from Riverdale Road on the south to the 20th Street overpass on the north, a distance of 3.4 miles. The railyard is bounded on the west by the Weber River and on the east by the developed area of the City of Ogden.

2.2 Site Description

The site was first used as a railyard by the Union Pacific Railroad and the Central Pacific Railroad (the predecessor of the Southern Pacific Railroad) in 1869. Since that time, four railroad companies (Union Pacific, Southern Pacific, Denver and Rio Grande Western, and the Ogden Union Railway and Depot Company) built and operated on various portions of the site. The Southern Pacific and Denver and Rio Grande Western Railroads operated in the northern portion of the site, while the Union Pacific Railroad and Ogden Union Railway and Depot Company operated in the southern portion of the site. With the completion of the Union Pacific-Southern Pacific merger in 1996, the entire railyard is currently under the ownership of the Union Pacific Railroad, with the exception of the facility owned and operated by Atlas Steel (Forrester Group 2002).

Railroad facilities previously located at the site included coal yards, freight houses, passenger service depots, switching yards, machine shops, boiler shops, transfer tracks, oil/water treatment plants, fuel storage tanks, cold storage houses, warehouses, offices, turntables, and roundhouses. Historically, there was a plant in the northern part of the yard that manufactured Pintsch gas (used to light rail cars) from a petroleum-based feedstock. At present, use of the remaining facilities at the site has declined significantly and the majority of the old shop buildings have been demolished.

For convenience in site investigation activities, potential source areas of contamination in soil and groundwater at the site have been identified as "Areas of Interest" (AOIs). Figure 2-1 shows these on-site AOIs and their proximity to off-site areas of potential ecological concern.

2.3 Environmental Setting

The operating portion of the railyard site (the "on-yard" area) contains no permanent water bodies, has little or no vegetation, and does not contain any habitat suitable for ecological receptors. For these reasons, no evaluation of ecological risks is needed for the on-yard portion of the site. However, there are a number of areas around the railyard site where ecological receptors might be exposed to site-related chemicals. These are described and discussed below.

Weber River

The railyard occupies the floodplain on the east side of the Weber River. The Weber River is designated by the state as "protected for nongame fish, water fowl, shore birds and other aquatic-oriented wildlife, including the necessary aquatic organisms in their food chain" (Class 3C, 3D) (UDEQ 2001).

At present, four surface drainage ditches cross through the railyard and discharge into the Weber River. These drainages include: AOI 9 (Burch Creek), AOI 10 (Storm Drain), 33rd Street Slough, and AOI 29 (Strongs Creek), as shown in Figure 2-1. Before construction of the holding ponds and sludge pits in AOI 34 (Waste Water Treatment Plant) in 1960, an irrigation canal ran southward across the present east side of the plant to the Weber River (Safety-Kleen 1998). Some of the water flowing in these ditches originates in the city east of the site (Forrester Group 2002).

Ogden River

The Ogden River originates at the Pineview Reservoir, located east of the City of Ogden in the Wasatch Mountain Range, and flows from east to west along the northern end of the site. Upstream (east) of the railyard, the Pioneer Power plant aqueduct and a City of Ogden storm sewer (near Wall Avenue) discharge into the Ogden River. In many locations downstream of the storm sewer outfall, the riverbanks have been partially channelized and built up with fill materials such as concrete and car bodies to confine river flow (Forrester Group 2001b). Near the 21st Street Pond, the river has several meanders before its confluence with the Weber River. The Ogden River and its tributaries from the Pineview dam to its confluence with the Weber River are designated as "protected for cold water species of game fish and other cold water aquatic life, including the necessary aquatic organisms in their food chain" (Class 3A) (UDEQ 2001).

There are no known surface drainages from the railyard portion of the site which discharge directly to the Ogden River. However, the Ogden River may be influenced by site-related contaminants in groundwater or subsurface soil (DNAPL and PAHs), and surface water runoff from the vicinity of the 21st Street Pond may enter the Ogden River following storm events.

21st Street Pond

A pond known locally as the 21st Street Pond is located near the northern edge of the site. The pond was excavated in 1973 as a borrow pit for the construction of the 21st Street overpass. Water levels in the pond are mainly controlled by sluice gates at the inlet (east end) and outlet (north-west end). These gates are connected directly to the Ogden River. Over the past few years, the water level in the pond has been purposely kept low to provide better fishing access from the bank (Forrester Group 2001b). Previously, trout were stocked twice a year at the pond to promote fishing. In June 2000, the stocking program was suspended, mainly due to concerns over potential risks to humans from ingestion of fish from the pond (Forrester Group 2001b).

3.0 NATURE AND EXTENT OF CONTAMINATION

3.1 Overview of Site-Specific Investigations

The site is of potential ecological concern because of various chemicals that have been released to the environment on or near the site. In order to address this concern, in 1999 the Union Pacific Railroad entered into an Administrative Order on Consent with the USEPA to investigate and address environmental contamination associated with the railyard. A Phase 1 Remedial Investigation of the nature and extent of contamination at the site was performed in 1998 (Safety-Kleen 1998). The Phase 1 investigation focused mainly on the on-yard portion of the site and the riparian area west of the yard. The study identified the presence of a number of chemicals of potential concern in soil, sediment, groundwater, and surface water, including:

- Diesel fuel, grease, oils, and associated petroleum hydrocarbons
- Chlorinated solvents and associated degradation products
- Metals
- Polycyclic aromatic hydrocarbons (PAHs)

The USEPA reviewed the adequacy of the Phase 1 data to support reliable human health and ecological risk evaluations, and identified several data gaps. The USEPA recommended additional sampling and analysis of environmental media that was needed to support risk assessment at site-related locations. This additional sampling is referred to as the Phase 2 investigation. During Phase 2, sampling and analysis was conducted both by USEPA (USEPA/ERTC 2001) and the Forrester Group (Forrester Group 2001a,b). These data were consolidated in the draft remedial investigation for the railyard site (Forrester Group 2002).

During the Phase 2 investigations, two important new concerns associated with the site were identified:

- A large plume of dense non-aqueous phase liquid (DNAPL) was discovered below the ground surface (Forrester Group 2001b) at the north end of the railyard. This DNAPL zone is suspected to originate at the location of the Pintsch gas plant that operated near AOI 34 from 1891 to no later than 1935. As shown in Figure 3-1, the DNAPL plume extends towards the north, coming into direct contact with the east end of the 21st Street Pond and extending under the Ogden River.

- Polychlorinated biphenyls (PCBs) were detected in tissues of fish collected from the 21st Street Pond as well as in sediments collected from the 21st Street Pond and the Ogden River (USEPA/ERTC 2001).

These two new concerns generated the need to collect additional samples specifically designed to characterize the potential risk to health and the environment from the DNAPL zone and the PCBs. This additional sampling event is referred to as the Phase 3 investigation. A field sampling and analysis plan (SAP) was prepared in July 2001 (USEPA 2001a) and the Phase 3 samples were collected in late July and early August of 2001. The final results from the Phase 3 sampling effort were summarized in October 2002 (USEPA 2002).

Table 3-1 summarizes the number, type, and location of the samples that have been collected, and the types of chemical analyses that were performed during these three phases of investigation.

3.2 Data Quality Evaluation

As noted above, investigations of the nature and extent of environmental contamination at the site have been conducted in three phases. Each of these phases of investigation was performed in accord with a well-prepared SAP, and each phase of study included sufficient quality assurance data to demonstrate that the data collected were reliable and relevant. On this basis, all data from each phase of the site investigation were selected for use in the ERA.

Detailed analytical data for all media for all site investigations are available in electronic format upon request.

3.3 Summary Statistics

For the purposes of this assessment, areas of potential ecological exposure along the Weber River and the Ogden River were divided into a number of reaches, including several locations that are not believed to be impacted by site-related releases and that serve as reference areas for the site. These reaches and reference areas are listed below and are shown in Figure 3-2.

Reach	Description
21st Street Pond	21st Street Pond (east end, west end) and surrounding areas
Buena Ventura Park Pond	Buena Ventura Park Pond and surrounding areas; this serves as a reference area for 21st Street Pond
Ogden River - Reach A	Ogden River upstream (east) of Wall Avenue; this serves as a reference area for Ogden River Reaches B and C
Ogden River - Reach B	Ogden River downstream (west) of Wall Avenue to the 21st Street Pond outfall
Ogden River - Reach C	Ogden River downstream (west) of the 21st Street Pond outfall to the confluence with the Weber River
Weber River - Reach A	Weber River upstream of the Ogden Railyard site, south of Riverdale Road; this serves as a reference area for Weber River Reaches B, C, and D
Weber River - Reach B	Weber River from AOI 9 to 33rd Street
Weber River - Reach C	Weber River from 33rd Street to 24th Street
Weber River - Reach D	Weber River downstream (north) of 24th Street

Appendix A provides summary statistics (detection frequency, average, minimum, maximum) for each analyte in each medium in each exposure area.

4.0 PROBLEM FORMULATION

Problem formulation is a systematic planning step that identifies the major concerns and issues to be considered in the ERA, and a description of the basic approach that will be used to characterize the potential risks that may exist (USEPA 1997a). Problem formulation usually begins by development of a conceptual site model that identifies sources of chemical release to the environment, evaluates the fate and transport of chemicals in the environment, and identifies exposure pathways of potential concern for ecological receptors. Based on the conceptual site model, assessment endpoints, measurement endpoints, and testable hypotheses are identified that form the basis of the ERA.

As discussed in USEPA guidance (USEPA 1997a), problem formulation is an iterative process, undergoing refinement as new information and findings become available. The problem formulation for this baseline ecological risk assessment began with a SERA that was completed for the site in March 2001 (USEPA 2001b). The purpose of the SERA was to determine if there was a need for additional data collection and/or additional risk assessment at the site, and to help focus any additional effort on the main issues of concern. Because a SERA is intentionally simplistic and conservative, it is not intended to support any final quantitative conclusions about the magnitude of the potential ecological risks identified. The following section summarizes the main findings of the SERA, which in turn helped define the problem formulation for the baseline risk assessment.

4.1 Screening-Level ERA Summary

Sources of Contamination

At the time of the SERA, the principle source of potential concern was the railyard area, which was known from the Phase 1 investigation to contain elevated levels of a number of potentially toxic chemicals in soil and groundwater. The chief area of potential ecological concern was the Weber River and the riparian area along the west side of the site. This was based on the expectation that site-related contaminants in soil might erode from the railyard area into the riparian area and then into the Weber River. In addition, Phase 1 data indicated that chemical contamination was present in surface water and seep water at the 21st Street Pond (Safety-Kleen 1998). The source of the contamination at the 21st Street Pond was not known at that time.

Ecological Receptors of Potential Concern

Ecological receptors evaluated in the SERA included terrestrial receptors (plants and soil invertebrates) and wildlife receptors in the Weber River riparian zone, and aquatic species (fish and benthic macroinvertebrates) in the Weber River and the 21st Street Pond.

Exposure Pathways Evaluated

Exposure pathways that were quantitatively evaluated in the SERA included:

- Direct contact of aquatic receptors with surface water
- Direct contact of benthic macroinvertebrates with sediment
- Direct contact of terrestrial plants and soil invertebrates with soil
- Ingestion of surface water and soil by wildlife receptors

Summary of Screening-Level Risk Findings

Based on the preliminary risk characterization in the SERA, none of the exposure pathways considered in the SERA could be excluded, and further evaluation was recommended for all exposure pathways. However, in many cases, the available information on the nature and extent of contamination was limited, and the SERA identified a number of data areas where additional information was needed to help improve the reliability and accuracy of the risk assessment. These data gaps were considered in the development of the Phase 2 sampling and analysis plan (USEPA 1999a).

4.2 Baseline ERA Site Conceptual Model

Figure 4-1 presents the site conceptual model (SCM) for the baseline ecological risk assessment. Because no pathways could be excluded as a result of the SERA, this site model is very similar to the site model that was developed for the SERA.

As indicated in the SCM, although there are a number of complete exposure pathways by which ecological receptors may come into contact with site-related chemicals, not all exposure pathways are likely to be of equal concern. For the purposes of this risk assessment, each complete exposure pathway has been classified as follows:

- The pathway is considered to be of potential concern, and sufficient data exist to support a quantitative risk evaluation. These cases are indicated by boxes containing a solid circle (●). These pathways are the primary focus of this risk assessment.

- The pathway is considered to be of potential concern, but available data are too limited to support a reliable quantitative risk evaluation. These cases are shown by boxes with an open circle (❍).

- The risk posed by the pathway is likely to be minor, either on an absolute basis and/or in comparison to other exposure pathways that affect the same receptor. These cases are indicated by boxes with an “X”. Because these pathways are judged to be of minor concern, they are not evaluated quantitatively in the ERA.

The following section provides a discussion of these exposure pathways.

4.3 Exposure Pathways and Receptors

Receptors identified for this assessment include aquatic receptors (fish and benthic macroinvertebrates), terrestrial receptors (plants and soil invertebrates), and wildlife receptors (avian and mammalian). These receptors may be potentially exposed to chemical contamination via one or more exposure media (Figure 4-1), including surface water, sediment, sediment porewater, aquatic food items, surface soil, and terrestrial food items. The following identifies which pathways are of chief concern at this site and which were selected for quantitative evaluation.

Aquatic Receptors

- The main pathway of exposure for all aquatic receptors is direct contact with surface water. This pathway was evaluated quantitatively for fish and benthic macroinvertebrates.

- Direct contact with sediment and porewater is a potentially significant pathway for benthic macroinvertebrates. Data are available to allow an assessment of risks from direct contact with sediment and porewater, and these pathways were evaluated quantitatively.

- Most fish have relatively low direct contact with sediment, and concern over this pathway is generally minor. However, bottom-feeding fish such as catfish, suckers, and carp may have sufficient direct contact with sediments that adverse effects such as increased incidence of tumors may occur when the sediment contains high levels of PAHs or PCBs (e.g., Pinkney et al. 2001). However, at present the evidence is not sufficient to establish a cause-effect relationship between direct contact with sediments and increased incidence of tumors (Pinkney et al. 2001), and EPA does not have an approach for quantifying potential risks to fish from this exposure pathway. Therefore, this pathway was evaluated qualitatively rather than quantitatively.

- Ingestion of aquatic food web items is a pathway of potential concern for fish and benthic invertebrates. Likewise, incidental ingestion of sediment by these receptors might occur in some cases. Quantitative evaluation of oral exposure of aquatic receptors is limited by lack of oral toxicity values for aquatic receptors, so ingestion exposures are evaluated qualitatively rather than quantitatively for fish or benthic macroinvertebrates.

Terrestrial Plants and Soil Invertebrates

- The primary exposure pathway for both terrestrial plants and soil invertebrates is direct contact with contaminated soils. This pathway was evaluated quantitatively for both receptors. For soil invertebrates, this evaluation includes both direct contact and soil ingestion.

Wildlife Receptors

- Wildlife receptors (birds, mammals) may be exposed by ingestion of surface water, and this pathway was evaluated quantitatively.

- Wildlife receptors (birds, mammals) may be exposed by ingestion of food web items (either from the terrestrial environment and/or from the aquatic environment). Data are available on the tissue levels of chemicals in fish and benthic macroinvertebrates (see Section 3), and risks to wildlife from ingestion of fish and benthic macroinvertebrates were evaluated quantitatively. Data are not available on the tissue levels of site-related chemicals in other types of food web items (e.g., plants, soil invertebrates), and estimation of tissue levels by mathematical modeling is judged to be too uncertain and unreliable to warrant evaluation. Therefore, dietary exposure of wildlife from other parts of the food web was evaluated qualitatively.

- Wildlife receptors may ingest soil or sediment during feeding, especially for soil- or sediment-dwelling prey items. This pathway can be important in some cases and was evaluated quantitatively.

- Direct contact (i.e., dermal exposure) of wildlife receptors to soils, sediments, and surface water may occur in some cases, but these exposures are judged to be minor in comparison to risks from ingestion exposure, and were not evaluated quantitatively.

- Inhalation exposure to airborne dusts is possible for all terrestrial receptors. However, this pathway is generally very minor, and was not evaluated quantitatively.

Selection of Wildlife Indicator Species

It is not feasible to evaluate exposures and risks for each avian and mammalian species potentially present at the site. For this reason, specific wildlife species are identified as surrogates (representative species) for the purpose of estimating exposure and risk. The surrogate species are wildlife species present at the site that are representative of other species with similar dietary preferences and feeding guilds. Selection criteria for wildlife surrogate species include trophic level, feeding habits, and the availability of life history information. The species identified as surrogate species at this site include:

Masked shrew (*Sorex cinereus*). The masked shrew represents mammalian insectivorous species that feed primarily on soil invertebrates.

American robin (*Turdus migratorius*). The American robin represents avian insectivorous passerine species that feed primarily on soil invertebrates.

Belted kingfisher (*Ceryle alcyon*). The belted kingfisher represents piscivorus avian species that feed primarily on fish.

Mink (*Mustela vison*). The mink represents semi-aquatic mammalian species that feed primarily on fish.

Mallard duck (*Anas platyrhynchos*). The mallard duck represents avian omnivorous species that feed primarily on benthic macroinvertebrates.

Exposure profiles are presented for each of these representative species in Appendix B.

4.4 Management Goals

Management goals are descriptions of the basic objectives which the risk manager at a site wishes to achieve. The overall management goal identified for ecological health at the Ogden Railyard site is as follows (USEPA 1999b):

Ensure adequate protection of ecological systems within the impacted areas of the Ogden Railyard site by protecting them from the deleterious effects of acute and chronic exposures to site-related contaminants of concern.

"Adequate protection" is generally defined as protection of growth, reproduction, and survival of local populations. That is, the focus is on ensuring sustainability of the local population, rather than on protection of every individual in the population. In order to provide greater specificity regarding this general goal and to identify specific measurable ecological values to be protected, the following list of sub-goals was derived:

- Ensure adequate protection of terrestrial soil organisms and plant communities by protecting them from the deleterious effects of chronic exposures to site-related contaminants of concern.

- Ensure adequate protection of aquatic life in the Weber River, Ogden River, and 21st Street Pond from the deleterious effects of chronic exposures to site-related contaminants of concern.

- Ensure adequate protection of aquatic and terrestrial mammal and bird populations by protecting them from the deleterious effects of chronic exposures to site-related contaminants of concern.

- Ensure adequate protection of threatened and endangered species (including candidate species) and species of special concern and their habitat by protecting them from the deleterious effects of chronic exposures to site-related contaminants of concern.

4.5 Assessment and Measurement Endpoints

Assessment endpoints are explicit statements of the characteristics of the ecological system that are to be protected. Assessment endpoints are either measured directly or are evaluated through indirect measures. Measurement endpoints represent quantifiable ecological characteristics that can be measured, interpreted, and related to the valued ecological components chosen as the assessment endpoints (USEPA 1992, 1997a).

Table 4-1 presents the assessment and measurement endpoints used to interpret potential ecological risks for the Ogden Railyard site. These measurement endpoints can be divided into three basic categories of approach, as follows:

- Hazard Quotients (HQs)
- Site-specific toxicity tests (SSTTs)
- Observations of population and community demographics (Pop/Comm. Dem.)

Each of these three basic approaches is described below.

<u>Method 1: Hazard Quotients</u>

Basic Equation

A Hazard Quotient (HQ) is the ratio of the estimated exposure of a receptor at the site to a "benchmark" exposure that is believed to be without significant risk of unacceptable adverse effect:

HQ = Exposure / Benchmark

Exposure may be expressed in a variety of ways, including:

- Concentration in an environmental medium (water, sediment, soil, diet)
- Concentration in the tissues of an exposed receptor
- Amount of chemical ingested by a receptor

In all cases, the benchmark toxicity value must be of the same type as the exposure estimate.

Interpretation of HQ Values

If the value of an HQ is less than or equal to 1E+00, risk of unacceptable adverse effects in the exposed individual is judged to be acceptable. If the HQ exceeds 1E+00, the risk of adverse effect in the exposed individual is of potential concern. When interpreting HQ results for ecological receptors, it is important to remember that the assessment endpoint is usually based on the sustainability of exposed populations, and risks to some individuals in a population may be acceptable if the population is expected to remain healthy and stable. In these cases, population risk is best characterized by quantifying the fraction of all receptors that have HQ values greater than 1E+00, and by the magnitude of the exceedences. Clearly, if all HQs for individuals in a population of receptors are below 1E+00, it is believed that no unacceptable effects will occur in the exposed population. Conversely, if many or all of the individual receptors have HQs that are above 1E+00, then unacceptable effects on the exposed population are likely, especially if the HQ values are large. If only a small portion of the exposed population has HQ values that exceed 1E+00, some individuals may be impacted, but population-level effects are not likely to occur. As the fraction of the population with HQ values above 1E+00 increases, and as the magnitude of the exceedences increases, risk that a population-level effect will occur also increases. This concept is illustrated schematically in Figure 4-2.

The fraction of the population that must have HQ values below a value of 1E+00 in order for the population to remain stable depends on the species being evaluated and on the toxicological endpoint underlying the toxicity benchmark (USEPA 2001c), and reliable characterization of the impact of a chemical stressor on an exposed population risks requires knowledge of population size, birth rates, and death rates, as well as immigration and emigration rates. Because this type of detailed knowledge of population dynamics is generally not available on a site-specific basis, extrapolation from a distribution of individual risks to a characterization of population-level risks is generally uncertain. For the purposes of this assessment, it is assumed that if at least

80% of the individuals in a population have an HQ ≤ 1E+00, risks to the population will be minimal. Conversely, it is assumed that if more than 20% of the individuals in a population have HQ values above 1E+00, then there is a potential risk to that population. It should be emphasized that this is a screening level assumption based on professional judgement, and that actual risks to populations are expected to gradually transition from "acceptable" to "unacceptable" as the frequency and magnitude of HQ values above 1E+00 increases.

In cases where a substantial fraction of the available concentration data are below the limit of detection, and the limit of detection is above the level corresponding to an HQ of 1E+00, it is usually not possible to estimate the fraction or magnitude of individual HQ values above 1E+00, since HQ values for non-detects might be either above or below a level of 1E+00.

Based on this approach, risks to a sub-population of receptors residing in an exposure area were classified into one of three categories, as shown below.

Risk Category	Distribution of HQ values	Preliminary Conclusion
A	Greater than 20% of HQs based on detects exceed 1E+00.	Risks to the sub-population at this location are possible.
B	There are at least 20% of the HQs greater than 1E+00, but these are partly or entirely based on non-detects. The method detection limit was inadequate to quantify risk.	Risk to the sub-population at this location cannot be determined.
C	Greater than 80% of all HQs (based on non-detects and detects) are below 1E+00.	Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable.

Selection of Chemicals of Potential Concern for the HQ Approach

An HQ value may be derived for any chemical for which adequate exposure and toxicity data are available. However, it is usually helpful to restrict the number of chemicals evaluated quantitatively to a subset of all chemicals for which data exist. These are referred to as chemicals of potential concern (COPCs). The general procedure used in this risk assessment to select COPCs for quantitative evaluation by the HQ approach is shown in Figure 4-3.

This procedure may be applied to each medium of potential concern (surface water, sediment, soil, food web items) for which direct data are available (or for which concentrations can be estimated by mathematical modeling), and for each main class of receptor exposed to that medium. If a chemical does not have a toxicity benchmark that is sufficient to allow characterization of toxicity to a receptor type from that medium, that chemical is assigned to the "Qualitative COPC" category (Type 1). Chemicals that have an appropriate toxicity reference value (TRV) but were never detected in the medium are usually excluded from further consideration. However, if the detection limit for the chemical was too high to expect detection of the chemical if it were present at a level of concern, the chemical is also assigned to the "Qualitative COPC" category (Type 2). If a TRV was available for a chemical and the maximum detected value of the chemical (from anywhere at the site) was less than the TRV, it is concluded that the chemical does not occur at a level of ecological concern and is not evaluated as a COPC. If the maximum detected value did exceed the TRV, then the chemical is evaluated quantitatively. It should be noted that this selection procedure is intended to be conservative; that is, the selection procedure is intended to eliminate only those chemicals that are clearly not of ecological concern, and to carry forward those chemicals that might be of concern.

In most cases, HQ values are not based on site-specific toxicity data, and do not account for site-specific factors that may either increase or decrease the toxicity of the metals compared to what is observed in the laboratory. Therefore, HQ values should be interpreted as estimates rather than highly precise predictions and should be viewed as part of the weight-of-evidence along with the results of site-specific toxicity testing and direct observations on the structure and function of the aquatic community (see below).

Method 2: Site-Specific Toxicity Tests

Site-specific toxicity tests measure the response of receptors that are exposed to site media. This may be done either in the field or in the laboratory using media collected on the site. The chief advantage of this approach is that site-specific conditions which can influence toxicity are usually accounted for. A potential disadvantage is that, if toxic effects are observed to occur when test organisms are exposed to site media, it is usually not possible to specify which chemical or combination of chemicals is responsible for the effect. Rather, the results of the toxicity testing reflect the combined effect of the mixture of chemicals present in the site medium. In addition, it is often difficult to test the full range of environmental conditions which may occur at the site across time and space, either in the field or in the laboratory, so these studies are not always adequate to identify the boundary between exposures that are acceptable and those that are not.

Method 3: Population and Community Demographic Observations

A third approach for evaluating impacts of environmental contamination on ecological receptors is to make direct observations on the receptors in the field, seeking to determine whether any receptor population has unusual numbers of individuals (either lower or higher than expected), or whether the diversity (number of different species) of a particular category of receptors (e.g., plants, benthic organisms, birds) is different than expected. The chief advantage of this approach is that direct observation of community status does not require making the numerous assumptions and estimates needed in the HQ approach. However, there are also a number of important limitations to this approach. The most important of these is that both the abundance and diversity of an ecological population depend on many site-specific factors (habitat suitability, availability of food, predator pressure, natural population cycles, meteorological conditions, etc.), and it is often difficult to know what the expected (non-impacted) abundance and diversity of an ecological population should be in a particular area. This problem is generally approached by seeking an appropriate "reference area" (either the site itself before the impact occurred, or some similar site that has not been impacted), and comparing the observed abundance and diversity in the reference area to that for the site. However, it is sometimes quite difficult to locate reference areas that are truly a good match for all of the important habitat variables at the site, so comparisons based on this approach do not always establish firm cause-and-effect conclusions regarding the impact of environmental contamination on a receptor population.

4.6 Weight of Evidence Evaluation

As noted above, each of the measurement endpoints has advantages but also has limitations. For this reason, conclusions based on only one method of evaluation may be misleading. Therefore, the best approach for deriving reliable conclusions is to combine the findings across all of the methods for which data are available, taking the relative strengths and weaknesses of each method into account. If the methods all yield similar conclusions, confidence in the conclusion is greatly increased. If different methods yield different conclusions, then a careful review must be performed to identify the basis of the discrepancy, and to decide which approach provides the most reliable information.

5.0 RISKS TO AQUATIC RECEPTORS

5.1 Hazard Quotient Approach

As discussed in Section 4.3, site-related contaminants are of potential concern in the Weber River west of the railyard and the Ogden River and the 21st Street Pond north of the railyard. Aquatic receptors living in these waters may be exposed to contaminants through several potential pathways. Based on the site conceptual model (Figure 4-1), the following exposure pathways have been selected for quantitative evaluation by the HQ approach:

- Direct contact with chemicals dissolved or suspended in surface water. This pathway is most applicable to fish, but is also applicable to benthic organisms that reside in the uppermost portion of the sediment substrate.

- Direct contact with chemicals in sediment or dissolved into the interstitial water (porewater) occupying the spaces between sediment particles. This pathway is most applicable to benthic macroinvertebrate species that live buried within the sediment substrate.

- Exposure of fish by all pathways combined, based on tissue levels of chemicals in fish tissue.

Each of these HQ-based evaluations is described below.

5.1.1 Risks to the Aquatic Community from Direct Contact with Surface Water

Exposure Assessment

Because concentrations of chemicals in surface water can vary significantly over time and location, exposure of aquatic receptors is best characterized as a distribution of individual values at each sampling location, rather than as an average of values over time and/or over location. That is, an HQ value is calculated for each sample for each chemical. In accord with USEPA guidance, non-detects were evaluated at one-half the detection limit.

The concentration value of a chemical in surface water may be expressed either as total recoverable or as “dissolved” (that which passes through a fine-pore filter). There is general consensus that toxicity to aquatic receptors is dominated by the level of dissolved chemicals (Prothro 1993), since chemicals that are adsorbed onto particulate mater may be less toxic that the dissolved forms. However, at this site, the only data available for chemicals in surface water are based on total recoverable. In some cases the difference between total recoverable and dissolved may be small, but calculating risks to aquatic receptors based on total recoverable could lead to an overestimate of actual risks.

Toxicity Assessment

Toxicity benchmark values for the protection of aquatic life from direct contact with contaminants in surface water are available from several sources. Each of the sources evaluated in deriving surface water benchmarks is described briefly in Appendix C-1, along with a hierarchy for identifying the most relevant and reliable benchmark value when more than one value is available. The selected toxicity benchmark values for all chemicals analyzed in surface water are shown in Table C-1a (non-hardness dependent benchmarks) and in Table C-1b (hardness dependent benchmarks) of Appendix C.

Surface Water COPC Selection

Surface water COPCs for aquatic receptors were selected using the procedure shown in Figure 4-3 based on all available surface water data from the 21st Street Pond, the Ogden River, and the Weber River. Maximum surface water concentrations for each chemical were compared to their respective chronic benchmark values (see Table C-1a,b). Note that toxicity benchmarks for a number of inorganic chemicals in surface water are hardness dependent. For simplicity, the toxicity benchmarks used in the COPC screen were calculated based on the site-wide average hardness (200 mg/L). The results of the COPC selection procedure for exposure of aquatic receptors to surface water are detailed in Appendix D-1 and the chemicals that were selected for quantitative evaluation are presented below.

Quantitative COPCs for Exposure of Aquatic Receptors to Surface Water		
Inorganics	PAHs	SVOCs
Aluminum Barium Cadmium Iron Lead Nickel Selenium Silver Zinc	Acenaphthene Anthracene Benzo[a]anthracene Benzo[a]pyrene Fluorene Naphthalene Pyrene	bis(2-Ethylhexyl)phthalate Acetone Carbon disulfide Dichloromethane Ethylbenzene

Hazard Quotients for Direct Contact with Surface Water

Because the toxicity of COPCs in surface water to aquatic receptors is usually dependent on the length of exposure, the HQ was calculated both for short-term (acute) and long-term (chronic) exposure conditions. In cases where the acute and chronic benchmarks are hardness-dependent, toxicity benchmarks were calculated for each sample based on the hardness of that sample. If a sample hardness was not reported or could not be estimated, the HQ was calculated based on the average site hardness (200 mg/L).

The detailed calculations of HQ values for each COPC in each sample are presented in Appendix E-1, along with graphs which summarize the distributions of HQ values for samples collected at each reach. Two examples are presented in Figure 5-1 (aluminum) and Figure 5-2 (naphthalene). In each figure, the upper panel shows the distribution of HQ values for acute toxicity, while the lower panel reflects the distribution of risks of chronic effects on growth or reproduction. HQs based on non-detects are shown as open-circles and HQs based on detects are shown as closed circles. Note that the results in these figures are plotted on a log-scale, so large differences between HQ values are somewhat compressed.

As discussed in Section 4.5, the population-level risk in each exposure reach was classified into one of three risk categories based on the fraction of the HQ distribution above a value of 1E+00. The results are summarized in Table 5-1. Inspection of Table 5-1, along with the figures in Appendix E-1, yields the following main conclusions:

Inorganics

- Based on the acute toxicity benchmarks, only one chemical at one location (aluminum in Buena Ventura Park Pond) is assigned to risk category A. However, this is a reference location that is not believed to be impacted by any site releases.

- Based on chronic benchmarks, several inorganic COPCs (aluminum, barium, cadmium, iron, and lead) are assigned to risk category A at one or more exposure locations. However, risks in two reference areas (Buena Ventura Park Pond, Weber River Reach A) are approximately the same as in areas potentially impacted by site releases, and no spatial pattern in risk levels is apparent. Based on this, it is concluded that the chronic toxicity benchmarks for these chemicals are probably overly-conservative for application at this site (at least for concentration values measured as total rather than soluble), and that chronic risks from these inorganic COPCs in surface water are not likely to be of population-level concern to aquatic receptors.

Organics

- There are no organic COPCs assigned to risk category A based on acute toxicity benchmarks. Based on chronic benchmarks, several PAHs (benzo[a]anthracene, benzo[a]pyrene, naphthalene, and pyrene) are of potential population-level concern in water samples from the east end of the 21st Street Pond. Because these PAHs are constituents of the DNAPL plume that is known to impact the east end of the 21st Street Pond, risks from these chemicals are judged to be site-related. However, because the water samples were not filtered before analysis, the measured concentrations may reflect PAHs adsorbed to suspended particulate matter in water rather than true dissolved-phase chemical. If so, risks from these PAHs in surface water would be lower than calculated.

5.1.2 Risks to Benthic Macroinvertebrates from Direct Contact with Sediment

Exposure Assessment

Benthic macroinvertebrates that spend some or most of their life cycle within the sediment substrate are exposed to chemicals through direct contact with sediment. Although concentrations of chemicals in sediment are usually not as time-variable as concentrations in surface water, concentrations do fluctuate as contaminated material is added or removed by surface water flow. In addition, there may be significant small scale variability in sediment concentrations at any specific sampling station. Therefore, exposure to sediments is usually best characterized as a distribution of individual values at a specific location. At this site, there is only one measurement of sediment concentration available per sampling location, so exposure was based on that single concentration value. In accord with USEPA guidance, non-detects were evaluated at one-half the detection limit.

In the case of PAHs, concentration data were collected using two different analytical methods: GC-MS and GC-MS-SIM (selective ion monitoring). The SIM data were collected because the detection limit for most PAHs by GC-MS is relatively high compared to sediment toxicity benchmarks, and the detection limit for SIM is about 10-fold lower. Risks were calculated using both sets of data.

Toxicity Assessment

Toxicity values for the protection of aquatic life (mainly benthic organisms) from contaminants in sediment are available from several sources. Each of the sources evaluated in deriving sediment benchmarks is described briefly in Appendix C-2, along with a hierarchy for identifying the most relevant and reliable benchmark value when more than one value is available. The selected toxicity benchmark values for all chemicals analyzed in sediment are shown in Table C-2b of Appendix C.

For some chemicals, sediment benchmark values depend on the concentration of total organic carbon (TOC) in the sediment. In these cases, the value of the TRV was adjusted for each sediment sample based on the TOC level measured in that sample. When the TOC content was not measured, the value was estimated based on the mean of other sediment samples from the same location.

In the case of PAHs, two sets of benchmarks were selected. The first is based on direct observations of PAH levels in sediments that are and are not toxic to benthic organisms. This is referred to as the Sediment Effects Concentration (SEC). The second set of benchmarks was calculated based on the expected partitioning of PAHs between sediment and porewater, and the concentration of PAHs in porewater that are toxic. This is referred to as the Equilibrium Sediment Guideline (ESG). Both types of benchmarks were used to evaluate risks.

Sediment COPC Selection

Sediment COPCs for benthic macroinvertebrates were selected based on all available sediment data from the 21st Street Pond, the Ogden River and its drainages, and the Weber River. Data were limited to sediment collected at a depth of 0 to 2 feet, because most benthic macroinvertebrates are expected to be located within this depth. Sediment concentrations for each chemical were compared to the sediment screening toxicity benchmark. For PAHs, the sediment toxicity benchmark used in the COPC screen was the lower of the SEC and ESG. The results of the COPC selection procedure for sediment are detailed in Appendix D-2 and the chemicals that were selected for quantitative evaluation are presented below.

Quantitative COPCs for Sediment				
Inorganics	Pesticides/ PCBs	PAHs		SVOCs/VOCs
Copper	4,4'-DDE	1-Methylnaphthalene	Benzo[k]fluoranthene	Biphenyl
Iron	4,4'-DDT	2-Methylnaphthalene	Chrysene	bis(2-Ethylhexyl)Phthalate
Lead	Dieldrin	Acenaphthene	Dibenz[a,h]anthracene	Dibenzofuran
Mercury	PCBs (as Aroclor)	Acenaphthylene	Fluoranthene	Phenol
Selenium		Anthracene	Fluorene	Acetone
Silver		Benzo[a]anthracene	Indeno[1,2,3-cd]pyrene	Acrolein
Zinc		Benzo[a]pyrene	Naphthalene	Benzene
		Benzo[b]fluoranthene	Phenanthrene	Bromomethane
		Benzo[g,h,i]perylene	Pyrene	Carbon disulfide
				Ethylbenzene
				Toluene
				Xylenes

Non-PAHs

The detailed calculations of HQ values for each non-PAH COPC in each sample are presented in Appendix E-2, along with figures that summarize the distribution of HQ values at each location. Two examples results are presented in Figure 5-3 (selenium) and Figure 5-4 (Aroclor 1260). HQs based on non-detects are shown as open-circles and HQs based on detects are shown as closed circles. At each reach or location, the risks from a COPC were classified into three risk categories (as described in Section 4.5) based on the HQ distribution. Note that the results in these figures are plotted on a log-scale, so large differences between HQ values are somewhat compressed.

Table 5-2 summarizes the population-level risk category assignments for exposure of benthic organisms to non-PAH COPCs in sediment. Inspection of Table 5-2 and the figures presented in Appendix E-2 yield the following main conclusions:

Inorganics

- The distributions of sediment HQs for lead, mercury, silver, and zinc are above a level of potential concern (risk category A) in Buena Ventura Park Pond (a reference location), but not in any location that is likely to have been impacted by site-related releases. Thus, these chemicals are not considered to be of significant ecological concern at this site.

- The distribution of HQs for selenium is above a level of potential concern at the west end of the 21st Street Pond, but not for reference areas or other site areas. Because the risks do not appear to reach a level of population concern in the east end of the 21st Street Pond or in the Ogden River near the pond, it is considered likely the selenium in this location is not site-related.

Non-PAH Organics

- Several organic COPCs are assigned to risk category A at one or more locations. This includes 4,4'-DDE, Aroclor 1260, biphenyl, bis(2-ethylhexyl)phthalate, carbon disulfide, toluene, and xylenes.

- HQ distributions for bis(2-ethylhexyl)phthalate, carbon disulfide, and toluene are generally similar in reference areas (Ogden River Reach A, Weber River Reach A, Buena Ventura Pond) and in areas potentially impacted by site releases. Based on this, it is concluded that these chemicals are unlikely to be site-related. Bis(2-ethylhexyl)phthalate and carbon disulfide are common laboratory contaminants and could be laboratory artifacts.

- Risks from Aroclor 1260 are above a level of population concern in Ogden River Reaches B and C, and in the east end of the 21st Street Pond (see Figure 5-4). This indicates that PCBs may be adversely impacting benthic communities in these locations, especially in Ogden River Reach B.

- Risks from 4,4'-DDE in the west end of the 21st Street Pond are relatively low, and the absence of detects of these chemicals in the east end of the 21st Street Pond and in Ogden River Reaches B and C suggests the source is more likely to be runoff from area soils than from a site-related release.

- Biphenyl was detected in only one sample (in the east end of the 21st Street Pond). Because all other samples were below the limit of detection, and because the limit of detection was relatively high, the data for this chemical cannot be interpreted with certainty.

- Xylenes (total, o-, and m,p-) are detected above a level of concern in several samples from the 21st Street Pond, and are likely to be an authentic site contaminant related to the DNAPL contamination. The overall exceedence rate (combining data across the three different types of analytical estimate) is 2 out of 17 in the west end of the pond, and 2 out of 5 in the east end of the pond. This indicates that population-level risks are not likely to be substantial in the west end of the pond, but could be of concern in the east end of the pond.

In summary, risks to benthic organisms from site-related non-PAHs in sediment do not appear to be of population-level concern except possibly for xylenes and PCBs in the east end of the 21st Street Pond and for PCBs in the Ogden River Reach B.

PAHs (Non-SIM Data)

Because there are two types of toxicity benchmarks for PAHs, risks were calculated based on both the SEC and the ESG benchmarks. When comparing PAHs in sediment to ESGs, the concentration was expressed as mass per unit total organic carbon (TOC) content in that sample. In cases where the TOC was not measured in a sample, the normalized concentration was based on the average measured TOC for samples from the same reach.

The detailed calculations of HQ values for each PAH COPCs measured by GC-MS in each sample are presented in Appendix E-3, along with figures that summarize the distribution of HQ values at each location. An example is presented in Figure 5-5 (benzo[a]pyrene). The upper part of the figure shows results based on the SEC approach and the bottom panel presents the results based on the ESG approach. HQs based on non-detects are shown as open-circles and HQs based on detects are shown as closed circles.

Table 5-3 summarizes the risk classifications based on these data. Inspection of Table 5-3 and the figures presented in Appendix E-3 indicates the following main conclusions:

- HQ values based on SEC benchmarks predict that the benthic community in the pond is severely impacted due to multiple PAH constituents in sediments. These risks are mainly on the east end of the pond (inside the fenced area), but elevated risks exist for a few PAHs outside the fenced area as well.

- For sediments from Reach B of the Ogden River (in the area of the DNAPL zone), multiple PAHS have one or more HQ values (based on detects compared to the SEC benchmarks) above 1E+00, and several PAHs have a sufficient fraction of the total HQs above 1E+00 to be assigned to risk category A. Although the data are too limited to warrant detailed statistical evaluation, the concentrations of most PAHs in Reach B appear to be generally similar to levels observed in Reach A (a reference area), suggesting that some of the PAHs in sediments from Ogden Reach B may not be site-related.

- In the Weber River, HQ values based on SEC benchmarks are not above a level of population concern for most PAHs. For benzo[b]fluoranthene, HQ values are above 1E+00 for one sample from Reach C and one sample from Reach D, but the exceedences are low and are not clearly different than for Ogden River Reach A (reference area).

- When risks from PAHs are evaluated using the ESG benchmarks, HQ values are lower than when evaluated using the SEC benchmarks, and only one PAH (naphthalene) remains assigned to risk category A in the east end of the 21st Street Pond.

PAHs (SIM Data)

Interpretation of the sediment HQs for PAHs presented above is difficult because in some cases the frequency of detection was low and the detection limits were not always sufficient to quantify concentrations of potential concern. For this reason, sediment samples from several locations in the 21st Street Pond and the Ogden River were analyzed by GC-MS-SIM. As noted above, the SIM method improved analytical quantitation limits for 17 PAHs by up to a factor of about 10.

Figures which summarize HQs based only on SIM data for each of the PAHs are provided in Appendix E-4, and the results are summarized in Table 5-4. Inspection of these figures and Table 5-4 support the conclusion that, based on SEC toxicity benchmarks, multiple PAHs are above a level of concern in sediments from the 21st Street Pond (especially in the eastern end of the pond) and from Ogden River Reach B. However, based on the ESG benchmarks, none of these chemicals leads to an HQ distribution assigned to risk category A. Figure 5-6 illustrates this pattern using acenaphthylene as an example.

Discussion of Sediment HQ Results Based on SEC and ESG Benchmarks

Conclusions regarding risks from PAHs in sediment depend upon which type of toxicity benchmark is employed. Based on the SEC benchmarks, bulk sediment concentrations of PAHs at the 21st Street Pond are predicted to be severely impacting benthic macroinvertebrate populations. However, based on the ESG benchmarks, risks are predicted to be much lower, with a majority of values below an HQ of 1E+00. In order to determine which approach is more reliable, it is necessary to review in detail the basis for each type of benchmark.

The SEC is derived from measurements of PAH concentrations in field sediment samples that are observed to cause an adverse effect in benthic organisms. This approach assumes that all of the toxicity to benthic organisms is due to the PAH that was measured, even though other chemicals (PAHs and non-PAHs) in the sediment may have been the true risk drivers. In addition, this approach does not take into consideration the effect of site-specific conditions, such as TOC, which may alter the exposure of a receptor exposed to the sediment. If only a fraction of the total amount of bulk chemical is biologically available due to site-specific conditions, the observed toxicity in the receptor will be lower than predicted.

The ESG is based on the calculated partitioning of PAHs from bulk sediment into interstitial porewater. This approach does account for the TOC of the sediment, and is based on direct toxicity measurements of the pure chemical in water. In comparison to the SEC, the ESG provides a better estimate of biologically available constituent. However, the ESGs may tend to be underprotective, since a) they do not consider toxicity associated with photoactivation of PAHs, b) they consider only a fraction of the possible PAH constituents (only 10 PAHs), and c) the calculated concentrations in porewater may not represent actual partitioning under field conditions.

Based on these considerations, it is concluded that actual risks to benthic macroinvertebrate receptors from PAH constituents in sediment are likely to fall somewhere between the ranges predicted by the SEC and the ESG methods. Because the distribution of HQ values generated by these two alternative approaches yield different conclusions regarding potential population level risks, it is judged that no firm conclusion can be drawn from the HQ approach based on bulk sediment concentration values.

5.1.3 Risks to Benthic Macroinvertebrates from Direct Contact with Sediment Porewater

Exposure Assessment

Adverse effects from COPCs in sediment are likely to be mediated primarily by chemicals that have dissolved into sediment porewater from the bulk sediment. Thus, the most direct approach for evaluating toxicity from PAHs in sediment is to measure the concentration of PAHs in the sediment porewater and compare those concentrations to water-based toxicity values. This is similar in concept to the ESG approach described above, except that the concentrations of PAHs in porewater are measured rather than predicted. Since there may be variability in sediment porewater concentrations at any specific sampling station, exposure to benthic macroinvertebrates is usually best characterized as a distribution of individual values at a specific location. At this site, there is only one measurement of porewater available per sampling location, so exposure was based on that single concentration value. Data used to assess exposure were restricted to those obtained using PAH SIM analysis. In accord with USEPA guidance, non-detects were evaluated at one-half the detection limit.

Toxicity Assessment

Risks to benthic organisms from PAHs in porewater were evaluated by comparison of measured sediment porewater concentrations to final chronic values (FCV) for freshwater organisms as established in the equilibrium partitioning sediment guidelines (USEPA 2000). The FCVs are intended to be protective of sediment-dwelling benthic organisms, and are derived from sediment porewater concentrations of PAHs associated with chronic toxicity. Table C-3 of Appendix C presents the FCVs for all PAHs that were analyzed in porewater.

Hazard Quotients for Direct Contact with PAHs in Sediment Porewater

The detailed calculations of HQ values and graphical presentations for each COPC in each porewater sample are presented in Appendix E-5. The results are summarized in Table 5-5, and an example (acenaphthene) is shown in Figure 5-7. Based on these calculations, the HQs for PAHs are below a level of concern in all sediment porewater samples. In most samples, detection limits for each PAH were adequate to provide meaningful estimates of risk. The exceptions were for dibenz[a,h]anthracene and indeno[1,2,3-c,d]pyrene for one sample from the 21st Street Pond within the fenced area. In this sample, the detection limits for these two PAHs were slightly above their respective FCV.

These calculations indicate that PAHs in sediment porewater do not pose a population-level risk to benthic organisms in the 21st Street Pond or the Ogden River.

5.1.4 Risks to Fish Based on Fish Tissue Burdens

One way to estimate risks to fish is to compare the tissue level of chemicals observed in fish collected at the site to tissue concentrations that occur in fish with and without evidence of adverse effects. This approach has the advantage that it integrates exposures over multiple sources (surface water, sediment, food web), and accounts for any site-specific factors that might increase or decrease exposure compared to laboratory conditions.

Exposure Assessment

Fish tissue data are available for the 21st Street Pond, Buena Ventura Park Pond, the Ogden River, and the Weber River. Results include tissue concentrations based on whole body, fillet, carcass, and liver for several different fish species. Each tissue sample was evaluated separately. The following table summarizes the available fish tissue data for the site.

Location	Tissue Type			
	carcass	**fillet**	**liver**	**whole body**
21st Street Pond	G, NG	G, NG	G, NG	G, NG, F
Buena Ventura Park Pond	--	G	--	--
Ogden River	--	G	--	NG, F
Weber River	--	G	--	--
G = Game NG = Non-Game F = Forage -- = No Data				

Toxicity Assessment

Jarvinen and Ankley (1999) provide a compilation of studies that identify effect levels and no-effect levels of organic and inorganic chemicals, expressed in terms of fish tissue concentrations. For this risk assessment, the tissue-based toxicity benchmark (also referred to as the maximum acceptable tissue concentration, or MATC) was defined as the highest residue reported to be associated with no adverse effects (No Observed Adverse Effect Level, or NOAEL) below the lowest reported residue that is reported to cause an adverse effect (Lowest Observed Adverse Effect Level, or LOAEL). Table C-4 of Appendix C summarizes the MATCs for each chemical detected in fish tissue. In cases where an MATC was only available for whole body, a tissue-specific MATC was derived based on the following equation:

$$MATC_{tissue} = MATC_{whole\ body} \cdot (Lipid\ Content_{tissue} / Lipid\ Content_{whole\ body})$$

Fish Tissue COPC Selection

No COPC screen was employed in the assessment of fish tissue burdens. Rather, risks were calculated for chemicals detected in any tissue.

Hazard Quotients for Fish Based on Fish Tissue Data

For each tissue type, HQs were calculated for each sample in each reach. Detailed risk calculations are provided in Appendix E-6, and results are summarized in Table 5-6. As seen, risks from 4,4'-DDE and 4,4'-DDD were above a level of potential concern at the 21st Street Pond. The distribution of HQ values for these COPCs at this location are shown in Figure 5-8. For these DDT metabolites, HQs were highest for carcass and fillet samples from non-game species such as suckers and carp. HQs for largemouth bass and some forage fish species were also greater than 1E+00. 4,4'-DDE and 4,4'-DDD HQs for all trout species were below a level of concern in all samples. Risks to fish based on tissue burdens of DDT, dieldrin, PCBs, and phenol were below a level of concern in all samples.

Based on these risk calculations, some species of fish in the 21st Street Pond may be at risk of adverse effects due to elevated tissue concentrations of DDT metabolites. The source of DDT metabolites in fish tissues is not known, but may be due to historic use in adjacent agricultural fields rather than a railyard-related release. Population-level adverse effects from other detected contaminants are not expected.

5.2 Evaluation of Site-Specific Toxicity Tests

One way to help reduce the uncertainty associated with HQ values based on toxicity benchmark values is to perform direct toxicity testing using site-specific media. Tests of this type have been performed to investigate the toxicity of site sediments on benthic organisms, using sediment samples collected from the 21st Street Pond, Buena Ventura Park Pond, and the Weber River.

The first sediment toxicity tests were performed during the Phase 2 investigation by USEPA's Environmental Response Team (USEPA/ERTC 2001). Test sediment samples were collected from 10 sampling stations along the Weber River. For each sampling station, a 10-day subchronic test using *Chironomus tentans* and a 14-day subchronic survival and growth toxicity test using the amphipod *Hyalella azteca* was conducted in accord with standard protocols. The detailed results are presented in USEPA/ERTC (2001) and are summarized in the upper portion of Table 5-7.

As seen, small but statistically significant decreases in survival were noted for organisms exposed to sediments from station WR025, but not other stations. Station WR025 is located near a wastewater treatment plant and lagoon area (AOI 34) in the railyard, and groundwater from this area does discharge to the Weber River. These results suggest that one or more chemicals released from the site in the vicinity of AOI 34 may be present in sediment of the Weber River and may be toxic to benthic organisms at that location. However, repeat studies would be needed to confirm this conclusion and to identify which chemical or combination of chemicals is responsible for the toxicity.

During the Phase 3 investigation, sediment toxicity tests were performed for sediments from the 21st Street Pond and Buena Ventura Park Pond (USEPA 2002). Sediments from three different locations in the 21st Street Pond were selected to represent sediments from areas above, on the edge of, and outside of the DNAPL zone. Sediments from Buena Ventura Park Pond were collected from two sampling locations and are considered to be reference samples. For each sampling station, a 14-day subchronic survival and growth toxicity test using the amphipod *Hyalella azteca* was conducted in accord with standard protocols. Each sediment toxicity test consisted of eight replicates (10 organisms per replicate) per station using 100% site sediment (without dilution). Detailed results from the Phase 3 sediment toxicity tests are presented in USEPA (2002) and are summarized in the lower portion of Table 5-7.

As seen, toxicity was not detected in any of these sediment samples, including samples from inside the fenced area of the pond where DNAPL has directly impacted the sediments. This apparent lack of toxicity is unexpected, since these sediments are clearly contaminated with DNAPL, and because HQ calculations for these sediments indicate that PAH levels may be above a level that results in toxicity (see Section 5.1.2, above).

One possible explanation is that because the test organisms (*H. azteca*) are epibenthic (i.e., they exist primarily at the interface between the sediment and the overlying water, rather than burrowing deeply into the sediment), they may not have been exposed to sediment porewater directly, but only indirectly through the release of contaminants from the sediment into the overlying test water. Because this water was renewed daily, concentrations of sediment-related chemicals in the overlying water might have been lower than the concentration in sediment porewater. However, further studies would be needed to determine if this hypothesis is correct and if the sediment is actually toxic.

5.3 Evaluation of Aquatic Community Surveys

Effects of chemical stressors on an ecosystem can sometimes be evaluated by direct observation of the density and diversity of species present in the ecosystem. At this site, observations on the benthic community structure are available from two separate studies.

The Phase 2 investigation focused on the benthic community in the Weber River. For each sample, several benthic macroinvertebrate metrics were evaluated to determine the biological condition of the benthic community. For each sample, a biological condition score was derived from the available benthic metrics based on Rapid Bioassessment Protocols (RBP) for rivers and streams described in Figure 5-9 (USEPA 1989). Results for each of the Phase 2 Weber River samples are shown in the upper portion of Table 5-8. As seen, the benthic community in the Weber River does not appear to be impacted at any site location in comparison to the reference location (WR09).

The Phase 3 investigation focused primarily on the 21st Street Pond and Buena Ventura Park Pond. Results from this investigation are shown in the lower portion of Table 5-8. It is important to note that the macroinvertebrates collected from the ponds are representative of free-swimming organisms found near the vegetated areas of the banks and not sediment-dwelling benthic organisms. This is primarily because the sediments from these ponds are composed of dense, fine-grained particles and do not support the types of benthic-dwelling organisms typically seen in the gravel and cobble substrates typical of rivers and streams. Because the RBP method is designed for use in evaluating benthic macroinvertebrate communities in streams and rivers, an RBP biological condition score cannot be derived for the 21st Street Pond and Buena Ventura Park Pond samples. Therefore, interpretation of these macroinvertebrate metrics is limited to a semi-quantitative comparison of the samples from the three locations in the 21st Street Pond to the two reference locations in the Buena Ventura Park Pond. As seen, although there is a tendency for the density and diversity of some organisms (e.g., scrapers) to be lower inside the fenced area at the east end of the 21st Street Pond than in the west end of the pond, the biotic community observed in samples collected from the 21st Street Pond appears to be generally similar in structure and density to the community observed in Buena Ventura Park Pond. This comparison indicates that, aside from some potential shifts in community structure in the east end of the pond, the invertebrate population in the 21st Street Pond is not severely impacted.

5.4 Weight of Evidence Evaluation

Risks from Surface Water

One line of evidence (the HQ approach) is available to evaluate risks to aquatic receptors from direct contact exposure to surface water. The findings from this line of evidence are summarized below.

Line of Evidence	Findings
HQ calculations based on surface water concentrations at the Weber River, the Ogden River, and the 21st Street Pond	Most HQ distributions are either below a level of population concern (at least 80% of all HQ values are ≤ 1E+00), or else do not appear to be site-related. Chronic HQ distributions are of potential concern for several PAHs in the east end of the 21st Street Pond. These are likely site-related, but might reflect PAHs bound to suspended sediment rather than dissolved in surface water. If so, risks are likely to be lower than calculated.

Based on this line of evidence, it is concluded that site-related chemicals in surface water do not pose a population-level risk to aquatic receptors, with the possible exception of the east side of the 21st Street Pond.

Sediments

Three lines of evidence are available to evaluate risks from sediments to benthic organisms. The findings from these lines of evidence are summarized below.

Line of Evidence	Findings
HQ Calculations	Non-PAHs Based on bulk sediment concentrations and SEC benchmarks, risks to benthic organisms from non-PAHs in sediment do not appear to be of population-level concern except possibly for xylenes and PCBs in the east end of the 21st Street Pond and for PCBs in the Ogden River Reach B. PAHs Based on bulk sediment concentrations and SEC benchmarks, risks from PAHs are of population-level concern in multiple locations, especially the east end of the 21st Street Pond. Based on bulk sediment concentrations and ESG benchmarks, risks from PAHs are not of population-level concern at any location except possibly for naphthalene at the east end of the 21st Street Pond. Based on porewater measurements, risks from PAHs are not of population-level concern at any location, including the east end of the 21st Street Pond.
Direct Toxicity Testing	Low toxicity (24-26% mortality) was noted at 1 location in the Weber River (near AOI 34). Toxicity was not observed at 7 other locations in the Weber River, and not at 3 locations from the 21st Street Pond.
Population Observations	No evidence of adverse effect in the Weber River (based on Rapid Assessment Protocol). There may be some shifts in community structure in the east end of the 21st Street Pond compared to the west end, but comparison with Buena Ventura Park Pond does not reveal substantial impacts.

In summary, based on a weight of evidence approach, it is concluded that sediments are not of population-level concern to benthic organisms at most locations. At the east end of the 21st Street Pond, population-level risks may occur from xylenes, PCBs, and PAHs. PCBs may also be of concern in sediments from Ogden River Reach B. However, at both these locations, results are mixed and no strong conclusions can be drawn.

Risks from All Pathways Combined

One line of evidence (tissue-based HQ values for fish) is available to evaluate risks to aquatic receptors (fish) from all aquatic exposure pathways combined (surface water, dietary exposure). The findings from this line of evidence are summarized below.

Line of Evidence	Findings
HQ calculations based on fish tissue burdens	Risks from 4,4'-DDD and 4,4'-DDE may be significant, but may not be site-related. Other chemicals are not in a range of concern.

Based on this line of evidence, it is concluded that risks to fish from site-related chemicals in all media (surface water, sediment, diet) are likely to be minimal.

Overall Conclusion Regarding Risks to Aquatic Receptors

The weight of evidence combined across all observations indicates that risks to aquatic receptors from site-related chemicals are low at all locations, except potentially for risks to benthic organisms from PCBs in the Ogden River and PCBs, PAHs, and xylenes in the east end of the 21st Street Pond.

6.0 RISKS TO TERRESTRIAL PLANTS AND SOIL ORGANISMS

6.1 Hazard Quotient Approach

This section provides an assessment of terrestrial plant and soil organisms living in riparian floodplain areas which are potentially impacted by contaminants from the Ogden Railyard. The structure and function of the riparian plant and invertebrate community is important because it provides a significant portion of the energy, organic matter, and nutrient inputs to the stream, and because riparian corridors usually provide high quality edge habitat as well as forage for a variety of wildlife species. Terrestrial plants and soil invertebrates are good indicators of riparian floodplain condition because they reside directly in the soil and are not mobile. Based on the site conceptual model (Figure 4-1), the following exposure pathways have been selected for quantitative evaluation by the HQ approach:

- Direct contact of plant roots with chemicals in surface soils or dissolved into the interstitial water occupying the spaces between soil particles.

- Direct contact and soil ingestion by soil invertebrates.

This HQ-based evaluation is described below.

Exposure Assessment

Terrestrial plants are exposed to contaminants in soil principally through their roots. Exposure may also occur due to deposition of dust on foliar (leaf) surfaces, but this pathway is believed to be small compared to root exposure. Soil organisms are exposed to contaminants in soil via direct contact and ingestion. Because these terrestrial receptors are not highly mobile, exposures are calculated on a sample-by-sample basis, rather than on average concentrations over some selected location. Soil data was limited to depths of 0 to 2 feet, because this layer is likely to be the layer in which plant roots and soil organisms are located. In accord with USEPA guidance, non-detects were evaluated at one-half the detection limit.

Toxicity Assessment

Toxicity values for the protection of terrestrial receptors (plants and soil organisms) from contaminants in surface soils are available from several sources. Each of the sources evaluated in deriving soil toxicity benchmarks is described briefly in Appendix C-5, along with a hierarchy for identifying the most relevant and reliable benchmark value when more than one value is available. The selected toxicity benchmark values for all chemicals analyzed in soil are shown in Table C-5 of Appendix C.

Soil COPC Selection

Soil COPCs for terrestrial receptors were selected based on all available surficial soil data from sampling locations at abandoned meanders near the 21st Street Pond and the riparian area west of the railyard along the Weber River. Maximum soil concentrations for each chemical were compared to their respective toxicity benchmark values (see Table C-5). The results of the COPC selection procedure for exposure of terrestrial receptors to soil are detailed in Appendix D-3 and the chemicals that were selected for quantitative evaluation are presented below.

Quantitative COPCs for Exposure of Terrestrial Receptors to Soil			
Inorganics		PCBs	VOCs
Aluminum Antimony Arsenic Barium Cadmium Chromium Copper Iron	Lead Manganese Mercury Selenium Silver Vanadium Zinc	Aroclor 1260	Tetrachloroethene

Calculation of Hazard Quotients

The detailed calculations of HQ values and graphical presentations for each COPC in each soil sample are presented in Appendix E-7, along with a set of figures that display the results. The results are summarized in Table 6-1, and Figure 6-1 presents two examples (aluminum and Aroclor 1260). Inspection of Table 6-1 and the figures in Appendix E-7 yields the following main conclusions:

- Risks from inorganic COPCs are above a level of concern for most soil samples in both site and reference locations, and there is no apparent spatial pattern (see Figure 6-1 using aluminum as an example). This suggests that the benchmarks used to calculate HQ values for these COPCs are likely to be overprotective. As shown in Table 6-2, this conclusion is supported by noting that the concentrations of inorganics in site soil are all within the normal range expected in Utah (Shacklette and Boerngen 1984), and that the toxicity benchmarks for inorganic COPCs are all below the typical ranges. Based on this, it is concluded that inorganic COPCs in soil are not of concern to terrestrial plants or soil invertebrates.

- HQs for PCBs (based on Aroclor) are above a level of concern in soils from abandoned meanders of the Ogden River near the 21st Street Pond (see Figure 6-1). This suggests that PCBs in material that was previously sediment in the Ogden River may inhibit the growth or survival of plants and soil invertebrates in this area.

6.2 Evaluation of Site-Specific Toxicity Tests

No site-specific toxicity tests for terrestrial receptors are available for the Ogden Railyard site.

6.3 Evaluation of Terrestrial Community Surveys

No plant or soil organism community evaluations are available for the Ogden Railyard site.

6.4 Weight of Evidence

Only one line of evidence (the HQ approach) is available to evaluate risks to plants and soil invertebrates from COPCs in soils. The findings from this line of evidence are summarized below:

Line of Evidence	Findings
HQ calculations based on concentrations measured in soil	Most HQ distributions are either below a level of concern (≥80% < 1E+00), or else do not appear to be site-related. Risks from PCBs in soil near the 21st Street Pond could be due to contaminated sediment in abandoned meanders of the Ogden River.

Based on this line of evidence, it is concluded that risks from site-related chemicals in surface soil are not of concern in the riparian area west of the railyard site. Risks from PCBs in soils near the 21st Street Pond may be of potential concern, but additional data (e.g., site-specific toxicity tests) would be needed to confirm this conclusion. The source of the PCBs in the abandoned meanders is not known and may not be site-related.

7.0 RISKS TO WILDLIFE RECEPTORS

This section presents an assessment of the populations of wildlife receptors that reside near the Ogden Railyard. Wildlife receptors include a wide variety of mammals and birds that span a variety of sizes and feeding guilds. Exposure of wildlife receptors may occur through ingestion of contaminated surface water while drinking, ingestion of contaminated soil or sediment while feeding, and ingestion of contaminated food web items.

As discussed in Section 4, it is not feasible to evaluate exposures and risks for each avian and mammalian species potentially present within the site. For this reason, specific wildlife species are identified as surrogates (representative species) for the purpose of estimation of exposure and risk to groups of species within similar feeding guilds. The surrogate species at this site and the exposure pathways evaluated for each species include:

Surrogate Species	**Feeding Guild**	**Exposure Pathways Evaluated**
Mink	Mammalian piscivore	Ingestion of surface water, sediment, and fish
Belted Kingfisher	Avian piscivore	
Mallard Duck	Avian omnivore	Ingestion of surface water, sediment, and benthic invertebrates
Masked Shrew	Mammalian insectivore	Ingestion of surface water and soil
American Robin	Avian insectivore	

7.1 Hazard Index Approach

The basic equation used for calculation of an HQ value for exposure of a terrestrial wildlife receptor to a chemical by ingestion of an environmental medium is:

$$HQ_{r,c,m} = \frac{C_{c,m} \cdot IR_{m,r} \cdot DF_{m,r} \cdot RBA_{c,m}}{BW_r \cdot TRV_{c,r}}$$

where:

$HQ_{r,c,m}$	=	HQ for exposure of receptor "r" to chemical "c" in medium "m"
$C_{c,m}$	=	Concentration of chemical "c" in medium "m" (mg/kg)
$IR_{m,r}$	=	Intake rate of medium "m" by receptor "r" (kg/day)
BW_r	=	Body weight of receptor "r" (kg)
$DF_{m,r}$	=	Dietary fraction of medium "m" by receptor "r" derived from site (%)
$RBA_{c,m}$	=	Relative bioavailability of chemical "c" in medium "m" (%)
$TRV_{c,r}$	=	Toxicity reference value for chemical "c" for receptor "r" (mg/kg BW/d)

Because all receptors are exposed to more than one environmental medium, the total Hazard Index (total HI) for a receptor from a specific chemical is calculated as the sum of HQs for that chemical across all exposure pathways:

$$HI_{c,r} = \sum HQ_{c,m,r}$$

If the total HI is below 1E+00, it is believed that no unacceptable effects will occur in the exposed population from the chemical of concern. If the total HI is above 1E+00, then unacceptable effects may occur, with the likelihood and/or severity of effects tending to increase as the value of the HI becomes larger.

7.1.1 Exposure Assessment

Wildlife receptors are generally mobile, and hence may be exposed to a range of different concentration values in water, soil, and food web items as they move throughout their home range. As described previously in Section 3, for the purposes of this assessment the riparian zones along the Weber River and the Ogden River were divided into a number of reaches (shown in Figure 3-2). Exposure of wildlife receptors for each COPC in each medium within each exposure unit was based on the 95% upper confidence limit (UCL) of the mean concentration or on the maximum concentration, whichever was lower. The 95% UCL was calculated based on the assumption that concentration values within each reach were distributed lognormally. Non-detects were evaluated by assuming a concentration value equal to one-half the detection limit.

7.1.2 COPC Selection

The COPC selection procedure for exposure of wildlife receptors at this site was performed using medium-specific concentration-based benchmarks in water, soil, or the diet. The values employed were derived by Sample et al. (1996) for several different types of mammalian and avian receptors by back-calculation from dose-based no-effect levels in the receptor, assuming typical intakes rates and body weight for the receptor. For COPC selection, the lowest NOAEL concentration-based TRVs for mammals and avian receptors were employed. These concentration-based benchmarks are presented in Appendix C-6. The maximum concentration values of each analyte in each medium (surface water, sediment, soil, and fish tissue) were compared to their respective concentration-based toxicity benchmark values, and any chemical that had one or more values above the benchmark were retained as COPCs (Appendix D4 to D7). Chemicals that were selected for quantitative evaluation in one or more media are presented below.

Quantitative COPCs for Exposure of Wildlife Receptors via Ingestion				
Inorganics		Pesticides/ PCBs	PAHs	SVOCs
Aluminum Antimony Arsenic Barium Cadmium Chromium Copper	Lead Manganese Mercury Selenium Thallium Vanadium Zinc	4,4'-DDE 4,4'-DDD 4,4'-DDT PCBs (as Aroclor)	Benzo[a]pyrene	bis(2-Ethylhexyl)phthalate Dibutylphthalate

7.1.3 Toxicity Assessment

Sample et al. (1996) provide a summary of available data on the toxicity of chemicals in wildlife receptors. Based on these studies, Sample et al. (1996) identified avian and mammalian dose-based TRVs for each chemical for which data are adequate. Two different types of TRVs were identified. The first type is based on a reported exposure level (dose) that is not associated with any adverse effects to the test organism. This is referred to as the No Observed Adverse Effect Level (NOAEL) based TRV. The second type of TRV is based on a reported exposure level that causes an observable adverse effect, and is referred to as the Lowest Observed Adverse Effect Level (LOAEL) based TRV. A summary of the available studies reviewed by Sample et al. (1996) and the selected NOAEL and LOAEL TRVs is presented in Appendix C-7.

Risk calculations for each COPC were based on the geometric mean of the NOAEL and LOAEL dose-based TRVs. This value is taken to be an estimate of the threshold dose level where adverse effects first begin to occur in exposed organisms. If cases where only one of the two needed values was available (a NOAEL but no LOAEL, or a LOAEL but no NOAEL), the missing value was estimated by assuming a ratio (LOAEL to NOAEL) of 5. This ratio is based on the observation that the true ratio of the NOAEL to the LOAEL is less than a factor of 5 in 96% of all cases where both values were available (USEPA 1997). Thus, use of a factor of 5 is conservative, and will tend to overestimate extrapolated LOAEL values and will tend to underestimate extrapolated NOAEL values. Table C-7c of Appendix C presents the dose-based TRVs used in this assessment to evaluate risks to wildlife receptors from ingestion of contaminants in surface water, soil, sediment, and food items.

Relative Bioavailablility

The TRVs calculated by Sample et al. (1996) are expressed in units of ingested dose. However, the value of the TRV depends on how much of the ingested dose is actually absorbed, which in turn depends on the properties of both the chemical and the exposure medium. Ideally, toxicity studies would be available that establish empiric TRVs for all site media of concern (water, food, soil, sediment). However, most laboratory tests use either food or water as the exposure medium, and essentially no studies use soil or sediment. Therefore, in cases where a TRV is based on a study in which the oral absorption fraction is different that what would be expected for a site medium, it is necessary to adjust the TRV to account for the difference in absorption.

The ratio of absorption from the study medium compared to absorption from site medium is referred to as the relative bioavailability (RBA). For the purposes of this assessment, it was assumed that organic COPCs are absorbed equally well from all site media (water, diet, soil, sediment). For inorganic COPCs, available data on cadmium and manganese suggest that absorption from the diet is about half that from water (IRIS 2002). Based on this, when toxicity data for inorganic COPCs were available from studies in food or water, but not both, the RBA for a chemical in food compared to that for water or other soluble forms (e.g., capsule) was assumed to be 0.5 (50%). That is:

$$TRV_{water} = TRV_{diet} \cdot 0.50$$
$$TRV_{diet} = TRV_{water\ or\ capsule} / 0.50$$

In the absence of any site specific data, it was assumed that chemicals in soil and sediment are absorbed to the same degree as chemicals in food. It is considered likely that this approach may tend to overestimate exposure and risk from ingestion of soil, but this is not known for certain.

7.1.4 Risk Calculations

Wildlife Intake Factors

Exposure parameters and dietary intake factors for each receptor for each medium were derived from the Wildlife Exposure Factors Handbook (USEPA 1993), as well as a variety of other sources. In some cases, no quantitative data could be located, so professional judgement was used in selecting exposure parameters. The exposure parameters selected for each wildlife receptor are detailed in Appendix B, and are summarized in Table 7-1. All intake values shown in these tables are expressed in terms of wet weight except for soil and sediment, which are expressed as dry weight.

In all cases, the fraction of the total dietary intake that comes from within the exposure reach was assumed to be 100%. This assumption was used because each of the exposure reaches is relatively large, and most wildlife receptors being evaluated are expected to derive nearly all of their food from within the exposure reach. If any receptors were to derive a significant portion of their diet from areas outside of the reaches being evaluated, estimated doses and risks could be lower than predicted.

Calculation of Total Hazard Indices

Tables 7-2a to 7-2e present the total HIs for each wildlife receptor for each COPC at each reach. Detailed calculations are provided in Appendix E-8. Inspection of these tables reveals the following main conclusions:

> Kingfisher. As shown in Table 7-2a, risks to piscivorous birds (as represented by the belted kingfisher) appear to be below a level of concern for all chemicals at all exposure locations except for 4,4'-DDE at the 21st Street Pond. This risk is due almost entirely to ingestion of fish that have accumulated DDE in their tissues. The source of DDE is not known, but may be due to historic use of DDT in adjacent agricultural fields rather than a railyard-related release.

Robin. As shown in Table 7-2b, risks to passerine birds (as represented by the American robin) appear to be below a level of concern for all chemicals at all exposure locations except for lead at Weber River - Reach A. This risk is due mainly to ingestion of lead in riparian area soil. However, this area is a reference area and is not suspected to have been impacted by site-related releases. Thus, site-related risks to the robin appear to be negligible.

Mallard. As shown in Table 7-2c, risks to aquatic birds that may ingest surface water, sediment and benthic macroinvertebrates (as represented by the mallard duck) appear to be below a level of concern for all chemicals at all exposure locations.

Masked Shrew. As shown in Table 7-2d, risks to mammalian insectivors (as represented by the masked shrew) appear to above a level of potential concern due to aluminum, arsenic, lead and mercury at the 21st Street Pond and along the Weber River. However, a similar risk is observed for these chemicals in Weber River - Reach A (a reference area), suggesting that the apparent risks from these chemicals may be due to TRV values that are overly conservative for this site.

Mink. As shown in Table 7-2e, risks to semi-aquatic piscivorous mammals (as represented by the mink) appear to be below a level of concern for all chemicals at all exposure locations.

Based on this line of evidence, it is concluded that risks to wildlife receptors from site-related chemicals are likely to be minimal.

7.2 Toxicity Equivalency Approach for PCBs

PCBs are a mixture of many different congeners, not all of which are equally toxic. Therefore, risk estimates based on the measured levels of total PCBs (as Aroclor) in site media may not always be reliable, since the relative concentration of the different congeners may vary among locations and media, and may be quite different than the ratios in the material tested to develop the Aroclor-based toxicity benchmarks. For these reasons, risks to mammals (mink) and birds (kingfisher, mallard) from ingestion of PCBs in aquatic prey (fish, benthic macroinvertebrates) were also evaluated using data on the concentrations of specific PCB congeners in aquatic prey. This approach evaluates congeners based on their toxicity relative to

2,3,7,8-tetrachlorodibenzodioxin (TCDD). The relative toxicity of a congener compared to that of TCDD is expressed in terms of the Toxicity Equivalency Factor (TEF). Table 7-3 lists consensus TEF values for the 12 PCB congeners that have the highest toxicity in mammals, birds, and fish. These TEF values were developed by a panel of experts assembled by the World Health Organization (Van den Berg et al. 1998). Note that TEFs are often based on limited data, and so they are only approximations of the relative toxicity of each congener, rounded to the nearest half order of magnitude.

In this approach, the aggregate toxicity of a mixture of different PCB congeners in a sample of diet (this is referred to as the TCDD Equivalent Concentration, or TEQ) is expressed as the sum of the TEQ values for each of the 12 congeners in that sample:

$$TEQ_{total} = \sum TEQ_i = \sum (C_i \cdot TEF_i)$$

7.2.1 Exposure Assessment

Congener-specific concentration values were obtained for 15 samples of fish and 4 samples of benthic macroinvertebrates. The TEQ values for these samples, corrected to account for laboratory-based method blanks, are shown in the upper portion of Table 7-4. Because there only a few samples from each reach, all exposure calculations were based on the maximum concentration value from each reach (shown in the lower half of Table 7-4).

7.2.2 Toxicity Assessment

Birds (Kingfisher and Mallard)

For birds, the most sensitive endpoint of TEQ-induced toxicity is abnormalities or deformities in hatchlings. In accord with the evaluation described in USEPA (1997b), the best available study of TEQ toxicity in bird eggs was reported by Hoffmann et al. (1998). Based on data from kestrels, this study identified a concentration of 23 pg/g ww TEQ in eggs as the no-effect level, and a concentration of 230 pg/g ww TEQ as the effect level. These values were used for evaluation of risks to kingfishers and mallards without application of any inter-species uncertainty factors.

To convert this egg-based benchmark to a diet-based benchmark, the relationship between concentration in the diet and concentration in bird egg must be estimated. A study by Braune and Norstrom (1989) in herring gulls observed an average TEQ ratio (egg/diet) of about 50, and this value was used to estimate the diet based-benchmarks:

Diet benchmark (ppt TEQ in aquatic prey item) = Egg Benchmark (ppt TEQ in egg) / 50

Thus, the no observed effect concentration (NOEC) and the lowest observed effect concentration (LOEC) in aquatic prey tissues are 0.46 and 4.6 ppt TEQ, respectively.

Mammals (Mink)

The TRV for ingestion of PCBs (as TEQ) by mink was based on the study of Tillitt et al. (1996). In this study, groups of female mink were fed fish that contained differing levels of TEQ (attributable to a mixture of PCBs, dioxins and furans), and the effects on reproductive success (kit survival) were measured. Tillet et al. reported exposure in units of pg TEQ/g fish tissue. However, these TEQ values were calculated from measured PCB, dioxin, and furan congener concentrations using older TEF values recommended by Ahlborg et al. (1992, 1994). In order to ensure that the TRV was expressed in the same units as the site-specific fish tissue data, the fish tissue TEQ values reported by Tillitt et al. were recalculated from the congener data using the more recent TEFs recommended by Van den Berg et al. (1998). These adjusted exposure levels and the reported effects (incidence of kit mortality) were fit to several different types of dichotomous models using USEPA's Benchmark Dose Software System. Several different models fit the data well, but depending on the shape of the fit, yielded different estimates of the dose that would cause a 10% extra risk of pup mortality. The lowest and highest estimates were as follows:

Dose Response Model	Benchmark Concentration (pg/g TEQ in Diet)
Quantal-Linear	3.3
Quantal-Quadratic	14

Other models yielded values intermediate between these two. Because of the substantial range in possible benchmark values, risk estimates were derived using both the lowest and the highest benchmark values, as shown above.

7.2.3 HQ Calculation

Risks to kingfisher, mallard, and mink were calculated as the ratio of the concentration in the diet (ppt TEQ in aquatic prey item) divided by the appropriate diet-based benchmark. The results are shown in Table 7-5.

For kingfisher (and other piscivorous birds), the concentration of PCBs in fish (as TEQ) in most locations is intermediate between the NOAEL and the LOAEL benchmarks, indicating that risks to the kingfisher are possible, but are likely to be relatively low. Risks are somewhat higher for individuals nesting along the Ogden River in the vicinity of the 21st Street Pond, but are even present in reference areas (e.g., Buena Ventura Park Pond). A similar pattern is observed for mallards exposed along the Ogden River. Data are not available to evaluate risks to mallards from ingestion of TEQ in benthic invertebrates from the 21st Street Pond.

For mink (and other piscivorous mammals), if TRV is based on the most conservative dose-response model (quantal-linear), risks could range as high as 5E+00, with highest values along the Ogden River in the vicinity of the 21st Street Pond. If the TRV is based on the quantal-quadratic dose response model, risks to mink would not be significant in any areas.

7.3 Evaluation of Site-Specific Toxicity Tests

No site-specific toxicity tests for wildlife receptors are available for the Ogden Railyard site.

7.4 Evaluation of Wildlife Surveys

No wildlife evaluations are available for the Ogden Railyard site.

7.5 Weight of Evidence

<u>Non-PCB Chemicals</u>

Only one line of evidence (the HI approach) is available to evaluate risks to wildlife receptors from non-PCB COPCs in water, soil, and the diet. The findings from this line of evidence are summarized below:

Line of Evidence	Findings
HI calculations based on COPC concentrations measured in soil, water and diet	Most HI values are either below a level of concern or else do not appear to be site-related.

Based on this line of evidence, it is concluded that risks from non-PCB site-related chemicals in surface water, surface soil, and the diet are not of population-level concern to wildlife receptors either in the riparian area along the Weber River west of the railyard site or along the Ogden River north of the railyard.

PCBs

Two lines of evidence (both based on the HQ approach) are available to evaluate risks to wildlife from PCBs. The findings from these lines of evidence are summarized below:

Line of Evidence	Findings
HQ calculations based on total Aroclor concentrations in soil, sediment and the diet	Risks are below a level of concern for all receptors at all locations.
HQ calculations for semi-aquatic birds and mammals based on congener-specific data in aquatic prey items (TEQ approach)	Depending on the toxicity benchmarks selected, risks could be of potential concern in the 21st Street Pond (kingfisher, mink) and the Ogden River near the pond (kingfisher, mallard, mink). Risk levels are likely to be low to moderate.

Based on these lines of evidence, it is concluded that risks from PCBs may be possible for specific individuals or family groups of semi-aquatic wildlife residing along the Ogden River or in the vicinity of the 21st Street Pond (the locations where PCB levels are highest in fish and benthic organisms).

Extrapolation from these sublocation-specific results to the potential for population-level effects is especially difficult, since no site-specific data were located on the size or density of local populations of kingfishers, mallards, or mink. However, a screening evaluation of population-level risk was performed as follows. First, the local population was defined as all breeding pairs that might reside anywhere along the Ogden River in Reaches A-D and along the Weber River in Reaches A-D (see Figure 3-2). These two river segments are each about 6 km long. Next, the number of breeding pairs that might exist in this area were estimated by dividing the total length of shoreline (about 12 km) by the linear length of the home range for kingfishers (about 1.5 km) and mink (about 2 km) (USEPA 1993). This indicates that there might be about 8 pairs of kingfishers and about 6 pairs of mink in the local population. A similar density (a total of 6 pairs) was assumed for mallards. Finally, based on the finding that risks to breeding pairs are of concern mainly at two potential home ranges (Ogden Reach B and the 21st Street Pond), the fraction of the population that might be impacted was estimated to be about 25% (2/8) for kingfisher and about 33% (2/6) for mink and mallards. These percentages of individuals at risk are sufficiently high that population-level risks to semi-aquatic mammalian and avian receptors are considered to be of potential concern at this site.

8.0 UNCERTAINTIES

Quantitative evaluation of ecological risks is generally limited by uncertainty regarding a number of important data. This lack of knowledge is usually circumvented by making estimates based on whatever limited data are available, or by making assumptions based on professional judgement when no reliable data are available. Because of these assumptions and estimates, the results of the risk calculations are themselves uncertain, and it is important for risk managers and the public to keep this in mind when interpreting the results of a risk assessment.

The following text summarizes the key sources of uncertainty influencing the results of this ERA.

8.1 Uncertainty in the Nature and Extent of Contamination

Representativeness of Samples Collected

Concentration levels of COPCs in environmental media are often quite variable as a function of location, and may also vary significantly as a function of time. Thus, samples collected during a field sampling program may or may not fully characterize the spatial and temporal variability in actual concentration levels. At this site, all of the field samples were collected in accord with sampling and analysis plans that specifically sought to ensure that samples were representative. However, in some locations, the number of samples collected was relatively small. Thus, without the collection of very large numbers of samples over both space and time, some uncertainty remains as to whether the samples collected provide an accurate representation of the distribution of concentration values actually present.

Accuracy of Analytical Measurements

Laboratory analysis of environmental samples is subject to a number of technical difficulties, and values reported by the laboratory may not always be exactly correct. However, all data used in this risk assessment had sufficient accompanying quality assurance data to ensure that results were within acceptable bounds for accuracy and precision. The magnitude of analytical error is usually small compared to other sources of uncertainty, although the relative uncertainty increases for results that are near the detection limit.

8.2 Uncertainty in Exposure Assessment

Exposure Pathways Not Evaluated

Exposure pathways selected for quantitative evaluation in this ERA do not include all potential exposure pathways for all ecological receptors. Exposure pathways that were not evaluated in this ERA included:

- Ingestion of prey items and sediments by benthic invertebrates
- Ingestion of water, sediment, and prey items by fish
- Direct contact of fish with contaminated sediments
- Dermal exposure of wildlife to soil, sediment, and surface water
- Ingestion of terrestrial food items by wildlife receptors

Omission of these pathways will tend to lead to an underestimation of total risk to the exposed receptors. However, as discussed previously, most of these exposure pathways are likely to be minor compared to other pathways that were evaluated, and the magnitude of the underestimation is not likely to be significant in most cases.

One possible exception is direct contact of fish with contaminated sediment. This pathway is of chief concern for species that tend to feed in the sediments (catfish, suckers, carp). Direct contact between the fish and the sediment could lead to dermal absorption of chemicals such as PAHs and PCBs, and these could cause effects such as increased tumors (e.g., Pinkney et al. 2001). However, the ecological significance of such tumors is uncertain, since the consequence of tumors on survival or reproductive success in fish is not well established.

Another possible exception is ingestion of prey items by benthic invertebrates. Although the general consensus is that uptake from food is usually less than from water (Clements 1991), available data are sufficient to establish that the ingestion pathway can be an important source of exposure to some aquatic macroinvertebrates (Timmermans et al. 1992), and that dietary exposures can be capable of limiting growth in at least some cases (Duddridge and Wainwright 1980). Based on the lack of data on the toxicity of contaminants in food chain items on aquatic invertebrate receptors, quantitative prediction of hazard using the traditional HQ and HI approach is not yet possible. To the extent that dietary exposures tend to be less important than water exposures in at least some species, failure to quantify the hazard from the ingestion pathway may not lead to a substantial underestimation of total hazard. However, the food pathway may be more important than the water pathway for some contaminants and/or some receptor species. Therefore, the inability to quantify hazard from ingestion exposures is a potential source of uncertainty that may tend to underestimate impacts of contamination on aquatic macroinvertebrate receptors.

Chemicals Not Detected

Any chemical that was never detected in a site medium was not evaluated in exposures of receptors to that medium. However, in some cases, the analytical detection limit was too high to expect the chemical would be detected even if it were present at a level of concern. Chemicals in this category were assigned to the Qualitative COPC list (Type 2). Appendix C identifies chemicals assigned to this category, and the results are summarized in Table 8-1. As seen, a number of such chemicals exist. Omission of these chemicals could result in an underestimation of risk. However, the magnitude of the error is likely to be low in most cases. This is because if the chemical were actually site-related or if it were present at a level of substantial health concern, it likely would have occurred at levels above the detection limit at least a few times. Thus, while the hazard from Qualitative Type 2 COPCs is unknown, it is probably not large enough to cause a substantial underestimation of risk.

Exposure Area Concentration Values

For exposures that are based on the average concentration across many samples rather than exposures that are based on individual samples (this is the case for most wildlife species), the desired input parameter is the true mean concentration of a contaminant within a medium, averaged over the area where exposure occurs. In this assessment, rather than using the sample mean, exposure was based on the 95% UCL of the mean, or the maximum value (which ever was lower). This approach is much more likely to overestimate than underestimate true risk, and this is a source of conservatism in the risk estimates.

Wildlife Exposure Factors

The intake (ingestion) rates for food, soil, water, and sediment used to estimate exposure of wildlife at the site are derived from literature reports of intake rates, average body sizes, dietary compositions, consumption rates, and metabolic rates by receptors at other locations or from measurements of laboratory-raised organisms. These values may or may not serve as appropriate models for site-specific intake rates of wild receptors at this site. Moreover, the actual dietary composition of an organism will vary daily and seasonally. In addition, some wildlife receptor-specific intake rates are estimated by extrapolation from data on a closely related species or by use of allometric scaling equations (scaling of intake rates based on body weights). This introduces further uncertainty into the exposure and risk estimates. These uncertainties could either under- or overestimation the actual exposures of wildlife to COPCs in water, sediment, soil, and diet.

Absorption From Ingested Doses

The toxicity of an ingested chemical depends on how much of the chemical is absorbed from the gastrointestinal tract into the body. However, the actual extent of chemical absorption from ingested media (soil, sediment, food, and water) is usually not known. The hazard from an ingested dose is estimated by comparing the dose to an ingested dose that is believed to be safe, based on tests in a laboratory setting. Thus, if the absorption is the same in the laboratory test and the exposure in the field, then the prediction of hazard will be accurate. However, if the absorption of chemical from the site medium is different (usually lower) than occurred in the laboratory study, then the hazard estimate will be incorrect (usually too high). In this assessment, estimates of wildlife exposure due to incidental soil and sediment ingestion conservatively assume a relative bioavailability of 100% for all chemicals. This assumption is expected to overestimate contaminant doses to wildlife, since absorption efficiencies for many chemicals (especially metals) are lower in site media (especially soil and sediment) than in most laboratory studies.

8.3 Uncertainties in Effects (Toxicity) Assessment

Representativeness of Receptors Evaluated

Risk characterizations for aquatic receptors are based on a generalized set of species found in freshwater aquatic communities. However, not all of these species are likely to occur at this site. Thus, HQ values above 1E+00 may reflect risks to species that are absent at the site, and risks to species that are actually present at the site may be lower.

Risks to wildlife are assessed for a small subset of the species likely to be present in the areas surrounding the Ogden Railyard. The representative wildlife species used for quantitative evaluation at this site was selected to represent a range of taxonomic groups and life history types of species likely to occur in the area. These species may not, however, represent the full range of sensitivities present. The species selected may be either more or less sensitive to contaminant exposures than typical species located within the area.

Absence of Toxicity Data for Some Chemicals

As discussed in Section 4, no reliable toxicity benchmark could be located for a number of chemicals that were detected in one or more samples of site media. Chemicals in this category were assigned to the Qualitative COPC list (Type 1). Appendix C identifies chemicals assigned to this category, and the results are summarized in Table 8-1. As seen, a number of such chemicals exist. The inability to evaluate hazard from these chemicals could result in an underestimation of risk, but the magnitude of the error is likely to be low. This is because absence of a toxicity benchmark for a chemical is often due to the fact that toxicological concern over that chemical is low. That is, chemicals that lack benchmarks are often considered to be relatively less hazardous that those for which benchmarks do exist. To the extent that this is true (even though there are likely some exceptions to this rule), risks from Qualitative Type 1 COPCs at this site are likely not of substantial concern.

One potential exception to this is the broad set of alkanes and alkenes that are the principal constituents of the DNAPL at the site. These chemicals are likely to cause narcotic effects on benthic organisms, similar to the effects of the PAH component of the DNAPL plume. Thus, risks to benthic organisms from sediments saturated by DNAPL may be underestimated based on an assessment of PAHs only.

Extrapolation of Toxicity Data Between Receptors

Toxicity data are not available for all of the species of potential concern at the site. Thus, it is sometimes necessary to estimate toxicity values for a receptor by extrapolating toxicity data across similar species. This extrapolation may either overestimate or underestimate the risk to the actual receptor, depending on whether the actual receptor is less sensitive or more sensitive that the species for which data are available. The direction of the error introduced by this extrapolation is unknown, but could be significant in some cases.

Extrapolation of Toxicity Data Across Dose or Duration

In some cases, TRV data are available only for high dose exposures, and extrapolation to low doses (similar to those that actually occur at the site) is a source of uncertainty. Likewise, some TRVs are based on relatively short-term exposures, and extrapolation to long-term conditions is uncertain, especially for chemicals that tend to build up in the exposed organism. When such extrapolations are necessary, it is customary to include an "uncertainty factor" in the derivation of the benchmark to account for the extrapolation. In general, the "uncertainty factor" is likely to be somewhat too large, so the benchmarks derived in this way are often conservative (overly protective).

Extrapolation of Toxicity Data from Laboratory to Field Conditions

Even when data are available for a species of concern at the site, the data are usually generated under laboratory conditions and extrapolation of those data to free-living receptors in the field is uncertain. In some cases, site-specific factors may tend to modify (often decrease) the toxicity of chemicals in surface water, sediments, and soil. For example, metals in surface water may be bound to soluble organic materials that reduce the tendency for the metal to bind to respiratory structures of fish or benthic organisms. Similarly, the presence of organic matter in soil, along with other substances, may have a significant influence on actual toxicity. Thus, risks based on literature-derived toxicity factors may sometimes overestimate risk from site media.

Uncertainty in the TEQ Approach for PCBs

An important limitation to the TEQ approach for evaluating risks from ingestion of PCBs is that the TEFs used to calculate the TEQ values are based mainly on the relative binding affinity of different congeners for the intracellular protein (the aryl hydrocarbon receptor) that mediates PCB-induced toxicity. However, the actual toxic response to an ingested dose of PCBs also depends on other toxicokinetic and toxicodynamic variables, such as the congener-specific rate of absorption, metabolism, distribution, and excretion, as well as species- and tissue-specific differences in response per unit TEQ bound to the receptor. Thus, proper calculation of health risk from oral exposure to PCBs in a site medium should take all of these variables into account. However, detailed species-specific toxicokinetic and toxicodynamic data are not available for most congeners, so this type of calculation is not possible at present. Thus, risk calculations based on the TEQ approach should be interpreted with this limitation in mind. Nevertheless, the TEQ approach is considered to be more reliable that the Aroclor-based approach, which does not account for the large and easily measurable changes in congener composition in environmental samples compared to commercial Aroclor mixtures.

8.4 Uncertainties in Risk Characterization

Interactions Among Chemicals

Most toxicity benchmark values are derived from studies of the adverse effects of a single contaminant. However, exposures to ecological receptors usually involve multiple contaminants, raising the possibility that synergistic or antagonistic interactions might occur. However, data are not adequate to permit any quantitative adjustment in toxicity values or risk calculations based on inter-contaminant interactions. In accordance with USEPA guidance, effects from different COPCs are not added unless reliable data are available to indicate that the two (or more) chemicals act on the same target tissue by the same mode of action. At this site, HQ values for each COPC were not added across different chemicals, except for PAHs and PCBs. If any of the other COPCs at the site act by a similar mode of action, total risks could be higher than estimated.

Estimation of Population-Level Impacts

Assessment endpoints for the receptors at this site are based on the sustainability of exposed populations, and risks to some individuals in a population may be acceptable if the population is expected to remain healthy and stable. However, even if it is possible to accurately characterize the distribution of risks or effects across the members of the exposed population, estimating the impact of those effects on the population is generally difficult and uncertain. For this ERA, it was assumed that if more than 80% of the population was below a level of concern, then population-level effects were not likely. Conversely, it was assumed that if more than 20% of the individuals in a population had HQ values above 1E+00, then impacts on population sustainability might occur. However, the relationship between adverse effects on individuals and effects on the population is complex, depending on the demographic and life history characteristics of the receptor being considered as well as the nature, magnitude and frequency of the chemical stresses and associated adverse effects. Thus, the actual distribution of HQ values that will lead to population-level adverse effects will vary from receptor to receptor, and use of a single criterion (80% below 1E+00) may not be appropriate in all cases.

8.5 Summary of Uncertainties

Table 8-2 summarizes the various sources of uncertainty in this ERA, along with a qualitative estimate of the direction and magnitude of the likely errors attributable to the uncertainty. Based on all of these considerations, the HQ and HI values calculated and presented in this ERA section should be viewed as having substantial uncertainty. Because of the inherent conservatism in the derivation of many of the exposure estimates and toxicity benchmarks, these HQ and HI values should generally be viewed as being more likely to be high than low, and should be interpreted in a weight-of-evidence approach based on other types of available information as well.

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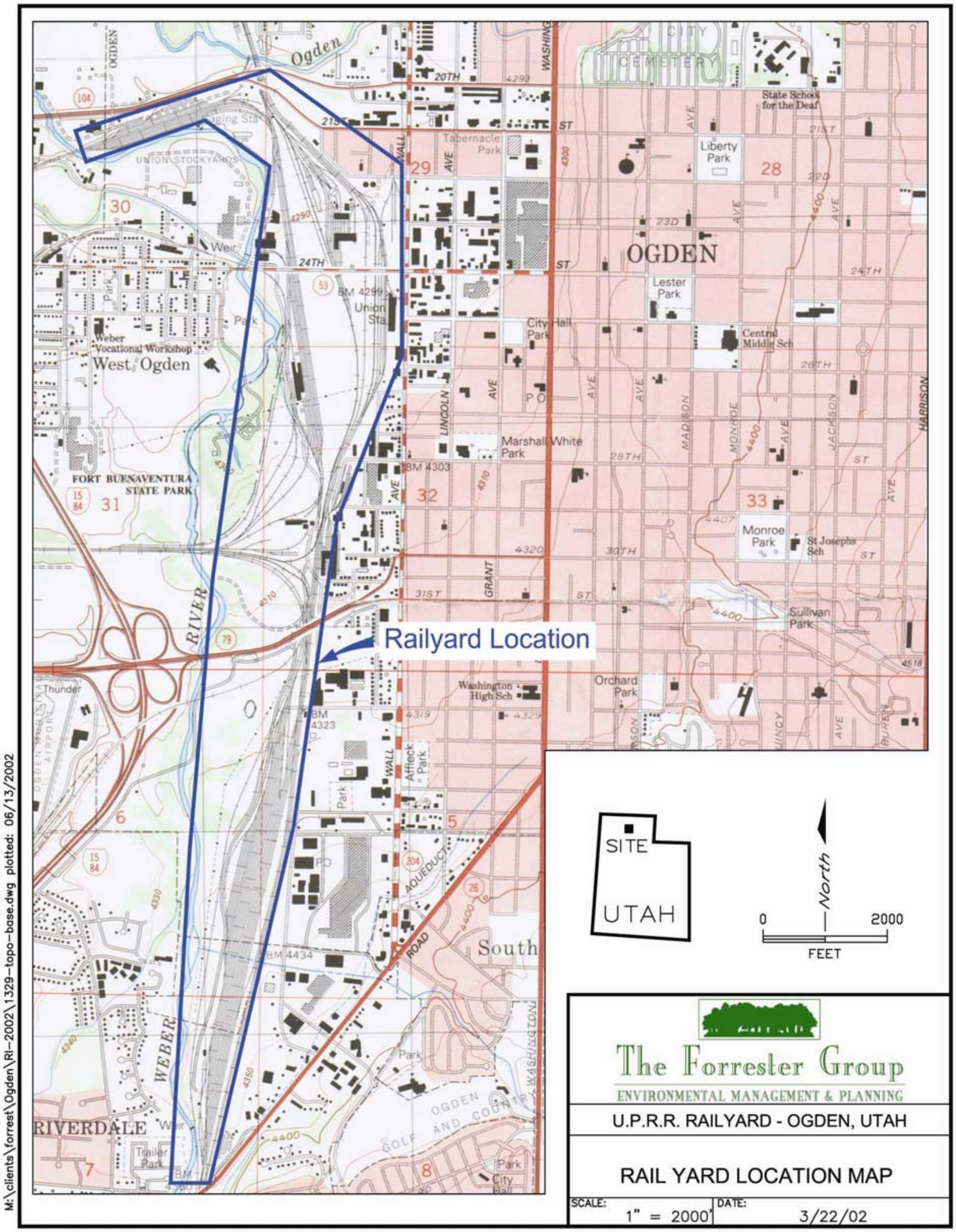

Figure 1-1
Ogden Railyard Location Map

Baseline Ecological Risk Assessment for the Ogden Railyard Site

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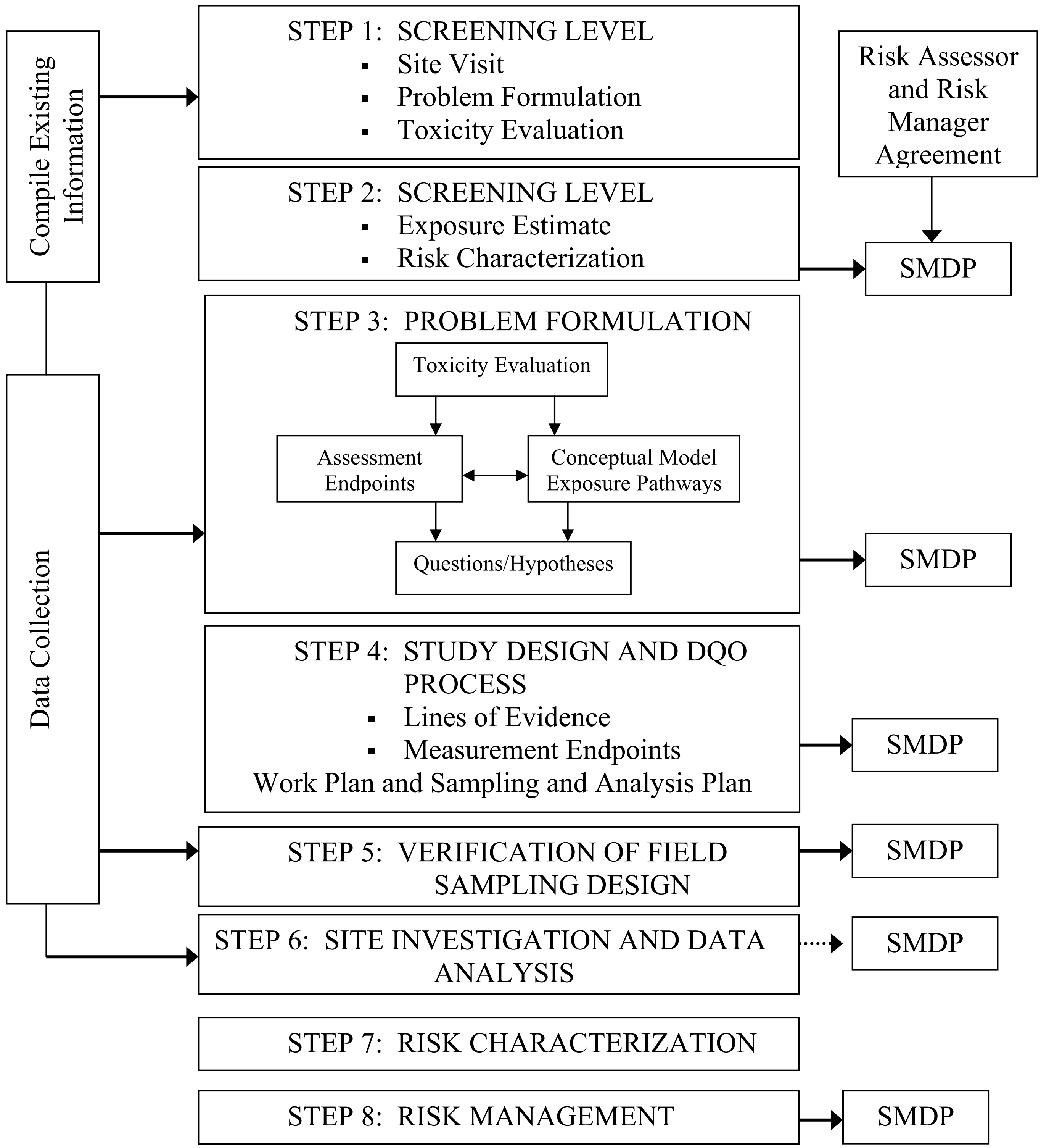

Source: USEPA 1997a

SMDP = Scientific/Management Decision Point

Figure 1-2 Eight Step Process for Ecological Risk Assessment at Superfund Sites

Baseline Ecological Risk Assessment for the Ogden Railyard Site

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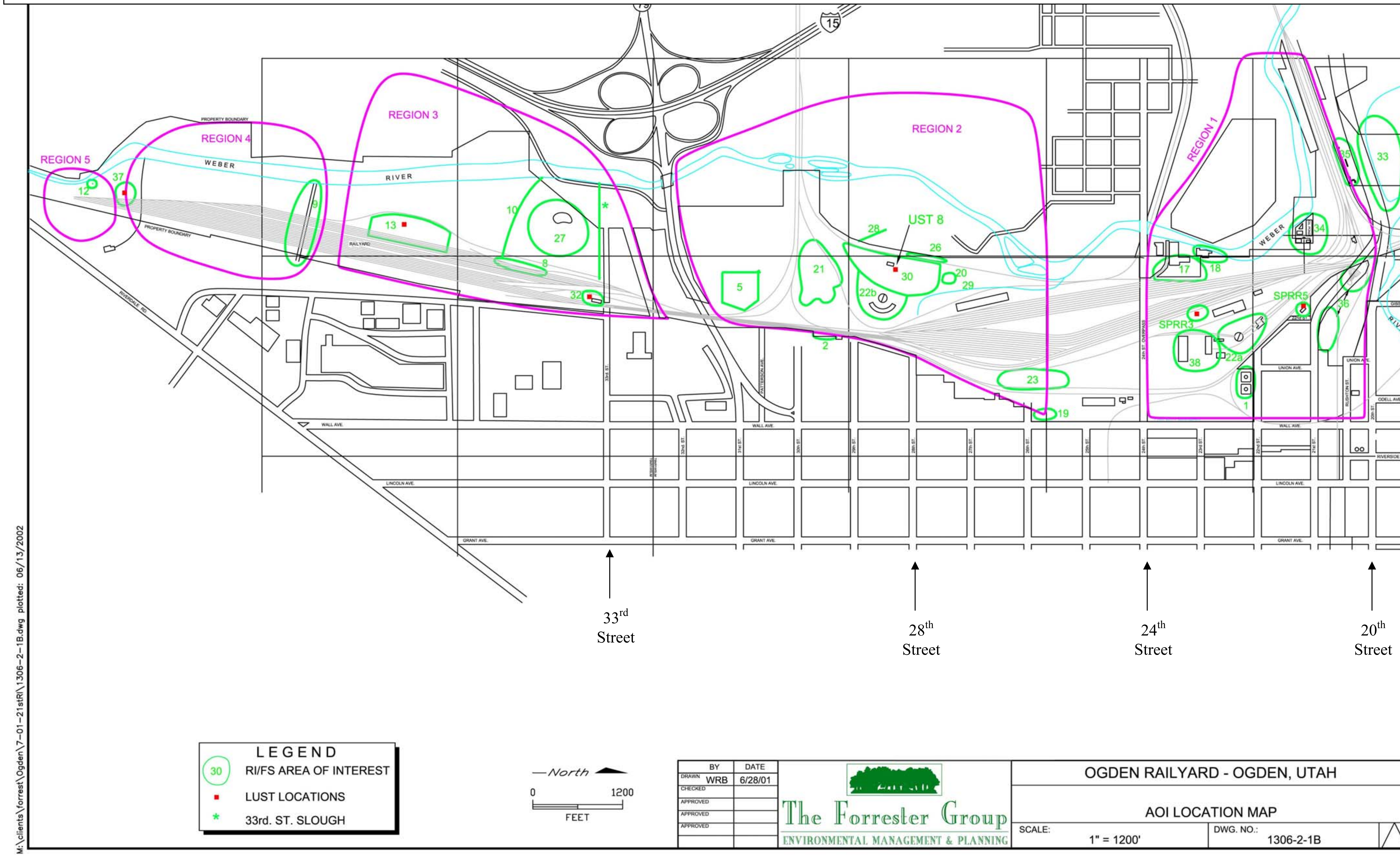
Figure 2-1
Ogden Railyard Areas of Interest (AOIs)



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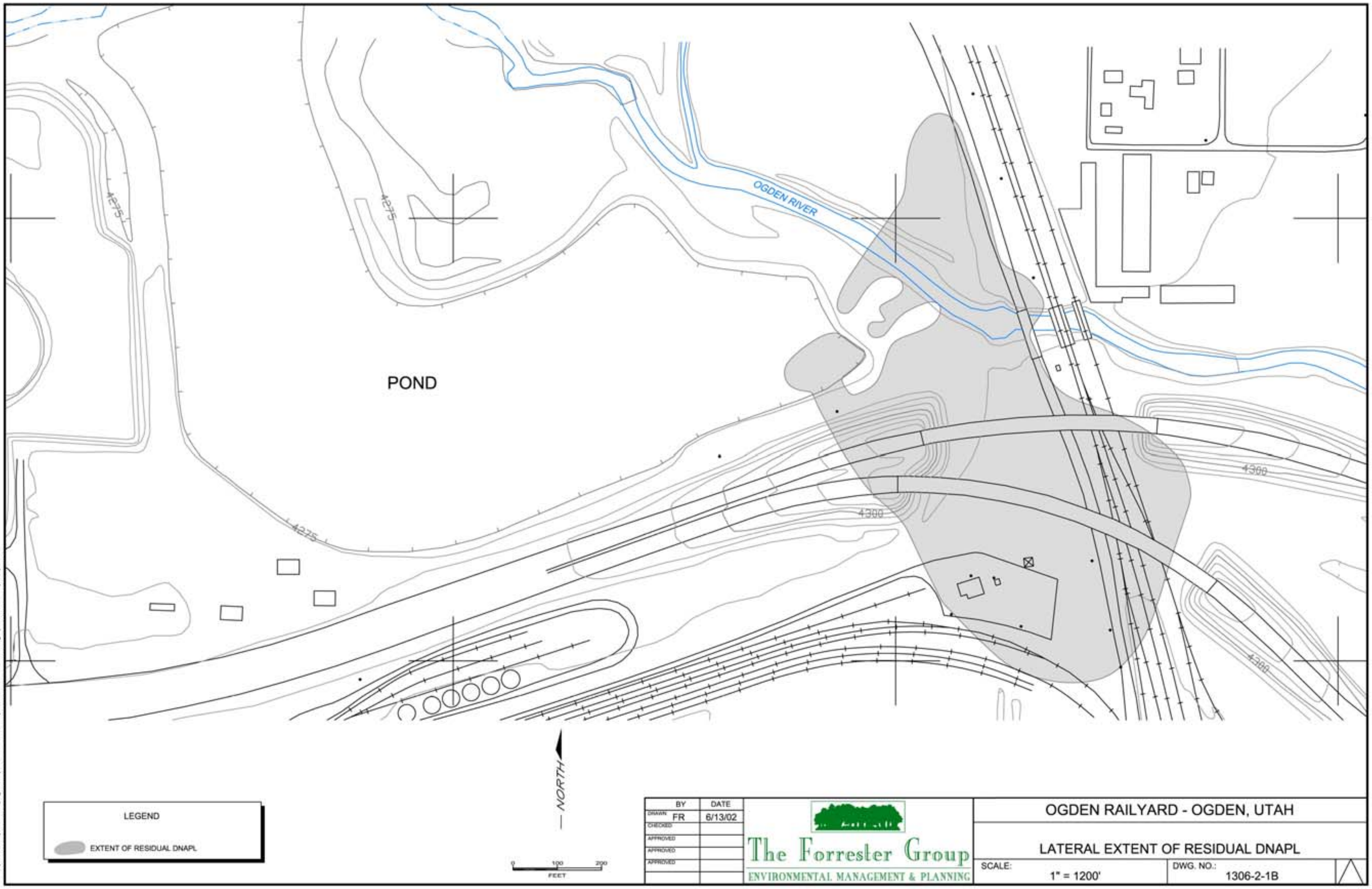

M:\clients\forrest\Ogden\7-01-21stR\1306-PL-2-6.dwg plotted: 06/13/2002

Figure 3-1
Location of the DNAPL Zone

Baseline Ecological Risk Assessment for the Ogden Railyard Site

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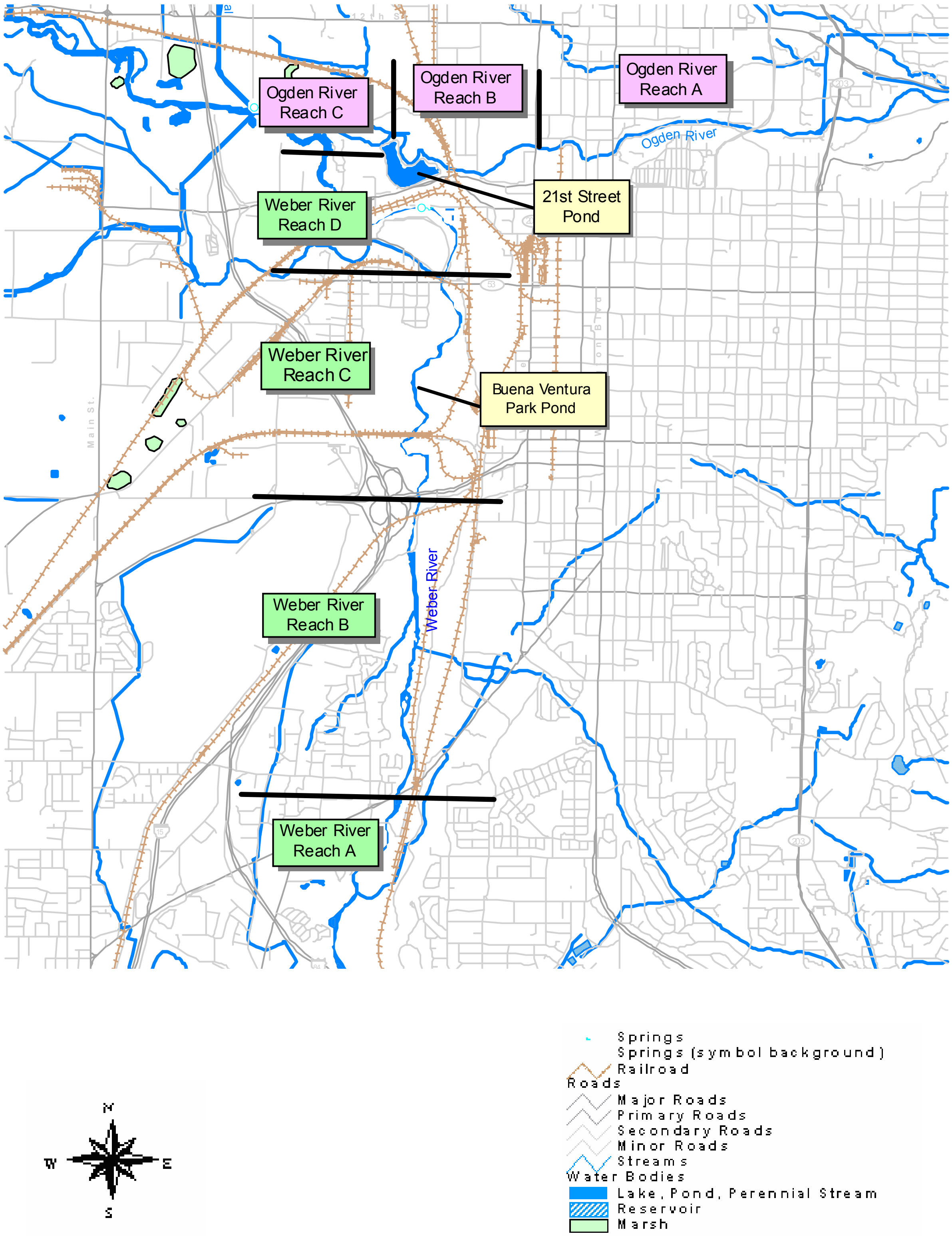

Figure 3-2
Exposure Locations for Ecological Receptors

Baseline Ecological Risk Assessment for the Ogden Railyard Site

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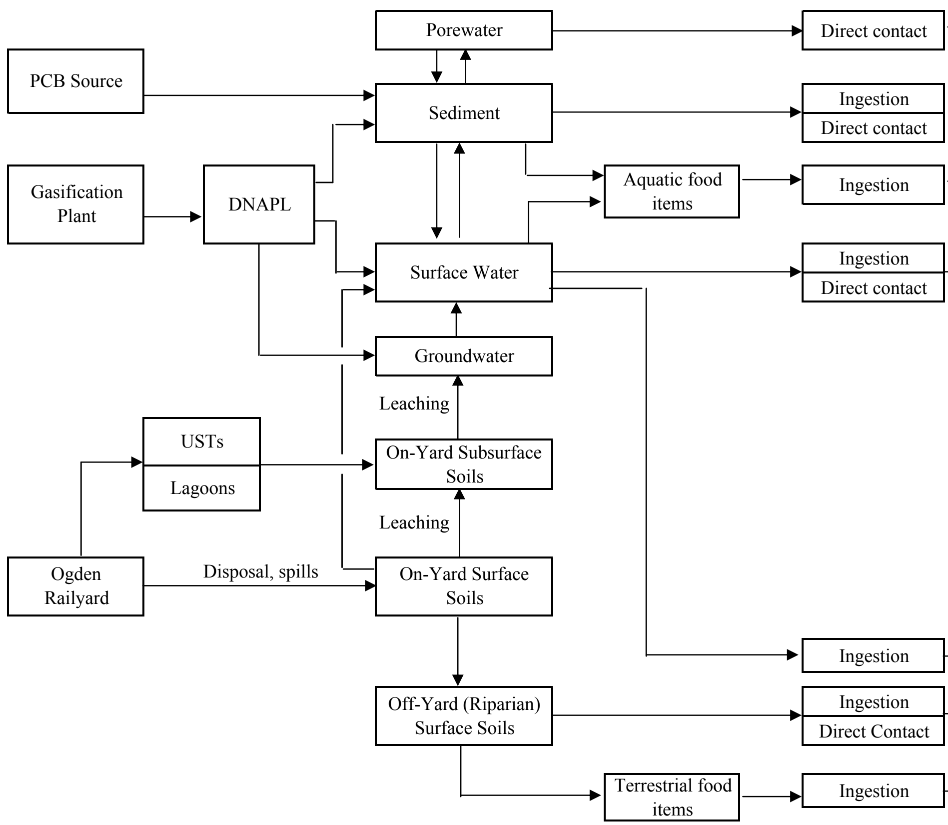


Aquatic Receptors

	Fish	Benthic Macroinvertebrate	Mammalian Piscivore (mink)	Avian Piscivore (kingfisher)	Avian Omnivore (mallard)
Porewater – Direct contact		●			
Sediment – Ingestion	❍	❍	●	●	●
Sediment – Direct contact	❍	●	X	X	X
Aquatic food items – Ingestion	❍	❍	●	●	●
Surface Water – Ingestion	X	X	●	●	●
Surface Water – Direct contact	●	●	X	X	X

Terrestrial Receptors

	Plants	Soil Invertebrates	Small Mammals (Shrew)	Birds (Robin)
Surface Water – Ingestion			●	●
Off-Yard (Riparian) Surface Soils – Ingestion		●	●	●
Off-Yard (Riparian) Surface Soils – Direct Contact	●		X	X
Terrestrial food items – Ingestion			❍	❍

LEGEND:

(blank)	Pathway is not complete; no evaluation required
X	Pathway is complete, but is judged to be minor; qualitative evaluation
❍	Pathway is complete and could be significant; however, data are lacking to perform quantitative assessment; qualitative evaluation
●	Pathway is complete and could be significant; quantitative evaluation

Figure 4-1
Site Conceptual Model for Ecological Exposure
Baseline Ecological Risk Assessment for the Ogden Railyard Site

Figure 4-2. Conceptual Approach for Characterizing Population-Level Risks

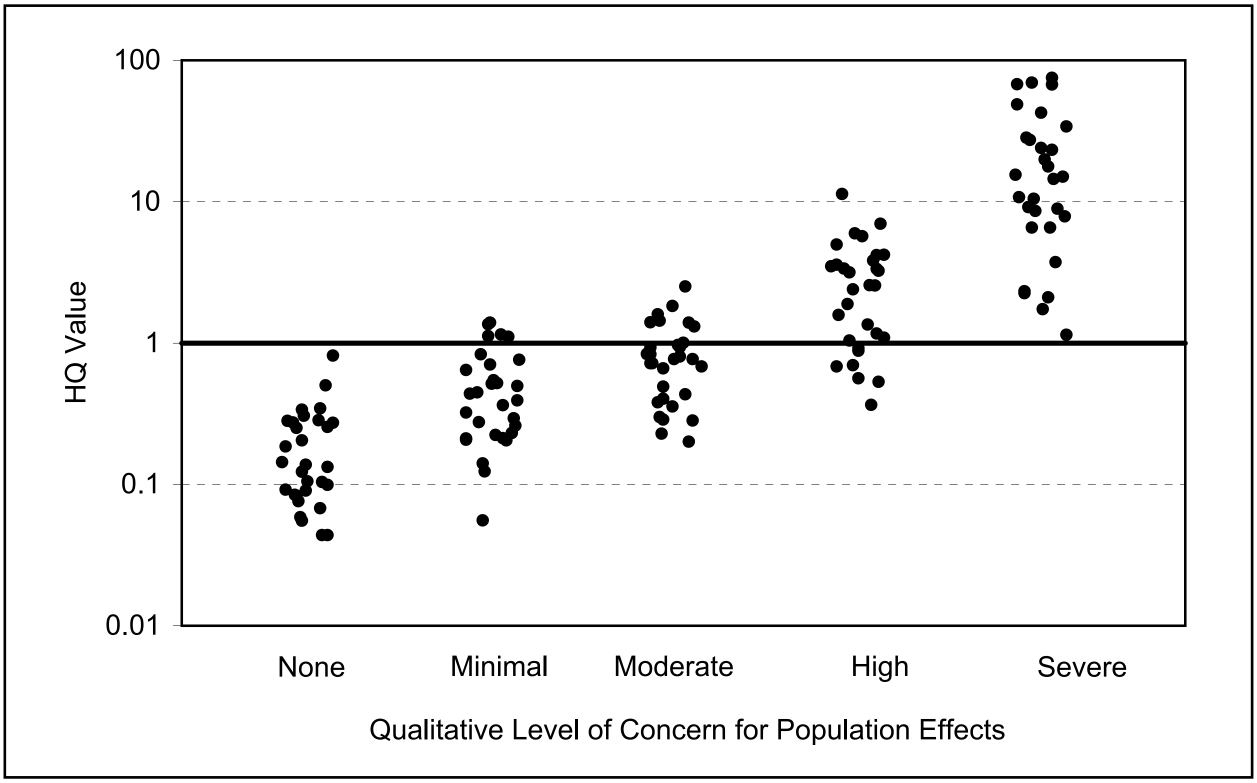


Figure 4-3
COPC Selection Procedure

Baseline Ecological Risk Assessment for the Ogden Railyard Site

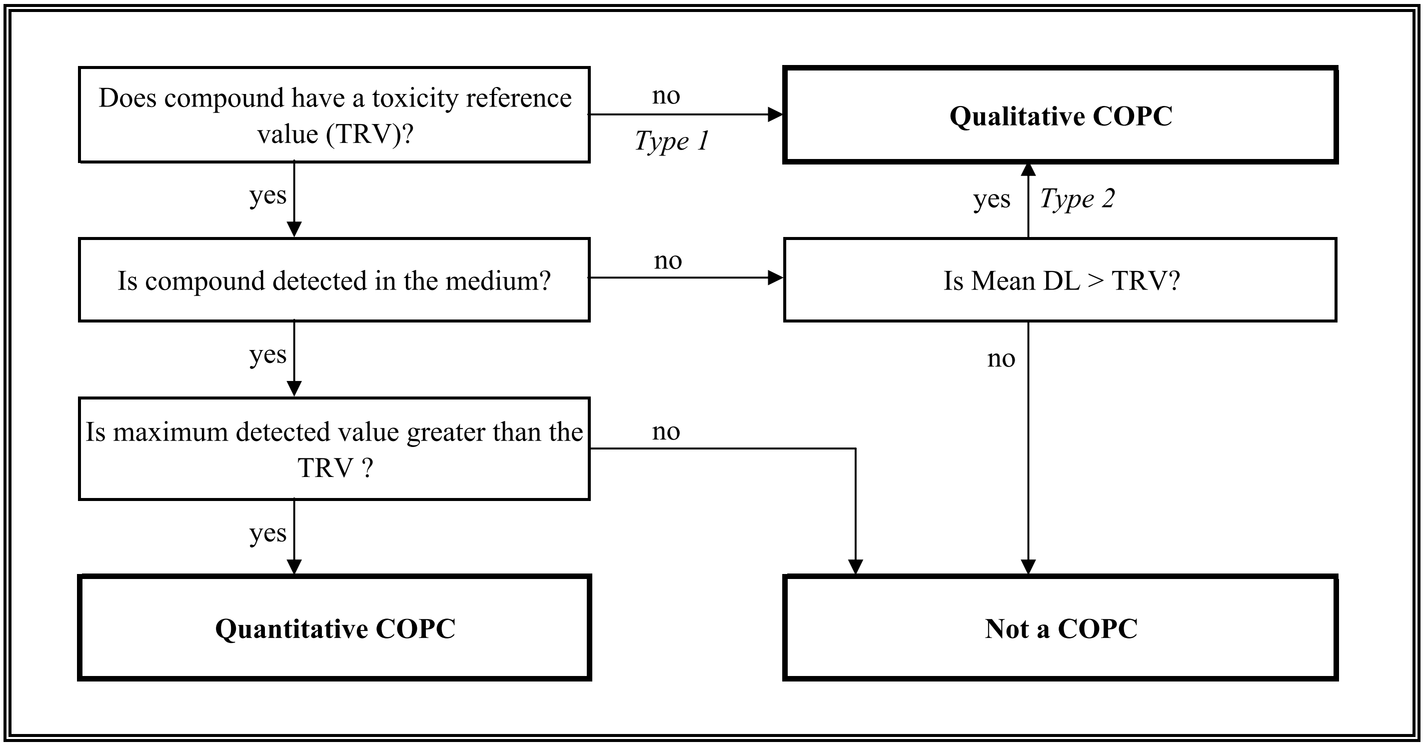
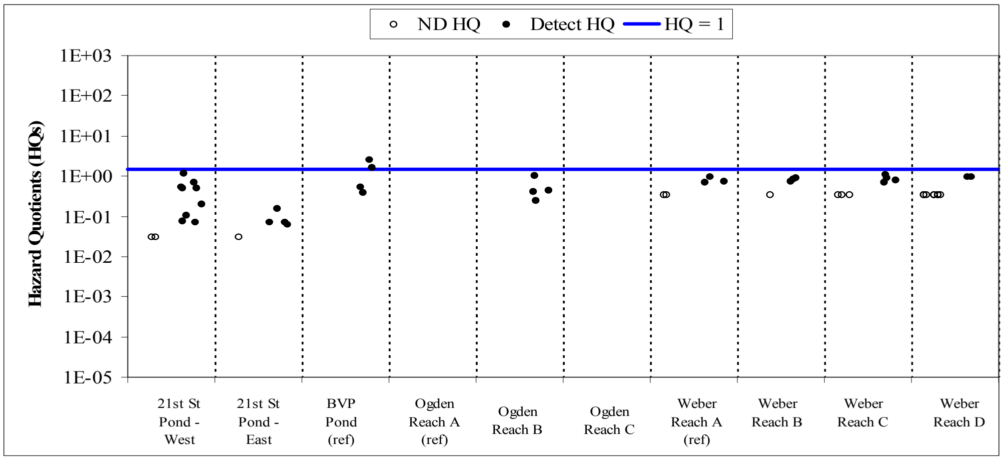


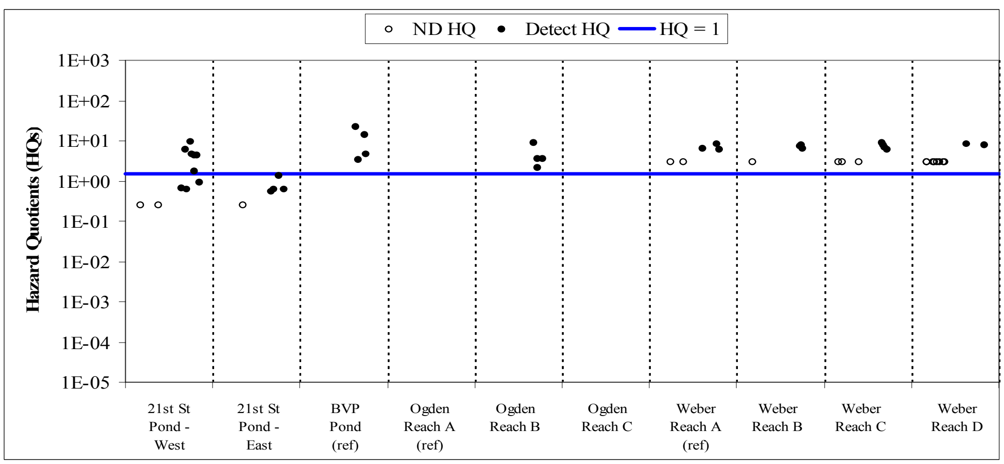
Figure 5-1
Aquatic Receptor HQs for Direct Contact with Surface Water
Baseline Ecological Risk Assessment for the Ogden Railyard Site
ALUMINUM

Based on the Acute Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	2	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	11	5	2	0	4	0	5	4	7	10
Detect Samples:	9	4	4	0	4	0	3	3	4	2
All Samples:	11	5	4	0	4	0	5	4	7	10
Risk Category:	**C**	**C**	**A**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

Based on the Chronic Toxicity Benchmark

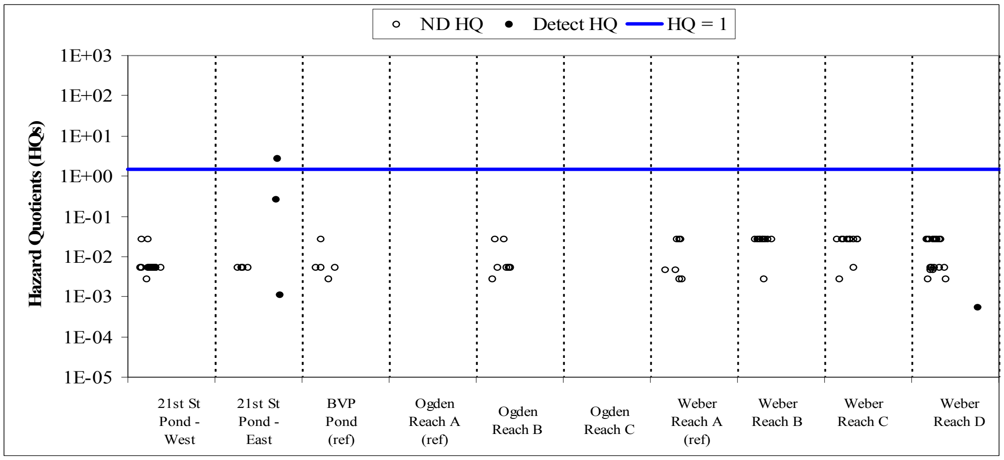


Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	6	0	4	0	4	0	3	3	4	2
ND HQs > 1:	0	0	0	0	0	0	2	1	3	8
All HQs ≤ 1:	5	5	0	0	0	0	0	0	0	0
Detect Samples:	9	4	4	0	4	0	3	3	4	2
All Samples:	11	5	4	0	4	0	5	4	7	10
Risk Category:	**A**	**C**	**A**	**na**	**A**	**na**	**A**	**A**	**A**	**B**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

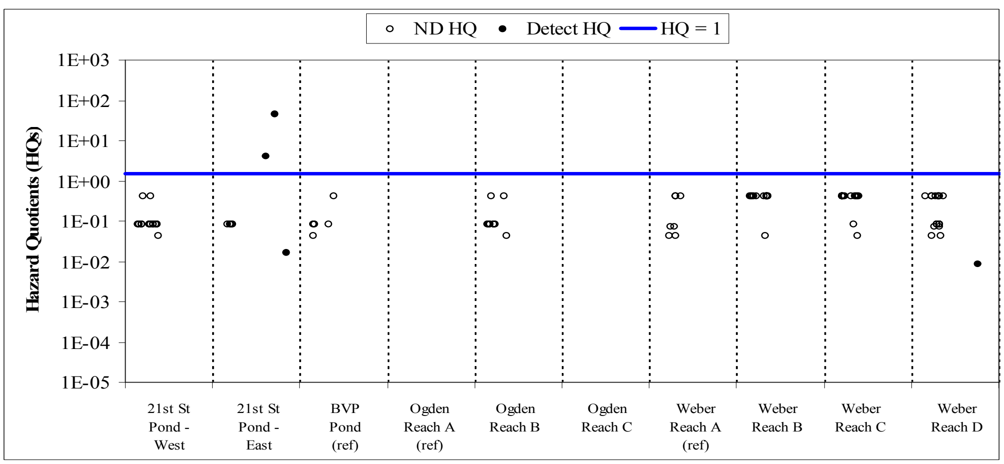
Figure 5-2
Aquatic Receptor HQs for Direct Contact with Surface Water
Baseline Ecological Risk Assessment for the Ogden Railyard Site
NAPHTHALENE

Based on the Acute Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	1	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	15	6	5	0	9	0	7	12	12	19
Detect Samples:	0	3	0	0	0	0	0	0	0	1
All Samples:	15	7	5	0	9	0	7	12	12	19
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

Based on the Chronic Toxicity Benchmark

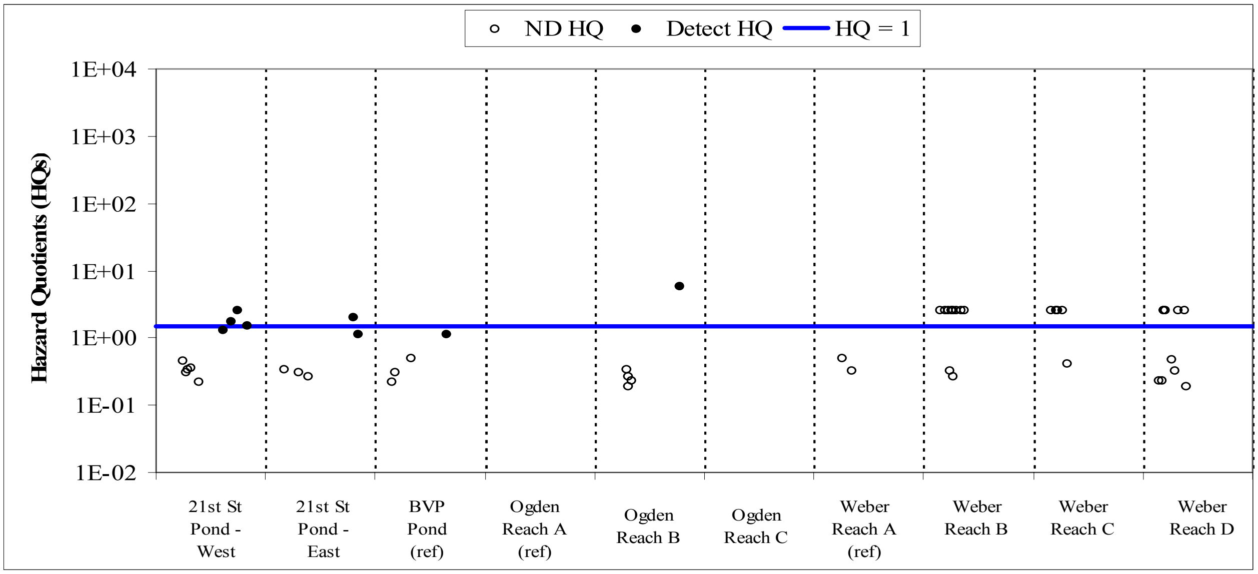


Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	2	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	15	5	5	0	9	0	7	12	12	19
Detect Samples:	0	3	0	0	0	0	0	0	0	1
All Samples:	15	7	5	0	9	0	7	12	12	19
Risk Category:	**C**	**A**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Figure 5-3
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment
Baseline Ecological Risk Assessment for the Ogden Railyard Site

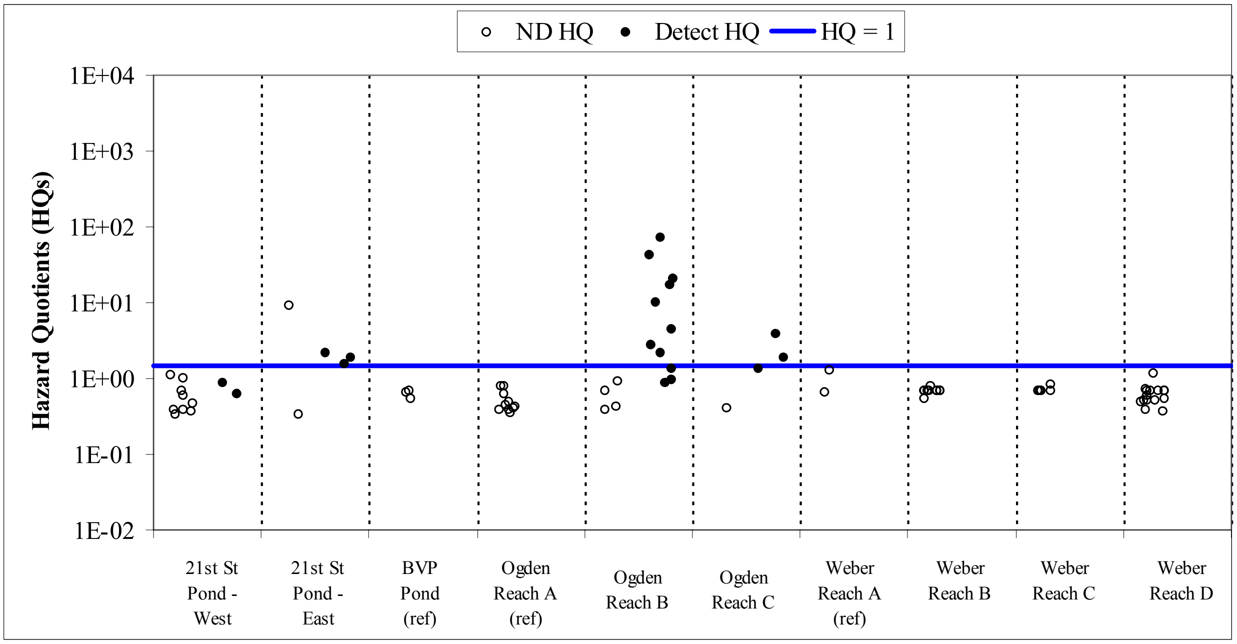
SELENIUM



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	3	1	0	0	1	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	8	4	5
All HQs ≤ 1:	6	4	4	0	4	0	2	2	1	5
Detect Samples:	4	2	1	0	1	0	0	0	0	0
All Samples:	9	5	4	0	5	0	2	10	5	10
Risk Category:	**A**	**C**	**C**	**na**	**C**	**na**	**C**	**B**	**B**	**B**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Figure 5-4
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment
Baseline Ecological Risk Assessment for the Ogden Railyard Site
AROCLOR-1260



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	3	0	0	8	2	0	0	0	0
ND HQs > 1:	0	1	0	0	0	0	0	0	0	0
All HQs $\leq$ 1:	11	1	3	10	7	2	2	10	5	15
Detect Samples:	2	3	0	0	11	3	0	0	0	0
All Samples:	11	5	3	10	15	4	2	10	5	15
Risk Category:	**C**	**A**	**C**	**C**	**A**	**A**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

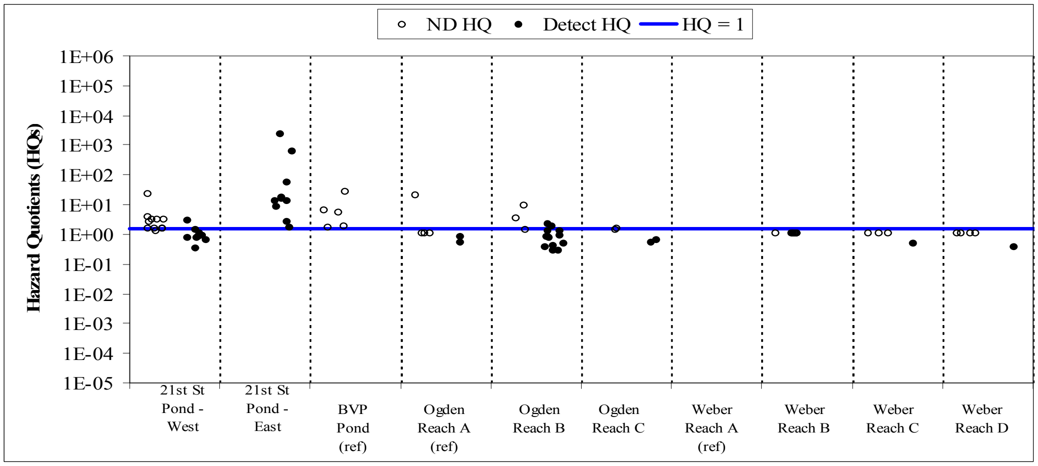
Figure 5-5

Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment
(Based on Non-SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

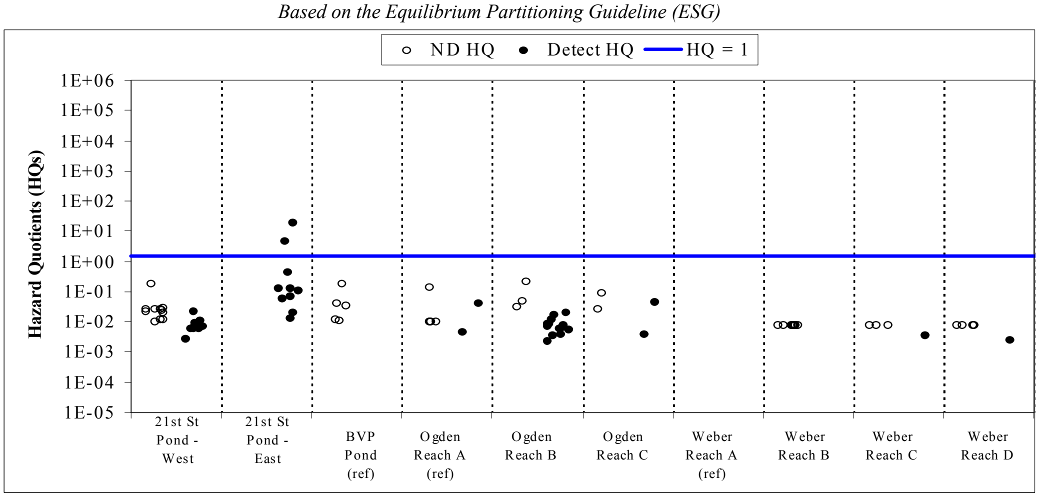
BENZO[A]PYRENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	1	10	0	0	2	0	0	0	0	0
ND HQs > 1:	10	0	5	1	2	1	0	0	0	0
All HQs ≤ 1:	10	0	0	5	12	3	0	8	4	5
Detect Samples:	10	10	0	2	13	2	0	0	1	1
All Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**B**	**A**	**B**	**C**	**B**	**B**	**na**	**C**	**C**	**C**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	2	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	21	8	5	6	16	4	0	8	4	5
Detect Samples:	10	10	0	2	13	2	0	0	1	1
All Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**	**na**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

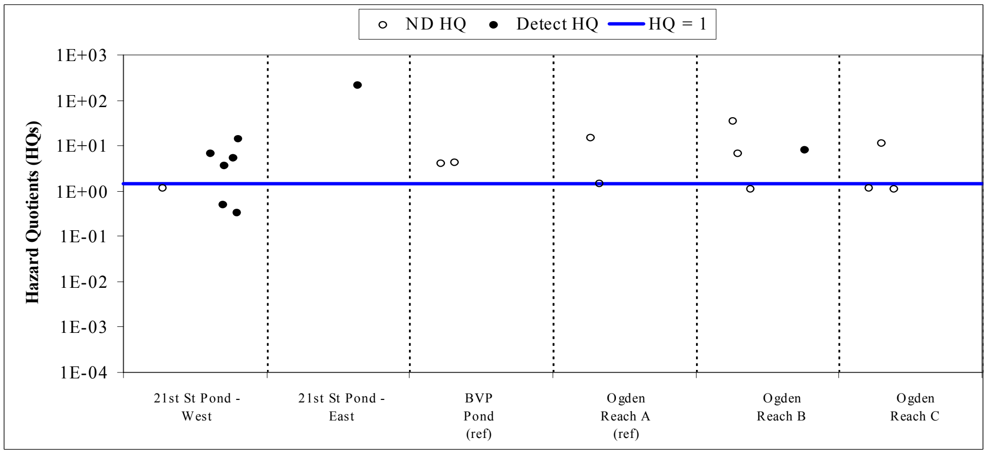
Figure 5-6

Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment (Based on SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

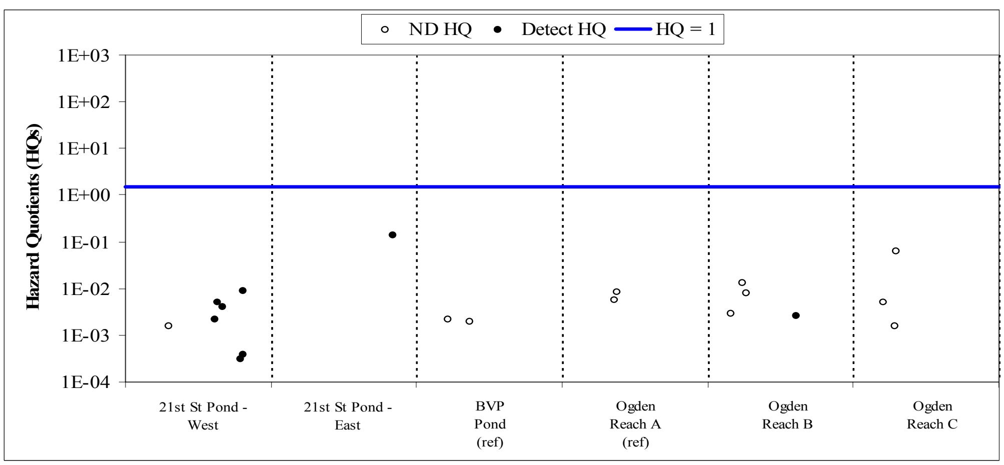
ACENAPHTHYLENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	4	1	0	0	1	0
N ND HQs > 1:	0	0	2	1	2	1
N All HQs ≤ 1:	3	0	0	1	1	2
N Detect Samples:	6	1	0	0	1	0
N Samples:	7	1	2	2	4	3
Risk Category:	**A**	**A**	**B**	**B**	**A**	**B**

Based on the Equilibrium Partitioning Guideline (ESG)

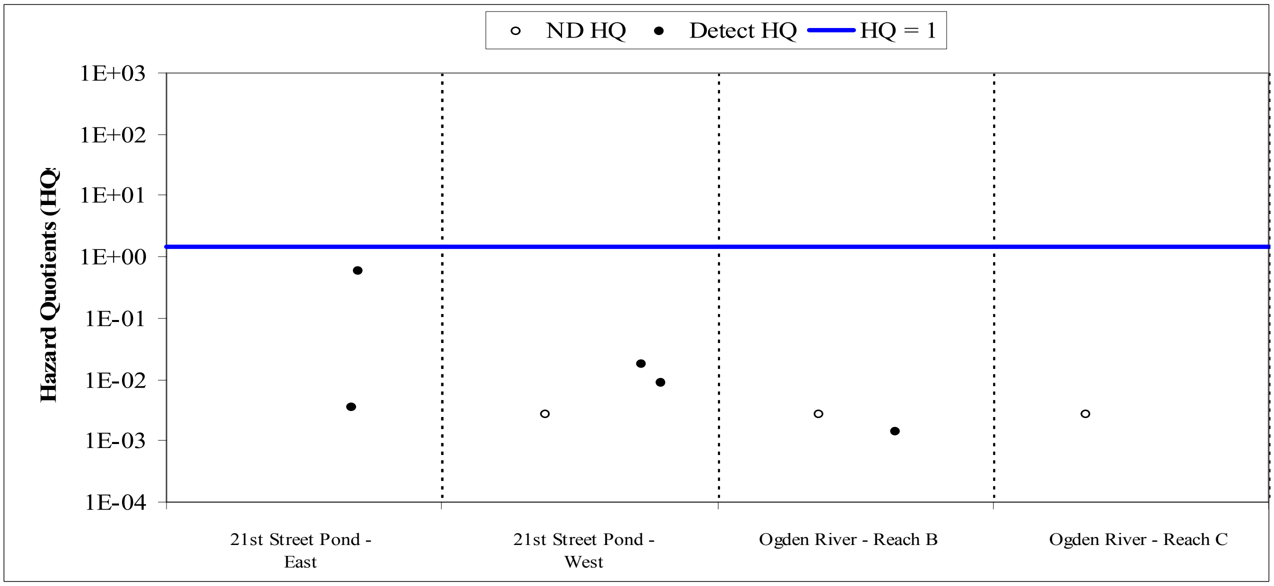


Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0
N All HQs ≤ 1:	7	1	2	2	4	3
N Detect Samples:	6	1	0	0	1	0
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Figure 5-7
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment Porewater
Baseline Ecological Risk Assessment for the Ogden Railyard Site

ACENAPHTHENE



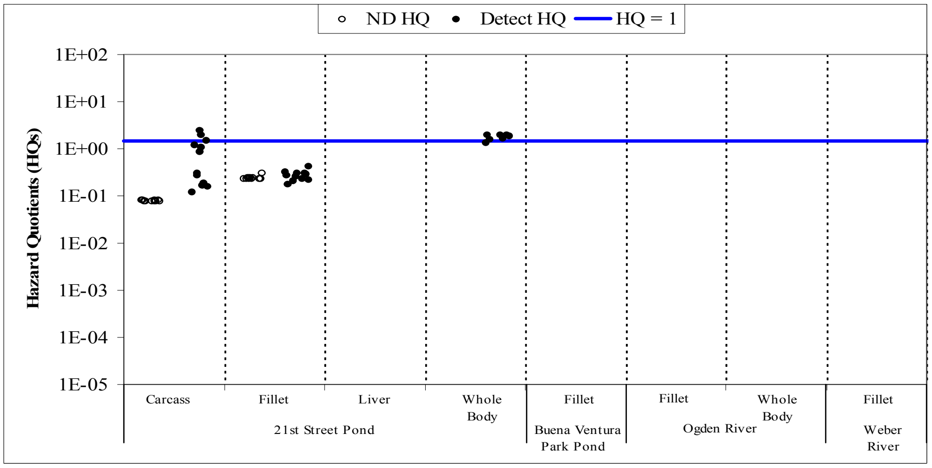
Statistic	21st Street Pond - East	21st Street Pond - West	Ogden River - Reach B	Ogden River - Reach C
Detect HQs > 1:	0	0	0	0
ND HQs > 1:	0	0	0	0
All HQs ≤ 1:	2	3	2	1
Detect Samples:	2	2	1	0
All Samples:	2	3	2	1
Risk Category:	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Figure 5-8
HQs for Fish Based on Fish Tissue Data

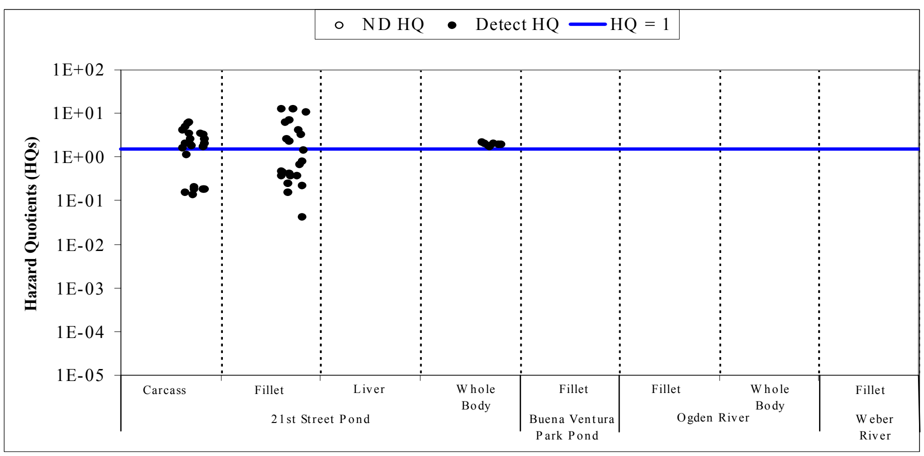
Baseline Ecological Risk Assessment for the Ogden Railyard Site

4,4'-DDD



Statistic	21st Street Pond				Buena Ventura Park Pond	Ogden River		Weber River
	Carcass	Fillet	Liver	Whole Body	Fillet	Fillet	Whole Body	Fillet
Detect HQs > 1:	2	0	0	6	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0
All HQs ≤ 1:	20	22	0	1	0	0	0	0
Detect Samples:	12	11	0	7	0	0	0	0
All Samples:	22	22	0	7	0	0	0	0
Risk Category:	**C**	**C**	**na**	**A**	**na**	**na**	**na**	**na**

4,4'-DDE



Statistic	21st Street Pond				Buena Ventura Park Pond	Ogden River		Weber River
	Carcass	Fillet	Liver	Whole Body	Fillet	Fillet	Whole Body	Fillet
Detect HQs > 1:	15	9	0	7	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0
All HQs ≤ 1:	7	13	0	0	0	0	0	0
Detect Samples:	22	22	0	7	0	0	0	0
All Samples:	22	22	0	7	0	0	0	0
Risk Category:	**A**	**A**	**na**	**A**	**na**	**na**	**na**	**na**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Site-Specific Study

Sampling and Analysis

Metric	Biological Condition Scoring Criteria 6	4	2	0
1. Taxa Richness[a]	>80%	60-80%	40-60%	<40%
2. Hilsenhoff Biotic Index (modified)[b]	>85%	70-85%	50-70%	<50%
3. Ratio of Scrapers/Filterers+Collectors[a,c]	>50%	35-50%	20-35%	<20%
4. Ratio of EPT and Chironomid Abundances[a]	>75%	50-75%	25-50%	<25%
5. % Contribution of Dominant Taxon[d]	<20%	20-30%	30-40%	>40%
6. EPT Index[a]	>90%	80-90%	70-80%	<70%
7. Community Loss Index[e]	<0.5	0.5-1.5	1.5-4.0	>4.0
8. Ratio of Shredders/Total[a,c]	>50%	35-50%	20-35%	<20%

(a) Score is a ratio of a study site to reference site x 100.
(b) Score is a ratio of reference site to a study site x 100.
(c) Determination of Functional Feeding Group is independent of taxonomic grouping.
(d) Scoring criteria evaluate actual percent contribution, not percent comparability to the reference station.
(e) Range of values obtained. A comparison to the reference station is incorporated in these indices.

BIOASSESSMENT

% Comp. to Ref. Score [a]	**Biological Condition Category**	**Attributes**
>83%	Not impaired	Comparable to the best situation to be expected within an ecoregion. Balanced trophic structure. Optimum community structure (composition and dominance) for stream size and habitat quality.
54-79%	Slightly impaired	Community structure less than expected. Composition (species richness) lower than expected due to loss of some intolerant forms. Percent contribution of tolerant forms increases.
21-50%	Moderately impaired	Fewer species due to loss of more tolerant forms. Reduction in EPT index.
<17%	Severely impaired	Few Species present. If high densities of organisms, then dominated by one or two taxa.

(a) Percentage values obtained that are intermediate to the above ranges will require subjective judgement as to the correct placement. Use of the habitat assessment and physiochemical data may be necessary to aid in the decision process.

Recommendations

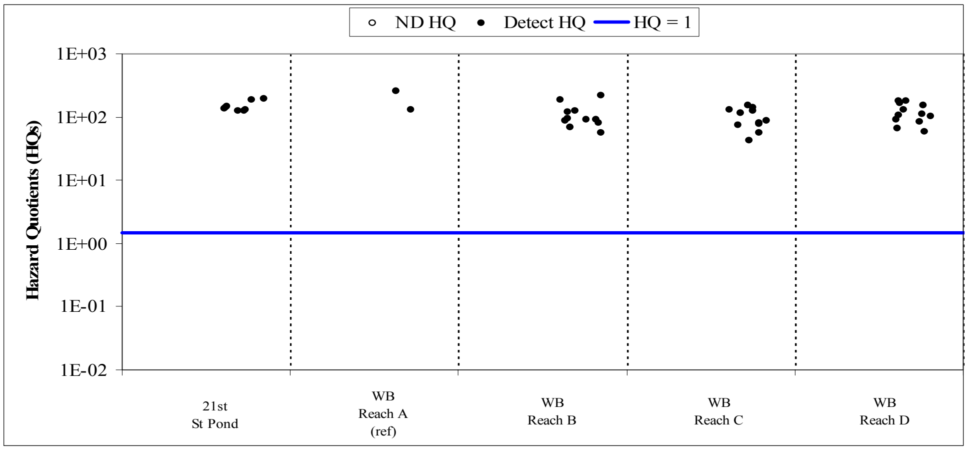
EPT = Ephemeroptera, Plecoptera, Trichoptera
Source: USEPA, 1989

Figure 5-9
Flowchart of Approach for Rapid Bioassessment Protocol (RBP) III
Baseline Ecological Risk Assessment for the Ogden Railyard Site

Figure 6-1
Terrestrial Receptor HQs for Direct Contact with Surface Soil

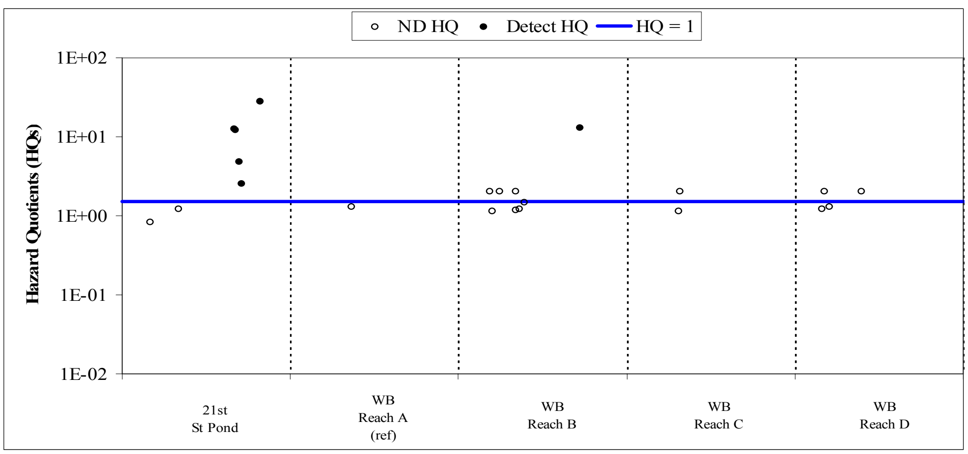
Baseline Ecological Risk Assessment for the Ogden Railyard Site

ALUMINUM



Statistic	21st Street Pond	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	8	2	11	11	12
ND HQs > 1:	0	0	0	0	0
All HQs ≤ 1:	0	0	0	0	0
Detect Samples:	8	2	11	11	12
All Samples:	8	2	11	11	12
Risk Category:	**A**	**A**	**A**	**A**	**A**

AROCLOR-1260



Statistic	21st Street Pond	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	5	0	1	0	0
ND HQs > 1:	0	0	3	1	2
All HQs ≤ 1:	2	1	4	1	2
Detect Samples:	5	0	1	0	0
All Samples:	7	1	8	2	4
Risk Category:	**A**	**C**	**B**	**B**	**B**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

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Table 3-1. Summary of Studies Performed at the Site

Phase	Study	Medium	Number and Location	Analytes
1	Safety-Kleen 1998	Surface Soil	13 samples from Weber River riparian zone 2 samples from 21st Street Pond	Metals, Pesticides, PAH, PCB (as Aroclor), TPH, SVOC, VOC
		Sediment	15 samples from Weber River 1 sample from Ogden River	Metals, Pesticides, PAH, PCB (as Aroclor), SVOC, VOC
		Surface water	3 samples from 21st St Pond 1 sample from Ogden River 14 samples from Weber River	Metals, Pesticides, PAH, PCB (as Aroclor), TPH, SVOC, VOC
2	USEPA/ERTC 2001	Surface Soil	1 sample from 21st Street Pond 9 samples from Weber River riparian zone	VOC, SVOC, Pesticides, PCB (as Aroclor), Metals
		Sediment	3 samples from 21st Street Pond (one measured directly at a bank seep) 1 sample from 33rd Street Slough 2 samples from AOI 10 Drainage Ditch 1 sample from Burch Creek 1 sample from Buena Ventura Park Pond 1 sample from Ogden River 1 sample from Roundhouse Drainage Ditch 1 sample from Strongs Creek 10 samples from Weber River	VOC, SVOC, Pesticides, PCB (as Aroclor), Metals, TOC, TPH
		Surface Water	2 samples from 21st Street Pond (one measured directly at a bank seep) 1 sample 33rd Street Slough 2 samples from Burch Creek 1 sample from Buena Ventura Park Pond 1 sample from Ogden River 1 sample from Roundhouse Drainage Ditch 3 samples from Strongs Creek 12 samples from Weber River	VOC, SVOC, Metals, Hardness, TSS, TOC, TPH
		Fish Tissue	56 samples from 21st Street Pond	SVOC, PAH, Pesticides, PCB (as Aroclor)

Table 3-1. Summary of Studies Performed at the Site

Phase	Study	Medium	Number and Location	Analytes
2 (cont.)	Forrester Group (various reports 1998-2001)	Surface Soil	9 samples from 21st St Pond 40 samples from Weber River	Metals, PAH, SVOC, VOC
		Sediment	22 samples from 21st St Pond 3 samples from Buena Ventura Park 17 samples from Ogden River 10 samples from Weber River	Metals, PAH, PCB, SVOC, VOC
		Surface Water	19 samples from 21st St Pond 3 samples from Buena Ventura Park 6 samples from Ogden River 23 samples from Weber River	Metals, PAH, PCB, SVOC, VOC
3	USEPA 2002	Sediment	10 samples from 21st Street Pond 2 samples from Buena Ventura Park Pond 14 samples from Ogden River 5 sample from Pioneer Power Plant Aqueduct 5 samples from Weber River 2 samples from Wall Avenue Storm Drain	SVOC, PAHs (analyzed via both BNA and BNA SIM), Pesticides, PCB (as Aroclor), PCB (as congeners)
		Sediment Porewater	5 samples from 21st Street Pond 3 samples from Ogden River	SVOC, VOC, PAHs
		Soil	6 samples from 21st Street Pond (in abandoned meanders around pond)	SVOC, VOC, PAHs, Pesticides, PCB (as Aroclor)
		Fish Tissue	6 samples from 21st Street Pond 2 samples from Buena Ventura Park Pond 12 samples from Ogden River 2 samples from Weber River	PAHs, PCB and Dioxins/Furans (as congeners)
		Benthic Tissue	1 samples from Pioneer Power Plant Aqueduct 1 samples from Buena Ventura Park Pond 3 samples from Ogden River	PCB (as congeners)

Table 4-1
Summary of Assessment and Measurement Endpoints

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Receptor	Assessment Endpoint	Measurement Endpoint
Aquatic Community	Protection of aquatic invertebrates and fish from adverse effects related to exposure to chemicals in surface water and sediment.	Comparison of sampling location-specific chemical concentrations in surface water to National Ambient Water Quality Criteria (AWQC).
		Comparison of sampling location-specific chemical concentrations in sediment to benthic macroinvertebrate toxicity benchmarks.
		Comparison of sampling location-specific chemical concentrations in sediment porewater to benthic macroinvertebrate toxicity benchmarks.
		Evaluate the toxicity of site sediment to *Chironomus tenans* and *Hyalella azteca* (growth and survival) through laboratory testing.
		Benthic invertebrate community structure, including density and diversity (taxa richness) of benthic organisms.
		Comparison of chemical concentrations in fish tissue to maximum allowable tissue concentration (MATC) toxicity benchmarks for fish.
Terrestrial Community	Protection of terrestrial plants and terrestrial soil invertebrates from adverse effects related to exposure to chemicals in surface soil.	Comparison of sampling location-specific chemical concentrations in soil to toxicity screening benchmarks for terrestrial plants and terrestrial soil invertebrates.
Wildlife Community	Protection of wildlife from adverse effects to growth, reproduction, or survival related to exposure to chemicals in surface water, sediment, soil, benthic macroinvertebrates, and fish.	Comparison of the reach-specific chemical doses estimated from exposure point concentrations (EPCs) in surface water, sediment, soil, and aquatic food items to toxicity reference values (TRVs) for wildlife.

Table 5-1. Summary of Risk Category Assignments for Surface Water

Based on Acute Toxicity Benchmark

Category	COPC	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Inorganics	Aluminum	C	C	**A**	na	C	na	C	C	C	C
	Barium	C	C	C	na	C	na	C	C	C	C
	Cadmium	C	C	C	na	C	na	C	C	C	C
	Iron	No Acute Benchmark Available									
	Lead	C	C	C	na	C	na	C	C	C	C
	Nickel	C	C	C	na	C	na	C	C	C	C
	Selenium	C	C	C	na	C	na	C	C	C	C
	Silver	C	C	C	na	C	na	C	C	C	C
	Zinc	C	C	C	na	C	na	C	C	C	C
Organics	Acenaphthene	C	C	C	na	C	na	C	C	C	C
	Anthracene	C	C	C	na	C	na	C	C	C	C
	Benzo[a]anthracene	B	B	B	na	B	na	B	B	B	B
	Benzo[a]pyrene	B	B	B	na	B	na	B	B	B	B
	Fluorene	C	C	C	na	C	na	C	C	C	C
	Naphthalene	C	C	C	na	C	na	C	C	C	C
	Pyrene	No Acute Benchmark Available									
	bis(2-Ethylhexyl)phthalate	C	C	C	na	C	na	C	C	C	C
	Acetone	C	na	C	na	C	na	C	C	C	C
	Carbon Disulfide	C	C	C	na	C	na	C	C	C	C
	Dichloromethane	C	C	C	na	C	na	C	C	C	C
	Ethylbenzene	C	C	C	na	C	na	C	C	C	C

Based on Chronic Toxicity Benchmark

Category	COPC	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Inorganics	Aluminum	**A**	C	**A**	na	**A**	na	**A**	**A**	**A**	B
	Barium	**A**	**A**	**A**	na	**A**	na	**A**	**A**	**A**	**A**
	Cadmium	**A**	**A**	**A**	na	**A**	na	B	B	B	B
	Iron	C	C	**A**	na	C	na	C	C	C	C
	Lead	C	C	**A**	na	C	na	C	C	C	C
	Nickel	C	C	C	na	C	na	C	C	C	C
	Selenium	C	C	C	na	C	na	B	B	B	B
	Silver	No Chronic Benchmark Available									
	Zinc	C	C	C	na	C	na	C	C	C	C
Organics	Acenaphthene	C	C	C	na	C	na	C	C	C	C
	Anthracene	C	C	B	na	B	na	B	B	B	B
	Benzo[a]anthracene	B	**A**	B	na	B	na	B	B	B	B
	Benzo[a]pyrene	B	**A**	B	na	B	na	B	B	B	B
	Fluorene	C	C	C	na	C	na	C	C	C	C
	Naphthalene	C	**A**	C	na	C	na	C	C	C	C
	Pyrene	B	**A**	B	na	B	na	B	B	B	B
	bis(2-Ethylhexyl)phthalate	C	C	B	na	B	na	B	B	B	B
	Acetone	C	na	C	na	C	na	C	C	C	C
	Carbon Disulfide	B	C	C	na	C	na	C	B	B	B
	Dichloromethane	C	C	C	na	C	na	C	C	C	C
	Ethylbenzene	C	C	C	na	C	na	C	C	C	C

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Table 5-2. Summary of Risk Category Assignments for Non-PAHs in Sediment

Category	COPC	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Inorganics	Copper	C	C	C	na	C	na	C	C	C	C
	Iron	C	C	C	na	C	na	C	C	C	C
	Lead	C	C	**A**	na	C	na	C	C	C	C
	Mercury	C	C	**A**	na	C	na	C	C	C	C
	Selenium	**A**	C	C	na	C	na	C	B	B	B
	Silver	C	C	**A**	na	C	na	C	C	C	C
	Zinc	C	C	**A**	na	C	na	C	C	C	C
Organics	4,4'-DDE	**A**	C	C	C	B	C	B	B	B	B
	4,4'-DDT	C	C	C	C	C	C	C	B	B	B
	Dieldrin	B	B	B	C	B	C	B	B	B	B
	Aroclor-1254	C	C	C	C	B	C	C	C	C	C
	Aroclor-1260	C	**A**	C	C	**A**	**A**	C	C	C	C
	Biphenyl	C	**A**	B	B	B	B	na	na	na	na
	bis(2-Ethylhexyl)phthalate	B	B	B	B	B	**A**	**A**	C	C	**A**
	Dibenzofuran	C	B	B	B	B	B	B	C	C	B
	Phenol	B	B	B	B	B	B	B	C	C	B
	Acetone	C	C	C	na	C	na	C	C	C	C
	Acrolein	B	B	B	na	B	na	B	B	B	B
	Acrylonitrile	B	C	B	na	B	na	C	B	B	B
	Benzene	C	C	C	na	C	na	C	C	C	C
	Bromomethane	C	C	C	na	C	na	C	C	C	C
	Carbon disulfide	B	B	B	na	B	na	**A**	C	C	C
	Ethylbenzene	C	C	C	na	C	na	C	C	C	C
	Toluene	C	C	C	na	C	na	**A**	C	C	**A**
	Xylenes (Total)	C	**A**	C	na	C	na	C	C	C	C
	Xylenes-o	**A**	na	C	na	C	na	C	C	C	C
	Xylenes-p,m	**A**	na	C	na	C	na	C	C	C	C

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Table 5-3. Summary of Risk Category Assignments for PAHs in Sediment Based on Non-SIM Data

Based on the SEC

Category	COPC	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
PAHs	1-Methylnaphthalene	C	C	C	na	C	na	na	na	na	na
	2-Methylnaphthalene	B	**A**	B	B	B	B	na	B	B	B
	Acenaphthene	B	**A**	B	B	B	B	na	B	B	B
	Acenaphthylene	B	**A**	**A**	B	B	B	na	B	B	B
	Anthracene	B	**A**	B	B	B	B	na	B	B	B
	Benzo[a]anthracene	B	**A**	B	B	**A**	B	na	B	B	B
	Benzo[a]pyrene	B	**A**	B	C	B	B	na	C	C	C
	Benzo[b]fluoranthene	**A**	**A**	B	**A**	**A**	**A**	na	B	**A**	B
	Benzo[g,h,i]perylene	B	**A**	B	C	B	C	na	C	C	C
	Benzo[k]fluoranthene	**A**	**A**	B	**A**	**A**	**A**	na	B	B	B
	Chrysene	B	**A**	B	C	**A**	C	na	C	C	C
	Dibenz[a,h]anthracene	B	**A**	B	B	B	B	na	B	B	B
	Fluoranthene	C	**A**	B	C	C	C	na	C	C	C
	Fluorene	B	**A**	B	B	B	B	na	B	B	B
	Indeno[1,2,3-c,d]pyrene	**A**	**A**	B	B	B	B	na	B	B	B
	Naphthalene	B	**A**	B	B	B	C	C	C	C	C
	Phenanthrene	B	**A**	B	C	B	**A**	na	C	C	C
	Pyrene	**A**	**A**	B	C	**A**	**A**	na	C	C	C

Based on the ESG

Category	COPC	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
PAHs	1-Methylnaphthalene	C	C	C	na	C	na	na	na	na	na
	2-Methylnaphthalene	C	C	C	C	C	C	na	C	C	C
	Acenaphthene	C	C	C	C	C	C	na	C	C	C
	Acenaphthylene	C	C	C	C	C	C	na	C	C	C
	Anthracene	C	C	C	C	C	C	na	C	C	C
	Benzo[a]anthracene	C	C	C	C	C	C	na	C	C	C
	Benzo[a]pyrene	C	C	C	C	C	C	na	C	C	C
	Benzo[b]fluoranthene	C	C	C	C	C	C	na	C	C	C
	Benzo[g,h,i]perylene	C	C	C	C	C	C	na	C	C	C
	Benzo[k]fluoranthene	C	C	C	C	C	C	na	C	C	C
	Chrysene	C	C	C	C	C	C	na	C	C	C
	Dibenz[a,h]anthracene	C	C	C	C	C	C	na	C	C	C
	Fluoranthene	C	C	C	C	C	C	na	C	C	C
	Fluorene	C	C	C	C	C	C	na	C	C	C
	Indeno[1,2,3-c,d]pyrene	C	C	C	C	C	C	na	C	C	C
	Naphthalene	C	**A**	C	C	C	C	C	C	C	C
	Phenanthrene	C	C	C	C	C	C	na	C	C	C
	Pyrene	C	C	C	C	C	C	na	C	C	C

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Table 5-4. Summary of Risk Category Assignments for PAHs in Sediment Based on SIM Data

Based on SEC Benchmarks

Category	COPC	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River Reach A	Ogden River Reach B	Ogden River Reach C
PAHs	1-Methylnaphthalene	na	na	na	na	na	na
	2-Methylnaphthalene	C	**A**	C	B	B	B
	Acenaphthene	**A**	**A**	B	B	B	**A**
	Acenaphthylene	**A**	**A**	B	B	**A**	B
	Anthracene	C	**A**	C	C	B	C
	Benzo[a]anthracene	C	**A**	C	C	**A**	C
	Benzo[a]pyrene	C	**A**	C	C	**A**	C
	Benzo[b]fluoranthene	**A**	**A**	**A**	**A**	**A**	**A**
	Benzo[g,h,i]perylene	C	**A**	C	C	C	C
	Benzo[k]fluoranthene	**A**	**A**	C	**A**	**A**	**A**
	Chrysene	C	**A**	C	C	**A**	C
	Dibenz[a,h]anthracene	C	**A**	C	B	**A**	C
	Fluoranthene	C	**A**	C	C	C	C
	Fluorene	C	**A**	C	C	B	C
	Indeno[1,2,3-c,d]pyrene	C	**A**	C	C	**A**	C
	Naphthalene	C	C	C	C	C	C
	Phenanthrene	C	**A**	C	C	C	**A**
	Pyrene	C	**A**	C	C	**A**	**A**

Based on ESG Benchmarks

Category	COPC	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River Reach A	Ogden River Reach B	Ogden River Reach C
PAHs	1-Methylnaphthalene	na	na	na	na	na	na
	2-Methylnaphthalene	C	C	C	C	C	C
	Acenaphthene	C	C	C	C	C	C
	Acenaphthylene	C	C	C	C	C	C
	Anthracene	C	C	C	C	C	C
	Benzo[a]anthracene	C	C	C	C	C	C
	Benzo[a]pyrene	C	C	C	C	C	C
	Benzo[b]fluoranthene	C	C	C	C	C	C
	Benzo[g,h,i]perylene	C	C	C	C	C	C
	Benzo[k]fluoranthene	C	C	C	C	C	C
	Chrysene	C	C	C	C	C	C
	Dibenz[a,h]anthracene	C	C	C	C	C	C
	Fluoranthene	C	C	C	C	C	C
	Fluorene	C	C	C	C	C	C
	Indeno[1,2,3-c,d]pyrene	C	C	C	C	C	C
	Naphthalene	C	C	C	C	C	C
	Phenanthrene	C	C	C	C	C	C
	Pyrene	C	C	C	C	C	C

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Table 5-5. Summary of Risk Category Assignments for PAHs in Porewater (Based on SIM Analysis)

Category	COPC	21st Street Pond - East	21st Street Pond - West	Ogden River - Reach B	Ogden River - Reach C
PAHs	2-Methylnaphthalene	C	C	C	C
	Acenaphthene	C	C	C	C
	Acenaphthylene	C	C	C	C
	Anthracene	C	C	C	C
	Benzo[a]anthracene	C	C	C	C
	Benzo[a]pyrene	C	C	C	C
	Benzo[b]fluoranthene	C	C	C	C
	Benzo[g,h,i]perylene	C	C	C	C
	Benzo[k]fluoranthene	C	C	C	C
	Chrysene	C	C	C	C
	Dibenz[a,h]anthracene	B	C	C	C
	Fluoranthene	C	C	C	C
	Fluorene	C	C	C	C
	Indeno[1,2,3-c,d]pyrene	B	C	C	C
	Naphthalene	C	C	C	C
	Phenanthrene	C	C	C	C
	Pyrene	C	C	C	C

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Table 5-6. Summary of Risk Category Assignments for Fish Based on Fish Tissue Data

Category	COPC	21st Street Pond				Buena Ventura Park Pond	Ogden River		Weber River
		Carcass	Fillet	Liver	Whole Body	Fillet	Fillet	Whole Body	Fillet
PAH	Acenaphthene	*No TRV Available*							
PCB	Aroclor-1260	C	C	na	C	na	na	na	na
PCB Congener	PCB-105	*No TRV Available*							
	PCB-114	*No TRV Available*							
	PCB-118	*No TRV Available*							
	PCB-123	*No TRV Available*							
	PCB-126	na	C	na	na	C	C	C	C
	PCB-156	*No TRV Available*							
	PCB-157	*No TRV Available*							
	PCB-167	*No TRV Available*							
	PCB-189	*No TRV Available*							
	PCB-77	*No TRV Available*							
Pesticide	4,4'-DDD	C	C	na	**A**	na	na	na	na
	4,4'-DDE	**A**	**A**	na	**A**	na	na	na	na
	4,4'-DDT	C	C	na	C	na	na	na	na
	Dieldrin	C	B	na	C	na	na	na	na
	gamma-Chlordane	*No TRV Available*							
SVOC	4-Methylphenol (p-Cresol)	*No TRV Available*							
	bis(2-Chloroethoxy)methane	*No TRV Available*							
	bis(2-Ethylhexyl)phthalate	*No TRV Available*							
	Dibutylphthalate	*No TRV Available*							
	Diethylphthalate	*No TRV Available*							
	Phenol	B	B	C	C	na	na	na	na

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Table 5-7
Summary of the Site-Specific Sediment Toxicity Tests
Baseline Ecological Risk Assessment for the Ogden Railyard Site

Conducted during the Phase 2 Investigation (USEPA/ERTC 2001)

Location	Location Description	Station	Mean Survival	Mean Dry Weight (mg per organism)
10-day Subchronic Test with *Chironomus tentans*				
Lab Control	--	--	93% (7%)	0.99 (0.08)
Weber River	Reach A (ref)	WR09A	89% (12%)	2.86 (0.11)
		WR011A	90% (9%)	3.51 (0.59)
	Reach B	WR012A	93% (9%)	2 (0.04)
		WR014A	81% (10%)	2.97 (0.20)
	Reach D	WR019A	96% (5%)	2.28 (0.32)
		WR021A	89% (16%)	1.91 (0.37)
		WR022A	94% (7%)	1.99 (0.15)
		WR024A	84% (11%)	3.47 (1.13)
		WR025A	**76% (16%)** [a,b]	2.05 (0.27)
		WR028A	91% (8%)	2.37 (0.26)
14-day Subchronic Test with *Hyalella azteca*				
Lab Control	--	--	93% (12%)	0.15 (0.03)
Weber River	Reach A (ref)	WR09A	96% (11%)	0.30 (0.03)
		WR011A	100% (0%)	0.24 (0.03)
	Reach B	WR012A	99% (4%)	0.40 (0.04)
		WR014A	95% (9%)	0.29 (0.09)
	Reach D	WR019A	91% (11%)	0.35 (0.07)
		WR021A	100% (0%)	0.30 (0.03)
		WR022A	99% (4%)	0.30 (0.03)
		WR024A	99% (4%)	0.33 (0.06)
		WR025A	**74% (29%)** [a]	0.25 (0.07)
		WR028A	96% (5%)	0.32 (0.03)

Conducted during the Phase 3 Investigation (USEPA 2002)

Location	Location Description	Station	Mean Survival	Mean Dry Weight (mg per organism)
14-day Subchronic Test with *Hyalella azteca*				
Lab Control	--	--	99% (4%)	0.36 (0.04)
Buena Ventura Park Pond	south end of pond (ref)	BVPP-08A*	99% (4%)	0.37 (0.04)
	north end of pond (ref)	BVPP-08B	99% (4%)	0.38 (0.06)
21st Street Pond	inside fenced area	21SP-04P	93% (5%)	0.37 (0.05)
	just outside fenced area	21SP-04R	96% (7%)	0.54 (0.04)
	northwest of fenced area	21SP-04T	99% (4%)	0.42 (0.06)

a Statistically different ($p \leq 0.05$) compared to the laboratory control
b Statistically different ($p \leq 0.05$) compared to reference station WR09A

Standard deviation shown in parentheses.
Eight replicates per station, 10 organisms per replicate.

* Test organisms for one replicate (D) were inadvertently not added to the test vessel at initiation. This replicate was excluded from the mean survival and growth results and statistical analysis.

Table 5-8
Results of the Benthic Macroinvertebrate Community Structure Assessment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Conducted During the Phase 2 Investigation

Community Stucture Metric	Weber River						
	Reach A		Reach B		Reach D		
	WR09 (ref)	WR011	WR012	WR014	WR019	WR024	WR028
Mean Number of Organisms per Replicate	286	244	233	142	160	210	212
Number of Taxa	23	20	24	20	18	22	25
Total Scrapers	152	105	285	149	149	294	210
Total Filterers	86	60	39	138	54	96	53
Mean Scrapers : Filterers	1.8	1.8	7.3	0.7	2.8	3.1	4
EPT Abundance	659	560	382	279	397	301	326
Chironomid Abundance	115	79	267	80	56	251	170
Mean EPT : Chironomid	5.7	7.1	1.4	3.5	7.1	1.2	1.9
Mean % Contribution Dominant Taxon per Replicate	60	56	47	25	32	41	29
EPT Index	14	11	14	12	12	13	14
Mean H^1 Diversity	1.6	1.6	1.7	2.2	2	1.9	2.2
Mean Hillsenhoff's Biotic Index	4.8	4.9	5.2	4.7	4.4	5.2	5.3
Community Loss Index (Relative to WR09)	NA	0.3	0.2	0.25	0.44	0.27	0.2
Biological Condition Score (Relative to WR09)	NA	89	83	94	94	83	100
Biological Condition Category (Relative to WR09)	NA	Not Impacted	Not Impacted	Not Impacted	Not Impacted	Not Impacted	Not Impacted

Conducted During the Phase 3 Investigation

Community Stucture Metric	21st Street Pond			Buena Ventura Park Pond (ref)		Ogden River - Reach C	Weber River - Reach D
	West	East, inside fence	East, outside fence				
	4Q	4R	4T	8A	8B	5C	14C
Total Number of Organisms	173	42	90	93	94	1420	173
Number of Taxa	15	9	8	6	7	15	11
Scrapers	96	9	79	2	10	769	120
Filterers	0	0	0	0	0	131	0
Scrapers : Filterers	--	--	--	--	--	5.9	--
Shredders	0	0	0	0	0	3	0
EPT Abundance	2	3	0	14	15	169	0
Chironomid Abundance	8	10	2	52	50	200	2
EPT : Chironomid	0.3	0.3	0	0.3	0.3	0.8	0
% Contribution Dominant Taxon	28	29	43	56	53	49	28
EPT Index	1	1	0	2	1	3	0
H^1 Diversity	2.0	1.9	1.5	1.3	1.4	1.7	1.8
Hillsenhoff's Biotic Index	7.4	7.4	6.8	6.0	6.5	6.9	6.7

Table 6-1. Summary of Risk Category Assignments for Exposure of Terrestrial Plants and Invertebrates to Soil

COPC	21st Street Pond	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Aluminum	**A**	**A**	**A**	**A**	**A**
Antimony	C	**A**	C	C	C
Arsenic	C	**A**	C	C	C
Barium	C	C	C	C	C
Cadmium	C	**A**	C	C	C
Chromium	**A**	**A**	**A**	**A**	**A**
Copper	C	**A**	C	C	**A**
Iron	**A**	**A**	**A**	**A**	**A**
Lead	**A**	**A**	**A**	C	**A**
Manganese	**A**	**A**	**A**	**A**	**A**
Mercury	C	**A**	**A**	**A**	C
Selenium	C	C	B	B	C
Silver	C	**A**	C	C	C
Vanadium	**A**	**A**	**A**	**A**	**A**
Zinc	C	**A**	**A**	**A**	**A**
Aroclor-1260	**A**	C	B	B	B
Tetrachloroethene	B	B	B	B	B

A = Risk to the sub-population at this location are possible
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C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Table 6-2
Comparison of Background Concentrations of Trace Elements to Measured Site and Benchmark Concentrations in Soil

Baseline Ecological Risk Assessment for the Ogden Railyard Site

COPC	Utah Background* Range (mg/kg)	Toxicity Benchmark (mg/kg)	Average Measured Site Concentration (mg/kg)				
			21st Street Pond	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Aluminum	15,000 - 100,000	50	7,358	9,745	5,519	4,906	5,942
Arsenic	1.5 - 48	10	5.7	13	3.3	4.7	3.3
Barium	150 - 1,500	160	86	145	95	91	114
Chromium	15 - 150	0.40	12	15	9	8	10
Copper	7 - 100	36	24	48	22	17	33
Iron	7,000 - 100,000	200	9,729	11,965	7,934	6,825	8,162
Mercury	0.01 - 4.6	0.10	0.05	1.40	0.12	0.18	0.10
Manganese	100 - 1,000	100	240	413	246	212	199
Lead	5 - 700	50	68	512	72	86	72
Antimony	1 - 1.4	3.0	0.97	4.55	1.59	0.60	1.63
Selenium	0.1 - 1.5	0.70	0.96	0.23	1.28	0.97	0.57
Vanadium	20 - 300	2.0	16	19	12	11	16
Zinc	20 - 2,000	50	60	546	114	90	105

* Utah background concentrations reported by Shacklette and Boerngen (1984) (N = 47).

Table 7-1
Exposure Factors for Representative Wildlife Species

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Class	**Type**	**Receptor**	**Genus species**	**Body Weight** (kg wet weight)	**Food Ingestion Rate** (kg wet weight/day)	**Water Ingestion Rate** (L/day)	**Sediment Ingestion Rate** (kg dry weight/day)	**Soil Ingestion Rate** (kg dry weight/day)	**Home Range Size**	**Assumed Dietary Fraction of Food Items**
Avian	Aquatic Piscivore	Belted Kingfisher	*Ceryle alcyon*	0.147	0.0735	0.016	0.0004	NA	1.5 km linear length of shoreline	100% fish
	Terrestial Omnivore	American Robin	*Turdus migratorius*	0.081	0.078	0.011	NA	0.0012	0.48 hectares	NA; No data available for terrestrial food items
	Avian Insectivore	Mallard Duck	*Anas platyrhynchos*	1.13	0.316	0.064	0.0015	NA	435 hectares	100% BMI
Mammalian	Terrestrial Insectivore	Masked Shrew	*Sorex cinereus*	0.0053	0.009	0.001	NA	0.0004	0.39 hectares	NA; No data available for terrestrial food items
	Semi-Aquatic Piscivore	Mink	*Mustela vison*	0.556	0.089	0.058	0.0002	NA	2 km linear length of shoreline	100% fish

NA = Not applicable
All dietary fractions are expressed as percent wet weight
See Appendix B for detailed information and sources.

Table 7-2a
Summary of Total Hazard Index (HI) Across All Exposure Pathways

BELTED KINGFISHER

Type	**COPC**	**Reach**								
		Buena Ventura Park Pond (ref)	21st Street Pond	Ogden River			Weber River			
				Reach A (ref)	Reach B	Reach C	Reach A (ref)	Reach B	Reach C	Reach D
Inorganics	Aluminum	1E-01	1E-01	--	6E-02	--	1E-01	7E-02	1E-01	7E-02
	Antimony	--	--	--	--	--	--	--	--	--
	Arsenic	2E-03	3E-03	--	2E-03	--	1E-03	2E-03	3E-03	2E-03
	Barium	5E-02	2E-02	--	2E-02	--	2E-02	1E-02	2E-02	1E-02
	Cadmium	--	--	--	--	--	--	--	--	--
	Chromium	2E-02	2E-02	--	1E-02	--	1E-02	7E-03	1E-02	3E-02
	Copper	--	--	--	--	--	--	--	--	--
	Lead	4E-02	1E-02	--	1E-02	--	2E-02	1E-02	2E-02	2E-02
	Manganese	4E-04	9E-04	--	6E-04	--	5E-04	4E-04	6E-04	4E-04
	Mercury	5E-02	2E-02	--	9E-03	--	3E-02	1E-02	2E-02	2E-02
	Selenium	1E-03	3E-03	--	4E-03	--	3E-04	1E-03	1E-03	9E-04
	Thallium	--	--	--	--	--	--	--	--	--
	Vanadium	2E-03	2E-03	--	1E-03	--	1E-03	1E-03	1E-03	1E-03
	Zinc	2E-02	6E-03	--	4E-03	--	8E-03	7E-03	2E-02	2E-02
Pesticides	4,4'-DDE	1E-03	**3E+01**	7E-04	1E-03	5E-04	1E-03	2E-03	4E-03	1E-03
	4,4'-DDD	--	1E-01	--	--	--	--	--	--	--
	4,4'-DDT	9E-04	1E-01	7E-04	3E-03	4E-03	1E-03	2E-03	2E-03	1E-03
PAHs	Benzo[a]pyrene	--	--	--	--	--	--	--	--	--
PCBs	Aroclor-1254	2E-04	3E-04	2E-04	1E-03	2E-04	3E-04	2E-04	2E-04	2E-04
	Aroclor-1260	2E-04	1E+00	1E-04	4E-02	1E-03	3E-04	2E-04	2E-04	2E-04
SVOCs	bis(2-Ethylhexyl)phthalate	2E-03	3E-01	2E-03	5E-04	6E-04	4E-03	6E-04	2E-03	2E-03
	Dibutylphthalate	2E-03	1E+00	7E-03	6E-03	2E-03	1E-02	3E-03	3E-03	8E-04

-- = no data available for this COPC at this reach

Table 7-2b
Summary of Total Hazard Index (HI) Across All Exposure Pathways

AMERICAN ROBIN

Type	COPC	Reach								
		Buena Ventura Park Pond (ref)	21st Street Pond	Ogden River			Weber River			
				Reach A (ref)	Reach B	Reach C	Reach A (ref)	Reach B	Reach C	Reach D
Inorganics	Aluminum	--	5E-01	--	--	--	8E-01	4E-01	4E-01	5E-01
	Antimony	--	--	--	--	--	--	--	--	--
	Arsenic	--	3E-02	--	--	--	8E-02	1E-02	3E-02	1E-02
	Barium	--	8E-02	--	--	--	1E-01	6E-02	6E-02	7E-02
	Cadmium	--	5E-03	--	--	--	2E-02	4E-03	3E-03	2E-03
	Chromium	--	1E-01	--	--	--	1E-01	7E-02	6E-02	8E-02
	Copper	--	1E-02	--	--	--	2E-02	9E-03	7E-03	2E-02
	Lead	--	9E-01	--	--	--	**4E+00**	5E-01	6E-01	5E-01
	Manganese	--	2E-03	--	--	--	4E-03	2E-03	2E-03	2E-03
	Mercury	--	2E-03	--	--	--	8E-02	5E-03	7E-03	4E-03
	Selenium	--	3E-02	--	--	--	6E-03	3E-02	3E-02	2E-02
	Thallium	--	--	--	--	--	--	--	--	--
	Vanadium	--	1E-02	--	--	--	1E-02	8E-03	8E-03	1E-02
	Zinc	--	3E-02	--	--	--	3E-01	5E-02	4E-02	5E-02
Pesticides	4,4'-DDE	--	--	--	--	--	--	--	--	--
	4,4'-DDD	--	--	--	--	--	--	--	--	--
	4,4'-DDT	--	3E-02	--	--	--	3E-03	7E-03	8E-03	8E-03
PAHs	Benzo[a]pyrene	--	--	--	--	--	--	--	--	--
PCBs	Aroclor-1254	--	--	--	--	--	--	--	--	--
	Aroclor-1260	--	1E-02	--	--	--	7E-04	4E-03	8E-04	8E-04
SVOCs	bis(2-Ethylhexyl)phthalate	--	9E-03	--	--	--	2E-03	2E-03	2E-03	1E-03
	Dibutylphthalate	--	1E-02	--	--	--	4E-03	8E-03	9E-03	9E-03

-- = no data available for this COPC at this reach

Table 7-2c
Summary of Total Hazard Index (HI) Across All Exposure Pathways

MALLARD DUCK

Type	COPC	Reach								
		Buena Ventura Park Pond (ref)	21st Street Pond	Ogden River			Weber River			
				Reach A (ref)	Reach B	Reach C	Reach A (ref)	Reach B	Reach C	Reach D
Inorganics	Aluminum	7E-02	7E-02	--	3E-02	--	6E-02	4E-02	6E-02	4E-02
	Antimony	--	--	--	--	--	--	--	--	--
	Arsenic	8E-04	1E-03	--	8E-04	--	7E-04	8E-04	2E-03	9E-04
	Barium	2E-02	1E-02	--	9E-03	--	1E-02	5E-03	1E-02	6E-03
	Cadmium	--	--	--	--	--	--	--	--	--
	Chromium	9E-03	1E-02	--	6E-03	--	6E-03	4E-03	6E-03	1E-02
	Copper	--	--	--	--	--	--	--	--	--
	Lead	4E-02	1E-02	--	2E-02	--	2E-02	1E-02	2E-02	2E-02
	Manganese	2E-04	4E-04	--	3E-04	--	3E-04	2E-04	3E-04	2E-04
	Mercury	3E-02	1E-02	--	4E-03	--	2E-02	5E-03	1E-02	8E-03
	Selenium	5E-03	1E-02	--	1E-02	--	9E-04	5E-03	5E-03	3E-03
	Thallium	--	--	--	--	--	--	--	--	--
	Vanadium	1E-03	1E-03	--	7E-04	--	7E-04	5E-04	7E-04	7E-04
	Zinc	1E-02	3E-03	--	2E-03	--	4E-03	3E-03	8E-03	9E-03
Pesticides	4,4'-DDE	5E-04	2E-03	4E-04	6E-04	3E-04	7E-04	1E-03	2E-03	7E-04
	4,4'-DDD	--	--	--	--	--	--	--	--	--
	4,4'-DDT	4E-04	6E-04	4E-04	2E-03	2E-03	7E-04	1E-03	1E-03	7E-04
PAHs	Benzo[a]pyrene	--	--	--	--	--	--	--	--	--
PCBs	Aroclor-1254	9E-05	2E-04	1E-04	7E-04	8E-05	1E-04	9E-05	1E-04	8E-05
	Aroclor-1260	7E-05	6E-04	7E-05	2E-02	5E-04	1E-04	9E-05	9E-05	8E-05
SVOCs	bis(2-Ethylhexyl)phthalate	1E-03	8E-04	9E-04	3E-04	3E-04	2E-03	3E-04	1E-03	9E-04
	Dibutylphthalate	8E-04	4E-04	3E-03	3E-03	8E-04	6E-03	1E-03	1E-03	4E-04

-- = no data available for this COPC at this reach

Table 7-2d
Summary of Total Hazard Index (HI) Across All Exposure Pathways

MASKED SHREW

Type	COPC	Reach								
		Buena Ventura Park Pond (ref)	21st Street Pond	Ogden River			Weber River			
				Reach A (ref)	Reach B	Reach C	Reach A (ref)	Reach B	Reach C	Reach D
Inorganics	Aluminum	--	**5E+01**	--	--	--	**8E+01**	**4E+01**	**4E+01**	**4E+01**
	Antimony	--	9E-02	--	--	--	7E-01	1E-01	5E-02	5E-01
	Arsenic	--	8E-01	--	--	--	**2E+00**	3E-01	7E-01	4E-01
	Barium	--	6E-01	--	--	--	8E-01	4E-01	5E-01	6E-01
	Cadmium	--	4E-02	--	--	--	2E-01	3E-02	3E-02	2E-02
	Chromium	--	2E-04	--	--	--	2E-04	1E-04	1E-04	1E-04
	Copper	--	3E-01	--	--	--	4E-01	2E-01	1E-01	4E-01
	Lead	--	6E-01	--	--	--	**3E+00**	4E-01	4E-01	3E-01
	Manganese	--	1E-01	--	--	--	3E-01	1E-01	1E-01	1E-01
	Mercury	--	1E-01	--	--	--	**4E+00**	2E-01	3E-01	2E-01
	Selenium	--	6E-02	--	--	--	1E-02	6E-02	7E-02	4E-02
	Thallium	--	--	--	--	--	--	--	--	--
	Vanadium	--	1E+00	--	--	--	1E+00	9E-01	9E-01	1E+00
	Zinc	--	3E-02	--	--	--	3E-01	4E-02	4E-02	5E-02
Pesticides	4,4'-DDE	--	--	--	--	--	--	--	--	--
	4,4'-DDD	--	--	--	--	--	--	--	--	--
	4,4'-DDT	--	6E-04	--	--	--	8E-05	2E-04	2E-04	2E-04
PAHs	Benzo[a]pyrene	--	--	--	--	--	--	--	--	--
PCBs	Aroclor-1254	--	--	--	--	--	--	--	--	--
	Aroclor-1260	--	2E-01	--	--	--	8E-03	5E-02	1E-02	1E-02
SVOCs	bis(2-Ethylhexyl)phthalate	--	2E-03	--	--	--	3E-04	4E-04	3E-04	3E-04
	Dibutylphthalate	--	2E-05	--	--	--	6E-06	1E-05	2E-05	1E-05

-- = no data available for this COPC at this reach

Table 7-2e
Summary of Total Hazard Index (HI) Across All Exposure Pathways

MINK

Type	COPC	Reach								
		Buena Ventura Park Pond (ref)	21st Street Pond	Ogden River			Weber River			
				Reach A (ref)	Reach B	Reach C	Reach A (ref)	Reach B	Reach C	Reach D
Inorganics	Aluminum	4E-01	4E-01	--	2E-01	--	4E-01	2E-01	4E-01	2E-01
	Antimony	1E-03	7E-04	--	5E-04	--	2E-03	2E-03	2E-03	1E-03
	Arsenic	2E-03	4E-03	--	2E-03	--	2E-03	2E-03	5E-03	3E-03
	Barium	1E-02	5E-03	--	5E-03	--	5E-03	2E-03	5E-03	3E-03
	Cadmium	--	--	--	--	--	--	--	--	--
	Chromium	1E-06	1E-06	--	6E-07	--	6E-07	4E-07	6E-07	1E-06
	Copper	--	--	--	--	--	--	--	--	--
	Lead	2E-03	6E-04	--	7E-04	--	8E-04	5E-04	8E-04	1E-03
	Manganese	9E-04	2E-03	--	1E-03	--	1E-03	8E-04	1E-03	9E-04
	Mercury	8E-03	4E-03	--	1E-03	--	5E-03	2E-03	4E-03	2E-03
	Selenium	8E-04	2E-03	--	2E-03	--	1E-04	7E-04	7E-04	5E-04
	Thallium	3E-04	6E-04	--	3E-04	--	1E-04	8E-05	7E-05	8E-05
	Vanadium	8E-03	8E-03	--	4E-03	--	5E-03	4E-03	5E-03	5E-03
	Zinc	6E-04	2E-04	--	1E-04	--	2E-04	2E-04	5E-04	5E-04
Pesticides	4,4'-DDE	8E-07	5E-02	5E-07	9E-07	4E-07	1E-06	2E-06	3E-06	1E-06
	4,4'-DDD	--	2E-04	--	--	--	--	--	--	--
	4,4'-DDT	6E-07	2E-04	5E-07	2E-06	3E-06	1E-06	2E-06	2E-06	1E-06
PAHs	Benzo[a]pyrene	3E-05	1E-02	8E-05	1E-04	5E-05	8E-04	2E-04	5E-05	4E-05
PCBs	Aroclor-1254	5E-05	9E-05	6E-05	4E-04	4E-05	7E-05	5E-05	5E-05	5E-05
	Aroclor-1260	4E-05	8E-01	4E-05	1E-02	3E-04	7E-05	5E-05	5E-05	5E-05
SVOCs	bis(2-Ethylhexyl)phthalate	1E-05	4E-03	1E-05	3E-06	4E-06	2E-05	4E-06	1E-05	1E-05
	Dibutylphthalate	8E-08	2E-04	4E-07	3E-07	9E-08	6E-07	1E-07	1E-07	4E-08

-- = no data available for this COPC at this reach

Table 7-3
List of PCB TEFs

Class	Target Analyte	TEF		
		Mammals	Birds	Fish
Co-planar PCBs	3,3',4,4'-TCB (77)	0.0001	0.05	0.0001
	3,4,4',5-TCB (81)	0.0001	0.1	0.0005
	3,3',4,4'-5-PeCB (126)	0.1	0.1	0.005
	3,3',4,4',5,5'-HxCB (169)	0.01	0.001	0.00005
Mono-ortho PCBs	2,3,3',4,4'-PeCB (105)	0.0001	0.0001	< 0.000005
	2,3,4,4',5-PeCB (114)	0.0005	0.0001	< 0.000005
	2,3',4,4',5-PeCB (118)	0.0001	0.00001	< 0.000005
	2',3,4,4',5-PeCB (123)	0.0001	0.00001	< 0.000005
	2,3,3',4,4',5-HxCB (156)	0.0005	0.0001	< 0.000005
	2,3,3',4,4',5'-HxCB (157)	0.0005	0.0001	< 0.000005
	2,3',4,4',5,5'-HxCB (167)	0.00001	0.00001	< 0.000005
	2,3,3',4,4',5,5'-HpCB (189)	0.0001	0.00001	< 0.000005

TEF = Toxicity Equivalency Factor
Source: Van den Berg et al. (1998)

Table 7-4. TEQ Values for PCB Congeners in Aquatic Prey Samples

Individual Sample Values for Fish

AOI	Reach	Species	Matrix		Net TEQ (pg/g) (a)		
					Based on Mammal TEF	Based on Bird TEF	Based on Fish TEF
21st Street Pond		Largemouth bass	fillet		2.53	3.53	0.12
		Largemouth bass	fillet		1.32	2.13	0.06
Buena Ventura Park Pond		Largemouth bass	fillet		0.22	1.60	0.01
Ogden River	A upstream	Brown trout	fillet	*	0.545	0.19	0.02
		15 sculpin	whole body	*	0.22	0.02	0.01
	A downstream	Brown trout	fillet		0.38	1.02	0.02
		16 sculpin, 1 green sunfish	whole body	*	0.41	0.15	0.01
	B	Brown trout	fillet		5.13	4.49	0.18
		5 dace, 5 sculpin, 1 creek chub	whole body		6.58	6.40	0.19
		White sucker	whole body		16.87	9.14	0.64
	C	2 Brown trout, 1 Largemouth bass	fillet		3.46	4.94	0.14
		2 Brown trout, 1 Largemouth bass	fillet		7.05	6.91	0.20
		dace, sculpin	whole body		13.26	9.46	0.27
Weber River	C	Brown trout	fillet		3.02	7.06	0.13
	D	Brown trout	fillet		1.14	3.04	0.05

(a) Net concentration = Raw concentration in fish sample minus concentration in laboratory-based method blank.
* = Samples with elevated level of PCB 77 in method blank

Summary Statistics for Fish

Location	Reach	N	Average TEQ (pg/g)			Maximum TEQ (pg/g)		
			Based on Mammal TEF	Based on Bird TEF	Based on Fish TEF	Based on Mammal TEF	Based on Bird TEF	Based on Fish TEF
21st Street Pond		2	1.93	2.83	0.09	2.53	3.53	0.12
Ogden River	A upstream	2	0.38	0.11	0.01	0.54	0.19	0.02
	A downstream	2	0.39	0.59	0.01	0.41	1.02	0.02
	B	3	9.53	6.68	0.34	16.87	9.14	0.64
	C	3	7.92	7.10	0.21	13.26	9.46	0.27
Weber River	C	1	3.02	7.06	0.13	3.02	7.06	0.13
	D	1	1.14	3.04	0.05	1.14	3.04	0.05
Buena Ventura Park Pond		1	0.22	1.60	0.01	0.22	1.60	0.01

Summary Statistics for Benthic Invertebrates

Location	Reach	N	Sample TEQ (pg/g)		
			Based on Mammal TEF	Based on Bird TEF	Based on Fish TEF
Ogden River	A upstream	1	0.74	2.13	0.03
	A downstream	1	1.62	3.00	0.07
	B	1	2.86	6.27	0.10
Buena Ventura Park Pond		1	0.54	1.54	0.02

Benthic tissue samples are based on a whole body composite of multiple species.

Table 7-5. Risks to Wildlife from PCBs in Aquatic Prey

Calculations Based on Congener-Specific Data

Evaluation of Risks to Kingfisher from Ingestion of Fish

HQ = C(fish) / TRV(fish)
TRV(fish) = TRV(egg) / BCF (fish to egg)

Reach	C(fish) (a) pg/g TEQ	TRV (pg/g TEQ in Fish)		HQ	
		NOAEL	LOAEL	NOAEL	LOAEL
21st Street Pond	3.5	0.46	4.6	8E+00	8E-01
Ogden River - A upstream	0.2	0.46	4.6	4E-01	4E-02
Ogden River - A downstream	1.0	0.46	4.6	2E+00	2E-01
Ogden River - B	9.1	0.46	4.6	2E+01	2E+00
Ogden River - C	9.5	0.46	4.6	2E+01	2E+00
Weber River - C	7.1	0.46	4.6	2E+01	2E+00
Weber River - D	3.0	0.46	4.6	7E+00	7E-01
Buena Ventura Park Pond	1.6	0.46	4.6	3E+00	3E-01

(a) Calculated from congener-specic values in fish using TEFs for birds (see Table 7-3)

Evaluation of Risks to Mallards from Ingestion of Benthic Invertebrates

HQ = C(benthics) / TRV(benthics)
TRV(benthics) = TRV(egg) / BCF (benthics to egg)

Reach	C(benthics) (a) pg/g TEQ	TRV (pg/g TEQ in Benthics)		HQ	
		NOAEL	LOAEL	NOAEL	LOAEL
Ogden River - A upstream	2.1	0.46	4.6	5E+00	5E-01
Ogden River - A downstream	3.0	0.46	4.6	7E+00	7E-01
Ogden River - B	6.3	0.46	4.6	1E+01	1E+00
Buena Ventura Park Pond	1.5	0.46	4.6	3E+00	3E-01

(a) Calculated from congener-specic values in fish using TEFs for birds (see Table 7-3)

Evaluation of Risks to Mink from Ingestion of Fish

HQ = C(fish) / TRV(diet-based)

Reach	C(fish) (b) pg/g TEQ	TRV (pg/g TEQ)		HQ	
		low (c)	high (d)	low	high
21st Street Pond	2.5	3.3	14.0	8E-01	2E-01
Ogden River - A upstream	0.5	3.3	14.0	2E-01	4E-02
Ogden River - A downstream	0.4	3.3	14.0	1E-01	3E-02
Ogden River - B	16.9	3.3	14.0	5E+00	1E+00
Ogden River - C	13.3	3.3	14.0	4E+00	9E-01
Weber River - C	3.0	3.3	14.0	9E-01	2E-01
Weber River - D	1.1	3.3	14.0	3E-01	8E-02
Buena Ventura Park Pond	0.2	3.3	14.0	7E-02	2E-02

(b) Calculated from congener-specic values in fish using TEFs for mammals (see Table 7-3)
(c) Benchmark concentration derived using the log logistic model
(d) Benchmark concentration derived using the quantal linear model

Table 8-1
Summary of Qualitative COPCs for Ecological Risk Assessment
Baseline Ecological Risk Assessment for the Ogden Railyard Site, Utah

Class	Wildlife Receptors								Terrestrial Receptors (plants, soil organisms)		Aquatic Receptors			
	Surface Water		Sediment		Soil		Aquatic Food Web		Soil		Surface Water		Sediment	
	Type 1	Type 2	Type 1	Type 2	Type 1	Type 2	Type 1	Type 2	Type 1	Type 2	Type 1	Type 2	Type 1	Type 2
Inorganics	7	0	7	0	7	0	0	0	4	0	0	1	7	0
Pesticides	3	0	6	0	4	0	3	0	21	2	5	8	10	0
PAHs	19	0	20	0	19	0	18	0	18	0	10	1	1	1
VOCs/SVOCs	93	0	96	0	94	0	40	0	85	1	54	52	63	3
PCBs	3	0	0	0	0	0	0	0	0	0	0	6	0	0
Petroleum Hydrocarbons	2	0	1	0	0	0	0	0	0	0	2	0	1	0

Table 8-2 Summary of Uncertainties in the Ecological Risk Assessment

Assessment Component	Description	Likely Direction of Error	Likely Magnitude of Error
Nature and Extent of Contamination	Samples collected may not be fully representative of variability in space or time, especially if the number of samples is small.	Unknown	Probably small
	Analytical results may be imprecise.	Unknown	Probably small
Exposure Assessment	Some exposure pathways were not evaluated.	Underestimate of risk	Probably small, except possibly for dietary ingestion by benthic organisms and direct contact of bottom-feeding fish with PAHs or PCBs in sediment
	Some chemicals were not evaluated because chemical was never detected, but detection limit was too high to detect the chemical if it were present at a level of concern.	Underestimate of risk	Usually small
	Exposure parameters for wildlife receptors are based on studies at other sites.	Unknown	Probably small
	Exposure point concentrations for wildlife receptors are based on a conservative estimate of the mean concentration in the exposure area.	Overestimate of risks	Possibly significant
	Absorption from site media is assumed to be the same as in laboratory studies.	Probably overestimate risk (especially metals)	Possibly significant
Effects (Toxicity) Assessment	Many chemicals lack reliable toxicity benchmarks for some receptors for some media; these chemicals are not evaluated.	Underestimation of risk	Probably small in most cases
	Available toxicity benchmarks are often based on limited data, and values must be extrapolated across species.	Unknown	Unknown, could be significant
	Wildlife receptors selected as representative species may not capture the full range of sensitivities in site receptors.	Unknown	Probably small
	Site-specific toxicity testing of sediments did not employ organisms that burrow into sediment.	Underestimation of risk	Could be significant
	Aquatic toxicity benchmarks are based on a wide range of species, many of which do not occur at this site.	Likely to overestimate risk	Probably small
Risk Characterization	Interactions between chemicals are difficult to account for; effects of one chemical may increase, decrease, or have no effect on other chemicals.	Unknown	Unknown, but probably small
	Estimation of population-level effects from HQ calculations is difficult; effects assumed to be unlikely when $\geq$80% or more had HQ $\leq$1, but this is an assumption and may vary from receptor to receptor.	Unknown	Unknown, probably small in most cases

APPENDIX A

ENVIRONMENTAL DATA SUMMARY STATISTICS

A-1: Surface Water

A-2: Sediment

A-3: Soil

A-4: Porewater

A-5: Fish Tissue

A-6: Benthic Macroinvertebrate Tissue

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Appendix A-1
Summary Statistics for Analytes in Site Surface Waters (ug/L)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Type	Analyte	Weber River - Reach A				Weber River - Reach B				Weber River - Reach C				Weber River - Reach D				Buena Ventura Park Pond			
		DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max
Metals	Aluminum	3/5	4.5E+02	2.5E+02	7.0E+02	3/4	5.2E+02	2.5E+02	6.8E+02	4/7	4.7E+02	2.5E+02	7.9E+02	2/10	3.4E+02	2.5E+02	7.1E+02	4/4	9.4E+02	2.9E+02	1.9E+03
	Antimony	0/5	1.5E+01	1.1E+00	2.5E+01	0/4	1.9E+01	1.1E+00	2.5E+01	0/7	2.2E+01	1.1E+00	2.5E+01	0/10	2.0E+01	1.1E+00	2.5E+01	1/4	2.0E+00	1.1E+00	3.4E+00
	Arsenic	1/5	6.7E+00	1.1E+00	1.0E+01	3/11	3.8E+00	1.0E+00	1.0E+01	4/11	6.4E+00	1.1E+00	1.0E+01	2/15	6.0E+00	1.0E+00	1.0E+01	0/4	3.8E+00	1.1E+00	4.8E+00
	Barium	5/5	1.1E+02	1.1E+02	1.2E+02	11/11	1.2E+02	1.0E+02	1.3E+02	11/11	1.2E+02	1.1E+02	1.3E+02	15/15	1.1E+02	1.1E+02	1.2E+02	4/4	8.4E+01	6.9E+01	1.1E+02
	Beryllium	0/5	1.9E+00	1.0E+00	2.5E+00	0/4	2.1E+00	1.0E+00	2.5E+00	0/7	2.3E+00	1.0E+00	2.5E+00	0/10	2.2E+00	1.0E+00	2.5E+00	0/4	3.2E-01	9.0E-02	1.0E+00
	Cadmium	0/5	2.5E+00	2.5E+00	2.5E+00	0/11	1.2E+00	5.0E-01	2.5E+00	0/11	1.8E+00	5.0E-01	2.5E+00	0/15	1.8E+00	5.0E-01	2.5E+00	3/4	1.3E+00	5.0E-01	2.5E+00
	Calcium	5/5	6.7E+04	6.4E+04	7.1E+04	4/4	6.5E+04	6.3E+04	6.6E+04	7/7	6.5E+04	6.4E+04	6.7E+04	10/10	6.6E+04	6.3E+04	6.9E+04	4/4	4.0E+04	3.8E+04	4.4E+04
	Chromium	0/5	4.0E+00	2.5E+00	5.0E+00	0/11	4.8E+00	2.5E+00	5.0E+00	0/11	4.8E+00	2.5E+00	5.0E+00	0/15	4.7E+00	2.5E+00	5.0E+00	3/4	2.0E+00	1.2E+00	3.0E+00
	Cobalt	0/5	5.0E+00	5.0E+00	5.0E+00	0/4	5.0E+00	5.0E+00	5.0E+00	0/7	5.0E+00	5.0E+00	5.0E+00	0/10	5.0E+00	5.0E+00	5.0E+00	0/4	1.7E+00	6.0E-01	5.0E+00
	Copper	0/5	5.0E+00	5.0E+00	5.0E+00	0/4	5.0E+00	5.0E+00	5.0E+00	0/7	5.0E+00	5.0E+00	5.0E+00	0/10	5.0E+00	5.0E+00	5.0E+00	3/4	6.2E+00	5.0E+00	7.4E+00
	Iron	2/5	2.6E+02	2.0E+02	3.7E+02	3/4	3.6E+02	2.0E+02	4.2E+02	4/7	3.6E+02	2.0E+02	6.0E+02	2/10	2.5E+02	2.0E+02	4.7E+02	4/4	1.0E+03	4.0E+02	2.1E+03
	Lead	0/5	3.4E+00	1.1E+00	5.0E+00	5/11	3.7E+00	5.0E-01	6.1E+00	4/11	4.3E+00	1.1E+00	5.0E+00	5/15	3.6E+00	1.1E+00	5.0E+00	4/4	6.7E+00	2.1E+00	1.2E+01
	Magnesium	5/5	1.9E+04	1.7E+04	1.9E+04	4/4	1.9E+04	1.8E+04	1.9E+04	7/7	1.9E+04	1.8E+04	1.9E+04	10/10	1.9E+04	1.8E+04	1.9E+04	4/4	9.8E+03	9.3E+03	1.0E+04
	Manganese	5/5	3.1E+01	3.0E+01	3.2E+01	3/4	2.7E+01	1.5E+01	3.1E+01	7/7	3.9E+01	3.0E+01	6.2E+01	10/10	3.4E+01	3.1E+01	3.8E+01	4/4	7.1E+01	4.5E+01	1.1E+02
	Mercury	1/5	2.7E-01	1.0E-01	6.6E-01	1/11	1.7E+00	1.0E-01	2.5E+00	0/11	1.1E+00	1.0E-01	2.5E+00	0/15	9.8E-01	1.0E-01	2.5E+00	0/4	4.8E-02	3.0E-02	1.0E-01
	Nickel	0/5	8.0E+00	5.0E+00	1.0E+01	0/4	8.8E+00	5.0E+00	1.0E+01	0/7	9.3E+00	5.0E+00	1.0E+01	0/10	9.0E+00	5.0E+00	1.0E+01	3/4	3.0E+00	1.8E+00	5.0E+00
	Potassium	5/5	2.6E+03	2.2E+03	3.2E+03	4/4	2.7E+03	2.5E+03	2.9E+03	7/7	2.8E+03	2.3E+03	3.0E+03	10/10	2.9E+03	2.7E+03	3.2E+03	3/4	7.3E+03	1.0E+03	2.3E+04
	Selenium	0/5	1.2E+01	1.1E+00	2.0E+01	0/11	7.1E+00	1.1E+00	2.0E+01	0/11	1.2E+01	1.1E+00	2.0E+01	0/15	1.2E+01	1.1E+00	2.0E+01	0/4	1.6E+00	1.1E+00	1.8E+00
	Silver	0/2	2.5E+00	2.5E+00	2.5E+00	0/10	4.8E+00	2.5E+00	5.0E+00	0/9	4.7E+00	2.5E+00	5.0E+00	0/11	4.5E+00	2.5E+00	5.0E+00	3/4	1.5E+00	1.1E+00	2.5E+00
	Sodium	5/5	2.7E+04	2.6E+04	2.8E+04	4/4	2.5E+04	2.3E+04	2.7E+04	7/7	2.7E+04	2.6E+04	3.0E+04	10/10	2.8E+04	2.7E+04	2.9E+04	4/4	2.0E+04	1.6E+04	3.3E+04
	Thallium	0/5	9.4E+00	1.1E+00	1.5E+01	0/4	1.2E+01	1.1E+00	1.5E+01	0/7	1.3E+01	1.1E+00	1.5E+01	0/10	1.2E+01	1.1E+00	1.5E+01	0/4	3.9E+00	1.1E+00	4.9E+00
	Vanadium	0/5	5.0E+00	5.0E+00	5.0E+00	0/4	5.0E+00	5.0E+00	5.0E+00	0/7	5.0E+00	5.0E+00	5.0E+00	0/10	5.0E+00	5.0E+00	5.0E+00	1/4	3.6E+00	2.2E+00	5.1E+00
	Zinc	0/5	1.1E+01	5.0E+00	1.5E+01	0/4	1.3E+01	5.0E+00	1.5E+01	0/7	1.4E+01	5.0E+00	1.5E+01	0/10	1.3E+01	5.0E+00	1.5E+01	2/4	1.2E+01	4.5E+00	2.6E+01
Pesticides	4,4'-DDD	na	na	na	na	0/7	5.0E-02	5.0E-02	5.0E-02	0/4	5.0E-02	5.0E-02	5.0E-02	0/5	5.0E-02	5.0E-02	5.0E-02	na	na	na	na
	4,4'-DDE	na	na	na	na	0/7	5.0E-02	5.0E-02	5.0E-02	0/4	5.0E-02	5.0E-02	5.0E-02	0/5	5.0E-02	5.0E-02	5.0E-02	na	na	na	na
	4,4'-DDT	na	na	na	na	0/7	5.0E-02	5.0E-02	5.0E-02	0/4	5.0E-02	5.0E-02	5.0E-02	0/5	5.0E-02	5.0E-02	5.0E-02	na	na	na	na
	Aldrin	na	na	na	na	0/7	2.5E-02	2.5E-02	2.5E-02	0/4	2.5E-02	2.5E-02	2.5E-02	0/5	2.5E-02	2.5E-02	2.5E-02	na	na	na	na
	alpha-BHC	na	na	na	na	0/7	2.5E-02	2.5E-02	2.5E-02	0/4	2.5E-02	2.5E-02	2.5E-02	0/5	2.5E-02	2.5E-02	2.5E-02	na	na	na	na
	beta-BHC	na	na	na	na	0/7	2.5E-02	2.5E-02	2.5E-02	0/4	2.5E-02	2.5E-02	2.5E-02	0/5	2.5E-02	2.5E-02	2.5E-02	na	na	na	na
	Chlordane	na	na	na	na	0/7	2.5E-01	2.5E-01	2.5E-01	0/4	2.5E-01	2.5E-01	2.5E-01	0/5	2.5E-01	2.5E-01	2.5E-01	na	na	na	na
	delta-BHC	na	na	na	na	0/7	2.5E-02	2.5E-02	2.5E-02	0/4	2.5E-02	2.5E-02	2.5E-02	0/5	2.5E-02	2.5E-02	2.5E-02	na	na	na	na
	Dieldrin	na	na	na	na	0/7	5.0E-02	5.0E-02	5.0E-02	0/4	5.0E-02	5.0E-02	5.0E-02	0/5	5.0E-02	5.0E-02	5.0E-02	na	na	na	na
	Endosulfan I	na	na	na	na	0/7	2.5E-02	2.5E-02	2.5E-02	0/4	2.5E-02	2.5E-02	2.5E-02	0/5	2.5E-02	2.5E-02	2.5E-02	na	na	na	na
	Endosulfan II	na	na	na	na	0/7	5.0E-02	5.0E-02	5.0E-02	0/4	5.0E-02	5.0E-02	5.0E-02	0/5	5.0E-02	5.0E-02	5.0E-02	na	na	na	na
	Endosulfan Sulfate	na	na	na	na	0/7	5.0E-02	5.0E-02	5.0E-02	0/4	5.0E-02	5.0E-02	5.0E-02	0/5	5.0E-02	5.0E-02	5.0E-02	na	na	na	na
	Endrin	na	na	na	na	0/7	5.0E-02	5.0E-02	5.0E-02	0/4	5.0E-02	5.0E-02	5.0E-02	0/5	5.0E-02	5.0E-02	5.0E-02	na	na	na	na
	Endrin Aldehyde	na	na	na	na	0/7	5.0E-02	5.0E-02	5.0E-02	0/4	5.0E-02	5.0E-02	5.0E-02	0/5	5.0E-02	5.0E-02	5.0E-02	na	na	na	na
	gamma-BHC (Lindane)	na	na	na	na	0/7	2.5E-02	2.5E-02	2.5E-02	0/4	2.5E-02	2.5E-02	2.5E-02	0/5	2.5E-02	2.5E-02	2.5E-02	na	na	na	na
	Heptachlor	na	na	na	na	0/7	2.5E-02	2.5E-02	2.5E-02	0/4	2.5E-02	2.5E-02	2.5E-02	0/5	2.5E-02	2.5E-02	2.5E-02	na	na	na	na
	Heptachlor Epoxide	na	na	na	na	0/7	2.5E-02	2.5E-02	2.5E-02	0/4	2.5E-02	2.5E-02	2.5E-02	0/5	2.5E-02	2.5E-02	2.5E-02	na	na	na	na
	Isodrin	na	na	na	na	0/7	2.5E-02	2.5E-02	2.5E-02	0/4	2.5E-02	2.5E-02	2.5E-02	0/5	2.5E-02	2.5E-02	2.5E-02	na	na	na	na
	Kepone	na	na	na	na	0/7	5.0E-02	5.0E-02	5.0E-02	0/4	5.0E-02	5.0E-02	5.0E-02	0/5	5.0E-02	5.0E-02	5.0E-02	na	na	na	na
	Methoxychlor	na	na	na	na	0/7	2.5E-01	2.5E-01	2.5E-01	0/4	2.5E-01	2.5E-01	2.5E-01	0/5	2.5E-01	2.5E-01	2.5E-01	na	na	na	na
	Toxaphene	na	na	na	na	0/7	5.0E-01	5.0E-01	5.0E-01	0/4	5.0E-01	5.0E-01	5.0E-01	0/5	5.0E-01	5.0E-01	5.0E-01	na	na	na	na
.Hs	2-Chloronaphthalene	0/3	5.0E+00	5.0E+00	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/10	5.0E+00	5.0E+00	5.0E+00	0/9	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	1-Methylnaphthalene	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	0/3	1.0E+00	1.0E+00	1.0E+00
	2-Methylnaphthalene	0/5	3.3E+00	7.5E-01	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	1.0E+00	5.0E+00	0/17	3.1E+00	7.5E-01	5.0E+00	0/4	2.0E+00	1.0E+00	5.0E+00
	Acenaphthene	0/5	3.3E+00	7.5E-01	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	1.0E+00	5.0E+00	1/17	2.9E+00	7.5E-01	5.0E+00	0/4	2.0E+00	1.0E+00	5.0E+00
	Acenaphthylene	0/5	3.3E+00	6.3E-01	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	5.0E-01	5.0E+00	0/17	2.9E+00	5.0E-01	5.0E+00	0/4	1.6E+00	5.0E-01	5.0E+00
	Aniline	0/2	1.0E+00	1.0E+00	1.0E+00	na	na	na	na	0/1	1.0E+00	1.0E+00	1.0E+00	0/8	1.0E+00	1.0E+00	1.0E+00	0/3	1.0E+00	1.0E+00	1.0E+00
	Anthracene	0/5	3.4E+00	1.0E+00	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	1.0E+00	5.0E+00	0/17	3.1E+00	1.0E+00	5.0E+00	0/4	2.0E+00	1.0E+00	5.0E+00
	Benzo[a]anthracene	0/5	3.4E+00	1.0E+00	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	1.0E+00	5.0E+00	0/17	3.1E+00	1.0E+00	5.0E+00	0/4	2.0E+00	1.0E+00	5.0E+00
	Benzo[a]pyrene	0/5	3.3E+00	7.5E-01	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	1.0E+00	5.0E+00	0/17	3.1E+00	7.5E-01	5.0E+00	0/4	2.0E+00	1.0E+00	5.0E+00
	Benzo[b]fluoranthene	0/5	3.4E+00	1.0E+00	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	1.0E+00	5.0E+00	0/17	3.1E+00	1.0E+00	5.0E+00	0/4	2.0E+00	1.0E+00	5.0E+00

Appendix A-1
Summary Statistics for Analytes in Site Surface Waters (ug/L)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Type	Analyte	Weber River - Reach A				Weber River - Reach B				Weber River - Reach C				Weber River - Reach D				Buena Ventura Park Pond			
		DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max
PA	Benzo[g,h,i]perylene	0/5	3.5E+00	1.3E+00	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	1.0E+00	5.0E+00	0/17	3.1E+00	1.0E+00	5.0E+00	0/4	2.0E+00	1.0E+00	5.0E+00
	Benzo[k]fluoranthene	0/5	3.4E+00	1.0E+00	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	1.0E+00	5.0E+00	0/17	3.1E+00	1.0E+00	5.0E+00	0/4	2.0E+00	1.0E+00	5.0E+00
	Chrysene	0/5	3.3E+00	7.5E-01	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	1.0E+00	5.0E+00	0/17	3.1E+00	7.5E-01	5.0E+00	0/4	2.0E+00	1.0E+00	5.0E+00
	Dibenz[a,h]anthracene	0/5	3.5E+00	1.3E+00	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	1.0E+00	5.0E+00	0/17	3.1E+00	1.0E+00	5.0E+00	0/4	2.0E+00	1.0E+00	5.0E+00
	Fluoranthene	0/5	3.4E+00	1.0E+00	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	1.0E+00	5.0E+00	0/17	3.1E+00	1.0E+00	5.0E+00	1/4	1.8E+00	1.0E-02	5.0E+00
	Fluorene	0/5	3.3E+00	7.5E-01	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	1.0E+00	5.0E+00	0/17	3.1E+00	7.5E-01	5.0E+00	0/4	2.0E+00	1.0E+00	5.0E+00
	Indeno[1,2,3-c,d]pyrene	0/5	3.4E+00	8.8E-01	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	1.0E+00	5.0E+00	0/17	3.1E+00	8.8E-01	5.0E+00	0/4	2.0E+00	1.0E+00	5.0E+00
	Naphthalene	0/7	2.5E+00	5.0E-01	5.0E+00	0/12	4.6E+00	5.0E-01	5.0E+00	0/12	4.3E+00	5.0E-01	5.0E+00	1/19	2.8E+00	1.0E-01	5.0E+00	0/5	1.7E+00	5.0E-01	5.0E+00
	Phenanthrene	0/5	3.3E+00	7.5E-01	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	1.0E+00	5.0E+00	1/17	3.0E+00	9.0E-02	5.0E+00	0/4	2.0E+00	1.0E+00	5.0E+00
	Pyrene	0/5	3.3E+00	7.5E-01	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	1.0E+00	5.0E+00	0/17	3.1E+00	7.5E-01	5.0E+00	0/4	2.0E+00	1.0E+00	5.0E+00
PCB	Aroclor-1016	na	na	na	na	0/7	2.5E-01	2.5E-01	2.5E-01	0/4	2.5E-01	2.5E-01	2.5E-01	0/5	2.5E-01	2.5E-01	2.5E-01	na	na	na	na
	Aroclor-1221	na	na	na	na	0/7	2.5E-01	2.5E-01	2.5E-01	0/4	2.5E-01	2.5E-01	2.5E-01	0/5	2.5E-01	2.5E-01	2.5E-01	na	na	na	na
	Aroclor-1232	na	na	na	na	0/7	2.5E-01	2.5E-01	2.5E-01	0/4	2.5E-01	2.5E-01	2.5E-01	0/5	2.5E-01	2.5E-01	2.5E-01	na	na	na	na
	Aroclor-1242	na	na	na	na	0/7	2.5E-01	2.5E-01	2.5E-01	0/4	2.5E-01	2.5E-01	2.5E-01	0/5	2.5E-01	2.5E-01	2.5E-01	na	na	na	na
	Aroclor-1248	na	na	na	na	0/7	2.5E-01	2.5E-01	2.5E-01	0/4	2.5E-01	2.5E-01	2.5E-01	0/5	2.5E-01	2.5E-01	2.5E-01	na	na	na	na
	Aroclor-1254	na	na	na	na	0/7	2.5E-01	2.5E-01	2.5E-01	0/4	2.5E-01	2.5E-01	2.5E-01	0/5	2.5E-01	2.5E-01	2.5E-01	na	na	na	na
	Aroclor-1260	na	na	na	na	0/7	2.5E-01	2.5E-01	2.5E-01	0/4	2.5E-01	2.5E-01	2.5E-01	0/5	2.5E-01	2.5E-01	2.5E-01	na	na	na	na
Petroleum Hydrocarbons	Diesel fuel	na	na	na	na	na	na	na	na	na	na	na	na	0/1	2.5E+02	2.5E+02	2.5E+02	na	na	na	na
	Total Petroleum Hydrocarbons (TPH)	0/2	5.0E+02	5.0E+02	5.0E+02	0/1	5.0E+02	5.0E+02	5.0E+02	0/1	5.0E+02	5.0E+02	5.0E+02	0/2	5.0E+02	5.0E+02	5.0E+02	na	na	na	na
SVOC	1,2,4-Trichlorobenzene	0/7	2.6E+00	5.0E-01	5.0E+00	0/12	4.6E+00	5.0E-01	5.0E+00	0/12	4.3E+00	5.0E-01	5.0E+00	0/19	2.8E+00	5.0E-01	5.0E+00	0/5	1.7E+00	5.0E-01	5.0E+00
	1,2-Dichlorobenzene	0/7	2.5E+00	5.0E-01	5.0E+00	0/12	4.6E+00	5.0E-01	5.0E+00	0/12	4.3E+00	5.0E-01	5.0E+00	0/19	2.8E+00	5.0E-01	5.0E+00	0/5	1.7E+00	5.0E-01	5.0E+00
	1,3-Dichlorobenzene	0/5	3.2E+00	5.0E-01	5.0E+00	0/12	4.6E+00	5.0E-01	5.0E+00	0/11	4.6E+00	5.0E-01	5.0E+00	0/11	4.2E+00	5.0E-01	5.0E+00	0/2	2.8E+00	5.0E-01	5.0E+00
	1,4-Dichlorobenzene	0/7	2.6E+00	5.0E-01	5.0E+00	0/12	4.6E+00	5.0E-01	5.0E+00	0/12	4.3E+00	5.0E-01	5.0E+00	0/19	2.8E+00	5.0E-01	5.0E+00	0/5	1.7E+00	5.0E-01	5.0E+00
	2,4,5-Trichlorophenol	0/3	5.0E+00	5.0E+00	5.0E+00	0/11	9.8E+00	5.0E+00	1.3E+01	0/10	8.0E+00	5.0E+00	1.3E+01	0/9	1.1E+01	5.0E+00	1.3E+01	0/1	5.0E+00	5.0E+00	5.0E+00
	2,4,6-Trichlorophenol	0/3	5.0E+00	5.0E+00	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/10	5.0E+00	5.0E+00	5.0E+00	0/9	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	2,4-Dichlorophenol	0/3	5.0E+00	5.0E+00	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/10	5.0E+00	5.0E+00	5.0E+00	0/9	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	2,4-Dimethylphenol	0/5	3.2E+00	5.0E-01	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	5.0E-01	5.0E+00	0/17	2.9E+00	5.0E-01	5.0E+00	0/4	1.6E+00	5.0E-01	5.0E+00
	2,4-Dinitrophenol	0/3	5.0E+00	5.0E+00	5.0E+00	0/11	9.8E+00	5.0E+00	1.3E+01	0/10	8.0E+00	5.0E+00	1.3E+01	0/9	1.1E+01	5.0E+00	1.3E+01	0/1	5.0E+00	5.0E+00	5.0E+00
	2,4-Dinitrotoluene	0/5	3.3E+00	7.5E-01	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	1.0E+00	5.0E+00	0/17	3.1E+00	7.5E-01	5.0E+00	0/4	2.0E+00	1.0E+00	5.0E+00
	2,6-Dinitrotoluene	0/5	3.2E+00	5.0E-01	5.0E+00	1/11	6.1E+00	5.0E+00	1.7E+01	0/11	4.6E+00	5.0E-01	5.0E+00	0/17	2.9E+00	5.0E-01	5.0E+00	0/4	1.6E+00	5.0E-01	5.0E+00
	2-Chlorophenol	0/3	5.0E+00	5.0E+00	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/10	5.0E+00	5.0E+00	5.0E+00	0/9	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	2-Methylphenol (o-Cresol)	0/5	3.3E+00	7.5E-01	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	1.0E+00	5.0E+00	0/17	3.1E+00	7.5E-01	5.0E+00	0/4	2.0E+00	1.0E+00	5.0E+00
	2-Nitroaniline	0/3	5.0E+00	5.0E+00	5.0E+00	0/11	9.8E+00	5.0E+00	1.3E+01	0/10	8.0E+00	5.0E+00	1.3E+01	0/9	1.1E+01	5.0E+00	1.3E+01	0/1	5.0E+00	5.0E+00	5.0E+00
	2-Nitrophenol	0/3	5.0E+00	5.0E+00	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/10	5.0E+00	5.0E+00	5.0E+00	0/9	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	3,3'-Dichlorobenzidine	0/5	3.5E+00	1.3E+00	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	1.0E+00	5.0E+00	0/17	3.1E+00	1.0E+00	5.0E+00	0/4	2.0E+00	1.0E+00	5.0E+00
	3-Nitroaniline	0/3	5.0E+00	5.0E+00	5.0E+00	0/11	9.8E+00	5.0E+00	1.3E+01	0/10	8.0E+00	5.0E+00	1.3E+01	0/9	1.1E+01	5.0E+00	1.3E+01	0/1	5.0E+00	5.0E+00	5.0E+00
	4,6-Dinitro-o-cresol	0/5	5.0E+00	5.0E+00	5.0E+00	0/11	9.8E+00	5.0E+00	1.3E+01	0/11	7.7E+00	5.0E+00	1.3E+01	0/17	8.1E+00	5.0E+00	1.3E+01	0/4	5.0E+00	5.0E+00	5.0E+00
	4-Bromophenyl-phenylether	0/3	5.0E+00	5.0E+00	5.0E+00	0/4	5.0E+00	5.0E+00	5.0E+00	0/6	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	4-Chloro-3-Methylphenol	0/3	5.0E+00	5.0E+00	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/10	5.0E+00	5.0E+00	5.0E+00	0/9	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	4-Chloroaniline	0/3	5.0E+00	5.0E+00	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/10	5.0E+00	5.0E+00	5.0E+00	0/9	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	4-Chlorophenyl-phenylether	0/3	5.0E+00	5.0E+00	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/10	5.0E+00	5.0E+00	5.0E+00	0/9	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	4-Methylphenol (p-Cresol)	0/5	3.2E+00	5.0E-01	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	5.0E-01	5.0E+00	0/17	2.9E+00	5.0E-01	5.0E+00	0/4	1.6E+00	5.0E-01	5.0E+00
	4-Nitroaniline	0/3	5.0E+00	5.0E+00	5.0E+00	0/11	9.8E+00	5.0E+00	1.3E+01	0/10	8.0E+00	5.0E+00	1.3E+01	0/9	1.1E+01	5.0E+00	1.3E+01	0/1	5.0E+00	5.0E+00	5.0E+00
	4-Nitrophenol	0/3	5.0E+00	5.0E+00	5.0E+00	0/11	9.8E+00	5.0E+00	1.3E+01	0/10	8.0E+00	5.0E+00	1.3E+01	0/9	1.1E+01	5.0E+00	1.3E+01	0/1	5.0E+00	5.0E+00	5.0E+00
	Benzyl alcohol	0/3	5.0E+00	5.0E+00	5.0E+00	0/4	5.0E+00	5.0E+00	5.0E+00	0/6	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	bis(2-Chloroethoxy)methane	0/3	5.0E+00	5.0E+00	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/10	5.0E+00	5.0E+00	5.0E+00	0/9	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	bis(2-Chloroethyl)ether	0/5	3.3E+00	7.5E-01	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	1.0E+00	5.0E+00	0/17	3.1E+00	7.5E-01	5.0E+00	0/4	2.0E+00	1.0E+00	5.0E+00
	bis(2-Chloroisopropyl)ether	0/3	5.0E+00	5.0E+00	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/10	5.0E+00	5.0E+00	5.0E+00	0/9	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	bis(2-Ethylhexyl)phthalate	0/5	3.5E+00	1.3E+00	5.0E+00	1/11	4.6E+00	1.1E+00	5.0E+00	0/11	4.6E+00	1.0E-01	5.0E+00	3/17	2.4E+00	1.0E-01	5.0E+00	0/4	1.4E+00	1.0E-01	5.0E+00
	bis(n-octyl)phthalate	0/5	3.5E+00	1.3E+00	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	1.0E+00	5.0E+00	0/17	3.1E+00	1.0E+00	5.0E+00	0/4	2.0E+00	1.0E+00	5.0E+00
	Butylbenzylphthalate	0/5	3.5E+00	1.3E+00	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	2.0E-01	5.0E+00	0/17	2.9E+00	5.0E-02	5.0E+00	0/4	1.7E+00	4.5E-01	5.0E+00
	Carbazole	0/5	4.3E+00	3.1E+00	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.8E+00	3.0E+00	5.0E+00	0/17	4.1E+00	3.0E+00	5.0E+00	0/4	3.5E+00	3.0E+00	5.0E+00
	Dibenzofuran	0/3	5.0E+00	5.0E+00	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/10	5.0E+00	5.0E+00	5.0E+00	0/9	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	Dibutylphthalate	0/5	4.5E+00	1.0E+00	6.5E+00	2/11	4.7E+00	3.0E+00	5.0E+00	1/11	4.6E+00	2.5E-01	5.7E+00	1/17	2.7E+00	2.5E-01	5.0E+00	0/4	1.5E+00	2.0E-01	5.0E+00

Appendix A-1
Summary Statistics for Analytes in Site Surface Waters (ug/L)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Type	Analyte	Weber River - Reach A				Weber River - Reach B				Weber River - Reach C				Weber River - Reach D				Buena Ventura Park Pond			
		DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max
	Diethylphthalate	0/5	3.3E+00	7.5E-01	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	2.0E-01	5.0E+00	0/17	2.8E+00	5.0E-02	5.0E+00	0/4	1.4E+00	1.5E-01	5.0E+00
	Dimethylphthalate	0/3	5.0E+00	5.0E+00	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/10	5.0E+00	5.0E+00	5.0E+00	0/9	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	Hexachlorobenzene	0/5	3.3E+00	7.5E-01	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	1.0E+00	5.0E+00	0/17	3.1E+00	7.5E-01	5.0E+00	0/4	2.0E+00	1.0E+00	5.0E+00
	Hexachlorobutadiene	0/7	2.6E+00	5.0E-01	5.0E+00	0/12	4.6E+00	5.0E-01	5.0E+00	0/12	4.3E+00	5.0E-01	5.0E+00	0/19	2.8E+00	5.0E-01	5.0E+00	0/5	1.7E+00	5.0E-01	5.0E+00
	Hexachlorocyclopentadiene	0/3	5.0E+00	5.0E+00	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/10	5.0E+00	5.0E+00	5.0E+00	0/9	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	Hexachloroethane	0/5	3.4E+00	1.0E+00	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	1.0E+00	5.0E+00	0/17	3.1E+00	1.0E+00	5.0E+00	0/4	2.0E+00	1.0E+00	5.0E+00
	Isophorone	0/3	5.0E+00	5.0E+00	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/10	5.0E+00	5.0E+00	5.0E+00	0/9	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	Nitrobenzene	0/5	3.3E+00	7.5E-01	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	1.0E+00	5.0E+00	0/17	3.1E+00	7.5E-01	5.0E+00	0/4	2.0E+00	1.0E+00	5.0E+00
	N-Nitrosodiphenylamine	0/3	5.0E+00	5.0E+00	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/10	5.0E+00	5.0E+00	5.0E+00	0/9	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	n-Nitrosodipropylamine	0/5	3.3E+00	7.5E-01	5.0E+00	0/11	5.0E+00	5.0E+00	5.0E+00	0/11	4.6E+00	1.0E+00	5.0E+00	0/17	3.1E+00	7.5E-01	5.0E+00	0/4	2.0E+00	1.0E+00	5.0E+00
	Pentachlorophenol (PCP)	0/5	3.4E+00	8.8E-01	5.0E+00	0/11	9.8E+00	5.0E+00	1.3E+01	0/11	7.4E+00	1.0E+00	1.3E+01	1/17	6.2E+00	8.8E-01	1.3E+01	0/4	2.0E+00	1.0E+00	5.0E+00
	Phenol	0/5	3.2E+00	5.0E-01	5.0E+00	2/11	4.7E+00	1.4E+00	5.0E+00	1/11	4.2E+00	5.0E-01	5.0E+00	0/17	2.9E+00	5.0E-01	5.0E+00	0/4	1.6E+00	5.0E-01	5.0E+00
	1,1,1,2-Tetrachloroethane	0/2	5.0E-01	5.0E-01	5.0E-01	0/14	4.7E+00	5.0E-01	5.0E+00	0/5	4.1E+00	5.0E-01	5.0E+00	0/12	4.3E+00	5.0E-01	5.0E+00	0/1	5.0E-01	5.0E-01	5.0E-01
	1,1,1-Trichloroethane	0/5	5.0E-01	5.0E-01	5.0E-01	0/17	2.0E+00	5.0E-01	2.5E+00	0/11	1.2E+00	5.0E-01	2.5E+00	0/20	1.5E+00	5.0E-01	2.5E+00	0/4	5.0E-01	5.0E-01	5.0E-01
	1,1,2,2-Tetrachloroethane	0/5	5.0E-01	5.0E-01	5.0E-01	0/17	2.0E+00	5.0E-01	2.5E+00	0/11	1.2E+00	5.0E-01	2.5E+00	0/20	1.5E+00	5.0E-01	2.5E+00	0/4	5.0E-01	5.0E-01	5.0E-01
	1,1,2-Trichloroethane	0/5	5.0E-01	5.0E-01	5.0E-01	0/17	2.0E+00	5.0E-01	2.5E+00	0/11	1.2E+00	5.0E-01	2.5E+00	0/20	1.5E+00	5.0E-01	2.5E+00	0/4	5.0E-01	5.0E-01	5.0E-01
	1,1-Dichloroethane	0/5	5.0E-01	5.0E-01	5.0E-01	0/17	2.0E+00	5.0E-01	2.5E+00	0/11	1.2E+00	5.0E-01	2.5E+00	0/20	1.5E+00	5.0E-01	2.5E+00	0/4	5.0E-01	5.0E-01	5.0E-01
	1,1-Dichloroethene	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01
	1,1-Dichloropropene	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01
	1,2,3-Trichlorobenzene	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01
	1,2,3-Trichloropropane	0/5	1.1E+00	5.0E-01	1.5E+00	0/17	4.1E+00	5.0E-01	5.0E+00	0/11	2.7E+00	5.0E-01	5.0E+00	0/20	3.2E+00	5.0E-01	5.0E+00	0/4	1.3E+00	5.0E-01	1.5E+00
	1,2,4-Trimethylbenzene	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01
	1,2-Dibromo-3-chloropropane (DBCP)	0/2	5.0E-01	5.0E-01	5.0E-01	1/14	4.4E+00	5.0E-01	5.0E+00	0/5	4.1E+00	5.0E-01	5.0E+00	0/12	4.3E+00	5.0E-01	5.0E+00	0/1	5.0E-01	5.0E-01	5.0E-01
	1,2-Dichloroethane	0/5	5.0E-01	5.0E-01	5.0E-01	0/17	2.0E+00	5.0E-01	2.5E+00	0/11	1.2E+00	5.0E-01	2.5E+00	0/20	1.5E+00	5.0E-01	2.5E+00	0/4	5.0E-01	5.0E-01	5.0E-01
	1,2-Dichloroethene	0/3	1.0E+00	1.0E+00	1.0E+00	0/16	2.2E+00	1.0E+00	2.5E+00	0/10	1.6E+00	1.0E+00	2.5E+00	0/18	1.8E+00	1.0E+00	2.5E+00	0/3	1.0E+00	1.0E+00	1.0E+00
	1,2-Dichloropropane	0/5	5.0E-01	5.0E-01	5.0E-01	0/17	2.0E+00	5.0E-01	2.5E+00	0/11	1.2E+00	5.0E-01	2.5E+00	0/20	1.5E+00	5.0E-01	2.5E+00	0/4	5.0E-01	5.0E-01	5.0E-01
	1,3,5-Trimethylbenzene	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01
	1,3-Dichloropropane	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01
	1,4-Dioxane	na	na	na	na	0/13	1.5E+02	1.5E+02	1.5E+02	0/4	1.5E+02	1.5E+02	1.5E+02	0/10	1.5E+02	1.5E+02	1.5E+02	na	na	na	na
	2,2-Dichloropropane	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01
	2-Chloro-1,3-butadiene (Chloroprene)	na	na	na	na	0/13	5.0E+00	5.0E+00	5.0E+00	0/4	5.0E+00	5.0E+00	5.0E+00	0/10	5.0E+00	5.0E+00	5.0E+00	na	na	na	na
	2-Chloroethyl vinyl ether	na	na	na	na	0/13	5.0E+00	5.0E+00	5.0E+00	0/4	5.0E+00	5.0E+00	5.0E+00	0/10	5.0E+00	5.0E+00	5.0E+00	0/3	1.0E+00	1.0E+00	1.0E+00
	2-Chlorotoluene	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01
	2-Hexanone	0/4	1.8E+00	1.0E+00	2.5E+00	0/15	4.6E+00	1.0E+00	5.0E+00	0/5	4.2E+00	1.0E+00	5.0E+00	0/12	4.3E+00	1.0E+00	5.0E+00	0/4	2.1E+00	1.0E+00	2.5E+00
	3-Chloropropene (Allyl Chloride)	na	na	na	na	0/13	5.0E+00	5.0E+00	5.0E+00	0/4	5.0E+00	5.0E+00	5.0E+00	0/10	5.0E+00	5.0E+00	5.0E+00	na	na	na	na
	4-Chlorotoluene	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01
	Acetone	1/5	2.7E+00	1.8E+00	4.0E+00	6/17	1.2E+02	1.8E+00	1.9E+03	1/11	3.4E+00	2.5E+00	5.0E+00	4/20	2.8E+02	1.8E+00	4.0E+03	0/1	4.0E+00	4.0E+00	4.0E+00
	Acetonitrile	0/3	2.5E+00	2.5E+00	2.5E+00	0/16	2.1E+01	2.5E+00	2.5E+01	0/10	1.2E+01	2.5E+00	2.5E+01	0/18	1.5E+01	2.5E+00	2.5E+01	0/3	2.5E+00	2.5E+00	2.5E+00
	Acrolein	na	na	na	na	0/13	5.0E+01	5.0E+01	5.0E+01	0/4	5.0E+01	5.0E+01	5.0E+01	0/10	5.0E+01	5.0E+01	5.0E+01	na	na	na	na
	Acrylonitrile	na	na	na	na	0/13	2.5E+01	2.5E+01	2.5E+01	0/4	2.5E+01	2.5E+01	2.5E+01	0/10	2.5E+01	2.5E+01	2.5E+01	0/3	2.5E+00	2.5E+00	2.5E+00
	Benzene	0/5	5.0E-01	5.0E-01	5.0E-01	0/17	2.0E+00	5.0E-01	2.5E+00	0/11	1.2E+00	5.0E-01	2.5E+00	0/20	1.5E+00	5.0E-01	2.5E+00	0/4	5.0E-01	5.0E-01	5.0E-01
	Bromobenzene	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01
	Bromodichloromethane	0/5	5.0E-01	5.0E-01	5.0E-01	0/17	2.0E+00	5.0E-01	2.5E+00	0/11	1.2E+00	5.0E-01	2.5E+00	0/20	1.5E+00	5.0E-01	2.5E+00	0/4	5.0E-01	5.0E-01	5.0E-01
	Bromoform	0/5	5.0E-01	5.0E-01	5.0E-01	0/17	2.0E+00	5.0E-01	2.5E+00	0/11	1.2E+00	5.0E-01	2.5E+00	0/20	1.5E+00	5.0E-01	2.5E+00	0/4	5.0E-01	5.0E-01	5.0E-01
	Bromomethane (Methyl bromide)	0/5	7.0E-01	5.0E-01	1.0E+00	0/17	4.0E+00	5.0E-01	5.0E+00	0/11	2.2E+00	5.0E-01	5.0E+00	0/20	2.8E+00	5.0E-01	5.0E+00	0/4	6.3E-01	5.0E-01	1.0E+00
	Carbon Disulfide	0/5	5.0E-01	5.0E-01	5.0E-01	1/17	2.0E+00	5.0E-01	2.5E+00	0/11	1.2E+00	5.0E-01	2.5E+00	0/20	1.5E+00	5.0E-01	2.5E+00	0/4	5.0E-01	5.0E-01	5.0E-01
	Carbon Tetrachloride	0/5	5.0E-01	5.0E-01	5.0E-01	0/17	2.0E+00	5.0E-01	2.5E+00	0/11	1.2E+00	5.0E-01	2.5E+00	0/20	1.5E+00	5.0E-01	2.5E+00	0/4	5.0E-01	5.0E-01	5.0E-01
	Chlorobenzene	0/5	5.0E-01	5.0E-01	5.0E-01	0/17	2.0E+00	5.0E-01	2.5E+00	0/11	1.2E+00	5.0E-01	2.5E+00	0/20	1.5E+00	5.0E-01	2.5E+00	0/4	5.0E-01	5.0E-01	5.0E-01
VOC	Chlorodibromomethane	0/5	5.0E-01	5.0E-01	5.0E-01	0/17	2.0E+00	5.0E-01	2.5E+00	0/11	1.2E+00	5.0E-01	2.5E+00	0/20	1.5E+00	5.0E-01	2.5E+00	0/4	5.0E-01	5.0E-01	5.0E-01
	Chloroethane (Ethyl chloride)	0/5	5.0E-01	5.0E-01	5.0E-01	0/17	3.9E+00	5.0E-01	5.0E+00	0/11	2.1E+00	5.0E-01	5.0E+00	0/20	2.8E+00	5.0E-01	5.0E+00	0/4	5.0E-01	5.0E-01	5.0E-01
	Chloroform	0/5	5.0E-01	5.0E-01	5.0E-01	0/17	2.0E+00	5.0E-01	2.5E+00	0/11	1.2E+00	5.0E-01	2.5E+00	0/20	1.5E+00	5.0E-01	2.5E+00	0/4	5.0E-01	5.0E-01	5.0E-01
	Chloromethane (Methyl chloride)	0/5	8.0E-01	5.0E-01	1.0E+00	0/17	4.0E+00	5.0E-01	5.0E+00	0/11	2.4E+00	5.0E-01	5.0E+00	0/20	2.9E+00	5.0E-01	5.0E+00	0/4	5.0E-01	5.0E-01	5.0E-01
	cis-1,2-Dichloroethene	0/3	5.0E-01	5.0E-01	5.0E-01	0/3	5.0E-01	5.0E-01	5.0E-01	0/6	5.0E-01	5.0E-01	5.0E-01	0/8	5.0E-01	5.0E-01	5.0E-01	0/3	5.0E-01	5.0E-01	5.0E-01
	cis-1,3-Dichloropropene	0/7	5.0E-01	5.0E-01	5.0E-01	0/18	1.9E+00	5.0E-01	2.5E+00	0/12	1.2E+00	5.0E-01	2.5E+00	0/22	1.4E+00	5.0E-01	2.5E+00	0/5	5.0E-01	5.0E-01	5.0E-01

Appendix A-1
Summary Statistics for Analytes in Site Surface Waters (ug/L)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Type	Analyte	Weber River - Reach A				Weber River - Reach B				Weber River - Reach C				Weber River - Reach D				Buena Ventura Park Pond			
		DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max
	Dibromomethane	0/2	5.0E-01	5.0E-01	5.0E-01	0/14	4.7E+00	5.0E-01	5.0E+00	0/5	4.1E+00	5.0E-01	5.0E+00	0/12	4.3E+00	5.0E-01	5.0E+00	0/1	5.0E-01	5.0E-01	5.0E-01
	Dichlorodifluoromethane	0/2	5.0E-01	5.0E-01	5.0E-01	0/14	4.7E+00	5.0E-01	5.0E+00	0/5	4.1E+00	5.0E-01	5.0E+00	0/12	4.3E+00	5.0E-01	5.0E+00	0/1	5.0E-01	5.0E-01	5.0E-01
	Dichloromethane	0/5	5.0E-01	5.0E-01	5.0E-01	12/17	6.0E+02	5.0E-01	5.8E+03	3/11	1.0E+00	5.0E-01	2.5E+00	7/20	4.9E+02	5.0E-01	5.6E+03	0/4	5.0E-01	5.0E-01	5.0E-01
	Ethyl Methacrylate	na	na	na	na	0/13	2.5E+01	2.5E+01	2.5E+01	0/4	2.5E+01	2.5E+01	2.5E+01	0/10	2.5E+01	2.5E+01	2.5E+01	na	na	na	na
	Ethylbenzene	0/5	5.0E-01	5.0E-01	5.0E-01	1/17	1.9E+00	5.0E-01	2.5E+00	0/11	1.2E+00	5.0E-01	2.5E+00	0/20	1.5E+00	5.0E-01	2.5E+00	0/4	5.0E-01	5.0E-01	5.0E-01
	Ethylene dibromide (EDB)	0/5	5.0E-01	5.0E-01	5.0E-01	0/17	3.9E+00	5.0E-01	5.0E+00	0/11	2.1E+00	5.0E-01	5.0E+00	0/20	2.8E+00	5.0E-01	5.0E+00	0/4	5.0E-01	5.0E-01	5.0E-01
	Hexane	0/3	5.0E-01	5.0E-01	5.0E-01	0/3	5.0E-01	5.0E-01	5.0E-01	0/6	5.0E-01	5.0E-01	5.0E-01	0/8	5.0E-01	5.0E-01	5.0E-01	0/3	5.0E-01	5.0E-01	5.0E-01
	Iodomethane	na	na	na	na	0/13	5.0E+00	5.0E+00	5.0E+00	0/4	5.0E+00	5.0E+00	5.0E+00	0/10	5.0E+00	5.0E+00	5.0E+00	na	na	na	na
	Isobutyl Alcohol	na	na	na	na	0/13	5.0E+01	5.0E+01	5.0E+01	0/4	5.0E+01	5.0E+01	5.0E+01	0/10	5.0E+01	5.0E+01	5.0E+01	na	na	na	na
	Isopropylbenzene	0/4	5.0E-01	5.0E-01	5.0E-01	0/2	5.0E-01	5.0E-01	5.0E-01	0/2	5.0E-01	5.0E-01	5.0E-01	0/4	5.0E-01	5.0E-01	5.0E-01	0/2	5.0E-01	5.0E-01	5.0E-01
	Methacrylonitrile	0/3	1.0E+00	1.0E+00	1.0E+00	0/16	4.3E+00	1.0E+00	5.0E+00	0/10	2.6E+00	1.0E+00	5.0E+00	0/18	3.2E+00	1.0E+00	5.0E+00	0/3	1.0E+00	1.0E+00	1.0E+00
	Methyl ethyl ketone (MEK)	0/5	2.3E+00	2.0E+00	2.5E+00	1/17	4.2E+00	2.0E+00	5.0E+00	0/11	3.4E+00	2.0E+00	5.0E+00	0/20	3.7E+00	2.0E+00	5.0E+00	0/1	2.0E+00	2.0E+00	2.0E+00
	Methyl isobutyl ketone (MIBK)	0/5	1.9E+00	1.0E+00	2.5E+00	1/17	4.1E+00	1.0E+00	5.0E+00	0/11	3.3E+00	1.0E+00	5.0E+00	0/20	3.6E+00	1.0E+00	5.0E+00	0/4	2.1E+00	1.0E+00	2.5E+00
	Methyl Methacrylate	na	na	na	na	0/13	5.0E+00	5.0E+00	5.0E+00	0/4	5.0E+00	5.0E+00	5.0E+00	0/10	5.0E+00	5.0E+00	5.0E+00	na	na	na	na
	Methyl-t-butyl ether (MTBE)	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01
	n-Butylbenzene	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01
	n-Propylbenzene	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01
	o-Xylene	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01
	sec-Butylbenzene	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01
	Styrene	0/5	5.0E-01	5.0E-01	5.0E-01	0/17	2.0E+00	5.0E-01	2.5E+00	0/11	1.2E+00	5.0E-01	2.5E+00	0/20	1.5E+00	5.0E-01	2.5E+00	0/4	5.0E-01	5.0E-01	5.0E-01
	tert-Butylbenzene	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01
	Tetrachloroethene	0/5	5.0E-01	5.0E-01	5.0E-01	0/17	2.0E+00	5.0E-01	2.5E+00	0/11	1.2E+00	5.0E-01	2.5E+00	0/20	1.5E+00	5.0E-01	2.5E+00	0/4	5.0E-01	5.0E-01	5.0E-01
	Toluene	0/5	5.0E-01	5.0E-01	5.0E-01	0/17	2.0E+00	5.0E-01	2.5E+00	0/11	1.2E+00	5.0E-01	2.5E+00	0/20	1.5E+00	5.0E-01	2.5E+00	0/4	5.0E-01	5.0E-01	5.0E-01
	trans-1,2-Dichloroethene	0/5	5.0E-01	5.0E-01	5.0E-01	0/4	5.0E-01	5.0E-01	5.0E-01	0/7	5.0E-01	5.0E-01	5.0E-01	0/10	5.0E-01	5.0E-01	5.0E-01	0/4	5.0E-01	5.0E-01	5.0E-01
	trans-1,3-Dichloropropene	0/5	5.0E-01	5.0E-01	5.0E-01	0/17	2.0E+00	5.0E-01	2.5E+00	0/11	1.2E+00	5.0E-01	2.5E+00	0/20	1.5E+00	5.0E-01	2.5E+00	0/4	5.0E-01	5.0E-01	5.0E-01
	trans-1,4-Dichloro-2-Butene	na	na	na	na	0/13	5.0E+00	5.0E+00	5.0E+00	0/4	5.0E+00	5.0E+00	5.0E+00	0/10	5.0E+00	5.0E+00	5.0E+00	na	na	na	na
	Trichloroethene	0/5	5.0E-01	5.0E-01	5.0E-01	0/17	2.0E+00	5.0E-01	2.5E+00	0/11	1.2E+00	5.0E-01	2.5E+00	0/20	1.5E+00	5.0E-01	2.5E+00	0/4	5.0E-01	5.0E-01	5.0E-01
	Trichlorofluoromethane	0/5	5.0E-01	5.0E-01	5.0E-01	0/17	3.9E+00	5.0E-01	5.0E+00	0/11	2.1E+00	5.0E-01	5.0E+00	0/20	2.8E+00	5.0E-01	5.0E+00	0/4	5.0E-01	5.0E-01	5.0E-01
	Vinyl Acetate	0/3	5.0E-01	5.0E-01	5.0E-01	0/16	4.2E+00	5.0E-01	5.0E+00	0/10	2.3E+00	5.0E-01	5.0E+00	0/18	3.0E+00	5.0E-01	5.0E+00	0/3	5.0E-01	5.0E-01	5.0E-01
	Vinyl Chloride	0/5	5.0E-01	5.0E-01	5.0E-01	0/17	3.9E+00	5.0E-01	5.0E+00	0/11	2.1E+00	5.0E-01	5.0E+00	0/20	2.8E+00	5.0E-01	5.0E+00	0/4	5.0E-01	5.0E-01	5.0E-01
	Xylenes (Total)	0/3	1.5E+00	1.5E+00	1.5E+00	0/16	2.3E+00	1.5E+00	2.5E+00	0/10	1.9E+00	1.5E+00	2.5E+00	0/18	2.1E+00	1.5E+00	2.5E+00	0/3	1.5E+00	1.5E+00	1.5E+00
	Xylenes-p,m	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01	0/2	5.0E-01	5.0E-01	5.0E-01	0/1	5.0E-01	5.0E-01	5.0E-01

Appendix A-1
Summary Statistics for Analytes in Site Surface Waters (ug/L)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Type	Analyte	21st Street Pond				Ogden River - Reach A				Ogden River - Reach B				Ogden River - Reach C			
		DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max
Metals	Aluminum	13/16	2.0E+02	2.2E+01	8.4E+02	na	na	na	na	4/4	3.9E+02	1.8E+02	7.7E+02	na	na	na	na
	Antimony	0/16	1.6E+00	1.1E+00	1.7E+00	na	na	na	na	0/4	1.5E+00	1.1E+00	1.7E+00	na	na	na	na
	Arsenic	0/16	4.5E+00	1.1E+00	4.8E+00	na	na	na	na	0/5	3.3E+00	1.0E+00	4.8E+00	na	na	na	na
	Barium	16/16	4.4E+01	3.4E+01	6.7E+01	na	na	na	na	5/5	4.6E+01	3.8E+01	5.8E+01	na	na	na	na
	Beryllium	0/16	1.5E-01	9.0E-02	1.0E+00	na	na	na	na	0/4	3.2E-01	9.0E-02	1.0E+00	na	na	na	na
	Cadmium	13/16	9.6E-01	1.4E-01	2.9E+00	na	na	na	na	3/5	1.2E+00	5.0E-01	2.5E+00	na	na	na	na
	Calcium	16/16	4.0E+04	3.5E+04	5.7E+04	na	na	na	na	4/4	4.1E+04	4.0E+04	4.2E+04	na	na	na	na
	Chromium	13/16	1.5E+00	2.7E-01	7.4E+00	na	na	na	na	3/5	2.3E+00	7.0E-01	5.0E+00	na	na	na	na
	Cobalt	0/16	8.8E-01	6.0E-01	5.0E+00	na	na	na	na	0/4	1.7E+00	6.0E-01	5.0E+00	na	na	na	na
	Copper	15/16	3.0E+00	1.6E+00	5.0E+00	na	na	na	na	3/4	4.2E+00	2.1E+00	6.3E+00	na	na	na	na
	Iron	16/16	4.0E+02	2.2E+02	7.0E+02	na	na	na	na	4/4	4.4E+02	2.8E+02	5.6E+02	na	na	na	na
	Lead	2/16	2.7E+00	9.5E-01	2.7E+01	na	na	na	na	2/5	1.9E+00	9.5E-01	4.7E+00	na	na	na	na
	Magnesium	16/16	1.4E+04	1.2E+04	1.9E+04	na	na	na	na	4/4	1.1E+04	1.0E+04	1.1E+04	na	na	na	na
	Manganese	16/16	7.8E+01	4.2E+01	1.0E+02	na	na	na	na	4/4	4.7E+01	3.8E+01	5.7E+01	na	na	na	na
	Mercury	0/16	3.4E-02	3.0E-02	1.0E-01	na	na	na	na	0/5	5.4E-01	3.0E-02	2.5E+00	na	na	na	na
	Nickel	15/16	1.5E+01	1.7E+00	2.0E+02	na	na	na	na	3/4	3.0E+00	1.8E+00	5.0E+00	na	na	na	na
	Potassium	16/16	4.6E+03	3.3E+03	8.5E+03	na	na	na	na	4/4	2.5E+03	2.1E+03	2.8E+03	na	na	na	na
	Selenium	2/16	2.1E+00	1.1E+00	5.2E+00	na	na	na	na	1/5	2.3E+00	1.1E+00	4.3E+00	na	na	na	na
	Silver	7/16	9.2E-01	5.0E-01	2.5E+00	na	na	na	na	1/5	1.9E+00	5.0E-01	5.0E+00	na	na	na	na
	Sodium	16/16	3.0E+04	2.1E+04	5.6E+04	na	na	na	na	4/4	1.5E+04	1.4E+04	1.7E+04	na	na	na	na
	Thallium	0/16	4.6E+00	1.1E+00	4.9E+00	na	na	na	na	0/4	3.9E+00	1.1E+00	4.9E+00	na	na	na	na
	Vanadium	0/16	2.4E+00	2.2E+00	5.0E+00	na	na	na	na	0/4	2.9E+00	2.2E+00	5.0E+00	na	na	na	na
	Zinc	2/16	1.8E+02	4.5E+00	2.8E+03	na	na	na	na	1/4	6.2E+00	4.5E+00	1.1E+01	na	na	na	na
Pesticides	4,4'-DDD	na	na	na	na	na	na	na	na	0/1	5.0E-02	5.0E-02	5.0E-02	na	na	na	na
	4,4'-DDE	na	na	na	na	na	na	na	na	0/1	5.0E-02	5.0E-02	5.0E-02	na	na	na	na
	4,4'-DDT	na	na	na	na	na	na	na	na	0/1	5.0E-02	5.0E-02	5.0E-02	na	na	na	na
	Aldrin	na	na	na	na	na	na	na	na	0/1	2.5E-02	2.5E-02	2.5E-02	na	na	na	na
	alpha-BHC	na	na	na	na	na	na	na	na	0/1	2.5E-02	2.5E-02	2.5E-02	na	na	na	na
	beta-BHC	na	na	na	na	na	na	na	na	0/1	2.5E-02	2.5E-02	2.5E-02	na	na	na	na
	Chlordane	na	na	na	na	na	na	na	na	0/1	2.5E-01	2.5E-01	2.5E-01	na	na	na	na
	delta-BHC	na	na	na	na	na	na	na	na	0/1	2.5E-02	2.5E-02	2.5E-02	na	na	na	na
	Dieldrin	na	na	na	na	na	na	na	na	0/1	5.0E-02	5.0E-02	5.0E-02	na	na	na	na
	Endosulfan I	na	na	na	na	na	na	na	na	0/1	2.5E-02	2.5E-02	2.5E-02	na	na	na	na
	Endosulfan II	na	na	na	na	na	na	na	na	0/1	5.0E-02	5.0E-02	5.0E-02	na	na	na	na
	Endosulfan Sulfate	na	na	na	na	na	na	na	na	0/1	5.0E-02	5.0E-02	5.0E-02	na	na	na	na
	Endrin	na	na	na	na	na	na	na	na	0/1	5.0E-02	5.0E-02	5.0E-02	na	na	na	na
	Endrin Aldehyde	na	na	na	na	na	na	na	na	0/1	5.0E-02	5.0E-02	5.0E-02	na	na	na	na
	gamma-BHC (Lindane)	na	na	na	na	na	na	na	na	0/1	2.5E-02	2.5E-02	2.5E-02	na	na	na	na
	Heptachlor	na	na	na	na	na	na	na	na	0/1	2.5E-02	2.5E-02	2.5E-02	na	na	na	na
	Heptachlor Epoxide	na	na	na	na	na	na	na	na	0/1	2.5E-02	2.5E-02	2.5E-02	na	na	na	na
	Isodrin	na	na	na	na	na	na	na	na	0/1	2.5E-02	2.5E-02	2.5E-02	na	na	na	na
	Kepone	na	na	na	na	na	na	na	na	0/1	5.0E-02	5.0E-02	5.0E-02	na	na	na	na
	Methoxychlor	na	na	na	na	na	na	na	na	0/1	2.5E-01	2.5E-01	2.5E-01	na	na	na	na
	Toxaphene	na	na	na	na	na	na	na	na	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na
	2-Chloronaphthalene	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na
	1-Methylnaphthalene	0/15	1.0E+00	1.0E+00	1.0E+00	na	na	na	na	0/3	1.0E+00	1.0E+00	1.0E+00	na	na	na	na
	2-Methylnaphthalene	2/21	1.2E+01	5.0E-01	2.1E+02	na	na	na	na	0/5	2.6E+00	1.0E+00	5.0E+00	na	na	na	na
	Acenaphthene	7/21	9.5E+00	2.0E-01	1.6E+02	na	na	na	na	0/8	1.8E+00	5.0E-01	5.0E+00	na	na	na	na
	Acenaphthylene	3/21	1.4E+00	1.0E-01	1.0E+01	na	na	na	na	0/8	1.6E+00	5.0E-01	5.0E+00	na	na	na	na
	Aniline	0/19	8.9E-01	5.0E-01	1.0E+00	na	na	na	na	0/3	1.0E+00	1.0E+00	1.0E+00	na	na	na	na
	Anthracene	2/21	2.1E+00	8.0E-01	1.6E+01	na	na	na	na	0/8	2.0E+00	1.0E+00	5.0E+00	na	na	na	na
	Benzo[a]anthracene	2/21	1.3E+00	9.0E-02	5.0E+00	na	na	na	na	0/8	2.0E+00	1.0E+00	5.0E+00	na	na	na	na
	Benzo[a]pyrene	2/21	1.2E+00	1.0E-01	5.0E+00	na	na	na	na	0/8	1.8E+00	5.0E-01	5.0E+00	na	na	na	na
.Hs	Benzo[b]fluoranthene	1/21	1.3E+00	1.0E-01	5.0E+00	na	na	na	na	0/8	2.0E+00	1.0E+00	5.0E+00	na	na	na	na

Appendix A-1
Summary Statistics for Analytes in Site Surface Waters (ug/L)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Type	Analyte	21st Street Pond				Ogden River - Reach A				Ogden River - Reach B				Ogden River - Reach C			
		DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max
PA	Benzo[g,h,i]perylene	0/21	1.4E+00	1.0E+00	5.0E+00	na	na	na	na	0/8	2.0E+00	1.0E+00	5.0E+00	na	na	na	na
	Benzo[k]fluoranthene	2/21	1.3E+00	1.0E-01	5.0E+00	na	na	na	na	0/8	2.0E+00	1.0E+00	5.0E+00	na	na	na	na
	Chrysene	2/21	1.3E+00	2.0E-01	5.0E+00	na	na	na	na	0/8	1.8E+00	5.0E-01	5.0E+00	na	na	na	na
	Dibenz[a,h]anthracene	0/21	1.4E+00	1.0E+00	5.0E+00	na	na	na	na	0/8	2.0E+00	1.0E+00	5.0E+00	na	na	na	na
	Fluoranthene	5/21	1.5E+00	7.0E-02	6.0E+00	na	na	na	na	0/8	2.0E+00	1.0E+00	5.0E+00	na	na	na	na
	Fluorene	2/21	4.4E+00	5.0E-01	6.2E+01	na	na	na	na	0/8	1.8E+00	5.0E-01	5.0E+00	na	na	na	na
	Indeno[1,2,3-c,d]pyrene	1/21	1.4E+00	1.0E+00	5.0E+00	na	na	na	na	0/8	2.0E+00	1.0E+00	5.0E+00	na	na	na	na
	Naphthalene	3/22	2.7E+01	2.0E-01	5.2E+02	na	na	na	na	0/9	1.8E+00	5.0E-01	5.0E+00	na	na	na	na
	Phenanthrene	3/21	5.5E+00	2.0E-01	8.4E+01	na	na	na	na	0/8	1.8E+00	5.0E-01	5.0E+00	na	na	na	na
	Pyrene	5/21	1.7E+00	8.0E-02	1.0E+01	na	na	na	na	0/8	2.0E+00	1.0E+00	5.0E+00	na	na	na	na
PCB	Aroclor-1016	0/4	1.5E-03	6.0E-04	2.4E-03	na	na	na	na	0/4	6.3E-02	1.0E-03	2.5E-01	na	na	na	na
	Aroclor-1221	na	na	na	na	na	na	na	na	0/1	2.5E-01	2.5E-01	2.5E-01	na	na	na	na
	Aroclor-1232	na	na	na	na	na	na	na	na	0/1	2.5E-01	2.5E-01	2.5E-01	na	na	na	na
	Aroclor-1242	na	na	na	na	na	na	na	na	0/1	2.5E-01	2.5E-01	2.5E-01	na	na	na	na
	Aroclor-1248	na	na	na	na	na	na	na	na	0/1	2.5E-01	2.5E-01	2.5E-01	na	na	na	na
	Aroclor-1254	na	na	na	na	na	na	na	na	0/1	2.5E-01	2.5E-01	2.5E-01	na	na	na	na
	Aroclor-1260	1/4	1.4E-03	1.2E-03	1.7E-03	na	na	na	na	0/4	6.3E-02	5.0E-04	2.5E-01	na	na	na	na
Petroleum Hydrocarbons	Diesel fuel	0/1	2.5E+02	2.5E+02	2.5E+02	na	na	na	na	na	na	na	na	na	na	na	na
	Total Petroleum Hydrocarbons (TPH)	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
SVOC	1,2,4-Trichlorobenzene	0/22	1.3E+00	5.0E-01	5.0E+00	na	na	na	na	0/6	2.3E+00	5.0E-01	5.0E+00	na	na	na	na
	1,2-Dichlorobenzene	0/22	1.3E+00	5.0E-01	5.0E+00	na	na	na	na	0/6	2.3E+00	5.0E-01	5.0E+00	na	na	na	na
	1,3-Dichlorobenzene	0/3	3.5E+00	5.0E-01	5.0E+00	na	na	na	na	0/3	3.5E+00	5.0E-01	5.0E+00	na	na	na	na
	1,4-Dichlorobenzene	0/22	1.3E+00	5.0E-01	5.0E+00	na	na	na	na	0/6	2.3E+00	5.0E-01	5.0E+00	na	na	na	na
	2,4,5-Trichlorophenol	0/2	8.8E+00	5.0E+00	1.3E+01	na	na	na	na	0/2	8.8E+00	5.0E+00	1.3E+01	na	na	na	na
	2,4,6-Trichlorophenol	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na
	2,4-Dichlorophenol	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na
	2,4-Dimethylphenol	1/11	1.3E+00	5.0E-01	5.0E+00	na	na	na	na	0/4	2.8E+00	5.0E-01	5.0E+00	na	na	na	na
	2,4-Dinitrophenol	0/2	8.8E+00	5.0E+00	1.3E+01	na	na	na	na	0/2	8.8E+00	5.0E+00	1.3E+01	na	na	na	na
	2,4-Dinitrotoluene	0/21	1.3E+00	5.0E-01	5.0E+00	na	na	na	na	0/5	2.6E+00	1.0E+00	5.0E+00	na	na	na	na
	2,6-Dinitrotoluene	0/21	9.3E-01	5.0E-01	5.0E+00	na	na	na	na	0/5	2.3E+00	5.0E-01	5.0E+00	na	na	na	na
	2-Chlorophenol	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na
	2-Methylphenol (o-Cresol)	0/21	1.3E+00	5.0E-01	5.0E+00	na	na	na	na	0/5	2.6E+00	1.0E+00	5.0E+00	na	na	na	na
	2-Nitroaniline	0/2	8.8E+00	5.0E+00	1.3E+01	na	na	na	na	0/2	8.8E+00	5.0E+00	1.3E+01	na	na	na	na
	2-Nitrophenol	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na
	3,3'-Dichlorobenzidine	0/11	1.7E+00	1.0E+00	5.0E+00	na	na	na	na	0/4	3.0E+00	1.0E+00	5.0E+00	na	na	na	na
	3-Nitroaniline	0/2	8.8E+00	5.0E+00	1.3E+01	na	na	na	na	0/2	8.8E+00	5.0E+00	1.3E+01	na	na	na	na
	4,6-Dinitro-o-cresol	0/21	5.4E+00	5.0E+00	1.3E+01	na	na	na	na	0/5	6.5E+00	5.0E+00	1.3E+01	na	na	na	na
	4-Bromophenyl-phenylether	0/1	5.0E+00	5.0E+00	5.0E+00	na	na	na	na	0/1	5.0E+00	5.0E+00	5.0E+00	na	na	na	na
	4-Chloro-3-Methylphenol	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na
	4-Chloroaniline	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na
	4-Chlorophenyl-phenylether	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na
	4-Methylphenol (p-Cresol)	0/21	9.3E-01	5.0E-01	5.0E+00	na	na	na	na	0/5	2.3E+00	5.0E-01	5.0E+00	na	na	na	na
	4-Nitroaniline	0/2	8.8E+00	5.0E+00	1.3E+01	na	na	na	na	0/2	8.8E+00	5.0E+00	1.3E+01	na	na	na	na
	4-Nitrophenol	0/2	8.8E+00	5.0E+00	1.3E+01	na	na	na	na	0/2	8.8E+00	5.0E+00	1.3E+01	na	na	na	na
	Benzyl alcohol	0/1	5.0E+00	5.0E+00	5.0E+00	na	na	na	na	0/1	5.0E+00	5.0E+00	5.0E+00	na	na	na	na
	bis(2-Chloroethoxy)methane	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na
	bis(2-Chloroethyl)ether	0/21	1.3E+00	5.0E-01	5.0E+00	na	na	na	na	0/5	2.6E+00	1.0E+00	5.0E+00	na	na	na	na
	bis(2-Chloroisopropyl)ether	0/6	2.3E+00	1.0E+00	5.0E+00	na	na	na	na	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na
	bis(2-Ethylhexyl)phthalate	0/21	6.4E-01	4.5E-02	5.0E+00	na	na	na	na	0/5	2.1E+00	5.0E-02	5.0E+00	na	na	na	na
	bis(n-octyl)phthalate	0/21	1.4E+00	1.0E+00	5.0E+00	na	na	na	na	1/5	2.4E+00	2.0E-01	5.0E+00	na	na	na	na
	Butylbenzylphthalate	1/21	9.9E-01	5.0E-02	5.0E+00	na	na	na	na	0/5	2.2E+00	5.0E-02	5.0E+00	na	na	na	na
	Carbazole	2/21	3.3E+00	5.0E-01	7.0E+00	na	na	na	na	0/5	3.8E+00	3.0E+00	5.0E+00	na	na	na	na
	Dibenzofuran	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na
	Dibutylphthalate	0/21	7.0E-01	1.0E-01	5.0E+00	na	na	na	na	0/5	2.2E+00	2.0E-01	5.0E+00	na	na	na	na

Type	Analyte	21st Street Pond				Ogden River - Reach A				Ogden River - Reach B				Ogden River - Reach C			
		DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max
	Diethylphthalate	0/21	9.0E-01	5.0E-02	5.0E+00	na	na	na	na	0/5	2.2E+00	1.0E-01	5.0E+00	na	na	na	na
	Dimethylphthalate	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na
	Hexachlorobenzene	0/21	1.3E+00	5.0E-01	5.0E+00	na	na	na	na	0/5	2.6E+00	1.0E+00	5.0E+00	na	na	na	na
	Hexachlorobutadiene	0/22	1.3E+00	5.0E-01	5.0E+00	na	na	na	na	0/6	2.3E+00	5.0E-01	5.0E+00	na	na	na	na
	Hexachlorocyclopentadiene	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na
	Hexachloroethane	0/21	1.4E+00	1.0E+00	5.0E+00	na	na	na	na	0/5	2.6E+00	1.0E+00	5.0E+00	na	na	na	na
	Isophorone	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na
	Nitrobenzene	0/21	1.3E+00	5.0E-01	5.0E+00	na	na	na	na	0/5	2.6E+00	1.0E+00	5.0E+00	na	na	na	na
	N-Nitrosodiphenylamine	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na	0/2	5.0E+00	5.0E+00	5.0E+00	na	na	na	na
	n-Nitrosodipropylamine	0/21	1.3E+00	5.0E-01	5.0E+00	na	na	na	na	0/5	2.6E+00	1.0E+00	5.0E+00	na	na	na	na
	Pentachlorophenol (PCP)	2/21	1.7E+00	5.0E-01	1.3E+01	na	na	na	na	0/5	4.1E+00	1.0E+00	1.3E+01	na	na	na	na
	Phenol	2/21	9.1E-01	1.0E-01	5.0E+00	na	na	na	na	0/5	2.3E+00	5.0E-01	5.0E+00	na	na	na	na
VOC	1,1,1,2-Tetrachloroethane	0/4	3.9E+00	5.0E-01	5.0E+00	na	na	na	na	0/2	2.8E+00	5.0E-01	5.0E+00	na	na	na	na
	1,1,1-Trichloroethane	0/19	8.2E-01	5.0E-01	2.5E+00	na	na	na	na	0/8	7.5E-01	5.0E-01	2.5E+00	na	na	na	na
	1,1,2,2-Tetrachloroethane	0/19	8.2E-01	5.0E-01	2.5E+00	na	na	na	na	0/8	7.5E-01	5.0E-01	2.5E+00	na	na	na	na
	1,1,2-Trichloroethane	0/19	8.2E-01	5.0E-01	2.5E+00	na	na	na	na	0/8	7.5E-01	5.0E-01	2.5E+00	na	na	na	na
	1,1-Dichloroethane	0/19	8.2E-01	5.0E-01	2.5E+00	na	na	na	na	0/8	7.5E-01	5.0E-01	2.5E+00	na	na	na	na
	1,1-Dichloroethene	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na
	1,1-Dichloropropene	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na
	1,2,3-Trichlorobenzene	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na
	1,2,3-Trichloropropane	0/19	2.0E+00	5.0E-01	5.0E+00	na	na	na	na	0/8	1.4E+00	5.0E-01	5.0E+00	na	na	na	na
	1,2,4-Trimethylbenzene	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na
	1,2-Dibromo-3-chloropropane (DBCP)	0/4	3.9E+00	5.0E-01	5.0E+00	na	na	na	na	0/5	1.4E+00	5.0E-01	5.0E+00	na	na	na	na
	1,2-Dichloroethane	0/19	8.2E-01	5.0E-01	2.5E+00	na	na	na	na	0/8	7.5E-01	5.0E-01	2.5E+00	na	na	na	na
	1,2-Dichloroethene	0/18	1.3E+00	1.0E+00	2.5E+00	na	na	na	na	0/7	1.2E+00	1.0E+00	2.5E+00	na	na	na	na
	1,2-Dichloropropane	0/19	8.2E-01	5.0E-01	2.5E+00	na	na	na	na	0/8	7.5E-01	5.0E-01	2.5E+00	na	na	na	na
	1,3,5-Trimethylbenzene	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na
	1,3-Dichloropropane	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na
	1,4-Dioxane	0/3	1.5E+02	1.5E+02	1.5E+02	na	na	na	na	0/1	1.5E+02	1.5E+02	1.5E+02	na	na	na	na
	2,2-Dichloropropane	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na
	2-Chloro-1,3-butadiene (Chloroprene)	0/3	5.0E+00	5.0E+00	5.0E+00	na	na	na	na	0/1	5.0E+00	5.0E+00	5.0E+00	na	na	na	na
	2-Chloroethyl vinyl ether	0/18	1.7E+00	1.0E+00	5.0E+00	na	na	na	na	0/7	1.8E+00	1.0E+00	5.0E+00	na	na	na	na
	2-Chlorotoluene	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na
	2-Hexanone	0/19	2.8E+00	1.0E+00	5.0E+00	na	na	na	na	0/8	1.9E+00	5.0E-01	5.0E+00	na	na	na	na
	3-Chloropropene (Allyl Chloride)	0/3	5.0E+00	5.0E+00	5.0E+00	na	na	na	na	0/1	5.0E+00	5.0E+00	5.0E+00	na	na	na	na
	4-Chlorotoluene	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na
	Acetone	0/4	4.8E+00	4.0E+00	5.0E+00	na	na	na	na	1/3	3.3E+00	1.0E+00	5.0E+00	na	na	na	na
	Acetonitrile	0/18	6.3E+00	2.5E+00	2.5E+01	na	na	na	na	0/7	6.8E+00	2.5E+00	2.5E+01	na	na	na	na
	Acrolein	0/3	5.0E+01	5.0E+01	5.0E+01	na	na	na	na	0/1	5.0E+01	5.0E+01	5.0E+01	na	na	na	na
	Acrylonitrile	0/18	6.3E+00	2.5E+00	2.5E+01	na	na	na	na	0/7	4.9E+00	5.0E-01	2.5E+01	na	na	na	na
	Benzene	1/19	7.9E-01	5.0E-01	2.5E+00	na	na	na	na	0/8	7.5E-01	5.0E-01	2.5E+00	na	na	na	na
	Bromobenzene	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na
	Bromodichloromethane	0/19	8.2E-01	5.0E-01	2.5E+00	na	na	na	na	0/8	7.5E-01	5.0E-01	2.5E+00	na	na	na	na
	Bromoform	0/19	8.2E-01	5.0E-01	2.5E+00	na	na	na	na	0/8	7.5E-01	5.0E-01	2.5E+00	na	na	na	na
	Bromomethane (Methyl bromide)	0/19	1.2E+00	5.0E-01	5.0E+00	na	na	na	na	0/8	1.1E+00	5.0E-01	5.0E+00	na	na	na	na
	Carbon Disulfide	0/19	8.2E-01	5.0E-01	2.5E+00	na	na	na	na	0/8	7.5E-01	5.0E-01	2.5E+00	na	na	na	na
	Carbon Tetrachloride	0/19	8.2E-01	5.0E-01	2.5E+00	na	na	na	na	0/8	7.5E-01	5.0E-01	2.5E+00	na	na	na	na
	Chlorobenzene	0/19	8.2E-01	5.0E-01	2.5E+00	na	na	na	na	0/8	7.5E-01	5.0E-01	2.5E+00	na	na	na	na
	Chlorodibromomethane	0/19	8.2E-01	5.0E-01	2.5E+00	na	na	na	na	0/8	7.5E-01	5.0E-01	2.5E+00	na	na	na	na
	Chloroethane (Ethyl chloride)	0/19	1.2E+00	5.0E-01	5.0E+00	na	na	na	na	0/8	1.1E+00	5.0E-01	5.0E+00	na	na	na	na
	Chloroform	0/19	8.2E-01	5.0E-01	2.5E+00	na	na	na	na	0/8	7.5E-01	5.0E-01	2.5E+00	na	na	na	na
	Chloromethane (Methyl chloride)	0/19	1.2E+00	5.0E-01	5.0E+00	na	na	na	na	0/8	1.1E+00	5.0E-01	5.0E+00	na	na	na	na
	cis-1,2-Dichloroethene	0/15	5.0E-01	5.0E-01	5.0E-01	na	na	na	na	0/6	5.0E-01	5.0E-01	5.0E-01	na	na	na	na
	cis-1,3-Dichloropropene	0/20	8.0E-01	5.0E-01	2.5E+00	na	na	na	na	0/9	7.2E-01	5.0E-01	2.5E+00	na	na	na	na

Appendix A-1
Summary Statistics for Analytes in Site Surface Waters (ug/L)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Type	Analyte	21st Street Pond				Ogden River - Reach A				Ogden River - Reach B				Ogden River - Reach C			
		DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max
	Dibromomethane	0/4	3.9E+00	5.0E-01	5.0E+00	na	na	na	na	0/2	2.8E+00	5.0E-01	5.0E+00	na	na	na	na
	Dichlorodifluoromethane	1/4	3.5E+00	5.0E-01	5.0E+00	na	na	na	na	0/2	2.8E+00	5.0E-01	5.0E+00	na	na	na	na
	Dichloromethane	3/19	7.2E-01	5.0E-01	3.3E+00	na	na	na	na	1/8	8.0E-01	5.0E-01	2.9E+00	na	na	na	na
	Ethyl Methacrylate	0/3	2.5E+01	2.5E+01	2.5E+01	na	na	na	na	0/1	2.5E+01	2.5E+01	2.5E+01	na	na	na	na
	Ethylbenzene	1/19	1.1E+00	5.0E-01	8.1E+00	na	na	na	na	0/8	7.5E-01	5.0E-01	2.5E+00	na	na	na	na
	Ethylene dibromide (EDB)	0/19	1.2E+00	5.0E-01	5.0E+00	na	na	na	na	0/8	1.1E+00	5.0E-01	5.0E+00	na	na	na	na
	Hexane	0/15	5.0E-01	5.0E-01	5.0E-01	na	na	na	na	0/6	5.0E-01	5.0E-01	5.0E-01	na	na	na	na
	Iodomethane	0/3	5.0E+00	5.0E+00	5.0E+00	na	na	na	na	0/1	5.0E+00	5.0E+00	5.0E+00	na	na	na	na
	Isobutyl Alcohol	0/3	5.0E+01	5.0E+01	5.0E+01	na	na	na	na	0/1	5.0E+01	5.0E+01	5.0E+01	na	na	na	na
	Isopropylbenzene	0/2	5.0E-01	5.0E-01	5.0E-01	na	na	na	na	0/2	5.0E-01	5.0E-01	5.0E-01	na	na	na	na
	Methacrylonitrile	0/18	1.7E+00	1.0E+00	5.0E+00	na	na	na	na	0/7	3.3E+00	1.0E+00	5.0E+00	na	na	na	na
	Methyl ethyl ketone (MEK)	0/4	4.3E+00	2.0E+00	5.0E+00	na	na	na	na	0/5	2.0E+00	1.0E+00	5.0E+00	na	na	na	na
	Methyl isobutyl ketone (MIBK)	0/19	2.8E+00	1.0E+00	5.0E+00	na	na	na	na	0/8	2.1E+00	1.0E+00	5.0E+00	na	na	na	na
	Methyl Methacrylate	0/3	5.0E+00	5.0E+00	5.0E+00	na	na	na	na	0/1	5.0E+00	5.0E+00	5.0E+00	na	na	na	na
	Methyl-t-butyl ether (MTBE)	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na
	n-Butylbenzene	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na
	n-Propylbenzene	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na
	o-Xylene	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na
	sec-Butylbenzene	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na
	Styrene	0/19	8.2E-01	5.0E-01	2.5E+00	na	na	na	na	0/8	7.5E-01	5.0E-01	2.5E+00	na	na	na	na
	tert-Butylbenzene	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na
	Tetrachloroethene	0/19	8.2E-01	5.0E-01	2.5E+00	na	na	na	na	0/8	7.5E-01	5.0E-01	2.5E+00	na	na	na	na
	Toluene	0/19	8.2E-01	5.0E-01	2.5E+00	na	na	na	na	0/8	7.5E-01	5.0E-01	2.5E+00	na	na	na	na
	trans-1,2-Dichloroethene	0/16	5.0E-01	5.0E-01	5.0E-01	na	na	na	na	0/7	5.0E-01	5.0E-01	5.0E-01	na	na	na	na
	trans-1,3-Dichloropropene	0/19	8.2E-01	5.0E-01	2.5E+00	na	na	na	na	0/8	7.5E-01	5.0E-01	2.5E+00	na	na	na	na
	trans-1,4-Dichloro-2-Butene	0/3	5.0E+00	5.0E+00	5.0E+00	na	na	na	na	0/1	5.0E+00	5.0E+00	5.0E+00	na	na	na	na
	Trichloroethene	0/19	8.2E-01	5.0E-01	2.5E+00	na	na	na	na	0/8	7.5E-01	5.0E-01	2.5E+00	na	na	na	na
	Trichlorofluoromethane	0/19	1.2E+00	5.0E-01	5.0E+00	na	na	na	na	0/8	1.1E+00	5.0E-01	5.0E+00	na	na	na	na
	Vinyl Acetate	0/18	1.3E+00	5.0E-01	5.0E+00	na	na	na	na	0/7	1.1E+00	5.0E-01	5.0E+00	na	na	na	na
	Vinyl Chloride	0/19	1.2E+00	5.0E-01	5.0E+00	na	na	na	na	0/8	1.1E+00	5.0E-01	5.0E+00	na	na	na	na
	Xylenes (Total)	1/18	1.8E+00	1.5E+00	4.8E+00	na	na	na	na	0/7	1.2E+00	5.0E-01	2.5E+00	na	na	na	na
	Xylenes-p,m	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na	0/1	5.0E-01	5.0E-01	5.0E-01	na	na	na	na

Appendix A-2
Summary Statistics for Analytes in Site Sediment (mg/kg)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Type	Analyte	Weber River - Reach A				Weber River - Reach B				Weber River - Reach C				Weber River - Reach D				Buena Ventura Park Pond			
		DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max
Metals	Aluminum	2/2	4.5E+03	3.0E+03	5.9E+03	2/2	3.8E+03	3.4E+03	4.2E+03	1/1	5.5E+03	5.5E+03	5.5E+03	5/5	4.0E+03	2.5E+03	6.1E+03	4/4	6.1E+03	3.0E+03	1.2E+04
	Antimony	0/2	4.5E+00	3.5E+00	5.5E+00	0/2	3.2E+00	2.5E+00	3.9E+00	0/1	4.3E+00	4.3E+00	4.3E+00	0/5	3.1E+00	2.3E+00	4.6E+00	2/4	1.5E+00	4.8E-01	3.2E+00
	Arsenic	2/2	3.1E+00	2.2E+00	4.0E+00	2/10	2.6E+00	2.5E+00	3.5E+00	1/5	2.9E+00	2.5E+00	4.6E+00	5/10	2.8E+00	1.7E+00	4.8E+00	4/4	3.5E+00	1.8E+00	4.8E+00
	Barium	2/2	1.7E+02	1.2E+02	2.2E+02	10/10	5.9E+01	1.9E+01	1.6E+02	5/5	7.8E+01	2.8E+01	2.3E+02	10/10	8.4E+01	3.3E+01	1.9E+02	2/4	9.5E+01	2.7E+01	2.5E+02
	Beryllium	0/2	3.7E-01	2.9E-01	4.5E-01	0/2	2.7E-01	2.1E-01	3.3E-01	0/1	3.6E-01	3.6E-01	3.6E-01	0/5	2.6E-01	1.9E-01	3.8E-01	3/4	2.3E-01	4.7E-02	4.6E-01
	Cadmium	1/2	6.2E-01	2.9E-01	9.6E-01	3/10	3.6E-01	2.1E-01	6.5E-01	2/5	4.2E-01	2.5E-01	6.3E-01	4/10	4.0E-01	2.2E-01	9.3E-01	3/4	4.6E-01	2.0E-02	9.6E-01
	Calcium	2/2	8.3E+04	5.6E+04	1.1E+05	2/2	5.8E+04	3.7E+04	7.9E+04	1/1	1.1E+05	1.1E+05	1.1E+05	5/5	4.4E+04	2.0E+04	7.7E+04	4/4	4.0E+04	1.8E+04	9.6E+04
	Chromium	2/2	9.1E+00	8.7E+00	9.4E+00	10/10	5.0E+00	3.7E+00	7.3E+00	5/5	5.3E+00	3.3E+00	9.7E+00	9/10	6.3E+00	5.0E-01	1.1E+01	4/4	1.0E+01	7.0E+00	1.5E+01
	Cobalt	2/2	3.3E+00	2.5E+00	4.0E+00	2/2	2.8E+00	2.4E+00	3.1E+00	1/1	3.5E+00	3.5E+00	3.5E+00	5/5	2.9E+00	2.2E+00	4.2E+00	4/4	3.3E+00	2.2E+00	5.5E+00
	Copper	2/2	1.3E+01	1.3E+01	1.3E+01	2/2	8.5E+00	7.0E+00	1.0E+01	1/1	1.6E+01	1.6E+01	1.6E+01	5/5	1.4E+01	6.8E+00	2.5E+01	4/4	1.7E+01	7.9E+00	3.0E+01
	Iron	2/2	7.2E+03	5.7E+03	8.7E+03	2/2	6.5E+03	6.2E+03	6.7E+03	1/1	9.0E+03	9.0E+03	9.0E+03	5/5	7.0E+03	5.1E+03	9.7E+03	4/4	7.3E+03	4.7E+03	1.2E+04
	Lead	2/2	4.3E+01	3.2E+01	5.3E+01	10/10	2.1E+01	6.9E+00	3.7E+01	5/5	2.4E+01	1.3E+01	4.9E+01	9/10	3.1E+01	1.0E+00	6.4E+01	4/4	7.5E+01	3.2E+01	1.2E+02
	Magnesium	2/2	4.0E+03	2.7E+03	5.3E+03	2/2	3.7E+03	3.1E+03	4.2E+03	1/1	5.2E+03	5.2E+03	5.2E+03	5/5	3.9E+03	2.4E+03	5.3E+03	4/4	5.4E+03	2.3E+03	7.6E+03
	Manganese	2/2	3.1E+02	1.8E+02	4.4E+02	2/2	2.4E+02	1.5E+02	3.2E+02	1/1	4.5E+02	4.5E+02	4.5E+02	5/5	2.2E+02	9.7E+01	3.4E+02	4/4	1.6E+02	8.5E+01	3.4E+02
	Mercury	1/2	8.0E-02	3.0E-02	1.3E-01	2/10	2.7E-02	2.0E-02	6.0E-02	1/5	3.4E-02	2.0E-02	9.0E-02	6/10	5.3E-02	2.0E-02	1.2E-01	4/4	2.4E-01	1.1E-01	3.9E-01
	Nickel	2/2	6.0E+00	4.6E+00	7.4E+00	2/2	4.9E+00	4.2E+00	5.5E+00	1/1	7.3E+00	7.3E+00	7.3E+00	5/5	5.8E+00	4.5E+00	8.4E+00	4/4	7.0E+00	3.2E+00	1.2E+01
	Potassium	2/2	9.7E+02	6.3E+02	1.3E+03	2/2	7.5E+02	6.3E+02	8.7E+02	1/1	1.1E+03	1.1E+03	1.1E+03	5/5	8.0E+02	5.5E+02	1.2E+03	4/4	1.5E+03	6.9E+02	3.2E+03
	Selenium	0/2	4.0E-01	3.2E-01	4.9E-01	0/10	2.1E+00	2.7E-01	2.5E+00	0/5	2.1E+00	4.1E-01	2.5E+00	0/10	1.4E+00	1.9E-01	2.5E+00	1/4	5.3E-01	2.2E-01	1.1E+00
	Silver	0/2	3.7E-01	2.9E-01	4.5E-01	8/10	5.7E-01	2.1E-01	1.0E+00	0/5	2.7E-01	2.5E-01	3.6E-01	0/10	2.5E-01	1.9E-01	3.8E-01	1/4	4.6E-01	1.6E-01	1.2E+00
	Sodium	2/2	2.2E+02	1.5E+02	2.8E+02	2/2	2.0E+02	1.9E+02	2.1E+02	1/1	2.4E+02	2.4E+02	2.4E+02	5/5	1.7E+02	1.1E+02	2.7E+02	4/4	1.7E+02	1.0E+02	3.3E+02
	Thallium	0/2	4.0E-01	3.2E-01	4.9E-01	0/2	2.9E-01	2.7E-01	3.2E-01	0/1	4.1E-01	4.1E-01	4.1E-01	0/5	2.9E-01	1.9E-01	4.8E-01	0/4	8.2E-01	2.2E-01	1.4E+00
	Vanadium	2/2	1.1E+01	8.1E+00	1.3E+01	2/2	9.3E+00	8.5E+00	1.0E+01	1/1	1.3E+01	1.3E+01	1.3E+01	5/5	9.6E+00	7.1E+00	1.4E+01	4/4	1.4E+01	9.0E+00	2.2E+01
	Zinc	2/2	9.9E+01	6.8E+01	1.3E+02	2/2	7.5E+01	5.7E+01	9.3E+01	1/1	1.3E+02	1.3E+02	1.3E+02	5/5	9.0E+01	5.4E+01	1.4E+02	4/4	1.2E+02	5.4E+01	1.8E+02
Pesticides	4,4'-DDD	0/2	4.6E-03	3.2E-03	6.0E-03	0/10	7.0E-03	2.6E-03	8.0E-03	0/5	7.2E-03	4.1E-03	8.0E-03	0/15	4.7E-03	2.2E-03	8.0E-03	0/3	3.5E-03	2.6E-03	4.1E-03
	4,4'-DDE	0/2	4.6E-03	3.2E-03	6.0E-03	0/10	7.0E-03	2.6E-03	8.0E-03	1/5	7.9E-03	7.3E-03	8.0E-03	0/15	4.7E-03	2.2E-03	8.0E-03	0/3	3.5E-03	2.6E-03	4.1E-03
	4,4'-DDT	0/2	4.6E-03	3.2E-03	6.0E-03	0/10	7.0E-03	2.6E-03	8.0E-03	0/5	7.2E-03	4.1E-03	8.0E-03	0/15	4.7E-03	2.2E-03	8.0E-03	0/3	3.5E-03	2.6E-03	4.1E-03
	Aldrin	0/2	4.6E-03	3.2E-03	6.0E-03	0/10	3.8E-03	2.6E-03	4.0E-03	0/5	4.0E-03	4.0E-03	4.1E-03	0/15	2.9E-03	1.1E-03	5.5E-03	0/3	2.2E-03	2.0E-03	2.6E-03
	alpha-BHC	0/2	4.6E-03	3.2E-03	6.0E-03	0/10	3.8E-03	2.6E-03	4.0E-03	0/5	4.0E-03	4.0E-03	4.1E-03	0/15	2.9E-03	1.1E-03	5.5E-03	0/3	2.2E-03	2.0E-03	2.6E-03
	beta-BHC	0/2	4.6E-03	3.2E-03	6.0E-03	0/10	3.8E-03	2.6E-03	4.0E-03	0/5	4.0E-03	4.0E-03	4.1E-03	0/15	2.9E-03	1.1E-03	5.5E-03	0/3	2.2E-03	2.0E-03	2.6E-03
	alpha-Chlordane	0/2	4.6E-03	3.2E-03	6.0E-03	0/2	3.2E-03	2.6E-03	3.8E-03	0/1	4.1E-03	4.1E-03	4.1E-03	0/10	2.3E-03	1.1E-03	5.5E-03	0/3	2.2E-03	2.0E-03	2.6E-03
	Atrazine	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	0/2	2.4E+00	8.0E-01	4.1E+00
	Caprolactam	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	0/2	2.4E+00	8.0E-01	4.1E+00
	Chlordane	na	na	na	na	0/8	4.0E-02	4.0E-02	4.0E-02	0/4	4.0E-02	4.0E-02	4.0E-02	0/5	4.0E-02	4.0E-02	4.0E-02	na	na	na	na
	delta-BHC	0/2	4.6E-03	3.2E-03	6.0E-03	0/10	3.8E-03	2.6E-03	4.0E-03	0/5	4.0E-03	4.0E-03	4.1E-03	0/15	2.9E-03	1.1E-03	5.5E-03	0/3	2.2E-03	2.0E-03	2.6E-03
	Dieldrin	0/2	4.6E-03	3.2E-03	6.0E-03	0/10	7.0E-03	2.6E-03	8.0E-03	0/5	7.2E-03	4.1E-03	8.0E-03	0/15	4.7E-03	2.2E-03	8.0E-03	0/3	3.5E-03	2.6E-03	4.1E-03
	Endosulfan I	0/2	4.6E-03	3.2E-03	6.0E-03	0/10	3.8E-03	2.6E-03	4.0E-03	0/5	4.0E-03	4.0E-03	4.1E-03	0/15	2.9E-03	1.1E-03	5.5E-03	0/3	2.2E-03	2.0E-03	2.6E-03
	Endosulfan II	0/2	4.6E-03	3.2E-03	6.0E-03	0/10	7.0E-03	2.6E-03	8.0E-03	0/5	7.2E-03	4.1E-03	8.0E-03	0/15	4.7E-03	2.2E-03	8.0E-03	0/3	3.5E-03	2.6E-03	4.1E-03
	Endosulfan Sulfate	0/2	4.6E-03	3.2E-03	6.0E-03	0/10	7.0E-03	2.6E-03	8.0E-03	0/5	7.2E-03	4.1E-03	8.0E-03	0/15	4.7E-03	2.2E-03	8.0E-03	0/3	3.5E-03	2.6E-03	4.1E-03
	Endrin	0/2	4.6E-03	3.2E-03	6.0E-03	0/10	7.0E-03	2.6E-03	8.0E-03	0/5	7.2E-03	4.1E-03	8.0E-03	0/15	4.7E-03	2.2E-03	8.0E-03	0/3	3.5E-03	2.6E-03	4.1E-03
	Endrin Aldehyde	0/2	4.6E-03	3.2E-03	6.0E-03	0/10	7.0E-03	2.6E-03	8.0E-03	0/5	7.2E-03	4.1E-03	8.0E-03	0/15	4.7E-03	2.2E-03	8.0E-03	0/3	3.5E-03	2.6E-03	4.1E-03
	Endrin ketone	0/2	4.6E-03	3.2E-03	6.0E-03	0/2	3.2E-03	2.6E-03	3.8E-03	0/1	4.1E-03	4.1E-03	4.1E-03	0/10	3.0E-03	2.2E-03	5.5E-03	0/3	3.5E-03	2.6E-03	4.1E-03
	gamma-BHC (Lindane)	0/2	4.6E-03	3.2E-03	6.0E-03	0/10	3.8E-03	2.6E-03	4.0E-03	0/5	4.0E-03	4.0E-03	4.1E-03	0/15	2.9E-03	1.1E-03	5.5E-03	0/3	2.2E-03	2.0E-03	2.6E-03
	gamma-Chlordane	0/2	4.6E-03	3.2E-03	6.0E-03	0/2	3.2E-03	2.6E-03	3.8E-03	0/1	4.1E-03	4.1E-03	4.1E-03	0/10	2.3E-03	1.1E-03	5.5E-03	0/3	2.2E-03	2.0E-03	2.6E-03
	Heptachlor	0/2	4.6E-03	3.2E-03	6.0E-03	0/10	3.8E-03	2.6E-03	4.0E-03	0/5	4.0E-03	4.0E-03	4.1E-03	0/15	2.9E-03	1.1E-03	5.5E-03	0/3	2.2E-03	2.0E-03	2.6E-03
	Heptachlor Epoxide	0/2	4.6E-03	3.2E-03	6.0E-03	0/10	3.8E-03	2.6E-03	4.0E-03	0/5	4.0E-03	4.0E-03	4.1E-03	0/15	2.9E-03	1.1E-03	5.5E-03	0/3	2.2E-03	2.0E-03	2.6E-03
	Isodrin	na	na	na	na	0/8	4.0E-03	4.0E-03	4.0E-03	0/4	4.0E-03	4.0E-03	4.0E-03	0/5	4.0E-03	4.0E-03	4.0E-03	na	na	na	na
	Kepone	na	na	na	na	0/8	8.0E-03	8.0E-03	8.0E-03	0/4	8.0E-03	8.0E-03	8.0E-03	0/5	8.0E-03	8.0E-03	8.0E-03	na	na	na	na
	Methoxychlor	0/2	4.6E-03	3.2E-03	6.0E-03	0/10	3.3E-02	2.6E-03	4.0E-02	0/5	3.3E-02	4.1E-03	4.0E-02	0/15	1.9E-02	2.3E-03	4.0E-02	0/3	1.5E-02	2.6E-03	2.1E-02
	Toxaphene	0/2	1.1E-01	8.0E-02	1.5E-01	0/10	8.0E-02	6.5E-02	9.5E-02	0/5	8.5E-02	8.0E-02	1.1E-01	0/15	1.0E-01	5.5E-02	1.9E-01	0/3	1.6E-01	6.5E-02	2.1E-01
	2-Chloronaphthalene	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	1-Methylnaphthalene	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	0/3	5.0E-01	2.6E-01	9.5E-01
	2-Methylnaphthalene	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	1/8	8.7E-01	2.4E-02	4.1E+00
	Acenaphthene	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	1/8	8.6E-01	2.4E-02	4.1E+00
	Acenaphthylene	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	2/8	8.9E-01	2.4E-02	4.1E+00
	Aniline	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	0/3	5.0E-01	2.6E-01	9.5E-01
	Anthracene	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	2/8	9.5E-01	8.0E-03	4.1E+00

Appendix A-2
Summary Statistics for Analytes in Site Sediment (mg/kg)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Type	Analyte	Weber River - Reach A				Weber River - Reach B				Weber River - Reach C				Weber River - Reach D				Buena Ventura Park Pond			
		DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max
PAHs	Benzo[a]anthracene	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	1/5	5.3E-01	8.5E-02	2.1E+00	1/10	9.0E-01	8.0E-02	2.9E+00	2/8	9.6E-01	3.1E-02	4.1E+00
	Benzo[a]pyrene	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	1/5	5.2E-01	7.6E-02	2.1E+00	1/10	9.0E-01	5.4E-02	2.9E+00	2/8	9.6E-01	2.8E-02	4.1E+00
	Benzo[b]fluoranthene	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	1/5	5.3E-01	1.1E-01	2.1E+00	1/10	9.0E-01	7.5E-02	2.9E+00	2/8	9.6E-01	3.5E-02	4.1E+00
	Benzo[g,h,i]perylene	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	1/5	5.2E-01	4.2E-02	2.1E+00	1/10	8.9E-01	3.4E-02	2.9E+00	2/8	9.5E-01	1.3E-02	4.1E+00
	Benzo[k]fluoranthene	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	1/5	5.2E-01	3.7E-02	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	2/8	9.6E-01	2.8E-02	4.1E+00
	Chrysene	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	1/5	5.3E-01	1.0E-01	2.1E+00	4/10	8.6E-01	3.5E-02	2.9E+00	2/8	9.6E-01	4.7E-02	4.1E+00
	Dibenz[a,h]anthracene	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/8	9.6E-01	2.4E-02	4.1E+00
	Fluoranthene	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	1/5	5.4E-01	1.4E-01	2.1E+00	2/10	8.9E-01	4.1E-02	2.9E+00	2/8	9.7E-01	5.2E-02	4.1E+00
	Fluorene	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/8	9.6E-01	2.4E-02	4.1E+00
	Indeno[1,2,3-c,d]pyrene	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	2/8	9.5E-01	1.5E-02	4.1E+00
	Naphthalene	2/4	1.1E+00	3.4E-03	3.0E+00	0/12	3.8E-01	6.0E-04	1.9E+00	0/6	4.5E-01	1.1E-03	2.1E+00	0/15	6.1E-01	6.8E-04	2.9E+00	1/9	7.7E-01	2.9E-03	4.1E+00
	Phenanthrene	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	1/5	5.2E-01	7.4E-02	2.1E+00	1/10	9.0E-01	5.2E-02	2.9E+00	2/8	9.6E-01	2.6E-02	4.1E+00
	Pyrene	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	2/5	5.2E-01	3.4E-02	2.1E+00	5/10	8.6E-01	3.5E-02	2.9E+00	3/8	9.4E-01	5.1E-02	4.1E+00
PCB	Aroclor-1016	0/2	5.7E-02	3.9E-02	7.5E-02	0/10	4.0E-02	3.2E-02	4.7E-02	0/5	4.2E-02	4.0E-02	5.0E-02	0/15	3.6E-02	2.2E-02	7.0E-02	0/3	3.7E-02	3.2E-02	4.1E-02
	Aroclor-1221	0/2	1.1E-01	8.0E-02	1.5E-01	0/10	4.8E-02	4.0E-02	9.5E-02	0/5	5.3E-02	4.0E-02	1.1E-01	0/15	5.9E-02	4.0E-02	1.4E-01	0/3	7.7E-02	6.5E-02	8.5E-02
	Aroclor-1232	0/2	5.7E-02	3.9E-02	7.5E-02	0/10	4.0E-02	3.2E-02	4.7E-02	0/5	4.2E-02	4.0E-02	5.0E-02	0/15	3.6E-02	2.2E-02	7.0E-02	0/3	3.7E-02	3.2E-02	4.1E-02
	Aroclor-1242	0/2	5.7E-02	3.9E-02	7.5E-02	0/10	4.0E-02	3.2E-02	4.7E-02	0/5	4.2E-02	4.0E-02	5.0E-02	0/15	3.6E-02	2.2E-02	7.0E-02	0/3	3.7E-02	3.2E-02	4.1E-02
	Aroclor-1248	0/2	5.7E-02	3.9E-02	7.5E-02	0/10	4.0E-02	3.2E-02	4.7E-02	0/5	4.2E-02	4.0E-02	5.0E-02	0/15	3.6E-02	2.2E-02	7.0E-02	0/3	3.7E-02	3.2E-02	4.1E-02
	Aroclor-1254	0/2	5.7E-02	3.9E-02	7.5E-02	0/10	4.0E-02	3.2E-02	4.7E-02	0/5	4.2E-02	4.0E-02	5.0E-02	0/15	3.6E-02	2.2E-02	7.0E-02	0/3	3.7E-02	3.2E-02	4.1E-02
	Aroclor-1260	0/2	5.7E-02	3.9E-02	7.5E-02	0/10	4.0E-02	3.2E-02	4.7E-02	0/5	4.2E-02	4.0E-02	5.0E-02	0/15	3.6E-02	2.2E-02	7.0E-02	0/3	3.7E-02	3.2E-02	4.1E-02
	Aroclor-1268	0/2	5.7E-02	3.9E-02	7.5E-02	0/2	4.0E-02	3.2E-02	4.7E-02	0/1	5.0E-02	5.0E-02	5.0E-02	0/5	4.1E-02	2.9E-02	7.0E-02	0/1	3.2E-02	3.2E-02	3.2E-02
	PCB-105	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	1/1	1.4E+02	1.4E+02	1.4E+02
	PCB-114	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	0/1	4.8E+00	4.8E+00	4.8E+00
	PCB-118	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	1/1	3.0E+02	3.0E+02	3.0E+02
	PCB-123	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	0/1	4.8E+00	4.8E+00	4.8E+00
	PCB-126	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	0/1	4.8E+00	4.8E+00	4.8E+00
	PCB-156	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	1/1	4.3E+01	4.3E+01	4.3E+01
	PCB-157	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	0/1	9.7E+00	9.7E+00	9.7E+00
	PCB-167	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	0/1	9.7E+00	9.7E+00	9.7E+00
	PCB-169	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	0/1	9.7E+00	9.7E+00	9.7E+00
	PCB-189	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	0/1	9.7E+00	9.7E+00	9.7E+00
	PCB-77	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	1/1	3.0E+01	3.0E+01	3.0E+01
	PCB-81	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	0/1	9.7E-01	9.7E-01	9.7E-01
Petroleum Hydrocarbons	Total Petroleum Hydrocarbons (TPH)	2/2	1.2E+03	1.1E+03	1.3E+03	2/2	5.4E+02	2.8E+02	7.9E+02	1/1	1.8E+03	1.8E+03	1.8E+03	5/5	8.3E+02	2.0E+02	2.2E+03	na	na	na	na
	1,2,4-Trichlorobenzene	0/4	1.1E+00	1.0E-03	3.0E+00	0/12	3.8E-01	6.0E-04	1.9E+00	0/6	4.5E-01	1.1E-03	2.1E+00	0/15	6.1E-01	6.8E-04	2.9E+00	0/5	5.5E-01	7.1E-04	1.3E+00
	1,2-Dichlorobenzene	0/4	1.1E+00	1.0E-03	3.0E+00	0/12	3.8E-01	6.0E-04	1.9E+00	0/6	4.5E-01	1.1E-03	2.1E+00	0/15	6.1E-01	6.8E-04	2.9E+00	0/5	5.5E-01	7.1E-04	1.3E+00
	1,3-Dichlorobenzene	0/4	1.1E+00	1.0E-03	3.0E+00	0/12	3.8E-01	6.0E-04	1.9E+00	0/6	4.5E-01	1.1E-03	2.1E+00	0/15	6.1E-01	6.8E-04	2.9E+00	0/5	5.5E-01	7.1E-04	1.3E+00
	1,4-Dichlorobenzene	0/4	1.1E+00	1.0E-03	3.0E+00	0/12	3.8E-01	6.0E-04	1.9E+00	0/6	4.5E-01	1.1E-03	2.1E+00	0/15	6.1E-01	6.8E-04	2.9E+00	0/5	5.5E-01	7.1E-04	1.3E+00
	2,2'-oxybis(1-Chloropropane)	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	2,4,5-Trichlorophenol	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	6.5E-01	4.2E-01	1.9E+00	0/5	7.4E-01	4.2E-01	2.1E+00	0/10	1.0E+00	4.2E-01	2.9E+00	0/6	2.4E+00	2.6E-01	1.0E+01
	2,4,6-Trichlorophenol	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	2,4-Dichlorophenol	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	2,4-Dimethylphenol	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	2,4-Dinitrophenol	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	6.5E-01	4.2E-01	1.9E+00	0/5	7.4E-01	4.2E-01	2.1E+00	0/10	1.0E+00	4.2E-01	2.9E+00	0/6	3.4E+00	1.3E+00	1.0E+01
	2,4-Dinitrotoluene	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	2,6-Dinitrotoluene	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	2-Chlorophenol	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	2-Methylphenol (o-Cresol)	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	2-Nitroaniline	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	6.5E-01	4.2E-01	1.9E+00	0/5	7.4E-01	4.2E-01	2.1E+00	0/10	1.0E+00	4.2E-01	2.9E+00	0/6	3.4E+00	1.3E+00	1.0E+01
	2-Nitrophenol	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	3,3'-Dichlorobenzidine	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	3-Nitroaniline	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	6.5E-01	4.2E-01	1.9E+00	0/5	7.4E-01	4.2E-01	2.1E+00	0/10	1.0E+00	4.2E-01	2.9E+00	0/6	3.4E+00	1.3E+00	1.0E+01
	4,6-Dinitro-o-cresol	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	6.5E-01	4.2E-01	1.9E+00	0/5	7.4E-01	4.2E-01	2.1E+00	0/10	1.0E+00	4.2E-01	2.9E+00	0/6	3.4E+00	1.3E+00	1.0E+01
	4-Bromophenyl-phenylether	0/2	2.3E+00	1.6E+00	3.0E+00	0/2	1.6E+00	1.3E+00	1.9E+00	0/1	2.1E+00	2.1E+00	2.1E+00	0/5	1.7E+00	1.2E+00	2.9E+00	0/3	2.0E+00	8.0E-01	4.1E+00
	4-Chloro-3-Methylphenol	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00

Appendix A-2
Summary Statistics for Analytes in Site Sediment (mg/kg)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Type	Analyte	Weber River - Reach A				Weber River - Reach B				Weber River - Reach C				Weber River - Reach D				Buena Ventura Park Pond			
		DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max
SVOC	4-Chloroaniline	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	4-Chlorophenyl-phenylether	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	4-Methylphenol (p-Cresol)	2/2	4.3E+00	3.8E+00	4.8E+00	3/10	4.6E-01	1.7E-01	1.3E+00	1/5	3.9E-01	1.7E-01	1.3E+00	6/10	1.1E+00	1.3E-01	3.5E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	4-Nitroaniline	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	6.5E-01	4.2E-01	1.9E+00	0/5	7.4E-01	4.2E-01	2.1E+00	0/10	1.0E+00	4.2E-01	2.9E+00	0/6	3.4E+00	1.3E+00	1.0E+01
	4-Nitrophenol	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	6.5E-01	4.2E-01	1.9E+00	0/5	7.4E-01	4.2E-01	2.1E+00	0/10	1.0E+00	4.2E-01	2.9E+00	0/6	3.4E+00	1.3E+00	1.0E+01
	Acetophenone	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	0/2	2.4E+00	8.0E-01	4.1E+00
	Benzaldehyde	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	0/2	2.4E+00	8.0E-01	4.1E+00
	Benzyl alcohol	0/2	2.3E+00	1.6E+00	3.0E+00	0/2	1.6E+00	1.3E+00	1.9E+00	0/1	2.1E+00	2.1E+00	2.1E+00	0/5	1.7E+00	1.2E+00	2.9E+00	0/1	1.3E+00	1.3E+00	1.3E+00
	Biphenyl	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	0/2	2.4E+00	8.0E-01	4.1E+00
	bis(2-Chloroethoxy)methane	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	bis(2-Chloroethyl)ether	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	bis(2-Chloroisopropyl)ether	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/3	2.0E+00	8.0E-01	4.1E+00
	bis(2-Ethylhexyl)phthalate	1/2	2.3E+00	1.6E+00	3.0E+00	7/10	4.3E-01	3.5E-02	1.9E+00	5/5	4.7E-01	5.3E-02	1.8E+00	8/10	7.1E-01	9.2E-02	1.7E+00	4/6	4.4E-01	7.3E-02	9.1E-01
	bis(n-octyl)phthalate	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	Butylbenzylphthalate	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	1/5	5.3E-01	9.5E-02	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	Carbazole	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	Dibenzofuran	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	Dibutylphthalate	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	1/10	9.0E-01	5.3E-02	2.9E+00	2/6	1.2E+00	7.5E-02	4.1E+00
	Diethylphthalate	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	Dimethylphthalate	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	Hexachlorobenzene	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	Hexachlorobutadiene	0/4	1.1E+00	1.0E-03	3.0E+00	0/12	3.8E-01	6.0E-04	1.9E+00	0/6	4.5E-01	1.1E-03	2.1E+00	0/15	6.1E-01	6.8E-04	2.9E+00	0/7	1.1E+00	7.1E-04	4.1E+00
	Hexachlorocyclopentadiene	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	Hexachloroethane	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	Isophorone	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	Nitrobenzene	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	N-Nitrosodiphenylamine	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	n-Nitrosodipropylamine	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	4.5E-01	1.7E-01	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	0/10	9.1E-01	1.7E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	Pentachlorophenol (PCP)	0/2	2.3E+00	1.6E+00	3.0E+00	0/10	6.5E-01	4.2E-01	1.9E+00	0/5	7.4E-01	4.2E-01	2.1E+00	0/10	1.0E+00	4.2E-01	2.9E+00	0/6	3.4E+00	1.3E+00	1.0E+01
	Phenol	0/2	2.3E+00	1.6E+00	3.0E+00	1/10	4.4E-01	7.8E-02	1.9E+00	0/5	5.4E-01	1.7E-01	2.1E+00	1/10	9.0E-01	1.1E-01	2.9E+00	0/6	1.3E+00	2.6E-01	4.1E+00
	1,1,1,2-Tetrachloroethane	0/2	1.5E-03	1.0E-03	2.0E-03	0/12	4.3E-03	6.0E-04	5.0E-03	0/5	4.2E-03	1.1E-03	5.0E-03	0/10	3.0E-03	6.8E-04	5.0E-03	0/1	7.1E-04	7.1E-04	7.1E-04
	1,1,1-Trichloroethane	0/5	2.1E-03	1.0E-03	2.5E-03	0/14	2.2E-03	6.0E-04	2.5E-03	0/6	2.3E-03	1.1E-03	2.5E-03	0/16	2.0E-03	6.8E-04	2.5E-03	0/4	4.1E-03	7.1E-04	7.0E-03
	1,1,2,2-Tetrachloroethane	0/5	2.1E-03	1.0E-03	2.5E-03	0/14	2.2E-03	6.0E-04	2.5E-03	0/6	2.3E-03	1.1E-03	2.5E-03	0/16	2.0E-03	6.8E-04	2.5E-03	0/4	4.1E-03	7.1E-04	7.0E-03
	1,1,2-Trichloroethane	1/5	2.4E-03	1.0E-03	4.0E-03	0/14	2.2E-03	6.0E-04	2.5E-03	0/6	2.3E-03	1.1E-03	2.5E-03	0/16	2.0E-03	6.8E-04	2.5E-03	0/4	4.1E-03	7.1E-04	7.0E-03
	1,1-Dichloroethane	0/5	2.1E-03	1.0E-03	2.5E-03	0/14	2.2E-03	6.0E-04	2.5E-03	0/6	2.3E-03	1.1E-03	2.5E-03	1/16	2.2E-03	6.8E-04	5.2E-03	0/4	4.1E-03	7.1E-04	7.0E-03
	1,1-Dichloroethene	0/2	1.5E-03	1.0E-03	2.0E-03	0/2	6.7E-04	6.0E-04	7.4E-04	0/1	1.1E-03	1.1E-03	1.1E-03	0/5	9.3E-04	6.8E-04	1.4E-03	0/1	7.1E-04	7.1E-04	7.1E-04
	1,1-Dichloropropene	0/2	1.5E-03	1.0E-03	2.0E-03	0/2	6.7E-04	6.0E-04	7.4E-04	0/1	1.1E-03	1.1E-03	1.1E-03	0/5	9.3E-04	6.8E-04	1.4E-03	0/1	7.1E-04	7.1E-04	7.1E-04
	1,2,3-Trichlorobenzene	0/2	1.5E-03	1.0E-03	2.0E-03	0/2	6.7E-04	6.0E-04	7.4E-04	0/1	1.1E-03	1.1E-03	1.1E-03	0/5	9.3E-04	6.8E-04	1.4E-03	0/1	7.1E-04	7.1E-04	7.1E-04
	1,2,3-Trichloropropane	0/5	2.1E-03	1.0E-03	2.5E-03	0/14	4.0E-03	6.0E-04	5.0E-03	0/6	3.9E-03	1.1E-03	5.0E-03	0/16	2.8E-03	6.8E-04	5.0E-03	0/4	4.1E-03	7.1E-04	7.0E-03
	1,2,4-Trimethylbenzene	0/2	1.5E-03	1.0E-03	2.0E-03	0/2	6.7E-04	6.0E-04	7.4E-04	0/1	1.1E-03	1.1E-03	1.1E-03	0/5	9.3E-04	6.8E-04	1.4E-03	0/1	7.1E-04	7.1E-04	7.1E-04
	1,2-Dibromo-3-chloropropane (DBCP)	0/2	1.5E-03	1.0E-03	2.0E-03	0/12	4.3E-03	6.0E-04	5.0E-03	0/5	4.2E-03	1.1E-03	5.0E-03	0/10	3.0E-03	6.8E-04	5.0E-03	0/4	4.1E-03	7.1E-04	7.0E-03
	1,2-Dichloroethane	0/5	2.1E-03	1.0E-03	2.5E-03	0/14	2.2E-03	6.0E-04	2.5E-03	0/6	2.3E-03	1.1E-03	2.5E-03	0/16	2.0E-03	6.8E-04	2.5E-03	0/4	4.1E-03	7.1E-04	7.0E-03
	1,2-Dichloroethene	0/3	5.0E-03	5.0E-03	5.0E-03	0/12	2.9E-03	2.5E-03	5.0E-03	0/5	3.0E-03	2.5E-03	5.0E-03	0/11	3.9E-03	2.5E-03	5.0E-03	0/3	1.0E-02	8.0E-03	1.4E-02
	1,2-Dichloropropane	0/5	2.1E-03	1.0E-03	2.5E-03	0/14	2.2E-03	6.0E-04	2.5E-03	0/6	2.3E-03	1.1E-03	2.5E-03	0/16	2.0E-03	6.8E-04	2.5E-03	0/4	4.1E-03	7.1E-04	7.0E-03
	1,3,5-Trimethylbenzene	0/2	1.5E-03	1.0E-03	2.0E-03	0/2	6.7E-04	6.0E-04	7.4E-04	0/1	1.1E-03	1.1E-03	1.1E-03	0/5	9.3E-04	6.8E-04	1.4E-03	0/1	7.1E-04	7.1E-04	7.1E-04
	1,3-Dichloropropane	0/2	1.5E-03	1.0E-03	2.0E-03	0/2	6.7E-04	6.0E-04	7.4E-04	0/1	1.1E-03	1.1E-03	1.1E-03	0/5	9.3E-04	6.8E-04	1.4E-03	0/1	7.1E-04	7.1E-04	7.1E-04
	1,4-Dioxane	na	na	na	na	0/10	1.5E-01	1.5E-01	1.5E-01	0/4	1.5E-01	1.5E-01	1.5E-01	0/5	1.5E-01	1.5E-01	1.5E-01	na	na	na	na
	2,2-Dichloropropane	0/2	1.5E-03	1.0E-03	2.0E-03	0/2	6.7E-04	6.0E-04	7.4E-04	0/1	1.1E-03	1.1E-03	1.1E-03	0/5	9.3E-04	6.8E-04	1.4E-03	0/1	7.1E-04	7.1E-04	7.1E-04
	2-Chloro-1,3-butadiene (Chloroprene)	na	na	na	na	0/10	5.0E-03	5.0E-03	5.0E-03	0/4	5.0E-03	5.0E-03	5.0E-03	0/5	5.0E-03	5.0E-03	5.0E-03	na	na	na	na
	2-Chloroethyl vinyl ether	0/3	2.5E-03	2.5E-03	2.5E-03	0/12	4.6E-03	2.5E-03	5.0E-03	0/5	4.5E-03	2.5E-03	5.0E-03	0/11	3.6E-03	2.5E-03	5.0E-03	0/3	5.2E-03	4.0E-03	7.0E-03
	2-Chlorotoluene	0/2	1.5E-03	1.0E-03	2.0E-03	0/2	6.7E-04	6.0E-04	7.4E-04	0/1	1.1E-03	1.1E-03	1.1E-03	0/5	9.3E-04	6.8E-04	1.4E-03	0/1	7.1E-04	7.1E-04	7.1E-04
	2-Hexanone	0/5	4.2E-03	2.1E-03	5.0E-03	0/14	4.5E-03	1.2E-03	5.0E-03	0/6	4.5E-03	2.2E-03	5.0E-03	0/16	4.0E-03	1.4E-03	5.0E-03	0/4	8.0E-03	1.4E-03	1.4E-02
	3-Chloropropene (Allyl Chloride)	na	na	na	na	0/10	5.0E-03	5.0E-03	5.0E-03	0/4	5.0E-03	5.0E-03	5.0E-03	0/5	5.0E-03	5.0E-03	5.0E-03	na	na	na	na
	4-Chlorotoluene	0/2	1.5E-03	1.0E-03	2.0E-03	0/2	6.7E-04	6.0E-04	7.4E-04	0/1	1.1E-03	1.1E-03	1.1E-03	0/5	9.3E-04	6.8E-04	1.4E-03	0/1	7.1E-04	7.1E-04	7.1E-04
	Acetone	5/5	9.3E-02	6.7E-02	1.3E-01	5/14	8.8E-03	1.4E-03	4.7E-02	4/6	3.2E-02	5.0E-03	9.5E-02	15/16	7.2E-02	2.0E-03	3.9E-01	2/4	1.3E-02	5.7E-03	3.1E-02
	Acetonitrile	0/3	1.0E-02	1.0E-02	1.0E-02	0/12	2.3E-02	1.0E-02	2.5E-02	0/5	2.2E-02	1.0E-02	2.5E-02	0/11	1.7E-02	1.0E-02	2.5E-02	0/3	2.1E-02	1.6E-02	2.9E-02

Appendix A-2
Summary Statistics for Analytes in Site Sediment (mg/kg)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Type	Analyte	Weber River - Reach A				Weber River - Reach B				Weber River - Reach C				Weber River - Reach D				Buena Ventura Park Pond			
		DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max
VOC	Acrolein	0/3	1.0E-02	1.0E-02	1.0E-02	0/12	4.3E-02	1.0E-02	5.0E-02	1/5	3.3E-02	4.5E-03	5.0E-02	0/11	2.8E-02	1.0E-02	5.0E-02	0/3	2.1E-02	1.6E-02	2.9E-02
	Acrylonitrile	0/3	1.0E-02	1.0E-02	1.0E-02	1/12	2.1E-02	1.0E-02	2.5E-02	0/5	2.2E-02	1.0E-02	2.5E-02	0/11	1.7E-02	1.0E-02	2.5E-02	0/3	2.1E-02	1.6E-02	2.9E-02
	Benzene	0/5	2.1E-03	1.0E-03	2.5E-03	0/14	2.2E-03	6.0E-04	2.5E-03	0/6	2.3E-03	1.1E-03	2.5E-03	0/16	2.0E-03	6.8E-04	2.5E-03	0/4	4.1E-03	7.1E-04	7.0E-03
	Bromobenzene	0/2	1.5E-03	1.0E-03	2.0E-03	0/2	6.7E-04	6.0E-04	7.4E-04	0/1	1.1E-03	1.1E-03	1.1E-03	0/5	9.3E-04	6.8E-04	1.4E-03	0/1	7.1E-04	7.1E-04	7.1E-04
	Bromodichloromethane	0/5	2.1E-03	1.0E-03	2.5E-03	0/14	2.2E-03	6.0E-04	2.5E-03	0/6	2.3E-03	1.1E-03	2.5E-03	0/16	2.0E-03	6.8E-04	2.5E-03	0/4	4.1E-03	7.1E-04	7.0E-03
	Bromoform	0/5	2.1E-03	1.0E-03	2.5E-03	0/14	2.2E-03	6.0E-04	2.5E-03	0/6	2.3E-03	1.1E-03	2.5E-03	0/16	2.0E-03	6.8E-04	2.5E-03	0/4	4.1E-03	7.1E-04	7.0E-03
	Bromomethane (Methyl bromide)	3/5	6.8E-03	2.1E-03	1.0E-02	0/14	4.3E-03	1.2E-03	5.0E-03	0/6	4.3E-03	2.2E-03	5.0E-03	1/16	3.6E-03	1.4E-03	5.0E-03	0/4	8.0E-03	1.4E-03	1.4E-02
	Carbon Disulfide	3/5	4.2E-03	1.0E-03	7.0E-03	1/14	2.4E-03	6.0E-04	5.0E-03	1/6	2.3E-03	1.1E-03	3.0E-03	7/16	2.1E-03	6.8E-04	5.2E-03	0/4	4.1E-03	7.1E-04	7.0E-03
	Carbon Tetrachloride	0/5	2.1E-03	1.0E-03	2.5E-03	0/14	2.2E-03	6.0E-04	2.5E-03	0/6	2.3E-03	1.1E-03	2.5E-03	0/16	2.0E-03	6.8E-04	2.5E-03	0/4	4.1E-03	7.1E-04	7.0E-03
	Chlorobenzene	0/5	2.1E-03	1.0E-03	2.5E-03	0/14	2.2E-03	6.0E-04	2.5E-03	0/6	2.3E-03	1.1E-03	2.5E-03	1/16	2.0E-03	6.8E-04	2.5E-03	0/4	4.1E-03	7.1E-04	7.0E-03
	Chlorodibromomethane	0/5	2.1E-03	1.0E-03	2.5E-03	0/14	2.2E-03	6.0E-04	2.5E-03	0/6	2.3E-03	1.1E-03	2.5E-03	0/16	2.0E-03	6.8E-04	2.5E-03	0/4	4.1E-03	7.1E-04	7.0E-03
	Chloroethane (Ethyl chloride)	0/5	3.6E-03	1.0E-03	5.0E-03	0/14	4.4E-03	6.0E-04	5.0E-03	0/6	4.3E-03	1.1E-03	5.0E-03	0/16	3.7E-03	6.8E-04	5.0E-03	0/4	7.8E-03	7.1E-04	1.4E-02
	Chloroform	0/5	2.1E-03	1.0E-03	2.5E-03	0/14	2.2E-03	6.0E-04	2.5E-03	0/6	2.3E-03	1.1E-03	2.5E-03	0/16	2.0E-03	6.8E-04	2.5E-03	0/4	4.1E-03	7.1E-04	7.0E-03
	Chloromethane (Methyl chloride)	0/5	2.5E-03	1.0E-03	3.5E-03	0/14	4.1E-03	6.0E-04	5.0E-03	0/6	4.0E-03	1.1E-03	5.0E-03	1/16	3.0E-03	6.8E-04	5.0E-03	0/4	7.8E-03	7.1E-04	1.4E-02
	cis-1,2-Dichloroethene	0/3	5.5E-03	5.0E-03	6.0E-03	0/2	4.3E-03	3.5E-03	5.0E-03	0/1	6.0E-03	6.0E-03	6.0E-03	0/6	4.5E-03	3.5E-03	6.5E-03	0/3	5.2E-03	4.0E-03	7.0E-03
	cis-1,3-Dichloropropene	0/7	1.9E-03	1.0E-03	2.5E-03	0/16	2.0E-03	6.0E-04	2.5E-03	0/7	2.1E-03	1.1E-03	2.5E-03	0/21	1.8E-03	6.8E-04	2.5E-03	0/5	3.4E-03	7.1E-04	7.0E-03
	Dibromomethane	0/2	1.5E-03	1.0E-03	2.0E-03	0/12	4.3E-03	6.0E-04	5.0E-03	0/5	4.2E-03	1.1E-03	5.0E-03	0/10	3.0E-03	6.8E-04	5.0E-03	0/1	7.1E-04	7.1E-04	7.1E-04
	Dichlorodifluoromethane	2/2	1.2E-02	8.1E-03	1.6E-02	2/12	5.0E-03	4.5E-03	5.8E-03	1/5	5.8E-03	5.0E-03	8.9E-03	5/10	7.0E-03	5.0E-03	1.3E-02	1/1	1.9E-03	1.9E-03	1.9E-03
	Dichloromethane	5/5	4.9E-03	2.0E-03	8.5E-03	9/14	2.7E-03	1.0E-03	5.2E-03	5/6	6.1E-03	2.0E-03	1.3E-02	12/16	3.6E-03	5.0E-04	9.0E-03	0/4	1.9E-03	7.1E-04	3.0E-03
	Ethyl Methacrylate	na	na	na	na	0/10	2.5E-02	2.5E-02	2.5E-02	0/4	2.5E-02	2.5E-02	2.5E-02	0/5	2.5E-02	2.5E-02	2.5E-02	na	na	na	na
	Ethylbenzene	0/5	2.1E-03	1.0E-03	2.5E-03	1/14	2.1E-03	6.0E-04	2.5E-03	0/6	2.3E-03	1.1E-03	2.5E-03	0/16	2.0E-03	6.8E-04	2.5E-03	0/4	4.1E-03	7.1E-04	7.0E-03
	Ethylene dibromide (EDB)	0/5	2.1E-03	1.0E-03	2.5E-03	0/14	4.0E-03	6.0E-04	5.0E-03	0/6	3.9E-03	1.1E-03	5.0E-03	0/16	2.8E-03	6.8E-04	5.0E-03	0/4	4.1E-03	7.1E-04	7.0E-03
	Hexane	0/3	2.5E-03	2.5E-03	2.5E-03	0/2	2.5E-03	2.5E-03	2.5E-03	0/1	2.5E-03	2.5E-03	2.5E-03	0/6	2.5E-03	2.5E-03	2.5E-03	0/3	5.2E-03	4.0E-03	7.0E-03
	Iodomethane	na	na	na	na	0/10	5.0E-03	5.0E-03	5.0E-03	0/4	5.0E-03	5.0E-03	5.0E-03	0/5	5.0E-03	5.0E-03	5.0E-03	na	na	na	na
	Isobutyl Alcohol	na	na	na	na	0/10	5.0E-02	5.0E-02	5.0E-02	0/4	5.0E-02	5.0E-02	5.0E-02	0/5	5.0E-02	5.0E-02	5.0E-02	na	na	na	na
	Isopropylbenzene	1/4	5.4E-03	1.0E-03	1.6E-02	0/4	6.7E-04	6.0E-04	7.4E-04	0/2	1.1E-03	1.1E-03	1.1E-03	1/10	1.1E-03	6.8E-04	3.3E-03	0/2	7.1E-04	7.1E-04	7.1E-04
	Methacrylonitrile	0/3	5.0E-03	5.0E-03	5.0E-03	0/12	5.0E-03	5.0E-03	5.0E-03	0/5	5.0E-03	5.0E-03	5.0E-03	0/11	5.0E-03	5.0E-03	5.0E-03	0/3	1.0E-02	8.0E-03	1.4E-02
	Methyl ethyl ketone (MEK)	5/5	3.6E-02	2.4E-02	5.6E-02	1/14	4.8E-03	2.4E-03	5.0E-03	2/6	8.0E-03	5.0E-03	1.6E-02	11/16	1.6E-02	3.4E-03	6.0E-02	0/1	2.9E-03	2.9E-03	2.9E-03
	Methyl isobutyl ketone (MIBK)	0/5	4.2E-03	2.1E-03	5.0E-03	0/14	4.5E-03	1.2E-03	5.0E-03	1/6	4.8E-03	2.2E-03	6.4E-03	0/16	4.0E-03	1.4E-03	5.0E-03	0/4	8.0E-03	1.4E-03	1.4E-02
	Methyl Methacrylate	na	na	na	na	0/10	5.0E-03	5.0E-03	5.0E-03	0/4	5.0E-03	5.0E-03	5.0E-03	0/5	5.0E-03	5.0E-03	5.0E-03	na	na	na	na
	Methyl-t-butyl ether (MTBE)	0/2	1.5E-03	1.0E-03	2.0E-03	0/2	6.7E-04	6.0E-04	7.4E-04	0/1	1.1E-03	1.1E-03	1.1E-03	1/5	1.2E-03	7.0E-04	2.1E-03	0/1	7.1E-04	7.1E-04	7.1E-04
	n-Butylbenzene	0/2	1.5E-03	1.0E-03	2.0E-03	0/2	6.7E-04	6.0E-04	7.4E-04	0/1	1.1E-03	1.1E-03	1.1E-03	0/5	9.3E-04	6.8E-04	1.4E-03	0/1	7.1E-04	7.1E-04	7.1E-04
	n-Propylbenzene	0/2	1.5E-03	1.0E-03	2.0E-03	0/2	6.7E-04	6.0E-04	7.4E-04	0/1	1.1E-03	1.1E-03	1.1E-03	0/5	9.3E-04	6.8E-04	1.4E-03	0/1	7.1E-04	7.1E-04	7.1E-04
	o-Xylene	0/2	1.5E-03	1.0E-03	2.0E-03	0/2	6.7E-04	6.0E-04	7.4E-04	0/1	1.1E-03	1.1E-03	1.1E-03	0/5	9.3E-04	6.8E-04	1.4E-03	0/1	7.1E-04	7.1E-04	7.1E-04
	sec-Butylbenzene	0/2	1.5E-03	1.0E-03	2.0E-03	0/2	6.7E-04	6.0E-04	7.4E-04	0/1	1.1E-03	1.1E-03	1.1E-03	0/5	9.3E-04	6.8E-04	1.4E-03	0/1	7.1E-04	7.1E-04	7.1E-04
	Styrene	0/5	2.1E-03	1.0E-03	2.5E-03	0/14	2.2E-03	6.0E-04	2.5E-03	0/6	2.3E-03	1.1E-03	2.5E-03	0/16	2.0E-03	6.8E-04	2.5E-03	0/4	4.1E-03	7.1E-04	7.0E-03
	tert-Butylbenzene	0/2	1.5E-03	1.0E-03	2.0E-03	0/2	6.7E-04	6.0E-04	7.4E-04	0/1	1.1E-03	1.1E-03	1.1E-03	0/5	9.3E-04	6.8E-04	1.4E-03	0/1	7.1E-04	7.1E-04	7.1E-04
	Tetrachloroethene	0/5	2.1E-03	1.0E-03	2.5E-03	0/14	2.2E-03	6.0E-04	2.5E-03	0/6	2.3E-03	1.1E-03	2.5E-03	0/16	2.0E-03	6.8E-04	2.5E-03	0/4	4.1E-03	7.1E-04	7.0E-03
	Toluene	5/5	1.2E+00	3.6E-01	1.9E+00	5/14	4.4E-03	7.4E-04	2.1E-02	3/6	6.9E-03	1.1E-03	2.8E-02	14/16	1.0E-01	6.8E-04	8.8E-01	0/4	4.1E-03	7.1E-04	7.0E-03
	trans-1,2-Dichloroethene	0/5	3.9E-03	1.0E-03	6.0E-03	0/4	2.5E-03	6.0E-04	5.0E-03	0/2	3.5E-03	1.1E-03	6.0E-03	0/11	2.9E-03	6.8E-04	6.5E-03	0/4	4.1E-03	7.1E-04	7.0E-03
	trans-1,3-Dichloropropene	0/5	2.1E-03	1.0E-03	2.5E-03	0/14	2.2E-03	6.0E-04	2.5E-03	0/6	2.3E-03	1.1E-03	2.5E-03	0/16	2.0E-03	6.8E-04	2.5E-03	0/4	4.1E-03	7.1E-04	7.0E-03
	trans-1,4-Dichloro-2-Butene	na	na	na	na	0/10	5.0E-03	5.0E-03	5.0E-03	0/4	5.0E-03	5.0E-03	5.0E-03	0/5	5.0E-03	5.0E-03	5.0E-03	na	na	na	na
	Trichloroethene	0/5	2.1E-03	1.0E-03	2.5E-03	0/14	2.2E-03	6.0E-04	2.5E-03	0/6	2.3E-03	1.1E-03	2.5E-03	0/16	2.0E-03	6.8E-04	2.5E-03	0/4	4.1E-03	7.1E-04	7.0E-03
	Trichlorofluoromethane	0/5	3.6E-03	1.0E-03	5.0E-03	0/14	2.6E-03	6.0E-04	5.0E-03	0/6	2.7E-03	1.1E-03	5.0E-03	0/16	2.9E-03	6.8E-04	5.0E-03	0/4	7.8E-03	7.1E-04	1.4E-02
	Vinyl Acetate	0/3	2.5E-03	2.5E-03	2.5E-03	0/12	4.6E-03	2.5E-03	5.0E-03	0/5	4.5E-03	2.5E-03	5.0E-03	0/11	3.6E-03	2.5E-03	5.0E-03	0/3	5.2E-03	4.0E-03	7.0E-03
	Vinyl Chloride	0/5	3.6E-03	1.0E-03	5.0E-03	0/14	4.4E-03	6.0E-04	5.0E-03	0/6	4.3E-03	1.1E-03	5.0E-03	0/16	3.7E-03	6.8E-04	5.0E-03	0/4	7.8E-03	7.1E-04	1.4E-02
	Xylenes (Total)	1/3	7.0E-03	1.0E-03	1.0E-02	1/12	4.3E-03	2.5E-03	1.0E-02	0/5	4.0E-03	2.5E-03	1.0E-02	1/11	6.8E-03	2.5E-03	1.0E-02	0/3	1.6E-02	1.2E-02	2.2E-02
	Xylenes-p,m	0/2	1.5E-03	1.0E-03	2.0E-03	0/2	6.7E-04	6.0E-04	7.4E-04	0/1	1.1E-03	1.1E-03	1.1E-03	0/5	9.3E-04	6.8E-04	1.4E-03	0/1	7.1E-04	7.1E-04	7.1E-04

Appendix A-2
Summary Statistics for Analytes in Site Sediment (mg/kg)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Type	Analyte	21st Street Pond				Ogden River - Reach A				Ogden River - Reach B				Ogden River - Reach C			
		DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max
Metals	Aluminum	14/14	9.0E+03	3.5E+03	1.7E+04	na	na	na	na	4/4	3.4E+03	2.4E+03	5.6E+03	na	na	na	na
	Antimony	0/14	1.4E+00	2.6E-01	7.0E+00	na	na	na	na	0/4	1.1E+00	2.2E-01	3.6E+00	na	na	na	na
	Arsenic	12/14	3.2E+00	7.5E-01	5.4E+00	na	na	na	na	4/5	2.6E+00	1.7E+00	4.3E+00	na	na	na	na
	Barium	12/14	9.7E+01	2.7E+01	1.5E+02	na	na	na	na	4/5	4.4E+01	9.4E+00	1.0E+02	na	na	na	na
	Beryllium	10/14	2.9E-01	1.5E-02	6.3E-01	na	na	na	na	3/4	2.4E-01	1.7E-01	3.2E-01	na	na	na	na
	Cadmium	0/14	1.1E-01	2.0E-02	5.5E-01	na	na	na	na	1/5	2.1E-01	2.0E-02	7.0E-01	na	na	na	na
	Calcium	14/14	6.1E+04	3.1E+04	9.7E+04	na	na	na	na	4/4	2.1E+04	1.7E+04	2.8E+04	na	na	na	na
	Chromium	14/14	1.3E+01	6.2E+00	2.2E+01	na	na	na	na	5/5	6.4E+00	4.5E+00	1.0E+01	na	na	na	na
	Cobalt	14/14	4.8E+00	2.7E+00	7.7E+00	na	na	na	na	4/4	3.0E+00	2.3E+00	4.4E+00	na	na	na	na
	Copper	14/14	1.9E+01	6.0E+00	3.3E+01	na	na	na	na	4/4	1.4E+01	5.4E+00	3.8E+01	na	na	na	na
	Iron	14/14	1.2E+04	6.0E+03	2.1E+04	na	na	na	na	4/4	8.1E+03	6.6E+03	1.0E+04	na	na	na	na
	Lead	14/14	2.5E+01	7.2E+00	4.9E+01	na	na	na	na	5/5	2.0E+01	7.9E+00	4.2E+01	na	na	na	na
	Magnesium	14/14	8.6E+03	6.4E+03	1.1E+04	na	na	na	na	4/4	7.4E+03	5.6E+03	8.7E+03	na	na	na	na
	Manganese	14/14	4.6E+02	1.3E+02	9.6E+02	na	na	na	na	4/4	2.3E+02	1.2E+02	5.3E+02	na	na	na	na
	Mercury	12/14	8.8E-02	2.0E-02	5.3E-01	na	na	na	na	2/5	2.1E-02	5.0E-03	3.3E-02	na	na	na	na
	Nickel	14/14	1.1E+01	5.2E+00	2.0E+01	na	na	na	na	4/4	6.7E+00	4.6E+00	9.3E+00	na	na	na	na
	Potassium	14/14	2.4E+03	9.2E+02	4.7E+03	na	na	na	na	4/4	7.5E+02	4.3E+02	1.5E+03	na	na	na	na
	Selenium	6/14	9.1E-01	2.2E-01	2.5E+00	na	na	na	na	1/5	1.4E+00	1.9E-01	5.8E+00	na	na	na	na
	Silver	1/14	2.7E-01	1.2E-01	7.5E-01	na	na	na	na	0/5	1.8E-01	7.0E-02	3.0E-01	na	na	na	na
	Sodium	14/14	2.6E+02	1.7E+02	3.8E+02	na	na	na	na	4/4	9.7E+01	6.3E+01	1.7E+02	na	na	na	na
	Thallium	2/14	1.1E+00	2.2E-01	1.7E+00	na	na	na	na	1/4	6.9E-01	4.1E-01	9.5E-01	na	na	na	na
	Vanadium	14/14	1.8E+01	8.8E+00	3.2E+01	na	na	na	na	4/4	8.0E+00	5.8E+00	1.3E+01	na	na	na	na
	Zinc	14/14	6.8E+01	2.7E+01	1.1E+02	na	na	na	na	4/4	4.3E+01	3.0E+01	7.1E+01	na	na	na	na
Pesticides	4,4'-DDD	0/9	3.9E-03	2.3E-03	5.5E-03	0/6	2.4E-03	2.1E-03	3.0E-03	0/6	3.8E-03	2.1E-03	8.0E-03	0/3	2.2E-03	2.0E-03	2.4E-03
	4,4'-DDE	5/9	6.4E-03	2.3E-03	1.2E-02	0/6	2.4E-03	2.1E-03	3.0E-03	0/6	3.8E-03	2.1E-03	8.0E-03	0/3	2.2E-03	2.0E-03	2.4E-03
	4,4'-DDT	0/9	3.9E-03	2.3E-03	5.5E-03	0/6	2.4E-03	2.1E-03	3.0E-03	1/6	4.3E-03	2.1E-03	8.0E-03	1/3	3.5E-03	2.1E-03	6.1E-03
	Aldrin	0/9	2.7E-03	1.2E-03	5.5E-03	0/6	1.3E-03	1.1E-03	1.5E-03	0/6	2.1E-03	1.2E-03	4.0E-03	0/3	1.1E-03	1.0E-03	1.3E-03
	alpha-BHC	0/9	2.7E-03	1.2E-03	5.5E-03	0/6	1.3E-03	1.1E-03	1.5E-03	0/6	2.1E-03	1.2E-03	4.0E-03	0/3	1.1E-03	1.0E-03	1.3E-03
	beta-BHC	0/9	2.7E-03	1.2E-03	5.5E-03	0/6	1.3E-03	1.1E-03	1.5E-03	0/6	2.1E-03	1.2E-03	4.0E-03	0/3	1.1E-03	1.0E-03	1.3E-03
	alpha-Chlordane	0/9	2.7E-03	1.2E-03	5.5E-03	0/6	1.3E-03	1.1E-03	1.5E-03	0/5	1.8E-03	1.2E-03	2.9E-03	0/3	1.1E-03	1.0E-03	1.3E-03
	Atrazine	0/10	1.1E+00	2.3E-01	3.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/4	2.5E+00	2.2E-01	7.0E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	Caprolactam	0/10	1.1E+00	2.3E-01	3.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/3	1.0E+00	2.2E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	Chlordane	na	na	na	na	na	na	na	na	0/1	4.0E-02	4.0E-02	4.0E-02	na	na	na	na
	delta-BHC	0/9	2.7E-03	1.2E-03	5.5E-03	0/6	1.3E-03	1.1E-03	1.5E-03	0/6	2.1E-03	1.2E-03	4.0E-03	0/3	1.1E-03	1.0E-03	1.3E-03
	Dieldrin	0/9	3.9E-03	2.3E-03	5.5E-03	0/6	2.4E-03	2.1E-03	3.0E-03	1/6	4.3E-03	2.1E-03	8.0E-03	0/3	2.2E-03	2.0E-03	2.4E-03
	Endosulfan I	0/9	2.7E-03	1.2E-03	5.5E-03	0/6	1.3E-03	1.1E-03	1.5E-03	0/6	2.1E-03	1.2E-03	4.0E-03	0/3	1.1E-03	1.0E-03	1.3E-03
	Endosulfan II	0/9	3.9E-03	2.3E-03	5.5E-03	0/6	2.4E-03	2.1E-03	3.0E-03	0/6	3.8E-03	2.1E-03	8.0E-03	0/3	2.2E-03	2.0E-03	2.4E-03
	Endosulfan Sulfate	0/9	3.9E-03	2.3E-03	5.5E-03	0/6	2.4E-03	2.1E-03	3.0E-03	0/6	3.8E-03	2.1E-03	8.0E-03	0/3	2.2E-03	2.0E-03	2.4E-03
	Endrin	0/9	3.9E-03	2.3E-03	5.5E-03	0/6	2.4E-03	2.1E-03	3.0E-03	0/6	3.8E-03	2.1E-03	8.0E-03	0/3	2.2E-03	2.0E-03	2.4E-03
	Endrin Aldehyde	2/9	4.6E-03	2.3E-03	8.1E-03	0/6	2.4E-03	2.1E-03	3.0E-03	0/6	3.8E-03	2.1E-03	8.0E-03	1/3	3.0E-03	2.1E-03	4.6E-03
	Endrin ketone	0/9	3.9E-03	2.3E-03	5.5E-03	0/6	2.4E-03	2.1E-03	3.0E-03	0/5	3.0E-03	2.1E-03	5.5E-03	0/3	2.2E-03	2.0E-03	2.4E-03
	gamma-BHC (Lindane)	0/9	2.7E-03	1.2E-03	5.5E-03	0/6	1.3E-03	1.1E-03	1.5E-03	0/6	2.1E-03	1.2E-03	4.0E-03	0/3	1.1E-03	1.0E-03	1.3E-03
	gamma-Chlordane	0/9	2.7E-03	1.2E-03	5.5E-03	0/6	1.3E-03	1.1E-03	1.5E-03	0/5	1.8E-03	1.2E-03	2.9E-03	0/3	1.1E-03	1.0E-03	1.3E-03
	Heptachlor	0/9	2.7E-03	1.2E-03	5.5E-03	0/6	1.3E-03	1.1E-03	1.5E-03	0/6	2.1E-03	1.2E-03	4.0E-03	0/3	1.1E-03	1.0E-03	1.3E-03
	Heptachlor Epoxide	0/9	2.7E-03	1.2E-03	5.5E-03	0/6	1.3E-03	1.1E-03	1.5E-03	0/6	2.1E-03	1.2E-03	4.0E-03	0/3	1.1E-03	1.0E-03	1.3E-03
	Isodrin	na	na	na	na	na	na	na	na	0/1	4.0E-03	4.0E-03	4.0E-03	na	na	na	na
	Kepone	na	na	na	na	na	na	na	na	0/1	8.0E-03	8.0E-03	8.0E-03	na	na	na	na
	Methoxychlor	0/9	1.4E-02	2.3E-03	2.4E-02	0/6	1.3E-02	1.1E-02	1.5E-02	0/6	1.8E-02	2.1E-03	4.0E-02	0/3	1.1E-02	1.0E-02	1.3E-02
	Toxaphene	0/9	1.6E-01	5.5E-02	2.4E-01	0/6	1.3E-01	1.1E-01	1.5E-01	0/6	1.3E-01	5.5E-02	2.8E-01	0/3	1.1E-01	1.0E-01	1.3E-01
	2-Chloronaphthalene	0/28	8.2E-01	2.3E-01	3.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	1-Methylnaphthalene	2/15	1.5E+01	2.9E-01	2.1E+02	na	na	na	na	0/3	5.3E-01	4.4E-01	6.5E-01	na	na	na	na
	2-Methylnaphthalene	11/43	4.0E+01	3.0E-03	1.4E+03	0/4	8.6E-01	8.5E-03	3.1E+00	0/12	5.1E-01	6.5E-03	1.5E+00	0/6	1.2E-01	6.5E-03	2.4E-01
	Acenaphthene	19/43	2.6E+01	3.0E-03	8.5E+02	1/8	5.1E-01	8.0E-03	3.1E+00	1/21	3.5E-01	6.5E-03	1.5E+00	2/7	1.2E-01	3.0E-03	2.4E-01
	Acenaphthylene	19/43	4.0E+00	2.0E-03	1.3E+02	0/8	5.1E-01	8.5E-03	3.1E+00	1/21	3.6E-01	6.5E-03	1.5E+00	0/7	1.3E-01	6.5E-03	2.4E-01
	Aniline	0/22	6.7E-01	2.0E-01	6.5E+00	na	na	na	na	0/3	5.3E-01	4.4E-01	6.5E-01	na	na	na	na
	Anthracene	19/43	1.6E+01	4.0E-03	5.2E+02	2/8	5.1E-01	3.1E-02	3.1E+00	9/21	3.3E-01	1.0E-02	1.5E+00	4/7	1.2E-01	7.0E-03	2.4E-01

Appendix A-2
Summary Statistics for Analytes in Site Sediment (mg/kg)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Type	Analyte	21st Street Pond				Ogden River - Reach A				Ogden River - Reach B				Ogden River - Reach C			
		DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max
PAHs	Benzo[a]anthracene	23/43	1.1E+01	5.0E-03	3.4E+02	4/8	5.0E-01	8.8E-02	3.1E+00	18/21	2.5E-01	3.7E-02	1.4E+00	5/7	1.2E-01	2.4E-02	2.4E-01
	Benzo[a]pyrene	29/43	1.2E+01	6.0E-03	3.5E+02	4/8	5.0E-01	7.7E-02	3.1E+00	17/21	2.6E-01	4.1E-02	1.4E+00	5/7	1.2E-01	2.7E-02	2.4E-01
	Benzo[b]fluoranthene	28/43	5.8E+00	5.0E-03	1.6E+02	4/8	4.8E-01	5.7E-02	3.1E+00	16/21	2.9E-01	3.3E-02	1.5E+00	5/7	1.1E-01	1.8E-02	2.4E-01
	Benzo[g,h,i]perylene	28/43	7.3E+00	3.0E-03	2.0E+02	3/8	5.0E-01	3.6E-02	3.1E+00	10/21	3.3E-01	1.9E-02	1.5E+00	5/7	1.0E-01	1.6E-02	2.4E-01
	Benzo[k]fluoranthene	27/43	5.9E+00	5.0E-03	1.7E+02	4/8	4.8E-01	5.9E-02	3.1E+00	15/21	3.0E-01	2.4E-02	1.5E+00	5/7	9.8E-02	1.7E-02	2.4E-01
	Chrysene	28/43	1.2E+01	7.0E-03	3.6E+02	4/8	5.1E-01	1.1E-01	3.1E+00	18/21	2.9E-01	4.2E-02	1.4E+00	6/7	1.0E-01	2.8E-02	2.2E-01
	Dibenz[a,h]anthracene	18/43	2.3E+00	3.0E-03	7.2E+01	1/8	5.1E-01	2.4E-02	3.1E+00	6/21	3.4E-01	1.0E-02	1.5E+00	3/7	1.2E-01	5.0E-03	2.4E-01
	Fluoranthene	29/43	2.0E+01	1.1E-02	6.4E+02	6/8	5.2E-01	4.0E-02	3.1E+00	18/21	3.7E-01	6.2E-02	1.4E+00	7/7	1.4E-01	4.9E-02	3.2E-01
	Fluorene	15/43	1.3E+01	3.0E-03	4.2E+02	2/8	4.9E-01	7.0E-03	3.1E+00	2/21	3.5E-01	6.5E-03	1.5E+00	1/7	1.3E-01	3.0E-03	2.4E-01
	Indeno[1,2,3-c,d]pyrene	27/43	5.7E+00	3.0E-03	1.6E+02	3/8	5.0E-01	5.6E-02	3.1E+00	14/21	3.2E-01	2.6E-02	1.5E+00	5/7	9.5E-02	1.7E-02	2.4E-01
	Naphthalene	16/46	5.1E+01	4.0E-03	1.9E+03	0/8	5.1E-01	8.5E-03	3.1E+00	1/22	3.4E-01	2.7E-03	1.5E+00	1/7	1.3E-01	2.0E-03	2.4E-01
	Phenanthrene	22/43	5.6E+01	5.0E-03	1.9E+03	4/8	5.1E-01	1.0E-01	3.1E+00	16/21	3.4E-01	3.3E-02	1.5E+00	5/7	1.9E-01	2.5E-02	3.6E-01
	Pyrene	35/43	4.0E+01	1.6E-02	1.2E+03	6/8	5.2E-01	4.1E-02	3.1E+00	18/21	4.4E-01	6.4E-02	1.8E+00	7/7	1.5E-01	4.6E-02	3.2E-01
PCB	Aroclor-1016	0/16	6.7E-02	2.0E-02	5.5E-01	0/10	3.0E-02	2.1E-02	4.7E-02	0/15	1.3E-01	2.3E-02	5.5E-01	0/4	3.2E-02	2.0E-02	6.5E-02
	Aroclor-1221	0/16	9.1E-02	2.0E-02	5.5E-01	0/10	4.5E-02	2.5E-02	6.0E-02	0/15	1.4E-01	2.9E-02	5.5E-01	0/4	4.9E-02	4.0E-02	6.5E-02
	Aroclor-1232	0/16	6.7E-02	2.0E-02	5.5E-01	0/10	3.0E-02	2.1E-02	4.7E-02	0/15	1.3E-01	2.3E-02	5.5E-01	0/4	3.2E-02	2.0E-02	6.5E-02
	Aroclor-1242	0/16	6.7E-02	2.0E-02	5.5E-01	0/10	3.0E-02	2.1E-02	4.7E-02	0/15	1.3E-01	2.3E-02	5.5E-01	0/4	3.2E-02	2.0E-02	6.5E-02
	Aroclor-1248	0/16	6.7E-02	2.0E-02	5.5E-01	0/10	3.0E-02	2.1E-02	4.7E-02	0/15	1.3E-01	2.3E-02	5.5E-01	0/4	3.2E-02	2.0E-02	6.5E-02
	Aroclor-1254	0/16	6.7E-02	2.0E-02	5.5E-01	1/9	3.3E-02	2.1E-02	4.7E-02	1/15	1.4E-01	2.3E-02	5.5E-01	0/4	3.2E-02	2.0E-02	6.5E-02
	Aroclor-1260	5/16	8.2E-02	2.0E-02	5.5E-01	0/10	3.0E-02	2.1E-02	4.7E-02	11/15	6.9E-01	2.3E-02	4.2E+00	3/4	1.1E-01	2.4E-02	2.3E-01
	Aroclor-1268	0/3	5.1E-02	2.8E-02	6.5E-02	na	na	na	na	0/1	2.7E-02	2.7E-02	2.7E-02	na	na	na	na
	PCB-105	1/1	2.6E+03	2.6E+03	2.6E+03	2/2	1.1E+03	1.2E+02	2.1E+03	2/2	4.5E+02	2.2E+02	6.7E+02	1/1	1.9E+02	1.9E+02	1.9E+02
	PCB-114	1/1	1.7E+02	1.7E+02	1.7E+02	1/2	8.9E+01	4.7E+00	1.7E+02	1/2	2.8E+01	8.5E+00	4.8E+01	1/1	1.5E+01	1.5E+01	1.5E+01
	PCB-118	1/1	7.2E+03	7.2E+03	7.2E+03	2/2	2.8E+03	2.7E+02	5.4E+03	2/2	3.0E+03	3.0E+03	3.1E+03	1/1	9.2E+02	9.2E+02	9.2E+02
	PCB-123	0/1	1.4E+01	1.4E+01	1.4E+01	0/2	4.8E+00	4.7E+00	4.9E+00	0/2	1.4E+01	4.9E+00	2.4E+01	0/1	4.9E+00	4.9E+00	4.9E+00
	PCB-126	1/1	4.5E+01	4.5E+01	4.5E+01	0/2	4.8E+00	4.7E+00	4.9E+00	1/2	7.8E+00	5.0E+00	1.1E+01	0/1	4.9E+00	4.9E+00	4.9E+00
	PCB-156	1/1	2.3E+03	2.3E+03	2.3E+03	2/2	1.8E+02	2.5E+01	3.4E+02	2/2	2.0E+03	2.0E+03	2.1E+03	1/1	5.3E+02	5.3E+02	5.3E+02
	PCB-157	1/1	3.1E+02	3.1E+02	3.1E+02	1/2	4.4E+01	9.5E+00	7.9E+01	2/2	1.4E+02	1.2E+02	1.6E+02	1/1	4.4E+01	4.4E+01	4.4E+01
	PCB-167	1/1	9.0E+02	9.0E+02	9.0E+02	1/2	6.9E+01	9.5E+00	1.3E+02	2/2	9.2E+02	8.6E+02	9.8E+02	1/1	2.6E+02	2.6E+02	2.6E+02
	PCB-169	0/1	9.8E+00	9.8E+00	9.8E+00	0/2	9.7E+00	9.5E+00	9.9E+00	0/2	9.4E+00	9.2E+00	9.7E+00	0/1	9.8E+00	9.8E+00	9.8E+00
	PCB-189	1/1	4.5E+02	4.5E+02	4.5E+02	0/2	9.7E+00	9.5E+00	9.9E+00	2/2	5.6E+02	5.0E+02	6.2E+02	1/1	1.5E+02	1.5E+02	1.5E+02
	PCB-77	1/1	1.6E+02	1.6E+02	1.6E+02	2/2	8.3E+01	3.2E+01	1.3E+02	1/2	3.5E+01	5.5E+00	6.5E+01	0/1	8.1E+00	8.1E+00	8.1E+00
	PCB-81	0/1	5.9E+00	5.9E+00	5.9E+00	0/2	9.7E-01	9.5E-01	9.9E-01	0/2	9.4E-01	9.2E-01	9.7E-01	0/1	9.8E-01	9.8E-01	9.8E-01
Petroleum Hydrocarbons	Total Petroleum Hydrocarbons (TPH)	1/1	1.1E+02	1.1E+02	1.1E+02	na	na	na	na	na	na	na	na	na	na	na	na
	1,2,4-Trichlorobenzene	0/28	7.1E-01	7.5E-04	6.5E+00	na	na	na	na	0/6	4.7E-01	6.7E-04	1.1E+00	na	na	na	na
	1,2-Dichlorobenzene	0/28	7.1E-01	7.5E-04	6.5E+00	na	na	na	na	0/6	4.7E-01	6.7E-04	1.1E+00	na	na	na	na
	1,3-Dichlorobenzene	0/21	5.6E-01	7.5E-04	2.7E+00	na	na	na	na	0/6	4.7E-01	6.7E-04	1.1E+00	na	na	na	na
	1,4-Dichlorobenzene	0/28	7.1E-01	7.5E-04	6.5E+00	na	na	na	na	0/6	4.7E-01	6.7E-04	1.1E+00	na	na	na	na
	2,2'-oxybis(1-Chloropropane)	0/1	2.2E+00	2.2E+00	2.2E+00	na	na	na	na	na	na	na	na	na	na	na	na
	2,4,5-Trichlorophenol	0/28	1.4E+00	2.3E-01	9.0E+00	0/2	4.1E+00	7.0E-01	7.5E+00	0/8	1.3E+00	4.2E-01	3.6E+00	0/3	5.5E-01	5.0E-01	6.0E-01
	2,4,6-Trichlorophenol	0/28	8.2E-01	2.3E-01	3.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	2,4-Dichlorophenol	0/28	8.2E-01	2.3E-01	3.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	2,4-Dimethylphenol	0/35	8.9E-01	2.0E-01	6.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	2,4-Dinitrophenol	0/28	2.3E+00	2.3E-01	9.0E+00	0/2	4.1E+00	7.0E-01	7.5E+00	0/8	2.1E+00	4.2E-01	3.6E+00	0/3	5.5E-01	5.0E-01	6.0E-01
	2,4-Dinitrotoluene	0/35	8.9E-01	2.0E-01	6.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	2,6-Dinitrotoluene	0/35	8.9E-01	2.0E-01	6.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	2-Chlorophenol	0/28	8.2E-01	2.3E-01	3.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	2-Methylphenol (o-Cresol)	0/35	8.9E-01	2.0E-01	6.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	2-Nitroaniline	0/28	2.3E+00	2.3E-01	9.0E+00	0/2	4.1E+00	7.0E-01	7.5E+00	0/8	2.1E+00	4.2E-01	3.6E+00	0/3	5.5E-01	5.0E-01	6.0E-01
	2-Nitrophenol	0/28	8.2E-01	2.3E-01	3.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	3,3'-Dichlorobenzidine	1/35	1.1E+00	3.7E-02	1.3E+01	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	3-Nitroaniline	0/28	2.3E+00	2.3E-01	9.0E+00	0/2	4.1E+00	7.0E-01	7.5E+00	0/8	2.1E+00	4.2E-01	3.6E+00	0/3	5.5E-01	5.0E-01	6.0E-01
	4,6-Dinitro-o-cresol	0/35	3.0E+00	2.3E-01	3.1E+01	0/2	4.1E+00	7.0E-01	7.5E+00	0/8	2.1E+00	4.2E-01	3.6E+00	0/3	5.5E-01	5.0E-01	6.0E-01
	4-Bromophenyl-phenylether	0/13	1.3E+00	2.3E-01	3.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/4	1.0E+00	2.2E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	4-Chloro-3-Methylphenol	0/28	8.2E-01	2.3E-01	3.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01

Appendix A-2
Summary Statistics for Analytes in Site Sediment (mg/kg)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Type	Analyte	21st Street Pond				Ogden River - Reach A				Ogden River - Reach B				Ogden River - Reach C			
		DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max
SVOC	4-Chloroaniline	0/28	8.2E-01	2.3E-01	3.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	4-Chlorophenyl-phenylether	0/28	8.2E-01	2.3E-01	3.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	4-Methylphenol (p-Cresol)	1/35	8.9E-01	2.0E-01	6.5E+00	1/2	9.9E-01	2.9E-01	1.7E+00	0/8	7.3E-01	1.7E-01	1.5E+00	1/3	2.7E-01	2.2E-01	3.5E-01
	4-Nitroaniline	0/28	2.3E+00	2.3E-01	9.0E+00	0/2	4.1E+00	7.0E-01	7.5E+00	0/8	2.1E+00	4.2E-01	3.6E+00	0/3	5.5E-01	5.0E-01	6.0E-01
	4-Nitrophenol	0/28	2.3E+00	2.3E-01	9.0E+00	0/2	4.1E+00	7.0E-01	7.5E+00	0/8	2.1E+00	4.2E-01	3.6E+00	0/3	5.5E-01	5.0E-01	6.0E-01
	Acetophenone	0/10	1.1E+00	2.3E-01	3.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/3	1.0E+00	2.2E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	Benzaldehyde	0/10	1.1E+00	2.3E-01	3.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/4	2.5E+00	2.2E-01	7.0E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	Benzyl alcohol	0/3	1.8E+00	2.3E-01	2.7E+00	na	na	na	na	0/1	1.1E+00	1.1E+00	1.1E+00	na	na	na	na
	Biphenyl	1/10	1.7E+00	2.3E-01	7.9E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/3	1.0E+00	2.2E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	bis(2-Chloroethoxy)methane	0/28	8.2E-01	2.3E-01	3.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	bis(2-Chloroethyl)ether	0/35	8.9E-01	2.0E-01	6.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	bis(2-Chloroisopropyl)ether	0/19	1.2E+00	2.0E-01	6.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/5	8.5E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	bis(2-Ethylhexyl)phthalate	14/35	9.2E-01	4.0E-02	6.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	5/9	1.3E+00	9.6E-02	7.0E+00	2/3	2.9E-01	2.4E-01	3.6E-01
	bis(n-octyl)phthalate	1/35	8.9E-01	2.0E-01	6.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	Butylbenzylphthalate	3/35	8.6E-01	9.6E-02	6.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	1/8	7.9E-01	2.2E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	Carbazole	5/35	8.9E-01	1.2E-01	6.9E+00	0/2	1.7E+00	2.9E-01	3.1E+00	1/8	6.8E-01	9.2E-02	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	Dibenzofuran	4/28	9.0E-01	1.2E-01	4.1E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	Dibutylphthalate	2/35	8.8E-01	4.8E-02	6.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	Diethylphthalate	1/35	8.8E-01	4.4E-02	6.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	Dimethylphthalate	0/28	8.2E-01	2.3E-01	3.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	Hexachlorobenzene	0/35	8.9E-01	2.0E-01	6.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	Hexachlorobutadiene	0/38	8.2E-01	7.5E-04	6.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/9	6.5E-01	6.7E-04	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	Hexachlorocyclopentadiene	0/28	8.2E-01	2.3E-01	3.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	Hexachloroethane	0/35	8.9E-01	2.0E-01	6.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	Isophorone	0/28	8.2E-01	2.3E-01	3.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	Nitrobenzene	0/35	8.9E-01	2.0E-01	6.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	N-Nitrosodiphenylamine	0/28	8.2E-01	2.3E-01	3.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	n-Nitrosodipropylamine	0/35	8.9E-01	2.0E-01	6.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	Pentachlorophenol (PCP)	0/35	3.1E+00	2.3E-01	3.1E+01	0/2	4.1E+00	7.0E-01	7.5E+00	0/8	2.1E+00	4.2E-01	3.6E+00	0/3	5.5E-01	5.0E-01	6.0E-01
	Phenol	0/35	8.9E-01	2.0E-01	6.5E+00	0/2	1.7E+00	2.9E-01	3.1E+00	0/8	7.3E-01	1.7E-01	1.5E+00	0/3	2.2E-01	2.1E-01	2.4E-01
	1,1,1,2-Tetrachloroethane	0/3	1.2E-03	7.5E-04	1.4E-03	na	na	na	na	0/2	2.8E-03	6.7E-04	5.0E-03	na	na	na	na
	1,1,1-Trichloroethane	0/19	4.8E-03	7.5E-04	8.5E-03	na	na	na	na	0/4	2.9E-03	6.7E-04	5.0E-03	na	na	na	na
	1,1,2,2-Tetrachloroethane	0/19	4.8E-03	7.5E-04	8.5E-03	na	na	na	na	0/4	2.9E-03	6.7E-04	5.0E-03	na	na	na	na
	1,1,2-Trichloroethane	0/19	4.8E-03	7.5E-04	8.5E-03	na	na	na	na	0/4	2.9E-03	6.7E-04	5.0E-03	na	na	na	na
	1,1-Dichloroethane	0/19	4.8E-03	7.5E-04	8.5E-03	na	na	na	na	0/4	2.9E-03	6.7E-04	5.0E-03	na	na	na	na
	1,1-Dichloroethene	0/3	1.2E-03	7.5E-04	1.4E-03	na	na	na	na	0/1	6.7E-04	6.7E-04	6.7E-04	na	na	na	na
	1,1-Dichloropropene	0/3	1.2E-03	7.5E-04	1.4E-03	na	na	na	na	0/1	6.7E-04	6.7E-04	6.7E-04	na	na	na	na
	1,2,3-Trichlorobenzene	0/3	1.2E-03	7.5E-04	1.4E-03	na	na	na	na	0/1	6.7E-04	6.7E-04	6.7E-04	na	na	na	na
	1,2,3-Trichloropropane	0/19	4.8E-03	7.5E-04	8.5E-03	na	na	na	na	0/4	3.5E-03	6.7E-04	5.0E-03	na	na	na	na
	1,2,4-Trimethylbenzene	1/3	4.1E-02	1.4E-03	1.2E-01	na	na	na	na	0/1	6.7E-04	6.7E-04	6.7E-04	na	na	na	na
	1,2-Dibromo-3-chloropropane (DBCP)	0/19	5.3E-03	7.5E-04	9.0E-03	na	na	na	na	0/4	3.5E-03	6.7E-04	5.0E-03	na	na	na	na
	1,2-Dichloroethane	0/19	4.8E-03	7.5E-04	8.5E-03	na	na	na	na	0/4	2.9E-03	6.7E-04	5.0E-03	na	na	na	na
	1,2-Dichloroethene	0/16	1.1E-02	6.5E-03	1.7E-02	na	na	na	na	0/3	6.3E-03	2.5E-03	1.0E-02	na	na	na	na
	1,2-Dichloropropane	0/19	4.8E-03	7.5E-04	8.5E-03	na	na	na	na	0/4	2.9E-03	6.7E-04	5.0E-03	na	na	na	na
	1,3,5-Trimethylbenzene	1/3	4.1E-02	1.4E-03	1.2E-01	na	na	na	na	0/1	6.7E-04	6.7E-04	6.7E-04	na	na	na	na
	1,3-Dichloropropane	0/3	1.2E-03	7.5E-04	1.4E-03	na	na	na	na	0/1	6.7E-04	6.7E-04	6.7E-04	na	na	na	na
	1,4-Dioxane	na	na	na	na	na	na	na	na	0/1	1.5E-01	1.5E-01	1.5E-01	na	na	na	na
	2,2-Dichloropropane	0/3	1.2E-03	7.5E-04	1.4E-03	na	na	na	na	0/1	6.7E-04	6.7E-04	6.7E-04	na	na	na	na
	2-Chloro-1,3-butadiene (Chloroprene)	na	na	na	na	na	na	na	na	0/1	5.0E-03	5.0E-03	5.0E-03	na	na	na	na
	2-Chloroethyl vinyl ether	0/16	6.0E-03	4.0E-03	9.0E-03	na	na	na	na	0/3	4.5E-03	3.5E-03	5.0E-03	na	na	na	na
	2-Chlorotoluene	0/3	1.2E-03	7.5E-04	1.4E-03	na	na	na	na	0/1	6.7E-04	6.7E-04	6.7E-04	na	na	na	na
	2-Hexanone	0/19	9.6E-03	1.5E-03	1.7E-02	na	na	na	na	0/4	5.7E-03	1.3E-03	1.0E-02	na	na	na	na
	3-Chloropropene (Allyl Chloride)	na	na	na	na	na	na	na	na	0/1	5.0E-03	5.0E-03	5.0E-03	na	na	na	na
	4-Chlorotoluene	0/3	1.2E-03	7.5E-04	1.4E-03	na	na	na	na	0/1	6.7E-04	6.7E-04	6.7E-04	na	na	na	na
	Acetone	7/19	1.3E-02	3.0E-03	2.5E-02	na	na	na	na	0/4	6.7E-03	5.0E-03	1.0E-02	na	na	na	na
	Acetonitrile	0/16	2.1E-02	6.5E-03	3.5E-02	na	na	na	na	0/3	1.9E-02	1.4E-02	2.5E-02	na	na	na	na

Appendix A-2
Summary Statistics for Analytes in Site Sediment (mg/kg)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Type	Analyte	21st Street Pond				Ogden River - Reach A				Ogden River - Reach B				Ogden River - Reach C			
		DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max
VOC	Acrolein	0/16	3.0E-02	1.6E-02	9.0E-02	na	na	na	na	0/3	2.8E-02	1.4E-02	5.0E-02	na	na	na	na
	Acrylonitrile	0/16	2.2E-02	1.3E-02	3.5E-02	na	na	na	na	0/3	1.9E-02	1.4E-02	2.5E-02	na	na	na	na
	Benzene	3/19	9.7E-03	1.4E-03	4.8E-02	na	na	na	na	0/4	2.9E-03	6.7E-04	5.0E-03	na	na	na	na
	Bromobenzene	0/3	1.2E-03	7.5E-04	1.4E-03	na	na	na	na	0/1	6.7E-04	6.7E-04	6.7E-04	na	na	na	na
	Bromodichloromethane	0/19	4.8E-03	7.5E-04	8.5E-03	na	na	na	na	0/4	2.9E-03	6.7E-04	5.0E-03	na	na	na	na
	Bromoform	0/19	4.8E-03	7.5E-04	8.5E-03	na	na	na	na	0/4	2.9E-03	6.7E-04	5.0E-03	na	na	na	na
	Bromomethane (Methyl bromide)	0/19	9.6E-03	1.5E-03	1.7E-02	na	na	na	na	0/4	5.7E-03	1.3E-03	1.0E-02	na	na	na	na
	Carbon Disulfide	0/19	4.8E-03	7.5E-04	8.5E-03	na	na	na	na	0/4	2.9E-03	6.7E-04	5.0E-03	na	na	na	na
	Carbon Tetrachloride	0/19	4.8E-03	7.5E-04	8.5E-03	na	na	na	na	0/4	2.9E-03	6.7E-04	5.0E-03	na	na	na	na
	Chlorobenzene	0/19	4.8E-03	7.5E-04	8.5E-03	na	na	na	na	0/4	2.9E-03	6.7E-04	5.0E-03	na	na	na	na
	Chlorodibromomethane	0/19	4.8E-03	7.5E-04	8.5E-03	na	na	na	na	0/4	2.9E-03	6.7E-04	5.0E-03	na	na	na	na
	Chloroethane (Ethyl chloride)	0/19	9.0E-03	7.5E-04	1.7E-02	na	na	na	na	0/4	5.5E-03	6.7E-04	1.0E-02	na	na	na	na
	Chloroform	0/19	4.8E-03	7.5E-04	8.5E-03	na	na	na	na	0/4	2.9E-03	6.7E-04	5.0E-03	na	na	na	na
	Chloromethane (Methyl chloride)	0/19	9.4E-03	7.5E-04	1.7E-02	na	na	na	na	0/4	5.5E-03	6.7E-04	1.0E-02	na	na	na	na
	cis-1,2-Dichloroethene	0/16	5.4E-03	3.0E-03	8.5E-03	na	na	na	na	0/2	4.3E-03	3.5E-03	5.0E-03	na	na	na	na
	cis-1,3-Dichloropropene	0/22	4.3E-03	7.5E-04	8.5E-03	na	na	na	na	0/5	2.5E-03	6.7E-04	5.0E-03	na	na	na	na
	Dibromomethane	0/3	1.2E-03	7.5E-04	1.4E-03	na	na	na	na	0/2	2.8E-03	6.7E-04	5.0E-03	na	na	na	na
	Dichlorodifluoromethane	2/3	3.9E-03	1.4E-03	6.3E-03	na	na	na	na	1/2	3.6E-03	2.2E-03	5.0E-03	na	na	na	na
	Dichloromethane	2/19	3.1E-03	1.4E-03	6.5E-03	na	na	na	na	1/4	1.6E-03	6.7E-04	2.2E-03	na	na	na	na
	Ethyl Methacrylate	na	na	na	na	na	na	na	na	0/1	2.5E-02	2.5E-02	2.5E-02	na	na	na	na
	Ethylbenzene	3/19	2.0E-02	1.4E-03	2.7E-01	na	na	na	na	0/4	2.9E-03	6.7E-04	5.0E-03	na	na	na	na
	Ethylene dibromide (EDB)	0/19	5.3E-03	7.5E-04	9.0E-03	na	na	na	na	0/4	3.5E-03	6.7E-04	5.0E-03	na	na	na	na
	Hexane	0/16	5.5E-03	3.0E-03	8.5E-03	na	na	na	na	0/2	4.3E-03	3.5E-03	5.0E-03	na	na	na	na
	Iodomethane	na	na	na	na	na	na	na	na	0/1	5.0E-03	5.0E-03	5.0E-03	na	na	na	na
	Isobutyl Alcohol	0/2	3.9E-02	3.3E-02	4.6E-02	na	na	na	na	0/1	5.0E-02	5.0E-02	5.0E-02	na	na	na	na
	Isopropylbenzene	2/6	8.6E-03	1.4E-03	4.0E-02	na	na	na	na	0/2	6.7E-04	6.7E-04	6.7E-04	na	na	na	na
	Methacrylonitrile	0/16	1.1E-02	6.5E-03	1.7E-02	na	na	na	na	0/3	7.2E-03	5.0E-03	1.0E-02	na	na	na	na
	Methyl ethyl ketone (MEK)	1/5	6.9E-03	5.6E-03	9.0E-03	na	na	na	na	0/2	3.8E-03	2.7E-03	5.0E-03	na	na	na	na
	Methyl isobutyl ketone (MIBK)	0/19	9.6E-03	1.5E-03	1.7E-02	na	na	na	na	0/4	5.7E-03	1.3E-03	1.0E-02	na	na	na	na
	Methyl Methacrylate	na	na	na	na	na	na	na	na	0/1	5.0E-03	5.0E-03	5.0E-03	na	na	na	na
	Methyl-t-butyl ether (MTBE)	0/3	1.2E-03	7.5E-04	1.4E-03	na	na	na	na	0/1	6.7E-04	6.7E-04	6.7E-04	na	na	na	na
	n-Butylbenzene	0/3	1.2E-03	7.5E-04	1.4E-03	na	na	na	na	0/1	6.7E-04	6.7E-04	6.7E-04	na	na	na	na
	n-Propylbenzene	1/3	9.0E-03	1.4E-03	2.4E-02	na	na	na	na	0/1	6.7E-04	6.7E-04	6.7E-04	na	na	na	na
	o-Xylene	1/3	2.8E-02	1.4E-03	8.1E-02	na	na	na	na	0/1	6.7E-04	6.7E-04	6.7E-04	na	na	na	na
	sec-Butylbenzene	1/3	2.0E-03	1.4E-03	3.3E-03	na	na	na	na	0/1	6.7E-04	6.7E-04	6.7E-04	na	na	na	na
	Styrene	0/19	4.8E-03	7.5E-04	8.5E-03	na	na	na	na	0/4	2.9E-03	6.7E-04	5.0E-03	na	na	na	na
	tert-Butylbenzene	0/3	1.2E-03	7.5E-04	1.4E-03	na	na	na	na	0/1	6.7E-04	6.7E-04	6.7E-04	na	na	na	na
	Tetrachloroethene	0/19	4.8E-03	7.5E-04	8.5E-03	na	na	na	na	0/4	2.9E-03	6.7E-04	5.0E-03	na	na	na	na
	Toluene	2/19	4.9E-03	1.4E-03	8.5E-03	na	na	na	na	0/4	2.9E-03	6.7E-04	5.0E-03	na	na	na	na
	trans-1,2-Dichloroethene	0/19	4.7E-03	7.5E-04	8.5E-03	na	na	na	na	0/3	3.1E-03	6.7E-04	5.0E-03	na	na	na	na
	trans-1,3-Dichloropropene	0/19	4.8E-03	7.5E-04	8.5E-03	na	na	na	na	0/4	2.9E-03	6.7E-04	5.0E-03	na	na	na	na
	trans-1,4-Dichloro-2-Butene	na	na	na	na	na	na	na	na	0/1	5.0E-03	5.0E-03	5.0E-03	na	na	na	na
	Trichloroethene	0/19	4.8E-03	7.5E-04	8.5E-03	na	na	na	na	0/4	2.9E-03	6.7E-04	5.0E-03	na	na	na	na
	Trichlorofluoromethane	0/19	9.0E-03	7.5E-04	1.7E-02	na	na	na	na	0/4	4.9E-03	6.7E-04	1.0E-02	na	na	na	na
	Vinyl Acetate	0/16	6.0E-03	4.0E-03	9.0E-03	na	na	na	na	0/3	4.5E-03	3.5E-03	5.0E-03	na	na	na	na
	Vinyl Chloride	0/19	9.4E-03	7.5E-04	1.7E-02	na	na	na	na	0/4	5.5E-03	6.7E-04	1.0E-02	na	na	na	na
	Xylenes (Total)	2/16	2.6E-02	9.5E-03	1.3E-01	na	na	na	na	0/3	9.0E-03	2.5E-03	1.5E-02	na	na	na	na
	Xylenes-p,m	1/3	1.8E-02	1.4E-03	5.1E-02	na	na	na	na	0/1	6.7E-04	6.7E-04	6.7E-04	na	na	na	na

Appendix A-3
Summary Statistics for Analytes in Site Surface Soil (mg/kg)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Type	Analyte	21st Street Pond				Weber River - Reach A				Weber River - Reach B				Weber River - Reach C				Weber River - Reach D			
		DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max
Metals	Aluminum	8/8	7.4E+03	6.2E+03	9.6E+03	0/2	9.7E+03	6.5E+03	1.3E+04	0/11	5.5E+03	2.8E+03	1.1E+04	0/11	4.9E+03	2.1E+03	7.7E+03	0/12	5.9E+03	3.0E+03	9.1E+03
	Antimony	0/8	9.7E-01	1.8E-01	3.8E+00	2/2	4.6E+00	1.4E+00	7.7E+00	0/11	1.6E+00	2.7E-01	3.7E+00	0/11	6.0E-01	2.3E-01	2.8E+00	0/12	1.6E+00	1.8E-01	8.0E+00
	Arsenic	9/11	5.7E+00	2.5E+00	1.3E+01	0/2	1.3E+01	3.5E+00	2.2E+01	0/19	3.3E+00	2.1E+00	6.3E+00	0/14	4.7E+00	1.6E+00	2.4E+01	0/14	3.3E+00	1.8E+00	7.0E+00
	Barium	5/11	8.6E+01	3.4E+01	2.6E+02	0/2	1.4E+02	1.0E+02	1.9E+02	0/19	9.5E+01	4.9E+01	1.7E+02	0/14	9.1E+01	3.0E+01	1.3E+02	0/14	1.1E+02	5.6E+01	1.7E+02
	Beryllium	7/8	3.5E-01	2.1E-01	6.7E-01	0/2	5.5E-01	1.6E-01	9.3E-01	0/11	3.4E-01	1.7E-01	7.5E-01	0/11	2.7E-01	1.3E-01	4.2E-01	0/12	1.8E-01	2.2E-02	3.0E-01
	Cadmium	3/11	3.8E-01	1.5E-02	1.9E+00	0/2	4.2E+00	6.0E-01	7.7E+00	0/19	8.3E-01	8.5E-02	2.2E+00	0/14	6.8E-01	8.2E-02	4.1E+00	0/14	3.1E-01	1.5E-02	7.9E-01
	Calcium	8/8	2.7E+04	2.1E+04	3.8E+04	0/2	2.5E+04	1.8E+04	3.2E+04	0/11	2.3E+04	1.4E+04	3.3E+04	0/11	2.2E+04	1.3E+04	3.4E+04	0/12	2.2E+04	1.3E+04	3.3E+04
	Chromium	11/11	1.2E+01	5.2E+00	2.0E+01	0/2	1.5E+01	1.0E+01	1.9E+01	0/19	8.5E+00	4.3E+00	1.6E+01	0/14	8.1E+00	4.8E+00	1.1E+01	0/14	1.0E+01	5.2E+00	1.6E+01
	Cobalt	7/8	3.8E+00	1.4E+00	5.6E+00	0/2	5.3E+00	3.1E+00	7.5E+00	0/11	3.5E+00	2.2E+00	6.1E+00	0/11	3.1E+00	1.9E+00	4.3E+00	0/12	3.0E+00	1.7E+00	4.3E+00
	Copper	8/8	2.4E+01	1.2E+01	9.4E+01	0/2	4.8E+01	1.6E+01	8.0E+01	0/11	2.2E+01	1.0E+01	6.2E+01	0/11	1.7E+01	6.0E+00	4.9E+01	0/12	3.3E+01	5.9E+00	1.0E+02
	Iron	8/8	9.7E+03	7.4E+03	1.3E+04	0/2	1.2E+04	7.9E+03	1.6E+04	0/11	7.9E+03	4.6E+03	1.6E+04	0/11	6.8E+03	4.6E+03	9.1E+03	0/12	8.2E+03	4.6E+03	1.6E+04
	Lead	11/11	6.8E+01	4.7E+00	2.2E+02	0/2	5.1E+02	8.3E+01	9.4E+02	0/19	7.2E+01	7.6E+00	1.7E+02	0/14	8.6E+01	1.6E+01	5.8E+02	0/14	7.2E+01	2.1E+01	2.7E+02
	Magnesium	8/8	6.9E+03	5.1E+03	1.0E+04	0/2	5.9E+03	4.0E+03	7.8E+03	0/11	4.5E+03	2.7E+03	6.8E+03	0/11	4.3E+03	2.7E+03	5.6E+03	0/12	4.4E+03	2.5E+03	6.1E+03
	Manganese	8/8	2.4E+02	1.8E+02	3.6E+02	0/2	4.1E+02	2.0E+02	6.3E+02	0/11	2.5E+02	1.4E+02	4.8E+02	0/11	2.1E+02	9.5E+01	3.4E+02	0/12	2.0E+02	1.1E+02	2.9E+02
	Mercury	9/11	5.3E-02	1.5E-02	1.4E-01	0/5	1.4E+00	2.0E-01	3.6E+00	0/21	1.2E-01	2.0E-02	3.7E-01	0/14	1.8E-01	5.4E-02	8.8E-01	0/14	1.0E-01	1.8E-02	3.9E-01
	Nickel	8/8	1.0E+01	7.1E+00	1.6E+01	0/2	1.2E+01	5.9E+00	1.9E+01	0/11	7.4E+00	3.4E+00	1.4E+01	0/11	6.1E+00	3.4E+00	1.6E+01	0/12	7.1E+00	3.0E+00	1.1E+01
	Potassium	8/8	2.3E+03	1.7E+03	3.3E+03	0/2	2.6E+03	2.1E+03	3.2E+03	0/11	1.8E+03	1.2E+03	2.6E+03	0/11	1.6E+03	1.1E+03	2.3E+03	0/12	1.8E+03	9.8E+02	3.2E+03
	Selenium	5/11	9.6E-01	1.9E-01	4.0E+00	0/2	2.3E-01	2.2E-01	2.5E-01	0/19	1.3E+00	2.0E-01	2.5E+00	0/14	9.7E-01	2.0E-01	2.5E+00	0/14	5.7E-01	1.9E-01	2.5E+00
	Silver	3/11	4.6E-01	5.5E-02	3.4E+00	0/2	1.8E+00	1.1E-01	3.5E+00	0/19	5.0E-01	6.5E-02	1.4E+00	0/14	5.7E-01	1.3E-01	4.3E+00	0/14	1.7E-01	5.5E-02	7.0E-01
	Sodium	8/8	1.6E+02	9.6E+01	4.5E+02	0/2	1.1E+02	1.0E+02	1.1E+02	0/11	2.7E+02	7.7E+01	9.3E+02	0/11	1.1E+02	7.1E+01	2.2E+02	0/12	1.4E+02	8.1E+01	2.5E+02
	Thallium	0/8	1.8E+00	2.0E-01	1.1E+01	0/2	4.3E-01	2.5E-01	6.0E-01	0/11	4.5E-01	2.2E-01	7.5E-01	0/11	5.6E-01	2.0E-01	6.5E-01	0/12	5.0E-01	2.1E-01	6.0E-01
	Vanadium	8/8	1.6E+01	1.4E+01	2.3E+01	0/2	1.9E+01	1.7E+01	2.2E+01	0/11	1.2E+01	8.1E+00	2.0E+01	0/11	1.1E+01	5.2E+00	1.6E+01	0/12	1.6E+01	9.8E+00	2.2E+01
	Zinc	8/8	6.0E+01	3.6E+01	1.7E+02	0/2	5.5E+02	1.5E+02	9.4E+02	0/11	1.1E+02	8.6E+01	2.4E+02	0/11	9.0E+01	3.0E+01	1.3E+02	0/12	1.0E+02	4.4E+01	2.1E+02
Pesticides	4,4'-DDD	0/7	2.0E-03	1.7E-03	2.9E-03	0/1	2.0E-03	2.0E-03	2.0E-03	0/8	4.3E-03	1.9E-03	8.0E-03	0/2	4.9E-03	1.9E-03	8.0E-03	0/4	5.0E-03	2.0E-03	8.0E-03
	4,4'-DDE	0/7	2.0E-03	1.7E-03	2.9E-03	1/1	1.8E-03	1.8E-03	1.8E-03	0/8	4.3E-03	1.9E-03	8.0E-03	0/2	4.9E-03	1.9E-03	8.0E-03	0/4	5.0E-03	2.0E-03	8.0E-03
	4,4'-DDT	4/7	7.2E-03	1.7E-03	1.5E-02	0/1	2.0E-03	2.0E-03	2.0E-03	0/8	4.3E-03	1.9E-03	8.0E-03	0/2	4.9E-03	1.9E-03	8.0E-03	0/4	5.0E-03	2.0E-03	8.0E-03
	Aldrin	0/7	1.1E-03	8.5E-04	2.0E-03	0/1	2.0E-03	2.0E-03	2.0E-03	0/8	2.8E-03	1.9E-03	4.0E-03	0/2	2.9E-03	1.9E-03	4.0E-03	0/4	3.0E-03	2.0E-03	4.0E-03
	alpha-BHC	0/7	1.1E-03	8.5E-04	2.0E-03	0/1	2.0E-03	2.0E-03	2.0E-03	0/8	2.8E-03	1.9E-03	4.0E-03	0/2	2.9E-03	1.9E-03	4.0E-03	0/4	3.0E-03	2.0E-03	4.0E-03
	beta-BHC	0/7	1.1E-03	8.5E-04	2.0E-03	0/1	2.0E-03	2.0E-03	2.0E-03	0/8	2.8E-03	1.9E-03	4.0E-03	0/2	2.9E-03	1.9E-03	4.0E-03	0/4	3.0E-03	2.0E-03	4.0E-03
	alpha-Chlordane	0/7	1.1E-03	8.5E-04	2.0E-03	0/1	2.0E-03	2.0E-03	2.0E-03	0/5	2.1E-03	1.9E-03	2.4E-03	0/1	1.9E-03	1.9E-03	1.9E-03	0/2	2.0E-03	2.0E-03	2.1E-03
	Chlordane	na	na	na	na	na	na	na	na	0/3	4.0E-02	4.0E-02	4.0E-02	0/1	4.0E-02	4.0E-02	4.0E-02	0/2	4.0E-02	4.0E-02	4.0E-02
	delta-BHC	0/7	1.1E-03	8.5E-04	2.0E-03	0/1	2.0E-03	2.0E-03	2.0E-03	0/8	2.8E-03	1.9E-03	4.0E-03	0/2	2.9E-03	1.9E-03	4.0E-03	0/4	3.0E-03	2.0E-03	4.0E-03
	Dieldrin	0/7	2.0E-03	1.7E-03	2.9E-03	0/1	2.0E-03	2.0E-03	2.0E-03	0/8	4.3E-03	1.9E-03	8.0E-03	0/2	4.9E-03	1.9E-03	8.0E-03	0/4	5.0E-03	2.0E-03	8.0E-03
	Endosulfan I	0/7	1.1E-03	8.5E-04	2.0E-03	0/1	2.0E-03	2.0E-03	2.0E-03	0/8	2.8E-03	1.9E-03	4.0E-03	0/2	2.9E-03	1.9E-03	4.0E-03	0/4	3.0E-03	2.0E-03	4.0E-03
	Endosulfan II	0/7	2.0E-03	1.7E-03	2.9E-03	0/1	2.0E-03	2.0E-03	2.0E-03	0/8	4.3E-03	1.9E-03	8.0E-03	0/2	4.9E-03	1.9E-03	8.0E-03	0/4	5.0E-03	2.0E-03	8.0E-03
	Endosulfan Sulfate	0/7	2.0E-03	1.7E-03	2.9E-03	0/1	2.0E-03	2.0E-03	2.0E-03	0/8	4.3E-03	1.9E-03	8.0E-03	0/2	4.9E-03	1.9E-03	8.0E-03	0/4	5.0E-03	2.0E-03	8.0E-03
	Endrin	0/7	2.0E-03	1.7E-03	2.9E-03	0/1	2.0E-03	2.0E-03	2.0E-03	0/8	4.3E-03	1.9E-03	8.0E-03	0/2	4.9E-03	1.9E-03	8.0E-03	0/4	5.0E-03	2.0E-03	8.0E-03
	Endrin Aldehyde	3/7	5.1E-03	1.7E-03	9.8E-03	0/1	2.0E-03	2.0E-03	2.0E-03	0/8	4.3E-03	1.9E-03	8.0E-03	0/2	4.9E-03	1.9E-03	8.0E-03	0/4	5.0E-03	2.0E-03	8.0E-03
	Endrin ketone	0/7	2.0E-03	1.7E-03	2.9E-03	0/1	2.0E-03	2.0E-03	2.0E-03	0/5	2.1E-03	1.9E-03	2.4E-03	0/1	1.9E-03	1.9E-03	1.9E-03	0/2	2.0E-03	2.0E-03	2.1E-03
	gamma-BHC (Lindane)	0/7	1.1E-03	8.5E-04	2.0E-03	0/1	2.0E-03	2.0E-03	2.0E-03	0/8	2.8E-03	1.9E-03	4.0E-03	0/2	2.9E-03	1.9E-03	4.0E-03	0/4	3.0E-03	2.0E-03	4.0E-03
	Heptachlor	0/7	1.1E-03	8.5E-04	2.0E-03	0/1	2.0E-03	2.0E-03	2.0E-03	0/8	2.8E-03	1.9E-03	4.0E-03	0/2	2.9E-03	1.9E-03	4.0E-03	0/4	3.0E-03	2.0E-03	4.0E-03
	Heptachlor Epoxide	0/7	1.1E-03	8.5E-04	2.0E-03	0/1	2.0E-03	2.0E-03	2.0E-03	0/8	2.8E-03	1.9E-03	4.0E-03	0/2	2.9E-03	1.9E-03	4.0E-03	0/4	3.0E-03	2.0E-03	4.0E-03
	Isodrin	na	na	na	na	na	na	na	na	0/3	4.0E-03	4.0E-03	4.0E-03	0/1	4.0E-03	4.0E-03	4.0E-03	0/2	4.0E-03	4.0E-03	4.0E-03
	Kepone	na	na	na	na	na	na	na	na	0/3	8.0E-03	8.0E-03	8.0E-03	0/1	8.0E-03	8.0E-03	8.0E-03	0/2	8.0E-03	8.0E-03	8.0E-03
	Methoxychlor	0/7	8.9E-03	2.0E-03	1.5E-02	0/1	2.0E-03	2.0E-03	2.0E-03	0/8	1.6E-02	1.9E-03	4.0E-02	0/2	2.1E-02	1.9E-03	4.0E-02	0/4	2.1E-02	2.0E-03	4.0E-02
	Toxaphene	0/7	9.3E-02	4.9E-02	1.5E-01	0/1	5.0E-02	5.0E-02	5.0E-02	0/8	6.3E-02	4.6E-02	8.0E-02	0/2	6.3E-02	4.6E-02	8.0E-02	0/4	6.5E-02	4.9E-02	8.0E-02
	2-Chloronaphthalene	0/10	3.3E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	1-Methylnaphthalene	1/7	2.0E-01	1.8E-01	2.3E-01	0/10	1.5E-01	3.9E-02	2.0E-01	0/10	2.3E-01	1.8E-01	5.5E-01	0/10	2.0E-01	1.8E-01	2.2E-01	0/10	1.9E-01	1.3E-01	2.1E-01
	2-Methylnaphthalene	2/11	2.5E-01	1.0E-01	9.5E-01	0/11	2.0E-01	4.8E-02	1.0E+00	0/23	3.8E-01	4.1E-02	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.6E-01	1.1E+00
	Acenaphthene	2/11	2.7E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	Acenaphthylene	2/11	2.6E-01	3.6E-02	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	Aniline	0/8	2.8E-01	1.7E-01	9.0E-01	0/10	1.9E-01	1.8E-01	2.1E-01	0/10	2.3E-01	1.8E-01	5.5E-01	0/10	2.0E-01	1.8E-01	2.2E-01	0/10	1.9E-01	1.8E-01	2.1E-01
	Anthracene	3/11	2.9E-01	8.7E-02	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.7E-01	6.9E-02	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	Benzo[a]anthracene	2/11	3.7E-01	1.7E-01	1.4E+00	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	4.0E-01	1.7E-01	1.2E+00	0/14	2.2E-01	3.6E-02	9.0E-01	0/14	2.8E-01	3.6E-02	1.1E+00

Appendix A-3
Summary Statistics for Analytes in Site Surface Soil (mg/kg)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Type	Analyte	21st Street Pond				Weber River - Reach A				Weber River - Reach B				Weber River - Reach C				Weber River - Reach D			
		DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max
PAHs	Benzo[a]pyrene	3/11	3.9E-01	4.4E-02	1.6E+00	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	4.0E-01	1.7E-01	1.2E+00	0/14	2.3E-01	4.0E-02	9.0E-01	0/14	2.9E-01	3.6E-02	1.1E+00
	Benzo[b]fluoranthene	3/11	3.6E-01	5.2E-02	1.2E+00	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.9E-01	4.3E-02	1.2E+00	0/14	2.3E-01	3.8E-02	9.0E-01	0/14	2.8E-01	5.7E-02	1.1E+00
	Benzo[g,h,i]perylene	3/11	4.1E-01	6.3E-02	1.6E+00	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.4E-01	3.9E-02	1.2E+00	0/14	2.3E-01	5.4E-02	9.0E-01	0/14	2.7E-01	3.7E-02	1.1E+00
	Benzo[k]fluoranthene	2/11	4.0E-01	1.7E-01	1.6E+00	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.9E-01	1.7E-01	1.2E+00	0/14	2.3E-01	4.3E-02	9.0E-01	0/14	2.9E-01	5.4E-02	1.1E+00
	Chrysene	3/11	4.5E-01	4.2E-02	2.1E+00	0/11	2.4E-01	4.6E-02	1.0E+00	0/23	3.9E-01	4.9E-02	1.2E+00	0/14	2.3E-01	4.5E-02	9.0E-01	0/14	2.8E-01	6.8E-02	1.1E+00
	Dibenz[a,h]anthracene	1/11	3.1E-01	9.6E-02	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	9.0E-02	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	5.1E-02	1.1E+00
	Fluoranthene	4/11	4.6E-01	5.0E-02	2.3E+00	0/11	2.5E-01	6.2E-02	1.0E+00	0/23	4.2E-01	3.9E-02	1.2E+00	0/14	2.3E-01	6.3E-02	9.0E-01	0/14	2.8E-01	6.9E-02	1.1E+00
	Fluorene	2/11	2.5E-01	1.0E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	Indeno[1,2,3-c,d]pyrene	2/11	4.0E-01	1.7E-01	1.5E+00	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.9E-01	1.7E-01	1.2E+00	0/14	2.3E-01	4.6E-02	9.0E-01	0/14	3.0E-01	3.5E-02	1.1E+00
	Naphthalene	3/12	2.2E-01	2.1E-03	9.5E-01	0/12	1.6E-01	3.3E-03	1.0E+00	0/28	3.0E-01	2.6E-03	1.2E+00	0/15	2.3E-01	3.5E-03	9.0E-01	0/16	2.6E-01	2.7E-03	1.1E+00
	Phenanthrene	5/11	4.5E-01	4.2E-02	2.3E+00	0/11	2.5E-01	3.9E-02	1.0E+00	0/23	3.8E-01	4.1E-02	1.2E+00	0/14	2.1E-01	4.5E-02	9.0E-01	0/14	2.7E-01	4.4E-02	1.1E+00
	Pyrene	7/11	6.1E-01	4.7E-02	3.7E+00	0/11	2.5E-01	6.7E-02	1.0E+00	0/23	4.0E-01	6.1E-02	1.2E+00	0/14	2.0E-01	5.5E-02	9.0E-01	0/14	2.6E-01	4.5E-02	1.1E+00
PCB	Aroclor-1016	0/7	2.0E-02	1.7E-02	2.9E-02	0/1	2.6E-02	2.6E-02	2.6E-02	0/8	3.1E-02	2.3E-02	4.0E-02	0/2	3.2E-02	2.3E-02	4.0E-02	0/4	3.2E-02	2.4E-02	4.0E-02
	Aroclor-1221	0/7	4.1E-02	3.4E-02	6.0E-02	0/1	5.0E-02	5.0E-02	5.0E-02	0/8	4.8E-02	4.0E-02	6.0E-02	0/2	4.3E-02	4.0E-02	4.6E-02	0/4	4.5E-02	4.0E-02	5.0E-02
	Aroclor-1232	0/7	2.0E-02	1.7E-02	2.9E-02	0/1	2.6E-02	2.6E-02	2.6E-02	0/8	3.1E-02	2.3E-02	4.0E-02	0/2	3.2E-02	2.3E-02	4.0E-02	0/4	3.2E-02	2.4E-02	4.0E-02
	Aroclor-1242	0/7	2.0E-02	1.7E-02	2.9E-02	0/1	2.6E-02	2.6E-02	2.6E-02	0/8	3.1E-02	2.3E-02	4.0E-02	0/2	3.2E-02	2.3E-02	4.0E-02	0/4	3.2E-02	2.4E-02	4.0E-02
	Aroclor-1248	0/7	2.0E-02	1.7E-02	2.9E-02	0/1	2.6E-02	2.6E-02	2.6E-02	0/8	3.1E-02	2.3E-02	4.0E-02	0/2	3.2E-02	2.3E-02	4.0E-02	0/4	3.2E-02	2.4E-02	4.0E-02
	Aroclor-1254	0/7	2.0E-02	1.7E-02	2.9E-02	0/1	2.6E-02	2.6E-02	2.6E-02	0/8	3.1E-02	2.3E-02	4.0E-02	0/2	3.2E-02	2.3E-02	4.0E-02	0/4	3.2E-02	2.4E-02	4.0E-02
	Aroclor-1260	5/7	1.8E-01	1.7E-02	5.5E-01	0/1	2.6E-02	2.6E-02	2.6E-02	0/8	6.0E-02	2.3E-02	2.6E-01	0/2	3.2E-02	2.3E-02	4.0E-02	0/4	3.2E-02	2.4E-02	4.0E-02
	Aroclor-1268	0/1	2.4E-02	2.4E-02	2.4E-02	0/1	2.6E-02	2.6E-02	2.6E-02	0/5	2.6E-02	2.3E-02	3.0E-02	0/1	2.3E-02	2.3E-02	2.3E-02	0/2	2.5E-02	2.4E-02	2.6E-02
Petroleum Hydrocarbons	Diesel fuel	0/2	3.3E+00	3.3E+00	3.3E+00	na	na	na	na	4/5	6.7E+00	2.5E+00	9.7E+00	na	na	na	na	na	na	na	na
	Total Petroleum Hydrocarbons (TPH)	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
SVOC	1,2,4-Trichlorobenzene	0/12	2.9E-01	5.2E-04	9.5E-01	0/12	2.4E-01	8.2E-04	1.0E+00	0/28	3.2E-01	6.6E-04	1.2E+00	0/15	2.3E-01	8.7E-04	9.0E-01	0/16	2.7E-01	6.9E-04	1.1E+00
	1,2-Dichlorobenzene	0/12	2.9E-01	5.2E-04	9.5E-01	0/12	2.4E-01	8.2E-04	1.0E+00	0/28	3.2E-01	6.6E-04	1.2E+00	0/15	2.3E-01	8.7E-04	9.0E-01	0/16	2.7E-01	6.9E-04	1.1E+00
	1,3-Dichlorobenzene	0/11	3.0E-01	5.2E-04	9.5E-01	0/12	2.4E-01	8.2E-04	1.0E+00	0/28	3.2E-01	6.6E-04	1.2E+00	0/15	2.3E-01	8.7E-04	9.0E-01	0/16	2.7E-01	6.9E-04	1.1E+00
	1,4-Dichlorobenzene	0/12	2.9E-01	5.2E-04	9.5E-01	0/12	2.4E-01	8.2E-04	1.0E+00	0/28	3.2E-01	6.6E-04	1.2E+00	0/15	2.3E-01	8.7E-04	9.0E-01	0/16	2.7E-01	6.9E-04	1.1E+00
	2,4,5-Trichlorophenol	0/10	3.8E-01	1.8E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	4.7E-01	1.8E-01	1.2E+00	0/14	3.0E-01	1.8E-01	9.0E-01	0/14	3.4E-01	1.8E-01	1.1E+00
	2,4,6-Trichlorophenol	0/10	3.3E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	2,4-Dichlorophenol	0/10	3.3E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	2,4-Dimethylphenol	0/10	3.3E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	2,4-Dinitrophenol	0/10	1.2E+00	4.2E-01	4.5E+00	0/11	9.5E-01	8.5E-01	1.0E+00	0/23	8.6E-01	4.2E-01	2.7E+00	0/14	8.5E-01	4.2E-01	1.1E+00	0/14	8.7E-01	4.2E-01	1.1E+00
	2,4-Dinitrotoluene	0/11	3.2E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	2,6-Dinitrotoluene	0/11	3.2E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	2-Chlorophenol	0/10	3.3E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	2-Methylphenol (o-Cresol)	0/10	3.3E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	2-Nitroaniline	0/10	1.2E+00	4.2E-01	4.5E+00	0/11	9.5E-01	8.5E-01	1.0E+00	0/23	8.6E-01	4.2E-01	2.7E+00	0/14	8.5E-01	4.2E-01	1.1E+00	0/14	8.7E-01	4.2E-01	1.1E+00
	2-Nitrophenol	0/10	3.3E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	3,3'-Dichlorobenzidine	0/11	3.3E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	1/23	3.8E-01	4.3E-02	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	3-Nitroaniline	0/10	1.2E+00	4.2E-01	4.5E+00	0/11	9.5E-01	8.5E-01	1.0E+00	0/23	8.6E-01	4.2E-01	2.7E+00	0/14	8.5E-01	4.2E-01	1.1E+00	0/14	8.7E-01	4.2E-01	1.1E+00
	4,6-Dinitro-o-cresol	0/10	1.2E+00	4.2E-01	4.5E+00	0/11	9.5E-01	8.5E-01	1.0E+00	0/23	8.6E-01	4.2E-01	2.7E+00	0/14	8.5E-01	4.2E-01	1.1E+00	0/14	8.7E-01	4.2E-01	1.1E+00
	4-Bromophenyl-phenylether	0/1	9.5E-01	9.5E-01	9.5E-01	0/1	1.0E+00	1.0E+00	1.0E+00	0/5	1.0E+00	9.0E-01	1.2E+00	0/1	9.0E-01	9.0E-01	9.0E-01	0/2	1.0E+00	9.5E-01	1.1E+00
	4-Chloro-3-Methylphenol	0/10	3.3E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	4-Chloroaniline	0/10	3.3E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	4-Chlorophenyl-phenylether	0/10	3.3E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	4-Methylphenol (p-Cresol)	1/10	3.3E-01	1.1E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	4-Nitroaniline	0/10	1.2E+00	4.2E-01	4.5E+00	0/11	9.5E-01	8.5E-01	1.0E+00	0/23	8.6E-01	4.2E-01	2.7E+00	0/14	8.5E-01	4.2E-01	1.1E+00	0/14	8.7E-01	4.2E-01	1.1E+00
	4-Nitrophenol	0/10	1.2E+00	4.2E-01	4.5E+00	0/11	9.5E-01	8.5E-01	1.0E+00	0/23	8.6E-01	4.2E-01	2.7E+00	0/14	8.5E-01	4.2E-01	1.1E+00	0/14	8.7E-01	4.2E-01	1.1E+00
	Benzyl alcohol	0/1	9.5E-01	9.5E-01	9.5E-01	0/1	1.0E+00	1.0E+00	1.0E+00	0/5	1.0E+00	9.0E-01	1.2E+00	0/1	9.0E-01	9.0E-01	9.0E-01	0/2	1.0E+00	9.5E-01	1.1E+00
	bis(2-Chloroethoxy)methane	0/10	3.3E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	bis(2-Chloroethyl)ether	0/11	3.2E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	bis(2-Chloroisopropyl)ether	0/4	3.6E-01	1.7E-01	9.5E-01	0/1	1.0E+00	1.0E+00	1.0E+00	0/13	5.0E-01	1.7E-01	1.2E+00	0/4	3.5E-01	1.7E-01	9.0E-01	0/4	5.8E-01	1.7E-01	1.1E+00
	bis(2-Ethylhexyl)phthalate	8/11	3.6E-01	4.5E-02	1.5E+00	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	2.2E-01	3.7E-02	9.5E-01	0/14	2.1E-01	7.2E-02	4.0E-01	0/14	2.8E-01	4.0E-02	1.1E+00
	bis(n-octyl)phthalate	0/11	3.2E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	1/23	3.8E-01	5.1E-02	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	Butylbenzylphthalate	3/11	2.8E-01	5.0E-02	9.5E-01	0/11	2.3E-01	4.5E-02	1.0E+00	0/23	3.7E-01	3.8E-02	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.1E-01	1.7E-01	1.1E+00

Appendix A-3
Summary Statistics for Analytes in Site Surface Soil (mg/kg)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Type	Analyte	21st Street Pond				Weber River - Reach A				Weber River - Reach B				Weber River - Reach C				Weber River - Reach D			
		DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max
	Carbazole	2/11	2.5E-01	3.9E-02	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	6.0E-02	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	Dibenzofuran	0/10	3.3E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	1/14	2.9E-01	4.5E-02	1.1E+00
	Dibutylphthalate	0/11	3.2E-01	1.7E-01	9.5E-01	4/11	2.0E-01	4.0E-02	1.0E+00	0/23	3.4E-01	4.2E-02	1.2E+00	0/14	2.2E-01	1.0E-01	9.0E-01	0/14	2.0E-01	2.5E-02	1.1E+00
	Diethylphthalate	0/11	3.2E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	Dimethylphthalate	0/10	3.3E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	Hexachlorobenzene	0/11	3.2E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	Hexachlorobutadiene	0/12	2.9E-01	5.2E-04	9.5E-01	0/12	2.4E-01	8.2E-04	1.0E+00	0/28	3.2E-01	6.6E-04	1.2E+00	0/15	2.3E-01	8.7E-04	9.0E-01	0/16	2.7E-01	6.9E-04	1.1E+00
	Hexachlorocyclopentadiene	0/10	3.3E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	Hexachloroethane	0/11	3.2E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	Isophorone	0/10	3.3E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	Nitrobenzene	0/11	3.2E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	N-Nitrosodiphenylamine	0/10	3.3E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	n-Nitrosodipropylamine	0/11	3.2E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	Pentachlorophenol (PCP)	0/10	1.2E+00	4.2E-01	4.5E+00	0/11	9.5E-01	8.5E-01	1.0E+00	0/23	8.6E-01	4.2E-01	2.7E+00	0/14	8.5E-01	4.2E-01	1.1E+00	0/14	8.7E-01	4.2E-01	1.1E+00
	Phenol	0/10	3.3E-01	1.7E-01	9.5E-01	0/11	2.7E-01	1.8E-01	1.0E+00	0/23	3.8E-01	1.7E-01	1.2E+00	0/14	2.4E-01	1.7E-01	9.0E-01	0/14	3.0E-01	1.7E-01	1.1E+00
	1,1,1,2-Tetrachloroethane	0/3	3.5E-03	5.2E-04	5.0E-03	0/1	8.2E-04	8.2E-04	8.2E-04	0/13	3.4E-03	6.6E-04	5.0E-03	0/4	4.0E-03	8.7E-04	5.0E-03	0/4	2.9E-03	6.9E-04	5.0E-03
	1,1,1-Trichloroethane	0/11	2.8E-03	5.2E-04	3.5E-03	0/11	3.2E-03	8.2E-04	4.0E-03	0/23	2.7E-03	6.6E-04	7.0E-03	0/14	2.8E-03	8.7E-04	4.0E-03	0/11	2.6E-03	6.9E-04	4.0E-03
	1,1,2,2-Tetrachloroethane	0/11	2.8E-03	5.2E-04	3.5E-03	0/11	3.2E-03	8.2E-04	4.0E-03	1/23	2.7E-03	6.6E-04	7.0E-03	0/14	2.8E-03	8.7E-04	4.0E-03	0/11	2.6E-03	6.9E-04	4.0E-03
	1,1,2-Trichloroethane	0/11	2.8E-03	5.2E-04	3.5E-03	0/11	3.2E-03	8.2E-04	4.0E-03	0/23	2.7E-03	6.6E-04	7.0E-03	0/14	2.8E-03	8.7E-04	4.0E-03	0/11	2.6E-03	6.9E-04	4.0E-03
	1,1-Dichloroethane	1/11	3.1E-03	5.2E-04	6.4E-03	0/11	3.2E-03	8.2E-04	4.0E-03	0/23	2.7E-03	6.6E-04	7.0E-03	0/14	2.8E-03	8.7E-04	4.0E-03	0/11	2.6E-03	6.9E-04	4.0E-03
	1,1-Dichloroethene	0/1	5.2E-04	5.2E-04	5.2E-04	0/1	8.2E-04	8.2E-04	8.2E-04	0/5	9.4E-04	6.6E-04	1.3E-03	0/1	8.7E-04	8.7E-04	8.7E-04	0/2	7.0E-04	6.9E-04	7.2E-04
	1,1-Dichloropropene	0/1	5.2E-04	5.2E-04	5.2E-04	0/1	8.2E-04	8.2E-04	8.2E-04	0/5	9.4E-04	6.6E-04	1.3E-03	0/1	8.7E-04	8.7E-04	8.7E-04	0/2	7.0E-04	6.9E-04	7.2E-04
	1,2,3-Trichlorobenzene	0/1	5.2E-04	5.2E-04	5.2E-04	0/1	8.2E-04	8.2E-04	8.2E-04	0/5	9.4E-04	6.6E-04	1.3E-03	0/1	8.7E-04	8.7E-04	8.7E-04	0/2	7.0E-04	6.9E-04	7.2E-04
	1,2,3-Trichloropropane	0/11	3.2E-03	5.2E-04	5.0E-03	0/11	3.2E-03	8.2E-04	4.0E-03	0/23	3.6E-03	6.6E-04	7.0E-03	0/14	3.3E-03	8.7E-04	5.0E-03	0/11	3.0E-03	6.9E-04	5.0E-03
	1,2,4-Trimethylbenzene	0/1	5.2E-04	5.2E-04	5.2E-04	0/1	8.2E-04	8.2E-04	8.2E-04	0/5	9.4E-04	6.6E-04	1.3E-03	0/1	8.7E-04	8.7E-04	8.7E-04	0/2	7.0E-04	6.9E-04	7.2E-04
	1,2-Dibromo-3-chloropropane (DBCP)	0/11	3.2E-03	5.2E-04	5.0E-03	0/11	3.2E-03	8.2E-04	4.0E-03	0/23	3.6E-03	6.6E-04	7.0E-03	0/14	3.3E-03	8.7E-04	5.0E-03	0/11	3.0E-03	6.9E-04	5.0E-03
	1,2-Dichloroethane	0/11	2.8E-03	5.2E-04	3.5E-03	0/11	3.2E-03	8.2E-04	4.0E-03	0/23	2.7E-03	6.6E-04	7.0E-03	0/14	2.8E-03	8.7E-04	4.0E-03	0/11	2.6E-03	6.9E-04	4.0E-03
	1,2-Dichloroethene	0/10	5.6E-03	2.5E-03	7.0E-03	0/10	7.0E-03	5.5E-03	8.5E-03	0/18	5.3E-03	2.5E-03	1.4E-02	0/13	5.4E-03	2.5E-03	8.0E-03	0/9	5.4E-03	2.5E-03	8.5E-03
	1,2-Dichloropropane	0/11	2.8E-03	5.2E-04	3.5E-03	0/11	3.2E-03	8.2E-04	4.0E-03	0/23	2.7E-03	6.6E-04	7.0E-03	0/14	2.8E-03	8.7E-04	4.0E-03	0/11	2.6E-03	6.9E-04	4.0E-03
	1,3,5-Trimethylbenzene	0/1	5.2E-04	5.2E-04	5.2E-04	0/1	8.2E-04	8.2E-04	8.2E-04	0/5	9.4E-04	6.6E-04	1.3E-03	0/1	8.7E-04	8.7E-04	8.7E-04	0/2	7.0E-04	6.9E-04	7.2E-04
	1,3-Dichloropropane	0/1	5.2E-04	5.2E-04	5.2E-04	0/1	8.2E-04	8.2E-04	8.2E-04	0/5	9.4E-04	6.6E-04	1.3E-03	0/1	8.7E-04	8.7E-04	8.7E-04	0/2	7.0E-04	6.9E-04	7.2E-04
	1,4-Dioxane	0/2	1.5E-01	1.5E-01	1.5E-01	na	na	na	na	0/8	1.5E-01	1.5E-01	1.5E-01	0/3	1.5E-01	1.5E-01	1.5E-01	0/2	1.5E-01	1.5E-01	1.5E-01
	2,2-Dichloropropane	0/1	5.2E-04	5.2E-04	5.2E-04	0/1	8.2E-04	8.2E-04	8.2E-04	0/5	9.4E-04	6.6E-04	1.3E-03	0/1	8.7E-04	8.7E-04	8.7E-04	0/2	7.0E-04	6.9E-04	7.2E-04
	2-Chloro-1,3-butadiene (Chloroprene)	0/2	5.0E-03	5.0E-03	5.0E-03	na	na	na	na	0/8	5.0E-03	5.0E-03	5.0E-03	0/3	5.0E-03	5.0E-03	5.0E-03	0/2	5.0E-03	5.0E-03	5.0E-03
	2-Chloroethyl vinyl ether	0/10	3.8E-03	3.0E-03	5.0E-03	0/10	3.3E-03	2.5E-03	4.0E-03	0/18	4.4E-03	2.5E-03	7.0E-03	0/13	3.5E-03	2.5E-03	5.0E-03	0/9	3.6E-03	2.5E-03	5.0E-03
	2-Chlorotoluene	0/1	5.2E-04	5.2E-04	5.2E-04	0/1	8.2E-04	8.2E-04	8.2E-04	0/5	9.4E-04	6.6E-04	1.3E-03	0/1	8.7E-04	8.7E-04	8.7E-04	0/2	7.0E-04	6.9E-04	7.2E-04
	2-Hexanone	0/11	5.6E-03	1.0E-03	7.0E-03	0/11	6.5E-03	1.6E-03	8.5E-03	0/23	5.4E-03	1.3E-03	1.4E-02	0/14	5.7E-03	1.7E-03	8.0E-03	0/11	5.2E-03	1.4E-03	8.5E-03
	3-Chloropropene (Allyl Chloride)	0/2	5.0E-03	5.0E-03	5.0E-03	na	na	na	na	0/8	5.0E-03	5.0E-03	5.0E-03	0/3	5.0E-03	5.0E-03	5.0E-03	0/2	5.0E-03	5.0E-03	5.0E-03
	4-Chlorotoluene	0/1	5.2E-04	5.2E-04	5.2E-04	0/1	8.2E-04	8.2E-04	8.2E-04	0/5	9.4E-04	6.6E-04	1.3E-03	0/1	8.7E-04	8.7E-04	8.7E-04	0/2	7.0E-04	6.9E-04	7.2E-04
	Acetone	1/11	7.2E-03	4.1E-03	2.0E-02	0/11	8.9E-03	5.5E-03	2.8E-02	0/23	6.5E-03	2.0E-03	1.4E-02	0/14	6.1E-03	5.0E-03	8.0E-03	0/11	6.0E-03	5.0E-03	8.5E-03
	Acetonitrile	0/10	1.4E-02	5.0E-03	2.5E-02	0/10	1.4E-02	1.2E-02	1.7E-02	0/18	2.0E-02	1.0E-02	2.8E-02	0/13	1.5E-02	9.5E-03	2.5E-02	0/9	1.5E-02	1.0E-02	2.5E-02
	Acrolein	0/9	2.1E-02	1.1E-02	5.0E-02	0/10	1.4E-02	1.2E-02	1.7E-02	0/17	3.1E-02	1.0E-02	5.0E-02	0/8	2.6E-02	9.5E-03	5.0E-02	0/2	5.0E-02	5.0E-02	5.0E-02
	Acrylonitrile	0/10	1.5E-02	1.1E-02	2.5E-02	0/10	1.4E-02	1.2E-02	1.7E-02	0/18	2.0E-02	1.0E-02	2.8E-02	0/13	1.5E-02	9.5E-03	2.5E-02	0/9	1.5E-02	1.0E-02	2.5E-02
	Benzene	1/11	2.6E-03	5.2E-04	3.5E-03	0/11	3.2E-03	8.2E-04	4.0E-03	0/23	2.7E-03	6.6E-04	7.0E-03	0/14	2.8E-03	8.7E-04	4.0E-03	0/11	2.6E-03	6.9E-04	4.0E-03
	Bromobenzene	0/1	5.2E-04	5.2E-04	5.2E-04	0/1	8.2E-04	8.2E-04	8.2E-04	0/5	9.4E-04	6.6E-04	1.3E-03	0/1	8.7E-04	8.7E-04	8.7E-04	0/2	7.0E-04	6.9E-04	7.2E-04
	Bromodichloromethane	0/11	2.8E-03	5.2E-04	3.5E-03	0/11	3.2E-03	8.2E-04	4.0E-03	0/23	2.7E-03	6.6E-04	7.0E-03	0/14	2.8E-03	8.7E-04	4.0E-03	0/11	2.6E-03	6.9E-04	4.0E-03
	Bromoform	0/11	2.8E-03	5.2E-04	3.5E-03	0/11	3.2E-03	8.2E-04	4.0E-03	0/23	2.7E-03	6.6E-04	7.0E-03	0/14	2.8E-03	8.7E-04	4.0E-03	0/11	2.6E-03	6.9E-04	4.0E-03
	Bromomethane (Methyl bromide)	0/11	5.6E-03	1.0E-03	7.0E-03	0/11	6.5E-03	1.6E-03	8.5E-03	0/23	5.4E-03	6.6E-04	1.4E-02	0/14	5.7E-03	1.7E-03	8.0E-03	0/11	5.2E-03	1.4E-03	8.5E-03
	Carbon Disulfide	0/11	2.8E-03	5.2E-04	3.5E-03	0/11	3.2E-03	8.2E-04	4.0E-03	0/23	2.7E-03	6.6E-04	7.0E-03	0/14	2.8E-03	8.7E-04	4.0E-03	0/11	2.6E-03	6.9E-04	4.0E-03
	Carbon Tetrachloride	0/11	2.8E-03	5.2E-04	3.5E-03	0/11	3.2E-03	8.2E-04	4.0E-03	0/23	2.7E-03	6.6E-04	7.0E-03	0/14	2.8E-03	8.7E-04	4.0E-03	0/11	2.6E-03	6.9E-04	4.0E-03
	Chlorobenzene	0/11	2.8E-03	5.2E-04	3.5E-03	0/11	3.2E-03	8.2E-04	4.0E-03	0/23	2.7E-03	6.6E-04	7.0E-03	0/14	2.8E-03	8.7E-04	4.0E-03	0/11	2.6E-03	6.9E-04	4.0E-03
VOC	Chlorodibromomethane	0/11	2.8E-03	5.2E-04	3.5E-03	0/11	3.2E-03	8.2E-04	4.0E-03	0/23	2.7E-03	6.6E-04	7.0E-03	0/14	2.8E-03	8.7E-04	4.0E-03	0/11	2.6E-03	6.9E-04	4.0E-03
	Chloroethane (Ethyl chloride)	0/11	5.5E-03	5.2E-04	7.0E-03	0/11	6.4E-03	8.2E-04	8.5E-03	0/23	5.2E-03	6.6E-04	1.4E-02	0/14	5.6E-03	8.7E-04	8.0E-03	0/11	5.0E-03	6.9E-04	8.5E-03
	Chloroform	0/11	2.8E-03	5.2E-04	3.5E-03	0/11	3.2E-03	8.2E-04	4.0E-03	1/23	2.8E-03	6.6E-04	7.0E-03	0/14	2.8E-03	8.7E-04	4.0E-03	0/11	2.6E-03	6.9E-04	4.0E-03

Appendix A-3
Summary Statistics for Analytes in Site Surface Soil (mg/kg)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Type	Analyte	21st Street Pond				Weber River - Reach A				Weber River - Reach B				Weber River - Reach C				Weber River - Reach D			
		DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max
	Chloromethane (Methyl chloride)	0/11	5.5E-03	5.2E-04	7.0E-03	0/11	6.4E-03	8.2E-04	8.5E-03	0/23	5.2E-03	6.6E-04	1.4E-02	0/14	5.6E-03	8.7E-04	8.0E-03	0/11	5.0E-03	6.9E-04	8.5E-03
	cis-1,2-Dichloroethene	0/8	3.1E-03	2.5E-03	3.5E-03	0/10	3.2E-03	2.5E-03	4.0E-03	0/10	4.3E-03	3.0E-03	7.0E-03	0/10	3.2E-03	2.5E-03	4.0E-03	0/7	3.1E-03	2.5E-03	4.0E-03
	cis-1,3-Dichloropropene	0/12	2.6E-03	5.2E-04	3.5E-03	0/12	3.0E-03	8.2E-04	4.0E-03	0/28	2.4E-03	6.6E-04	7.0E-03	0/15	2.7E-03	8.7E-04	4.0E-03	0/13	2.3E-03	6.9E-04	4.0E-03
	Dibromomethane	0/3	3.5E-03	5.2E-04	5.0E-03	0/1	8.2E-04	8.2E-04	8.2E-04	0/13	3.4E-03	6.6E-04	5.0E-03	0/4	4.0E-03	8.7E-04	5.0E-03	0/4	2.9E-03	6.9E-04	5.0E-03
	Dichlorodifluoromethane	0/3	3.5E-03	5.2E-04	5.0E-03	0/1	8.2E-04	8.2E-04	8.2E-04	1/13	3.5E-03	6.6E-04	5.0E-03	0/4	4.0E-03	8.7E-04	5.0E-03	0/4	2.9E-03	6.9E-04	5.0E-03
	Dichloromethane	2/11	2.5E-03	5.2E-04	5.0E-03	0/11	2.5E-03	8.2E-04	6.0E-03	0/23	1.7E-03	6.6E-04	4.5E-03	0/14	2.9E-03	8.7E-04	7.0E-03	0/11	3.1E-03	6.9E-04	7.8E-03
	Ethyl Methacrylate	0/2	2.5E-02	2.5E-02	2.5E-02	na	na	na	na	0/8	2.5E-02	2.5E-02	2.5E-02	0/3	2.5E-02	2.5E-02	2.5E-02	0/2	2.5E-02	2.5E-02	2.5E-02
	Ethylbenzene	1/11	2.8E-03	5.2E-04	3.5E-03	0/11	3.2E-03	8.2E-04	4.0E-03	0/23	2.7E-03	6.6E-04	7.0E-03	0/14	2.8E-03	8.7E-04	4.0E-03	0/11	2.6E-03	6.9E-04	4.0E-03
	Ethylene dibromide (EDB)	0/11	3.2E-03	5.2E-04	5.0E-03	0/11	3.2E-03	8.2E-04	4.0E-03	0/23	3.6E-03	6.6E-04	7.0E-03	0/14	3.3E-03	8.7E-04	5.0E-03	0/11	3.0E-03	6.9E-04	5.0E-03
	Hexane	0/8	3.1E-03	2.5E-03	3.5E-03	0/10	3.3E-03	2.5E-03	4.0E-03	0/10	3.9E-03	2.5E-03	7.0E-03	0/10	3.1E-03	2.5E-03	4.0E-03	0/7	3.1E-03	2.5E-03	4.0E-03
	Iodomethane	0/2	5.0E-03	5.0E-03	5.0E-03	na	na	na	na	0/8	5.0E-03	5.0E-03	5.0E-03	0/3	5.0E-03	5.0E-03	5.0E-03	0/2	5.0E-03	5.0E-03	5.0E-03
	Isobutyl Alcohol	0/2	5.0E-02	5.0E-02	5.0E-02	na	na	na	na	0/8	5.0E-02	5.0E-02	5.0E-02	0/3	5.0E-02	5.0E-02	5.0E-02	0/2	5.0E-02	5.0E-02	5.0E-02
	Isopropylbenzene	0/2	5.2E-04	5.2E-04	5.2E-04	0/2	8.2E-04	8.2E-04	8.2E-04	0/10	9.4E-04	6.6E-04	1.3E-03	0/2	8.7E-04	8.7E-04	8.7E-04	0/4	7.0E-04	6.9E-04	7.2E-04
	Methacrylonitrile	0/10	6.1E-03	5.0E-03	7.0E-03	0/10	7.0E-03	5.5E-03	8.5E-03	0/18	6.4E-03	5.0E-03	1.4E-02	0/13	6.0E-03	5.0E-03	8.0E-03	0/9	6.0E-03	5.0E-03	8.5E-03
	Methyl ethyl ketone (MEK)	0/4	4.3E-03	2.1E-03	5.0E-03	0/1	3.3E-03	3.3E-03	3.3E-03	0/13	4.4E-03	6.6E-04	5.2E-03	0/5	5.1E-03	3.5E-03	7.0E-03	0/4	3.9E-03	2.7E-03	5.0E-03
	Methyl isobutyl ketone (MIBK)	0/11	5.6E-03	1.0E-03	7.0E-03	0/11	6.5E-03	1.6E-03	8.5E-03	0/23	5.4E-03	1.3E-03	1.4E-02	0/14	5.7E-03	1.7E-03	8.0E-03	0/11	5.2E-03	1.4E-03	8.5E-03
	Methyl Methacrylate	0/2	5.0E-03	5.0E-03	5.0E-03	na	na	na	na	0/8	5.0E-03	5.0E-03	5.0E-03	0/3	5.0E-03	5.0E-03	5.0E-03	0/2	5.0E-03	5.0E-03	5.0E-03
	Methyl-t-butyl ether (MTBE)	0/1	5.2E-04	5.2E-04	5.2E-04	0/1	8.2E-04	8.2E-04	8.2E-04	0/5	9.4E-04	6.6E-04	1.3E-03	0/1	8.7E-04	8.7E-04	8.7E-04	0/2	7.0E-04	6.9E-04	7.2E-04
	n-Butylbenzene	0/1	5.2E-04	5.2E-04	5.2E-04	0/1	8.2E-04	8.2E-04	8.2E-04	0/5	9.4E-04	6.6E-04	1.3E-03	0/1	8.7E-04	8.7E-04	8.7E-04	0/2	7.0E-04	6.9E-04	7.2E-04
	n-Propylbenzene	0/1	5.2E-04	5.2E-04	5.2E-04	0/1	8.2E-04	8.2E-04	8.2E-04	0/5	9.4E-04	6.6E-04	1.3E-03	0/1	8.7E-04	8.7E-04	8.7E-04	0/2	7.0E-04	6.9E-04	7.2E-04
	o-Xylene	0/1	5.2E-04	5.2E-04	5.2E-04	0/1	8.2E-04	8.2E-04	8.2E-04	0/5	9.4E-04	6.6E-04	1.3E-03	0/1	8.7E-04	8.7E-04	8.7E-04	0/2	7.0E-04	6.9E-04	7.2E-04
	sec-Butylbenzene	0/1	5.2E-04	5.2E-04	5.2E-04	0/1	8.2E-04	8.2E-04	8.2E-04	0/5	9.4E-04	6.6E-04	1.3E-03	0/1	8.7E-04	8.7E-04	8.7E-04	0/2	7.0E-04	6.9E-04	7.2E-04
	Styrene	0/11	2.8E-03	5.2E-04	3.5E-03	0/11	3.2E-03	8.2E-04	4.0E-03	0/23	2.7E-03	6.6E-04	7.0E-03	0/14	2.8E-03	8.7E-04	4.0E-03	0/11	2.6E-03	6.9E-04	4.0E-03
	tert-Butylbenzene	0/1	5.2E-04	5.2E-04	5.2E-04	0/1	8.2E-04	8.2E-04	8.2E-04	0/5	9.4E-04	6.6E-04	1.3E-03	0/1	8.7E-04	8.7E-04	8.7E-04	0/2	7.0E-04	6.9E-04	7.2E-04
	Tetrachloroethene	0/11	2.8E-03	5.2E-04	3.5E-03	0/11	3.2E-03	8.2E-04	4.0E-03	0/23	2.7E-03	6.6E-04	7.0E-03	0/14	2.8E-03	8.7E-04	4.0E-03	2/11	2.8E-03	6.9E-04	6.8E-03
	Toluene	1/11	2.7E-03	5.2E-04	3.5E-03	0/11	3.2E-03	8.2E-04	4.0E-03	0/23	2.7E-03	6.6E-04	7.0E-03	0/14	2.8E-03	8.7E-04	4.0E-03	0/11	2.6E-03	6.9E-04	4.0E-03
	trans-1,2-Dichloroethene	0/9	2.8E-03	5.2E-04	3.5E-03	0/11	3.2E-03	8.2E-04	4.0E-03	0/15	3.1E-03	6.6E-04	7.0E-03	0/11	2.9E-03	8.7E-04	4.0E-03	0/9	2.6E-03	6.9E-04	4.0E-03
	trans-1,3-Dichloropropene	0/11	2.8E-03	5.2E-04	3.5E-03	0/11	3.2E-03	8.2E-04	4.0E-03	0/23	2.7E-03	6.6E-04	7.0E-03	0/14	2.8E-03	8.7E-04	4.0E-03	0/11	2.6E-03	6.9E-04	4.0E-03
	trans-1,4-Dichloro-2-Butene	0/2	5.0E-03	5.0E-03	5.0E-03	na	na	na	na	0/8	5.0E-03	5.0E-03	5.0E-03	0/3	5.0E-03	5.0E-03	5.0E-03	0/2	5.0E-03	5.0E-03	5.0E-03
	Trichloroethene	0/11	2.8E-03	5.2E-04	3.5E-03	0/11	3.2E-03	8.2E-04	4.0E-03	0/23	2.7E-03	6.6E-04	7.0E-03	0/14	2.8E-03	8.7E-04	4.0E-03	0/11	2.6E-03	6.9E-04	4.0E-03
	Trichlorofluoromethane	1/11	4.9E-03	5.2E-04	7.0E-03	0/11	6.4E-03	8.2E-04	8.5E-03	0/23	4.4E-03	6.6E-04	1.4E-02	0/14	5.1E-03	8.7E-04	8.0E-03	0/11	4.6E-03	6.9E-04	8.5E-03
	Vinyl Acetate	0/10	3.8E-03	3.0E-03	5.0E-03	0/10	3.5E-03	3.0E-03	4.0E-03	0/18	4.4E-03	2.5E-03	7.0E-03	0/13	3.5E-03	2.5E-03	5.0E-03	0/9	3.6E-03	2.5E-03	5.0E-03
	Vinyl Chloride	0/11	5.5E-03	5.2E-04	7.0E-03	0/11	6.4E-03	8.2E-04	8.5E-03	0/23	5.2E-03	6.6E-04	1.4E-02	0/14	5.6E-03	8.7E-04	8.0E-03	0/11	5.0E-03	6.9E-04	8.5E-03
	Xylenes (Total)	1/10	9.1E-03	2.5E-03	1.3E-02	0/10	1.1E-02	8.5E-03	1.3E-02	0/18	7.5E-03	2.5E-03	2.1E-02	0/13	7.7E-03	2.5E-03	1.2E-02	0/9	8.0E-03	2.5E-03	1.3E-02
	Xylenes-p,m	0/1	5.2E-04	5.2E-04	5.2E-04	0/1	8.2E-04	8.2E-04	8.2E-04	0/5	9.4E-04	6.6E-04	1.3E-03	0/1	8.7E-04	8.7E-04	8.7E-04	0/2	7.0E-04	6.9E-04	7.2E-04

Appendix A-4
Summary Statistics for Analytes in Site Sediment Porewater (ug/L)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Type	Analyte	21st Street Pond				Ogden River - Reach B				Ogden River - Reach C			
		DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max
PAHs	2-Chloronaphthalene	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	2-Methylnaphthalene	2/10	2.3E+00	1.5E-01	5.0E+00	0/4	2.6E+00	1.5E-01	5.0E+00	0/2	2.6E+00	1.5E-01	5.0E+00
	Acenaphthene	6/10	8.6E+00	1.5E-01	3.4E+01	1/4	2.6E+00	8.0E-02	5.0E+00	0/2	2.6E+00	1.5E-01	5.0E+00
	Acenaphthylene	1/10	2.7E+00	1.5E-01	5.0E+00	0/4	2.6E+00	1.5E-01	5.0E+00	0/2	2.6E+00	1.5E-01	5.0E+00
	Anthracene	4/10	2.8E+00	8.0E-02	5.0E+00	0/4	2.6E+00	1.5E-01	5.0E+00	0/2	2.6E+00	1.5E-01	5.0E+00
	Benzo[a]anthracene	1/10	2.6E+00	5.0E-02	5.0E+00	0/4	2.6E+00	1.5E-01	5.0E+00	0/2	2.6E+00	1.5E-01	5.0E+00
	Benzo[a]pyrene	0/10	2.6E+00	1.5E-01	5.0E+00	0/4	2.6E+00	1.5E-01	5.0E+00	0/2	2.6E+00	1.5E-01	5.0E+00
	Benzo[b]fluoranthene	1/10	2.6E+00	9.0E-02	5.0E+00	0/4	2.6E+00	1.5E-01	5.0E+00	0/2	2.6E+00	1.5E-01	5.0E+00
	Benzo[g,h,i]perylene	0/10	2.6E+00	1.5E-01	5.0E+00	0/4	2.6E+00	1.5E-01	5.0E+00	0/2	2.6E+00	1.5E-01	5.0E+00
	Benzo[k]fluoranthene	0/10	2.6E+00	1.5E-01	5.0E+00	0/4	2.6E+00	1.5E-01	5.0E+00	0/2	2.6E+00	1.5E-01	5.0E+00
	Chrysene	0/10	2.6E+00	1.5E-01	5.0E+00	0/4	2.6E+00	1.5E-01	5.0E+00	0/2	2.6E+00	1.5E-01	5.0E+00
	Dibenz[a,h]anthracene	0/10	2.6E+00	1.5E-01	5.0E+00	0/4	2.6E+00	1.5E-01	5.0E+00	0/2	2.6E+00	1.5E-01	5.0E+00
	Dibenzofuran	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	Fluoranthene	4/10	2.5E+00	1.0E-01	5.0E+00	0/4	2.6E+00	1.5E-01	5.0E+00	0/2	2.6E+00	1.5E-01	5.0E+00
	Fluorene	4/10	4.6E+00	1.5E-01	1.5E+01	1/4	2.6E+00	8.0E-02	5.0E+00	0/2	2.6E+00	1.5E-01	5.0E+00
	Indeno[1,2,3-c,d]pyrene	0/10	2.6E+00	1.5E-01	5.0E+00	0/4	2.6E+00	1.5E-01	5.0E+00	0/2	2.6E+00	1.5E-01	5.0E+00
	Naphthalene	4/10	4.5E+00	1.5E-01	1.2E+01	1/4	2.6E+00	1.5E-01	5.0E+00	0/2	2.6E+00	1.5E-01	5.0E+00
	Phenanthrene	1/10	2.6E+00	1.5E-01	5.0E+00	0/4	2.6E+00	1.5E-01	5.0E+00	0/2	2.6E+00	1.5E-01	5.0E+00
	Pyrene	5/10	2.7E+00	8.0E-02	5.0E+00	0/4	2.6E+00	1.5E-01	5.0E+00	0/2	2.6E+00	1.5E-01	5.0E+00
SVOCs	2,4,5-Trichlorophenol	0/5	1.3E+01	1.3E+01	1.3E+01	0/2	1.3E+01	1.3E+01	1.3E+01	0/1	1.3E+01	1.3E+01	1.3E+01
	2,4,6-Trichlorophenol	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	2,4-Dichlorophenol	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	2,4-Dimethylphenol	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	2,4-Dinitrophenol	0/5	1.3E+01	1.3E+01	1.3E+01	0/2	1.3E+01	1.3E+01	1.3E+01	0/1	1.3E+01	1.3E+01	1.3E+01
	2,4-Dinitrotoluene	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	2,6-Dinitrotoluene	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	2-Chlorophenol	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	2-Methylphenol (o-Cresol)	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	2-Nitroaniline	0/5	1.3E+01	1.3E+01	1.3E+01	0/2	1.3E+01	1.3E+01	1.3E+01	0/1	1.3E+01	1.3E+01	1.3E+01
	2-Nitrophenol	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	3,3'-Dichlorobenzidine	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	3-Nitroaniline	0/5	1.3E+01	1.3E+01	1.3E+01	0/2	1.3E+01	1.3E+01	1.3E+01	0/1	1.3E+01	1.3E+01	1.3E+01
	4,6-Dinitro-o-cresol	0/5	1.3E+01	1.3E+01	1.3E+01	0/2	1.3E+01	1.3E+01	1.3E+01	0/1	1.3E+01	1.3E+01	1.3E+01
	4-Chloro-3-Methylphenol	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	4-Chloroaniline	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	4-Chlorophenyl-phenylether	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	4-Methylphenol (p-Cresol)	1/5	1.4E+01	5.0E+00	5.1E+01	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	4-Nitroaniline	0/5	1.3E+01	1.3E+01	1.3E+01	0/2	1.3E+01	1.3E+01	1.3E+01	0/1	1.3E+01	1.3E+01	1.3E+01
	4-Nitrophenol	0/5	1.3E+01	1.3E+01	1.3E+01	0/2	1.3E+01	1.3E+01	1.3E+01	0/1	1.3E+01	1.3E+01	1.3E+01
	bis(2-Chloroethoxy)methane	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	bis(2-Chloroethyl)ether	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	bis(2-Chloroisopropyl)ether	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	bis(2-Ethylhexyl)phthalate	5/5	8.0E+00	1.0E+00	2.1E+01	2/2	1.5E+00	1.0E+00	2.0E+00	1/1	1.0E+00	1.0E+00	1.0E+00
	bis(n-octyl)phthalate	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	Butylbenzylphthalate	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	Carbazole	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	Dibutylphthalate	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	Diethylphthalate	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	Dimethylphthalate	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	Hexachlorobenzene	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	Hexachlorobutadiene	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	Hexachlorocyclopentadiene	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	Hexachloroethane	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	Isophorone	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	Nitrobenzene	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	N-Nitrosodiphenylamine	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	n-Nitrosodipropylamine	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00
	Pentachlorophenol (PCP)	0/5	1.3E+01	1.3E+01	1.3E+01	0/2	1.3E+01	1.3E+01	1.3E+01	0/1	1.3E+01	1.3E+01	1.3E+01
	Phenol	0/5	5.0E+00	5.0E+00	5.0E+00	0/2	5.0E+00	5.0E+00	5.0E+00	0/1	5.0E+00	5.0E+00	5.0E+00

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Appendix A-5
Summary Statistics for Analytes in Fish Tissue

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Type	Analyte	Units	Weber River - Reach C				Weber River - Reach D				Buena Ventura Park Pond				21st Street Pond			
			DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max
PAHs	2-Chloronaphthalene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	2-Methylnaphthalene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	Acenaphthene	mg/kg ww	na	na	na	na	na	na	na	na	0/1	1.3E-01	1.3E-01	1.3E-01	1/33	8.9E-01	1.3E-01	1.2E+00
	Acenaphthylene	mg/kg ww	na	na	na	na	na	na	na	na	0/1	1.3E-01	1.3E-01	1.3E-01	0/33	9.0E-01	1.3E-01	1.2E+00
	Anthracene	mg/kg ww	na	na	na	na	na	na	na	na	0/1	1.3E-01	1.3E-01	1.3E-01	0/33	9.0E-01	1.3E-01	1.2E+00
	Benzo[a]anthracene	mg/kg ww	na	na	na	na	na	na	na	na	0/1	1.3E-01	1.3E-01	1.3E-01	0/33	9.0E-01	1.3E-01	1.2E+00
	Benzo[a]pyrene	mg/kg ww	na	na	na	na	na	na	na	na	0/1	1.3E-01	1.3E-01	1.3E-01	0/33	9.0E-01	1.3E-01	1.2E+00
	Benzo[b]fluoranthene	mg/kg ww	na	na	na	na	na	na	na	na	0/1	1.3E-01	1.3E-01	1.3E-01	0/33	9.0E-01	1.3E-01	1.2E+00
	Benzo[g,h,i]perylene	mg/kg ww	na	na	na	na	na	na	na	na	0/1	1.3E-01	1.3E-01	1.3E-01	0/33	9.0E-01	1.3E-01	1.2E+00
	Benzo[k]fluoranthene	mg/kg ww	na	na	na	na	na	na	na	na	0/1	1.3E-01	1.3E-01	1.3E-01	0/33	9.0E-01	1.3E-01	1.2E+00
	Chrysene	mg/kg ww	na	na	na	na	na	na	na	na	0/1	1.3E-01	1.3E-01	1.3E-01	0/33	9.0E-01	1.3E-01	1.2E+00
	Dibenz[a,h]anthracene	mg/kg ww	na	na	na	na	na	na	na	na	0/1	1.3E-01	1.3E-01	1.3E-01	0/33	9.0E-01	1.3E-01	1.2E+00
	Dibenzofuran	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	Fluoranthene	mg/kg ww	na	na	na	na	na	na	na	na	0/1	1.3E-01	1.3E-01	1.3E-01	0/33	9.0E-01	1.3E-01	1.2E+00
	Fluorene	mg/kg ww	na	na	na	na	na	na	na	na	0/1	1.3E-01	1.3E-01	1.3E-01	0/33	9.0E-01	1.3E-01	1.2E+00
	Indeno[1,2,3-c,d]pyrene	mg/kg ww	na	na	na	na	na	na	na	na	0/1	1.3E-01	1.3E-01	1.3E-01	0/33	9.0E-01	1.3E-01	1.2E+00
	Naphthalene	mg/kg ww	na	na	na	na	na	na	na	na	0/1	1.3E-01	1.3E-01	1.3E-01	0/33	9.0E-01	1.3E-01	1.2E+00
	Phenanthrene	mg/kg ww	na	na	na	na	na	na	na	na	0/1	1.3E-01	1.3E-01	1.3E-01	0/33	9.0E-01	1.3E-01	1.2E+00
	Pyrene	mg/kg ww	na	na	na	na	na	na	na	na	0/1	1.3E-01	1.3E-01	1.3E-01	0/33	9.0E-01	1.3E-01	1.2E+00
PCBs (as Aroclors)	Aroclor-1016	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	2.0E-02	9.9E-03	3.2E-02
	Aroclor-1221	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	4.2E-02	2.4E-02	6.3E-02
	Aroclor-1232	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	2.0E-02	9.9E-03	3.2E-02
	Aroclor-1242	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	2.0E-02	9.9E-03	3.2E-02
	Aroclor-1248	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	2.0E-02	9.9E-03	3.2E-02
	Aroclor-1254	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	2.0E-02	9.9E-03	3.2E-02
	Aroclor-1260	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	28/29	2.8E-01	5.3E-03	1.9E+00
	Aroclor-1268	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/28	2.0E-02	6.8E-03	3.2E-02
PCBs (as congeners)	PCB-105	pg/g ww	1/1	2.5E+03	2.5E+03	2.5E+03	1/1	5.9E+02	5.9E+02	5.9E+02	1/1	4.5E+02	4.5E+02	4.5E+02	2/2	4.7E+02	3.8E+02	5.7E+02
	PCB-114	pg/g ww	1/1	1.6E+02	1.6E+02	1.6E+02	1/1	3.8E+01	3.8E+01	3.8E+01	1/1	3.5E+01	3.5E+01	3.5E+01	2/2	3.7E+01	3.0E+01	4.4E+01
	PCB-118	pg/g ww	1/1	7.3E+03	7.3E+03	7.3E+03	1/1	1.7E+03	1.7E+03	1.7E+03	1/1	1.2E+03	1.2E+03	1.2E+03	2/2	1.9E+03	1.5E+03	2.3E+03
	PCB-123	pg/g ww	0/1	1.5E+01	1.5E+01	1.5E+01	0/1	8.1E+00	8.1E+00	8.1E+00	0/1	4.8E+00	4.8E+00	4.8E+00	0/2	1.1E+01	1.1E+01	1.1E+01
	PCB-126	pg/g ww	1/1	1.8E+01	1.8E+01	1.8E+01	1/1	1.1E+01	1.1E+01	1.1E+01	0/1	4.8E+00	4.8E+00	4.8E+00	2/2	1.9E+01	1.4E+01	2.3E+01
	PCB-156	pg/g ww	1/1	9.7E+02	9.7E+02	9.7E+02	1/1	5.0E+02	5.0E+02	5.0E+02	1/1	1.4E+02	1.4E+02	1.4E+02	2/2	6.0E+02	4.8E+02	7.2E+02
	PCB-157	pg/g ww	1/1	2.4E+02	2.4E+02	2.4E+02	1/1	6.1E+01	6.1E+01	6.1E+01	1/1	2.9E+01	2.9E+01	2.9E+01	2/2	6.9E+01	5.5E+01	8.4E+01
	PCB-167	pg/g ww	1/1	5.0E+02	5.0E+02	5.0E+02	1/1	1.4E+02	1.4E+02	1.4E+02	1/1	7.3E+01	7.3E+01	7.3E+01	2/2	3.4E+02	2.5E+02	4.3E+02
	PCB-169	pg/g ww	0/1	1.6E+01	1.6E+01	1.6E+01	0/1	9.8E+00	9.8E+00	9.8E+00	0/1	9.5E+00	9.5E+00	9.5E+00	0/2	9.7E+00	9.7E+00	9.7E+00
	PCB-189	pg/g ww	1/1	1.1E+02	1.1E+02	1.1E+02	1/1	4.6E+01	4.6E+01	4.6E+01	0/1	9.5E+00	9.5E+00	9.5E+00	2/2	1.3E+02	9.5E+01	1.6E+02
	PCB-77	pg/g ww	1/1	1.1E+02	1.1E+02	1.1E+02	1/1	4.9E+01	4.9E+01	4.9E+01	1/1	3.4E+01	3.4E+01	3.4E+01	2/2	3.0E+01	2.6E+01	3.4E+01
	PCB-81	pg/g ww	0/1	9.5E-01	9.5E-01	9.5E-01	0/1	9.8E-01	9.8E-01	9.8E-01	0/1	9.5E-01	9.5E-01	9.5E-01	0/2	9.7E-01	9.7E-01	9.7E-01
Pesticides	4,4'-DDD	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	18/29	5.0E-03	1.5E-03	1.6E-02
	4,4'-DDE	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	29/29	1.3E-01	1.9E-03	5.9E-01
	4,4'-DDT	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	1/29	2.1E-03	1.9E-03	2.7E-03
	Aldrin	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	2.0E-03	1.9E-03	2.5E-03
	alpha-BHC	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	2.0E-03	1.9E-03	2.5E-03
	alpha-Chlordane	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	2.0E-03	1.9E-03	2.5E-03
	beta-BHC	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	2.0E-03	1.9E-03	2.5E-03
	delta-BHC	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	2.0E-03	1.9E-03	2.5E-03
	Dieldrin	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	2.0E-03	1.9E-03	2.5E-03
	Endosulfan I	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	2.0E-03	1.9E-03	2.5E-03
	Endosulfan II	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	2.0E-03	1.9E-03	2.5E-03
	Endosulfan Sulfate	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	2.0E-03	1.9E-03	2.5E-03
	Endrin	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	2.0E-03	1.9E-03	2.5E-03
	Endrin Aldehyde	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	2.0E-03	1.9E-03	2.5E-03
	Endrin ketone	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	2.0E-03	1.9E-03	2.5E-03
	gamma-BHC	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	2.0E-03	1.9E-03	2.5E-03
	gamma-Chlordane	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	2/29	2.8E-03	1.9E-03	2.0E-02
	Heptachlor	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	2.0E-03	1.9E-03	2.5E-03
	Heptachlor Epoxide	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	2.0E-03	1.9E-03	2.5E-03
	Methoxychlor	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	2.0E-03	1.9E-03	2.5E-03
	Toxaphene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	4.2E-02	2.4E-02	6.3E-02

Appendix A-5
Summary Statistics for Analytes in Fish Tissue

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Type	Analyte	Units	Weber River - Reach C				Weber River - Reach D				Buena Ventura Park Pond				21st Street Pond			
			DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max
SVOCs	1,2,4-Trichlorobenzene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	1,2-Dichlorobenzene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	1,3-Dichlorobenzene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	1,4-Dichlorobenzene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	2,4,5-Trichlorophenol	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	2,4,6-Trichlorophenol	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	2,4-Dichlorophenol	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	2,4-Dimethylphenol	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	2,4-Dinitrophenol	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	2,4-Dinitrotoluene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	2,6-Dinitrotoluene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	2-Chlorophenol	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	2-Methylphenol (o-Cresol)	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	2-Nitroaniline	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	2-Nitrophenol	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	3,3'-Dichlorobenzidine	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	3-Nitroaniline	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	4,6-Dinitro-o-cresol	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	4-Bromophenyl-phenylether	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	4-Chloro-3-Methylphenol	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	4-Chloroaniline	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	4-Chlorophenyl-phenylether	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	4-Methylphenol (p-Cresol)	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	4-Nitroaniline	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	4-Nitrophenol	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	Benzyl alcohol	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	bis(2-Chloroethoxy)methane	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	bis(2-Chloroethyl)ether	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	bis(2-Chloroisopropyl)ether	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	bis(2-Ethylhexyl)phthalate	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	22/29	1.2E+00	4.1E-01	2.7E+00
	bis(n-octyl)phthalate	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	Butylbenzylphthalate	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	Carbazole	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	Dibutylphthalate	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	1/29	1.0E+00	9.8E-01	1.2E+00
	Diethylphthalate	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	1/29	1.0E+00	9.8E-01	1.7E+00
	Dimethylphthalate	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	Hexachlorobenzene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	Hexachlorobutadiene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	Hexachlorocyclopentadiene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	Hexachloroethane	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	Isophorone	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	Nitrobenzene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	N-Nitrosodiphenylamine	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	n-Nitrosodipropylamine	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	Pentachlorophenol (PCP)	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/29	1.0E+00	9.8E-01	1.2E+00
	Phenol	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na	0/30	1.0E+00	7.9E-01	1.2E+00

Appendix A-5
Summary Statistics for Analytes in Fish Tissue

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Type	Analyte	Units	Ogden River - Reach A				Ogden River - Reach B				Ogden River - Reach C			
			DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max
PAHs	2-Chloronaphthalene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	2-Methylnaphthalene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Acenaphthene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Acenaphthylene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Anthracene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Benzo[a]anthracene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Benzo[a]pyrene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Benzo[b]fluoranthene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Benzo[g,h,i]perylene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Benzo[k]fluoranthene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Chrysene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Dibenz[a,h]anthracene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Dibenzofuran	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Fluoranthene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Fluorene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Indeno[1,2,3-c,d]pyrene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Naphthalene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Phenanthrene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Pyrene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
PCBs (as Aroclors)	Aroclor-1016	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Aroclor-1221	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Aroclor-1232	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Aroclor-1242	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Aroclor-1248	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Aroclor-1254	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Aroclor-1260	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Aroclor-1268	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
PCBs (as congeners)	PCB-105	pg/g ww	4/4	6.9E+02	5.2E+02	8.6E+02	3/3	3.4E+03	1.7E+03	6.7E+03	3/3	1.6E+03	1.2E+03	2.0E+03
	PCB-114	pg/g ww	4/4	4.2E+01	3.0E+01	5.5E+01	3/3	3.1E+02	9.9E+01	6.9E+02	3/3	1.0E+02	7.4E+01	1.2E+02
	PCB-118	pg/g ww	4/4	1.8E+03	1.4E+03	2.4E+03	3/3	1.6E+04	6.2E+03	3.4E+04	3/3	6.2E+03	4.5E+03	7.7E+03
	PCB-123	pg/g ww	3/4	2.1E+01	4.9E+00	4.2E+01	0/3	1.5E+02	9.9E+00	4.2E+02	0/3	2.2E+01	1.5E+01	3.6E+01
	PCB-126	pg/g ww	0/4	5.0E+00	4.5E+00	5.4E+00	2/3	4.2E+01	2.6E+01	7.4E+01	3/3	3.0E+01	2.4E+01	3.5E+01
	PCB-156	pg/g ww	4/4	2.3E+02	1.6E+02	2.9E+02	3/3	5.3E+03	2.4E+03	9.4E+03	3/3	2.4E+03	1.7E+03	3.2E+03
	PCB-157	pg/g ww	4/4	5.2E+01	3.7E+01	6.5E+01	3/3	5.7E+02	3.5E+02	9.9E+02	3/3	2.3E+02	1.6E+02	3.1E+02
	PCB-167	pg/g ww	4/4	9.4E+01	5.6E+01	1.4E+02	3/3	3.0E+03	1.3E+03	6.4E+03	3/3	9.3E+02	6.8E+02	1.1E+03
	PCB-169	pg/g ww	0/4	1.0E+01	9.1E+00	1.1E+01	0/3	8.3E+01	9.7E+00	2.1E+02	0/3	3.4E+02	9.8E+00	7.5E+02
	PCB-189	pg/g ww	0/4	1.0E+01	9.1E+00	1.1E+01	3/3	1.1E+03	6.1E+02	1.9E+03	3/3	4.0E+02	2.7E+02	4.9E+02
	PCB-77	pg/g ww	4/4	3.1E+01	2.2E+01	4.3E+01	2/3	3.8E+01	2.2E+00	7.4E+01	3/3	7.9E+01	5.6E+01	1.0E+02
	PCB-81	pg/g ww	0/4	1.0E+00	9.1E-01	1.1E+00	0/3	1.4E+00	9.7E-01	2.2E+00	0/3	9.9E-01	9.8E-01	1.0E+00
Pesticides	4,4'-DDD	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	4,4'-DDE	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	4,4'-DDT	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Aldrin	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	alpha-BHC	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	alpha-Chlordane	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	beta-BHC	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	delta-BHC	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Dieldrin	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Endosulfan I	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Endosulfan II	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Endosulfan Sulfate	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Endrin	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Endrin Aldehyde	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Endrin ketone	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	gamma-BHC	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	gamma-Chlordane	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Heptachlor	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Heptachlor Epoxide	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Methoxychlor	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Toxaphene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na

Appendix A-5
Summary Statistics for Analytes in Fish Tissue

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Type	Analyte	Units	Ogden River - Reach A				Ogden River - Reach B				Ogden River - Reach C			
			DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max
SVOCs	1,2,4-Trichlorobenzene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	1,2-Dichlorobenzene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	1,3-Dichlorobenzene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	1,4-Dichlorobenzene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	2,4,5-Trichlorophenol	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	2,4,6-Trichlorophenol	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	2,4-Dichlorophenol	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	2,4-Dimethylphenol	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	2,4-Dinitrophenol	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	2,4-Dinitrotoluene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	2,6-Dinitrotoluene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	2-Chlorophenol	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	2-Methylphenol (o-Cresol)	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	2-Nitroaniline	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	2-Nitrophenol	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	3,3'-Dichlorobenzidine	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	3-Nitroaniline	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	4,6-Dinitro-o-cresol	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	4-Bromophenyl-phenylether	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	4-Chloro-3-Methylphenol	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	4-Chloroaniline	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	4-Chlorophenyl-phenylether	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	4-Methylphenol (p-Cresol)	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	4-Nitroaniline	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	4-Nitrophenol	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Benzyl alcohol	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	bis(2-Chloroethoxy)methane	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	bis(2-Chloroethyl)ether	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	bis(2-Chloroisopropyl)ether	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	bis(2-Ethylhexyl)phthalate	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	bis(n-octyl)phthalate	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Butylbenzylphthalate	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Carbazole	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Dibutylphthalate	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Diethylphthalate	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Dimethylphthalate	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Hexachlorobenzene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Hexachlorobutadiene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Hexachlorocyclopentadiene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Hexachloroethane	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Isophorone	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Nitrobenzene	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	N-Nitrosodiphenylamine	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	n-Nitrosodipropylamine	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Pentachlorophenol (PCP)	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na
	Phenol	mg/kg ww	na	na	na	na	na	na	na	na	na	na	na	na

Appendix A-6
Summary Statistics for Analytes in Benthic Invertebrate Tissue

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Type	Analyte	Units	Buena Ventura Park Pond				Ogden River - Reach A				Ogden River - Reach B			
			DF	Avg	Min	Max	DF	Avg	Min	Max	DF	Avg	Min	Max
PCBs (as congeners)	PCB-105	pg/g ww	1/1	1.1E+02	1.1E+02	1.1E+02	2/2	1.7E+02	1.4E+02	2.1E+02	1/1	8.0E+02	8.0E+02	8.0E+02
	PCB-114	pg/g ww	1/1	8.9E+00	8.9E+00	8.9E+00	1/2	1.4E+01	1.3E+01	1.5E+01	1/1	5.5E+01	5.5E+01	5.5E+01
	PCB-118	pg/g ww	1/1	3.1E+02	3.1E+02	3.1E+02	2/2	4.8E+02	3.8E+02	5.8E+02	1/1	4.2E+03	4.2E+03	4.2E+03
	PCB-123	pg/g ww	0/1	3.9E+00	3.9E+00	3.9E+00	0/2	9.0E+00	5.2E+00	1.3E+01	0/1	8.9E+00	8.9E+00	8.9E+00
	PCB-126	pg/g ww	0/1	3.9E+00	3.9E+00	3.9E+00	0/2	9.0E+00	5.2E+00	1.3E+01	0/1	8.9E+00	8.9E+00	8.9E+00
	PCB-156	pg/g ww	1/1	3.4E+01	3.4E+01	3.4E+01	1/2	3.9E+01	2.6E+01	5.2E+01	1/1	2.2E+03	2.2E+03	2.2E+03
	PCB-157	pg/g ww	0/1	7.8E+00	7.8E+00	7.8E+00	0/2	1.8E+01	1.0E+01	2.6E+01	1/1	1.7E+02	1.7E+02	1.7E+02
	PCB-167	pg/g ww	1/1	1.7E+01	1.7E+01	1.7E+01	1/2	2.6E+01	2.6E+01	2.6E+01	1/1	1.0E+03	1.0E+03	1.0E+03
	PCB-169	pg/g ww	0/1	7.8E+00	7.8E+00	7.8E+00	0/2	1.8E+01	1.0E+01	2.6E+01	0/1	1.8E+01	1.8E+01	1.8E+01
	PCB-189	pg/g ww	0/1	7.8E+00	7.8E+00	7.8E+00	0/2	1.8E+01	1.0E+01	2.6E+01	1/1	4.9E+02	4.9E+02	4.9E+02
	PCB-77	pg/g ww	1/1	2.1E+01	2.1E+01	2.1E+01	2/2	2.9E+01	2.8E+01	2.9E+01	1/1	9.6E+01	9.6E+01	9.6E+01
	PCB-81	pg/g ww	0/1	7.8E-01	7.8E-01	7.8E-01	0/2	1.8E+00	1.0E+00	2.6E+00	0/1	1.8E+00	1.8E+00	1.8E+00

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APPENDIX B

WILDLIFE EXPOSURE PROFILES

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Appendix B Wildlife Exposure Profiles

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Masked Shrew *Sorex cinereus*				
Parameter	**Symbol**	**Reported Values**	**References**	**Values Identified for ERA**
Habitat		Masked shrews are the most common shrews in moist forests, open country, and brush of the northern United States. High-metabolic rates require cool, moist areas such as low damp areas in stream valleys or floodplains.	Zeveloff, 1988	
Body Weight (kg wet weight)	BW	2.4-7.8 g (mean of range = 5.1g) 4-7g (mean of range = 5.5g)	Whitaker, 1980; Burt & Grossenheider, 1976	Mean of reported means: 0.0053
Food Ingestion Rate (kg wet weight/day)	IR_{food}	0.00795 - Mean - adults both sexes - Ohio laboratory 0.62 g/g- day = 0.01 kg/d = Mean - adults both sexes - Ohio lab	USEPA, 1993 [a]	Mean of mean values: 0.0090
Water Ingestion Rate (L/day)	IR_{water}	Can be estimated based on the following equation: Can be estimated based on the following equation: $IR_{water} = 0.099 * BW^{0.90}$	USEPA, 1993	Estimated from equation: 0.00089
Soil Ingestion Rate (kg dry weight/day)	IR_{soil}	Ingestion of soil (IR_{soil}) as percentage of food intake (kg soil dry weight/kg food dry weight) is reported at 13%. Value reported for short-tail shrew.	Talmage & Walton, 1993 [a]	$IR_{soil} = IR_{food} * 0.32 *$ % soil in diet; where 0.32 (kg food dry weight /kg food wet weight) = wet weight to dry weight conversion factor for food assuming 32% dry matter in food: 0.00037
Dietary Composition (fraction wet volume)	df	The masked shrew is primarily feeds on insects with beetles, flies, and ant comprising most of their diet. Diet consists of butterflies, moths, beetle larvae, slugs, snails, and spiders; seldom eat worms or vegetable matter.	Zeveloff, 1988	Concentrations in terrestrial prey items are not available for this site; this pathway will be evaluated qualitatively.
Home Range Size (ha)	HR	0.39 - Mean - both sexes - Manitoba bog	USEPA, 1993 [a]	Reported mean selected: 0.39
Seasonal Use		No information available.		No Info

a uses values established for the short-tailed shrew

Mink *Mustela vison*				
Parameter	**Symbol**	**Reported Values**	**References**	**Values Identified for ERA**
Habitat		Mink are associated with aquatic habitats including rivers, streams, lakes, ditches, swamps, marshes and backwater areas. They prefer irregular shorelines and brushy or wooded cover adjacent to the water.	USEPA, 1993	
Body Weight (kg wet weight)	BW	1.04 - Mean - adult male - summer - Montana 1.233 - Mean - adult male - fall - Montana 0.550 - Mean - adult female- summer - Montana 0.586 - Mean - adult female - fall - Montana 0.777 - Mean - juvenile male - summer - Montana 0.533 - Mean - juvenile female - summer - Montana	USEPA, 1993	Mean of means for females: 0.556
Food Ingestion Rate (kg wet weight/day)	IR_{food}	0.13 g/g-day - Mean - captive males = 0.15 kg/day (using 1.14 kg BW) 0.12 g/g-day - Mean - farm raised males = 0.14 kg/day 0.16 g/g-day - Mean - farm raised females = 0.089 kg/day (0.556 BW)	USEPA, 1993	Mean of means for females: 0.089
Water Ingestion Rate (L/day)	IR_{water}	0.028 g/g-day = 0.022 L/day - Mean for farm raised mink.	USEPA, 1993	Reported mean selected: 0.0584
Sediment Ingestion Rate (kg dry weight/day)	$IR_{sediment}$	Sediment ingestion rates for the mink are not available. Ingestion of sediment (IR_{sed}) as percentage of food intake (kg dry weight/kg food dry weight) is assumed to be equal to 1%.	Assumption	$IR_{sed} = IR_{food} * 0.25 *$ % sediment in diet; where 0.25 (kg food dry weight /kg food wet weight) = wet weight to dry weight conversion factor for food assuming 25% dry matter in food: 0.0002
Dietary Composition (fraction wet volume)	df	Mink are opportunistic feeders taking whatever prey is abundant. In many parts of its range mammals are the most important prey but mink hunt aquatic prey as well depending on the season. In mink intestines collected from Montana, percent freqency of occurrence in samples for food items: 61.5% fish; 19.2% mammals and 26.9% aquatic invertebrates. In mink stomachs, the frequency of occurrence was: 11.5% fish, and 7.2% mammals.	USEPA, 1993; RCG/Hagler Bailly, 1995	Fraction fish= df_{fish} = 100%
Home Range Size (ha)	HR	Range size and shape depends on habitat. Shape is linear along streams and circular in marshes. Montana /riverine: 7.8 - Female mink in heavy vegetation 20.4 - Female mink in sparse vegetation	USEPA, 1993	Mean of reported values: 14.1 *(aprrox. 2 km of linear shoreline)*
Seasonal Use		Mink are nocturnal and active year round.	USEPA, 1993	

American Robin
Turdus migratorius

Parameter	Symbol	Reported Values	References	Values Identified for ERA
Habitat		Breeds in moist forests, swamps, open woodlands, orchards, parks, and lawns. Forages on ground in open areas along habitat edges of streams.	USEPA, 1993; Sample & Suter, 1994	
Body Weight (kg wet weight)	BW	0.0773 - Mean - adults - Pennsylvania 0.0862 - Mean - adult male nonbreeders - New York 0.0836 - Mean - adult female nonbreeders - New York 0.0774 - Mean - adult female breeders -New York 0.0806 - Mean - adult male breeders - New York 0.0635 to 0.103 - Range breeding adults - PA (median=0.0833)	USEPA, 1993	Mean of reported means for breeding adults: 0.0814
Food Ingestion Rate (kg wet weight/day)	IR_{food}	0.89 g/g-day (wet weight) - Mean - breeding free living male and females - California = 0.0698 kg/day (BW = 0.0823 kg) 1.52 g/g-day (wet weight) - Mean - free living adults - Kansas = 0.12 kg/day (BW = 0.055 kg)	USEPA, 1993	Mean of two reported values: 0.078
Water Ingestion Rate (L/day)	IR_{water}	Specific values for the American robin are unavailable. Estimated based on following equation $IR_{water} = 0.059*BW^{0.67}$	USEPA, 1993	Estimated from equation: 0.011
Soil Ingestion Rate (kg dry weight/day)	IR_{soil}	Specific soil ingestion values are not available for the American robin. If soil ingestion is assumed to be proportional to the fraction of earthworms (soil invertebrates) in the diet, then the reported soil ingestion for the American woodcock can be used as a basis for deriving a value for the American robin. If the diet of the woodcock is 99% earthworms and 10.4% of their diet is soil then a robin consuming 77% earthworms will consume 8.1% soi	Beyer et al., 1994; Sample & Suter, 1994	$IR_{soil} = IR_{food}$ * 0.2 * % soil in diet; where 0.2 (kg food dry weight /kg food wet weight) = wet weight to dry weight conversion factor for food assuming 20% dry matter in food: 0.0012
Dietary Composition (fraction wet volume)	df	Western United States Spring: fruit 17%; invertebrates 83% Summer: fruit 29%; invertebrates 71% Fall: fruit 63%; invertebrates 37% Winter: fruit 70%; invertebrates 30%	USEPA, 1993	Concentrations in terrestrial prey items are not available for this site; this pathway will be evaluated qualitatively.
Home Range Size (ha)	HR	Foraging home range from nests in summer 0.15 - Mean - adults with nestling 0.81 - Mean - adults with fledgling	USEPA, 1993	Mean of mean values: 0.48
Seasonal Use		Migratory in northern portion of range. Leave breeding grounds from September to November returning from February to April.	USEPA, 1993	

Belted Kingfisher
Ceryle alcyon

Parameter	Symbol	Reported Values	References	Values Identified for ERA
Habitat		Forages on ground in open areas along habitat edges of streams, rivers ponds and lakes where fish concentrations are greatest. Nests in burrows that are devoid of vegetation.	USEPA, 1993	
Body Weight (kg wet weight)	BW	0.148kg - Mean - adults - Pennsylvania 0.136kg - Mean - adults - Pennsylvania 0.158kg - Mean - adults - Ohio	USEPA, 1993	Mean of reported means: 0.147
Food Ingestion Rate (kg wet weight/day)	IR_{food}	0.5 g/g-day - Mean - adults - northcentral lower Michigan (food ingestion rate calculated using a body weight of 0.147kg)	USEPA, 1993	Reported value: 0.0735
Water Ingestion Rate (L/day)	IR_{water}	Species specific values not available. Estimated based on following equation: $IR_{water} = 0.059 * BW^{0.67}$	USEPA, 1993	Estimated from equation: 0.016
Sediment Ingestion Rate (kg dry weight/day)	IR_{sed}	Ingestion of sediment (I_{sed}) as percentage of food intake (kg dry weight/kg food dry weight) is not available. Because of burrowing in the banks of rivers or streams nature while constructing nests, soil ingestion is assumed to be 2% of the diet. Ingestion assumption based on 9.6% sediment ingestion by bluegill (Kolehmainen, 1974).	Assumption	$IR_{sed} = IR_{food} * 0.27 * \%$ sediment in diet; where 0.27 (kg food dry weight /kg food wet weight) = wet weight to dry weight conversion factor for food assuming 27% dry matter in food: 0.0004
Dietary Composition (fraction wet volume)	df	Michigan/trout streams: Trout: 30% Game fish: 13% Forage fish: 15% Unidentified fish: 1% Crayfish: 41% Invertebrates: <1% (up to 19% in spring and fall)	USEPA, 1993	Fraction fish = df_{fish} = 100%
Home Range Size (ha)	HR	During the spring and early summer the breeding pairs defend both the territory including both their nest site and their foraging area. By autumn each bird defends an individual feeding territory only. Breeding territories can be more than twice as long as the feeding territory. Foraging territory is inversely related to prey abundance.	USEPA, 1993	No Info
Foraging Distance (km)		Foraging distance in early summer (breeding pairs): 2.19 - Mean - Pennsylvania 1.03 - Mean - Ohio/streams 1.03 - Mean - southwest Ohio/streams	USEPA, 1993	Mean of means for breeding pairs: 1.42
Seasonal Use		Migratory in northern portion of range. Leave breeding grounds from October to December returning from February to April.	USEPA, 1993	

Mallard *Anas platyrhynchos*				
Parameter	**Symbol**	**Reported Values**	**References**	**Values Identified for ERA**
Habitat		Natural bottomland wetlands and rivers, reservoirs, and ponds in winter. Dense grassy vegetation with height of at least one-half meter, usually within a few kilometers of water, for nesting	USEPA, 1993	
Body Weight (kg wet weight)	BW	1.225 - Mean - adult male 1.043 - Mean - adult female 1.043 to 1.814 - Range	USEPA, 1993	1.13
Food Ingestion Rate (kg wet weight/day)	IR_{food}	Species specific values are not available. Can be estimated based on following equation: $IR_{food}=(0.0582*BW^{0.651}) / 0.2$ Where: 0.2 = dry weight to wet weight conversion factor assumin 20% dry matter in diet.	USEPA, 1993	Estimated from equation: 0.32
Water Ingestion Rate (L/day)	IR_{water}	Values not reported. Estimated based on following equation: $IR_{water} = 0.059*BW^{0.67}$	USEPA, 1993	Estimated from equation: 0.064
Sediment Ingestion Rate (kg dry weight/day)	IR_{sed}	Ingestion of sediment (IR_{sed}) as percentage of food intake (kg sediment dry weight/kg food dry weight) reported at 3.3%.	Beyer et al., 1994	$IR_{sed} = IR_{food}$ * 0.145 * % sediment in diet; where 0.145 (kg food dry weight /kg food wet weight) = wet weight to dry weight conversion factor for food assuming 14.5% dry matter in food: 0.0015
Dietary Composition (fraction wet volume)	df	South central North Dakota/prairie potholes. Spring breeding season: Invertebrates 74.7% ; plant material 25.3% Louisiana coastal marsh in winter Snails 1.05%; plant material 92.2% and other 6.8%	USEPA, 1993 USEPA, 1993	Diet reported for breeding season used because this is when exposures for mallards would be expected to occur. Aquatic invertebrates = $df_{aquinverts}$= 100%
Home Range Size (ha)	HR	468 - Mean - adult female - North Dakota 111 - Mean - laying female - North Dakota 540 - Mean - adult female - Minnesota 620 - Mean - adult male Minnesota 40 to 1,440 - Range	USEPA, 1993	Mean of reported mean values for adult females: 435
Seasonal Use		Migratory in northern portion of range. Leave breeding grounds by November returning from mid-March to mid-May.	USEPA, 1993	

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APPENDIX C

DERIVATION OF TOXICITY BENCHMARKS

Aquatic Receptors

C-1: Exposure of aquatic receptors to surface water

C-2: Exposure of benthic organisms to sediments

C-3: Exposure of benthic organisms to sediment porewater

C-4: Maximum allowable tissue concentrations (MATCs) based on fish tissue

Terrestrial Receptors

C-5: Exposure of plants and soil invertebrates to soil

Wildlife Receptors

C-6: Concentration-based benchmarks for ingestion of surface water & food

C-7: Dose-based ingestion toxicity reference values (TRVs)

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APPENDIX C
SELECTION OF TOXICITY BENCHMARKS FOR ECOLOGICAL RECEPTORS

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Overview

The hazard quotient approach to risk characterization is based on comparison of site-related indices of exposure to appropriate benchmarks of toxicity. These benchmarks may be concentration-based (e.g., the concentration in soil, sediment, surface water, or diet), or may be dose-based. Each benchmark is chemical-specific, receptor-specific and is usually medium-specific.

For this risk assessment, all toxicity benchmarks were based on values developed by various regulatory agencies and published in the literature. This appendix describes the various sources of benchmark values that were reviewed for use in this risk assessment, and identifies the hierarchy that was used to prioritize values when more than one value was available.

This appendix is organized into the following sections:

Aquatic Receptors (Fish & Benthic Macroinvertebrates)

C-1 Benchmarks for Direct Contact With Surface Water
C-2 Benchmarks for Direct Contact with Sediment
C-3 Benchmarks for Direct Contact with Sediment Porewater
C-4 Benchmarks for Fish Tissue Burdens

Terrestrial Receptors (Plants & Soil Organisms)

C-5 Benchmarks for Direct Contact with Surface Soils

Wildlife Receptors

C-6 Concentration-Based Benchmarks for Ingestion of Surface Water & Food
C-7 Dose-Based Ingestion Toxicity Reference Values

Aquatic Receptors (Fish & Benthic Macroinvertebrates)

C-1 Benchmarks for Direct Contact With Surface Water

Toxicity values for the protection aquatic life from contaminants in surface water are available from several sources. Each of these sources is described briefly below.

National Ambient Water Quality Criteria

The USEPA has established acute and chronic National Ambient Water Quality Criteria (NAWQC) values for surface waters for the protection of aquatic communities (USEPA 1999a, 2001). The acute NAWQC is intended to protect against short-term (48 to 96 hour) lethality, while the chronic NAWQC is intended to protect against long-term effects on growth, reproduction, and survival. The NAWQC values are not species-specific, but are designed to protect 95% of the aquatic species for which toxicity data are available (USEPA 1985).

Great Lake Water Quality Initiative Tier II Values

The approach used for the derivation of Great Lake Water Quality Initiative (GLWQI) Tier II secondary acute values (SAVs) and secondary chronic values (SCVs) is similar to that used to derive NAWQC. Data and detailed methods and are described in Suter and Tsao (1996). In brief, a secondary acute value is derived by taking the lowest genus mean acute value (GMAV) and dividing it by the Final Acute Value Factor (FAVF). The FAVF is based on the number of studies and types of species used to derive the FAV. Once an SAV is calculated, the geometric mean of each of the secondary acute-chronic ratios (SACR) is found. The SCV is calculated by dividing the SAV by the SACR.

USEPA Region 4 Screening Values

Screening level freshwater benchmarks for are also available from USEPA Region 4 (USEPA, 2002). The Region 4 acute and chronic screening values are equal to the lowest effect level (LEL) divided by 10 to protect for sensitive species. If no chronic LEL is available, the chronic screening value is equal to the lowest acute LC50 or EC50 divided by 10.

Canadian Water Quality Guidelines

The Canadian Council of Ministers of the Environment (CCME) have established water quality guidelines (WQG) for the protection of aquatic life in Canadian waters (CCME, 1991, 2001). The protocol for deriving water quality guidelines is similar to the NAWQC procedure. Protocol details are available on the CCME WQG website. In brief, the guideline is equal to the most sensitive LOEL from a chronic exposure study divided by a safety factor of 10. If a chronic LOEL is not available, the WQG is equal to the acute LC50 divided by the acute/chronic ratio (ACR). The CCME WQG is designed to be protective of "100% of the aquatic life species, 100% of the time".

Oak Ridge National Laboratory Lowest Chronic Values and EC20 Values

Oak Ridge National Laboratory (ORNL) has compiled summary tables of the lowest chronic values (LCVs) in surface water for fish, daphnids, non-daphnid invertebrates, aquatic plants, and aquatic populations (Suter and Tsao, 1996). In some instances, the LCVs were extrapolated from LC50 and EC50 data using fish and daphnid-specific equations. ORNL also summarized EC20 data for fish, daphnids, sensitive species, and aquatic populations. The EC20s are based on a level of biological effect and are intended to be indices of population production (Suter and Tsao, 1996).

USEPA Region 5 Ecological Screening Levels

The USEPA Region 5 has derived ecological screening levels (ESLs) for RCRA Appendix IX Hazardous Constituents in soil, surface water, sediment, and air (USEPA 1999b). The surface water ESL is based on either an aquatic benchmark, which is protective of direct contact exposures, or a wildlife receptor-specific benchmark, which is protective of ingestion exposures in the mink and belted kingfisher. The surface water ESL does not distinguish whether it is derived based on aquatic or wildlife exposure.

OSWER Ecotox Thresholds

The OSWER Ecotox Thresholds (ETs) were presented in a USEPA ECO Update Bulletin (USEPA, 1996). The bulletin provided an overview of the development and use of ecological benchmarks for surface water and sediment. For surface water, the ET is based on either the chronic NAWQC or the GLWQI Tier II value.

Because the USEPA Region 5 ESLs do not make a distinction between surface water benchmarks derived from aquatic data and wildlife data, these values were excluded from consideration as a benchmark source. The OSWER ETs were also excluded because they are based on primary sources (NAWQC, GLWQI Tier II) that had been previously reviewed. For the remaining sources, selection of the surface water toxicity benchmarks for aquatic receptors was based on the following hierarchy:

- National Ambient Water Quality Criteria
- Great Lake Water Quality Initiative Tier II Values
- USEPA Region 4 Screening Values
- Canadian Water Quality Guidelines
- Oak Ridge National Laboratory LCVs and EC20s

The surface water benchmark values from these sources are shown in Table C-1a, along with the values selected for use in the risk assessment. For many metals and metalloids, the NAWQC values are dependent on the hardness of the water, so the precise value of the acute and chronic NAWQC that applies to a sample depends on the hardness of that sample. The equations and parameters used to calculate the acute and chronic NAWQC values for these metals are presented in Table C-1b. For COPC screening, a water hardness of 200 mg/L (about the average for the site) was assumed. For risk calculations, site-specific water hardness values were used (when available). In some cases, site-specific samples may have hardness values that are outside the range of hardness values used to develop the equations. Because extrapolation of the equations outside this hardness range is uncertain, lower and upper bounds (equal to the lower and upper bounds of the data set used to derive the equation) were applied whenever site hardness values were outside the range.

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C-2 Benchmarks for Direct Contact with Sediment

Toxicity values for the protection benthic macroinvertebrates from contaminants in freshwater sediment are available from several sources. Each of these sources is described briefly below.

Consensus-Based Sediment Quality Guidelines

MacDonald et al. (2000) issued consensus-based sediment quality guidelines (SQGs) for 28 chemicals of concern, in an effort to focus on agreement among the various sediment quality guidelines. For each chemical of concern, a threshold effect concentration (TEC) and a probable effect concentration (PEC) were identified based on available sediment toxicity literature. The consensus-based TECs were calculated by determining the geometric mean of all threshold effect values from the literature. The consensus-based PECs were calculated by determining the geometric mean of all probable effect values from the literature. A summary of the types of sediment effect concentrations included in the TEC and PEC calculations is provided in MacDonald et al. (2000).

The predictive reliability of these values were also evaluated. The predictive ability analyses were focused on the ability of each SQG when applied alone to classify samples as either toxic or non-toxic. Sediment toxicity should be observed only rarely below the TEC and should be frequently observed above the PEC. Individual TECs were considered reliable if more than 75% of the sediment samples were correctly predicted to be non-toxic. Similarly, the individual PEC was considered reliable if greater than 75% of the sediment samples were correctly predicted to be toxic. The SQGs were considered to be reliable only if a minimum of 20 samples were included in the predictive ability evaluation (MacDonald et al. 2000).

Because field collected sediments contain a mixture of chemicals, a second analysis was completed to investigate whether the toxicity of a sediment could be predicted based on the average of the PEC ratios for the sediment, using only the PEC values that were found to be reliable. It was found that 92% of sediment samples with a mean PEC quotient > 1.0 were toxic to one or more species of aquatic organisms. The mean PEC quotient was found to be highly correlated with incidence of toxicity ($R^2 = 0.98$) (MacDonald et al. 2000).

ARCS Sediment Effect Concentrations

As part of the Assessment and Remediation of Contaminated Sediment (ARCS) Project, Ingersoll et al. (1996) compiled freshwater sediment toxicity data from nine different sites in the United States and identified a series of sediment effect concentrations (SECs) for a series of metals in sediment. The SECs are defined as the concentrations of individual contaminants in sediment below which toxicity is rarely observed and above which toxicity is frequently observed. The database was compiled to classify toxicity data for Great Lakes sediment samples and is segregated into “effect” data and “no effect" data. Ingersoll et al.(1996) derived five different SECs; effect range low (ERL), effect range median (ERM), threshold effect level (TEL), probable effect level (PEL) and no effect concentration (NEC). The derivation of each of these SECs is presented below:

- effect range low (ERL) = 10^{th} percentile of adverse effect data
- effect range median (ERM) = 50^{th} percentile (median) of adverse effect data
- no effect range median (NERM) = 50^{th} percentile (median) of no effect data
- no effect range high (NERH) = 85^{th} percentile of no effect data
- threshold effect level (TEL) = geometric mean of ERL and NERM
- probable effect level (PEL) = geometric mean of ERM and NERH
- no effect concentration (NEC) = maximum of no effect data

The ERL is defined as the concentration below which adverse effects are unlikely to occur. The ERM is defined as the concentration of a chemical above which effects are frequently or always observed or predicted among most species. The NEC is the maximum concentration of a chemical in sediment that does not significantly adversely affect the particular response when compared to the control.

Equilibrium-Partitioning Guidelines for PAHs

The equilibrium-partitioning sediment guidelines (EqPs or ESGs) for PAHs are based on the predicted partitioning of PAHs between sediment and pore water, taking the total organic carbon (TOC) of the sediment into account (USEPA 2000). These ESGs are intended to be protective of benthic organisms from sediment pore water concentrations associated with chronic toxicity to aquatic organisms. ESGs are available for ten specific PAHs. ESGs do not consider toxicity associated with photoactivation of PAHs.

USEPA Region 5 Ecological Screening Levels

The USEPA Region 5 Ecological Screening Levels (ESLs) for sediment were developed based on available federal freshwater sediment criteria and state-promulgated sediment quality guidelines (USEPA 1999). If no freshwater guidelines were available, marine criteria were used. For those chemicals for which no guidelines were available, an interim ESL was developed using the equilibrium partitioning approach. These interim guidelines were developed for both nonpolar and polar organic constituents. The equilibrium partitioning method is generally only applied to nonpolar organics, however, it was assumed to be a satisfactory method for organics for use on a screening level approach (USEPA 1999). The ESL was derived from the lowest federal, state or interim water quality guideline and assumes a total organic carbon content of 1%.

NOAA Sediment Effect Concentrations

The National Oceanic and Atmospheric Administration (NOAA) compiled sediment data from studies performed in both freshwater and saltwater (originally presented in NOS OMA Technical Memo 52, Long and Morgan 1990).The NOAA ERL and ERM were developed using the same procedures as outlined for the ARCS Project (Ingersoll et al. 1996). The NOAA ERL is defined as the concentration of a chemical in sediment below which adverse effects are rarely observed or predicted among sensitive species. The NOAA ERM is representative of concentrations above which effects frequently occur. The original data set used by Long and Morgan (1990) has since been supplemented with additional saltwater data, therefore these additional marine reports are not applicable (ie: Long et al. 1995).

USEPA Region 4 Screening Levels

The USEPA Region 4 Screening Levels are derived from three different sediment effects data sets including NOAA freshwater and marine data from Long and Morgan (1990), additional NOAA marine data from Long et al. (1995), and Florida State Department of Environmental Protection marine data from MacDonald et al. (1996). The sediment effect level is based on the reported ERL from each study. In instances when the USEPA Contract Laboratory Program (CLP) practical quantitation limit (PQL) is above the effect level, the screening value is equal to the CLP PQL (USEPA 2002).

CCME Sediment Quality Guidelines

The Canadian Council of Ministers of the Environment (CCME) derived sediment quality guidelines to support protection and management strategies for freshwater, estuarine, and marine ecosystems (CCME 1995). Guideline derivation protocols are detailed in CCME (1995) and are similar to the procedures described previously for the ARCS Project (Ingersoll et al. 1996). Separate guidelines were derived for freshwater and marine sediments (CCME 2001). The freshwater interim sediment quality guideline (ISQG) was equal to the TEL and is representative of the concentration below which adverse effects are not anticipated for aquatic life associated with bed sediments (CCME 1995). A PEL was also calculated to establish concentrations above which adverse effects are likely to occur.

Ontario Sediment Effect Levels

Persaud et al. (1993) derived sediment effect levels for the protection of aquatic organisms in Ontario, Canada. Three types of sediment quality guidelines were developed; a No Effect Level (no toxic effects), a Low Effect Level (tolerable by benthic species), and a Severe Effect Level (detrimental to most benthic species). A summary and review of the available approaches to sediment guideline development and the protocol for the derivation of the Ontario values is described in detail in Persaud et al. (1993). Briefly, the No Effect Level is obtained through a chemical equilibrium approach using water quality standards. Because the equilibrium partitioning approach is only predictive for nonpolar organics, a No Effect Level is not derived for metals and polar organics. The Low Effect Level and Severe Effect Level are based on the 5th and 95th percentiles of all effects data for bulk sediment analysis, respectively. For non-polar organics these concentrations were normalized for total organic carbon.

Oak Ridge National Laboratory Equilibrium Partitioning Guidelines

Oak Ridge National Laboratory (ORNL) has compiled summary tables of the lowest chronic values (LCVs) in surface water for fish, daphnids, and non-daphnid invertebrates for nonionic organics (see Section C-1). Using on these values, sediment equilibrium partitioning (EqP) guidelines were calculated based on the chemical K_{oc} and normalizing to 1% total organic carbon (Jones et al. 1997). Secondary chronic values (SCVs), intended to be conservative predictors of effects, were also calculated using the same EqP approach.

USEPA Region 6 Sediment Guidelines

The USEPA Region 6 sediment guidelines were compiled from many of the common sediment toxicity data sources described above. Benchmarks are provided in the ecological risk assessment guidance prepared by the Texas Resource Conservation Commission (TNRCC, 2001).

Syracuse Research Corporation Equilibrium Partitioning Values

Syracuse Research Corporation (SRC) derived sediment benchmarks using the equilibrium partitioning approach for analytes detected in sediment where other "preferred" benchmarks were unavailable from common and generally accepted sources. In accord with USEPA guidance (USEPA, 1993), benchmarks were only derived for nonionic organics. That is, organics that would carry a charge (either positive or negative) within the pH range of about 5-9 were not evaluated with this approach. Sediment benchmarks were calculated based on the following equation:

$$\text{Benchmark}_{sed} = \text{Benchmark}_{water} * \text{Koc} * \text{foc}$$

The water benchmark used to derive the sediment benchmark is the chronic surface water benchmark as presented in Table C-1a. The Koc is the partitioning coefficient of a chemical between water and organic carbon, and is used to describe the distribution of a chemical between the organic fraction of sediment and the interstitial water. The units of Koc are mg of chemical per kg organic carbon per mg/L in water. Values for Koc were obtained from the Environmental Fate Database CHEMFATE (SRC, 2002). The foc is the fraction organic carbon in the sediment (kg of organic carbon per kg bulk sediment). The value of foc used to calculate screening level sediment benchmarks was 0.003 (0.3%), which is the 5th percentile of site total organic carbon measurements. The screening sediment benchmarks as estimated from the EqP approach are presented in Table C-2a.

Of these sources, the following were excluded from use in this risk assessment due to inadequate documentation of derivation methodology, use of site-specific assumptions, use of marine or estuarine sediments, or use of inappropriate receptors:

- USEPA Region 4 Screening Levels
- USEPA Region 5 Ecological Screening Levels
- CCME Sediment Quality Guidelines (ISQG/PEL)
- Ontario Sediment Effect Levels (Low/Severe)
- ORNL EqP Guidelines

Of the remaining sources, a benchmark selection hierarchy was established for each chemical class of compounds analyzed in sediment. The selection hierarchy is shown in Figure C-1 and a summary of all selected sediment toxicity benchmarks is shown in Table C-2b. For those chemicals in which the benchmarks are reported in the original source as normalized for total organic carbon, a TOC of 0.003 (0.3%; the 5th percentile of site total organic carbon measurements) was used to select chemicals of potential concern in sediment. For the purposes of estimating risks, these benchmarks were adjusted using the sample-specific total organic carbon.

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US Environmental Protection Agency (USEPA). 2002. Region 4 Ecological Risk Assessment Bulletins - Supplement to RAGS. Downloaded on July 15, 2002 from website: http://www.epa.gov/region04/waste/ots/ecolbul.htm

C-3 Benchmarks for Direct Contact with PAHs in Sediment Porewater

For polycyclic aromatic hydrocarbon (PAH) compounds, the USEPA has derived PAH-specific final chronic values (FCVs) for sediment porewater. These values are intended to protect against the narcotic effects that PAHs cause in benthic organisms. Because the narcotic effect level for different PAHs is strongly correlated with K_{ow}, the PAH-specific FCV is calculated from the K_{ow} for that PAH value using the following equation:

$$\log_{10} (\text{PAH-specific FCV umol/L}) = -0.945 \cdot \log_{10}(K_{ow}) + \log_{10}(2.24)$$

The porewater benchmark values for PAHs in sediment porewater calculated using this equation are shown in Table C-3.

References:

US Environmental Protection Agency (USEPA). 2000. Equilibrium Partitioning Sediment Guidelines (ESGs) for the Protection of Benthic Organisms: PAH Mixtures. Final Draft. USEPA, Office of Science and Technology and Office of Research and Development. April 5, 2000.

C-4 Benchmarks for Fish Tissue Burdens

Jarvinen and Ankley (1999) have compiled a comprehensive database of tissue residue data for aquatic organisms exposed to inorganic and organic chemicals. For this risk assessment, attention was focused on benchmarks that were based on survival, growth and reproduction of aquatic receptors. Tissue burden benchmarks were selected for fish carcass, fillet, liver and whole body for all detected chemicals based on the lowest reported concentration that did not cause an effect in freshwater fish species. In cases where an MATC was available only for whole body, a tissue-specific MATC was derived by assuming that the concentration in the tissue was proportional to the lipid content of the tissue:

$$MATC_{tissue} = MATC_{whole\ body} * (Lipid\ Content_{tissue} / Lipid\ Content_{whole\ body})$$

The tissue burden benchmark values for all chemicals detected in fish tissue are shown in Table C-4.

References:

Jarvinen, AW and GT Ankley. 1999. Linkage of Effects to Tissue Residues: Development of a Comprehensive Database for Aquatic Organisms Exposed to Inorganic and Organic Chemicals. Society of Environmental Toxicology and Chemistry (SETAC) Publication.

Terrestrial Receptors (Plants & Soil Invertebrates)

C-5 Benchmarks for Direct Contact with Surface Soils

Toxicity values for the protection aquatic life from contaminants in surficial soils are available from several sources. Each of these sources is described briefly below.

Oak Ridge National Laboratory Plants/Soil Organisms/Microbes

Oak Ridge National Laboratory (ORNL) reviewed data on the toxicity of chemicals in soil on a wide range of plants, soil organisms, and microbes, and determined the lowest observed effect concentration (LOEC) (Efroymson et al. 1997a,b) . The LOEC was defined as the lowest applied concentration of the chemical causing a greater than 20% reduction in the measured response. In some cases, the LOEC was the lowest concentration tested or the only concentration reported (EC50 or ED50 data). The LOECs for a series of different plants and soil organisms were rank ordered and a value selected that approximated the 10th percentile. When a benchmark was based on a lethality endpoint, the benchmark value was divided by 5 to approximate an effects concentration for growth and reproduction. The factor was selected based on the author's judgement (Efroymson et al. 1997a,b). The benchmark values were then rounded to one significant figure.

Dutch Target and Intervention Values

The Dutch Target and Intervention Values were derived from available data on ecotoxicological effects of contaminants in soil to terrestrial species and soil microbial processes (Swartjes 1999). The Target Values for soil are related to negligible risk for soil ecosystems (95% protection). The Intervention Values are defined as the hazardous concentration for 50% of the soil ecosystem population and are not protective of sensitive species. The Dutch benchmarks were developed by reviewing available literature to determine the lowest no observed effect concentration (NOEC). When there was a LOEC but no NOEC, the NOEC was estimated from the LOEC according to the effect level observed at the LOEC, as follows:

LOEC Effect Range	NOEC
10% - 20%	LOEC / 2
20% - 50%	LOEC / 3
50% - 80%	LOEC / 10

The ecotoxicological data were selected according to the criteria established in Crommenentujin et al. (1994) and were normalized for soil characteristics such as organic matter and clay content. If not enough data were available for terrestrial species and microbial processes, aquatic data (adjusted by an uncertainty factor of 10) were used to derive the benchmark values (Swartjes 1999).

CCME Soil Quality Guidelines

The Canadian Council of Ministers of the Environment (CCME) established effects-based environmental soil quality guidelines (SQG_E) designed to be clean-up goals to protect ecological receptors from direct contact and ingestion exposures to soil-based contaminants. From the available soil toxicity literature, CCME compiled an adverse effect data set and a no effect data set. Several SQG_Es were calculated based on land use types (agricultural-A, residential/parkland-R/P, commercial/industrial-C/I). Based on the amount of toxicity data available, different derivation methods are used to calculate the land use SQG_E. Each of these methods are detailed in CCME (1999) and described briefly below.

<u>Weight-of Evidence Method</u>
A, R/P Land Uses = threshold effects concentration (TEC), 25th percentile of effect and no effect data sets divided by an uncertainty factor
C/I Land Use = effects concentration low (ECL), 25th percentile of effect data set

<u>Lowest-Observed-Effect Concentration (LOEC) Method</u>
A, R/P Land Uses = lowest available LOEC divided by an uncertainty factor
C/I Land Use = geometric mean of available LOEC data

<u>Median Effects Method</u>
A, R/P Land Uses = lowest available EC50 or LC50 divided by an uncertainty factor
C/I Land Use = no guideline calculated

In addition to calculating an SQG_E, CCME also derived SQGs for human health (SQG_{HH}). The final soil guideline is the minimum of the SQG_E and the SQG_{HH}.

USEPA Region 4 Ecological Screening Levels

The USEPA Region 4 compiled soil toxicity screening benchmarks from several sources including ORNL (Efroymson et al. 1997a,b), CCME (CCME 1997), and Dutch values (Crommenentujin et al. 1994). From these sources, screening levels were selected based on contaminant levels associated with ecological effects (USEPA 2002). These screening values do not take into account area or regional background levels.

USEPA Region 5 Ecological Screening Levels

The USEPA Region 5 reviewed and evaluated soil quality criteria from international, federal, and state sources (USEPA 1999). A default soil ecological screening level (ESL) was selected based on the lowest receptor-specific ESL for terrestrial (plant/soil organisms) and wildlife receptors found during a review of existing toxicological information. The ESL was derived from the concentration which resulted in no observed adverse effects (NOAEL) for chronic exposure of the target species. When a chronic value was not available, the most relevant toxicological result was adjusted by division with uncertainty factors as appropriate to approximate the chronic NOAEL for the selected receptor (USEPA 1999).

Because the CCME final SQGs do not make a distinction between ecological and human health benchmarks, they were not included as a benchmark source. Because the USEPA Region 5 ESLs do not make a distinction between soil benchmarks derived from plant/soil organism data and wildlife data, these values were excluded from consideration as a benchmark source. The Region 4 benchmarks were also excluded because they are based on primary sources that had been previously reviewed. For the remaining sources, selection of the surficial soil toxicity benchmarks for terrestrial receptors was based on the following hierarchy:

- Minimum of the ORNL plant, soil organism, microbe benchmarks
- Dutch Target

The soil benchmark values for all chemicals analyzed in surface soils are shown in Table C-5.

References:

Canadian Council of Ministers of the Environment (CCME). 1997. Recommended Canadian Soil Quality Guidelines. CCME, Winnipeg.

Canadian Council of Ministers of the Environment (CCME). 1999. Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health: Summary of the Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines. In: Canadian Environmental Quality Guidelines, Chapter 7, CCME, 1999, Winnipeg.

Crommentuijin, GH, EJ Van der Plassche and JH Canton. 1994. Guidance Document on the Derivation of Ecotoxicological Criteria for Serious Soil Contamination in View of the Intervention Value for Soil Clean-up. RIVM report 950011003. RIVM, Bilthoven, The Netherlands.

Efroymson, R.A., M.E. Will, G.W. Suter II, and A.C. Wooten. 1997a. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision. Prepared for the U.S. Department of Energy, Office of Environmental Management by Lockheed Martin Energy Systems, Inc. managing the Oak Ridge National Laboratory (ORNL). ORNL publication. ES/ER/TM-85/R3, November 1997.

Efroymson, R.A., M.E. Will and G.W. Suter II. 1997b. Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision. Prepared for the U.S. Department of Energy, Office of Environmental

Management by Lockheed Martin Energy Systems, Inc. managing the Oak Ridge National Laboratory (ORNL). ORNL publication. ES/ER/TM-126/R2, November 1997.

Swartjes, FA. 1999. Risk-Based Assessment of Soil and Groundwater Quality in the Netherlands: Standards and Remediation Urgency. Risk Analysis 19(6):1235-1249.

US Environmental Protection Agency (USEPA). 1999b. Region 5 Ecological Screening Levels for RCRA Appendix IX Hazardous Constituents. Working Draft 1999. United States Environmental Protection Agency, Region 5.

US Environmental Protection Agency (USEPA). 2002. Region 4 Ecological Risk Assessment Bulletins - Supplement to RAGS. Soil Screening Values. From: Friday, GP. 1998. Ecological Screening Values for Surface Water, Sediment, and Soil. Westinghouse Savannah River Company, Savannah River Technology Center. Report ID WSRC-TR-98-00110. Downloaded on July 15, 2002 from website: http://www.epa.gov/region04/waste/ots/ecolbul.htm

Wildlife Receptors

Sample et al. (1996) summarized available literature on the toxicity of chemicals in wildlife receptors. From these studies, Sample et al (1996) developed toxicity reference values (TRVs) for mammals and birds based on the No Observed Adverse Effect Level (NOAEL) and the Lowest Observed Adverse Effect Level (LOAEL) TRV.

C-6 Concentration-Based Benchmarks for Ingestion of Surface Water & Food

After a NOAEL and LOAEL dose were identified, Sample et al. (1996) back-calculated concentration-based surface water and dietary TRVs for several different avian and mammalian receptors using default body weight and intake rates. The lowest NOAEL concentration-based TRVs for the receptors of concern at this site for all chemicals analyzed in environmental and biological media are shown in Table C-6. These concentration-based TRVs were used to select chemicals of potential concern (COPCs) in surface water, sediment, soil and food items for wildlife. Because specific TRVs are not available for sediment and soil ingestion pathways, food TRVs were used to evaluate these ingestion exposures.

C-7 Dose-Based Ingestion Toxicity Reference Values

For the purposes of calculating hazard quotients (HQs) for quantitative wildlife COPCs, the avian and mammalian NOAEL and LOAEL dose-based TRVs selected by Sample et al. (1996) were used. All available dose-based studies for avian and mammalian receptors presented in Sample et al. (1996) for the quantitative wildlife COPCs at this site are presented in Table C-7a and C-7b, respectively.

When no reliable toxicity data could be located for a site surrogate receptor, it was necessary to extrapolate toxicity data from studies using another type of receptor. Toxicity data were not extrapolated across receptor classes (ie: mammalian data were not extrapolated to avian receptors). Table C-7c presents the dose-based TRVs used in this assessment to evaluate risks to wildlife receptors from ingestion of contaminants in surface water, soil, sediment and food items.

References:

Sample, BE, DM Opresko, GW Suter II. 1996. Toxicological Benchmarks for Wildlife: 1996 Revision. Oak Ridge National Laboratory. Document Number ES/ER/TM-86/R3. June 1996.

Table C-1a
Surface Water Toxicity Benchmarks for Aquatic Receptors

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Analyte Type	Analyte	ACUTE				CHRONIC				
		NAWQC - Acute (mg/L) [1]	GLWQI Tier II SAV (mg/L) [2]	USEPA R4 - Acute (mg/L) [2]	**Surface Water Acute Benchmark (mg/L)**	NAWQC - Chronic (mg/L) [1]	GLWQI Tier II SCV (mg/L) [2]	USEPA R4 - Chronic (mg/L) [2]	Other (mg/L) [2]	**Surface Water Chronic Benchmark (mg/L)**
Inorganics	Aluminum	0.75	--	0.75	7.5E-01	0.087	--	0.087	--	8.7E-02
	Antimony	--	0.18	1.3	1.8E-01	--	0.03	0.16	--	3.0E-02
	Arsenic	0.34	--	0.36	3.4E-01	0.15	--	0.19	--	1.5E-01
	Barium	--	0.11	--	1.1E-01	--	0.004	--	--	4.0E-03
	Beryllium	--	0.035	0.016	3.5E-02	--	0.00066	0.00053	--	6.6E-04
	Cadmium	0.0043 [4]	--	0.00392	4.3E-03	0.0005 [4]	--	0.00113	--	4.5E-04
	Calcium	--	--	--	no benchmark	--	--	--	116	1.2E+02
	Chromium III	3.181 [4]	--	1.74	3.2E+00	0.152 [4]	--	0.207	--	1.5E-01
	Cobalt	--	1.5	--	1.5E+00	--	0.023	--	--	2.3E-02
	Copper	0.027 [4]	--	0.0177	2.7E-02	0.017 [4]	--	0.0118	--	1.7E-02
	Iron	--	--	--	no benchmark	1	--	1	--	1.0E+00
	Lead	0.197 [4]	--	0.0816	2.0E-01	0.0077 [4]	--	0.00318	--	7.7E-03
	Magnesium	--	--	--	no benchmark	--	--	--	82	8.2E+01
	Manganese	--	2.3	--	2.3E+00	--	0.12	--	--	1.2E-01
	Mercury	0.0014	--	0.0024	1.4E-03	--	0.0013	0.000012	--	1.3E-03
	Nickel	0.843 [4]	--	1.42	8.4E-01	0.094 [4]	--	0.158	--	9.4E-02
	Potassium	--	--	--	no benchmark	--	--	--	53	5.3E+01
	Selenium	--	--	0.02	2.0E-02	0.005	--	0.005	--	5.0E-03
	Silver	0.013 [4]	--	0.00406	1.3E-02	0.0013 [3,4]	0.00036	0.000012	--	1.3E-03
	Sodium	--	--	--	no benchmark	--	--	--	680	6.8E+02
	Thallium	--	0.11	0.14	1.1E-01	--	0.012	0.004	--	1.2E-02
	Vanadium	--	0.28	--	2.8E-01	--	0.02	--	--	2.0E-02
	Zinc	0.216 [4]	--	0.117	2.2E-01	0.216 [4]	--	0.106	--	2.2E-01
Pesticides	4,4-DDD	--	0.00019	0.000064	1.9E-04	--	0.000011	0.0000064	--	1.1E-05
	4,4-DDE	--	--	0.105	1.1E-01	--	--	0.0105	--	1.1E-02
	4,4-DDT	0.0011	--	0.0011	1.1E-03	--	0.000013	0.000001	--	1.3E-05
	Aldrin	0.003	--	0.003	3.0E-03	0.0003 [3]	--	0.0003	--	3.0E-04
	BHC, alpha	--	--	--	no benchmark	--	--	0.5	--	5.0E-01
	BHC, beta	--	--	--	no benchmark	--	--	5	--	5.0E+00
	BHC, delta	--	--	--	no benchmark	--	--	--	--	no benchmark
	BHC, gamma (Lindane)	0.00095	--	0.002	9.5E-04	0.000095 [3]	--	0.00008	--	9.5E-05
	Chlordane	0.0024	--	0.0024	2.4E-03	0.0000043	--	0.0000043	--	4.3E-06
	Dieldrin	0.00024	--	0.0025	2.4E-04	0.000056	--	0.0000019	--	5.6E-05
	Endosulfan I	0.00022	--	--	2.2E-04	0.000056	--	--	--	5.6E-05
	Endosulfan II	0.00022	--	--	2.2E-04	0.000056	--	--	--	5.6E-05
	Endosulfan sulfate	--	--	--	no benchmark	--	--	--	--	no benchmark
	Endrin	0.000086	--	0.00018	8.6E-05	0.000036	--	0.0000023	--	3.6E-05
	Endrin aldehyde	--	--	--	no benchmark	--	--	--	--	no benchmark
	Heptachlor	0.00052	0.000125	0.00052	5.2E-04	0.0000038	0.0000069	0.0000038	--	3.8E-06
	Heptachlor epoxide	0.00052	--	--	5.2E-04	0.0000038	--	--	--	3.8E-06
	Isodrin	--	--	--	no benchmark	--	--	--	--	no benchmark
	Kepone	--	--	--	no benchmark	--	--	--	--	no benchmark
	Methoxychlor	--	--	--	no benchmark	0.00003	0.000019	0.00003	--	3.0E-05
	Toxaphene	0.00073	--	0.00073	7.3E-04	0.0000002	--	0.0000002	--	2.0E-07
Polycyclic Aromatic Hydrocarbons (PAHs)	2-Chloronaphthalene	--	--	--	no benchmark	--	--	--	--	no benchmark
	2-Methylnaphthalene	--	--	--	no benchmark	--	--	--	--	no benchmark
	Acenaphthene	--	--	0.17	1.7E-01	--	--	0.017	--	1.7E-02
	Acenaphthylene	--	--	--	no benchmark	--	--	--	--	no benchmark
	Aniline	--	--	--	no benchmark	--	--	--	0.0022	2.2E-03
	Anthracene	--	0.013	--	1.3E-02	--	0.00073	--	--	7.3E-04
	Benz[a]anthracene	--	0.00049	--	4.9E-04	--	0.000027	--	--	2.7E-05
	Benzo(ghi)perylene	--	--	--	no benchmark	--	--	--	--	no benchmark
	Benzo[a]pyrene	--	0.00024	--	2.4E-04	--	0.000014	--	--	1.4E-05
	Benzo[b]fluoranthene	--	--	--	no benchmark	--	--	--	--	no benchmark
	Benzo[k]fluoranthene	--	--	--	no benchmark	--	--	--	--	no benchmark
	Chrysene	--	--	--	no benchmark	--	--	--	--	no benchmark
	Dibenz[ah]anthracene	--	--	--	no benchmark	--	--	--	--	no benchmark
	Dibenzofuran	--	0.066	--	6.6E-02	--	0.0037	--	--	3.7E-03
	Fluoranthene	--	--	0.398	4.0E-01	--	--	0.0398	--	4.0E-02
	Fluorene	--	0.07	--	7.0E-02	--	0.0039	--	--	3.9E-03
	Indeno[1,2,3-cd]pyrene	--	--	--	no benchmark	--	--	--	--	no benchmark
	Naphthalene	--	0.19	0.23	1.9E-01	--	0.012	0.062	--	1.2E-02
	Phenanthrene	--	--	--	no benchmark	--	--	--	--	no benchmark
	Pyrene	--	--	--	no benchmark	--	--	--	0.000025	2.5E-05

Table C-1a
Surface Water Toxicity Benchmarks for Aquatic Receptors

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Analyte Type	Analyte	ACUTE				CHRONIC				
		NAWQC - Acute (mg/L) [1]	GLWQI Tier II SAV (mg/L) [2]	USEPA R4 - Acute (mg/L) [2]	**Surface Water Acute Benchmark (mg/L)**	NAWQC - Chronic (mg/L) [1]	GLWQI Tier II SCV (mg/L) [2]	USEPA R4 - Chronic (mg/L) [2]	Other (mg/L)[2]	**Surface Water Chronic Benchmark (mg/L)**
Polychlorinated Biphenyls (PCBs)	PCB-1016	--	--	0.0002	2.0E-04	--	--	0.000014	--	1.4E-05
	PCB-1221	--	0.005	0.0002	5.0E-03	--	0.00028	0.000014	--	2.8E-04
	PCB-1232	--	0.01	0.0002	1.0E-02	--	0.00058	0.000014	--	5.8E-04
	PCB-1242	--	0.0012	0.0002	1.2E-03	--	0.000053	0.000014	--	5.3E-05
	PCB-1248	--	0.0014	0.0002	1.4E-03	--	0.000081	0.000014	--	8.1E-05
	PCB-1254	--	0.0006	0.0002	6.0E-04	--	0.000033	0.000014	--	3.3E-05
	PCB-1260	--	1.7	0.0002	1.7E+00	--	0.094	0.000014	--	9.4E-02
Petroleum Hydro-carbons	Diesel fuel	--	--	--	no benchmark	--	--	--	--	no benchmark
	Total Petroleum Hydrocarbons (TPH)	--	--	--	no benchmark	--	--	--	--	no benchmark
Semi-Volatile Organic Compound (SVOCs)	1,2,4-Trichlorobenzene	--	0.7	0.15	7.0E-01	--	0.11	0.0449	--	1.1E-01
	1,2-Dichlorobenzene	--	0.26	0.158	2.6E-01	--	0.014	0.0158	--	1.4E-02
	1,3-Dichlorobenzene	--	0.63	0.502	6.3E-01	--	0.071	0.0502	--	7.1E-02
	1,4-Dichlorobenzene	--	0.18	0.112	1.8E-01	--	0.015	0.0112	--	1.5E-02
	1-Methylnaphthalene	--	--	--	no benchmark	--	--	--	--	no benchmark
	2,4,5-Trichlorophenol	--	--	--	no benchmark	--	--	--	--	no benchmark
	2,4,6-Trichlorophenol	--	--	0.032	3.2E-02	--	--	0.0032	--	3.2E-03
	2,4-Dichlorophenol	--	--	0.202	2.0E-01	--	--	0.0365	--	3.7E-02
	2,4-Dimethylphenol	--	--	0.212	2.1E-01	--	--	0.0212	--	2.1E-02
	2,4-Dinitrophenol	--	--	0.062	6.2E-02	--	--	0.0062	--	6.2E-03
	2,4-Dinitrotoluene	--	--	3.1	3.1E+00	--	--	0.31	--	3.1E-01
	2,6-Dinitrotoluene	--	--	--	no benchmark	--	--	--	--	no benchmark
	2-Chlorophenol	--	--	0.438	4.4E-01	--	--	0.0438	--	4.4E-02
	2-Methyl-4,6-dinitrophenol	--	--	0.023	2.3E-02	--	--	0.0023	--	2.3E-03
	2-Methylphenol	--	0.23	--	2.3E-01	--	0.013	--	--	1.3E-02
	2-Nitroaniline	--	--	--	no benchmark	--	--	--	--	no benchmark
	2-Nitrophenol	--	--	--	no benchmark	--	--	3.5	--	3.5E+00
	3,3-Dichlorobenzidine	--	--	--	no benchmark	--	--	--	--	no benchmark
	3-Methyl-4-chlorophenol	--	--	0.003	3.0E-03	--	--	0.0003	--	3.0E-04
	4-Bromophenyl-phenyl ether	--	--	--	no benchmark	--	0.0015	--	--	1.5E-03
	4-Chloroaniline	--	--	--	no benchmark	--	--	--	--	no benchmark
	4-Chlorophenyl phenyl ether	--	--	--	no benchmark	--	--	--	--	no benchmark
	4-Methylphenol	--	--	--	no benchmark	--	--	--	--	no benchmark
	4-Nitrophenol	--	1.2	0.828	1.2E+00	--	0.3	0.0828	--	3.0E-01
	Benzyl alcohol	--	0.15	--	1.5E-01	--	0.0086	--	--	8.6E-03
	Bis(2-chloroethoxy) methane	--	--	--	no benchmark	--	--	--	--	no benchmark
	Bis(2-chloroethyl)ether	--	--	23.8	2.4E+01	--	--	2.38	--	2.4E+00
	Bis(2-ethylhexyl)phthalate (DEHP)	--	0.027	1.11	2.7E-02	--	0.003	0.0003	--	3.0E-03
	Bis-2-chloro-1-methylethyl ether	--	--	--	no benchmark	--	--	--	--	no benchmark
	Butyl benzyl phthalate	--	--	0.33	3.3E-01	--	0.019	0.022	--	1.9E-02
	Carbazole	--	--	--	no benchmark	--	--	--	--	no benchmark
	Dibutyl phthalate	--	0.19	0.094	1.9E-01	--	0.035	0.0094	--	3.5E-02
	Diethyl phthalate	--	1.8	5.21	1.8E+00	--	0.21	0.521	--	2.1E-01
	Dimethyl phthalate	--	--	3.3	3.3E+00	--	--	0.33	--	3.3E-01
	Di-n-octylphthalate	--	--	--	no benchmark	--	--	--	0.1	1.0E-01
	Hexachlorobenzene	--	--	--	no benchmark	--	--	--	--	no benchmark
	Hexachlorobutadiene	--	--	0.009	9.0E-03	--	--	0.00093	--	9.3E-04
	Hexachlorocyclopentadiene	--	--	0.0007	7.0E-04	--	--	0.00007	--	7.0E-05
	Hexachloroethane	--	0.21	0.098	2.1E-01	--	0.012	0.0098	--	1.2E-02
	Isophorone	--	--	11.7	1.2E+01	--	--	1.17	--	1.2E+00
	Nitroaniline [m-]	--	--	--	no benchmark	--	--	--	--	no benchmark
	Nitroaniline [p-]	--	--	--	no benchmark	--	--	--	--	no benchmark
	Nitrobenzene	--	--	2.7	2.7E+00	--	--	0.27	--	2.7E-01
	Nitroso-di-n-propylamine [N-]	--	--	--	no benchmark	--	--	--	--	no benchmark
	Nitrosodiphenylamine [N-]	--	3.8	0.585	3.8E+00	--	0.21	0.0585	--	2.1E-01
	Pentachlorophenol	0.019 [5]	--	0.02	1.9E-02	0.015 [5]	--	0.013	--	1.5E-02
	Phenol	--	--	1.02	1.0E+00	--	--	0.256	--	2.6E-01
	1,1,1,2-Tetrachloroethane	--	--	--	no benchmark	--	--	--	--	no benchmark
	1,1,1-Trichloroethane	--	0.2	5.28	2.0E-01	--	0.011	0.528	--	1.1E-02
	1,1,2,2-Tetrachloroethane	--	2.1	0.932	2.1E+00	--	0.61	0.24	--	6.1E-01
	1,1,2-Trichloroethane	--	5.2	3.6	5.2E+00	--	1.2	0.94	--	1.2E+00
	1,1-Dichloroethane	--	0.83	--	8.3E-01	--	0.047	--	--	4.7E-02
	1,1-Dichloroethene	--	0.45	3.03	4.5E-01	--	0.025	0.303	--	2.5E-02
	1,1-Dichloropropene	--	--	--	no benchmark	--	--	--	--	no benchmark
	1,2,3-Trichlorobenzene	--	--	--	no benchmark	--	--	--	0.008	8.0E-03
	1,2,3-Trichloropropane	--	--	--	no benchmark	--	--	--	--	no benchmark
	1,2,4-Trimethylbenzene	--	--	--	no benchmark	--	--	--	--	no benchmark
	1,2-Dibromo-3-chloropropane	--	--	--	no benchmark	--	--	--	--	no benchmark

Table C-1a
Surface Water Toxicity Benchmarks for Aquatic Receptors

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Analyte Type	Analyte	ACUTE				CHRONIC				
		NAWQC - Acute (mg/L) [1]	GLWQI Tier II SAV (mg/L) [2]	USEPA R4 - Acute (mg/L) [2]	**Surface Water Acute Benchmark (mg/L)**	NAWQC - Chronic (mg/L) [1]	GLWQI Tier II SCV (mg/L) [2]	USEPA R4 - Chronic (mg/L) [2]	Other (mg/L)[2]	**Surface Water Chronic Benchmark (mg/L)**
Volatile Organic Compounds (VOCs)	1,2-Dibromoethane	--	--	--	no benchmark	--	--	--	--	no benchmark
	1,2-Dichloroethane	--	8.8	11.8	8.8E+00	--	0.91	2	--	9.1E-01
	1,2-Dichloroethene	--	1.1	13.5	1.1E+00	--	0.59	1.35	--	5.9E-01
	1,2-Dichloropropane	--	--	5.25	5.3E+00	--	--	0.525	--	5.3E-01
	1,3,5-Trimethylbenzene	--	--	--	no benchmark	--	--	--	--	no benchmark
	1,3-Dichloropropane	--	--	--	no benchmark	--	--	--	--	no benchmark
	1,4-Dioxane	--	--	--	no benchmark	--	--	--	--	no benchmark
	2,2-Dichloropropane	--	--	--	no benchmark	--	--	--	--	no benchmark
	2-Butanone	--	240	--	2.4E+02	--	14	--	--	1.4E+01
	2-Chloroethylvinyl ether	--	--	35.4	3.5E+01	--	--	3.54	--	3.5E+00
	2-Chlorotoluene	--	--	--	no benchmark	--	--	--	--	no benchmark
	2-Hexanone	--	1.8	--	1.8E+00	--	0.099	--	--	9.9E-02
	4-Chlorotoluene	--	--	--	no benchmark	--	--	--	--	no benchmark
	4-Methyl-2-pentanone	--	2.2	--	2.2E+00	--	0.17	--	--	1.7E-01
	Acetone	--	28	--	2.8E+01	--	1.5	--	--	1.5E+00
	Acetonitrile	--	--	--	no benchmark	--	--	--	--	no benchmark
	Acrolein	--	--	0.0068	6.8E-03	--	--	0.0021	--	2.1E-03
	Acrylonitrile	--	--	0.755	7.6E-01	--	--	0.0755	--	7.6E-02
	Allyl chloride	--	--	--	no benchmark	--	--	--	--	no benchmark
	Benzene	--	2.3	0.53	2.3E+00	--	0.13	0.053	--	1.3E-01
	Benzene, Ethylmethyl	--	--	--	no benchmark	--	--	--	--	no benchmark
	Bromobenzene	--	--	--	no benchmark	--	--	--	--	no benchmark
	Bromodichloromethane	--	--	--	no benchmark	--	--	--	--	no benchmark
	Bromoform	--	2.3	2.93	2.3E+00	--	0.32	0.293	--	3.2E-01
	Carbon disulfide	--	0.017	--	1.7E-02	--	0.00092	--	--	9.2E-04
	Carbon tetrachloride	--	0.18	3.52	1.8E-01	--	0.0098	0.352	--	9.8E-03
	Chlorobenzene	--	1.1	1.95	1.1E+00	--	0.064	0.195	--	6.4E-02
	Chloroethane	--	--	--	no benchmark	--	--	--	--	no benchmark
	Chloroform	--	0.49	2.89	4.9E-01	--	0.028	0.289	--	2.8E-02
	Chloroprene	--	--	--	no benchmark	--	--	--	--	no benchmark
	cis-1,2-Dichloroethene	--	--	--	no benchmark	--	--	--	--	no benchmark
	cis-1,3-Dichloropropene	--	--	--	no benchmark	--	--	--	--	no benchmark
	Dibromochloromethane	--	--	--	no benchmark	--	--	--	--	no benchmark
	Dichlorodifluoromethane	--	--	--	no benchmark	--	--	--	--	no benchmark
	Ethyl methacrylate	--	--	--	no benchmark	--	--	--	--	no benchmark
	Ethylbenzene	--	0.13	4.53	1.3E-01	--	0.0073	0.453	--	7.3E-03
	Hexane	--	0.01	--	1.0E-02	--	0.00058	--	--	5.8E-04
	Isobutanol	--	--	--	no benchmark	--	--	--	--	no benchmark
	Methacrylonitrile	--	--	--	no benchmark	--	--	--	--	no benchmark
	Methyl bromide	--	--	1.1	1.1E+00	--	--	0.11	--	1.1E-01
	Methyl chloride	--	--	55	5.5E+01	--	--	5.5	--	5.5E+00
	Methyl iodide	--	--	--	no benchmark	--	--	--	--	no benchmark
	Methyl methacrylate	--	--	--	no benchmark	--	--	--	--	no benchmark
	Methylene bromide	--	--	--	no benchmark	--	--	--	--	no benchmark
	Methylene chloride	--	26	19.3	2.6E+01	--	2.2	1.93	--	2.2E+00
	MTBE	--	--	--	no benchmark	--	--	--	--	no benchmark
	n-Butylbenzene	--	--	--	no benchmark	--	--	--	--	no benchmark
	n-Propylbenzene	--	--	--	no benchmark	--	--	--	--	no benchmark
	sec-Butylbenzene	--	--	--	no benchmark	--	--	--	--	no benchmark
	Styrene	--	--	--	no benchmark	--	--	--	0.072	7.2E-02
	tert-Butylbenzene	--	--	--	no benchmark	--	--	--	--	no benchmark
	Tetrachloroethylene (PCE)	--	0.83	0.528	8.3E-01	--	0.098	0.084	--	9.8E-02
	Toluene	--	0.12	1.75	1.2E-01	--	0.0098	0.175	--	9.8E-03
	trans-1,2-Dichloroethene	--	--	--	no benchmark	--	--	--	--	no benchmark
	trans-1,3-Dichloropropene	--	--	--	no benchmark	--	--	--	--	no benchmark
	trans-1,4-Dichloro-2-butene	--	--	--	no benchmark	--	--	--	--	no benchmark
	Trichloroethylene (TCE)	--	0.44	--	4.4E-01	--	0.047	--	--	4.7E-02
	Trichlorofluoromethane	--	--	--	no benchmark	--	--	--	--	no benchmark
	Vinyl acetate	--	0.28	--	2.8E-01	--	0.016	--	--	1.6E-02
	Vinyl chloride	--	--	--	no benchmark	--	--	--	--	no benchmark
	Xylene [o]	--	0.23	--	2.3E-01	--	0.013	--	--	1.3E-02
	Xylene [p,m]	--	0.032	--	3.2E-02	--	0.0018	--	--	1.8E-03
	Xylene, Total	--	0.23	--	2.3E-01	--	0.013	--	--	1.3E-02

Table C-1a
Surface Water Toxicity Benchmarks for Aquatic Receptors

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Analyte Type	Analyte	ACUTE				CHRONIC				
		NAWQC - Acute (mg/L) [1]	GLWQI Tier II SAV (mg/L) [2]	USEPA R4 - Acute (mg/L) [2]	**Surface Water Acute Benchmark (mg/L)**	NAWQC - Chronic (mg/L) [1]	GLWQI Tier II SCV (mg/L) [2]	USEPA R4 - Chronic (mg/L) [2]	Other (mg/L)[2]	**Surface Water Chronic Benchmark (mg/L)**

1 Source:
USEPA, 2001. 2001 Update of Ambient Water Quality Criteria for Cadmium. April 2001. EPA 822-R-01-001
USEPA, 1999. National Recommended Water Quality Criteria -- Correction. April 1999. EPA 822-Z-99-001

2 Source:
Spatial Analysis and Decision Assistance (SADA) Database version 2.3 - Table "Ecological SW Benchmarks"

3 Only acute NAWQC available; chronic NAWQC is equal to acute / 10.
4 Metal toxicity is hardness-dependent; values shown are calculated based on an average site hardness of 200 mg/L.
5 PCP toxicity is pH-dependent; value shown is calculated based on a pH of 7.8.

NAWQC = National Ambient Water Quality Criteria
GLQWI = Great Lakes Water Quality Initiative
SAV/SCV = Secondary Acute/Chronic Value
CCME = Canadian Council of Ministers of the Environment
WQG = Water Quality Guidelines
LCV = Lowest Chronic Value
EC20 = Effect Concentration Causing Less Than 20% Reduction

Table C-1b
Surface Water Toxicity Benchmarks for Aquatic Receptors:
Ambient Water Quality Criteria for Metals that are Hardness-Dependent

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Analyte	Hardness-Dependent Parameters where: *AWQC = exp(a * ln(Hardness) + b)*				Range of Hardness Data Used in AWQC Derivation (mg/L $CaCO_3$)				Ambient Water Quality Criteria (ug/L)		Source	Notes
	Acute		Chronic		Acute		Chronic					
	a	b	a	b	Lower	Upper	Lower	Upper	Acute	Chronic		
Cadmium	1.0166	-3.924	0.7409	-4.7190	5	360	20	280	4.3E+00	4.5E-01	1	
Chromium III	0.819	3.7256	0.8190	0.6848	10	360	20	206	3.2E+03	1.5E+02	2	
Copper	0.9422	-1.7	0.8545	-1.7020	10	400	20	210	2.7E+01	1.7E+01	2	
Lead	1.273	-1.46	1.2730	-4.7050	20	360	30	150	2.0E+02	7.7E+00	2	
Nickel	0.846	2.255	0.8460	0.0584	10	360	20	210	8.4E+02	9.4E+01	2	
Silver	1.72	-6.52	--	--	10	400	--	--	1.3E+01	1.3E+00	2	a
Zinc	0.8473	0.884	0.8473	0.8840	10	500	20	210	2.2E+02	2.2E+02	2	

-- = not available

AWQCs are presented based on an average hardness of approximately 200 mg/L in surface water.

AWQCs are presented based on total recoverable metals.

Sources:

1 USEPA, 2001. 2001 Update of Ambient Water Quality Criteria for Cadmium. April 2001. EPA 822-R-01-001

2 USEPA, 1999. National Recommended Water Quality Criteria -- Correction. April 1999. EPA 822-Z-99-001

Notes:

a Silver chronic AWQC is not available; AWQC is equal to the acute criterion / 10

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Table C-2a
Summary of Estimated Sediment Benchmarks Using the Equilibrium Partitioning Approach

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Analyte	CAS	Cwater[1] (mg/L)	pKa[2]	Environ. form at pH 6-8	logKow[3]	Koc[4]	Csed[5] (mg/kg)
1,1,1,2-Tetrachloroethane	630206	no benchmark	--	--	--	--	NB
1,1,1-Trichloroethane	71556	0.011	--	NONIONIC	2.49	1.79E+02	5.91E-03
1,1,2,2-Tetrachloroethane	79345	0.61	--	NONIONIC	2.39	7.90E+01	1.45E-01
1,1,2-Trichloroethane	79005	1.2	--	NONIONIC	2.05	7.90E+01	2.84E-01
1,1-Dichloroethane	75343	0.047	--	NONIONIC	1.79	4.00E+01	5.64E-03
1,1-Dichloroethene	75354	0.025	--	NONIONIC	2.13	3.43E+02	2.57E-02
1,2,3-Trichlorobenzene	87616	0.008	--	NONIONIC	4.05	4030	9.67E-02
1,2,3-Trichloropropane	96184	no benchmark	--	--	--	--	NB
1,2,4-Trichlorobenzene	120821	0.11	--	NONIONIC	3.98	1.43E+03	4.72E-01
1,2-Dibromo-3-chloropropane (DBCP)	96128	no benchmark	--	--	--	--	NB
1,2-Dichlorobenzene	95501	0.014	--	NONIONIC	3.38	2.80E+02	1.18E-02
1,2-Dichloroethane	107062	0.91	--	NONIONIC	1.48	3.20E+01	8.74E-02
1,2-Dichloroethene	540590	0.59	--	NONIONIC	1.86	35	6.20E-02
1,2-Dichloropropane	78875	0.525	--	NONIONIC	2	2.70E+01	4.25E-02
1,3-Dichlorobenzene	541731	0.071	--	NONIONIC	3.6	2.93E+02	6.24E-02
1,4-Dichlorobenzene	106467	0.015	--	NONIONIC	3.52	6.00E+02	2.70E-02
1,4-Dioxane	123911	no benchmark	--	--	--	--	NB
2,2'-oxybis(1-Chloropropane)	108601	no benchmark	--	--	--	--	NB
2,4,5-Trichlorophenol	95954	no benchmark	--	--	--	--	NB
2,4,6-Trichlorophenol	88062	0.0032	5.99	IONIC	3.69	6.20E+02	NC
2,4-Dichlorophenol	120832	0.0365	7.6	IONIC	2.92	1.26E+02	NC
2,4-Dimethylphenol	105679	0.0212	10.61	NONIONIC	2.3	1.80E+01	1.14E-03
2,4-Dinitrophenol	51285	0.0062	4.09	IONIC	1.54	(ion)	NC
2,4-Dinitrotoluene	121142	0.31	--	NONIONIC	1.98	9.00E+01	8.37E-02
2,6-Dinitrotoluene	606202	no benchmark	--	--	--	--	NB
2-Chloro-1,3-butadiene (Chloroprene)	126998	no benchmark	--	--	--	--	NB
2-Chloroethyl vinyl ether	110758	3.54	--	NONIONIC	--	**8.106**	8.61E-02
2-Chloronaphthalene	91587	no benchmark	--	--	--	--	NB
2-Chlorophenol	95578	0.0438	8.56	NONIONIC	2.15	5.12E+01	6.72E-03
2-Hexanone	591786	0.099	--	NONIONIC	1.38	**13.02**	0.00386694
2-Methylphenol (o-Cresol)	95487	0.013	10.28	NONIONIC	1.95	1.03E+02	4.02E-03
2-Nitroaniline	88744	no benchmark	--	--	--	--	NB
2-Nitrophenol	88755	3.5	7.23	IONIC	1.79	1.14E+02	NC
3,3'-Dichlorobenzidine	91941	no benchmark	--	--	--	--	NB
3-Chloropropene (Allyl Chloride)	107051	no benchmark	--	--	--	--	NB
3-Nitroaniline	99092	no benchmark	--	--	--	--	NB
4,6-Dinitro-o-cresol	534521	0.0023	4.31	IONIC	2.12	2.57E+02	NC
4-Bromophenyl-phenylether	101553	0.0015	--	NONIONIC	5.243	1.70E+04	7.65E-02
4-Chloro-3-Methylphenol	59507	0.0003	--	NONIONIC	--	**717.6**	0.00064584
4-Chloroaniline	106478	no benchmark	--	--	--	--	NB
4-Chlorophenyl-phenylether	7005723	no benchmark	--	--	--	--	NB
4-Methylphenol (p-Cresol)	106445	no benchmark	--	--	--	--	NB
4-Nitroaniline	100016	no benchmark	--	--	--	--	NB
4-Nitrophenol	100027	0.3	7.08	IONIC	1.91	2.36E+02	NC
Acetone	67641	1.5	20	NONIONIC	-0.24	1.80E+01	8.10E-02
Acetonitrile	75058	no benchmark	--	--	--	--	NB
Acetophenone	98862	no benchmark	--	--	--	--	NB
Acrolein	107028	0.0021	--	NONIONIC	-0.01	5.00E+00	3.15E-05
Acrylonitrile	107131	0.0755	--	NONIONIC	0.25	9.00E+00	2.04E-03
Aldrin	309002	0.0003	--	NONIONIC	5.52	4.85E+04	4.37E-02
alpha-BHC	319846	0.5	--	NONIONIC	3.8	2.00E+03	2.99E+00
Aniline	62533	0.0022	4.6	NONIONIC	0.9	5.40E+01	3.56E-04
Benzene	71432	0.13	--	NONIONIC	2.13	4.90E+01	1.91E-02
Benzyl alcohol	100516	0.0086	15.4	NONIONIC	1.1	5.00E+00	1.29E-04

Table C-2a
Summary of Estimated Sediment Benchmarks Using the Equilibrium Partitioning Approach

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Analyte	CAS	Cwater[1] (mg/L)	pKa[2]	Environ. form at pH 6-8	logKow[3]	Koc[4]	Csed[5] (mg/kg)
beta-BHC	319857	5	--	NONIONIC	3.78	4.25E+03	6.38E+01
Biphenyl	92524	0.014	--	NONIONIC	4.09	1400	5.88E-02
bis(2-Chloroethoxy)methane	111911	no benchmark	--	--	--	--	NB
bis-(2-Chloroethyl)ether	111444	2.38	--	NONIONIC	1.29	7.90E+01	5.64E-01
bis(2-Chloroisopropyl)ether	108601	no benchmark	--	--	--	--	NB
bis(2-Ethylhexyl)phthalate	117817	0.003	--	NONIONIC	5.11	5.80E+03	5.22E-02
bis(n-octyl)phthalate	117840	0.1	--	NONIONIC	5.22	2.39E+03	7.16E-01
Bromodichloromethane	75274	no benchmark	--	--	--	--	NB
Bromoform	75252	0.32	--	NONIONIC	2.37	2.82E+02	2.71E-01
Bromomethane (Methyl bromide)	74839	0.11	--	NONIONIC	1.19	9.80E+00	3.23E-03
Butylbenzylphthalate	85687	0.019	--	NONIONIC	4.91	1.70E+04	9.69E-01
Carbon Disulfide	75150	0.00092	--	NONIONIC	2.24	8.90E+01	2.46E-04
Carbon Tetrachloride	56235	0.0098	--	NONIONIC	2.83	2.24E+02	6.59E-03
Chlorobenzene	108907	0.064	--	NONIONIC	2.84	2.09E+02	4.01E-02
Chlorodibromomethane	124481	no benchmark	--	--	--	--	NB
Chloroethane (Ethyl chloride)	75003	no benchmark	--	--	--	--	NB
Chloroform	67663	0.028	--	NONIONIC	1.97	4.00E+01	3.36E-03
Chloromethane (Methyl chloride)	74873	5.5	--	NONIONIC	0.91	7.40E+01	1.22E+00
cis-1,3-Dichloropropene	10061015	no benchmark	--	--	--	--	NB
delta-BHC	319868	no benchmark	--	--	--	--	NB
Dibenzofuran	132649	0.0037	--	NONIONIC	4.12	8.13E+03	9.02E-02
Dibromomethane	74953	no benchmark	--	--	--	--	NB
Dibutylphthalate	84742	0.035	--	NONIONIC	4.72	6.31E+03	6.63E-01
Dichlorodifluoromethane	75718	no benchmark	--	--	--	--	NB
Dichloromethane	75092	2.2	--	NONIONIC	1.25	2.80E+01	1.85E-01
Diethylphthalate	84662	0.21	--	NONIONIC	2.47	9.80E+01	6.17E-02
Dimethylphthalate	131113	0.33	--	NONIONIC	1.56	4.00E+01	3.96E-02
Endosulfan I	959988	0.000056	--	NONIONIC	3.83	6.32E+03	1.06E-03
Endosulfan II	33213659	0.000056	--	NONIONIC	3.83	6.77E+03	1.14E-03
Endosulfan Sulfate	1031078	no benchmark	--	--	--	--	NB
Endrin Aldehyde	7421934	no benchmark	--	--	--	--	NB
Ethyl Methacrylate	97632	no benchmark	--	--	--	--	NB
Ethylbenzene	100414	0.0073	--	NONIONIC	3.15	2.50E+02	5.48E-03
Ethylene dibromide (EDB)	106934	no benchmark	--	--	--	--	NB
Heptachlor	76448	0.0000038	--	NONIONIC	4.27	3.48E+03	3.96E-05
Hexachlorobenzene	118741	no benchmark	--	--	--	--	NB
Hexachlorobutadiene	87683	0.00093	--	NONIONIC	4.78	2.30E+03	6.42E-03
Hexachlorocyclopentadiene	77474	0.00007	--	NONIONIC	5.04	2.00E+03	4.20E-04
Hexachloroethane	67721	0.012	--	NONIONIC	3.93	2.19E+03	7.88E-02
Hexane	110543	0.00058	--	NONIONIC	--	**149**	2.59E-04
Iodomethane	74884	no benchmark	--	--	--	--	NB
Isobutyl Alcohol	78831	no benchmark	--	--	--	--	NB
Isodrin	465736	no benchmark	--	--	--	--	NB
Isophorone	78591	1.17	--	NONIONIC	1.67	2.50E+01	8.78E-02
Kepone	143500	no benchmark	--	--	--	--	NB
Methacrylonitrile	126987	no benchmark	--	--	--	--	NB
Methoxychlor	72435	0.00003	--	NONIONIC	4.83	8.00E+04	7.20E-03
Methyl ethyl ketone (MEK)	78933	14	14.7	NONIONIC	0.29	5.20E+00	2.18E-01
Methyl isobutyl ketone (MIBK)	108101	0.17	--	NONIONIC	1.19	1.90E+01	9.69E-03
Methyl Metharcylate	80626	no benchmark	--	--	--	--	NB
Nitrobenzene	98953	0.27	--	NONIONIC	1.85	2.29E+02	1.85E-01
N-Nitrosodiphenylamine	86306	0.21	--	NONIONIC	3.13	1.20E+03	7.56E-01
n-Nitrosodipropylamine	621647	no benchmark	--	--	--	--	NB
Pentachlorophenol (PCP)	87865	0.015	4.7	IONIC	5.12	3.80E+03	NC

Table C-2a
Summary of Estimated Sediment Benchmarks Using the Equilibrium Partitioning Approach

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Analyte	CAS	Cwater[1] (mg/L)	pKa[2]	Environ. form at pH 6-8	logKow[3]	Koc[4]	Csed[5] (mg/kg)
Phenol	108952	0.256	9.994	NONIONIC	1.46	3.02E+01	2.32E-02
Styrene	100425	0.072	--	NONIONIC	2.95	9.20E+02	1.99E-01
Tetrachloroethene	127184	0.098	--	NONIONIC	3.4	3.63E+02	1.07E-01
Toluene	108883	0.0098	--	NONIONIC	2.73	9.50E+01	2.79E-03
Toxaphene	8001352	0.0000002	--	NONIONIC	4.82	2.10E+05	1.26E-04
trans-1,2-Dichloroethene	156605	no benchmark	--	--	--	--	NB
trans-1,3-Dichloropropene	10061026	no benchmark	--	--	--	--	NB
trans-1,4-Dichloro-2-Butene	110576	no benchmark	--	--	--	--	NB
Trichloroethene	79016	0.047	--	NONIONIC	2.42	1.04E+02	1.47E-02
Trichlorofluoromethane	75694	no benchmark	--	--	--	--	NB
Vinyl Acetate	108054	0.016	--	NONIONIC	0.73	1.90E+01	9.12E-04
Vinyl Chloride	75014	no benchmark	--	--	--	--	NB
Xylenes (Total)	1330207	0.013	--	NONIONIC	3.12	1.29E+02	5.03E-03
Xylenes-o	95476	0.013	--	NONIONIC	3.12	1.29E+02	5.03E-03
Xylenes-p,m	179601231	0.0018	--	NONIONIC	3.15	2.60E+02	1.40E-03

NB = No surface water benchmark; sediment benchmark not calculated
NC = Not calculated
(ion.) = Koc not calculated due to ionization
Koc values in **boldface type** were estimated using Pckocwin v1.66 EPI Suite estimation software.

All pKa, Kow, and Koc values are the SRC recommended values in CHEMFATE database (http://esc.syrres.com/efdb/Chemfate.htm)
1 Cwater based on selected surface water chronic benchmark (Table C-1a).
2 PKA-Log Acid Dissociation Constant
3 LOGP-Log Octanol/Water Part. Coeff.
4 SOIA-Soil Adsorption Constant
5 Csed estimated based on Equilibrium Partitioning Approach:
Csed = Cwater * Koc * 0.003 [asjusted to a TOC of 0.3%, the 5th percentile of all site TOC measurements]

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Table C-2b
Sediment Toxicity Benchmarks for Benthic Macroinvertebrates

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Analyte Type	Analyte Name	CAS #	Consensus-Based TEC (mg/kg) [a]	ARCS TEL (mg/kg) [b]	EqP Value (mg/kg) [c]	ESGs for PAHs (mg/kg) [f]	Other (mg/kg)		Sediment Screening Benchmark (mg/kg)	Notes
Inorganics	Aluminum	7429-90-5	--	25,519	--	--	--		2.6E+04	
	Antimony	7440-36-0	--	--	--	--	2.0	NOAA ERL d	2.0E+00	
	Arsenic	7440-38-2	9.8	12	--	--	--		9.8E+00	
	Barium	7440-39-3	--	--	--	--	48,000	Region 6 SQG e	4.8E+04	
	Beryllium	7440-41-7	--	--	--	--	--		no benchmark	
	Cadmium	7440-43-9	0.99	0.59	--	--	--		9.9E-01	
	Calcium	7440-70-2	--	--	--	--	--		no benchmark	
	Chromium	7440-47-3	43	56	--	--	--		4.3E+01	
	Cobalt	7440-48-4	--	--	--	--	--		no benchmark	
	Copper	7440-50-8	32	28	--	--	--		3.2E+01	
	Iron	7439-89-6	--	--	--	--	20,000	Region 6 SQG e	2.0E+04	
	Lead	7439-92-1	36	34	--	--	--		3.6E+01	
	Magnesium	7439-95-4	--	--	--	--	--		no benchmark	
	Manganese	7439-96-5	--	1,670	--	--	--		1.7E+03	
	Mercury	7439-97-6	0.18	--	--	--	--		1.8E-01	
	Nickel	7440-02-0	23	40	--	--	--		2.3E+01	
	Potassium	7440-09-7	--	--	--	--	--		no benchmark	
	Selenium	7782-49-2	--	--	--	--	1.0	Region 6 SQG e	1.0E+00	
	Silver	7440-22-4	--	--	--	--	1.0	NOAA ERL d	1.0E+00	
	Sodium	7440-23-5	--	--	--	--	--		no benchmark	
	Thallium	7440-28-0	--	--	--	--	--		no benchmark	
	Vanadium	7440-62-2	--	--	--	--	57	Region 6 SQG e	5.7E+01	
	Zinc	7440-66-6	121	159	--	--	--		1.2E+02	
Pesticides	4,4'-DDD	72-54-8	0.005	--	--	--	--		4.9E-03	
	4,4'-DDE	72-55-9	0.003	--	--	--	--		3.2E-03	
	4,4'-DDT	50-29-3	0.004	--	--	--	--		4.2E-03	
	Aldrin	309-00-2	--	--	0.044	--	--		4.4E-02	
	alpha-BHC	319-84-6	--	--	2.99	--	--		3.0E+00	
	alpha-Chlordane	5103-71-9	--	--	--	--	--		no benchmark	
	Atrazine	1912-24-9	--	--	--	--	--		no benchmark	
	beta-BHC	319-85-7	--	--	63.81	--	--		6.4E+01	
	Caprolactam	105-60-2	--	--	--	--	--		no benchmark	
	Chlordane	57-74-9	0.003	--	--	--	--		3.2E-03	
	delta-BHC	319-86-8	--	--	--	--	--		no benchmark	
	Dieldrin	60-57-1	0.002	--	--	--	--		1.9E-03	
	Endosulfan I	959-98-8	--	--	0.0011	--	--		1.1E-03	
	Endosulfan II	33213-65-9	--	--	0.0011	--	--		1.1E-03	
	Endosulfan Sulfate	1031-07-8	--	--	--	--	--		no benchmark	
	Endrin	72-20-8	0.002	--	--	--	--		2.2E-03	
	Endrin Aldehyde	7421-93-4	--	--	--	--	--		no benchmark	
	Endrin ketone	53494-70-5	--	--	--	--	--		no benchmark	
	gamma-BHC (Lindane)	58-89-9	0.002	--	--	--	--		2.4E-03	
	gamma-Chlordane	12789-03-6	--	--	--	--	--		no benchmark	
	Heptachlor	76-44-8	--	--	0.00004	--	--		4.0E-05	
	Heptachlor Epoxide	1024-57-3	0.002	--	--	--	--		2.5E-03	
	Isodrin	465-73-6	--	--	--	--	--		no benchmark	
	Kepone	143-50-0	--	--	--	--	--		no benchmark	
	Methoxychlor	72-43-5	--	--	0.007	--	--		7.2E-03	
	Toxaphene	8001-35-2	--	--	0.0001	--	--		1.3E-04	
Polyaromatic Hydrocarbons (PAHs)	1-Methylnaphthalene	90-12-0	--	--	--	1.34	--		1.3E+00	
	2-Chloronaphthalene	91-58-7	--	--	--	--	--		no benchmark	
	2-Methylnaphthalene	91-57-6	--	--	--	1.34	--		1.3E+00	
	Acenaphthene	83-32-9	--	--	--	1.36	--		1.4E+00	
	Acenaphthylene	208-96-8	--	--	--	1.47	--		1.5E+00	
	Aniline	62-53-3	--	--	0.00036	--	--		3.6E-04	
	Anthracene	120-12-7	0.06	0.03	--	1.78	--		5.7E-02	
	Benzo[a]anthracene	56-55-3	0.11	0.26	--	2.52	--		1.1E-01	
	Benzo[a]pyrene	50-32-8	0.15	0.35	--	2.90	--		1.5E-01	
	Benzo[b]fluoranthene	205-99-2	--	0.03	--	2.94	--		2.9E+00	
	Benzo[g,h,i]perylene	191-24-2	--	0.29	--	1.94	--		1.9E+00	
	Benzo[k]fluoranthene	207-08-9	--	0.03	--	2.94	--		2.9E+00	
	Chrysene	218-01-9	0.17	0.50	--	2.48	--		1.7E-01	
	Dibenz[a,h]anthracene	53-70-3	0.03	--	--	3.37	--		3.3E-02	
	Dibenzofuran	132-64-9	--	--	0.09	--	--		9.0E-02	
	Fluoranthene	206-44-0	0.42	0.06	--	2.12	--		4.2E-01	
	Fluorene	86-73-7	0.08	0.03	--	1.61	--		7.7E-02	
	Indeno[1,2,3-c,d]pyrene	193-39-5	--	0.08	--	3.35	--		3.3E+00	
	Naphthalene	91-20-3	0.18	0.03	--	1.16	--		1.8E-01	
	Phenanthrene	85-01-8	0.20	--	--	1.79	--		2.0E-01	
	Pyrene	129-00-0	0.20	0.57	--	2.09	--		2.0E-01	
Polychlorinated Biphenyls (PCBs)	Aroclor-1016	12674-11-2	0.06	--	--	--	--		6.0E-02	1
	Aroclor-1221	11104-28-2	0.06	--	--	--	--		6.0E-02	1
	Aroclor-1232	11141-16-5	0.06	--	--	--	--		6.0E-02	1
	Aroclor-1242	53469-21-9	0.06	--	--	--	--		6.0E-02	1
	Aroclor-1248	12672-29-6	0.06	--	--	--	--		6.0E-02	1
	Aroclor-1254	11097-69-1	0.06	--	--	--	--		6.0E-02	1
	Aroclor-1260	11096-82-5	0.06	--	--	--	--		6.0E-02	1
	Aroclor-1268	11100-14-4	0.06	--	--	--	--		6.0E-02	1

Table C-2b
Sediment Toxicity Benchmarks for Benthic Macroinvertebrates

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Analyte Type	Analyte Name	CAS #	Consensus-Based TEC (mg/kg) [a]	ARCS TEL (mg/kg) [b]	EqP Value (mg/kg) [c]	ESGs for PAHs (mg/kg) [f]	Other (mg/kg)		Sediment Screening Benchmark (mg/kg)	Notes
Petroleum Hydro-carbons	Total Petroleum Hydrocarbons (TPH)	TPH	--	--	--	--	--		no benchmark	
Semi-Volatile Organic Compounds (SVOCs)	1,1'-Biphenyl	92-52-4	--	--	0.06	--	--		5.9E-02	
	1,2,4-Trichlorobenzene	120-82-1	--	--	0.47	--	--		4.7E-01	
	1,2-Dichlorobenzene	95-50-1	--	--	0.01	--	--		1.2E-02	
	1,3-Dichlorobenzene	541-73-1	--	--	0.06	--	--		6.2E-02	
	1,4-Dichlorobenzene	106-46-7	--	--	0.03	--	--		2.7E-02	
	2,2'-oxybis(1-Chloropropane)	108-60-1	--	--	--	--	--		no benchmark	
	2,4,5-Trichlorophenol	95-95-4	--	--	--	--	--		no benchmark	
	2,4,6-Trichlorophenol	88-06-2	--	--	--	--	--		no benchmark	
	2,4-Dichlorophenol	120-83-2	--	--	--	--	--		no benchmark	
	2,4-Dimethylphenol	105-67-9	--	--	0.001	--	--		1.1E-03	
	2,4-Dinitrophenol	51-28-5	--	--	--	--	--		no benchmark	
	2,4-Dinitrotoluene	121-14-2	--	--	0.08	--	--		8.4E-02	
	2,6-Dinitrotoluene	606-20-2	--	--	--	--	--		no benchmark	
	2-Chlorophenol	95-57-8	--	--	0.01	--	--		6.7E-03	
	2-Methylphenol (o-Cresol)	95-48-7	--	--	0.004	--	--		4.0E-03	
	2-Nitroaniline	88-74-4	--	--	--	--	--		no benchmark	
	2-Nitrophenol	88-75-5	--	--	--	--	--		no benchmark	
	3,3'-Dichlorobenzidine	91-94-1	--	--	--	--	--		no benchmark	
	3-Nitroaniline	99-09-2	--	--	--	--	--		no benchmark	
	4,6-Dinitro-o-cresol	534-52-1	--	--	--	--	--		no benchmark	
	4-Bromophenyl-phenylether	101-55-3	--	--	0.08	--	--		7.7E-02	
	4-Chloro-3-Methylphenol	59-50-7	--	--	0.001	--	--		6.5E-04	
	4-Chloroaniline	106-47-8	--	--	--	--	--		no benchmark	
	4-Chlorophenyl-phenylether	7005-72-3	--	--	--	--	--		no benchmark	
	4-Methylphenol (p-Cresol)	106-44-5	--	--	--	--	--		no benchmark	
	4-Nitroaniline	100-01-6	--	--	--	--	--		no benchmark	
	4-Nitrophenol	100-02-7	--	--	--	--	--		no benchmark	
	Acetophenone	98-86-2	--	--	--	--	--		no benchmark	
	Benzaldehyde	100-52-7	--	--	--	--	--		no benchmark	
	Benzyl alcohol	100-51-6	--	--	0.0001	--	--		1.3E-04	
	Biphenyl	92-52-4	--	--	0.06	--	--		5.9E-02	
	bis(2-Chloroethoxy)methane	111-91-1	--	--	--	--	--		no benchmark	
	bis-(2-Chloroethyl)ether	111-44-4	--	--	0.56	--	--		5.6E-01	
	bis(2-Chloroethyl)ether	111-44-4	--	--	0.56	--	--		5.6E-01	
	bis(2-Chloroisopropyl)ether	108-60-1	--	--	--	--	--		no benchmark	
	bis(2-Ethylhexyl)phthalate	117-81-7	--	--	0.05	--	--		5.2E-02	
	bis(n-octyl)phthalate	117-84-0	--	--	0.72	--	--		7.2E-01	
	Butylbenzylphthalate	85-68-7	--	--	0.97	--	--		9.7E-01	
	Carbazole	86-74-8	--	--	--	--	--		no benchmark	
	Dibutylphthalate	84-74-2	--	--	0.66	--	--		6.6E-01	
	Diethylphthalate	84-66-2	--	--	0.06	--	--		6.2E-02	
	Dimethylphthalate	131-11-3	--	--	0.04	--	--		4.0E-02	
	Hexachlorobenzene	118-74-1	--	--	--	--	--		no benchmark	
	Hexachlorobutadiene	87-68-3	--	--	0.01	--	--		6.4E-03	
	Hexachlorocyclopentadiene	77-47-4	--	--	0.0004	--	--		4.2E-04	
	Hexachloroethane	67-72-1	--	--	0.08	--	--		7.9E-02	
	Isophorone	78-59-1	--	--	0.09	--	--		8.8E-02	
	Nitrobenzene	98-95-3	--	--	0.19	--	--		1.9E-01	
	N-Nitrosodiphenylamine	86-30-6	--	--	0.76	--	--		7.6E-01	
	n-Nitrosodipropylamine	621-64-7	--	--	--	--	--		no benchmark	
	Pentachlorophenol (PCP)	87-86-5	--	--	--	--	--		no benchmark	
	Phenol	108-95-2	--	--	0.02	--	--		2.3E-02	
	1,1,1,2-Tetrachloroethane	630-20-6	--	--	--	--	--		no benchmark	
	1,1,1-Trichloroethane	71-55-6	--	--	0.01	--	--		5.9E-03	
	1,1,2,2-Tetrachloroethane	79-34-5	--	--	0.14	--	--		1.4E-01	
	1,1,2-Trichloroethane	79-00-5	--	--	0.28	--	--		2.8E-01	
	1,1-Dichloroethane	75-34-3	--	--	0.006	--	--		5.6E-03	
	1,1-Dichloroethene	75-35-4	--	--	0.03	--	--		2.6E-02	
	1,1-Dichloropropene	563-58-6	--	--	--	--	--		no benchmark	
	1,2,3-Trichlorobenzene	87-61-6	--	--	0.10	--	--		9.7E-02	
	1,2,3-Trichloropropane	96-18-4	--	--	--	--	--		no benchmark	
	1,2,4-Trimethylbenzene	95-63-6	--	--	--	--	--		no benchmark	
	1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	--	--	--	--	--		no benchmark	
	1,2-Dichloroethane	107-06-2	--	--	0.09	--	--		8.7E-02	
	1,2-Dichloroethene	540-59-0	--	--	0.06	--	--		6.2E-02	
	1,2-Dichloropropane	78-87-5	--	--	0.04	--	--		4.3E-02	
	1,3,5-Trimethylbenzene	108-67-8	--	--	--	--	--		no benchmark	
	1,3-Dichloropropane	142-28-9	--	--	--	--	--		no benchmark	
	1,4-Dioxane	123-91-1	--	--	--	--	--		no benchmark	
	2,2-Dichloropropane	594-20-7	--	--	--	--	--		no benchmark	
	2-Chloro-1,3-butadiene (Chloroprene)	126-99-8	--	--	--	--	--		no benchmark	
	2-Chloroethyl vinyl ether	110-75-8	--	--	0.09	--	--		8.6E-02	
	2-Chlorotoluene	95-49-8	--	--	--	--	--		no benchmark	
	2-Hexanone	591-78-6	--	--	0.00	--	--		3.9E-03	
	3-Chloropropene (Allyl Chloride)	107-05-1	--	--	--	--	--		no benchmark	
	4-Chlorotoluene	106-43-4	--	--	--	--	--		no benchmark	
	Acetone	67-64-1	--	--	0.08	--	--		8.1E-02	

Table C-2b
Sediment Toxicity Benchmarks for Benthic Macroinvertebrates

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Analyte Type	Analyte Name	CAS #	Consensus-Based TEC (mg/kg) [a]	ARCS TEL (mg/kg) [b]	EqP Value (mg/kg) [c]	ESGs for PAHs (mg/kg) [f]	Other (mg/kg)		Sediment Screening Benchmark (mg/kg)	Notes
Volatile Organic Compounds (VOCs)	Acetonitrile	75-05-8	--	--	--	--	--		no benchmark	
	Acrolein	107-02-8	--	--	0.0000	--	--		3.2E-05	
	Acrylonitrile	107-13-1	--	--	0.0020	--	--		2.0E-03	
	Benzene	71-43-2	--	--	0.02	--	--		1.9E-02	
	Bromobenzene	108-86-1	--	--	--	--	--		no benchmark	
	Bromodichloromethane	75-27-4	--	--	--	--	--		no benchmark	
	Bromoform	75-25-2	--	--	0.27	--	--		2.7E-01	
	Bromomethane (Methyl bromide)	74-83-9	--	--	0.003	--	--		3.2E-03	
	Carbon Disulfide	75-15-0	--	--	0.000	--	--		2.5E-04	
	Carbon Tetrachloride	56-23-5	--	--	0.01	--	--		6.6E-03	
	Chlorobenzene	108-90-7	--	--	0.04	--	--		4.0E-02	
	Chlorodibromomethane	124-48-1	--	--	--	--	--		no benchmark	
	Chloroethane (Ethyl chloride)	75-00-3	--	--	--	--	--		no benchmark	
	Chloroform	67-66-3	--	--	0.00	--	--		3.4E-03	
	Chloromethane (Methyl chloride)	74-87-3	--	--	1.22	--	--		1.2E+00	
	cis-1,2-Dichloroethene	156-59-2	--	--	--	--	--		no benchmark	
	cis-1,3-Dichloropropene	10061-01-5	--	--	--	--	--		no benchmark	
	Dibromomethane	74-95-3	--	--	--	--	--		no benchmark	
	Dichlorodifluoromethane	75-71-8	--	--	--	--	--		no benchmark	
	Dichloromethane	75-09-2	--	--	0.18	--	--		1.8E-01	
	Ethyl Methacrylate	97-63-2	--	--	--	--	--		no benchmark	
	Ethylbenzene	100-41-4	--	--	0.005	--	--		5.5E-03	
	Ethylene dibromide (EDB)	106-93-4	--	--	--	--	--		no benchmark	
	Hexane	110-54-3	--	--	0.00	--	--		2.6E-04	
	Iodomethane	74-88-4	--	--	--	--	--		no benchmark	
	Isobutyl Alcohol	78-83-1	--	--	--	--	--		no benchmark	
	Isopropylbenzene	98-82-8	--	--	--	--	--		no benchmark	
	Methacrylonitrile	126-98-7	--	--	--	--	--		no benchmark	
	Methyl ethyl ketone (MEK)	78-93-3	--	--	0.22	--	--		2.2E-01	
	Methyl isobutyl ketone (MIBK)	108-10-1	--	--	0.01	--	--		9.7E-03	
	Methyl Metharcylate	80-62-6	--	--	--	--	--		no benchmark	
	Methyl-t-butyl ether (MTBE)	1634-04-4	--	--	--	--	--		no benchmark	
	n-Butylbenzene	104-51-8	--	--	--	--	--		no benchmark	
	n-Propylbenzene	103-65-1	--	--	--	--	--		no benchmark	
	o-Xylene	95-47-6	--	--	0.01	--	--		5.0E-03	2
	sec-Butylbenzene	135-98-8	--	--	--	--	--		no benchmark	
	Styrene	100-42-5	--	--	0.20	--	--		2.0E-01	
	tert-Butylbenzene	98-06-6	--	--	--	--	--		no benchmark	
	Tetrachloroethene	127-18-4	--	--	0.11	--	--		1.1E-01	
	Toluene	108-88-3	--	--	0.00	--	--		2.8E-03	
	trans-1,2-Dichloroethene	156-60-5	--	--	--	--	--		no benchmark	
	trans-1,3-Dichloropropene	10061-02-6	--	--	--	--	--		no benchmark	
	trans-1,4-Dichloro-2-Butene	110-57-6	--	--	--	--	--		no benchmark	
	Trichloroethene	79-01-6	--	--	0.01	--	--		1.5E-02	
	Trichlorofluoromethane	75-69-4	--	--	--	--	--		no benchmark	
	Vinyl Acetate	108-05-4	--	--	0.001	--	--		9.1E-04	
	Vinyl Chloride	75-01-4	--	--	--	--	--		no benchmark	
	Xylenes (Total)	1330-20-7	--	--	0.01	--	--		5.0E-03	
	Xylenes-p,m	179601-23-1	--	--	0.001	--	--		1.4E-03	2

Sources Hierarchy:

a MacDonald et al. (2000); consensus-based threshold effect concentration (TEC).

b Ingersoll, et al. (1996); minimum No Effect Range Median (NERM) for total extraction of sediment (BT) samples from *Hyalella azteca* 28-day (HA28) tests and *Chironomus riparius* 14-day (CR14) tests.

c Derived based on the equilibrium partitioning (EqP) approach as described in Region 5 ESL Guidance (USEPA, 1999) normalized to 0.3% TOC (5th percentile of all site TOC measurements).

d Long and Morgan (1990); NOAA effect range level (ERL).

e Spatial Analysis and Decision Assistance (SADA) database; Region 6 value for marine environments.

f USEPA (2000); Equilibrium-partitioning sediment guidelines (ESGs) $C_{OC,PAHi,FCVi}$ normalized to 0.3% TOC (5th percentile of all site TOC measurements).

Notes:

1 Equal to the SQG for total PCBs.

2 Equal to the EDQL for total xylene.

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Table C-3
Benthic Macroinvertebrate Toxicity Benchmarks
for PAHs in Sediment Porewater

Baseline Ecological Risk Assessment for the Ogden Railyard

Chemical Class	Chemical Name	Chemical CAS #	Final Chronic Value (ug/L)
PAHs	2-Methylnaphthalene	91-57-6	72
	Acenaphthene	83-32-9	56
	Acenaphthylene	208-96-8	310
	Anthracene	120-12-7	21
	Benzo[a]anthracene	56-55-3	2.2
	Benzo[a]pyrene	50-32-8	0.96
	Benzo[b]fluoranthene	205-99-2	0.68
	Benzo[g,h,i]perylene	191-24-2	0.44
	Benzo[k]fluoranthene	207-08-9	0.64
	Chrysene	218-01-9	2
	Dibenz[a,h]anthracene	53-70-3	0.28
	Fluoranthene	206-44-0	7.1
	Fluorene	86-73-7	39
	Indeno[1,2,3-c,d]pyrene	193-39-5	0.28
	Naphthalene	91-20-3	190
	Phenanthrene	85-01-8	19
	Pyrene	129-00-0	10

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Table C-4
Maximum Allowable Tissue Concentrations (MATCs)
for Analytes Detected in Fish Tissues

Analyte	Fish Tissue Benchmark (ug/g ww)			
	Carcass	Fillet	Liver	Whole Body
4,4'-DDD	0.0255	0.0086	--	0.008
4,4'-DDE	0.1339	0.0449	--	0.042
4,4'-DDT	0.0255	0.0086	--	0.008
4-Methylphenol (p-Cresol)	No Benchmark	--	--	--
Acenaphthene	No Benchmark	No Benchmark	--	--
Aroclor-1260	102.01	34.22	--	32
bis(2-Chloroethoxy)methane	No Benchmark	--	--	--
bis(2-Ethylhexyl)phthalate	No Benchmark	No Benchmark	No Benchmark	No Benchmark
Dibutylphthalate	--	--	--	No Benchmark
Dieldrin	1.15	--	--	0.36
Diethylphthalate	No Benchmark	No Benchmark	--	--
gamma-Chlordane	No Benchmark	No Benchmark	--	--
PCB-105	--	No Benchmark	--	No Benchmark
PCB-114	--	No Benchmark	--	No Benchmark
PCB-118	--	No Benchmark	--	No Benchmark
PCB-126	--	0.031	--	0.079
PCB-156	--	No Benchmark	--	No Benchmark
PCB-157	--	No Benchmark	--	No Benchmark
PCB-167	--	No Benchmark	--	No Benchmark
PCB-189	--	No Benchmark	--	No Benchmark
PCB-77	--	No Benchmark	--	No Benchmark
Phenol	--	--	107.1	25

No Benchmark = chemical was detected in tissue, but no MATC was located.

-- = Chemical was not detected in tissue, no MATC required.

= Shaded cells indicate that organ MATC is estimated from the whole body MATC, as described below.

Source: Jarvinen & Ankley (1999)

$MATC_{organ} = MATC_{whole\ body} * (Lipid\ Content_{organ} / Lipid\ Content_{wholebody})$

<u>Lipid Content Ratios:</u>

Fillet	1.1
Carcass	3.2
Liver	4.3

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Table C-5
Soil Toxicity Benchmarks for Terrestrial Receptors (Plants, Soil Organisms)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Analyte Type	Analytes	ORNL Invertebrates (mg/kg dw)	ORNL Microbes (mg/kg dw)	ORNL Plants (mg/kg dw)	Dutch Target (mg/kg dw)	Soil Screening Benchmark (mg/kg dw)
Inorganics	Aluminum	--	600	50	--	5.0E+01
	Antimony	--	--	5	3	3.0E+00
	Arsenic	60	100	10	29	1.0E+01
	Barium	--	3000	500	160	1.6E+02
	Beryllium	--	--	10	1.1	1.1E+00
	Cadmium	20	20	4	0.8	8.0E-01
	Calcium	--	--	--	--	no benchmark
	Chromium	0.4	10	1	100	4.0E-01
	Cobalt	--	1000	20	9	9.0E+00
	Copper	50	100	100	36	3.6E+01
	Iron	--	200	--	--	2.0E+02
	Lead	500	900	50	85	5.0E+01
	Magnesium	--	--	--	--	no benchmark
	Manganese	--	100	500	--	1.0E+02
	Mercury	0.1	30	0.3	0.3	1.0E-01
	Nickel	200	90	30	35	3.0E+01
	Potassium	--	--	--	--	no benchmark
	Selenium	70	100	1	0.7	7.0E-01
	Silver	--	50	2	--	2.0E+00
	Sodium	--	--	--	--	no benchmark
	Thallium	--	--	1	1	1.0E+00
	Vanadium	--	20	2	42	2.0E+00
	Zinc	100	100	50	140	5.0E+01
Pesticides	4,4'-DDD	--	--	--	--	no benchmark
	4,4'-DDE	--	--	--	--	no benchmark
	4,4'-DDT	--	--	--	--	no benchmark
	Aldrin	--	--	--	--	no benchmark
	alpha-BHC	--	--	--	--	no benchmark
	alpha-Chlordane	--	--	--	--	no benchmark
	beta-BHC	--	--	--	--	no benchmark
	Chlordane	--	--	--	0.00003	3.0E-05
	delta-BHC	--	--	--	--	no benchmark
	Dieldrin	--	--	--	--	no benchmark
	Endosulfan I	--	--	--	--	no benchmark
	Endosulfan II	--	--	--	--	no benchmark
	Endosulfan Sulfate	--	--	--	--	no benchmark
	Endrin	--	--	--	--	no benchmark
	Endrin aldehyde	--	--	--	--	no benchmark
	Endrin ketone	--	--	--	--	no benchmark
	gamma-BHC (Lindane)	--	--	--	--	no benchmark
	g-Chlordane	--	--	--	--	no benchmark
	Heptachlor	--	--	--	0.0007	7.0E-04
	Heptachlor Epoxide	--	--	--	0.0000002	2.0E-07
	Isodrin	--	--	--	--	no benchmark
	Kepone	--	--	--	--	no benchmark
	Methoxychlor	--	--	--	--	no benchmark
	Toxaphene	--	--	--	--	no benchmark
Polychlorinated Biphenyls (PCBs)	Aroclor-1016	--	--	40	0.02	2.0E-02
	Aroclor-1221	--	--	40	0.02	2.0E-02
	Aroclor-1232	--	--	40	0.02	2.0E-02
	Aroclor-1242	--	--	40	0.02	2.0E-02
	Aroclor-1248	--	--	40	0.02	2.0E-02
	Aroclor-1254	--	--	40	0.02	2.0E-02
	Aroclor-1260	--	--	40	0.02	2.0E-02
	Aroclor-1268	--	--	40	0.02	2.0E-02

Table C-5
Soil Toxicity Benchmarks for Terrestrial Receptors (Plants, Soil Organisms)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Analyte Type	Analytes	ORNL Invertebrates (mg/kg dw)	ORNL Microbes (mg/kg dw)	ORNL Plants (mg/kg dw)	Dutch Target (mg/kg dw)	Soil Screening Benchmark (mg/kg dw)
Polycyclic Aromatic Hydrcarbons (PAHs)	2-Chloronaphthalene	--	--	--	--	no benchmark
	2-Methylnaphthalene	--	--	--	--	no benchmark
	Acenaphthene	--	--	20	--	2.0E+01
	Acenaphthylene	--	--	--	--	no benchmark
	Aniline	--	--	--	--	no benchmark
	Anthracene	--	--	--	--	no benchmark
	Benzo(A)Anthracene	--	--	--	--	no benchmark
	Benzo(A)Pyrene	--	--	--	--	no benchmark
	Benzo(B)Fluoranthene	--	--	--	--	no benchmark
	Benzo(G,H,I)Perylene	--	--	--	--	no benchmark
	Benzo(K)Fluoranthene	--	--	--	--	no benchmark
	Chrysene	--	--	--	--	no benchmark
	Dibenz(a,h)Anthracene	--	--	--	--	no benchmark
	Dibenzofuran	--	--	--	--	no benchmark
	Fluoranthene	--	--	--	--	no benchmark
	Fluorene	30	--	--	--	3.0E+01
	Indeno(1,2,3-c,d)Pyrene	--	--	--	--	no benchmark
	Naphthalene	--	--	--	--	no benchmark
	Phenanthrene	--	--	--	--	no benchmark
	Pyrene	--	--	--	--	no benchmark
Semi-Volatile Organic Compounds (SVOCs)	1,2,4-Trichlorobenzene	20	--	--	--	2.0E+01
	1,2-Dichlorobenzene	--	--	--	--	no benchmark
	1,3-Dichlorobenzene	--	--	--	--	no benchmark
	1,4-Dichlorobenzene	20	--	--	--	2.0E+01
	1-Methylnaphthalene	--	--	--	--	no benchmark
	2,2'-oxybis(1-Chloropropane)	--	--	--	--	no benchmark
	2,4,5-Trichlorophenol	9	--	4	--	4.0E+00
	2,4,6-Trichlorophenol	10	--	--	--	1.0E+01
	2,4-Dichlorophenol	--	--	--	--	no benchmark
	2,4-Dimethylphenol	--	--	--	--	no benchmark
	2,4-Dinitrophenol	--	--	20	--	2.0E+01
	2,4-Dinitrotoluene	--	--	--	--	no benchmark
	2,6-Dinitrotoluene	--	--	--	--	no benchmark
	2-Chlorophenol	--	--	--	--	no benchmark
	2-Methylphenol (o-Cresol)	--	--	--	--	no benchmark
	2-Nitroaniline	--	--	--	--	no benchmark
	2-Nitrophenol	--	--	--	--	no benchmark
	3,3'-Dichlorobenzidine	--	--	--	--	no benchmark
	3-Nitroaniline	--	--	--	--	no benchmark
	4,6-Dinitro-o-cresol	--	--	--	--	no benchmark
	4-Bromophenyl-phenylether	--	--	--	--	no benchmark
	4-Chloro-3-Methylphenol	--	--	--	--	no benchmark
	4-Chloroaniline	--	--	--	0.005	5.0E-03
	4-Chlorophenyl-phenylether	--	--	--	--	no benchmark
	4-Methylphenol	--	--	--	--	no benchmark
	4-Nitroaniline	--	--	--	--	no benchmark
	4-Nitrophenol	7	--	--	--	7.0E+00
	Benzyl alcohol	--	--	--	--	no benchmark
	bis(2-Chloroethoxy)methane	--	--	--	--	no benchmark
	bis(2-Chloroethyl)ether	--	--	--	--	no benchmark
	bis-(2-Chloroethyl)ether	--	--	--	--	no benchmark
	bis(2-Chloroisopropyl)ether	--	--	--	--	no benchmark
	Bis(2-Ethylhexyl) Phthalate	--	--	--	--	no benchmark
	Butyl Benzyl Phthalate	--	--	--	--	no benchmark
	Carbazole	--	--	--	--	no benchmark

Table C-5
Soil Toxicity Benchmarks for Terrestrial Receptors (Plants, Soil Organisms)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Analyte Type	Analytes	ORNL Invertebrates (mg/kg dw)	ORNL Microbes (mg/kg dw)	ORNL Plants (mg/kg dw)	Dutch Target (mg/kg dw)	Soil Screening Benchmark (mg/kg dw)
	Diethyl Phthalate	--	--	100	--	1.0E+02
	Dimethylphthalate	200	--	--	--	2.0E+02
	Di-N-Butyl Phthalate	--	--	200	--	2.0E+02
	Di-N-Octyl Phthalate	--	--	--	--	no benchmark
	Hexachlorobenzene	--	1000	--	--	1.0E+03
	Hexachlorobutadiene	--	--	--	--	no benchmark
	Hexachlorocyclopentadiene	--	--	10	--	1.0E+01
	Hexachloroethane	--	--	--	--	no benchmark
	Isophorone	--	--	--	--	no benchmark
	Nitrobenzene	40	1000	--	--	4.0E+01
	N-Nitrosodiphenylamine	20	--	--	--	2.0E+01
	n-Nitrosodipropylamine	--	--	--	--	no benchmark
	Pentachlorophenol	6	400	3	--	3.0E+00
	Phenol	30	100	70	0.05	5.0E-02
Organic Compounds (VOCs)	1,1,1,2-Tetrachloroethane	--	--	--	--	no benchmark
	1,1,1-Trichloroethane	--	--	--	0.07	7.0E-02
	1,1,2,2-Tetrachloroethane	--	--	--	--	no benchmark
	1,1,2-Trichloroethane	--	--	--	0.4	4.0E-01
	1,1-Dichloroethane	--	--	--	0.02	2.0E-02
	1,1-Dichloroethene	--	--	--	0.1	1.0E-01
	1,1-Dichloropropene	--	--	--	--	no benchmark
	1,2,3-Trichlorobenzene	20	--	--	--	2.0E+01
	1,2,3-Trichloropropane	--	--	--	--	no benchmark
	1,2,4-Trimethylbenzene	--	--	--	--	no benchmark
	1,2-Dibromo-3-chloropropane (DBCP)	--	--	--	--	no benchmark
	1,2-Dibromoethane	--	--	--	--	no benchmark
	1,2-Dichloroethane	--	--	--	0.02	2.0E-02
	1,2-Dichloropropane	700	--	2	0.002	2.0E-03
	1,3,5-Trimethylbenzene	--	--	--	--	no benchmark
	1,3-Dichloropropane	--	--	--	--	no benchmark
	1,4-Dioxane	--	--	--	--	no benchmark
	2,2-Dichloropropane	--	--	--	--	no benchmark
	2-Butanone (MEK)	--	--	--	--	no benchmark
	2-Chloro-1,3-butadiene (Chloroprene)	--	--	--	--	no benchmark
	2-Chloroethyl vinyl ether	--	--	--	--	no benchmark
	2-Chlorotoluene	--	--	--	--	no benchmark
	2-Hexanone	--	--	--	--	no benchmark
	3-Chloropropene (Allyl Chloride)	--	--	--	--	no benchmark
	4-Chlorotoluene	--	--	--	--	no benchmark
	4-Methyl-2-Pentanone (MIBK)	--	--	--	--	no benchmark
	Acetone	--	--	--	--	no benchmark
	Acetonitrile	--	--	--	--	no benchmark
	Acrolein	--	--	--	--	no benchmark
	Acrylonitrile	--	1000	--	0.000007	7.0E-06
	Benzene	--	--	--	0.01	1.0E-02
	Bromobenzene	--	--	--	--	no benchmark
	Bromodichloromethane	--	--	--	--	no benchmark
	Bromoform	--	--	--	--	no benchmark
	Bromomethane	--	--	--	--	no benchmark
	Carbon Disulfide	--	--	--	--	no benchmark
	Carbon tetrachloride	--	1000	--	0.4	4.0E-01
	Chlorobenzene	40	--	--	--	4.0E+01
	Chloroethane	--	--	--	--	no benchmark
	Chloroform	--	--	--	0.02	2.0E-02
	Chloromethane	--	--	--	--	no benchmark

Table C-5
Soil Toxicity Benchmarks for Terrestrial Receptors (Plants, Soil Organisms)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Analyte Type	Analytes	ORNL Invertebrates (mg/kg dw)	ORNL Microbes (mg/kg dw)	ORNL Plants (mg/kg dw)	Dutch Target (mg/kg dw)	Soil Screening Benchmark (mg/kg dw)
Volatile	cis-1,2-Dichloroethene	--	--	--	--	no benchmark
	cis-1,3-Dichloropropene	--	--	--	--	no benchmark
	Dibromochloromethane	--	--	--	--	no benchmark
	Dibromomethane	--	--	--	--	no benchmark
	Dichlorodifluoromethane	--	--	--	--	no benchmark
	Ethyl Methacrylate	--	--	--	--	no benchmark
	Ethylbenzene	--	--	--	0.03	3.0E-02
	Hexane	--	--	--	--	no benchmark
	Iodomethane	--	--	--	--	no benchmark
	Isobutyl Alcohol	--	--	--	--	no benchmark
	Isopropylbenzene	--	--	--	--	no benchmark
	Methacrylonitrile	--	--	--	--	no benchmark
	Methyl Metharcylate	--	--	--	--	no benchmark
	Methylene Chloride	--	--	--	0.4	4.0E-01
	Methyl-t-butyl ether (MTBE)	--	--	--	--	no benchmark
	n-Butylbenzene	--	--	--	--	no benchmark
	n-Propylbenzene	--	--	--	--	no benchmark
	o-Xylene	--	--	--	--	no benchmark
	sec-Butylbenzene	--	--	--	--	no benchmark
	Styrene	--	--	300	0.3	3.0E-01
	tert-Butylbenzene	--	--	--	--	no benchmark
	Tetrachloroethene	--	--	--	0.002	2.0E-03
	Toluene	--	--	200	0.01	1.0E-02
	Total 1,2-Dichloroethene	--	--	--	0.2	2.0E-01
	Dichloroethene (all isomers)	--	--	--	--	no benchmark
	Total Xylenes	--	--	--	0.1	1.0E-01
	trans-1,2-Dichloroethene	--	--	--	--	no benchmark
	trans-1,3-Dichloropropene	--	--	--	--	no benchmark
	trans-1,4-Dichloro-2-Butene	--	1000	--	--	1.0E+03
	Trichloroethene	--	--	--	0.1	1.0E-01
	Trichlorofluoromethane	--	--	--	--	no benchmark
	Vinyl acetate	--	--	--	--	no benchmark
	Vinyl Chloride	--	--	--	0.01	1.0E-02
	Xylenes-p,m	--	--	--	--	no benchmark
Other	Gasoline	--	--	--	--	no benchmark
	Grease & Oil	--	--	--	--	no benchmark
	Lubricating oil	--	--	--	--	no benchmark
	pH	--	--	--	--	no benchmark
	TPH-Diesel	--	--	--	--	no benchmark

Table C-6
Summary of Concentration-Based Wildlife Toxicity Benchmarks

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Analyte Type	Analyte	CAS #	Water		Diet		Notes
			Benchmark (mg/L)[1]	Endpoint Species	Benchmark (mg/kg)[1]	Endpoint Species	
Inorganics	Aluminum	7429-90-5	8.113	Mink	3.825	Short-tailed shrew	
	Antimony	7440-36-0	0.525	Mink	0.248	Short-tailed shrew	
	Arsenic	7440-38-2	0.530	Mink	0.250	Short-tailed shrew	
	Barium	7440-39-3	41.8	Mink	17.2	American robin	
	Beryllium	7440-41-7	5.13	Mink	2.42	Short-tailed shrew	
	Cadmium	7440-43-9	7.494	Mink	1.2	American robin	
	Calcium	7440-70-2	no benchmark		no benchmark		
	Chromium +3	7440-47-3	7.26	American Robin	0.83	American robin	
	Chromium +6	7440-47-3	25.48	Mink	0.83	American robin	
	Cobalt	7440-48-4	no benchmark		no benchmark		
	Copper	7440-50-8	118.2	Mink	38.9	American robin	
	Iron	7439-89-6	no benchmark		no benchmark		
	Lead	7439-92-1	8.21	American Robin	0.94	American robin	
	Magnesium	7439-95-4	no benchmark		no benchmark		
	Manganese	7439-96-5	684	Mink	322	Short-tailed shrew	
	Mercury	7439-97-6	0.046	American Robin	0.005	American robin	Based on Methyl Mercury Dicyandiamide
	Nickel	7440-02-0	310.77	Mink	64.08	American robin	
	Potassium	7440-09-7	no benchmark		no benchmark		
	Selenium	7782-49-2	1.554	Mink	0.331	American robin	
	Silver	7440-22-4	no benchmark		no benchmark		
	Sodium	7440-23-5	no benchmark		no benchmark		
	Thallium	7440-28-0	0.058	Mink	0.027	Short-tailed shrew	
	Vanadium	7440-62-2	1.515	Mink	0.714	Short-tailed shrew	
	Zinc	7440-66-6	105.3	American Robin	12	American robin	
Pesticides	4,4'-DDD	72-54-8	0.020	American Robin	0.002	American robin	Based on DDT and metabolites
	4,4'-DDE	72-55-9	0.020	American Robin	0.002	American robin	Based on DDT and metabolites
	4,4'-DDT	50-29-3	0.020	American Robin	0.002	American robin	Based on DDT and metabolites
	Aldrin	309-00-2	1.554	Mink	0.733	Short-tailed shrew	
	alpha-BHC	319-84-6	0.14	Mink	0.1	Mink	Based on BHC-mixed isomers
	alpha-Chlordane	5103-71-9	na		1.8	American robin	
	Atrazine	1912-24-9	na		no benchmark		
	beta-BHC	319-85-7	3.11	Mink	1.47	Short-tailed shrew	
	Caprolactam	105-60-2	na		no benchmark	no benchmark	
	Chlordane	57-74-9	15.5	American Robin	1.8	American robin	
	delta-BHC	319-86-8	0.14	Mink	0.1	Mink	Based on BHC-mixed isomers
	Dieldrin	60-57-1	0.115	Mink	0.064	American robin	
	Endosulfan I	959-98-8	1.17	Mink	0.55	Short-tailed shrew	Based on Endosulfan
	Endosulfan II	33213-65-9	1.17	Mink	0.55	Short-tailed shrew	Based on Endosulfan
	Endosulfan Sulfate	1031-07-8	1.17	Mink	0.55	Short-tailed shrew	Based on Endosulfan
	Endrin	72-20-8	0.073	American Robin	0.008	American robin	
	Endrin Aldehyde	7421-93-4	no benchmark		no benchmark		
	Endrin ketone	53494-70-5	na		no benchmark		
	gamma-BHC (Lindane)	58-89-9	14.53	American Robin	1.66	American robin	
	gamma-Chlordane	12789-03-6	na		1.8	American robin	Based on Chlordane
	Heptachlor	76-44-8	1.010	Mink	0.476	Short-tailed shrew	
	Heptachlor Epoxide	1024-57-3	no benchmark		no benchmark		
	Isodrin	465-73-6	no benchmark		no benchmark		
	Kepone	143-50-0	0.622	Mink	0.293	Short-tailed shrew	
	Methoxychlor	72-43-5	31.1	Mink	14.7	Short-tailed shrew	
	Toxaphene	8001-35-2	62.2	Mink	29.3	Short-tailed shrew	
Polycyclic Aromatic Hydrocarbons (PAHs)	2-Chloronaphthalene	91-58-7	no benchmark		no benchmark		
	2-Methylnaphthalene	91-57-6	no benchmark		no benchmark		
	Acenaphthene	83-32-9	no benchmark		no benchmark		
	Acenaphthylene	208-96-8	no benchmark		no benchmark		
	Aniline	62-53-3	no benchmark		no benchmark		
	Anthracene	120-12-7	no benchmark		no benchmark		
	Benzo(A)Anthracene	56-55-3	no benchmark		no benchmark		
	Benzo(A)Pyrene	50-32-8	4.20	Mink	1.98	Short-tailed shrew	
	Benzo(B)Fluoranthene	205-99-2	no benchmark		no benchmark		
	Benzo(G,H,I)Perylene	191-24-2	no benchmark		no benchmark		
	Benzo(K)Fluoranthene	207-08-9	no benchmark		no benchmark		
	Chrysene	218-01-9	no benchmark		no benchmark		
	Dibenz[a,h]anthracene	53-70-3	no benchmark		no benchmark		
	Dibenzofuran	132-64-9	no benchmark		no benchmark		
	Fluoranthene	206-44-0	no benchmark		no benchmark		
	Fluorene	86-73-7	no benchmark		no benchmark		
	Indeno(1,2,3-c,d)Pyrene	193-39-5	no benchmark		no benchmark		
	Naphthalene	91-20-3	no benchmark		no benchmark		
	Phenanthrene	85-01-8	no benchmark		no benchmark		
	Pyrene	129-00-0	no benchmark		no benchmark		
Polychlorinated Biphenyls (PCBs)	Aroclor-1016	12674-11-2	13.84	Mink	6.52	Short-tailed shrew	
	Aroclor-1221	11104-28-2	no benchmark		0.071	Short-tailed shrew	Based on Aroclor-1248
	Aroclor-1232	11141-16-5	no benchmark		0.071	Short-tailed shrew	Based on Aroclor-1248
	Aroclor-1242	53469-21-9	0.697	Mink	0.329	Short-tailed shrew	
	Aroclor-1248	12672-29-6	0.151	Mink	0.071	Short-tailed shrew	
	Aroclor-1254	11097-69-1	0.304	Masked Shrew	0.111	Short-tailed shrew	
	Aroclor-1260	11096-82-5	no benchmark		0.071	Short-tailed shrew	Based on Aroclor-1248
	Aroclor-1268	11100-14-4	na		0.071	Short-tailed shrew	Based on Aroclor-1248

Table C-6
Summary of Concentration-Based Wildlife Toxicity Benchmarks

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Analyte Type	Analyte	CAS #	Water		Diet		Notes
			Benchmark (mg/L)[1]	Endpoint Species	Benchmark (mg/kg)[1]	Endpoint Species	
Petroleum Hydrocarbons	Diesel fuel	68476-34-6	no benchmark		no benchmark		
	Grease & Oil	G&O	no benchmark		na		
	Total Petroleum Hydrocarbons (TPH)	TPH	no benchmark		no benchmark		
	TPH-Diesel	68334-30-5	no benchmark		na		
	TPH-Gasoline	8006-61-9	no benchmark		na		
Semi-Volatile Organic Compounds (SVOCs)	1,2,4-Trichlorobenzene	120-82-1	no benchmark		no benchmark		
	1,2-Dichlorobenzene	95-50-1	no benchmark		no benchmark		
	1,3-Dichlorobenzene	541-73-1	no benchmark		no benchmark		
	1,4-Dichlorobenzene	106-46-7	no benchmark		no benchmark		
	1-Methylnaphthalene	90-12-0	no benchmark		no benchmark		
	2,4,5-Trichlorophenol	95-95-4	no benchmark		no benchmark		
	2,4,6-Trichlorophenol	88-06-2	no benchmark		no benchmark		
	2,4-Dichlorophenol	120-83-2	no benchmark		no benchmark		
	2,4-Dimethylphenol	105-67-9	no benchmark		no benchmark		
	2,4-Dinitrophenol	51-28-5	no benchmark		no benchmark		
	2,4-Dinitrotoluene	121-14-2	no benchmark		no benchmark		
	2,6-Dinitrotoluene	606-20-2	no benchmark		no benchmark		
	2-Chlorophenol	95-57-8	no benchmark		no benchmark		
	2-Methylphenol	95-48-7	no benchmark		1043.9	Short-tailed shrew	
	2-Nitroaniline	88-74-4	no benchmark		no benchmark		
	2-Nitrophenol	88-75-5	no benchmark		no benchmark		
	3,3'-Dichlorobenzidine	91-94-1	no benchmark		no benchmark		
	3-Nitroaniline	99-09-2	no benchmark		no benchmark		
	4,6-Dinitro-o-cresol	534-52-1	no benchmark		no benchmark		
	4-Bromophenyl-phenylether	101-55-3	no benchmark		no benchmark		
	4-Chloro-3-Methylphenol	59-50-7	no benchmark		no benchmark		
	4-Chloroaniline	106-47-8	no benchmark		no benchmark		
	4-Chlorophenyl-phenylether	7005-72-3	no benchmark		no benchmark		
	4-Methylphenol	106-44-5	2214.1	Mink	1043.9	Short-tailed shrew	Based on 2-methylphenol (o-cresol)
	4-Nitroaniline	100-01-6	no benchmark		no benchmark		
	4-Nitrophenol	100-02-7	no benchmark		no benchmark		
	Acetophenone	98-86-2	na		no benchmark		
	Benzaldehyde	100-52-7	na		no benchmark		
	Benzyl alcohol	100-51-6	no benchmark		no benchmark		
	Biphenyl	92-52-4	na		no benchmark		
	bis(2-Chloroethoxy)methane	111-91-1	no benchmark		no benchmark		
	bis(2-Chloroethyl)ether	111-44-4	no benchmark		no benchmark		
	bis(2-Chloroisopropyl)ether	108-60-1	no benchmark		no benchmark		
	Bis(2-Ethylhexyl) Phthalate	117-81-7	7.99	American Robin	0.91	American robin	
	Butyl Benzyl Phthalate	85-68-7	no benchmark		no benchmark		
	Carbazole	86-74-8	no benchmark		no benchmark		
	Diethylphthalate	84-66-2	19226	Mink	9084	Short-tailed shrew	
	Dimethylphthalate	131-11-3	no benchmark		no benchmark		
	Di-N-Butyl Phthalate	84-74-2	0.80	American Robin	0.09	American robin	
	Di-N-Octyl Phthalate	117-84-0	no benchmark		no benchmark		
	Hexachlorobenzene	118-74-1	no benchmark		no benchmark		
	Hexachlorobutadiene	87-68-3	no benchmark		no benchmark		
	Hexachlorocyclopentadiene	77-47-4	no benchmark		no benchmark		
	Hexachloroethane	67-72-1	no benchmark		no benchmark		
	Isophorone	78-59-1	no benchmark		no benchmark		
	Nitrobenzene	98-95-3	no benchmark		no benchmark		
	N-Nitrosodiphenylamine	86-30-6	no benchmark		no benchmark		
	n-Nitrosodipropylamine	621-64-7	no benchmark		no benchmark		
	Pentachlorophenol (PCP)	87-86-5	1.865	Mink	0.879	Short-tailed shrew	
	Phenol	108-95-2	no benchmark		no benchmark		
	1,1,1,2-Tetrachloroethane	630-20-6	no benchmark		no benchmark		
	1,1,1-Trichloroethane	71-55-6	4369	Mink	2060	Short-tailed shrew	
	1,1,2,2-Tetrachloroethane	79-34-5	no benchmark		no benchmark		
	1,1,2-Trichloroethane	79-00-5	4369	Mink	2060	Short-tailed shrew	Based on 1,1,1-Trichloroethane
	1,1-Dichloroethane	75-34-3	124.9	American Robin	14.2	American robin	Based on 1,2-Dichloroethane
	1,1-Dichloroethene	75-35-4	44.9	Mink	32.5	Mink	
	1,1-Dichloropropene	563-58-6	no benchmark		no benchmark		
	1,2,3-Trichlorobenzene	87-61-6	no benchmark		no benchmark		
	1,2,3-Trichloropropane	96-18-4	no benchmark		no benchmark		
	1,2,4-Trimethylbenzene	95-63-6	no benchmark		no benchmark		
	1,2-Dibromo-3-Chloropropane	96-12-8	no benchmark		no benchmark		
	1,2-Dichloroethane	107-06-2	124.9	American Robin	14.2	American robin	
	1,2-Dichloropropane	78-87-5	no benchmark		no benchmark		
	1,3,5-Trimethylbenzene	108-67-8	no benchmark		no benchmark		
	1,3-Dichloropropane	142-28-9	no benchmark		no benchmark		
	1,4-Dioxane	123-91-1	3.88	Mink	1.83	Short-tailed shrew	
	2,2-Dichloropropane	594-20-7	no benchmark		no benchmark		
	2-Butanone (MEK)	78-93-3	13759	Mink	6487	Short-tailed shrew	
	2-Chloro-1,3-butadiene (Chloroprene)	126-99-8	no benchmark		no benchmark		
	2-Chloroethyl vinyl ether	110-75-8	no benchmark		no benchmark		
	2-Chlorotoluene	95-49-8	no benchmark		no benchmark		
	2-Hexanone	591-78-6	no benchmark		no benchmark		
	3-Chloropropene (Allyl Chloride)	107-05-1	no benchmark		no benchmark		

Table C-6
Summary of Concentration-Based Wildlife Toxicity Benchmarks

Baseline Ecological Risk Assessment for the Ogden Railyard Site

Analyte Type	Analyte	CAS #	Water		Diet		Notes
			Benchmark (mg/L)[1]	Endpoint Species	Benchmark (mg/kg)[1]	Endpoint Species	
Volatile Organic Compounds (VOCs)	4-Chlorotoluene	106-43-4	no benchmark		no benchmark		
	4-Methyl-2-Pentanone (MIBK)	108-10-1	194.2	Mink	91.6	Short-tailed shrew	
	Acetone	67-64-1	77.7	Mink	36.6	Short-tailed shrew	
	Acetonitrile	75-05-8	no benchmark		no benchmark		
	Acrolein	107-02-8	no benchmark		no benchmark		
	Acrylonitrile	107-13-1	no benchmark		no benchmark		
	Benzene	71-43-2	110.8	Mink	52.2	Short-tailed shrew	
	Bromobenzene	108-86-1	no benchmark		no benchmark		
	Bromodichloromethane	75-27-4	no benchmark		no benchmark		
	Bromoform	75-25-2	no benchmark		no benchmark		
	Bromomethane	74-83-9	no benchmark		no benchmark		
	Carbon Disulfide	75-15-0	no benchmark		no benchmark		
	Carbon Tetrachloride	56-23-5	124.3	Mink	58.6	Short-tailed shrew	
	Chlorobenzene	108-90-7	no benchmark		no benchmark		
	Chlorodibromomethane	124-48-1	no benchmark		no benchmark		
	Chloroethane	75-00-3	no benchmark		no benchmark		
	Chloroform	67-66-3	117	Mink	55	Short-tailed shrew	
	Chloromethane (Methyl chloride)	74-87-3	no benchmark		no benchmark		
	cis-1,2-Dichloroethene	156-59-2	190.0	Mink	89.6	Short-tailed shrew	Based on 1,2-Dichloroethene
	cis-1,3-Dichloropropene	10061-01-5	no benchmark		no benchmark		
	Dibromomethane	74-95-3	no benchmark		no benchmark		
	Dichlorodifluoromethane	75-71-8	no benchmark		no benchmark		
	Ethyl Methacrylate	97-63-2	no benchmark		no benchmark		
	Ethylbenzene	100-41-4	no benchmark		no benchmark		
	Ethylene dibromide (EDB)	106-93-4	no benchmark		no benchmark		
	Hexane	110-54-3	no benchmark		no benchmark		
	Iodomethane	74-88-4	no benchmark		no benchmark		
	Isobutyl Alcohol	78-83-1	no benchmark		no benchmark		
	Isopropylbenzene	98-82-8	no benchmark		no benchmark		
	Methacrylonitrile	126-98-7	no benchmark		no benchmark		
	Methyl Methacrylate	80-62-6	no benchmark		no benchmark		
	Methylene Chloride	75-09-2	45.5	Mink	21.4	Short-tailed shrew	
	Methyl-t-butyl ether (MTBE)	1634-04-4	no benchmark		no benchmark		
	n-Butylbenzene	104-51-8	no benchmark		no benchmark		
	n-Propylbenzene	103-65-1	no benchmark		no benchmark		
	o-Xylene	95-47-6	8.828	Mink	4.162	Short-tailed shrew	Based on Xylene, mixed isomers
	p,m-Xylene	179601-23-1	8.828	Mink	4.162	Short-tailed shrew	Based on Xylene, mixed isomers
	sec-Butylbenzene	135-98-8	no benchmark		no benchmark		
	Styrene	100-42-5	no benchmark		no benchmark		
	tert-Butylbenzene	98-06-6	no benchmark		no benchmark		
	Tetrachloroethene	127-18-4	5.89	Mink	2.77	Short-tailed shrew	
	Toluene	108-88-3	109.3	Mink	51.5	Short-tailed shrew	
	Total 1,2-Dichloroethene	540-59-0	190.0	Mink	89.6	Short-tailed shrew	Based on 1,2-Dichloroethene
	Total Xylenes	1330-20-7	8.828	Mink	4.162	Short-tailed shrew	
	trans-1,2-Dichloroethene	156-60-5	190.0	Mink	89.6	Short-tailed shrew	Based on 1,2-Dichloroethene
	trans-1,3-Dichloropropene	10061-02-6	no benchmark		no benchmark		
	trans-1,4-Dichloro-2-Butene	110-57-6	no benchmark		no benchmark		
	Trichloroethene	79-01-6	2.943	Mink	1.387	Short-tailed shrew	
	Trichlorofluoromethane	75-69-4	no benchmark		no benchmark		
	Vinyl Acetate	108-05-4	no benchmark		no benchmark		
	Vinyl Chloride	75-01-4	1.321	Mink	0.623	Short-tailed shrew	

[1] Lowest reported NOAEL benchmark from (Sample et al. 1996) for the wildlife receptors of concern at the Ogden Railyard site.
na = not analyzed, no benchmark required

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Table C-7a
Wildlife Toxicity Refence Values for Avian Receptors

Baseline Ecological Risk Assessment for the Ogden Railyard Site, Utah

Type	COPC	CAS	TRV (mg/kg BW/d)		Adjusted Values* (mg/kg BW/d)		Chemical Form	Test Species	Exposure Route	Reference
			NOAEL	LOAEL	NOAEL	LOAEL				
Inorganics	Aluminum	7429-90-5	109.7	na	109.7	548.5		Ringed Dove	oral in diet	Carriere et al., 1986
	Antimony	7440-36-0	na	na	na	na		na	na	no toxicity data available
	Arsenic	7440-38-2	2.46	7.38	2.46	7.38		Brown-headed Cowbird (males only)	oral in diet	USFWS, 1969
			5.14	12.84	5.14	12.84		Mallard Ducks	oral in diet	USFWS, 1964
	Barium	7440-39-3	20.8	41.7	20.8	41.7		1-day old chicks	oral in diet	Johnson et al., 1960
	Cadmium	7440-43-9	1.45	20	1.45	20		Mallard Ducks	oral in diet	White and Finley, 1978
	Chromium	7440-47-3	1	5	1	5	Cr+3 as CrK(SO4)2	Black Duck	oral in diet	Haseltine et al., unpublished data
	Copper	7440-50-8	47	61.7	47	61.7		1-day old chicks	oral in diet	Mehring et al., 1960
	Lead	7439-92-1	3.85	na	3.85	19.25		American Kestrels	oral in diet	Pattee, 1984
			1.13	11.3	1.13	11.3		Japanese Quail	oral in diet	Edens et al., 1976
	Manganese	7439-96-5	977	na	977	4885		Japanese Quail (males only, starting at 1-day old)	oral in diet	Laskey and Edens, 1985
	Mercury	7439-97-6	0.45	0.9	0.45	0.9	Mercuric Chloride	Japanese Quail	oral in diet	Hill and Schaffner, 1976
			0.0064	0.064	0.0064	0.064	Methyl Mercury Dicyandiamide	Mallard Duck	oral in diet	Heinz, 1979
	Selenium	7782-49-2	0.5	1	0.5	1	sodium selenite	Mallard Duck	oral in diet	Heinz et al., 1987
			0.4	0.8	0.4	0.8	selanomethionine	Mallard Duck	oral in diet	Heinz et al., 1989
			0.44	1.5	0.44	1.5	selenomethionine	Screech Owl	oral in diet	Wiemeyer and Hoffman, 1996
			1.8	na	1.8	9	selenomethionine	Black-Crowned Night Heron	oral in diet	Smith et al., 1988
	Thallium	7440-28-0	na	na	na	na		na	na	no toxicity data available
	Vanadium	7440-62-2	11.4	na	11.4	57		Mallard Duck	oral in diet	White and Dieter, 1978
	Zinc	7440-66-6	14.5	131	14.5	131		White Leghorn Hens	oral in diet	Stahl et al., 1990
Pesticides	4,4'-DDE	72-55-9	na	na	na	na		na	na	no toxicity data available
	4,4'-DDD	72-54-8	na	na	na	na		na	na	no toxicity data available
	4,4'-DDT	50-29-3	0.0028	0.028	0.0028	0.028		Brown Pelican	oral in diet	Anderson et al., 1975
PAHs	Benzo[a]pyrene	50-32-8	na	na	na	na		na	na	no toxicity data available
PCBs	Aroclor-1254	11097-69-1	0.18	1.8	0.18	1.8		Ring-necked Pheasant	oral via gelatin capsule	Dahlgren et al., 1972
	Aroclor-1260	11096-82-5	na	na	na	na		na	na	no toxicity data available
SVOCs	bis(2-Ethylhexyl)phthalate	117-81-7	1.1	na	1.1	5.5		Ringed Dove	oral in diet	Peakall, 1974
	Dibutylphthalate	84-74-2	0.11	1.1	0.11	1.1		Ringed Dove	oral in diet	Peakall, 1974

All NOAEL and LOAEL values provided by Sample et al. (1996)

na = no TRV available

* Adjusted values derived based on the following assumptions:
If no LOAEL, = NOAEL * 5
If no NOAEL, = LOAEL / 5

Table C-7b
Wildlife Toxicity Reference Values for Mammalian Receptors

Baseline Ecological Risk Assessment for the Ogden Railyard Site, Utah

Type	COPC	CAS	TRV (mg/kg BW/d)		Adjusted Values* (mg/kg BW/d)		Chemical Form	Test Species	Exposure Route	Reference
			NOAEL	LOAEL	NOAEL	LOAEL				
Inorganics	Aluminum	7429-90-5	1.93	19.3	1.93	19.3		Mouse	oral in water	Ondreicka et al., 1966
	Antimony	7440-36-0	0.125	1.25	0.125	1.25		Mouse	oral in water	Schroeder et al., 1968b
	Arsenic	7440-38-2	0.126	1.26	0.126	1.26		Mouse	oral in water (+incidental in food)	Schroeder and Mitchner, 1971
	Barium	7440-39-3	5.1	na	5.1	25.5		Rat	oral in water	Perry et al., 1983
			na	19.8	3.96	19.8		Rat	oral gavage in water	Borzelleca et al., 1988
	Cadmium	7440-43-9	1	10	1	10		Rat	oral gavage	Sutou et al., 1980b
	Chromium	7440-47-3	2737	na	2737	13685	Cr+3 as CR2O3	Rat	oral in diet	Ivankovic and Preussmann, 1975
			3.28	na	3.28	16.4	Cr+6 as K2Cr2O4	Rat	oral in water	MacKenzie et al., 1958
			na	13.14	2.628	13.14	Cr+6	Rat	oral in water	Steven et al., 1976 (cited in Eisler, 1986)
	Copper	7440-50-8	11.7	15.14	11.7	15.14		Mink	oral in diet	Aulerich et al., 1982
	Lead	7439-92-1	8	80	8	80		Rat	oral in diet	Azar et al., 1973
	Manganese	7439-96-5	88	284	88	284		Rat	oral in diet	Laskey et al., 1982
	Mercury	7439-97-6	1	na	1	5	Mercuric Chloride, HgCl2	Mink	oral in diet	Aulerich et al., 1974
			13.2	na	13.2	66	Mercuric sulfide	Mouse	oral in diet	Revis et al., 1989
			0.015	0.025	0.015	0.025	Methyl Mercury Chlorid	Mink	oral in diet	Wobeser et al., 1976
			0.032	0.16	0.032	0.16	Methyl Mercury Chloride, C	Rat	oral in diet	Verschuuren et al., 1976
	Selenium	7782-49-2	0.2	0.33	0.2	0.33		Rat	oral in water	Rosenfeld and Beath, 1954
	Thallium	7440-28-0	0.0074	0.074	0.0074	0.074		Rat	oral in water	Formigli et al., 1986
	Vanadium	7440-62-2	0.21	2.1	0.21	2.1		Rat	oral intubation	Domingo et al., 1986
	Zinc	7440-66-6	160	320	160	320		Rat	oral in diet	Schlicker and Cox, 1968
Pesticides	4,4'-DDE	72-55-9	na	na	na	na				no toxicity data available
	4,4'-DDD	72-54-8	na	na	na	na				no toxicity data available
	4,4'-DDT	50-29-3	0.8	4	0.8	4		Rat	oral in diet	Fitzhugh, 1948
PAHs	Benzo[a]pyrene	50-32-8	1	10	1	10		Mouse	oral intubation	Mackenzie and Angevine, 1981
PCBs	Aroclor-1254	11097-69-1	0.068	0.68	0.068	0.68		Oldfield Mouse (*Permyscus poliontus*)	oral in diet	McCoy et al., 1995
			0.14	0.69	0.14	0.69		Mink	oral in diet	Aulerich and Ringer, 1977
	Aroclor-1260	11096-82-5	na	na	na	na				no toxicity data available
SVOCs	bis(2-Ethylhexyl)phthalate	117-81-7	18.3	183	18.3	183		Mouse	oral in diet	Lamb et al., 1987
	Dibutylphthalate	84-74-2	550	1833	550	1833		Mouse	oral in diet	Lamb et al., 1987

All NOAEL and LOAEL values provided by Sample et al. (1996)

na = no TRV available

* Adjusted values derived based on the following assumptions:
If no LOAEL, = NOAEL * 5
If no NOAEL, = LOAEL / 5

Table C-7c
Selected Wildlife Toxicity Reference Values for Quantitative COPCs

Baseline Ecological Risk Assessment for the Ogden Railyard Site, Utah

AVIAN RECEPTORS

Belted Kingfisher

Type	COPC	CAS #	NOAEL diet	LOAEL diet	NOAEL water	LOAEL water	Geomean diet	Geomean water	Selected*
Inorganics	Aluminum	7429-90-5	110	549	na	na	245	123	
	Antimony	7440-36-0	na	na	na	na	na	na	
	Arsenic	7440-38-2	5.14	12.84	na	na	8.1	4.1	Mallard Duck
	Barium	7440-39-3	20.8	41.7	na	na	29.5	14.7	
	Cadmium	7440-43-9	1.45	20	na	na	5.4	2.7	
	Chromium	7440-47-3	1	5	na	na	2.2	1.1	
	Copper	7440-50-8	47	61.7	na	na	53.9	26.9	
	Lead	7439-92-1	3.85	19.25	na	na	8.6	4.3	American Kestrel
	Manganese	7439-96-5	977	4885	na	na	2184.6	1092.3	
	Mercury	7439-97-6	0.0064	0.064	na	na	0.02	0.01	Mallard Duck
	Selenium	7782-49-2	1.8	9	na	na	4.0	2.0	Black-Crowned Night Heron
	Thallium	7440-28-0	na	na	na	na	na	na	
	Vanadium	7440-62-2	11.4	57	na	na	25.5	12.7	
	Zinc	7440-66-6	14.5	131	na	na	43.6	21.8	
Pesticides	4,4'-DDE	72-55-9	0.0028	0.028	na	na	0.01	0.009	based on TRV for DDT
	4,4'-DDD	72-54-8	0.0028	0.028	na	na	0.01	0.009	based on TRV for DDT
	4,4'-DDT	50-29-3	0.0028	0.028	na	na	0.01	0.009	
PAHs	Benzo[a]pyrene	50-32-8	na	na	na	na	na	na	
PCBs	Aroclor-1254	11097-69-1	na	na	0.18	1.8	0.6	0.6	
	Aroclor-1260	11096-82-5	na	na	0.18	1.8	0.6	0.6	based on TRV for Aroclor 1254
SVOCs	bis(2-Ethylhexyl)phthalate	117-81-7	1.1	5.5	na	na	2.5	2.5	
	Dibutylphthalate	84-74-2	0.11	1.1	na	na	0.3	0.3	

American Robin

Type	COPC	CAS #	NOAEL diet	LOAEL diet	NOAEL water	LOAEL water	Geomean diet	Geomean water	Selected*
Inorganics	Aluminum	7429-90-5	110	549	na	na	245	123	
	Antimony	7440-36-0	na	na	na	na	na	na	
	Arsenic	7440-38-2	2.46	7.38	na	na	4.3	2.1	Brown-headed Cowbird
	Barium	7440-39-3	20.8	41.7	na	na	29.5	14.7	
	Cadmium	7440-43-9	1.45	20	na	na	5.4	2.7	
	Chromium	7440-47-3	1	5	na	na	2.2	1.1	
	Copper	7440-50-8	47	61.7	na	na	53.9	26.9	
	Lead	7439-92-1	1.13	11.3	na	na	3.6	1.8	Japanese Quail
	Manganese	7439-96-5	977	4885	na	na	2184.6	1092.3	
	Mercury	7439-97-6	0.45	0.9	na	na	0.64	0.32	Japanese Quail
	Selenium	7782-49-2	0.4	0.8	na	na	0.6	0.3	Mallard Duck; lowest TRV
	Thallium	7440-28-0	na	na	na	na	na	na	
	Vanadium	7440-62-2	11.4	57	na	na	25.5	12.7	
	Zinc	7440-66-6	14.5	131	na	na	43.6	21.8	
Pesticides	4,4'-DDE	72-55-9	0.0028	0.028	na	na	0.01	0.009	based on TRV for DDT
	4,4'-DDD	72-54-8	0.0028	0.028	na	na	0.01	0.009	based on TRV for DDT
	4,4'-DDT	50-29-3	0.0028	0.028	na	na	0.01	0.009	
PAHs	Benzo[a]pyrene	50-32-8	na	na	na	na	na	na	
PCBs	Aroclor-1254	11097-69-1	na	na	0.18	1.8	0.6	0.6	
	Aroclor-1260	11096-82-5	na	na	0.18	1.8	0.6	0.6	based on TRV for Aroclor 1254
SVOCs	bis(2-Ethylhexyl)phthalate	117-81-7	1.1	5.5	na	na	2.5	2.5	
	Dibutylphthalate	84-74-2	0.11	1.1	na	na	0.3	0.3	

Mallard Duck

Type	COPC	CAS #	NOAEL diet	LOAEL diet	NOAEL water	LOAEL water	Geomean diet	Geomean water	Selected*
Inorganics	Aluminum	7429-90-5	110	549	na	na	245	123	
	Antimony	7440-36-0	na	na	na	na	na	na	
	Arsenic	7440-38-2	5.14	12.84	na	na	8.1	4.1	Mallard Duck
	Barium	7440-39-3	20.8	41.7	na	na	29.5	14.7	
	Cadmium	7440-43-9	1.45	20	na	na	5.4	2.7	
	Chromium	7440-47-3	1	5	na	na	2.2	1.1	
	Copper	7440-50-8	47	61.7	na	na	53.9	26.9	
	Lead	7439-92-1	1.13	11.3	na	na	3.6	1.8	Japanese Quail
	Manganese	7439-96-5	977	4885	na	na	2184.6	1092.3	
	Mercury	7439-97-6	0.0064	0.064	na	na	0.02	0.01	Mallard Duck
	Selenium	7782-49-2	0.4	0.8	na	na	0.6	0.3	Mallard Duck; lowest TRV
	Thallium	7440-28-0	na	na	na	na	na	na	
	Vanadium	7440-62-2	11.4	57	na	na	25.5	12.7	
	Zinc	7440-66-6	14.5	131	na	na	43.6	21.8	
Pesticides	4,4'-DDE	72-55-9	0.0028	0.028	na	na	0.01	0.009	based on TRV for DDT
	4,4'-DDD	72-54-8	0.0028	0.028	na	na	0.01	0.009	based on TRV for DDT
	4,4'-DDT	50-29-3	0.0028	0.028	na	na	0.01	0.009	
PAHs	Benzo[a]pyrene	50-32-8	na	na	na	na	na	na	
PCBs	Aroclor-1254	11097-69-1	na	na	0.18	1.8	0.6	0.6	
	Aroclor-1260	11096-82-5	na	na	0.18	1.8	0.6	0.6	based on TRV for Aroclor 1254
SVOCs	bis(2-Ethylhexyl)phthalate	117-81-7	1.1	5.5	na	na	2.5	2.5	
	Dibutylphthalate	84-74-2	0.11	1.1	na	na	0.3	0.3	

MAMMALIAN RECEPTORS

Masked Shrew

Type	COPC	CAS #	NOAEL diet	LOAEL diet	NOAEL water	LOAEL water	Geomean diet	Geomean water	Selected*
Inorganics	Aluminum	7429-90-5	na	na	1.93	19.3	12.2	6.1	
	Antimony	7440-36-0	na	na	0.125	1.25	0.8	0.4	
	Arsenic	7440-38-2	na	na	0.126	1.26	0.8	0.4	
	Barium	7440-39-3	na	na	3.96	19.8	17.7	8.9	lowest TRV
	Cadmium	7440-43-9	1	10	na	na	3.2	1.6	
	Chromium	7440-47-3	2737	13685	2.628	13.14	6120.1	5.9	lowest TRV
	Copper	7440-50-8	11.7	15.14	na	na	13.3	6.7	
	Lead	7439-92-1	8	80	na	na	25.3	12.6	
	Manganese	7439-96-5	88	284	na	na	158.1	79.0	
	Mercury	7439-97-6	0.032	0.16	na	na	0.07	0.04	Rat
	Selenium	7782-49-2	na	na	0.2	0.33	1.1	0.3	
	Thallium	7440-28-0	na	na	0.0074	0.074	1.138	0.023	
	Vanadium	7440-62-2	na	na	0.21	2.1	1.1	0.7	
	Zinc	7440-66-6	160	320	na	na	226.3	113.1	
Pesticides	4,4'-DDE	72-55-9	0.8	4	na	na	1.8	1.8	based on TRV for DDT
	4,4'-DDD	72-54-8	0.8	4	na	na	1.8	1.8	based on TRV for DDT
	4,4'-DDT	50-29-3	0.8	4	na	na	1.8	1.8	
PAHs	Benzo[a]pyrene	50-32-8	na	na	1	10	1.1	3.2	
PCBs	Aroclor-1254	11097-69-1	0.068	0.68	na	na	0.2	0.2	Oldfield Mouse
	Aroclor-1260	11096-82-5	0.068	0.68	na	na	0.2	0.2	based on TRV for Aroclor 1254
SVOCs	bis(2-Ethylhexyl)phthalate	117-81-7	18.3	183	na	na	57.9	57.9	
	Dibutylphthalate	84-74-2	550	1833	na	na	1004.1	1004.1	

Mink

Type	COPC	CAS #	NOAEL diet	LOAEL diet	NOAEL water	LOAEL water	Geomean diet	Geomean water	Selected*
Inorganics	Aluminum	7429-90-5	na	na	1.93	19.3	12.2	6.1	
	Antimony	7440-36-0	na	na	0.125	1.25	0.8	0.4	
	Arsenic	7440-38-2	na	na	0.126	1.26	0.8	0.4	
	Barium	7440-39-3	na	na	3.96	19.8	17.7	8.9	lowest TRV
	Cadmium	7440-43-9	1	10	na	na	3.2	1.6	
	Chromium	7440-47-3	2737	13685	2.628	13.14	6120.1	5.9	lowest TRV
	Copper	7440-50-8	11.7	15.14	na	na	13.3	6.7	
	Lead	7439-92-1	8	80	na	na	25.3	12.6	
	Manganese	7439-96-5	88	284	na	na	158.1	79.0	
	Mercury	7439-97-6	0.015	0.025	na	na	0.02	0.01	Mink
	Selenium	7782-49-2	na	na	0.2	0.33	1.1	0.3	
	Thallium	7440-28-0	na	na	0.0074	0.074	1.138	0.023	
	Vanadium	7440-62-2	na	na	0.21	2.1	1.1	0.7	
	Zinc	7440-66-6	160	320	na	na	226.3	113.1	
Pesticides	4,4'-DDE	72-55-9	0.8	4	na	na	1.8	1.8	based on TRV for DDT
	4,4'-DDD	72-54-8	0.8	4	na	na	1.8	1.8	based on TRV for DDT
	4,4'-DDT	50-29-3	0.8	4	na	na	1.8	1.8	
PAHs	Benzo[a]pyrene	50-32-8	na	na	1	10	1.1	3.2	
PCBs	Aroclor-1254	11097-69-1	0.14	0.69	na	na	0.3	0.3	Mink
	Aroclor-1260	11096-82-5	0.14	0.69	na	na	0.3	0.3	based on TRV for Aroclor 1254
SVOCs	bis(2-Ethylhexyl)phthalate	117-81-7	18.3	183	na	na	57.9	57.9	
	Dibutylphthalate	84-74-2	550	1833	na	na	1004.1	1004.1	

All units in mg/kg BW/day.

Source: Sample et al. (1996)
*When more than one toxicity study is available, the study which most closely resembles the surrogate receptor, exposure pathway, and chemical form expected for the site is selected.
If TRV was for water/gavage exposure route, *2 for food dose equivalent.

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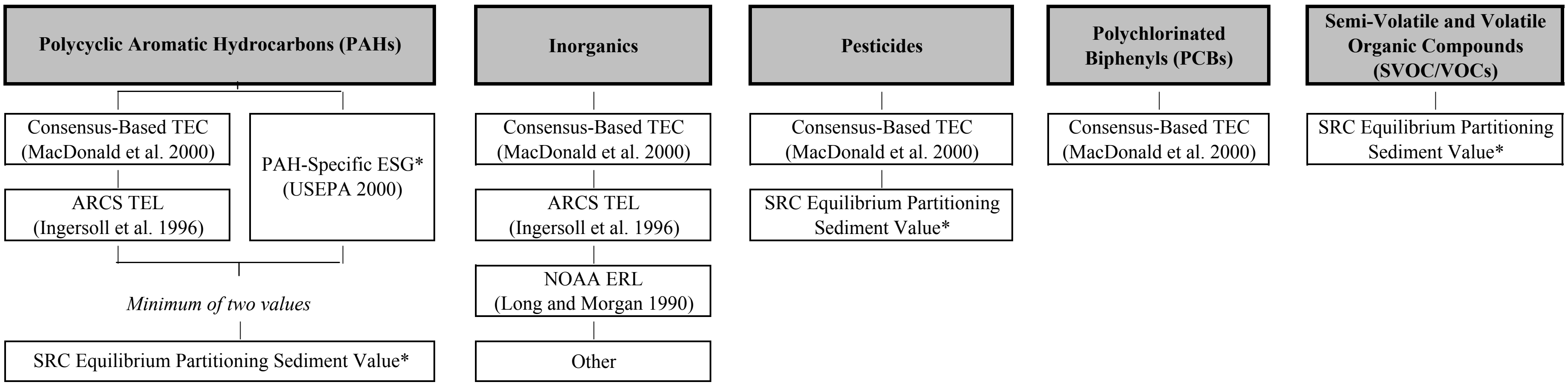
Figure C-1 Summary of the Selection Hierarchy for Sediment Toxicity Benchmarks for Aquatic Receptors

Baseline Ecological Risk Assessment for the Ogden Railyard Site



**Screening level benchmark based on a TOC of 0.3% (the 5th percentile of all site TOC measurements).*

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APPENDIX D

COPC SCREENING RESULTS

D-1: Exposure of aquatic receptors to surface water

D-2: Exposure of benthic organisms to sediments

D-3: Exposure of plants and soil invertebrates to soil

D-4: Exposure of wildlife receptors to surface water

D-5: Exposure of wildlife receptors to sediment

D-6: Exposure of wildlife receptors to soil

D-7: Exposure of wildlife receptors to dietary items

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Appendix D-1 Aquatic Receptor COPC Screen for Surface Water

Ecological Risk Assessment for Ogden, Utah

Group	Analyte	CAS #	DATA: Number of Detections	Number of Samples	Detection Frequency (DF)	Mean Non-Detected Conc (mg/L)	Maximum Detected Conc (mg/L)	Aquatic Surface Water Benchmark (mg/L)	COPC SELECTION STEPS: Does compound have a TRV?	Is compound detected?	Is Max Detect ≥ TRV?	Is Mean DL ≥ TRV?	SURFACE WATER COPCs: QUANT COPC	QUAL COPC Type 1	QUAL COPC Type 2	Not a COPC
Metals	Aluminum	7429-90-5	33	50	66%	2.10E-01	1.85E+00	8.70E-02	yes	yes	yes	na	1	0	0	0
	Antimony	7440-36-0	1	50	2%	1.11E-02	3.40E-03	3.00E-02	yes	yes	no	na	0	0	0	1
	Arsenic	7440-38-2	10	67	15%	5.55E-03	3.10E-03	1.50E-01	yes	yes	no	na	0	0	0	1
	Barium	7440-39-3	67	67	100%	na	1.30E-01	4.00E-03	yes	yes	yes	na	1	0	0	0
	Beryllium	7440-41-7	0	50	0%	1.22E-03	na	6.60E-04	yes	no	na	yes	0	0	1	0
	Cadmium	7440-43-9	19	67	28%	1.69E-03	2.90E-03	4.52E-04	yes	yes	yes	na	1	0	0	0
	Calcium	7440-70-2	50	50	100%	na	7.11E+01	1.16E+02	yes	yes	no	na	0	0	0	1
	Chromium	7440-47-3	19	67	28%	4.33E-03	7.40E-03	1.52E-01	yes	yes	no	na	0	0	0	1
	Cobalt	7440-48-4	0	50	0%	3.15E-03	na	2.30E-02	yes	no	na	no	0	0	0	1
	Copper	7440-50-8	21	50	42%	5.00E-03	7.40E-03	1.69E-02	yes	yes	no	na	0	0	0	1
	Iron	7439-89-6	35	50	70%	2.00E-01	2.11E+00	1.00E+00	yes	yes	yes	na	1	0	0	0
	Lead	7439-92-1	22	67	33%	2.76E-03	2.69E-02	7.69E-03	yes	yes	yes	na	1	0	0	0
	Magnesium	7439-95-4	50	50	100%	na	1.94E+01	8.20E+01	yes	yes	no	na	0	0	0	1
	Manganese	7439-96-5	49	50	98%	1.50E-02	1.12E-01	1.20E-01	yes	yes	no	na	0	0	0	1
	Mercury	7439-97-6	2	67	3%	7.47E-04	9.70E-04	1.30E-03	yes	yes	no	na	0	0	0	1
	Nickel	7440-02-0	21	50	42%	8.45E-03	2.03E-01	9.38E-02	yes	yes	yes	na	1	0	0	0
	Potassium	7440-09-7	49	50	98%	1.00E+00	2.26E+01	5.30E+01	yes	yes	no	na	0	0	0	1
	Selenium	7782-49-2	3	67	4%	7.56E-03	5.20E-03	5.00E-03	yes	yes	yes	na	1	0	0	0
	Silver	7440-22-4	11	57	19%	3.53E-03	1.40E-03	1.34E-03	yes	yes	yes	na	1	0	0	0
	Sodium	7440-23-5	50	50	100%	na	5.64E+01	6.80E+02	yes	yes	no	na	0	0	0	1
	Thallium	7440-28-0	0	50	0%	8.24E-03	na	1.20E-02	yes	no	na	no	0	0	0	1
	Vanadium	7440-62-2	1	50	2%	3.86E-03	5.10E-03	2.00E-02	yes	yes	no	na	0	0	0	1
	Zinc	7440-66-6	5	50	10%	9.27E-03	2.82E+00	2.16E-01	yes	yes	yes	na	1	0	0	0
Pesticides	4,4'-DDD	72-54-8	0	17	0%	5.00E-05	na	1.10E-05	yes	no	na	yes	0	0	1	0
	4,4'-DDE	72-55-9	0	17	0%	5.00E-05	na	1.05E-02	yes	no	na	no	0	0	0	1
	4,4'-DDT	50-29-3	0	17	0%	5.00E-05	na	1.30E-05	yes	no	na	yes	0	0	1	0
	Aldrin	309-00-2	0	17	0%	2.50E-05	na	3.00E-04	yes	no	na	no	0	0	0	1
	alpha-BHC	319-84-6	0	17	0%	2.50E-05	na	5.00E-01	yes	no	na	no	0	0	0	1
	beta-BHC	319-85-7	0	17	0%	2.50E-05	na	5.00E+00	yes	no	na	no	0	0	0	1
	Chlordane	57-74-9	0	17	0%	2.50E-04	na	4.30E-06	yes	no	na	yes	0	0	1	0
	delta-BHC	319-86-8	0	17	0%	2.50E-05	na	no benchmark	no	na	na	na	0	1	0	0
	Dieldrin	60-57-1	0	17	0%	5.00E-05	na	5.60E-05	yes	no	na	no	0	0	0	1
	Endosulfan I	959-98-8	0	17	0%	2.50E-05	na	5.60E-05	yes	no	na	no	0	0	0	1
	Endosulfan II	33213-65-9	0	17	0%	5.00E-05	na	5.60E-05	yes	no	na	no	0	0	0	1
	Endosulfan Sulfate	1031-07-8	0	17	0%	5.00E-05	na	no benchmark	no	na	na	na	0	1	0	0
	Endrin	72-20-8	0	17	0%	5.00E-05	na	3.60E-05	yes	no	na	yes	0	0	1	0
	Endrin Aldehyde	7421-93-4	0	17	0%	5.00E-05	na	no benchmark	no	na	na	na	0	1	0	0
	gamma-BHC (Lindane)	58-89-9	0	17	0%	2.50E-05	na	9.50E-05	yes	no	na	no	0	0	0	1
	Heptachlor	76-44-8	0	17	0%	2.50E-05	na	3.80E-06	yes	no	na	yes	0	0	1	0
	Heptachlor Epoxide	1024-57-3	0	17	0%	2.50E-05	na	3.80E-06	yes	no	na	yes	0	0	1	0
	Isodrin	465-73-6	0	17	0%	2.50E-05	na	no benchmark	no	na	na	na	0	1	0	0
	Kepone	143-50-0	0	17	0%	5.00E-05	na	no benchmark	no	na	na	na	0	1	0	0
	Methoxychlor	72-43-5	0	17	0%	2.50E-04	na	3.00E-05	yes	no	na	yes	0	0	1	0
	Toxaphene	8001-35-2	0	17	0%	5.00E-04	na	2.00E-07	yes	no	na	yes	0	0	1	0
c Aromatic Hydrocarbons (PAHs)	2-Chloronaphthalene	91-58-7	0	38	0%	5.00E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2-Methylnaphthalene	91-57-6	2	74	3%	3.08E-03	2.10E-01	no benchmark	no	na	na	na	0	1	0	0
	Acenaphthene	83-32-9	8	77	10%	3.11E-03	1.60E-01	1.70E-02	yes	yes	yes	na	1	0	0	0
	Acenaphthylene	208-96-8	3	77	4%	2.82E-03	1.00E-02	no benchmark	no	na	na	na	0	1	0	0
	Aniline	62-53-3	0	36	0%	9.44E-04	na	2.20E-03	yes	no	na	no	0	0	0	1
	Anthracene	120-12-7	2	77	3%	3.03E-03	1.60E-02	7.30E-04	yes	yes	yes	na	1	0	0	0
	Benzo[a]anthracene	56-55-3	2	77	3%	3.03E-03	4.00E-04	2.70E-05	yes	yes	yes	na	1	0	0	0
	Benzo[a]pyrene	50-32-8	2	77	3%	2.98E-03	1.00E-04	1.40E-05	yes	yes	yes	na	1	0	0	0
	Benzo[b]fluoranthene	205-99-2	1	77	1%	3.00E-03	1.00E-04	no benchmark	no	na	na	na	0	1	0	0
	Benzo[g,h,i]perylene	191-24-2	0	77	0%	2.99E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Benzo[k]fluoranthene	207-08-9	2	77	3%	3.03E-03	2.00E-04	no benchmark	no	na	na	na	0	1	0	0
	Chrysene	218-01-9	2	77	3%	2.98E-03	7.00E-04	no benchmark	no	na	na	na	0	1	0	0
	Dibenz[a,h]anthracene	53-70-3	0	77	0%	2.99E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Dibenzofuran	132-64-9	0	38	0%	5.00E-03	na	3.70E-03	yes	no	na	yes	0	0	1	0

Appendix D-1 Aquatic Receptor COPC Screen for Surface Water

Ecological Risk Assessment for Ogden, Utah

Group	Analyte	CAS #	DATA					Aquatic Surface Water Benchmark (mg/L)	COPC SELECTION STEPS				SURFACE WATER COPCs			
			Number of Detections	Number of Samples	Detection Frequency (DF)	Mean Non-Detected Conc (mg/L)	Maximum Detected Conc (mg/L)		Does compound have a TRV?	Is compound detected?	Is Max Detect ≥ TRV?	Is Mean DL ≥ TRV?	QUANT COPC	QUAL COPC Type 1	QUAL COPC Type 2	Not a COPC
Polycycli	Fluoranthene	206-44-0	6	77	8%	3.14E-03	6.00E-03	3.98E-02	yes	yes	no	na	0	0	0	1
	Fluorene	86-73-7	2	77	3%	na	6.20E-02	3.90E-03	yes	yes	yes	na	1	0	0	0
	Indeno[1,2,3-c,d]pyrene	193-39-5	1	77	1%	na	1.00E-03	no benchmark	no	na	na	na	0	1	0	0
	Naphthalene	91-20-3	4	86	5%	na	5.20E-01	1.20E-02	yes	yes	yes	na	1	0	0	0
	Phenanthrene	85-01-8	4	77	5%	na	8.40E-02	no benchmark	no	na	na	na	0	1	0	0
	Pyrene	129-00-0	5	77	6%	na	1.00E-02	2.50E-05	yes	yes	yes	na	1	0	0	0
Polychlorinated Biphenyls (PCBs)	Aroclor-1016	12674-11-2	0	24	0%	na	na	1.40E-05	yes	no	na	yes	0	0	1	0
	Aroclor-1221	11104-28-2	0	17	0%	na	na	2.80E-04	yes	no	na	yes	0	0	1	0
	Aroclor-1232	11141-16-5	0	17	0%	na	na	5.80E-04	yes	no	na	yes	0	0	1	0
	Aroclor-1242	53469-21-9	0	17	0%	na	na	5.30E-05	yes	no	na	yes	0	0	1	0
	Aroclor-1248	12672-29-6	0	17	0%	na	na	8.10E-05	yes	no	na	yes	0	0	1	0
	Aroclor-1254	11097-69-1	0	17	0%	na	na	3.30E-05	yes	no	na	yes	0	0	1	0
	Aroclor-1260	11096-82-5	1	24	4%	na	1.50E-06	9.40E-02	yes	yes	no	na	0	0	0	1
Petroleum Hydro-carbons	Diesel fuel	68476-34-6	0	2	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	Total Petroleum Hydrocarbons (TPH)	TPH	0	6	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
Semi-Volatile Organic Compounds (SVOCs)	1,2,4-Trichlorobenzene	120-82-1	0	83	0%	na	na	1.10E-01	yes	no	na	yes	0	0	1	0
	1,2-Dichlorobenzene	95-50-1	0	83	0%	na	na	1.40E-02	yes	no	na	yes	0	0	1	0
	1,3-Dichlorobenzene	541-73-1	0	47	0%	na	na	7.10E-02	yes	no	na	yes	0	0	1	0
	1,4-Dichlorobenzene	106-46-7	0	83	0%	na	na	1.50E-02	yes	no	na	yes	0	0	1	0
	1-Methylnaphthalene	90-12-0	0	21	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	2,4,5-Trichlorophenol	95-95-4	0	38	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	2,4,6-Trichlorophenol	88-06-2	0	38	0%	na	na	3.20E-03	yes	no	na	yes	0	0	1	0
	2,4-Dichlorophenol	120-83-2	0	38	0%	na	na	3.65E-02	yes	no	na	yes	0	0	1	0
	2,4-Dimethylpheno	105-67-9	1	63	2%	na	5.00E-04	2.12E-02	yes	yes	no	na	0	0	0	1
	2,4-Dinitrophenol	51-28-5	0	38	0%	na	na	6.20E-03	yes	no	na	yes	0	0	1	0
	2,4-Dinitrotoluene	121-14-2	0	74	0%	na	na	3.10E-01	yes	no	na	yes	0	0	1	0
	2,6-Dinitrotoluene	606-20-2	1	74	1%	na	1.70E-02	no benchmark	no	na	na	na	0	1	0	0
	2-Chlorophenol	95-57-8	0	38	0%	na	na	4.38E-02	yes	no	na	yes	0	0	1	0
	2-Methylphenol (o-Cresol)	95-48-7	0	74	0%	na	na	1.30E-02	yes	no	na	yes	0	0	1	0
	2-Nitroaniline	88-74-4	0	38	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	2-Nitrophenol	88-75-5	0	38	0%	na	na	3.50E+00	yes	no	na	yes	0	0	1	0
	3,3'-Dichlorobenzidine	91-94-1	0	63	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	3-Nitroaniline	99-09-2	0	38	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	4,6-Dinitro-o-cresol	534-52-1	0	74	0%	na	na	2.30E-03	yes	no	na	yes	0	0	1	0
	4-Bromophenyl-phenylether	101-55-3	0	18	0%	na	na	1.50E-03	yes	no	na	yes	0	0	1	0
	4-Chloro-3-Methylphenol	59-50-7	0	38	0%	na	na	3.00E-04	yes	no	na	yes	0	0	1	0
	4-Chloroaniline	106-47-8	0	38	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	4-Chlorophenyl-phenylether	7005-72-3	0	38	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	4-Methylphenol (p-Cresol)	106-44-5	0	74	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	4-Nitroaniline	100-01-6	0	38	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	4-Nitrophenol	100-02-7	0	38	0%	na	na	3.00E-01	yes	no	na	yes	0	0	1	0
	Benzyl alcohol	100-51-6	0	18	0%	na	na	8.60E-03	yes	no	na	yes	0	0	1	0
	bis(2-Chloroethoxy)methane	111-91-1	0	38	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	bis(2-Chloroethyl)ether	111-44-4	0	74	0%	na	na	2.38E+00	yes	no	na	yes	0	0	1	0
	bis(2-Chloroisopropyl)ether	108-60-1	0	42	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	bis(2-Ethylhexyl)phthalate	117-81-7	4	74	5%	na	4.70E-03	3.00E-03	yes	yes	yes	na	1	0	0	0
	bis(n-octyl)phthalate	117-84-0	1	74	1%	na	2.00E-04	1.00E-01	yes	yes	no	na	0	0	0	1
	Butylbenzylphthalate	85-68-7	1	74	1%	na	1.00E-04	1.90E-02	yes	yes	no	na	0	0	0	1
	Carbazole	86-74-8	2	74	3%	na	7.00E-03	no benchmark	no	na	na	na	0	1	0	0
	Dibutylphthalate	84-74-2	4	74	5%	na	5.70E-03	3.50E-02	yes	yes	no	na	0	0	0	1
	Diethylphthalate	84-66-2	0	74	0%	na	na	2.10E-01	yes	no	na	yes	0	0	1	0
	Dimethylphthalate	131-11-3	0	38	0%	na	na	3.30E-01	yes	no	na	yes	0	0	1	0
	Hexachlorobenzene	118-74-1	0	74	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	Hexachlorobutadiene	87-68-3	0	83	0%	na	na	9.30E-04	yes	no	na	yes	0	0	1	0
	Hexachlorocyclopentadiene	77-47-4	0	38	0%	na	na	7.00E-05	yes	no	na	yes	0	0	1	0

Appendix D-1 Aquatic Receptor COPC Screen for Surface Water

Ecological Risk Assessment for Ogden, Utah

Group	Analyte	CAS #	DATA					Aquatic Surface Water Benchmark (mg/L)	COPC SELECTION STEPS				SURFACE WATER COPCs			
			Number of Detections	Number of Samples	Detection Frequency (DF)	Mean Non-Detected Conc (mg/L)	Maximum Detected Conc (mg/L)		Does compound have a TRV?	Is compound detected?	Is Max Detect ≥ TRV?	Is Mean DL ≥ TRV?	QUANT COPC	QUAL COPC Type 1	QUAL COPC Type 2	Not a COPC
	Hexachloroethane	67-72-1	0	74	0%	na	na	1.20E-02	yes	no	na	yes	0	0	1	0
	Isophorone	78-59-1	0	38	0%	na	na	1.17E+00	yes	no	na	yes	0	0	1	0
	Nitrobenzene	98-95-3	0	74	0%	na	na	2.70E-01	yes	no	na	yes	0	0	1	0
	N-Nitrosodiphenylamine	86-30-6	0	38	0%	na	na	2.10E-01	yes	no	na	yes	0	0	1	0
	n-Nitrosodipropylamine	621-64-7	0	74	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	Pentachlorophenol (PCP)	87-86-5	3	74	4%	na	1.00E-03	1.50E-02	yes	yes	no	na	0	0	0	1
	Phenol	108-95-2	5	74	7%	na	5.00E-03	2.56E-01	yes	yes	no	na	0	0	0	1
Volatile Organic Compounds (VOCs)	1,1,1,2-Tetrachloroethane	630-20-6	0	40	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	1,1,1-Trichloroethane	71-55-6	0	84	0%	na	na	1.10E-02	yes	no	na	yes	0	0	1	0
	1,1,2,2-Tetrachloroethane	79-34-5	0	84	0%	na	na	6.10E-01	yes	no	na	yes	0	0	1	0
	1,1,2-Trichloroethane	79-00-5	0	84	0%	na	na	1.20E+00	yes	no	na	yes	0	0	1	0
	1,1-Dichloroethane	75-34-3	0	84	0%	na	na	4.70E-02	yes	no	na	yes	0	0	1	0
	1,1-Dichloroethene	75-35-4	0	9	0%	na	na	2.50E-02	yes	no	na	yes	0	0	1	0
	1,1-Dichloropropene	563-58-6	0	9	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	1,2,3-Trichlorobenzene	87-61-6	0	9	0%	na	na	8.00E-03	yes	no	na	yes	0	0	1	0
	1,2,3-Trichloropropane	96-18-4	0	84	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	1,2,4-Trimethylbenzene	95-63-6	0	9	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	1	43	2%	na	1.70E-03	no benchmark	no	na	na	na	0	1	0	0
	1,2-Dichloroethane	107-06-2	0	84	0%	na	na	9.10E-01	yes	no	na	yes	0	0	1	0
	1,2-Dichloroethene	540-59-0	0	75	0%	na	na	5.90E-01	yes	no	na	yes	0	0	1	0
	1,2-Dichloropropane	78-87-5	0	84	0%	na	na	5.25E-01	yes	no	na	yes	0	0	1	0
	1,3,5-Trimethylbenzene	108-67-8	0	9	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	1,3-Dichloropropane	142-28-9	0	9	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	1,4-Dioxane	123-91-1	0	31	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	2,2-Dichloropropane	594-20-7	0	9	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	2-Chloro-1,3-butadiene (Chloroprene)	126-99-8	0	31	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	2-Chloroethyl vinyl ether	110-75-8	0	55	0%	na	na	3.54E+00	yes	no	na	yes	0	0	1	0
	2-Chlorotoluene	95-49-8	0	9	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	2-Hexanone	591-78-6	0	67	0%	na	na	9.90E-02	yes	no	na	yes	0	0	1	0
	3-Chloropropene (Allyl Chloride)	107-05-1	0	31	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	4-Chlorotoluene	106-43-4	0	9	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	Acetone	67-64-1	13	61	21%	na	4.00E+00	1.50E+00	yes	yes	yes	na	1	0	0	0
	Acetonitrile	75-05-8	0	75	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	Acrolein	107-02-8	0	31	0%	na	na	2.10E-03	yes	no	na	yes	0	0	1	0
	Acrylonitrile	107-13-1	0	55	0%	na	na	7.55E-02	yes	no	na	yes	0	0	1	0
	Benzene	71-43-2	1	84	1%	na	2.00E-03	1.30E-01	yes	yes	no	na	0	0	0	1
	Bromobenzene	108-86-1	0	9	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	Bromodichloromethane	75-27-4	0	84	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	Bromoform	75-25-2	0	84	0%	na	na	3.20E-01	yes	no	na	yes	0	0	1	0
	Bromomethane (Methyl bromide)	74-83-9	0	84	0%	na	na	1.10E-01	yes	no	na	yes	0	0	1	0
	Carbon Disulfide	75-15-0	1	84	1%	na	1.20E-03	9.20E-04	yes	yes	yes	na	1	0	0	0
	Carbon Tetrachloride	56-23-5	0	84	0%	na	na	9.80E-03	yes	no	na	yes	0	0	1	0
	Chlorobenzene	108-90-7	0	84	0%	na	na	6.40E-02	yes	no	na	yes	0	0	1	0
	Chlorodibromomethane	124-48-1	0	84	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	Chloroethane (Ethyl chloride)	75-00-3	0	84	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	Chloroform	67-66-3	0	84	0%	na	na	2.80E-02	yes	no	na	yes	0	0	1	0
	Chloromethane (Methyl chloride)	74-87-3	0	84	0%	na	na	5.50E+00	yes	no	na	yes	0	0	1	0
	cis-1,2-Dichloroethene	156-59-2	0	44	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	cis-1,3-Dichloropropene	10061-01-5	0	93	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	Dibromomethane	74-95-3	0	40	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	Dichlorodifluoromethane	75-71-8	1	40	3%	na	3.60E-03	no benchmark	no	na	na	na	0	1	0	0
	Dichloromethane	75-09-2	26	84	31%	na	5.80E+00	2.20E+00	yes	yes	yes	na	1	0	0	0
	Ethyl Methacrylate	97-63-2	0	31	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	Ethylbenzene	100-41-4	2	84	2%	na	8.10E-03	7.30E-03	yes	yes	yes	na	1	0	0	0
	Ethylene dibromide (EDB)	106-93-4	0	84	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	Hexane	110-54-3	0	44	0%	na	na	5.80E-04	yes	no	na	yes	0	0	1	0
	Iodomethane	74-88-4	0	31	0%	na	na	no benchmark	no	na	na	na	0	1	0	0

Appendix D-1 Aquatic Receptor COPC Screen for Surface Water

Ecological Risk Assessment for Ogden, Utah

Group	Analyte	CAS #	DATA: Number of Detections	DATA: Number of Samples	DATA: Detection Frequency (DF)	DATA: Mean Non-Detected Conc (mg/L)	DATA: Maximum Detected Conc (mg/L)	Aquatic Surface Water Benchmark (mg/L)	COPC SELECTION STEPS: Does compound have a TRV?	COPC SELECTION STEPS: Is compound detected?	COPC SELECTION STEPS: Is Max Detect ≥ TRV?	COPC SELECTION STEPS: Is Mean DL ≥ TRV?	SURFACE WATER COPCs: QUANT COPC	SURFACE WATER COPCs: QUAL COPC Type 1	SURFACE WATER COPCs: QUAL COPC Type 2	SURFACE WATER COPCs: Not a COPC
	Isobutyl Alcohol	78-83-1	0	31	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	Isopropylbenzene	98-82-8	0	18	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	Methacrylonitrile	126-98-7	0	75	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	Methyl ethyl ketone (MEK)	78-93-3	1	63	2%	na	2.20E-03	1.40E+01	yes	yes	no	na	0	0	0	1
	Methyl isobutyl ketone (MIBK)	108-10-1	1	84	1%	na	1.50E-03	1.70E-01	yes	yes	no	na	0	0	0	1
	Methyl Metharcylate	80-62-6	0	31	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	Methyl-t-butyl ether (MTBE)	1634-04-4	0	9	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	n-Butylbenzene	104-51-8	0	9	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	n-Propylbenzene	103-65-1	0	9	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	o-Xylene	95-47-6	0	9	0%	na	na	1.30E-02	yes	no	na	yes	0	0	1	0
	sec-Butylbenzene	135-98-8	0	9	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	Styrene	100-42-5	0	84	0%	na	na	7.20E-02	yes	no	na	yes	0	0	1	0
	tert-Butylbenzene	98-06-6	0	9	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	Tetrachloroethene	127-18-4	0	84	0%	na	na	9.80E-02	yes	no	na	yes	0	0	1	0
	Toluene	108-88-3	0	84	0%	na	na	9.80E-03	yes	no	na	yes	0	0	1	0
	trans-1,2-Dichloroethene	156-60-5	0	53	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	trans-1,3-Dichloropropene	10061-02-6	0	84	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	trans-1,4-Dichloro-2-Butene	110-57-6	0	31	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	Trichloroethene	79-01-6	0	84	0%	na	na	4.70E-02	yes	no	na	yes	0	0	1	0
	Trichlorofluoromethane	75-69-4	0	84	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	Vinyl Acetate	108-05-4	0	75	0%	na	na	1.60E-02	yes	no	na	yes	0	0	1	0
	Vinyl Chloride	75-01-4	0	84	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	Xylenes (Total)	1330-20-7	1	75	1%	na	4.80E-03	1.30E-02	yes	yes	no	na	0	0	0	1
	Xylenes-p,m	179601-23-1	0	9	0%	na	na	1.80E-03	yes	no	na	yes	0	0	1	0
												Totals	**21**	**71**	**68**	**34**

Appendix D-2 Aquatic Receptor COPC Screen for Sediment

Ecological Risk Assessment for Ogden, Utah

Group	Analyte	CAS #	DATA					Aquatic Sediment Benchmark (mg/kg)	COPC SELECTION STEPS				SEDIMENT COPCs			
			Number of Detections	Number of Samples	Detection Frequency (DF)	Mean Non-Detected Conc (mg/kg)	Maximum Detected Conc (mg/kg)		Does compound have a TRV?	Is compound detected?	Is Max Detect ≥ TRV?	Is Mean DL ≥ TRV?	QUANT COPC	QUAL COPC Type 1	QUAL COPC Type 2	Not a COPC
Metals	Aluminum	7429-90-5	32	32	100%	na	1.67E+04	2.55E+04	yes	yes	no	na	0	0	0	1
	Antimony	7440-36-0	2	32	6%	2.09E-03	1.40E+00	2.00E+00	yes	yes	no	na	0	0	0	1
	Arsenic	7440-38-2	30	50	60%	2.36E-03	5.40E+00	9.79E+00	yes	yes	no	na	0	0	0	1
	Barium	7440-39-3	45	50	90%	2.72E-02	2.49E+02	4.80E+04	yes	yes	no	na	0	0	0	1
	Beryllium	7440-41-7	16	32	50%	2.95E-04	6.30E-01	no benchmark	no	na	na	na	0	1	0	0
	Cadmium	7440-43-9	14	50	28%	1.77E-04	9.60E-01	9.90E-01	yes	yes	no	na	0	0	0	1
	Calcium	7440-70-2	32	32	100%	na	1.10E+05	no benchmark	no	na	na	na	0	1	0	0
	Chromium	7440-47-3	49	50	98%	5.00E-04	2.23E+01	4.34E+01	yes	yes	no	na	0	0	0	1
	Cobalt	7440-48-4	32	32	100%	na	7.70E+00	no benchmark	no	na	na	na	0	1	0	0
	Copper	7440-50-8	32	32	100%	na	3.76E+01	3.16E+01	yes	yes	yes	na	1	0	0	0
	Iron	7439-89-6	32	32	100%	na	2.10E+04	2.00E+04	yes	yes	yes	na	1	0	0	0
	Lead	7439-92-1	49	50	98%	1.00E-03	1.20E+02	3.58E+01	yes	yes	yes	na	1	0	0	0
	Magnesium	7439-95-4	32	32	100%	na	1.10E+04	no benchmark	no	na	na	na	0	1	0	0
	Manganese	7439-96-5	32	32	100%	na	9.60E+02	1.67E+03	yes	yes	no	na	0	0	0	1
	Mercury	7439-97-6	28	50	56%	2.04E-05	5.30E-01	1.80E-01	yes	yes	yes	na	1	0	0	0
	Nickel	7440-02-0	32	32	100%	na	2.00E+01	2.27E+01	yes	yes	no	na	0	0	0	1
	Potassium	7440-09-7	0	32	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	Selenium	7782-49-2	8	50	16%	1.20E-03	5.80E+00	1.00E+00	yes	yes	yes	na	1	0	0	0
	Silver	7440-22-4	10	50	20%	2.42E-04	1.20E+00	1.00E+00	yes	yes	yes	na	1	0	0	0
	Sodium	7440-23-5	32	32	100%	na	3.81E+02	no benchmark	no	na	na	na	0	1	0	0
	Thallium	7440-28-0	3	32	9%	7.47E-04	1.30E+00	no benchmark	no	na	na	na	0	1	0	0
	Vanadium	7440-62-2	32	32	100%	na	3.18E+01	5.70E+01	yes	yes	no	na	0	0	0	1
	Zinc	7440-66-6	32	32	100%	na	1.82E+02	1.21E+02	yes	yes	yes	na	1	0	0	0
Pesticides	4,4'-DDD	72-54-8	0	65	0%	4.44E-06	na	4.88E-03	yes	no	na	no	0	0	0	1
	4,4'-DDE	72-55-9	7	65	11%	4.50E-06	1.20E-02	3.16E-03	yes	yes	yes	na	1	0	0	0
	4,4'-DDT	50-29-3	2	65	3%	4.50E-06	6.10E-03	4.16E-03	yes	yes	yes	na	1	0	0	0
	Aldrin	309-00-2	0	65	0%	2.64E-06	na	4.37E-02	yes	no	na	no	0	0	0	1
	alpha-BHC	319-84-6	0	65	0%	2.64E-06	na	2.99E+00	yes	no	na	no	0	0	0	1
	alpha-Chlordane	5103-71-9	2	47	4%	2.17E-06	1.30E-02	no benchmark	no	na	na	na	0	1	0	0
	Atrazine	1912-24-9	0	21	0%	1.43E-03	na	no benchmark	no	na	na	na	0	1	0	0
	beta-BHC	319-85-7	0	65	0%	2.64E-06	na	6.38E+01	yes	no	na	no	0	0	0	1
	Caprolactam	105-60-2	0	20	0%	1.15E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Chlordane	57-74-9	0	18	0%	4.00E-05	na	3.24E-03	yes	no	na	no	0	0	0	1
	delta-BHC	319-86-8	0	65	0%	2.64E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Dieldrin	60-57-1	1	65	2%	4.47E-06	5.40E-03	1.90E-03	yes	yes	yes	na	1	0	0	0
	Endosulfan I	959-98-8	0	65	0%	2.64E-06	na	1.06E-03	yes	no	na	no	0	0	0	1
	Endosulfan II	33213-65-9	0	65	0%	4.44E-06	na	1.14E-03	yes	no	na	no	0	0	0	1
	Endosulfan Sulfate	1031-07-8	0	65	0%	4.44E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Endrin	72-20-8	0	65	0%	4.44E-06	na	2.22E-03	yes	no	na	no	0	0	0	1
	Endrin Aldehyde	7421-93-4	3	65	5%	4.49E-06	8.10E-03	no benchmark	no	na	na	na	0	1	0	0
	Endrin ketone	53494-70-5	0	47	0%	3.07E-06	na	no benchmark	no	na	na	na	0	1	0	0
	gamma-BHC (Lindane)	58-89-9	0	65	0%	2.64E-06	na	2.37E-03	yes	no	na	no	0	0	0	1
	gamma-Chlordane	12789-03-6	2	47	4%	2.17E-06	1.70E-02	no benchmark	no	na	na	na	0	1	0	0
	Heptachlor	76-44-8	0	65	0%	2.64E-06	na	3.96E-05	yes	no	na	no	0	0	0	1
	Heptachlor Epoxide	1024-57-3	0	65	0%	2.64E-06	na	2.47E-03	yes	no	na	no	0	0	0	1
	Isodrin	465-73-6	0	18	0%	4.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Kepone	143-50-0	0	18	0%	8.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Methoxychlor	72-43-5	0	65	0%	1.91E-05	na	7.20E-03	yes	no	na	no	0	0	0	1
	Toxaphene	8001-35-2	0	65	0%	1.15E-04	na	1.26E-04	yes	no	na	no	0	0	0	1
ocarbons (PAHs)	2-Chloronaphthalene	91-58-7	0	74	0%	8.25E-04	na	no benchmark	no	na	na	na	0	1	0	0
	1-Methylnaphthalene	90-12-0	2	21	10%	4.64E-04	2.10E+02	1.34E+00	yes	yes	yes	na	1	0	0	0
	2-Methylnaphthalene	91-57-6	12	100	12%	6.68E-04	1.40E+03	1.34E+00	yes	yes	yes	na	1	0	0	0
	Acenaphthene	83-32-9	24	114	21%	6.22E-04	8.50E+02	1.36E+00	yes	yes	yes	na	1	0	0	0
	Acenaphthylene	208-96-8	22	114	19%	6.00E-04	1.30E+02	1.47E+00	yes	yes	yes	na	1	0	0	0
	Aniline	62-53-3	0	28	0%	6.36E-04	na	3.56E-04	yes	no	na	yes	0	0	1	0
	Anthracene	120-12-7	36	114	32%	7.09E-04	5.20E+02	5.72E-02	yes	yes	yes	na	1	0	0	0
	Benzo[a]anthracene	56-55-3	54	114	47%	8.27E-04	3.40E+02	1.08E-01	yes	yes	yes	na	1	0	0	0
	Benzo[a]pyrene	50-32-8	59	114	52%	8.63E-04	3.50E+02	1.50E-01	yes	yes	yes	na	1	0	0	0

Appendix D-2 Aquatic Receptor COPC Screen for Sediment

Ecological Risk Assessment for Ogden, Utah

Group	Analyte	CAS #	DATA					Aquatic Sediment Benchmark (mg/kg)	COPC SELECTION STEPS				SEDIMENT COPCs			
			Number of Detections	Number of Samples	Detection Frequency (DF)	Mean Non-Detected Conc (mg/kg)	Maximum Detected Conc (mg/kg)		Does compound have a TRV?	Is compound detected?	Is Max Detect ≥ TRV?	Is Mean DL ≥ TRV?	QUANT COPC	QUAL COPC Type 1	QUAL COPC Type 2	Not a COPC
Polycyclic Aromatic Hydr	Benzo[b]fluoranthene	205-99-2	57	114	50%	8.58E-04	1.60E+02	2.94E+00	yes	yes	yes	na	1	0	0	0
	Benzo[g,h,i]perylene	191-24-2	50	114	44%	8.03E-04	2.00E+02	1.94E+00	yes	yes	yes	na	1	0	0	0
	Benzo[k]fluoranthene	207-08-9	54	114	47%	8.28E-04	1.70E+02	2.94E+00	yes	yes	yes	na	1	0	0	0
	Chrysene	218-01-9	63	114	55%	9.16E-04	3.60E+02	1.66E-01	yes	yes	yes	na	1	0	0	0
	Dibenz[a,h]anthracene	53-70-3	28	114	25%	6.54E-04	7.20E+01	3.30E-02	yes	yes	yes	na	1	0	0	0
	Dibenzofuran	132-64-9	4	74	5%	8.28E-04	4.10E+00	9.02E-02	yes	yes	yes	na	1	0	0	0
	Fluoranthene	206-44-0	65	114	57%	9.44E-04	6.40E+02	4.23E-01	yes	yes	yes	na	1	0	0	0
	Fluorene	86-73-7	20	114	18%	6.15E-04	4.20E+02	7.74E-02	yes	yes	yes	na	1	0	0	0
	Indeno[1,2,3-c,d]pyrene	193-39-5	51	114	45%	8.14E-04	1.60E+02	3.35E+00	yes	yes	yes	na	1	0	0	0
	Naphthalene	91-20-3	21	129	16%	5.48E-04	1.90E+03	1.76E-01	yes	yes	yes	na	1	0	0	0
	Phenanthrene	85-01-8	51	114	45%	8.22E-04	1.90E+03	2.04E-01	yes	yes	yes	na	1	0	0	0
	Pyrene	129-00-0	76	114	67%	1.05E-03	1.20E+03	1.95E-01	yes	yes	yes	na	1	0	0	0
Polychlorinated Biphenyls (PCBs)	Aroclor-1016	12674-11-2	0	86	0%	5.77E-05	na	5.98E-02	yes	no	na	no	0	0	0	1
	Aroclor-1221	11104-28-2	0	86	0%	7.63E-05	na	5.98E-02	yes	no	na	no	0	0	0	1
	Aroclor-1232	11141-16-5	0	86	0%	5.77E-05	na	5.98E-02	yes	no	na	no	0	0	0	1
	Aroclor-1242	53469-21-9	0	86	0%	5.77E-05	na	5.98E-02	yes	no	na	no	0	0	0	1
	Aroclor-1248	12672-29-6	0	86	0%	5.77E-05	na	5.98E-02	yes	no	na	no	0	0	0	1
	Aroclor-1254	11097-69-1	2	85	2%	5.89E-05	1.40E-01	5.98E-02	yes	yes	yes	na	1	0	0	0
	Aroclor-1260	11096-82-5	20	86	23%	4.31E-05	4.20E+00	5.98E-02	yes	yes	yes	na	1	0	0	0
	Aroclor-1268	11100-14-4	0	15	0%	4.39E-05	na	5.98E-02	yes	no	na	no	0	0	0	1
Petroleum Hydro-carbons	Total Petroleum Hydrocarbons (TPH)	TPH	11	11	100%	na	2.20E+03	no benchmark	no	na	na	na	0	1	0	0
Semi-Volatile Organic Compounds (SVOCs)	1,2,4-Trichlorobenzene	120-82-1	0	76	0%	6.10E-04	na	4.72E-01	yes	no	na	no	0	0	0	1
	1,2-Dichlorobenzene	95-50-1	0	76	0%	6.10E-04	na	1.18E-02	yes	no	na	no	0	0	0	1
	1,3-Dichlorobenzene	541-73-1	0	69	0%	5.53E-04	na	6.24E-02	yes	no	na	no	0	0	0	1
	1,4-Dichlorobenzene	106-46-7	0	76	0%	6.10E-04	na	2.70E-02	yes	no	na	no	0	0	0	1
	2,2'-oxybis(1-Chloropropane)	108-60-1	0	1	0%	2.15E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2,4,5-Trichlorophenol	95-95-4	0	74	0%	1.35E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2,4,6-Trichlorophenol	88-06-2	0	74	0%	8.25E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2,4-Dichlorophenol	120-83-2	0	74	0%	8.25E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2,4-Dimethylphenol	105-67-9	0	81	0%	8.56E-04	na	1.14E-03	yes	no	na	no	0	0	0	1
	2,4-Dinitrophenol	51-28-5	0	74	0%	1.85E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2,4-Dinitrotoluene	121-14-2	0	81	0%	8.56E-04	na	8.37E-02	yes	no	na	no	0	0	0	1
	2,6-Dinitrotoluene	606-20-2	0	81	0%	8.56E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2-Chlorophenol	95-57-8	0	74	0%	8.25E-04	na	6.72E-03	yes	no	na	no	0	0	0	1
	2-Methylphenol (o-Cresol)	95-48-7	0	81	0%	8.56E-04	na	4.02E-03	yes	no	na	no	0	0	0	1
	2-Nitroaniline	88-74-4	0	74	0%	1.85E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2-Nitrophenol	88-75-5	0	74	0%	8.25E-04	na	no benchmark	no	na	na	na	0	1	0	0
	3,3'-Dichlorobenzidine	91-94-1	1	81	1%	9.65E-04	3.70E-02	no benchmark	no	na	na	na	0	1	0	0
	3-Nitroaniline	99-09-2	0	74	0%	1.85E-03	na	no benchmark	no	na	na	na	0	1	0	0
	4,6-Dinitro-o-cresol	534-52-1	0	81	0%	2.18E-03	na	no benchmark	no	na	na	na	0	1	0	0
	4-Bromophenyl-phenylether	101-55-3	0	35	0%	1.39E-03	na	7.65E-02	yes	no	na	no	0	0	0	1
	4-Chloro-3-Methylphenol	59-50-7	0	74	0%	8.25E-04	na	6.46E-04	yes	no	na	yes	0	0	1	0
	4-Chloroaniline	106-47-8	0	74	0%	8.25E-04	na	no benchmark	no	na	na	na	0	1	0	0
	4-Chlorophenyl-phenylether	7005-72-3	0	74	0%	8.25E-04	na	no benchmark	no	na	na	na	0	1	0	0
	4-Methylphenol (p-Cresol)	106-44-5	15	81	19%	7.83E-04	4.80E+00	no benchmark	no	na	na	na	0	1	0	0
	4-Nitroaniline	100-01-6	0	74	0%	1.85E-03	na	no benchmark	no	na	na	na	0	1	0	0
	4-Nitrophenol	100-02-7	0	74	0%	1.85E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Acetophenone	98-86-2	0	20	0%	1.15E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Benzaldehyde	100-52-7	0	21	0%	1.43E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Benzyl alcohol	100-51-6	0	15	0%	1.71E-03	na	1.29E-04	yes	no	na	yes	0	0	1	0
	Biphenyl	92-52-4	1	20	5%	1.10E-03	7.90E+00	5.88E-02	yes	yes	yes	na	1	0	0	0
	bis(2-Chloroethoxy)methane	111-91-1	0	74	0%	8.25E-04	na	no benchmark	no	na	na	na	0	1	0	0
	bis-(2-Chloroethyl)ether	111-44-4	0	1	0%	2.15E-03	na	5.64E-01	yes	no	na	no	0	0	0	1
	bis(2-Chloroethyl)ether	111-44-4	0	1	0%	2.15E-03	na	5.64E-01	yes	no	na	no	0	0	0	1
	bis(2-Chloroisopropyl)ether	108-60-1	0	1	0%	2.15E-03	na	no benchmark	no	na	na	na	0	1	0	0

Appendix D-2 Aquatic Receptor COPC Screen for Sediment

Ecological Risk Assessment for Ogden, Utah

Group	Analyte	CAS #	DATA: Number of Detections	Number of Samples	Detection Frequency (DF)	Mean Non-Detected Conc (mg/kg)	Maximum Detected Conc (mg/kg)	Aquatic Sediment Benchmark (mg/kg)	COPC SELECTION STEPS: Does compound have a TRV?	Is compound detected?	Is Max Detect ≥ TRV?	Is Mean DL ≥ TRV?	SEDIMENT COPCs: QUANT COPC	QUAL COPC Type 1	QUAL COPC Type 2	Not a COPC
	bis(2-Ethylhexyl)phthalate	117-81-7	46	82	56%	1.31E-03	4.00E+00	5.22E-02	yes	yes	yes	na	1	0	0	0
	bis(n-octyl)phthalate	117-84-0	1	81	1%	8.61E-04	5.20E-01	7.16E-01	yes	yes	no	na	0	0	0	1
	Butylbenzylphthalate	85-68-7	5	81	6%	8.89E-04	6.70E-01	9.69E-01	yes	yes	no	na	0	0	0	1
	Carbazole	86-74-8	6	81	7%	8.11E-04	6.90E+00	no benchmark	no	na	na	na	0	1	0	0
	Dibutylphthalate	84-74-2	5	81	6%	8.96E-04	9.90E-02	6.63E-01	yes	yes	no	na	0	0	0	1
	Diethylphthalate	84-66-2	1	81	1%	8.64E-04	4.40E-02	6.17E-02	yes	yes	no	na	0	0	0	1
	Dimethylphthalate	131-11-3	0	74	0%	8.25E-04	na	3.96E-02	yes	no	na	no	0	0	0	1
	Hexachlorobenzene	118-74-1	0	81	0%	8.56E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Hexachlorobutadiene	87-68-3	0	96	0%	7.22E-04	na	6.42E-03	yes	no	na	no	0	0	0	1
	Hexachlorocyclopentadiene	77-47-4	0	74	0%	8.25E-04	na	4.20E-04	yes	no	na	yes	0	0	1	0
	Hexachloroethane	67-72-1	0	81	0%	8.56E-04	na	7.88E-02	yes	no	na	no	0	0	0	1
	Isophorone	78-59-1	0	74	0%	8.25E-04	na	8.78E-02	yes	no	na	no	0	0	0	1
	Nitrobenzene	98-95-3	0	81	0%	8.56E-04	na	1.85E-01	yes	no	na	no	0	0	0	1
	N-Nitrosodiphenylamine	86-30-6	0	74	0%	8.25E-04	na	7.56E-01	yes	no	na	no	0	0	0	1
	n-Nitrosodipropylamine	621-64-7	0	81	0%	8.56E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Pentachlorophenol (PCP)	87-86-5	0	81	0%	2.22E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Phenol	108-95-2	2	81	2%	8.73E-04	1.10E-01	2.32E-02	yes	yes	yes	na	1	0	0	0
e Organic Compounds (VOCs)	1,1,1,2-Tetrachloroethane	630-20-6	0	35	0%	3.29E-06	na	no benchmark	no	na	na	na	0	1	0	0
	1,1,1-Trichloroethane	71-55-6	0	68	0%	3.05E-06	na	5.91E-03	yes	no	na	no	0	0	0	1
	1,1,2,2-Tetrachloroethane	79-34-5	0	68	0%	3.05E-06	na	1.45E-01	yes	no	na	no	0	0	0	1
	1,1,2-Trichloroethane	79-00-5	1	68	1%	3.06E-06	4.00E-03	2.84E-01	yes	yes	no	na	0	0	0	1
	1,1-Dichloroethane	75-34-3	1	68	1%	3.06E-06	5.20E-03	5.64E-03	yes	yes	no	na	0	0	0	1
	1,1-Dichloroethene	75-35-4	0	15	0%	1.00E-06	na	2.57E-02	yes	no	na	no	0	0	0	1
	1,1-Dichloropropene	563-58-6	0	15	0%	1.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	1,2,3-Trichlorobenzene	87-61-6	0	15	0%	1.00E-06	na	9.67E-02	yes	no	na	no	0	0	0	1
	1,2,3-Trichloropropane	96-18-4	0	68	0%	3.79E-06	na	no benchmark	no	na	na	na	0	1	0	0
	1,2,4-Trimethylbenzene	95-63-6	1	15	7%	1.02E-06	1.20E-01	no benchmark	no	na	na	na	0	1	0	0
	1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	0	56	0%	4.21E-06	na	no benchmark	no	na	na	na	0	1	0	0
	1,2-Dichloroethane	107-06-2	0	68	0%	3.05E-06	na	8.74E-02	yes	no	na	no	0	0	0	1
	1,2-Dichloroethene	540-59-0	0	53	0%	6.26E-06	na	6.20E-02	yes	no	na	no	0	0	0	1
	1,2-Dichloropropane	78-87-5	0	68	0%	3.05E-06	na	4.25E-02	yes	no	na	no	0	0	0	1
	1,3,5-Trimethylbenzene	108-67-8	1	15	7%	1.02E-06	1.20E-01	no benchmark	no	na	na	na	0	1	0	0
	1,3-Dichloropropane	142-28-9	0	15	0%	1.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	1,4-Dioxane	123-91-1	0	20	0%	1.50E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2,2-Dichloropropane	594-20-7	0	15	0%	1.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	2-Chloro-1,3-butadiene (Chloroprene)	126-99-8	0	20	0%	5.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	2-Chloroethyl vinyl ether	110-75-8	0	53	0%	4.73E-06	na	8.61E-02	yes	no	na	no	0	0	0	1
	2-Chlorotoluene	95-49-8	0	15	0%	1.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	2-Hexanone	591-78-6	0	68	0%	6.06E-06	na	3.87E-03	yes	no	na	no	0	0	0	1
	3-Chloropropene (Allyl Chloride)	107-05-1	0	20	0%	5.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	4-Chlorotoluene	106-43-4	0	15	0%	1.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Acetone	67-64-1	38	68	56%	7.80E-06	3.90E-01	8.10E-02	yes	yes	yes	na	1	0	0	0
	Acetonitrile	75-05-8	0	53	0%	1.98E-05	na	no benchmark	no	na	na	na	0	1	0	0
	Acrolein	107-02-8	1	53	2%	3.16E-05	4.50E-03	3.15E-05	yes	yes	yes	na	1	0	0	0
	Acrylonitrile	107-13-1	1	53	2%	2.00E-05	1.00E-02	2.04E-03	yes	yes	yes	na	1	0	0	0
	Benzene	71-43-2	3	68	4%	3.00E-06	4.80E-02	1.91E-02	yes	yes	yes	na	1	0	0	0
	Bromobenzene	108-86-1	0	15	0%	1.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Bromodichloromethane	75-27-4	0	68	0%	3.05E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Bromoform	75-25-2	0	68	0%	3.05E-06	na	2.71E-01	yes	no	na	no	0	0	0	1
	Bromomethane (Methyl bromide)	74-83-9	4	68	6%	5.96E-06	1.00E-02	3.23E-03	yes	yes	yes	na	1	0	0	0
	Carbon Disulfide	75-15-0	12	68	18%	3.17E-06	7.00E-03	2.46E-04	yes	yes	yes	na	1	0	0	0
	Carbon Tetrachloride	56-23-5	0	68	0%	3.05E-06	na	6.59E-03	yes	no	na	no	0	0	0	1
	Chlorobenzene	108-90-7	1	68	1%	3.06E-06	1.90E-03	4.01E-02	yes	yes	no	na	0	0	0	1
	Chlorodibromomethane	124-48-1	0	68	0%	3.05E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Chloroethane (Ethyl chloride)	75-00-3	0	68	0%	5.72E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Chloroform	67-66-3	0	68	0%	3.05E-06	na	3.36E-03	yes	no	na	no	0	0	0	1
	Chloromethane (Methyl chloride)	74-87-3	1	68	1%	5.51E-06	5.00E-03	1.22E+00	yes	yes	no	na	0	0	0	1
	cis-1,2-Dichloroethene	156-59-2	0	33	0%	5.09E-06	na	no benchmark	no	na	na	na	0	1	0	0

Appendix D-2 Aquatic Receptor COPC Screen for Sediment

Ecological Risk Assessment for Ogden, Utah

Group	Analyte	CAS #	DATA: Number of Detections	DATA: Number of Samples	DATA: Detection Frequency (DF)	DATA: Mean Non-Detected Conc (mg/kg)	DATA: Maximum Detected Conc (mg/kg)	Aquatic Sediment Benchmark (mg/kg)	COPC SELECTION STEPS: Does compound have a TRV?	COPC SELECTION STEPS: Is compound detected?	COPC SELECTION STEPS: Is Max Detect ≥ TRV?	COPC SELECTION STEPS: Is Mean DL ≥ TRV?	SEDIMENT COPCs: QUANT COPC	SEDIMENT COPCs: QUAL COPC Type 1	SEDIMENT COPCs: QUAL COPC Type 2	SEDIMENT COPCs: Not a COPC
Volatil	cis-1,3-Dichloropropene	10061-01-5	0	83	0%	2.68E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Dibromomethane	74-95-3	0	35	0%	3.29E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Dichlorodifluoromethane	75-71-8	14	35	40%	4.83E-06	1.61E-02	no benchmark	no	na	na	na	0	1	0	0
	Dichloromethane	75-09-2	34	68	50%	2.45E-06	1.30E-02	1.85E-01	yes	yes	no	na	0	0	0	1
	Ethyl Methacrylate	97-63-2	0	20	0%	2.50E-05	na	no benchmark	no	na	na	na	0	1	0	0
	Ethylbenzene	100-41-4	4	68	6%	3.00E-06	2.70E-01	5.48E-03	yes	yes	yes	na	1	0	0	0
	Ethylene dibromide (EDB)	106-93-4	0	68	0%	3.90E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Hexane	110-54-3	0	33	0%	4.32E-06	na	2.59E-04	yes	no	na	no	0	0	0	1
	Iodomethane	74-88-4	0	20	0%	5.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Isobutyl Alcohol	78-83-1	0	22	0%	4.90E-05	na	no benchmark	no	na	na	na	0	1	0	0
	Isopropylbenzene	98-82-8	4	30	13%	1.01E-06	3.96E-02	no benchmark	no	na	na	na	0	1	0	0
	Methacrylonitrile	126-98-7	0	53	0%	7.21E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Methyl ethyl ketone (MEK)	78-93-3	20	49	41%	4.98E-06	6.00E-02	2.18E-01	yes	yes	no	na	0	0	0	1
	Methyl isobutyl ketone (MIBK)	108-10-1	1	68	1%	6.08E-06	6.40E-03	9.69E-03	yes	yes	no	na	0	0	0	1
	Methyl Metharcylate	80-62-6	0	20	0%	5.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Methyl-t-butyl ether (MTBE)	1634-04-4	1	15	7%	1.03E-06	2.10E-03	no benchmark	no	na	na	na	0	1	0	0
	n-Butylbenzene	104-51-8	0	15	0%	1.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	n-Propylbenzene	103-65-1	1	15	7%	1.02E-06	2.41E-02	no benchmark	no	na	na	na	0	1	0	0
	o-Xylene	95-47-6	1	15	7%	1.02E-06	8.05E-02	5.03E-03	yes	yes	yes	na	1	0	0	0
	sec-Butylbenzene	135-98-8	1	15	7%	1.02E-06	3.26E-03	no benchmark	no	na	na	na	0	1	0	0
	Styrene	100-42-5	0	68	0%	3.05E-06	na	1.99E-01	yes	no	na	no	0	0	0	1
	tert-Butylbenzene	98-06-6	0	15	0%	1.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Tetrachloroethene	127-18-4	0	68	0%	3.05E-06	na	1.07E-01	yes	no	na	no	0	0	0	1
	Toluene	108-88-3	29	68	43%	3.62E-06	1.90E+00	2.79E-03	yes	yes	yes	na	1	0	0	0
	trans-1,2-Dichloroethene	156-60-5	0	48	0%	3.81E-06	na	no benchmark	no	na	na	na	0	1	0	0
	trans-1,3-Dichloropropene	10061-02-6	0	68	0%	3.05E-06	na	no benchmark	no	na	na	na	0	1	0	0
	trans-1,4-Dichloro-2-Butene	110-57-6	0	20	0%	5.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Trichloroethene	79-01-6	0	68	0%	3.05E-06	na	1.47E-02	yes	no	na	no	0	0	0	1
	Trichlorofluoromethane	75-69-4	0	68	0%	4.99E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Vinyl Acetate	108-05-4	0	53	0%	4.73E-06	na	9.12E-04	yes	no	na	no	0	0	0	1
	Vinyl Chloride	75-01-4	0	68	0%	5.84E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Xylenes (Total)	1330-20-7	5	53	9%	9.49E-06	1.30E-01	5.03E-03	yes	yes	yes	na	1	0	0	0
	Xylenes-p,m	179601-23-1	1	15	7%	1.02E-06	5.12E-02	1.40E-03	yes	yes	yes	na	1	0	0	0
												Totals	**45**	**82**	**4**	**73**

Appendix D-3 COPC Screen for Surface Soil for Terrestrial Receptors from Direct Contact

Ecological Risk Assessment for Ogden, Utah

			DATA						COPC SELECTION STEPS				SURFACE SOIL COPCs			
Group	**Analyte**	**CAS #**	Number of Detections	Number of Samples	Detection Frequency (DF)	Mean Non-Detected Conc (mg/kg)	Maximum Detected Conc (mg/kg)	Terrestrial Soil Benchmark (mg/kg)	Does compound have a TRV?	Is compound detected?	Is Max Detect ≥ TRV?	Is Mean DL ≥ TRV?	**QUANT COPC**	**QUAL COPC Type 1**	**QUAL COPC Type 2**	**Not a COPC**
Metals	Aluminum	7429-90-5	44	44	100%	na	1.30E+04	5.00E+01	yes	yes	yes	na	1	0	0	0
	Antimony	7440-36-0	9	44	20%	1.09E-03	8.00E+00	3.00E+00	yes	yes	yes	na	1	0	0	0
	Arsenic	7440-38-2	48	60	80%	3.19E-03	2.40E+01	1.00E+01	yes	yes	yes	na	1	0	0	0
	Barium	7440-39-3	54	60	90%	3.81E-02	2.58E+02	1.60E+02	yes	yes	yes	na	1	0	0	0
	Beryllium	7440-41-7	37	44	84%	2.39E-04	9.30E-01	1.10E+00	yes	yes	no	na	0	0	0	1
	Cadmium	7440-43-9	47	60	78%	8.08E-05	7.70E+00	8.00E-01	yes	yes	yes	na	1	0	0	0
	Calcium	7440-70-2	44	44	100%	na	3.78E+04	no benchmark	no	na	na	na	0	1	0	0
	Chromium	7440-47-3	60	60	100%	na	1.96E+01	4.00E-01	yes	yes	yes	na	1	0	0	0
	Cobalt	7440-48-4	43	44	98%	1.35E-03	7.50E+00	9.00E+00	yes	yes	no	na	0	0	0	1
	Copper	7440-50-8	44	44	100%	na	1.04E+02	3.60E+01	yes	yes	yes	na	1	0	0	0
	Iron	7439-89-6	44	44	100%	na	1.60E+04	2.00E+02	yes	yes	yes	na	1	0	0	0
	Lead	7439-92-1	60	60	100%	na	9.40E+02	5.00E+01	yes	yes	yes	na	1	0	0	0
	Magnesium	7439-95-4	44	44	100%	na	1.00E+04	no benchmark	no	na	na	na	0	1	0	0
	Manganese	7439-96-5	44	44	100%	na	6.30E+02	1.00E+02	yes	yes	yes	na	1	0	0	0
	Mercury	7439-97-6	58	65	89%	1.89E-05	3.60E+00	1.00E-01	yes	yes	yes	na	1	0	0	0
	Nickel	7440-02-0	44	44	100%	na	1.90E+01	3.00E+01	yes	yes	no	na	0	0	0	1
	Potassium	7440-09-7	44	44	100%	na	3.29E+03	no benchmark	no	na	na	na	0	1	0	0
	Selenium	7782-49-2	15	60	25%	1.01E-03	1.10E+00	7.00E-01	yes	yes	yes	na	1	0	0	0
	Silver	7440-22-4	18	60	30%	1.44E-04	4.30E+00	2.00E+00	yes	yes	yes	na	1	0	0	0
	Sodium	7440-23-5	44	44	100%	na	9.30E+02	no benchmark	no	na	na	na	0	1	0	0
	Thallium	7440-28-0	0	44	0%	7.38E-04	na	1.00E+00	yes	no	na	no	0	0	0	1
	Vanadium	7440-62-2	44	44	100%	na	2.25E+01	2.00E+00	yes	yes	yes	na	1	0	0	0
	Zinc	7440-66-6	44	44	100%	na	9.40E+02	5.00E+01	yes	yes	yes	na	1	0	0	0
Pesticides	4,4'-DDD	72-54-8	0	22	0%	3.63E-06	na	no benchmark	no	na	na	na	0	1	0	0
	4,4'-DDE	72-55-9	1	22	5%	3.71E-06	1.80E-03	no benchmark	no	na	na	na	0	1	0	0
	4,4'-DDT	50-29-3	4	22	18%	3.99E-06	1.50E-02	no benchmark	no	na	na	na	0	1	0	0
	Aldrin	309-00-2	0	22	0%	2.28E-06	na	no benchmark	no	na	na	na	0	1	0	0
	alpha-BHC	319-84-6	0	22	0%	2.28E-06	na	no benchmark	no	na	na	na	0	1	0	0
	alpha-Chlordane	5103-71-9	0	16	0%	1.63E-06	na	no benchmark	no	na	na	na	0	1	0	0
	beta-BHC	319-85-7	0	22	0%	2.28E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Chlordane	57-74-9	0	6	0%	4.00E-05	na	3.00E-05	yes	no	na	yes	0	0	1	0
	delta-BHC	319-86-8	0	22	0%	2.28E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Dieldrin	60-57-1	0	22	0%	3.63E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Endosulfan I	959-98-8	0	22	0%	2.28E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Endosulfan II	33213-65-9	0	22	0%	3.63E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Endosulfan Sulfate	1031-07-8	0	22	0%	3.63E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Endrin	72-20-8	0	22	0%	3.63E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Endrin Aldehyde	7421-93-4	3	22	14%	3.87E-06	9.80E-03	no benchmark	no	na	na	na	0	1	0	0
	Endrin ketone	53494-70-5	0	16	0%	1.99E-06	na	no benchmark	no	na	na	na	0	1	0	0
	gamma-BHC (Lindane)	58-89-9	0	22	0%	2.28E-06	na	no benchmark	no	na	na	na	0	1	0	0
	gamma-Chlordane	12789-03-6	3	16	19%	1.76E-06	5.10E-03	no benchmark	no	na	na	na	0	1	0	0
	Heptachlor	76-44-8	0	22	0%	2.28E-06	na	7.00E-04	yes	no	na	no	0	0	0	1
	Heptachlor Epoxide	1024-57-3	0	22	0%	2.28E-06	na	2.00E-07	yes	no	na	yes	0	0	1	0
	Isodrin	465-73-6	0	6	0%	4.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Kepone	143-50-0	0	6	0%	8.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Methoxychlor	72-43-5	0	22	0%	1.46E-05	na	no benchmark	no	na	na	na	0	1	0	0
	Toxaphene	8001-35-2	0	22	0%	7.20E-05	na	no benchmark	no	na	na	na	0	1	0	0
	2-Chloronaphthalene	91-58-7	0	72	0%	3.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2-Methylnaphthalene	91-57-6	9	73	12%	3.20E-04	2.00E-01	no benchmark	no	na	na	na	0	1	0	0
	Acenaphthene	83-32-9	2	73	3%	3.07E-04	3.10E-01	2.00E+01	yes	yes	no	na	0	0	0	1

Appendix D-3 COPC Screen for Surface Soil for Terrestrial Receptors from Direct Contact

Ecological Risk Assessment for Ogden, Utah

Group	Analyte	CAS #	DATA: Number of Detections	DATA: Number of Samples	DATA: Detection Frequency (DF)	DATA: Mean Non-Detected Conc (mg/kg)	DATA: Maximum Detected Conc (mg/kg)	Terrestrial Soil Benchmark (mg/kg)	COPC SELECTION STEPS: Does compound have a TRV?	COPC SELECTION STEPS: Is compound detected?	COPC SELECTION STEPS: Is Max Detect ≥ TRV?	COPC SELECTION STEPS: Is Mean DL ≥ TRV?	SURFACE SOIL COPCs: QUANT COPC	SURFACE SOIL COPCs: QUAL COPC Type 1	SURFACE SOIL COPCs: QUAL COPC Type 2	SURFACE SOIL COPCs: Not a COPC
Polycyclic Aromatic Hydrocarbons (PAHs)	Acenaphthylene	208-96-8	2	73	3%	3.07E-04	4.00E-01	no benchmark	no	na	na	na	0	1	0	0
	Aniline	62-53-3	0	48	0%	2.16E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Anthracene	120-12-7	5	73	7%	3.13E-04	7.10E-01	no benchmark	no	na	na	na	0	1	0	0
	Benzo[a]anthracene	56-55-3	8	73	11%	3.19E-04	1.40E+00	no benchmark	no	na	na	na	0	1	0	0
	Benzo[a]pyrene	50-32-8	7	73	10%	3.17E-04	1.60E+00	no benchmark	no	na	na	na	0	1	0	0
	Benzo[b]fluoranthene	205-99-2	11	73	15%	3.27E-04	1.20E+00	no benchmark	no	na	na	na	0	1	0	0
	Benzo[g,h,i]perylene	191-24-2	14	73	19%	3.10E-04	1.60E+00	no benchmark	no	na	na	na	0	1	0	0
	Benzo[k]fluoranthene	207-08-9	6	73	8%	3.14E-04	1.60E+00	no benchmark	no	na	na	na	0	1	0	0
	Chrysene	218-01-9	13	73	18%	3.31E-04	2.10E+00	no benchmark	no	na	na	na	0	1	0	0
	Dibenz[a,h]anthracene	53-70-3	3	73	4%	3.19E-04	9.60E-02	no benchmark	no	na	na	na	0	1	0	0
	Dibenzofuran	132-64-9	1	72	1%	3.17E-04	4.50E-02	no benchmark	no	na	na	na	0	1	0	0
	Fluoranthene	206-44-0	15	73	21%	3.37E-04	2.30E+00	no benchmark	no	na	na	na	0	1	0	0
	Fluorene	86-73-7	2	73	3%	3.07E-04	2.20E-01	3.00E+01	yes	yes	no	na	0	0	0	1
	Indeno[1,2,3-c,d]pyrene	193-39-5	9	73	12%	3.21E-04	1.50E+00	no benchmark	no	na	na	na	0	1	0	0
	Naphthalene	91-20-3	14	83	17%	2.83E-04	2.70E-01	no benchmark	no	na	na	na	0	1	0	0
	Phenanthrene	85-01-8	17	73	23%	3.41E-04	2.30E+00	no benchmark	no	na	na	na	0	1	0	0
	Pyrene	129-00-0	27	73	37%	3.72E-04	3.70E+00	no benchmark	no	na	na	na	0	1	0	0
Polychlorinated Biphenyls (PCBs)	Aroclor-1016	12674-11-2	0	22	0%	2.77E-05	na	2.00E-02	yes	no	na	no	0	0	0	1
	Aroclor-1221	11104-28-2	0	22	0%	4.47E-05	na	2.00E-02	yes	no	na	no	0	0	0	1
	Aroclor-1232	11141-16-5	0	22	0%	2.77E-05	na	2.00E-02	yes	no	na	no	0	0	0	1
	Aroclor-1242	53469-21-9	0	22	0%	2.77E-05	na	2.00E-02	yes	no	na	no	0	0	0	1
	Aroclor-1248	12672-29-6	0	22	0%	2.77E-05	na	2.00E-02	yes	no	na	no	0	0	0	1
	Aroclor-1254	11097-69-1	0	22	0%	2.77E-05	na	2.00E-02	yes	no	na	no	0	0	0	1
	Aroclor-1260	11096-82-5	6	22	27%	2.99E-05	5.50E-01	2.00E-02	yes	yes	yes	na	1	0	0	0
	Aroclor-1268	11100-14-4	0	10	0%	2.52E-05	na	2.00E-02	yes	no	na	no	0	0	0	1
	1,2,4-Trichlorobenzene	120-82-1	0	83	0%	2.76E-04	na	2.00E+01	yes	no	na	no	0	0	0	1
	1,2-Dichlorobenzene	95-50-1	0	83	0%	2.76E-04	na	no benchmark	no	na	na	na	0	1	0	0
	1,3-Dichlorobenzene	541-73-1	0	82	0%	2.77E-04	na	no benchmark	no	na	na	na	0	1	0	0
	1,4-Dichlorobenzene	106-46-7	0	83	0%	2.76E-04	na	2.00E+01	yes	no	na	no	0	0	0	1
	1-Methylnaphthalene	90-12-0	5	47	11%	2.03E-04	2.30E-01	no benchmark	no	na	na	na	0	1	0	0
	2,2'-oxybis(1-Chloropropane)	108-60-1	0	26	0%	4.88E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2,4,5-Trichlorophenol	95-95-4	0	72	0%	3.67E-04	na	4.00E+00	yes	no	na	no	0	0	0	1
	2,4,6-Trichlorophenol	88-06-2	0	72	0%	3.15E-04	na	1.00E+01	yes	no	na	no	0	0	0	1
	2,4-Dichlorophenol	120-83-2	0	72	0%	3.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2,4-Dimethylphenol	105-67-9	0	72	0%	3.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2,4-Dinitrophenol	51-28-5	0	72	0%	9.15E-04	na	2.00E+01	yes	no	na	no	0	0	0	1
	2,4-Dinitrotoluene	121-14-2	0	73	0%	3.13E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2,6-Dinitrotoluene	606-20-2	0	73	0%	3.13E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2-Chlorophenol	95-57-8	0	72	0%	3.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2-Methylphenol (o-Cresol)	95-48-7	0	72	0%	3.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2-Nitroaniline	88-74-4	0	72	0%	9.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2-Nitrophenol	88-75-5	0	72	0%	3.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	3,3'-Dichlorobenzidine	91-94-1	1	73	1%	3.18E-04	4.30E-02	no benchmark	no	na	na	na	0	1	0	0
	3-Nitroaniline	99-09-2	0	72	0%	9.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	4,6-Dinitro-o-cresol	534-52-1	0	72	0%	9.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	4-Bromophenyl-phenylether	101-55-3	0	10	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	4-Chloro-3-Methylphenol	59-50-7	0	72	0%	3.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	4-Chloroaniline	106-47-8	0	72	0%	3.15E-04	na	5.00E-03	yes	no	na	no	0	0	0	1
	4-Chlorophenyl-phenylether	7005-72-3	0	72	0%	3.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	4-Methylphenol (p-Cresol)	106-44-5	1	72	1%	3.17E-04	1.10E-01	no benchmark	no	na	na	na	0	1	0	0

Appendix D-3 COPC Screen for Surface Soil for Terrestrial Receptors from Direct Contact

Ecological Risk Assessment for Ogden, Utah

Group	Analyte	CAS #	DATA					Terrestrial Soil Benchmark (mg/kg)	COPC SELECTION STEPS				SURFACE SOIL COPCs			
			Number of Detections	Number of Samples	Detection Frequency (DF)	Mean Non-Detected Conc (mg/kg)	Maximum Detected Conc (mg/kg)		Does compound have a TRV?	Is compound detected?	Is Max Detect ≥ TRV?	Is Mean DL ≥ TRV?	**QUANT COPC**	**QUAL COPC Type 1**	**QUAL COPC Type 2**	**Not a COPC**
	4-Nitroaniline	100-01-6	0	72	0%	9.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	4-Nitrophenol	100-02-7	0	72	0%	9.15E-04	na	7.00E+00	yes	no	na	no	0	0	0	1
	Benzyl alcohol	100-51-6	0	10	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	bis(2-Chloroethoxy)methane	111-91-1	0	72	0%	3.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	bis-(2-Chloroethyl)ether	111-44-4	0	73	0%	3.13E-04	na	no benchmark	no	na	na	na	0	1	0	0
	bis(2-Chloroethyl)ether	111-44-4	0	73	0%	3.13E-04	na	no benchmark	no	na	na	na	0	1	0	0
	bis(2-Chloroisopropyl)ether	108-60-1	0	26	0%	4.88E-04	na	no benchmark	no	na	na	na	0	1	0	0
	bis(2-Ethylhexyl)phthalate	117-81-7	32	73	44%	2.96E-04	1.50E+00	no benchmark	no	na	na	na	0	1	0	0
	bis(n-octyl)phthalate	117-84-0	1	73	1%	3.15E-04	5.10E-02	no benchmark	no	na	na	na	0	1	0	0
	Butylbenzylphthalate	85-68-7	9	73	12%	3.31E-04	2.80E-01	no benchmark	no	na	na	na	0	1	0	0
	Carbazole	86-74-8	3	73	4%	3.09E-04	2.60E-01	no benchmark	no	na	na	na	0	1	0	0
	Dibutylphthalate	84-74-2	20	73	27%	3.21E-04	2.20E-01	2.00E+02	yes	yes	no	na	0	0	0	1
	Diethylphthalate	84-66-2	0	73	0%	3.13E-04	na	1.00E+02	yes	no	na	no	0	0	0	1
	Dimethylphthalate	131-11-3	0	72	0%	3.15E-04	na	2.00E+02	yes	no	na	no	0	0	0	1
	Hexachlorobenzene	118-74-1	0	73	0%	3.13E-04	na	1.00E+03	yes	no	na	no	0	0	0	1
	Hexachlorobutadiene	87-68-3	0	83	0%	2.76E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Hexachlorocyclopentadiene	77-47-4	0	72	0%	3.15E-04	na	1.00E+01	yes	no	na	no	0	0	0	1
	Hexachloroethane	67-72-1	0	73	0%	3.13E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Isophorone	78-59-1	0	72	0%	3.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Nitrobenzene	98-95-3	0	73	0%	3.13E-04	na	4.00E+01	yes	no	na	no	0	0	0	1
	N-Nitrosodiphenylamine	86-30-6	0	72	0%	3.15E-04	na	2.00E+01	yes	no	na	no	0	0	0	1
	n-Nitrosodipropylamine	621-64-7	0	73	0%	3.13E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Pentachlorophenol (PCP)	87-86-5	0	72	0%	9.15E-04	na	3.00E+00	yes	no	na	no	0	0	0	1
	Phenol	108-95-2	0	72	0%	3.15E-04	na	5.00E-02	yes	no	na	no	0	0	0	1
	1,1,1,2-Tetrachloroethane	630-20-6	0	25	0%	3.33E-06	na	no benchmark	no	na	na	na	0	1	0	0
	1,1,1-Trichloroethane	71-55-6	0	70	0%	2.81E-06	na	7.00E-02	yes	no	na	no	0	0	0	1
	1,1,2,2-Tetrachloroethane	79-34-5	1	70	1%	2.82E-06	1.20E-03	no benchmark	no	na	na	na	0	1	0	0
	1,1,2-Trichloroethane	79-00-5	0	70	0%	2.81E-06	na	4.00E-01	yes	no	na	no	0	0	0	1
	1,1-Dichloroethane	75-34-3	1	70	1%	2.82E-06	6.40E-03	2.00E-02	yes	yes	no	na	0	0	0	1
	1,1-Dichloroethene	75-35-4	0	10	0%	8.29E-07	na	1.00E-01	yes	no	na	no	0	0	0	1
	1,1-Dichloropropene	563-58-6	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	1,2,3-Trichlorobenzene	87-61-6	0	10	0%	8.29E-07	na	2.00E+01	yes	no	na	no	0	0	0	1
	1,2,3-Trichloropropane	96-18-4	0	70	0%	3.35E-06	na	no benchmark	no	na	na	na	0	1	0	0
	1,2,4-Trimethylbenzene	95-63-6	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	0	70	0%	3.35E-06	na	no benchmark	no	na	na	na	0	1	0	0
	1,2-Dichloroethane	107-06-2	0	70	0%	2.81E-06	na	2.00E-02	yes	no	na	no	0	0	0	1
	1,2-Dichloroethene	540-59-0	0	60	0%	5.67E-06	na	2.00E-01	yes	no	na	no	0	0	0	1
	1,2-Dichloropropane	78-87-5	0	70	0%	2.81E-06	na	2.00E-03	yes	no	na	no	0	0	0	1
	1,3,5-Trimethylbenzene	108-67-8	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	1,3-Dichloropropane	142-28-9	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	1,4-Dioxane	123-91-1	0	15	0%	1.50E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2,2-Dichloropropane	594-20-7	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	2-Chloro-1,3-butadiene (Chloroprene)	126-99-8	0	15	0%	5.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	2-Chloroethyl vinyl ether	110-75-8	0	60	0%	3.78E-06	na	no benchmark	no	na	na	na	0	1	0	0
	2-Chlorotoluene	95-49-8	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	2-Hexanone	591-78-6	0	70	0%	5.63E-06	na	no benchmark	no	na	na	na	0	1	0	0
	3-Chloropropene (Allyl Chloride)	107-05-1	0	15	0%	5.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	4-Chlorotoluene	106-43-4	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	Acetone	67-64-1	4	70	6%	6.32E-06	2.80E-02	no benchmark	no	na	na	na	0	1	0	0
	Acetonitrile	75-05-8	0	60	0%	1.63E-05	na	no benchmark	no	na	na	na	0	1	0	0

Appendix D-3 COPC Screen for Surface Soil for Terrestrial Receptors from Direct Contact

Ecological Risk Assessment for Ogden, Utah

Group	Analyte	CAS #	DATA					Terrestrial Soil Benchmark (mg/kg)	COPC SELECTION STEPS				SURFACE SOIL COPCs			
			Number of Detections	Number of Samples	Detection Frequency (DF)	Mean Non-Detected Conc (mg/kg)	Maximum Detected Conc (mg/kg)		Does compound have a TRV?	Is compound detected?	Is Max Detect ≥ TRV?	Is Mean DL ≥ TRV?	**QUANT COPC**	**QUAL COPC Type 1**	**QUAL COPC Type 2**	**Not a COPC**
Volatile Organic Compounds (VOCs)	Acrolein	107-02-8	0	46	0%	2.54E-05	na	no benchmark	no	na	na	na	0	1	0	0
	Acrylonitrile	107-13-1	0	60	0%	1.64E-05	na	7.00E-06	yes	no	na	yes	0	0	1	0
	Benzene	71-43-2	2	70	3%	2.81E-06	1.20E-03	1.00E-02	yes	yes	no	na	0	0	0	1
	Bromobenzene	108-86-1	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	Bromodichloromethane	75-27-4	0	70	0%	2.81E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Bromoform	75-25-2	0	70	0%	2.81E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Bromomethane (Methyl bromide)	74-83-9	0	70	0%	5.62E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Carbon Disulfide	75-15-0	0	70	0%	2.81E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Carbon Tetrachloride	56-23-5	0	70	0%	2.81E-06	na	4.00E-01	yes	no	na	no	0	0	0	1
	Chlorobenzene	108-90-7	0	70	0%	2.81E-06	na	4.00E+01	yes	no	na	no	0	0	0	1
	Chlorodibromomethane	124-48-1	0	70	0%	2.81E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Chloroethane (Ethyl chloride)	75-00-3	0	70	0%	5.51E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Chloroform	67-66-3	1	70	1%	2.84E-06	1.00E-03	2.00E-02	yes	yes	no	na	0	0	0	1
	Chloromethane (Methyl chloride)	74-87-3	0	70	0%	5.51E-06	na	no benchmark	no	na	na	na	0	1	0	0
	cis-1,2-Dichloroethene	156-59-2	0	45	0%	3.40E-06	na	no benchmark	no	na	na	na	0	1	0	0
	cis-1,3-Dichloropropene	10061-01-5	0	80	0%	2.56E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Dibromomethane	74-95-3	0	25	0%	3.33E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Dichlorodifluoromethane	75-71-8	1	25	4%	3.44E-06	2.20E-03	no benchmark	no	na	na	na	0	1	0	0
	Dichloromethane	75-09-2	22	70	31%	2.13E-06	7.80E-03	4.00E-01	yes	yes	no	na	0	0	0	1
	Ethyl Methacrylate	97-63-2	0	15	0%	2.50E-05	na	no benchmark	no	na	na	na	0	1	0	0
	Ethylbenzene	100-41-4	1	70	1%	2.82E-06	2.40E-03	3.00E-02	yes	yes	no	na	0	0	0	1
	Ethylene dibromide (EDB)	106-93-4	0	70	0%	3.35E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Hexane	110-54-3	0	45	0%	3.32E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Iodomethane	74-88-4	0	15	0%	5.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Isobutyl Alcohol	78-83-1	0	15	0%	5.00E-05	na	no benchmark	no	na	na	na	0	1	0	0
	Isopropylbenzene	98-82-8	0	20	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	Methacrylonitrile	126-98-7	0	60	0%	6.29E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Methyl ethyl ketone (MEK)	78-93-3	0	27	0%	4.38E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Methyl isobutyl ketone (MIBK)	108-10-1	0	70	0%	5.63E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Methyl Metharcylate	80-62-6	0	15	0%	5.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Methyl-t-butyl ether (MTBE)	1634-04-4	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	n-Butylbenzene	104-51-8	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	n-Propylbenzene	103-65-1	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	o-Xylene	95-47-6	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	sec-Butylbenzene	135-98-8	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	Styrene	100-42-5	0	70	0%	2.81E-06	na	3.00E-01	yes	no	na	no	0	0	0	1
	tert-Butylbenzene	98-06-6	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	Tetrachloroethene	127-18-4	2	70	3%	2.82E-06	6.80E-03	2.00E-03	yes	yes	yes	na	1	0	0	0
	Toluene	108-88-3	2	70	3%	2.81E-06	2.00E-03	1.00E-02	yes	yes	no	na	0	0	0	1
	trans-1,2-Dichloroethene	156-60-5	0	55	0%	2.98E-06	na	no benchmark	no	na	na	na	0	1	0	0
	trans-1,3-Dichloropropene	10061-02-6	0	70	0%	2.81E-06	na	no benchmark	no	na	na	na	0	1	0	0
	trans-1,4-Dichloro-2-Butene	110-57-6	0	15	0%	5.00E-06	na	1.00E+03	yes	no	na	no	0	0	0	1
	Trichloroethene	79-01-6	0	70	0%	2.81E-06	na	1.00E-01	yes	no	na	no	0	0	0	1
	Trichlorofluoromethane	75-69-4	1	70	1%	4.98E-06	3.00E-03	no benchmark	no	na	na	na	0	1	0	0
	Vinyl Acetate	108-05-4	0	60	0%	3.81E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Vinyl Chloride	75-01-4	0	70	0%	5.51E-06	na	1.00E-02	yes	no	na	no	0	0	0	1
	Xylenes (Total)	1330-20-7	1	60	2%	8.30E-06	1.30E-02	1.00E-01	yes	yes	no	na	0	0	0	1
	Xylenes-p,m	179601-23-1	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
												Totals	**17**	**128**	**3**	**50**

Appendix D-4 Wildlife Receptor COPC Screen for Surface Water

Ecological Risk Assessment for Ogden, Utah

Group	Analyte	CAS #	DATA					Wildlife Surface Water Benchmark (mg/L)	COPC SELECTION STEPS				SURFACE WATER COPCs			
			Number of Detections	Number of Samples	Detection Frequency (DF)	Mean Non-Detected Conc (mg/L)	Maximum Detected Conc (mg/L)		Does compound have a TRV?	Is compound detected?	Is Max Detect ≥ TRV?	Is Mean DL ≥ TRV?	**QUANT COPC**	**QUAL COPC Type 1**	**QUAL COPC Type 2**	**Not a COPC**
Metals	Aluminum	7429-90-5	33	50	66%	2.10E-01	1.85E+00	8.11E+00	yes	yes	no	na	0	0	0	1
	Antimony	7440-36-0	1	50	2%	1.11E-02	3.40E-03	5.25E-01	yes	yes	no	na	0	0	0	1
	Arsenic	7440-38-2	10	67	15%	5.55E-03	3.10E-03	5.30E-01	yes	yes	no	na	0	0	0	1
	Barium	7440-39-3	67	67	100%	na	1.30E-01	4.18E+01	yes	yes	no	na	0	0	0	1
	Beryllium	7440-41-7	0	50	0%	1.22E-03	na	5.13E+00	yes	no	na	no	0	0	0	1
	Cadmium	7440-43-9	19	67	28%	1.69E-03	2.90E-03	7.49E+00	yes	yes	no	na	0	0	0	1
	Calcium	7440-70-2	50	50	100%	na	7.11E+01	no benchmark	no	na	na	na	0	1	0	0
	Chromium	7440-47-3	19	67	28%	4.33E-03	7.40E-03	7.26E+00	yes	yes	no	na	0	0	0	1
	Cobalt	7440-48-4	0	50	0%	3.15E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Copper	7440-50-8	21	50	42%	5.00E-03	7.40E-03	1.18E+02	yes	yes	no	na	0	0	0	1
	Iron	7439-89-6	35	50	70%	2.00E-01	2.11E+00	no benchmark	no	na	na	na	0	1	0	0
	Lead	7439-92-1	22	67	33%	2.76E-03	2.69E-02	8.21E+00	yes	yes	no	na	0	0	0	1
	Magnesium	7439-95-4	50	50	100%	na	1.94E+01	no benchmark	no	na	na	na	0	1	0	0
	Manganese	7439-96-5	49	50	98%	1.50E-02	1.12E-01	6.84E+02	yes	yes	no	na	0	0	0	1
	Mercury	7439-97-6	2	67	3%	7.47E-04	9.70E-04	4.60E-02	yes	yes	no	na	0	0	0	1
	Nickel	7440-02-0	21	50	42%	8.45E-03	2.03E-01	3.11E+02	yes	yes	no	na	0	0	0	1
	Potassium	7440-09-7	49	50	98%	1.00E+00	2.26E+01	no benchmark	no	na	na	na	0	1	0	0
	Selenium	7782-49-2	3	67	4%	7.56E-03	5.20E-03	1.55E+00	yes	yes	no	na	0	0	0	1
	Silver	7440-22-4	11	57	19%	3.53E-03	1.40E-03	no benchmark	no	na	na	na	0	1	0	0
	Sodium	7440-23-5	50	50	100%	na	5.64E+01	no benchmark	no	na	na	na	0	1	0	0
	Thallium	7440-28-0	0	50	0%	8.24E-03	na	5.80E-02	yes	no	na	no	0	0	0	1
	Vanadium	7440-62-2	1	50	2%	3.86E-03	5.10E-03	1.52E+00	yes	yes	no	na	0	0	0	1
	Zinc	7440-66-6	5	50	10%	9.27E-03	2.82E+00	1.05E+02	yes	yes	no	na	0	0	0	1
Pesticides	4,4'-DDD	72-54-8	0	17	0%	5.00E-05	na	2.00E-02	yes	no	na	no	0	0	0	1
	4,4'-DDE	72-55-9	0	17	0%	5.00E-05	na	2.00E-02	yes	no	na	no	0	0	0	1
	4,4'-DDT	50-29-3	0	17	0%	5.00E-05	na	2.00E-02	yes	no	na	no	0	0	0	1
	Aldrin	309-00-2	0	17	0%	2.50E-05	na	1.55E+00	yes	no	na	no	0	0	0	1
	alpha-BHC	319-84-6	0	17	0%	2.50E-05	na	1.40E-01	yes	no	na	no	0	0	0	1
	beta-BHC	319-85-7	0	17	0%	2.50E-05	na	3.11E+00	yes	no	na	no	0	0	0	1
	Chlordane	57-74-9	0	17	0%	2.50E-04	na	1.55E+01	yes	no	na	no	0	0	0	1
	delta-BHC	319-86-8	0	17	0%	2.50E-05	na	1.40E-01	yes	no	na	no	0	0	0	1
	Dieldrin	60-57-1	0	17	0%	5.00E-05	na	1.15E-01	yes	no	na	no	0	0	0	1
	Endosulfan I	959-98-8	0	17	0%	2.50E-05	na	1.17E+00	yes	no	na	no	0	0	0	1
	Endosulfan II	33213-65-9	0	17	0%	5.00E-05	na	1.17E+00	yes	no	na	no	0	0	0	1
	Endosulfan Sulfate	1031-07-8	0	17	0%	5.00E-05	na	1.17E+00	yes	no	na	no	0	0	0	1
	Endrin	72-20-8	0	17	0%	5.00E-05	na	7.30E-02	yes	no	na	no	0	0	0	1
	Endrin Aldehyde	7421-93-4	0	17	0%	5.00E-05	na	no benchmark	no	na	na	na	0	1	0	0
	gamma-BHC (Lindane)	58-89-9	0	17	0%	2.50E-05	na	1.45E+01	yes	no	na	no	0	0	0	1
	Heptachlor	76-44-8	0	17	0%	2.50E-05	na	1.01E+00	yes	no	na	no	0	0	0	1
	Heptachlor Epoxide	1024-57-3	0	17	0%	2.50E-05	na	no benchmark	no	na	na	na	0	1	0	0
	Isodrin	465-73-6	0	17	0%	2.50E-05	na	no benchmark	no	na	na	na	0	1	0	0
	Kepone	143-50-0	0	17	0%	5.00E-05	na	6.22E-01	yes	no	na	no	0	0	0	1
	Methoxychlor	72-43-5	0	17	0%	2.50E-04	na	3.11E+01	yes	no	na	no	0	0	0	1
	Toxaphene	8001-35-2	0	17	0%	5.00E-04	na	6.22E+01	yes	no	na	no	0	0	0	1
c Aromatic Hydrocarbons (PAHs)	2-Chloronaphthalene	91-58-7	0	38	0%	5.00E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2-Methylnaphthalene	91-57-6	2	74	3%	3.08E-03	2.10E-01	no benchmark	no	na	na	na	0	1	0	0
	Acenaphthene	83-32-9	8	77	10%	3.11E-03	1.60E-01	no benchmark	no	na	na	na	0	1	0	0
	Acenaphthylene	208-96-8	3	77	4%	2.82E-03	1.00E-02	no benchmark	no	na	na	na	0	1	0	0
	Aniline	62-53-3	0	36	0%	9.44E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Anthracene	120-12-7	2	77	3%	3.03E-03	1.60E-02	no benchmark	no	na	na	na	0	1	0	0
	Benzo[a]anthracene	56-55-3	2	77	3%	3.03E-03	4.00E-04	no benchmark	no	na	na	na	0	1	0	0
	Benzo[a]pyrene	50-32-8	2	77	3%	2.98E-03	1.00E-04	4.20E+00	yes	yes	no	na	0	0	0	1
	Benzo[b]fluoranthene	205-99-2	1	77	1%	3.00E-03	1.00E-04	no benchmark	no	na	na	na	0	1	0	0
	Benzo[g,h,i]perylene	191-24-2	0	77	0%	2.99E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Benzo[k]fluoranthene	207-08-9	2	77	3%	3.03E-03	2.00E-04	no benchmark	no	na	na	na	0	1	0	0
	Chrysene	218-01-9	2	77	3%	2.98E-03	7.00E-04	no benchmark	no	na	na	na	0	1	0	0
	Dibenz[a,h]anthracene	53-70-3	0	77	0%	2.99E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Dibenzofuran	132-64-9	0	38	0%	5.00E-03	na	no benchmark	no	na	na	na	0	1	0	0

Appendix D-4 Wildlife Receptor COPC Screen for Surface Water

Ecological Risk Assessment for Ogden, Utah

Group	Analyte	CAS #	DATA					Wildlife Surface Water Benchmark (mg/L)	COPC SELECTION STEPS				SURFACE WATER COPCs			
			Number of Detections	Number of Samples	Detection Frequency (DF)	Mean Non-Detected Conc (mg/L)	Maximum Detected Conc (mg/L)		Does compound have a TRV?	Is compound detected?	Is Max Detect ≥ TRV?	Is Mean DL ≥ TRV?	QUANT COPC	QUAL COPC Type 1	QUAL COPC Type 2	Not a COPC
Polycycli	Fluoranthene	206-44-0	6	77	8%	3.14E-03	6.00E-03	no benchmark	no	na	na	na	0	1	0	0
	Fluorene	86-73-7	2	77	3%	2.98E-03	6.20E-02	no benchmark	no	na	na	na	0	1	0	0
	Indeno[1,2,3-c,d]pyrene	193-39-5	1	77	1%	2.99E-03	1.00E-03	no benchmark	no	na	na	na	0	1	0	0
	Naphthalene	91-20-3	4	86	5%	2.79E-03	5.20E-01	no benchmark	no	na	na	na	0	1	0	0
	Phenanthrene	85-01-8	4	77	5%	3.03E-03	8.40E-02	no benchmark	no	na	na	na	0	1	0	0
	Pyrene	129-00-0	5	77	6%	3.10E-03	1.00E-02	no benchmark	no	na	na	na	0	1	0	0
Polychlorinated Biphenyls (PCBs)	Aroclor-1016	12674-11-2	0	24	0%	1.77E-04	na	1.38E+01	yes	no	na	no	0	0	0	1
	Aroclor-1221	11104-28-2	0	17	0%	2.50E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Aroclor-1232	11141-16-5	0	17	0%	2.50E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Aroclor-1242	53469-21-9	0	17	0%	2.50E-04	na	6.97E-01	yes	no	na	no	0	0	0	1
	Aroclor-1248	12672-29-6	0	17	0%	2.50E-04	na	1.51E-01	yes	no	na	no	0	0	0	1
	Aroclor-1254	11097-69-1	0	17	0%	2.50E-04	na	3.04E-01	yes	no	na	no	0	0	0	1
	Aroclor-1260	11096-82-5	1	24	4%	1.85E-04	1.50E-06	no benchmark	no	na	na	na	0	1	0	0
Petroleum Hydro-carbons	Diesel fuel	68476-34-6	0	2	0%	2.50E-01	na	no benchmark	no	na	na	na	0	1	0	0
	Total Petroleum Hydrocarbons (TPH)	TPH	0	6	0%	5.00E-01	na	no benchmark	no	na	na	na	0	1	0	0
Semi-Volatile Organic Compounds (SVOCs)	1,2,4-Trichlorobenzene	120-82-1	0	83	0%	2.78E-03	na	no benchmark	no	na	na	na	0	1	0	0
	1,2-Dichlorobenzene	95-50-1	0	83	0%	2.77E-03	na	no benchmark	no	na	na	na	0	1	0	0
	1,3-Dichlorobenzene	541-73-1	0	47	0%	4.14E-03	na	no benchmark	no	na	na	na	0	1	0	0
	1,4-Dichlorobenzene	106-46-7	0	83	0%	2.78E-03	na	no benchmark	no	na	na	na	0	1	0	0
	1-Methylnaphthalene	90-12-0	0	21	0%	1.00E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2,4,5-Trichlorophenol	95-95-4	0	38	0%	8.95E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2,4,6-Trichlorophenol	88-06-2	0	38	0%	5.00E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2,4-Dichlorophenol	120-83-2	0	38	0%	5.00E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2,4-Dimethylpheno	105-67-9	1	63	2%	3.26E-03	5.00E-04	no benchmark	no	na	na	na	0	1	0	0
	2,4-Dinitrophenol	51-28-5	0	38	0%	8.95E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2,4-Dinitrotoluene	121-14-2	0	74	0%	3.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2,6-Dinitrotoluene	606-20-2	1	74	1%	2.78E-03	1.70E-02	no benchmark	no	na	na	na	0	1	0	0
	2-Chlorophenol	95-57-8	0	38	0%	5.00E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2-Methylphenol (o-Cresol)	95-48-7	0	74	0%	3.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2-Nitroaniline	88-74-4	0	38	0%	8.95E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2-Nitrophenol	88-75-5	0	38	0%	5.00E-03	na	no benchmark	no	na	na	na	0	1	0	0
	3,3'-Dichlorobenzidine	91-94-1	0	63	0%	3.43E-03	na	no benchmark	no	na	na	na	0	1	0	0
	3-Nitroaniline	99-09-2	0	38	0%	8.95E-03	na	no benchmark	no	na	na	na	0	1	0	0
	4,6-Dinitro-o-cresol	534-52-1	0	74	0%	7.03E-03	na	no benchmark	no	na	na	na	0	1	0	0
	4-Bromophenyl-phenylether	101-55-3	0	18	0%	5.00E-03	na	no benchmark	no	na	na	na	0	1	0	0
	4-Chloro-3-Methylphenol	59-50-7	0	38	0%	5.00E-03	na	no benchmark	no	na	na	na	0	1	0	0
	4-Chloroaniline	106-47-8	0	38	0%	5.00E-03	na	no benchmark	no	na	na	na	0	1	0	0
	4-Chlorophenyl-phenylether	7005-72-3	0	38	0%	5.00E-03	na	no benchmark	no	na	na	na	0	1	0	0
	4-Methylphenol (p-Cresol)	106-44-5	0	74	0%	2.81E-03	na	2.21E+03	yes	no	na	no	0	0	0	1
	4-Nitroaniline	100-01-6	0	38	0%	8.95E-03	na	no benchmark	no	na	na	na	0	1	0	0
	4-Nitrophenol	100-02-7	0	38	0%	8.95E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Benzyl alcohol	100-51-6	0	18	0%	5.00E-03	na	no benchmark	no	na	na	na	0	1	0	0
	bis(2-Chloroethoxy)methane	111-91-1	0	38	0%	5.00E-03	na	no benchmark	no	na	na	na	0	1	0	0
	bis(2-Chloroethyl)ether	111-44-4	0	74	0%	3.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	bis(2-Chloroisopropyl)ether	108-60-1	0	42	0%	4.62E-03	na	no benchmark	no	na	na	na	0	1	0	0
	bis(2-Ethylhexyl)phthalate	117-81-7	4	74	5%	2.57E-03	4.70E-03	7.99E+00	yes	yes	no	na	0	0	0	1
	bis(n-octyl)phthalate	117-84-0	1	74	1%	3.10E-03	2.00E-04	no benchmark	no	na	na	na	0	1	0	0
	Butylbenzylphthalate	85-68-7	1	74	1%	2.88E-03	1.00E-04	no benchmark	no	na	na	na	0	1	0	0
	Carbazole	86-74-8	2	74	3%	4.06E-03	7.00E-03	no benchmark	no	na	na	na	0	1	0	0
	Dibutylphthalate	84-74-2	4	74	5%	2.69E-03	5.70E-03	8.00E-01	yes	yes	no	na	0	0	0	1
	Diethylphthalate	84-66-2	0	74	0%	2.76E-03	na	1.92E+04	yes	no	na	no	0	0	0	1
	Dimethylphthalate	131-11-3	0	38	0%	5.00E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Hexachlorobenzene	118-74-1	0	74	0%	3.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Hexachlorobutadiene	87-68-3	0	83	0%	2.78E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Hexachlorocyclopentadiene	77-47-4	0	38	0%	5.00E-03	na	no benchmark	no	na	na	na	0	1	0	0

Appendix D-4 Wildlife Receptor COPC Screen for Surface Water

Ecological Risk Assessment for Ogden, Utah

Group	Analyte	CAS #	DATA					Wildlife Surface Water Benchmark (mg/L)	COPC SELECTION STEPS				SURFACE WATER COPCs			
			Number of Detections	Number of Samples	Detection Frequency (DF)	Mean Non-Detected Conc (mg/L)	Maximum Detected Conc (mg/L)		Does compound have a TRV?	Is compound detected?	Is Max Detect ≥ TRV?	Is Mean DL ≥ TRV?	QUANT COPC	QUAL COPC Type 1	QUAL COPC Type 2	Not a COPC
	Hexachloroethane	67-72-1	0	74	0%	3.05E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Isophorone	78-59-1	0	38	0%	5.00E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Nitrobenzene	98-95-3	0	74	0%	3.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	N-Nitrosodiphenylamine	86-30-6	0	38	0%	5.00E-03	na	no benchmark	no	na	na	na	0	1	0	0
	n-Nitrosodipropylamine	621-64-7	0	74	0%	3.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Pentachlorophenol (PCP)	87-86-5	3	74	4%	5.23E-03	1.00E-03	1.87E+00	yes	yes	no	na	0	0	0	1
	Phenol	108-95-2	5	74	7%	2.78E-03	5.00E-03	no benchmark	no	na	na	na	0	1	0	0
Volatile Organic Compounds (VOCs)	1,1,1,2-Tetrachloroethane	630-20-6	0	40	0%	3.99E-03	na	no benchmark	no	na	na	na	0	1	0	0
	1,1,1-Trichloroethane	71-55-6	0	84	0%	1.24E-03	na	4.37E+03	yes	no	na	no	0	0	0	1
	1,1,2,2-Tetrachloroethane	79-34-5	0	84	0%	1.24E-03	na	no benchmark	no	na	na	na	0	1	0	0
	1,1,2-Trichloroethane	79-00-5	0	84	0%	1.24E-03	na	4.37E+03	yes	no	na	no	0	0	0	1
	1,1-Dichloroethane	75-34-3	0	84	0%	1.24E-03	na	1.25E+02	yes	no	na	no	0	0	0	1
	1,1-Dichloroethene	75-35-4	0	9	0%	5.00E-04	na	4.49E+01	yes	no	na	no	0	0	0	1
	1,1-Dichloropropene	563-58-6	0	9	0%	5.00E-04	na	no benchmark	no	na	na	na	0	1	0	0
	1,2,3-Trichlorobenzene	87-61-6	0	9	0%	5.00E-04	na	no benchmark	no	na	na	na	0	1	0	0
	1,2,3-Trichloropropane	96-18-4	0	84	0%	2.65E-03	na	no benchmark	no	na	na	na	0	1	0	0
	1,2,4-Trimethylbenzene	95-63-6	0	9	0%	5.00E-04	na	no benchmark	no	na	na	na	0	1	0	0
	1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	1	43	2%	3.71E-03	1.70E-03	no benchmark	no	na	na	na	0	1	0	0
	1,2-Dichloroethane	107-06-2	0	84	0%	1.24E-03	na	1.25E+02	yes	no	na	no	0	0	0	1
	1,2-Dichloroethene	540-59-0	0	75	0%	1.62E-03	na	1.90E+02	yes	no	na	no	0	0	0	1
	1,2-Dichloropropane	78-87-5	0	84	0%	1.24E-03	na	no benchmark	no	na	na	na	0	1	0	0
	1,3,5-Trimethylbenzene	108-67-8	0	9	0%	5.00E-04	na	no benchmark	no	na	na	na	0	1	0	0
	1,3-Dichloropropane	142-28-9	0	9	0%	5.00E-04	na	no benchmark	no	na	na	na	0	1	0	0
	1,4-Dioxane	123-91-1	0	31	0%	1.50E-01	na	3.88E+00	yes	no	na	no	0	0	0	1
	2,2-Dichloropropane	594-20-7	0	9	0%	5.00E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2-Chloro-1,3-butadiene (Chloroprene)	126-99-8	0	31	0%	5.00E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2-Chloroethyl vinyl ether	110-75-8	0	55	0%	3.28E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2-Chlorotoluene	95-49-8	0	9	0%	5.00E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2-Hexanone	591-78-6	0	67	0%	3.37E-03	na	no benchmark	no	na	na	na	0	1	0	0
	3-Chloropropene (Allyl Chloride)	107-05-1	0	31	0%	5.00E-03	na	no benchmark	no	na	na	na	0	1	0	0
	4-Chlorotoluene	106-43-4	0	9	0%	5.00E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Acetone	67-64-1	13	61	21%	3.88E-03	4.00E+00	7.77E+01	yes	yes	no	na	0	0	0	1
	Acetonitrile	75-05-8	0	75	0%	1.19E-02	na	no benchmark	no	na	na	na	0	1	0	0
	Acrolein	107-02-8	0	31	0%	5.00E-02	na	no benchmark	no	na	na	na	0	1	0	0
	Acrylonitrile	107-13-1	0	55	0%	1.51E-02	na	no benchmark	no	na	na	na	0	1	0	0
	Benzene	71-43-2	1	84	1%	1.22E-03	2.00E-03	1.11E+02	yes	yes	no	na	0	0	0	1
	Bromobenzene	108-86-1	0	9	0%	5.00E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Bromodichloromethane	75-27-4	0	84	0%	1.24E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Bromoform	75-25-2	0	84	0%	1.24E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Bromomethane (Methyl bromide)	74-83-9	0	84	0%	2.21E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Carbon Disulfide	75-15-0	1	84	1%	1.22E-03	1.20E-03	no benchmark	no	na	na	na	0	1	0	0
	Carbon Tetrachloride	56-23-5	0	84	0%	1.24E-03	na	1.24E+02	yes	no	na	no	0	0	0	1
	Chlorobenzene	108-90-7	0	84	0%	1.24E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Chlorodibromomethane	124-48-1	0	84	0%	1.24E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Chloroethane (Ethyl chloride)	75-00-3	0	84	0%	2.16E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Chloroform	67-66-3	0	84	0%	1.24E-03	na	1.17E+02	yes	no	na	no	0	0	0	1
	Chloromethane (Methyl chloride)	74-87-3	0	84	0%	2.27E-03	na	no benchmark	no	na	na	na	0	1	0	0
	cis-1,2-Dichloroethene	156-59-2	0	44	0%	5.00E-04	na	1.90E+02	yes	no	na	no	0	0	0	1
	cis-1,3-Dichloropropene	10061-01-5	0	93	0%	1.17E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Dibromomethane	74-95-3	0	40	0%	3.99E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Dichlorodifluoromethane	75-71-8	1	40	3%	3.96E-03	3.60E-03	no benchmark	no	na	na	na	0	1	0	0
	Dichloromethane	75-09-2	26	84	31%	6.72E-04	5.80E+00	4.55E+01	yes	yes	no	na	0	0	0	1
	Ethyl Methacrylate	97-63-2	0	31	0%	2.50E-02	na	no benchmark	no	na	na	na	0	1	0	0
	Ethylbenzene	100-41-4	2	84	2%	1.21E-03	8.10E-03	no benchmark	no	na	na	na	0	1	0	0
	Ethylene dibromide (EDB)	106-93-4	0	84	0%	2.16E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Hexane	110-54-3	0	44	0%	5.00E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Iodomethane	74-88-4	0	31	0%	5.00E-03	na	no benchmark	no	na	na	na	0	1	0	0

Appendix D-4 Wildlife Receptor COPC Screen for Surface Water

Ecological Risk Assessment for Ogden, Utah

Group	Analyte	CAS #	DATA					Wildlife Surface Water Benchmark (mg/L)	COPC SELECTION STEPS				SURFACE WATER COPCs			
			Number of Detections	Number of Samples	Detection Frequency (DF)	Mean Non-Detected Conc (mg/L)	Maximum Detected Conc (mg/L)		Does compound have a TRV?	Is compound detected?	Is Max Detect ≥ TRV?	Is Mean DL ≥ TRV?	**QUANT COPC**	**QUAL COPC Type 1**	**QUAL COPC Type 2**	**Not a COPC**
	Isobutyl Alcohol	78-83-1	0	31	0%	5.00E-02	na	no benchmark	no	na	na	na	0	1	0	0
	Isopropylbenzene	98-82-8	0	18	0%	5.00E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Methacrylonitrile	126-98-7	0	75	0%	2.81E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Methyl ethyl ketone (MEK)	78-93-3	1	63	2%	3.56E-03	2.20E-03	1.38E+04	yes	yes	no	na	0	0	0	1
	Methyl isobutyl ketone (MIBK)	108-10-1	1	84	1%	3.19E-03	1.50E-03	1.94E+02	yes	yes	no	na	0	0	0	1
	Methyl Methacrylate	80-62-6	0	31	0%	5.00E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Methyl-t-butyl ether (MTBE)	1634-04-4	0	9	0%	5.00E-04	na	no benchmark	no	na	na	na	0	1	0	0
	n-Butylbenzene	104-51-8	0	9	0%	5.00E-04	na	no benchmark	no	na	na	na	0	1	0	0
	n-Propylbenzene	103-65-1	0	9	0%	5.00E-04	na	no benchmark	no	na	na	na	0	1	0	0
	o-Xylene	95-47-6	0	9	0%	5.00E-04	na	8.83E+00	yes	no	na	no	0	0	0	1
	sec-Butylbenzene	135-98-8	0	9	0%	5.00E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Styrene	100-42-5	0	84	0%	1.24E-03	na	no benchmark	no	na	na	na	0	1	0	0
	tert-Butylbenzene	98-06-6	0	9	0%	5.00E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Tetrachloroethene	127-18-4	0	84	0%	1.24E-03	na	5.89E+00	yes	no	na	no	0	0	0	1
	Toluene	108-88-3	0	84	0%	1.24E-03	na	1.09E+02	yes	no	na	no	0	0	0	1
	trans-1,2-Dichloroethene	156-60-5	0	53	0%	5.00E-04	na	1.90E+02	yes	no	na	no	0	0	0	1
	trans-1,3-Dichloropropene	10061-02-6	0	84	0%	1.24E-03	na	no benchmark	no	na	na	na	0	1	0	0
	trans-1,4-Dichloro-2-Butene	110-57-6	0	31	0%	5.00E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Trichloroethene	79-01-6	0	84	0%	1.24E-03	na	2.94E+00	yes	no	na	no	0	0	0	1
	Trichlorofluoromethane	75-69-4	0	84	0%	2.16E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Vinyl Acetate	108-05-4	0	75	0%	2.36E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Vinyl Chloride	75-01-4	0	84	0%	2.16E-03	na	1.32E+00	yes	no	na	no	0	0	0	1
	Xylenes (Total)	1330-20-7	1	75	1%	1.86E-03	4.80E-03	8.83E+00	yes	yes	no	na	0	0	0	1
	Xylenes-p,m	179601-23-1	0	9	0%	5.00E-04	na	8.83E+00	yes	no	na	no	0	0	0	1
												Totals	**0**	**127**	**0**	**67**

Appendix D-5 Wildlife Receptor COPC Screen for Sediment

Ecological Risk Assessment for Ogden, Utah

Group	Analyte	CAS #	DATA					Wildlife Receptor Sediment Benchmark (mg/kg)	COPC SELECTION STEPS				SEDIMENT COPCs			
			Number of Detections	Number of Samples	Detection Frequency (DF)	Mean Non-Detected Conc (mg/kg)	Maximum Detected Conc (mg/kg)		Does compound have a TRV?	Is compound detected?	Is Max Detect ≥ TRV?	Is Mean DL ≥ TRV?	**QUANT COPC**	**QUAL COPC Type 1**	**QUAL COPC Type 2**	**Not a COPC**
Metals	Aluminum	7429-90-5	32	32	100%	na	1.67E+04	3.83E+00	yes	yes	yes	na	1	0	0	0
	Antimony	7440-36-0	2	32	6%	2.09E-03	1.40E+00	2.48E-01	yes	yes	yes	na	1	0	0	0
	Arsenic	7440-38-2	30	50	60%	2.36E-03	5.40E+00	2.50E-01	yes	yes	yes	na	1	0	0	0
	Barium	7440-39-3	45	50	90%	2.72E-02	2.49E+02	1.72E+01	yes	yes	yes	na	1	0	0	0
	Beryllium	7440-41-7	16	32	50%	2.95E-04	6.30E-01	2.42E+00	yes	yes	no	na	0	0	0	1
	Cadmium	7440-43-9	14	50	28%	1.77E-04	9.60E-01	1.20E+00	yes	yes	no	na	0	0	0	1
	Calcium	7440-70-2	32	32	100%	na	1.10E+05	no benchmark	no	na	na	na	0	1	0	0
	Chromium	7440-47-3	49	50	98%	5.00E-04	2.23E+01	8.30E-01	yes	yes	yes	na	1	0	0	0
	Cobalt	7440-48-4	32	32	100%	na	7.70E+00	no benchmark	no	na	na	na	0	1	0	0
	Copper	7440-50-8	32	32	100%	na	3.76E+01	3.89E+01	yes	yes	no	na	0	0	0	1
	Iron	7439-89-6	32	32	100%	na	2.10E+04	no benchmark	no	na	na	na	0	1	0	0
	Lead	7439-92-1	49	50	98%	1.00E-03	1.20E+02	9.40E-01	yes	yes	yes	na	1	0	0	0
	Magnesium	7439-95-4	32	32	100%	na	1.10E+04	no benchmark	no	na	na	na	0	1	0	0
	Manganese	7439-96-5	32	32	100%	na	9.60E+02	3.22E+02	yes	yes	yes	na	1	0	0	0
	Mercury	7439-97-6	28	50	56%	2.04E-05	5.30E-01	5.00E-03	yes	yes	yes	na	1	0	0	0
	Nickel	7440-02-0	32	32	100%	na	2.00E+01	6.41E+01	yes	yes	no	na	0	0	0	1
	Potassium	7440-09-7	0	32	0%	na	na	no benchmark	no	na	na	na	0	1	0	0
	Selenium	7782-49-2	8	50	16%	1.20E-03	5.80E+00	3.31E-01	yes	yes	yes	na	1	0	0	0
	Silver	7440-22-4	10	50	20%	2.42E-04	1.20E+00	no benchmark	no	na	na	na	0	1	0	0
	Sodium	7440-23-5	32	32	100%	na	3.81E+02	no benchmark	no	na	na	na	0	1	0	0
	Thallium	7440-28-0	3	32	9%	7.47E-04	1.30E+00	2.70E-02	yes	yes	yes	na	1	0	0	0
	Vanadium	7440-62-2	32	32	100%	na	3.18E+01	7.14E-01	yes	yes	yes	na	1	0	0	0
	Zinc	7440-66-6	32	32	100%	na	1.82E+02	1.20E+01	yes	yes	yes	na	1	0	0	0
Pesticides	4,4'-DDD	72-54-8	0	65	0%	4.44E-06	na	2.00E-03	yes	no	na	no	0	0	0	1
	4,4'-DDE	72-55-9	7	65	11%	4.50E-06	1.20E-02	2.00E-03	yes	yes	yes	na	1	0	0	0
	4,4'-DDT	50-29-3	2	65	3%	4.50E-06	6.10E-03	2.00E-03	yes	yes	yes	na	1	0	0	0
	Aldrin	309-00-2	0	65	0%	2.64E-06	na	7.33E-01	yes	no	na	no	0	0	0	1
	alpha-BHC	319-84-6	0	65	0%	2.64E-06	na	1.00E-01	yes	no	na	no	0	0	0	1
	alpha-Chlordane	5103-71-9	2	47	4%	2.17E-06	1.30E-02	1.80E+00	yes	yes	no	na	0	0	0	1
	Atrazine	1912-24-9	0	21	0%	1.43E-03	na	no benchmark	no	na	na	na	0	1	0	0
	beta-BHC	319-85-7	0	65	0%	2.64E-06	na	1.47E+00	yes	no	na	no	0	0	0	1
	Caprolactam	105-60-2	0	20	0%	1.15E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Chlordane	57-74-9	0	18	0%	4.00E-05	na	1.80E+00	yes	no	na	no	0	0	0	1
	delta-BHC	319-86-8	0	65	0%	2.64E-06	na	1.00E-01	yes	no	na	no	0	0	0	1
	Dieldrin	60-57-1	1	65	2%	4.47E-06	5.40E-03	6.40E-02	yes	yes	no	na	0	0	0	1
	Endosulfan I	959-98-8	0	65	0%	2.64E-06	na	5.50E-01	yes	no	na	no	0	0	0	1
	Endosulfan II	33213-65-9	0	65	0%	4.44E-06	na	5.50E-01	yes	no	na	no	0	0	0	1
	Endosulfan Sulfate	1031-07-8	0	65	0%	4.44E-06	na	5.50E-01	yes	no	na	no	0	0	0	1
	Endrin	72-20-8	0	65	0%	4.44E-06	na	8.00E-03	yes	no	na	no	0	0	0	1
	Endrin Aldehyde	7421-93-4	3	65	5%	4.49E-06	8.10E-03	no benchmark	no	na	na	na	0	1	0	0
	Endrin ketone	53494-70-5	0	47	0%	3.07E-06	na	no benchmark	no	na	na	na	0	1	0	0
	gamma-BHC (Lindane)	58-89-9	0	65	0%	2.64E-06	na	1.66E+00	yes	no	na	no	0	0	0	1
	gamma-Chlordane	12789-03-6	2	47	4%	2.17E-06	1.70E-02	1.80E+00	yes	yes	no	na	0	0	0	1
	Heptachlor	76-44-8	0	65	0%	2.64E-06	na	4.76E-01	yes	no	na	no	0	0	0	1
	Heptachlor Epoxide	1024-57-3	0	65	0%	2.64E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Isodrin	465-73-6	0	18	0%	4.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Kepone	143-50-0	0	18	0%	8.00E-06	na	2.93E-01	yes	no	na	no	0	0	0	1
	Methoxychlor	72-43-5	0	65	0%	1.91E-05	na	1.47E+01	yes	no	na	no	0	0	0	1
	Toxaphene	8001-35-2	0	65	0%	1.15E-04	na	2.93E+01	yes	no	na	no	0	0	0	1
(PAHs)	2-Chloronaphthalene	91-58-7	0	74	0%	8.25E-04	na	no benchmark	no	na	na	na	0	1	0	0
	1-Methylnaphthalene	90-12-0	2	21	10%	4.64E-04	2.10E+02	no benchmark	no	na	na	na	0	1	0	0
	2-Methylnaphthalene	91-57-6	12	100	12%	6.68E-04	1.40E+03	no benchmark	no	na	na	na	0	1	0	0
	Acenaphthene	83-32-9	24	114	21%	6.22E-04	8.50E+02	no benchmark	no	na	na	na	0	1	0	0
	Acenaphthylene	208-96-8	22	114	19%	6.00E-04	1.30E+02	no benchmark	no	na	na	na	0	1	0	0
	Aniline	62-53-3	0	28	0%	6.36E-04	na	no benchmark	no	na	na	na	0	1	0	0

Appendix D-5 Wildlife Receptor COPC Screen for Sediment

Ecological Risk Assessment for Ogden, Utah

Group	Analyte	CAS #	DATA: Number of Detections	DATA: Number of Samples	DATA: Detection Frequency (DF)	DATA: Mean Non-Detected Conc (mg/kg)	DATA: Maximum Detected Conc (mg/kg)	Wildlife Receptor Sediment Benchmark (mg/kg)	COPC SELECTION STEPS: Does compound have a TRV?	COPC SELECTION STEPS: Is compound detected?	COPC SELECTION STEPS: Is Max Detect ≥ TRV?	COPC SELECTION STEPS: Is Mean DL ≥ TRV?	SEDIMENT COPCs: QUANT COPC	SEDIMENT COPCs: QUAL COPC Type 1	SEDIMENT COPCs: QUAL COPC Type 2	SEDIMENT COPCs: Not a COPC
Polycyclic Aromatic Hydrocarbons	Anthracene	120-12-7	36	114	32%	7.09E-04	5.20E+02	no benchmark	no	na	na	na	0	1	0	0
	Benzo[a]anthracene	56-55-3	54	114	47%	8.27E-04	3.40E+02	no benchmark	no	na	na	na	0	1	0	0
	Benzo[a]pyrene	50-32-8	59	114	52%	8.63E-04	3.50E+02	1.98E+00	yes	yes	yes	na	1	0	0	0
	Benzo[b]fluoranthene	205-99-2	57	114	50%	8.58E-04	1.60E+02	no benchmark	no	na	na	na	0	1	0	0
	Benzo[g,h,i]perylene	191-24-2	50	114	44%	8.03E-04	2.00E+02	no benchmark	no	na	na	na	0	1	0	0
	Benzo[k]fluoranthene	207-08-9	54	114	47%	8.28E-04	1.70E+02	no benchmark	no	na	na	na	0	1	0	0
	Chrysene	218-01-9	63	114	55%	9.16E-04	3.60E+02	no benchmark	no	na	na	na	0	1	0	0
	Dibenz[a,h]anthracene	53-70-3	28	114	25%	6.54E-04	7.20E+01	no benchmark	no	na	na	na	0	1	0	0
	Dibenzofuran	132-64-9	4	74	5%	8.28E-04	4.10E+00	no benchmark	no	na	na	na	0	1	0	0
	Fluoranthene	206-44-0	65	114	57%	9.44E-04	6.40E+02	no benchmark	no	na	na	na	0	1	0	0
	Fluorene	86-73-7	20	114	18%	6.15E-04	4.20E+02	no benchmark	no	na	na	na	0	1	0	0
	Indeno[1,2,3-c,d]pyrene	193-39-5	51	114	45%	8.14E-04	1.60E+02	no benchmark	no	na	na	na	0	1	0	0
	Naphthalene	91-20-3	21	129	16%	5.48E-04	1.90E+03	no benchmark	no	na	na	na	0	1	0	0
	Phenanthrene	85-01-8	51	114	45%	8.22E-04	1.90E+03	no benchmark	no	na	na	na	0	1	0	0
	Pyrene	129-00-0	76	114	67%	1.05E-03	1.20E+03	no benchmark	no	na	na	na	0	1	0	0
Polychlorinated Biphenyls (PCBs)	Aroclor-1016	12674-11-2	0	86	0%	5.77E-05	na	6.52E+00	yes	no	na	no	0	0	0	1
	Aroclor-1221	11104-28-2	0	86	0%	7.63E-05	na	7.10E-02	yes	no	na	no	0	0	0	1
	Aroclor-1232	11141-16-5	0	86	0%	5.77E-05	na	7.10E-02	yes	no	na	no	0	0	0	1
	Aroclor-1242	53469-21-9	0	86	0%	5.77E-05	na	3.29E-01	yes	no	na	no	0	0	0	1
	Aroclor-1248	12672-29-6	0	86	0%	5.77E-05	na	7.10E-02	yes	no	na	no	0	0	0	1
	Aroclor-1254	11097-69-1	2	85	2%	5.89E-05	1.40E-01	1.11E-01	yes	yes	yes	na	1	0	0	0
	Aroclor-1260	11096-82-5	20	86	23%	4.31E-05	4.20E+00	7.10E-02	yes	yes	yes	na	1	0	0	0
	Aroclor-1268	11100-14-4	0	15	0%	4.39E-05	na	7.10E-02	yes	no	na	no	0	0	0	1
Petroleum Hydro-carbons	Total Petroleum Hydrocarbons (TPH)	TPH	11	11	100%	na	2.20E+03	no benchmark	no	na	na	na	0	1	0	0
Organic Compounds (SVOCs)	1,2,4-Trichlorobenzene	120-82-1	0	76	0%	6.10E-04	na	no benchmark	no	na	na	na	0	1	0	0
	1,2-Dichlorobenzene	95-50-1	0	76	0%	6.10E-04	na	no benchmark	no	na	na	na	0	1	0	0
	1,3-Dichlorobenzene	541-73-1	0	69	0%	5.53E-04	na	no benchmark	no	na	na	na	0	1	0	0
	1,4-Dichlorobenzene	106-46-7	0	76	0%	6.10E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2,2'-oxybis(1-Chloropropane)	108-60-1	0	1	0%	2.15E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2,4,5-Trichlorophenol	95-95-4	0	74	0%	1.35E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2,4,6-Trichlorophenol	88-06-2	0	74	0%	8.25E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2,4-Dichlorophenol	120-83-2	0	74	0%	8.25E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2,4-Dimethylphenol	105-67-9	0	81	0%	8.56E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2,4-Dinitrophenol	51-28-5	0	74	0%	1.85E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2,4-Dinitrotoluene	121-14-2	0	81	0%	8.56E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2,6-Dinitrotoluene	606-20-2	0	81	0%	8.56E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2-Chlorophenol	95-57-8	0	74	0%	8.25E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2-Methylphenol (o-Cresol)	95-48-7	0	81	0%	8.56E-04	na	1.04E+03	yes	no	na	no	0	0	0	1
	2-Nitroaniline	88-74-4	0	74	0%	1.85E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2-Nitrophenol	88-75-5	0	74	0%	8.25E-04	na	no benchmark	no	na	na	na	0	1	0	0
	3,3'-Dichlorobenzidine	91-94-1	1	81	1%	9.65E-04	3.70E-02	no benchmark	no	na	na	na	0	1	0	0
	3-Nitroaniline	99-09-2	0	74	0%	1.85E-03	na	no benchmark	no	na	na	na	0	1	0	0
	4,6-Dinitro-o-cresol	534-52-1	0	81	0%	2.18E-03	na	no benchmark	no	na	na	na	0	1	0	0
	4-Bromophenyl-phenylether	101-55-3	0	35	0%	1.39E-03	na	no benchmark	no	na	na	na	0	1	0	0
	4-Chloro-3-Methylphenol	59-50-7	0	74	0%	8.25E-04	na	no benchmark	no	na	na	na	0	1	0	0
	4-Chloroaniline	106-47-8	0	74	0%	8.25E-04	na	no benchmark	no	na	na	na	0	1	0	0
	4-Chlorophenyl-phenylether	7005-72-3	0	74	0%	8.25E-04	na	no benchmark	no	na	na	na	0	1	0	0
	4-Methylphenol (p-Cresol)	106-44-5	15	81	19%	7.83E-04	4.80E+00	1.04E+03	yes	yes	no	na	0	0	0	1
	4-Nitroaniline	100-01-6	0	74	0%	1.85E-03	na	no benchmark	no	na	na	na	0	1	0	0
	4-Nitrophenol	100-02-7	0	74	0%	1.85E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Acetophenone	98-86-2	0	20	0%	1.15E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Benzaldehyde	100-52-7	0	21	0%	1.43E-03	na	no benchmark	no	na	na	na	0	1	0	0

Appendix D-5 Wildlife Receptor COPC Screen for Sediment

Ecological Risk Assessment for Ogden, Utah

Group	Analyte	CAS #	DATA					Wildlife Receptor Sediment Benchmark (mg/kg)	COPC SELECTION STEPS				SEDIMENT COPCs			
			Number of Detections	Number of Samples	Detection Frequency (DF)	Mean Non-Detected Conc (mg/kg)	Maximum Detected Conc (mg/kg)		Does compound have a TRV?	Is compound detected?	Is Max Detect ≥ TRV?	Is Mean DL ≥ TRV?	**QUANT COPC**	**QUAL COPC Type 1**	**QUAL COPC Type 2**	**Not a COPC**
Semi-Volatile	Benzyl alcohol	100-51-6	0	15	0%	1.71E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Biphenyl	92-52-4	1	20	5%	1.10E-03	7.90E+00	no benchmark	no	na	na	na	0	1	0	0
	bis(2-Chloroethoxy)methane	111-91-1	0	74	0%	8.25E-04	na	no benchmark	no	na	na	na	0	1	0	0
	bis-(2-Chloroethyl)ether	111-44-4	0	1	0%	2.15E-03	na	no benchmark	no	na	na	na	0	1	0	0
	bis(2-Chloroethyl)ether	111-44-4	0	1	0%	2.15E-03	na	no benchmark	no	na	na	na	0	1	0	0
	bis(2-Chloroisopropyl)ether	108-60-1	0	1	0%	2.15E-03	na	no benchmark	no	na	na	na	0	1	0	0
	bis(2-Ethylhexyl)phthalate	117-81-7	46	82	56%	1.31E-03	4.00E+00	9.10E-01	yes	yes	yes	na	1	0	0	0
	bis(n-octyl)phthalate	117-84-0	1	81	1%	8.61E-04	5.20E-01	no benchmark	no	na	na	na	0	1	0	0
	Butylbenzylphthalate	85-68-7	5	81	6%	8.89E-04	6.70E-01	no benchmark	no	na	na	na	0	1	0	0
	Carbazole	86-74-8	6	81	7%	8.11E-04	6.90E+00	no benchmark	no	na	na	na	0	1	0	0
	Dibutylphthalate	84-74-2	5	81	6%	8.96E-04	9.90E-02	9.00E-02	yes	yes	yes	na	1	0	0	0
	Diethylphthalate	84-66-2	1	81	1%	8.64E-04	4.40E-02	9.08E+03	yes	yes	no	na	0	0	0	1
	Dimethylphthalate	131-11-3	0	74	0%	8.25E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Hexachlorobenzene	118-74-1	0	81	0%	8.56E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Hexachlorobutadiene	87-68-3	0	96	0%	7.22E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Hexachlorocyclopentadiene	77-47-4	0	74	0%	8.25E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Hexachloroethane	67-72-1	0	81	0%	8.56E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Isophorone	78-59-1	0	74	0%	8.25E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Nitrobenzene	98-95-3	0	81	0%	8.56E-04	na	no benchmark	no	na	na	na	0	1	0	0
	N-Nitrosodiphenylamine	86-30-6	0	74	0%	8.25E-04	na	no benchmark	no	na	na	na	0	1	0	0
	n-Nitrosodipropylamine	621-64-7	0	81	0%	8.56E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Pentachlorophenol (PCP)	87-86-5	0	81	0%	2.22E-03	na	8.79E-01	yes	no	na	no	0	0	0	1
	Phenol	108-95-2	2	81	2%	8.73E-04	1.10E-01	no benchmark	no	na	na	na	0	1	0	0
	1,1,1,2-Tetrachloroethane	630-20-6	0	35	0%	3.29E-06	na	no benchmark	no	na	na	na	0	1	0	0
	1,1,1-Trichloroethane	71-55-6	0	68	0%	3.05E-06	na	2.06E+03	yes	no	na	no	0	0	0	1
	1,1,2,2-Tetrachloroethane	79-34-5	0	68	0%	3.05E-06	na	no benchmark	no	na	na	na	0	1	0	0
	1,1,2-Trichloroethane	79-00-5	1	68	1%	3.06E-06	4.00E-03	2.06E+03	yes	yes	no	na	0	0	0	1
	1,1-Dichloroethane	75-34-3	1	68	1%	3.06E-06	5.20E-03	1.42E+01	yes	yes	no	na	0	0	0	1
	1,1-Dichloroethene	75-35-4	0	15	0%	1.00E-06	na	3.25E+01	yes	no	na	no	0	0	0	1
	1,1-Dichloropropene	563-58-6	0	15	0%	1.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	1,2,3-Trichlorobenzene	87-61-6	0	15	0%	1.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	1,2,3-Trichloropropane	96-18-4	0	68	0%	3.79E-06	na	no benchmark	no	na	na	na	0	1	0	0
	1,2,4-Trimethylbenzene	95-63-6	1	15	7%	1.02E-06	1.20E-01	no benchmark	no	na	na	na	0	1	0	0
	1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	0	56	0%	4.21E-06	na	no benchmark	no	na	na	na	0	1	0	0
	1,2-Dichloroethane	107-06-2	0	68	0%	3.05E-06	na	1.42E+01	yes	no	na	no	0	0	0	1
	1,2-Dichloroethene	540-59-0	0	53	0%	6.26E-06	na	8.96E+01	yes	no	na	no	0	0	0	1
	1,2-Dichloropropane	78-87-5	0	68	0%	3.05E-06	na	no benchmark	no	na	na	na	0	1	0	0
	1,3,5-Trimethylbenzene	108-67-8	1	15	7%	1.02E-06	1.20E-01	no benchmark	no	na	na	na	0	1	0	0
	1,3-Dichloropropane	142-28-9	0	15	0%	1.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	1,4-Dioxane	123-91-1	0	20	0%	1.50E-04	na	1.83E+00	yes	no	na	no	0	0	0	1
	2,2-Dichloropropane	594-20-7	0	15	0%	1.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	2-Chloro-1,3-butadiene (Chloroprene)	126-99-8	0	20	0%	5.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	2-Chloroethyl vinyl ether	110-75-8	0	53	0%	4.73E-06	na	no benchmark	no	na	na	na	0	1	0	0
	2-Chlorotoluene	95-49-8	0	15	0%	1.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	2-Hexanone	591-78-6	0	68	0%	6.06E-06	na	no benchmark	no	na	na	na	0	1	0	0
	3-Chloropropene (Allyl Chloride)	107-05-1	0	20	0%	5.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	4-Chlorotoluene	106-43-4	0	15	0%	1.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Acetone	67-64-1	38	68	56%	7.80E-06	3.90E-01	3.66E+01	yes	yes	no	na	0	0	0	1
	Acetonitrile	75-05-8	0	53	0%	1.98E-05	na	no benchmark	no	na	na	na	0	1	0	0
	Acrolein	107-02-8	1	53	2%	3.16E-05	4.50E-03	no benchmark	no	na	na	na	0	1	0	0
	Acrylonitrile	107-13-1	1	53	2%	2.00E-05	1.00E-02	no benchmark	no	na	na	na	0	1	0	0
	Benzene	71-43-2	3	68	4%	3.00E-06	4.80E-02	5.22E+01	yes	yes	no	na	0	0	0	1
	Bromobenzene	108-86-1	0	15	0%	1.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Bromodichloromethane	75-27-4	0	68	0%	3.05E-06	na	no benchmark	no	na	na	na	0	1	0	0
Cs)	Bromoform	75-25-2	0	68	0%	3.05E-06	na	no benchmark	no	na	na	na	0	1	0	0

Appendix D-5 Wildlife Receptor COPC Screen for Sediment

Ecological Risk Assessment for Ogden, Utah

Group	Analyte	CAS #	DATA					Wildlife Receptor Sediment Benchmark (mg/kg)	COPC SELECTION STEPS				SEDIMENT COPCs			
			Number of Detections	Number of Samples	Detection Frequency (DF)	Mean Non-Detected Conc (mg/kg)	Maximum Detected Conc (mg/kg)		Does compound have a TRV?	Is compound detected?	Is Max Detect ≥ TRV?	Is Mean DL ≥ TRV?	**QUANT COPC**	**QUAL COPC Type 1**	**QUAL COPC Type 2**	**Not a COPC**
Volatile Organic Compounds (VO	Bromomethane (Methyl bromide)	74-83-9	4	68	6%	5.96E-06	1.00E-02	no benchmark	no	na	na	na	0	1	0	0
	Carbon Disulfide	75-15-0	12	68	18%	3.17E-06	7.00E-03	no benchmark	no	na	na	na	0	1	0	0
	Carbon Tetrachloride	56-23-5	0	68	0%	3.05E-06	na	5.86E+01	yes	no	na	no	0	0	0	1
	Chlorobenzene	108-90-7	1	68	1%	3.06E-06	1.90E-03	no benchmark	no	na	na	na	0	1	0	0
	Chlorodibromomethane	124-48-1	0	68	0%	3.05E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Chloroethane (Ethyl chloride)	75-00-3	0	68	0%	5.72E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Chloroform	67-66-3	0	68	0%	3.05E-06	na	5.50E+01	yes	no	na	no	0	0	0	1
	Chloromethane (Methyl chloride)	74-87-3	1	68	1%	5.51E-06	5.00E-03	no benchmark	no	na	na	na	0	1	0	0
	cis-1,2-Dichloroethene	156-59-2	0	33	0%	5.09E-06	na	8.96E+01	yes	no	na	no	0	0	0	1
	cis-1,3-Dichloropropene	10061-01-5	0	83	0%	2.68E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Dibromomethane	74-95-3	0	35	0%	3.29E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Dichlorodifluoromethane	75-71-8	14	35	40%	4.83E-06	1.61E-02	no benchmark	no	na	na	na	0	1	0	0
	Dichloromethane	75-09-2	34	68	50%	2.45E-06	1.30E-02	2.14E+01	yes	yes	no	na	0	0	0	1
	Ethyl Methacrylate	97-63-2	0	20	0%	2.50E-05	na	no benchmark	no	na	na	na	0	1	0	0
	Ethylbenzene	100-41-4	4	68	6%	3.00E-06	2.70E-01	no benchmark	no	na	na	na	0	1	0	0
	Ethylene dibromide (EDB)	106-93-4	0	68	0%	3.90E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Hexane	110-54-3	0	33	0%	4.32E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Iodomethane	74-88-4	0	20	0%	5.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Isobutyl Alcohol	78-83-1	0	22	0%	4.90E-05	na	no benchmark	no	na	na	na	0	1	0	0
	Isopropylbenzene	98-82-8	4	30	13%	1.01E-06	3.96E-02	no benchmark	no	na	na	na	0	1	0	0
	Methacrylonitrile	126-98-7	0	53	0%	7.21E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Methyl ethyl ketone (MEK)	78-93-3	20	49	41%	4.98E-06	6.00E-02	6.49E+03	yes	yes	no	na	0	0	0	1
	Methyl isobutyl ketone (MIBK)	108-10-1	1	68	1%	6.08E-06	6.40E-03	9.16E+01	yes	yes	no	na	0	0	0	1
	Methyl Metharcylate	80-62-6	0	20	0%	5.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Methyl-t-butyl ether (MTBE)	1634-04-4	1	15	7%	1.03E-06	2.10E-03	no benchmark	no	na	na	na	0	1	0	0
	n-Butylbenzene	104-51-8	0	15	0%	1.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	n-Propylbenzene	103-65-1	1	15	7%	1.02E-06	2.41E-02	no benchmark	no	na	na	na	0	1	0	0
	o-Xylene	95-47-6	1	15	7%	1.02E-06	8.05E-02	4.16E+00	yes	yes	no	na	0	0	0	1
	sec-Butylbenzene	135-98-8	1	15	7%	1.02E-06	3.26E-03	no benchmark	no	na	na	na	0	1	0	0
	Styrene	100-42-5	0	68	0%	3.05E-06	na	no benchmark	no	na	na	na	0	1	0	0
	tert-Butylbenzene	98-06-6	0	15	0%	1.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Tetrachloroethene	127-18-4	0	68	0%	3.05E-06	na	2.77E+00	yes	no	na	no	0	0	0	1
	Toluene	108-88-3	29	68	43%	3.62E-06	1.90E+00	5.15E+01	yes	yes	no	na	0	0	0	1
	trans-1,2-Dichloroethene	156-60-5	0	48	0%	3.81E-06	na	8.96E+01	yes	no	na	no	0	0	0	1
	trans-1,3-Dichloropropene	10061-02-6	0	68	0%	3.05E-06	na	no benchmark	no	na	na	na	0	1	0	0
	trans-1,4-Dichloro-2-Butene	110-57-6	0	20	0%	5.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Trichloroethene	79-01-6	0	68	0%	3.05E-06	na	1.39E+00	yes	no	na	no	0	0	0	1
	Trichlorofluoromethane	75-69-4	0	68	0%	4.99E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Vinyl Acetate	108-05-4	0	53	0%	4.73E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Vinyl Chloride	75-01-4	0	68	0%	5.84E-06	na	6.23E-01	yes	no	na	no	0	0	0	1
	Xylenes (Total)	1330-20-7	5	53	9%	9.49E-06	1.30E-01	4.16E+00	yes	yes	no	na	0	0	0	1
	Xylenes-p,m	179601-23-1	1	15	7%	1.02E-06	5.12E-02	4.16E+00	yes	yes	no	na	0	0	0	1
												Totals	**19**	**130**	**0**	**55**

Appendix D-6 COPC Screen for Surface Soil for Wildlife Receptors

Ecological Risk Assessment for Ogden, Utah

Group	Analyte	CAS #	DATA: Number of Detections	DATA: Number of Samples	DATA: Detection Frequency (DF)	DATA: Mean Non-Detected Conc (mg/kg)	DATA: Maximum Detected Conc (mg/kg)	Wildlife Receptor Soil Benchmark (mg/kg)	COPC SELECTION STEPS: Does compound have a TRV?	COPC SELECTION STEPS: Is compound detected?	COPC SELECTION STEPS: Is Max Detect ≥ TRV?	COPC SELECTION STEPS: Is Mean DL ≥ TRV?	SURFACE SOIL COPCs: QUANT COPC	SURFACE SOIL COPCs: QUAL COPC Type 1	SURFACE SOIL COPCs: QUAL COPC Type 2	SURFACE SOIL COPCs: Not a COPC
Metals	Aluminum	7429-90-5	44	44	100%	na	1.30E+04	3.83E+00	yes	yes	yes	na	1	0	0	0
	Antimony	7440-36-0	9	44	20%	1.09E-03	8.00E+00	2.48E-01	yes	yes	yes	na	1	0	0	0
	Arsenic	7440-38-2	48	60	80%	3.19E-03	2.40E+01	2.50E-01	yes	yes	yes	na	1	0	0	0
	Barium	7440-39-3	54	60	90%	3.81E-02	2.58E+02	1.72E+01	yes	yes	yes	na	1	0	0	0
	Beryllium	7440-41-7	37	44	84%	2.39E-04	9.30E-01	2.42E+00	yes	yes	no	na	0	0	0	1
	Cadmium	7440-43-9	47	60	78%	8.08E-05	7.70E+00	1.20E+00	yes	yes	yes	na	1	0	0	0
	Calcium	7440-70-2	44	44	100%	na	3.78E+04	no benchmark	no	na	na	na	0	1	0	0
	Chromium	7440-47-3	60	60	100%	na	1.96E+01	8.30E-01	yes	yes	yes	na	1	0	0	0
	Cobalt	7440-48-4	43	44	98%	1.35E-03	7.50E+00	no benchmark	no	na	na	na	0	1	0	0
	Copper	7440-50-8	44	44	100%	na	1.04E+02	3.89E+01	yes	yes	yes	na	1	0	0	0
	Iron	7439-89-6	44	44	100%	na	1.60E+04	no benchmark	no	na	na	na	0	1	0	0
	Lead	7439-92-1	60	60	100%	na	9.40E+02	9.40E-01	yes	yes	yes	na	1	0	0	0
	Magnesium	7439-95-4	44	44	100%	na	1.00E+04	no benchmark	no	na	na	na	0	1	0	0
	Manganese	7439-96-5	44	44	100%	na	6.30E+02	3.22E+02	yes	yes	yes	na	1	0	0	0
	Mercury	7439-97-6	58	65	89%	1.89E-05	3.60E+00	5.00E-03	yes	yes	yes	na	1	0	0	0
	Nickel	7440-02-0	44	44	100%	na	1.90E+01	6.41E+01	yes	yes	no	na	0	0	0	1
	Potassium	7440-09-7	44	44	100%	na	3.29E+03	no benchmark	no	na	na	na	0	1	0	0
	Selenium	7782-49-2	15	60	25%	1.01E-03	1.10E+00	3.31E-01	yes	yes	yes	na	1	0	0	0
	Silver	7440-22-4	18	60	30%	1.44E-04	4.30E+00	no benchmark	no	na	na	na	0	1	0	0
	Sodium	7440-23-5	44	44	100%	na	9.30E+02	no benchmark	no	na	na	na	0	1	0	0
	Thallium	7440-28-0	0	44	0%	7.38E-04	na	2.70E-02	yes	no	na	no	0	0	0	1
	Vanadium	7440-62-2	44	44	100%	na	2.25E+01	7.14E-01	yes	yes	yes	na	1	0	0	0
	Zinc	7440-66-6	44	44	100%	na	9.40E+02	1.20E+01	yes	yes	yes	na	1	0	0	0
Pesticides	4,4'-DDD	72-54-8	0	22	0%	3.63E-06	na	2.00E-03	yes	no	na	no	0	0	0	1
	4,4'-DDE	72-55-9	1	22	5%	3.71E-06	1.80E-03	2.00E-03	yes	yes	no	na	0	0	0	1
	4,4'-DDT	50-29-3	4	22	18%	3.99E-06	1.50E-02	2.00E-03	yes	yes	yes	na	1	0	0	0
	Aldrin	309-00-2	0	22	0%	2.28E-06	na	7.33E-01	yes	no	na	no	0	0	0	1
	alpha-BHC	319-84-6	0	22	0%	2.28E-06	na	1.00E-01	yes	no	na	no	0	0	0	1
	alpha-Chlordane	5103-71-9	0	16	0%	1.63E-06	na	1.80E+00	yes	no	na	no	0	0	0	1
	beta-BHC	319-85-7	0	22	0%	2.28E-06	na	1.47E+00	yes	no	na	no	0	0	0	1
	Chlordane	57-74-9	0	6	0%	4.00E-05	na	1.80E+00	yes	no	na	no	0	0	0	1
	delta-BHC	319-86-8	0	22	0%	2.28E-06	na	1.00E-01	yes	no	na	no	0	0	0	1
	Dieldrin	60-57-1	0	22	0%	3.63E-06	na	6.40E-02	yes	no	na	no	0	0	0	1
	Endosulfan I	959-98-8	0	22	0%	2.28E-06	na	5.50E-01	yes	no	na	no	0	0	0	1
	Endosulfan II	33213-65-9	0	22	0%	3.63E-06	na	5.50E-01	yes	no	na	no	0	0	0	1
	Endosulfan Sulfate	1031-07-8	0	22	0%	3.63E-06	na	5.50E-01	yes	no	na	no	0	0	0	1
	Endrin	72-20-8	0	22	0%	3.63E-06	na	8.00E-03	yes	no	na	no	0	0	0	1
	Endrin Aldehyde	7421-93-4	3	22	14%	3.87E-06	9.80E-03	no benchmark	no	na	na	na	0	1	0	0
	Endrin ketone	53494-70-5	0	16	0%	1.99E-06	na	no benchmark	no	na	na	na	0	1	0	0
	gamma-BHC (Lindane)	58-89-9	0	22	0%	2.28E-06	na	1.66E+00	yes	no	na	no	0	0	0	1
	gamma-Chlordane	12789-03-6	3	16	19%	1.76E-06	5.10E-03	1.80E+00	yes	yes	no	na	0	0	0	1
	Heptachlor	76-44-8	0	22	0%	2.28E-06	na	4.76E-01	yes	no	na	no	0	0	0	1
	Heptachlor Epoxide	1024-57-3	0	22	0%	2.28E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Isodrin	465-73-6	0	6	0%	4.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Kepone	143-50-0	0	6	0%	8.00E-06	na	2.93E-01	yes	no	na	no	0	0	0	1
	Methoxychlor	72-43-5	0	22	0%	1.46E-05	na	1.47E+01	yes	no	na	no	0	0	0	1
	Toxaphene	8001-35-2	0	22	0%	7.20E-05	na	2.93E+01	yes	no	na	no	0	0	0	1
	2-Chloronaphthalene	91-58-7	0	72	0%	3.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2-Methylnaphthalene	91-57-6	9	73	12%	3.20E-04	2.00E-01	no benchmark	no	na	na	na	0	1	0	0
	Acenaphthene	83-32-9	2	73	3%	3.07E-04	3.10E-01	no benchmark	no	na	na	na	0	1	0	0

Appendix D-6 COPC Screen for Surface Soil for Wildlife Receptors

Ecological Risk Assessment for Ogden, Utah

Group	Analyte	CAS #	DATA					Wildlife Receptor Soil Benchmark (mg/kg)	COPC SELECTION STEPS				SURFACE SOIL COPCs			
			Number of Detections	Number of Samples	Detection Frequency (DF)	Mean Non-Detected Conc (mg/kg)	Maximum Detected Conc (mg/kg)		Does compound have a TRV?	Is compound detected?	Is Max Detect ≥ TRV?	Is Mean DL ≥ TRV?	**QUANT COPC**	**QUAL COPC Type 1**	**QUAL COPC Type 2**	**Not a COPC**
Polycyclic Aromatic Hydrocarbons (PAHs)	Acenaphthylene	208-96-8	2	73	3%	3.07E-04	4.00E-01	no benchmark	no	na	na	na	0	1	0	0
	Aniline	62-53-3	0	48	0%	2.16E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Anthracene	120-12-7	5	73	7%	3.13E-04	7.10E-01	no benchmark	no	na	na	na	0	1	0	0
	Benzo[a]anthracene	56-55-3	8	73	11%	3.19E-04	1.40E+00	no benchmark	no	na	na	na	0	1	0	0
	Benzo[a]pyrene	50-32-8	7	73	10%	3.17E-04	1.60E+00	1.98E+00	yes	yes	no	na	0	0	0	1
	Benzo[b]fluoranthene	205-99-2	11	73	15%	3.27E-04	1.20E+00	no benchmark	no	na	na	na	0	1	0	0
	Benzo[g,h,i]perylene	191-24-2	14	73	19%	3.10E-04	1.60E+00	no benchmark	no	na	na	na	0	1	0	0
	Benzo[k]fluoranthene	207-08-9	6	73	8%	3.14E-04	1.60E+00	no benchmark	no	na	na	na	0	1	0	0
	Chrysene	218-01-9	13	73	18%	3.31E-04	2.10E+00	no benchmark	no	na	na	na	0	1	0	0
	Dibenz[a,h]anthracene	53-70-3	3	73	4%	3.19E-04	9.60E-02	no benchmark	no	na	na	na	0	1	0	0
	Dibenzofuran	132-64-9	1	72	1%	3.17E-04	4.50E-02	no benchmark	no	na	na	na	0	1	0	0
	Fluoranthene	206-44-0	15	73	21%	3.37E-04	2.30E+00	no benchmark	no	na	na	na	0	1	0	0
	Fluorene	86-73-7	2	73	3%	3.07E-04	2.20E-01	no benchmark	no	na	na	na	0	1	0	0
	Indeno[1,2,3-c,d]pyrene	193-39-5	9	73	12%	3.21E-04	1.50E+00	no benchmark	no	na	na	na	0	1	0	0
	Naphthalene	91-20-3	14	83	17%	2.83E-04	2.70E-01	no benchmark	no	na	na	na	0	1	0	0
	Phenanthrene	85-01-8	17	73	23%	3.41E-04	2.30E+00	no benchmark	no	na	na	na	0	1	0	0
	Pyrene	129-00-0	27	73	37%	3.72E-04	3.70E+00	no benchmark	no	na	na	na	0	1	0	0
Polychlorinated Biphenyls (PCBs)	Aroclor-1016	12674-11-2	0	22	0%	2.77E-05	na	6.52E+00	yes	no	na	no	0	0	0	1
	Aroclor-1221	11104-28-2	0	22	0%	4.47E-05	na	7.10E-02	yes	no	na	no	0	0	0	1
	Aroclor-1232	11141-16-5	0	22	0%	2.77E-05	na	7.10E-02	yes	no	na	no	0	0	0	1
	Aroclor-1242	53469-21-9	0	22	0%	2.77E-05	na	3.29E-01	yes	no	na	no	0	0	0	1
	Aroclor-1248	12672-29-6	0	22	0%	2.77E-05	na	7.10E-02	yes	no	na	no	0	0	0	1
	Aroclor-1254	11097-69-1	0	22	0%	2.77E-05	na	1.11E-01	yes	no	na	no	0	0	0	1
	Aroclor-1260	11096-82-5	6	22	27%	2.99E-05	5.50E-01	7.10E-02	yes	yes	yes	na	1	0	0	0
	Aroclor-1268	11100-14-4	0	10	0%	2.52E-05	na	7.10E-02	yes	no	na	no	0	0	0	1
	1,2,4-Trichlorobenzene	120-82-1	0	83	0%	2.76E-04	na	no benchmark	no	na	na	na	0	1	0	0
	1,2-Dichlorobenzene	95-50-1	0	83	0%	2.76E-04	na	no benchmark	no	na	na	na	0	1	0	0
	1,3-Dichlorobenzene	541-73-1	0	82	0%	2.77E-04	na	no benchmark	no	na	na	na	0	1	0	0
	1,4-Dichlorobenzene	106-46-7	0	83	0%	2.76E-04	na	no benchmark	no	na	na	na	0	1	0	0
	1-Methylnaphthalene	90-12-0	5	47	11%	2.03E-04	2.30E-01	no benchmark	no	na	na	na	0	1	0	0
	2,2'-oxybis(1-Chloropropane)	108-60-1	0	26	0%	4.88E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2,4,5-Trichlorophenol	95-95-4	0	72	0%	3.67E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2,4,6-Trichlorophenol	88-06-2	0	72	0%	3.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2,4-Dichlorophenol	120-83-2	0	72	0%	3.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2,4-Dimethylphenol	105-67-9	0	72	0%	3.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2,4-Dinitrophenol	51-28-5	0	72	0%	9.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2,4-Dinitrotoluene	121-14-2	0	73	0%	3.13E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2,6-Dinitrotoluene	606-20-2	0	73	0%	3.13E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2-Chlorophenol	95-57-8	0	72	0%	3.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2-Methylphenol (o-Cresol)	95-48-7	0	72	0%	3.15E-04	na	1.04E+03	yes	no	na	no	0	0	0	1
	2-Nitroaniline	88-74-4	0	72	0%	9.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	2-Nitrophenol	88-75-5	0	72	0%	3.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	3,3'-Dichlorobenzidine	91-94-1	1	73	1%	3.18E-04	4.30E-02	no benchmark	no	na	na	na	0	1	0	0
	3-Nitroaniline	99-09-2	0	72	0%	9.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	4,6-Dinitro-o-cresol	534-52-1	0	72	0%	9.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	4-Bromophenyl-phenylether	101-55-3	0	10	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	4-Chloro-3-Methylphenol	59-50-7	0	72	0%	3.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	4-Chloroaniline	106-47-8	0	72	0%	3.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	4-Chlorophenyl-phenylether	7005-72-3	0	72	0%	3.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	4-Methylphenol (p-Cresol)	106-44-5	1	72	1%	3.17E-04	1.10E-01	1.04E+03	yes	yes	no	na	0	0	0	1

Appendix D-6 COPC Screen for Surface Soil for Wildlife Receptors

Ecological Risk Assessment for Ogden, Utah

Group	Analyte	CAS #	DATA					Wildlife Receptor Soil Benchmark (mg/kg)	COPC SELECTION STEPS				SURFACE SOIL COPCs			
			Number of Detections	Number of Samples	Detection Frequency (DF)	Mean Non-Detected Conc (mg/kg)	Maximum Detected Conc (mg/kg)		Does compound have a TRV?	Is compound detected?	Is Max Detect ≥ TRV?	Is Mean DL ≥ TRV?	QUANT COPC	QUAL COPC Type 1	QUAL COPC Type 2	Not a COPC
	4-Nitroaniline	100-01-6	0	72	0%	9.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	4-Nitrophenol	100-02-7	0	72	0%	9.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Benzyl alcohol	100-51-6	0	10	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	bis(2-Chloroethoxy)methane	111-91-1	0	72	0%	3.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	bis-(2-Chloroethyl)ether	111-44-4	0	73	0%	3.13E-04	na	no benchmark	no	na	na	na	0	1	0	0
	bis(2-Chloroethyl)ether	111-44-4	0	73	0%	3.13E-04	na	no benchmark	no	na	na	na	0	1	0	0
	bis(2-Chloroisopropyl)ether	108-60-1	0	26	0%	4.88E-04	na	no benchmark	no	na	na	na	0	1	0	0
	bis(2-Ethylhexyl)phthalate	117-81-7	32	73	44%	2.96E-04	1.50E+00	9.10E-01	yes	yes	yes	na	1	0	0	0
	bis(n-octyl)phthalate	117-84-0	1	73	1%	3.15E-04	5.10E-02	no benchmark	no	na	na	na	0	1	0	0
	Butylbenzylphthalate	85-68-7	9	73	12%	3.31E-04	2.80E-01	no benchmark	no	na	na	na	0	1	0	0
	Carbazole	86-74-8	3	73	4%	3.09E-04	2.60E-01	no benchmark	no	na	na	na	0	1	0	0
	Dibutylphthalate	84-74-2	20	73	27%	3.21E-04	2.20E-01	9.00E-02	yes	yes	yes	na	1	0	0	0
	Diethylphthalate	84-66-2	0	73	0%	3.13E-04	na	9.08E+03	yes	no	na	no	0	0	0	1
	Dimethylphthalate	131-11-3	0	72	0%	3.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Hexachlorobenzene	118-74-1	0	73	0%	3.13E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Hexachlorobutadiene	87-68-3	0	83	0%	2.76E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Hexachlorocyclopentadiene	77-47-4	0	72	0%	3.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Hexachloroethane	67-72-1	0	73	0%	3.13E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Isophorone	78-59-1	0	72	0%	3.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Nitrobenzene	98-95-3	0	73	0%	3.13E-04	na	no benchmark	no	na	na	na	0	1	0	0
	N-Nitrosodiphenylamine	86-30-6	0	72	0%	3.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	n-Nitrosodipropylamine	621-64-7	0	73	0%	3.13E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Pentachlorophenol (PCP)	87-86-5	0	72	0%	9.15E-04	na	8.79E-01	yes	no	na	no	0	0	0	1
	Phenol	108-95-2	0	72	0%	3.15E-04	na	no benchmark	no	na	na	na	0	1	0	0
	1,1,1,2-Tetrachloroethane	630-20-6	0	25	0%	3.33E-06	na	no benchmark	no	na	na	na	0	1	0	0
	1,1,1-Trichloroethane	71-55-6	0	70	0%	2.81E-06	na	2.06E+03	yes	no	na	no	0	0	0	1
	1,1,2,2-Tetrachloroethane	79-34-5	1	70	1%	2.82E-06	1.20E-03	no benchmark	no	na	na	na	0	1	0	0
	1,1,2-Trichloroethane	79-00-5	0	70	0%	2.81E-06	na	2.06E+03	yes	no	na	no	0	0	0	1
	1,1-Dichloroethane	75-34-3	1	70	1%	2.82E-06	6.40E-03	1.42E+01	yes	yes	no	na	0	0	0	1
	1,1-Dichloroethene	75-35-4	0	10	0%	8.29E-07	na	3.25E+01	yes	no	na	no	0	0	0	1
	1,1-Dichloropropene	563-58-6	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	1,2,3-Trichlorobenzene	87-61-6	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	1,2,3-Trichloropropane	96-18-4	0	70	0%	3.35E-06	na	no benchmark	no	na	na	na	0	1	0	0
	1,2,4-Trimethylbenzene	95-63-6	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	0	70	0%	3.35E-06	na	no benchmark	no	na	na	na	0	1	0	0
	1,2-Dichloroethane	107-06-2	0	70	0%	2.81E-06	na	1.42E+01	yes	no	na	no	0	0	0	1
	1,2-Dichloroethene	540-59-0	0	60	0%	5.67E-06	na	8.96E+01	yes	no	na	no	0	0	0	1
	1,2-Dichloropropane	78-87-5	0	70	0%	2.81E-06	na	no benchmark	no	na	na	na	0	1	0	0
	1,3,5-Trimethylbenzene	108-67-8	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	1,3-Dichloropropane	142-28-9	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	1,4-Dioxane	123-91-1	0	15	0%	1.50E-04	na	1.83E+00	yes	no	na	no	0	0	0	1
	2,2-Dichloropropane	594-20-7	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	2-Chloro-1,3-butadiene (Chloroprene)	126-99-8	0	15	0%	5.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	2-Chloroethyl vinyl ether	110-75-8	0	60	0%	3.78E-06	na	no benchmark	no	na	na	na	0	1	0	0
	2-Chlorotoluene	95-49-8	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	2-Hexanone	591-78-6	0	70	0%	5.63E-06	na	no benchmark	no	na	na	na	0	1	0	0
	3-Chloropropene (Allyl Chloride)	107-05-1	0	15	0%	5.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	4-Chlorotoluene	106-43-4	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	Acetone	67-64-1	4	70	6%	6.32E-06	2.80E-02	3.66E+01	yes	yes	no	na	0	0	0	1
	Acetonitrile	75-05-8	0	60	0%	1.63E-05	na	no benchmark	no	na	na	na	0	1	0	0

Appendix D-6 COPC Screen for Surface Soil for Wildlife Receptors

Ecological Risk Assessment for Ogden, Utah

Group	Analyte	CAS #	DATA					Wildlife Receptor Soil Benchmark (mg/kg)	COPC SELECTION STEPS				SURFACE SOIL COPCs			
			Number of Detections	Number of Samples	Detection Frequency (DF)	Mean Non-Detected Conc (mg/kg)	Maximum Detected Conc (mg/kg)		Does compound have a TRV?	Is compound detected?	Is Max Detect ≥ TRV?	Is Mean DL ≥ TRV?	**QUANT COPC**	**QUAL COPC Type 1**	**QUAL COPC Type 2**	**Not a COPC**
Volatile Organic Compounds (VOCs)	Acrolein	107-02-8	0	46	0%	2.54E-05	na	no benchmark	no	na	na	na	0	1	0	0
	Acrylonitrile	107-13-1	0	60	0%	1.64E-05	na	no benchmark	no	na	na	na	0	1	0	0
	Benzene	71-43-2	2	70	3%	2.81E-06	1.20E-03	5.22E+01	yes	yes	no	na	0	0	0	1
	Bromobenzene	108-86-1	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	Bromodichloromethane	75-27-4	0	70	0%	2.81E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Bromoform	75-25-2	0	70	0%	2.81E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Bromomethane (Methyl bromide)	74-83-9	0	70	0%	5.62E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Carbon Disulfide	75-15-0	0	70	0%	2.81E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Carbon Tetrachloride	56-23-5	0	70	0%	2.81E-06	na	5.86E+01	yes	no	na	no	0	0	0	1
	Chlorobenzene	108-90-7	0	70	0%	2.81E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Chlorodibromomethane	124-48-1	0	70	0%	2.81E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Chloroethane (Ethyl chloride)	75-00-3	0	70	0%	5.51E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Chloroform	67-66-3	1	70	1%	2.84E-06	1.00E-03	5.50E+01	yes	yes	no	na	0	0	0	1
	Chloromethane (Methyl chloride)	74-87-3	0	70	0%	5.51E-06	na	no benchmark	no	na	na	na	0	1	0	0
	cis-1,2-Dichloroethene	156-59-2	0	45	0%	3.40E-06	na	8.96E+01	yes	no	na	no	0	0	0	1
	cis-1,3-Dichloropropene	10061-01-5	0	80	0%	2.56E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Dibromomethane	74-95-3	0	25	0%	3.33E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Dichlorodifluoromethane	75-71-8	1	25	4%	3.44E-06	2.20E-03	no benchmark	no	na	na	na	0	1	0	0
	Dichloromethane	75-09-2	22	70	31%	2.13E-06	7.80E-03	2.14E+01	yes	yes	no	na	0	0	0	1
	Ethyl Methacrylate	97-63-2	0	15	0%	2.50E-05	na	no benchmark	no	na	na	na	0	1	0	0
	Ethylbenzene	100-41-4	1	70	1%	2.82E-06	2.40E-03	no benchmark	no	na	na	na	0	1	0	0
	Ethylene dibromide (EDB)	106-93-4	0	70	0%	3.35E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Hexane	110-54-3	0	45	0%	3.32E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Iodomethane	74-88-4	0	15	0%	5.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Isobutyl Alcohol	78-83-1	0	15	0%	5.00E-05	na	no benchmark	no	na	na	na	0	1	0	0
	Isopropylbenzene	98-82-8	0	20	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	Methacrylonitrile	126-98-7	0	60	0%	6.29E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Methyl ethyl ketone (MEK)	78-93-3	0	27	0%	4.38E-06	na	6.49E+03	yes	no	na	no	0	0	0	1
	Methyl isobutyl ketone (MIBK)	108-10-1	0	70	0%	5.63E-06	na	9.16E+01	yes	no	na	no	0	0	0	1
	Methyl Metharcylate	80-62-6	0	15	0%	5.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Methyl-t-butyl ether (MTBE)	1634-04-4	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	n-Butylbenzene	104-51-8	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	n-Propylbenzene	103-65-1	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	o-Xylene	95-47-6	0	10	0%	8.29E-07	na	4.16E+00	yes	no	na	no	0	0	0	1
	sec-Butylbenzene	135-98-8	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	Styrene	100-42-5	0	70	0%	2.81E-06	na	no benchmark	no	na	na	na	0	1	0	0
	tert-Butylbenzene	98-06-6	0	10	0%	8.29E-07	na	no benchmark	no	na	na	na	0	1	0	0
	Tetrachloroethene	127-18-4	2	70	3%	2.82E-06	6.80E-03	2.77E+00	yes	yes	no	na	0	0	0	1
	Toluene	108-88-3	2	70	3%	2.81E-06	2.00E-03	5.15E+01	yes	yes	no	na	0	0	0	1
	trans-1,2-Dichloroethene	156-60-5	0	55	0%	2.98E-06	na	8.96E+01	yes	no	na	no	0	0	0	1
	trans-1,3-Dichloropropene	10061-02-6	0	70	0%	2.81E-06	na	no benchmark	no	na	na	na	0	1	0	0
	trans-1,4-Dichloro-2-Butene	110-57-6	0	15	0%	5.00E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Trichloroethene	79-01-6	0	70	0%	2.81E-06	na	1.39E+00	yes	no	na	no	0	0	0	1
	Trichlorofluoromethane	75-69-4	1	70	1%	4.98E-06	3.00E-03	no benchmark	no	na	na	na	0	1	0	0
	Vinyl Acetate	108-05-4	0	60	0%	3.81E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Vinyl Chloride	75-01-4	0	70	0%	5.51E-06	na	6.23E-01	yes	no	na	no	0	0	0	1
	Xylenes (Total)	1330-20-7	1	60	2%	8.30E-06	1.30E-02	4.16E+00	yes	yes	no	na	0	0	0	1
	Xylenes-p,m	179601-23-1	0	10	0%	8.29E-07	na	4.16E+00	yes	no	na	no	0	0	0	1
												Totals	**17**	**124**	**0**	**57**

Appendix D-7 COPC Screen for Fish Tissue Ingestion by Wildlife Receptors

Ecological Risk Assessment for Ogden, Utah

			DATA						COPC SELECTION STEPS				FISH TISSUE COPCs			
Group	**Analyte**	**CAS #**	Number of Detections	Number of Samples	Detection Frequency (DF)	Mean Non-Detected Conc (mg/kg)	Maximum Detected Conc (mg/kg)	Wildlife Receptor Food Benchmark (mg/kg)	Does compound have a TRV?	Is compound detected?	Is Max Detect ≥ TRV?	Is Mean DL ≥ TRV?	**QUANT COPC**	**QUAL COPC Type 1**	**QUAL COPC Type 2**	**Not a COPC**
PAH	2-Chloronaphthalene	91-58-7	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2-Methylnaphthalene	91-57-6	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Acenaphthene	83-32-9	1	34	3%	8.79E-04	5.64E-01	no benchmark	no	na	na	na	0	1	0	0
	Acenaphthylene	208-96-8	0	34	0%	8.82E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Anthracene	120-12-7	0	34	0%	8.82E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Benzo[a]anthracene	56-55-3	0	34	0%	8.82E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Benzo[a]pyrene	50-32-8	0	34	0%	8.82E-04	na	1.98E+00	yes	no	na	no	0	0	0	1
	Benzo[b]fluoranthene	205-99-2	0	34	0%	8.82E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Benzo[g,h,i]perylene	191-24-2	0	34	0%	8.82E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Benzo[k]fluoranthene	207-08-9	0	34	0%	8.82E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Chrysene	218-01-9	0	34	0%	8.82E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Dibenz[a,h]anthracene	53-70-3	0	34	0%	8.82E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Dibenzofuran	132-64-9	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Fluoranthene	206-44-0	0	34	0%	8.82E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Fluorene	86-73-7	0	34	0%	8.82E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Indeno[1,2,3-c,d]pyrene	193-39-5	0	34	0%	8.82E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Naphthalene	91-20-3	0	34	0%	8.82E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Phenanthrene	85-01-8	0	34	0%	8.82E-04	na	no benchmark	no	na	na	na	0	1	0	0
	Pyrene	129-00-0	0	34	0%	8.82E-04	na	no benchmark	no	na	na	na	0	1	0	0
PCB	Aroclor-1016	12674-11-2	0	29	0%	2.02E-05	na	6.52E+00	yes	no	na	no	0	0	0	1
	Aroclor-1221	11104-28-2	0	29	0%	4.20E-05	na	7.10E-02	yes	no	na	no	0	0	0	1
	Aroclor-1232	11141-16-5	0	29	0%	2.02E-05	na	7.10E-02	yes	no	na	no	0	0	0	1
	Aroclor-1242	53469-21-9	0	29	0%	2.02E-05	na	3.29E-01	yes	no	na	no	0	0	0	1
	Aroclor-1248	12672-29-6	0	29	0%	2.02E-05	na	7.10E-02	yes	no	na	no	0	0	0	1
	Aroclor-1254	11097-69-1	0	29	0%	2.02E-05	na	1.11E-01	yes	no	na	no	0	0	0	1
	Aroclor-1260	11096-82-5	28	29	97%	3.09E-05	1.86E+00	7.10E-02	yes	yes	yes	na	1	0	0	0
	Aroclor-1268	11100-14-4	0	28	0%	1.99E-05	na	7.10E-02	yes	no	na	no	0	0	0	1
Pesticide	4,4'-DDD	72-54-8	18	29	62%	2.04E-06	1.59E-02	2.00E-03	yes	yes	yes	na	1	0	0	0
	4,4'-DDE	72-55-9	29	29	100%	na	5.85E-01	2.00E-03	yes	yes	yes	na	1	0	0	0
	4,4'-DDT	50-29-3	1	29	3%	2.03E-06	2.69E-03	2.00E-03	yes	yes	yes	na	1	0	0	0
	Aldrin	309-00-2	0	29	0%	2.03E-06	na	7.33E-01	yes	no	na	no	0	0	0	1
	alpha-BHC	319-84-6	0	29	0%	2.03E-06	na	1.00E-01	yes	no	na	no	0	0	0	1
	alpha-Chlordane	5103-71-9	0	29	0%	2.03E-06	na	1.80E+00	yes	no	na	no	0	0	0	1
	beta-BHC	319-85-7	0	29	0%	2.03E-06	na	1.47E+00	yes	no	na	no	0	0	0	1
	delta-BHC	319-86-8	0	29	0%	2.03E-06	na	1.00E-01	yes	no	na	no	0	0	0	1
	Dieldrin	60-57-1	0	29	0%	2.03E-06	na	6.40E-02	yes	no	na	no	0	0	0	1
	Endosulfan I	959-98-8	0	29	0%	2.03E-06	na	5.50E-01	yes	no	na	no	0	0	0	1
	Endosulfan II	33213-65-9	0	29	0%	2.03E-06	na	5.50E-01	yes	no	na	no	0	0	0	1
	Endosulfan Sulfate	1031-07-8	0	29	0%	2.03E-06	na	5.50E-01	yes	no	na	no	0	0	0	1
	Endrin	72-20-8	0	29	0%	2.03E-06	na	8.00E-03	yes	no	na	no	0	0	0	1
	Endrin Aldehyde	7421-93-4	0	29	0%	2.03E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Endrin ketone	53494-70-5	0	29	0%	2.03E-06	na	no benchmark	no	na	na	na	0	1	0	0
	gamma-BHC	58-89-9	0	29	0%	2.03E-06	na	1.66E+00	yes	no	na	no	0	0	0	1
	gamma-Chlordane	12789-03-6	2	29	7%	2.03E-06	2.05E-02	1.80E+00	yes	yes	no	na	0	0	0	1
	Heptachlor	76-44-8	0	29	0%	2.03E-06	na	4.76E-01	yes	no	na	no	0	0	0	1
	Heptachlor Epoxide	1024-57-3	0	29	0%	2.03E-06	na	no benchmark	no	na	na	na	0	1	0	0
	Methoxychlor	72-43-5	0	29	0%	2.03E-06	na	1.47E+01	yes	no	na	no	0	0	0	1
	Toxaphene	8001-35-2	0	29	0%	4.20E-05	na	2.93E+01	yes	no	na	no	0	0	0	1

Appendix D-7 COPC Screen for Fish Tissue Ingestion by Wildlife Receptors

Ecological Risk Assessment for Ogden, Utah

Group	Analyte	CAS #	DATA					Wildlife Receptor Food Benchmark (mg/kg)	COPC SELECTION STEPS				FISH TISSUE COPCs			
			Number of Detections	Number of Samples	Detection Frequency (DF)	Mean Non-Detected Conc (mg/kg)	Maximum Detected Conc (mg/kg)		Does compound have a TRV?	Is compound detected?	Is Max Detect ≥ TRV?	Is Mean DL ≥ TRV?	**QUANT COPC**	**QUAL COPC Type 1**	**QUAL COPC Type 2**	**Not a COPC**
SVOC	1,2,4-Trichlorobenzene	120-82-1	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	1,2-Dichlorobenzene	95-50-1	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	1,3-Dichlorobenzene	541-73-1	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	1,4-Dichlorobenzene	106-46-7	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2,4,5-Trichlorophenol	95-95-4	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2,4,6-Trichlorophenol	88-06-2	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2,4-Dichlorophenol	120-83-2	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2,4-Dimethylphenol	105-67-9	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2,4-Dinitrophenol	51-28-5	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2,4-Dinitrotoluene	121-14-2	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2,6-Dinitrotoluene	606-20-2	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2-Chlorophenol	95-57-8	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2-Methylphenol (o-Cresol)	95-48-7	0	29	0%	1.01E-03	na	1.04E+03	yes	no	na	no	0	0	0	1
	2-Nitroaniline	88-74-4	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	2-Nitrophenol	88-75-5	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	3,3'-Dichlorobenzidine	91-94-1	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	3-Nitroaniline	99-09-2	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	4,6-Dinitro-o-cresol	534-52-1	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	4-Bromophenyl-phenylether	101-55-3	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	4-Chloro-3-Methylphenol	59-50-7	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	4-Chloroaniline	106-47-8	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	4-Chlorophenyl-phenylether	7005-72-3	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	4-Methylphenol (p-Cresol)	106-44-5	0	29	0%	1.01E-03	na	1.04E+03	yes	no	na	no	0	0	0	1
	4-Nitroaniline	100-01-6	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	4-Nitrophenol	100-02-7	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Benzyl alcohol	100-51-6	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	bis(2-Chloroethoxy)methane	111-91-1	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	bis(2-Chloroethyl)ether	111-44-4	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	bis(2-Chloroisopropyl)ether	108-60-1	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	bis(2-Ethylhexyl)phthalate	117-81-7	22	29	76%	9.96E-04	2.73E+00	9.10E-01	yes	yes	yes	na	1	0	0	0
	bis(n-octyl)phthalate	117-84-0	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Butylbenzylphthalate	85-68-7	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Carbazole	86-74-8	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Dibutylphthalate	84-74-2	1	29	3%	1.01E-03	1.06E+00	9.00E-02	yes	yes	yes	na	1	0	0	0
	Diethylphthalate	84-66-2	1	29	3%	1.01E-03	1.74E+00	9.08E+03	yes	yes	no	na	0	0	0	1
	Dimethylphthalate	131-11-3	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Hexachlorobenzene	118-74-1	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Hexachlorobutadiene	87-68-3	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Hexachlorocyclopentadiene	77-47-4	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Hexachloroethane	67-72-1	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Isophorone	78-59-1	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Nitrobenzene	98-95-3	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	N-Nitrosodiphenylamine	86-30-6	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	n-Nitrosodipropylamine	621-64-7	0	29	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
	Pentachlorophenol (PCP)	87-86-5	0	29	0%	1.01E-03	na	8.79E-01	yes	no	na	no	0	0	0	1
	Phenol	108-95-2	0	30	0%	1.01E-03	na	no benchmark	no	na	na	na	0	1	0	0
												Totals	**6**	**61**	**0**	**27**

APPENDIX E

RISK CALCULATIONS AND DETAILED RESULTS

E-1: Exposure of Aquatic Receptors to Surface Water

E-2: Exposure of Benthic Organisms to Non-PAHs in Sediments

E-3: Exposure of Benthic Organisms to PAHs in Sediments (Based on Non-SIM Data)

E-4: Exposure of Benthic Organisms to PAHs in Sediments (Based on SIM Data)

E-5: Exposure of Benthic Organisms to Porewater

E-6: Exposure of Fish Evaluated Using Fish Tissue Data

E-7: Exposure of Terrestrial Receptors to Soil

E-8: Exposure of Wildlife Receptors from Ingestion Pathways

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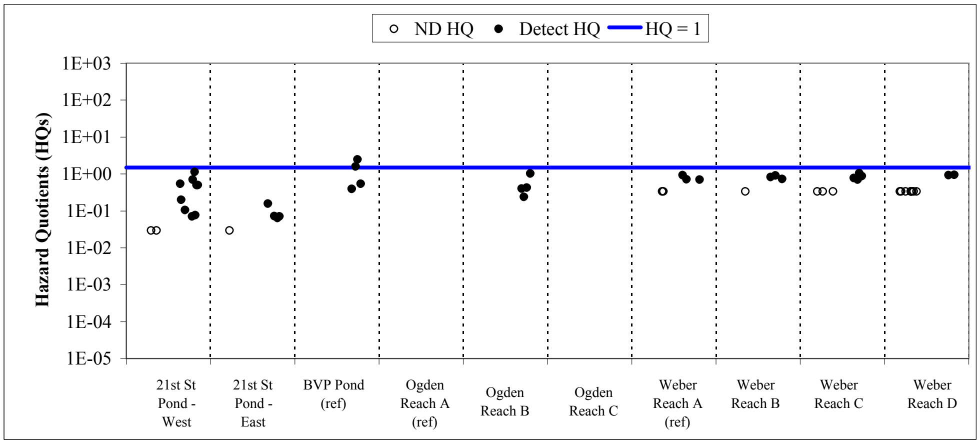
Appendix E-1
Aquatic Receptor HQs for Direct Contact with Surface Water

Baseline Ecological Risk Assessment for the Ogden Railyard Site

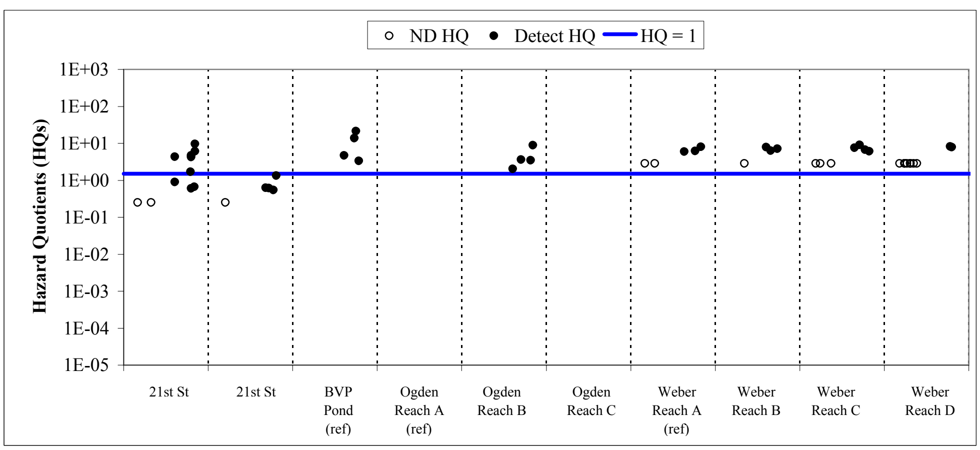
ALUMINUM

Based on the Acute Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	2	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	11	5	2	0	4	0	5	4	7	10
Detect Samples:	9	4	4	0	4	0	3	3	4	2
All Samples:	11	5	4	0	4	0	5	4	7	10
Risk Category:	**C**	**C**	**A**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

Based on the Chronic Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	6	0	4	0	4	0	3	3	4	2
ND HQs > 1:	0	0	0	0	0	0	2	1	3	8
All HQs ≤ 1:	5	5	0	0	0	0	0	0	0	0
Detect Samples:	9	4	4	0	4	0	3	3	4	2
All Samples:	11	5	4	0	4	0	5	4	7	10
Risk Category:	**A**	**C**	**A**	**na**	**A**	**na**	**A**	**A**	**A**	**B**

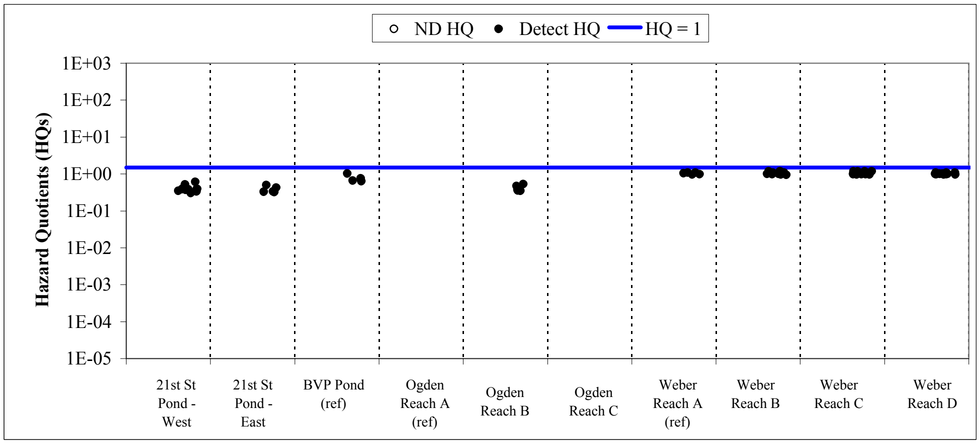
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-1
Aquatic Receptor HQs for Direct Contact with Surface Water

Baseline Ecological Risk Assessment for the Ogden Railyard Site

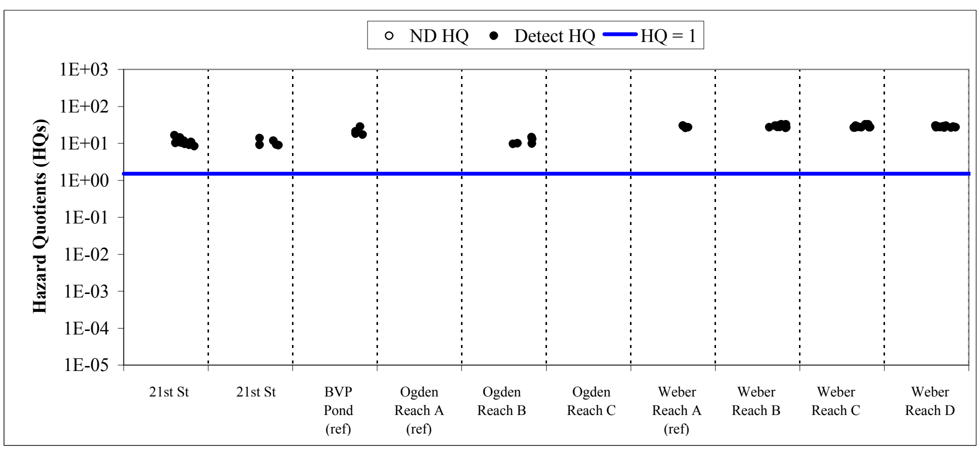
BARIUM

Based on the Acute Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	11	5	4	0	5	0	5	11	11	15
Detect Samples:	11	5	4	0	5	0	5	11	11	15
All Samples:	11	5	4	0	5	0	5	11	11	15
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

Based on the Chronic Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	11	5	4	0	5	0	5	11	11	15
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	0	0	0	0	0	0	0	0	0	0
Detect Samples:	11	5	4	0	5	0	5	11	11	15
All Samples:	11	5	4	0	5	0	5	11	11	15
Risk Category:	**A**	**A**	**A**	**na**	**A**	**na**	**A**	**A**	**A**	**A**

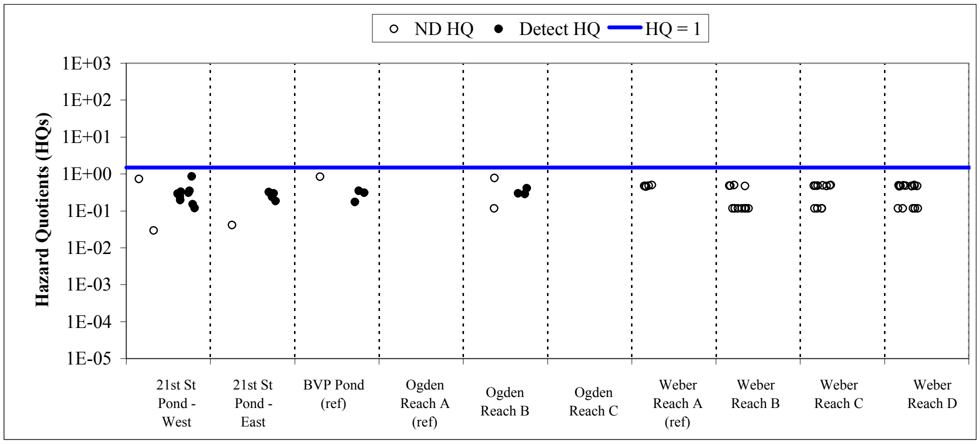
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-1
Aquatic Receptor HQs for Direct Contact with Surface Water

Baseline Ecological Risk Assessment for the Ogden Railyard Site

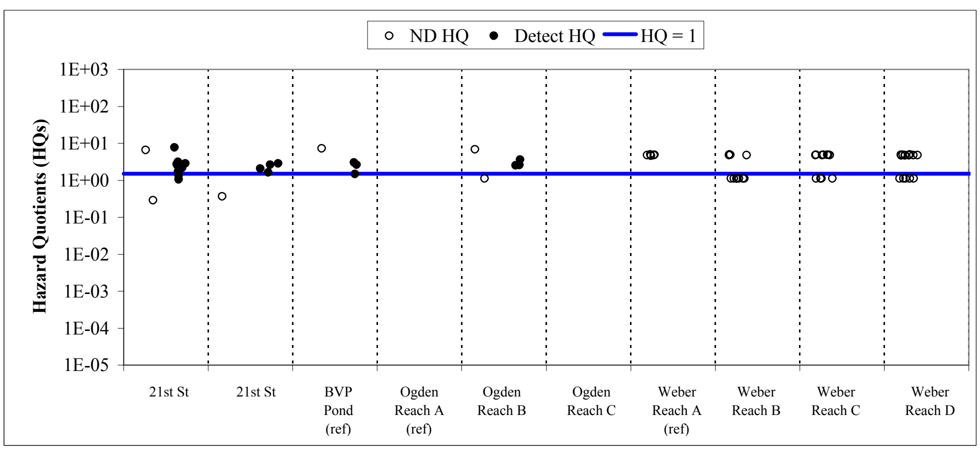
CADMIUM

Based on the Acute Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	11	5	4	0	5	0	5	11	11	15
Detect Samples:	9	4	3	0	3	0	0	0	0	0
All Samples:	11	5	4	0	5	0	5	11	11	15
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

Based on the Chronic Toxicity Benchmark

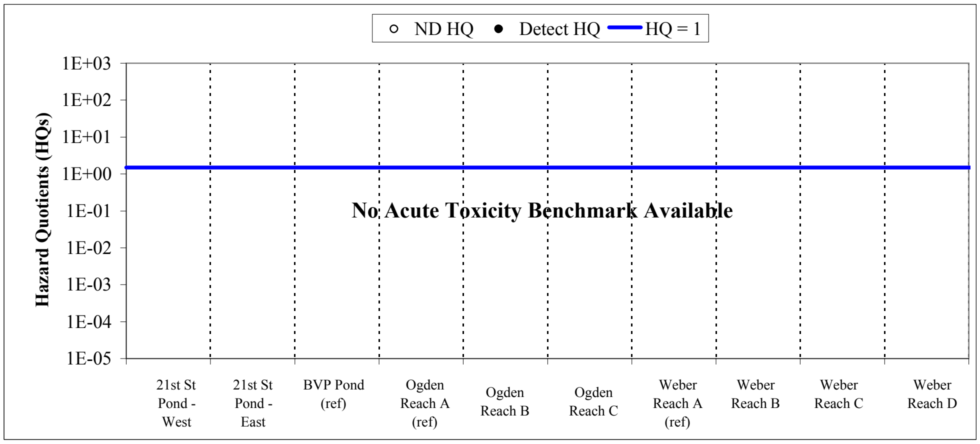


Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	7	4	2	0	3	0	0	0	0	0
ND HQs > 1:	1	0	1	0	1	0	5	4	7	10
All HQs ≤ 1:	3	1	1	0	1	0	0	7	4	5
Detect Samples:	9	4	3	0	3	0	0	0	0	0
All Samples:	11	5	4	0	5	0	5	11	11	15
Risk Category:	**A**	**A**	**A**	**na**	**A**	**na**	**B**	**B**	**B**	**B**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

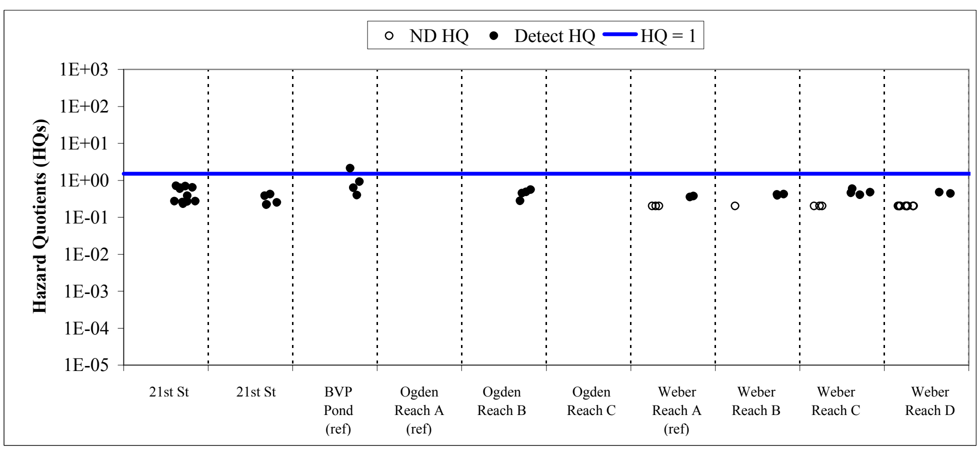
Appendix E-1
Aquatic Receptor HQs for Direct Contact with Surface Water
Baseline Ecological Risk Assessment for the Ogden Railyard Site
IRON

Based on the Acute Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	--	0	--	--	--	--	--	--	--	--
ND HQs > 1:	--	0	--	--	--	--	--	--	--	--
All HQs ≤ 1:	--	0	--	--	--	--	--	--	--	--
Detect Samples:	11	5	4	0	4	0	2	3	4	2
All Samples:	11	5	4	0	4	0	5	4	7	10
Risk Category:	**--**	**--**	**--**	**na**	**--**	**na**	**--**	**--**	**--**	**--**

Based on the Chronic Toxicity Benchmark

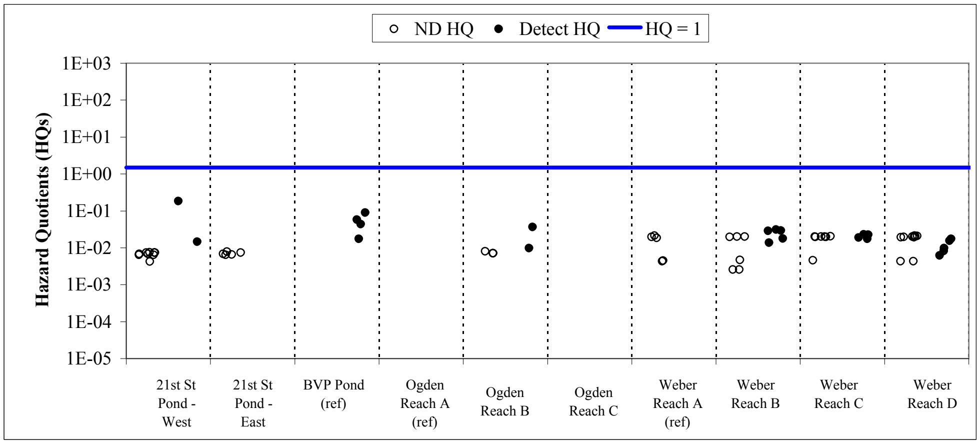


Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	1	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	11	5	3	0	4	0	5	4	7	10
Detect Samples:	11	5	4	0	4	0	2	3	4	2
All Samples:	11	5	4	0	4	0	5	4	7	10
Risk Category:	**C**	**C**	**A**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

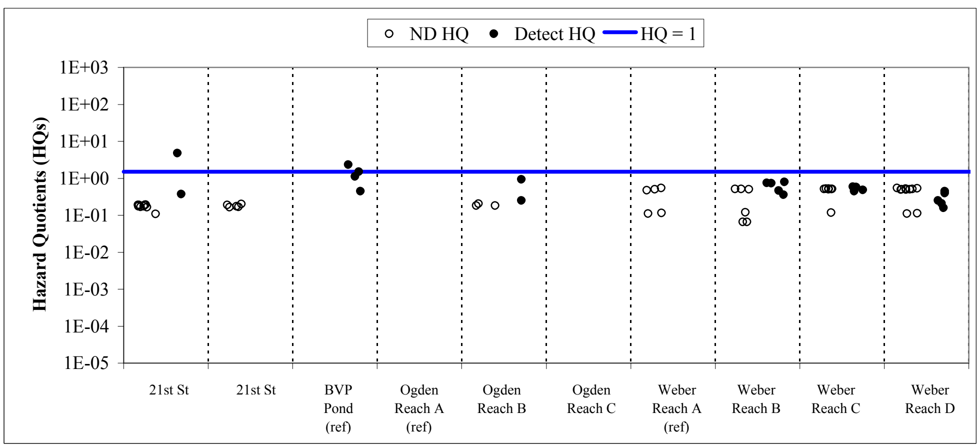
Appendix E-1
Aquatic Receptor HQs for Direct Contact with Surface Water
Baseline Ecological Risk Assessment for the Ogden Railyard Site
LEAD

Based on the Acute Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	11	5	4	0	5	0	5	11	11	15
Detect Samples:	2	0	4	0	2	0	0	5	4	5
All Samples:	11	5	4	0	5	0	5	11	11	15
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

Based on the Chronic Toxicity Benchmark



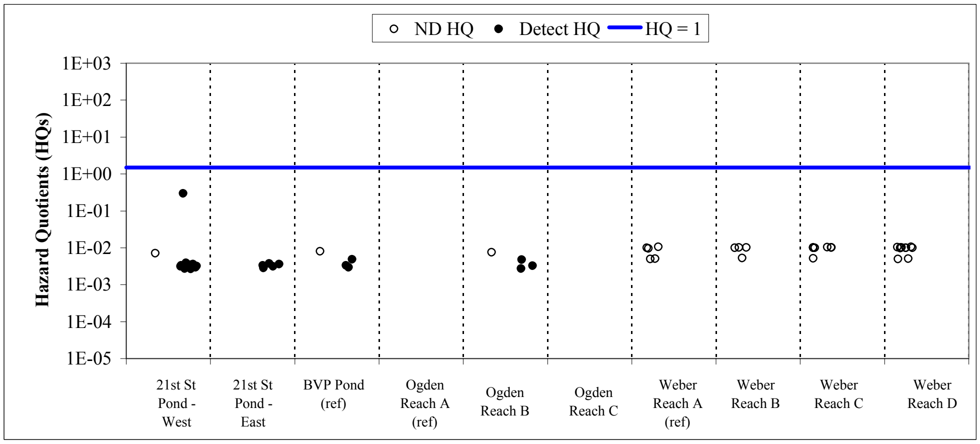
Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	1	0	1	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	10	5	3	0	5	0	5	11	11	15
Detect Samples:	2	0	4	0	2	0	0	5	4	5
All Samples:	11	5	4	0	5	0	5	11	11	15
Risk Category:	**C**	**C**	**A**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-1
Aquatic Receptor HQs for Direct Contact with Surface Water
Baseline Ecological Risk Assessment for the Ogden Railyard Site

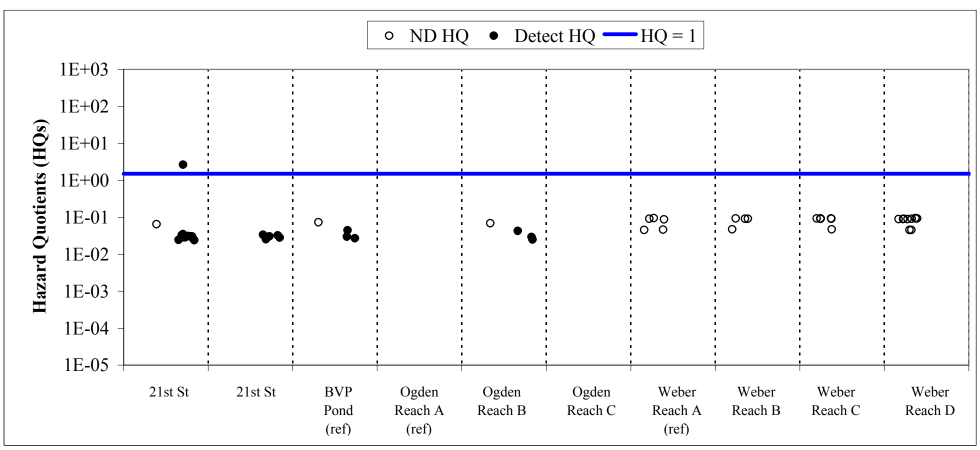
NICKEL

Based on the Acute Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	11	5	4	0	4	0	5	4	7	10
Detect Samples:	10	5	3	0	3	0	0	0	0	0
All Samples:	11	5	4	0	4	0	5	4	7	10
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

Based on the Chronic Toxicity Benchmark

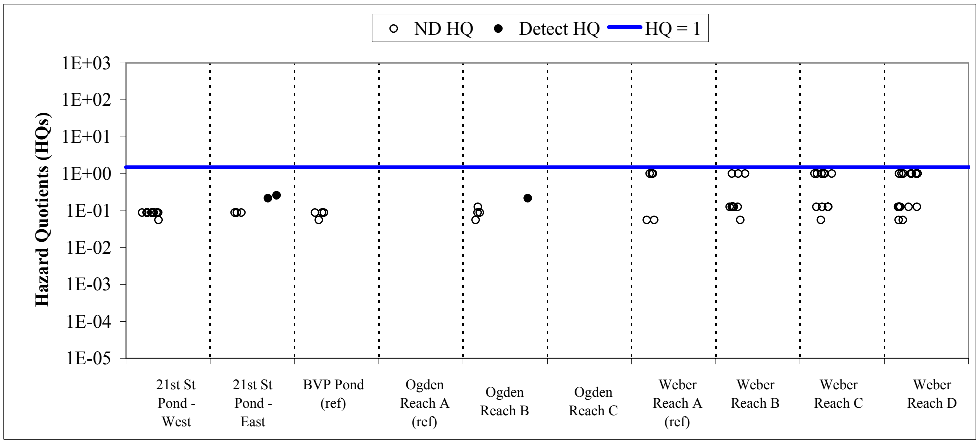


Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	1	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	10	5	4	0	4	0	5	4	7	10
Detect Samples:	10	5	3	0	3	0	0	0	0	0
All Samples:	11	5	4	0	4	0	5	4	7	10
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

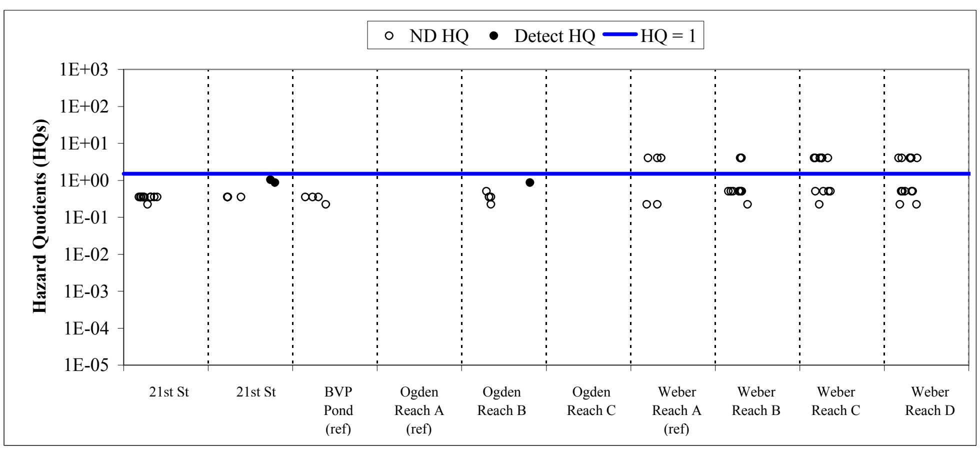
Appendix E-1
Aquatic Receptor HQs for Direct Contact with Surface Water
Baseline Ecological Risk Assessment for the Ogden Railyard Site
SELENIUM

Based on the Acute Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	11	5	4	0	5	0	5	11	11	15
Detect Samples:	0	2	0	0	1	0	0	0	0	0
All Samples:	11	5	4	0	5	0	5	11	11	15
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

Based on the Chronic Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	3	3	6	8
All HQs ≤ 1:	11	5	4	0	5	0	2	8	5	7
Detect Samples:	0	2	0	0	1	0	0	0	0	0
All Samples:	11	5	4	0	5	0	5	11	11	15
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**B**	**B**	**B**	**B**

A = Risk to the sub-population at this location are possible
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C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
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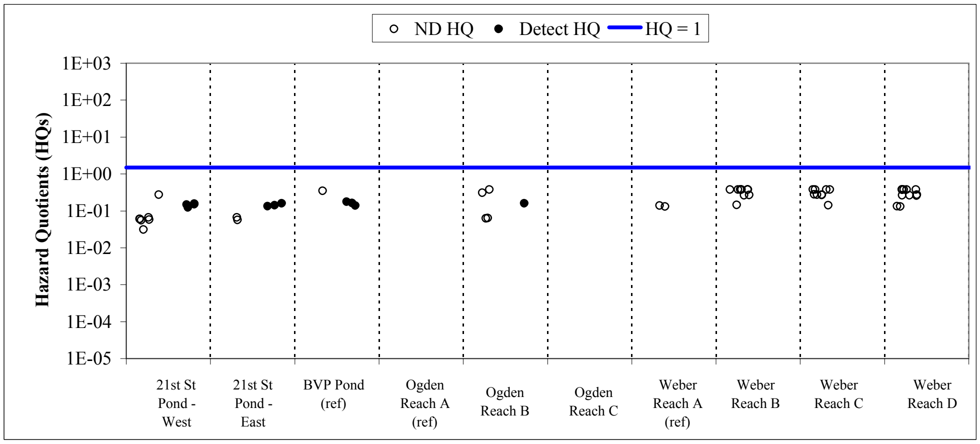
Appendix E-1
Aquatic Receptor HQs for Direct Contact with Surface Water

Baseline Ecological Risk Assessment for the Ogden Railyard Site

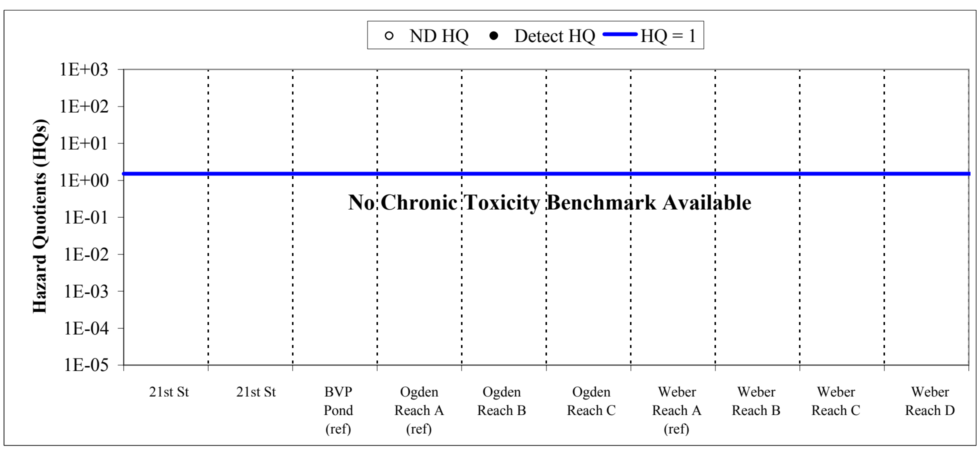
SILVER

Based on the Acute Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	11	5	4	0	5	0	2	10	9	11
Detect Samples:	4	3	3	0	1	0	0	0	0	0
All Samples:	11	5	4	0	5	0	2	10	9	11
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

Based on the Chronic Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	--	0	--	--	--	--	--	--	--	--
ND HQs > 1:	--	0	--	--	--	--	--	--	--	--
All HQs ≤ 1:	--	0	--	--	--	--	--	--	--	--
Detect Samples:	4	3	3	0	1	0	0	0	0	0
All Samples:	11	5	4	0	5	0	2	10	9	11
Risk Category:	**--**	**A**	**--**	**na**	**--**	**na**	**--**	**--**	**--**	**--**

A = Risk to the sub-population at this location are possible
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C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
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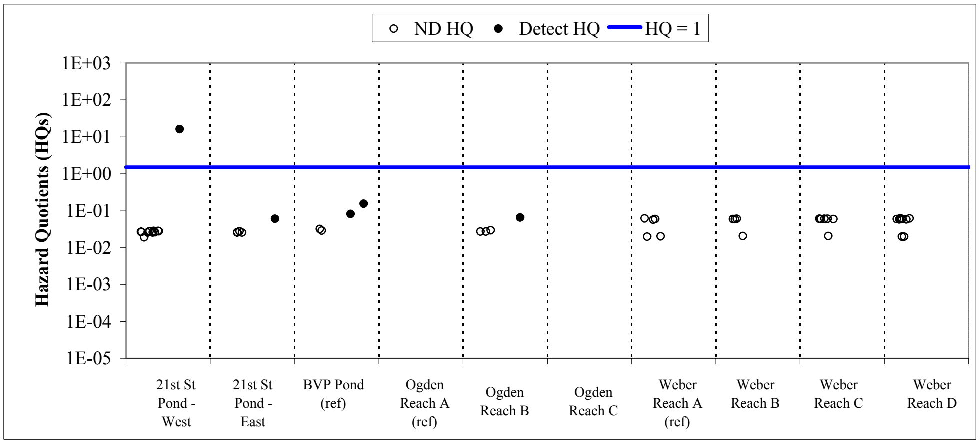
Appendix E-1
Aquatic Receptor HQs for Direct Contact with Surface Water

Baseline Ecological Risk Assessment for the Ogden Railyard Site

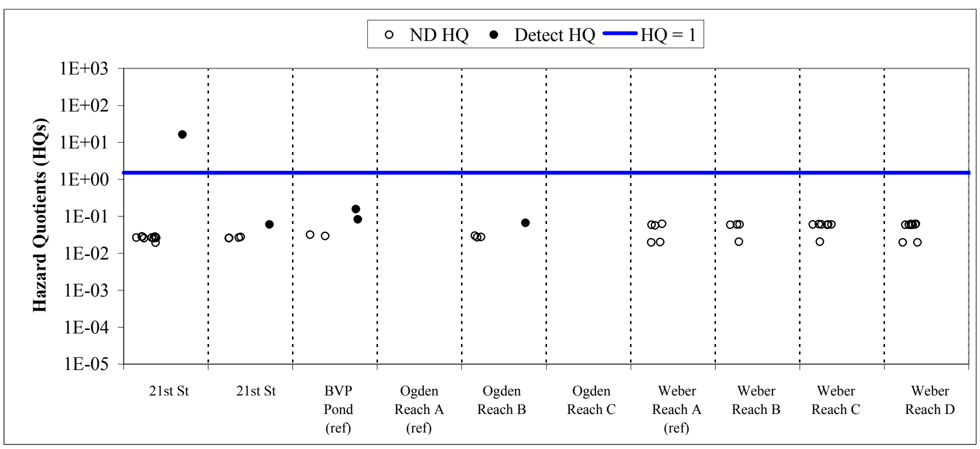
ZINC

Based on the Acute Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	1	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	10	5	4	0	4	0	5	4	7	10
Detect Samples:	1	1	2	0	1	0	0	0	0	0
All Samples:	11	5	4	0	4	0	5	4	7	10
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

Based on the Chronic Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	1	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	10	5	4	0	4	0	5	4	7	10
Detect Samples:	1	1	2	0	1	0	0	0	0	0
All Samples:	11	5	4	0	4	0	5	4	7	10
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
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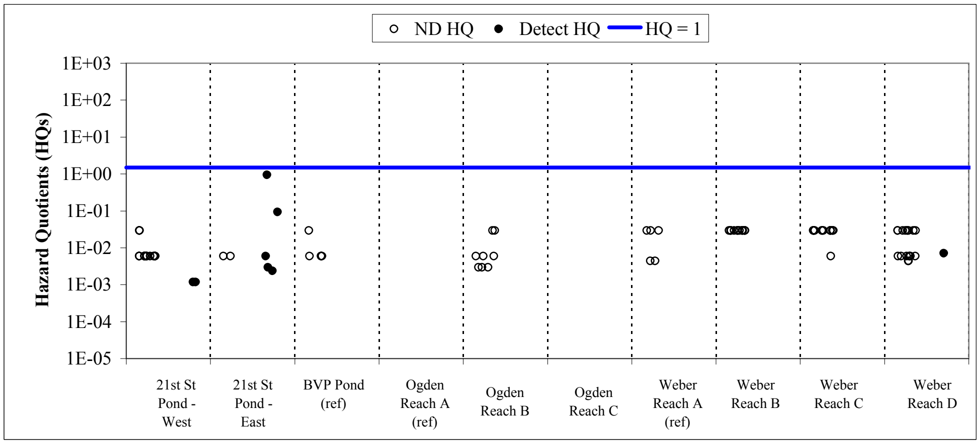
Appendix E-1
Aquatic Receptor HQs for Direct Contact with Surface Water

Baseline Ecological Risk Assessment for the Ogden Railyard Site

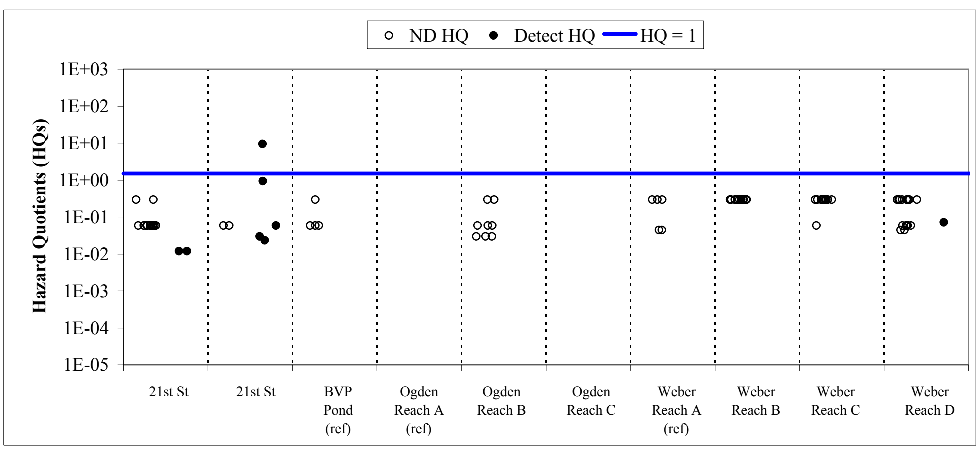
ACENAPHTHENE

Based on the Acute Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	14	7	4	0	8	0	5	11	11	17
Detect Samples:	2	5	0	0	0	0	0	0	0	1
All Samples:	14	7	4	0	8	0	5	11	11	17
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

Based on the Chronic Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	1	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	14	6	4	0	8	0	5	11	11	17
Detect Samples:	2	5	0	0	0	0	0	0	0	1
All Samples:	14	7	4	0	8	0	5	11	11	17
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
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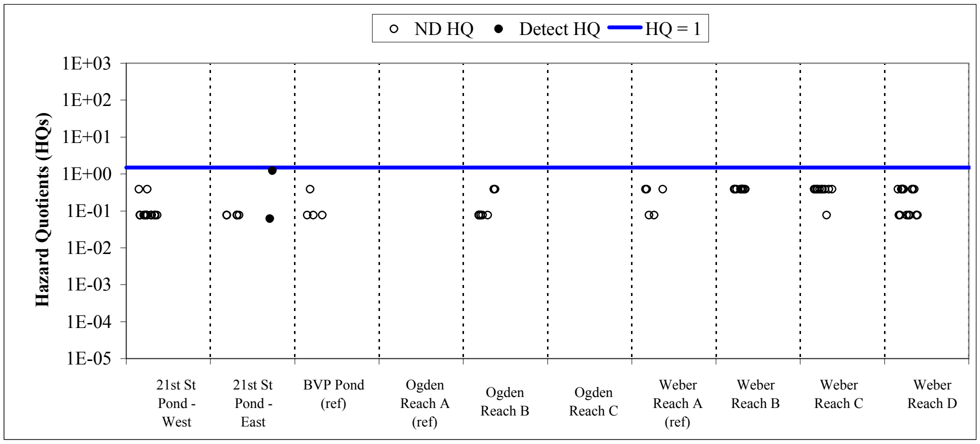
Appendix E-1
Aquatic Receptor HQs for Direct Contact with Surface Water

Baseline Ecological Risk Assessment for the Ogden Railyard Site

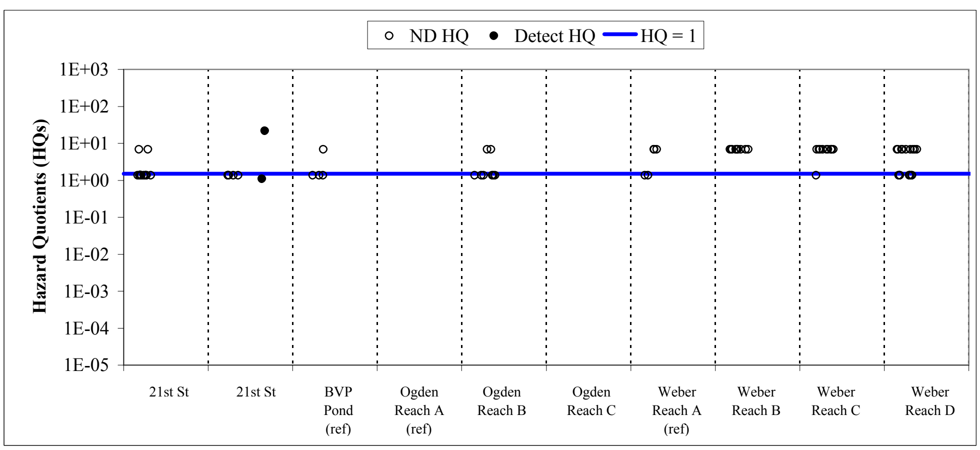
ANTHRACENE

Based on the Acute Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	14	7	4	0	8	0	5	11	11	17
Detect Samples:	0	2	0	0	0	0	0	0	0	0
All Samples:	14	7	4	0	8	0	5	11	11	17
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

Based on the Chronic Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	1	0	0	0	0	0	0	0	0
ND HQs > 1:	2	0	1	0	2	0	3	11	10	9
All HQs ≤ 1:	12	6	3	0	6	0	2	0	1	8
Detect Samples:	0	2	0	0	0	0	0	0	0	0
All Samples:	14	7	4	0	8	0	5	11	11	17
Risk Category:	**C**	**C**	**B**	**na**	**B**	**na**	**B**	**B**	**B**	**B**

A = Risk to the sub-population at this location are possible
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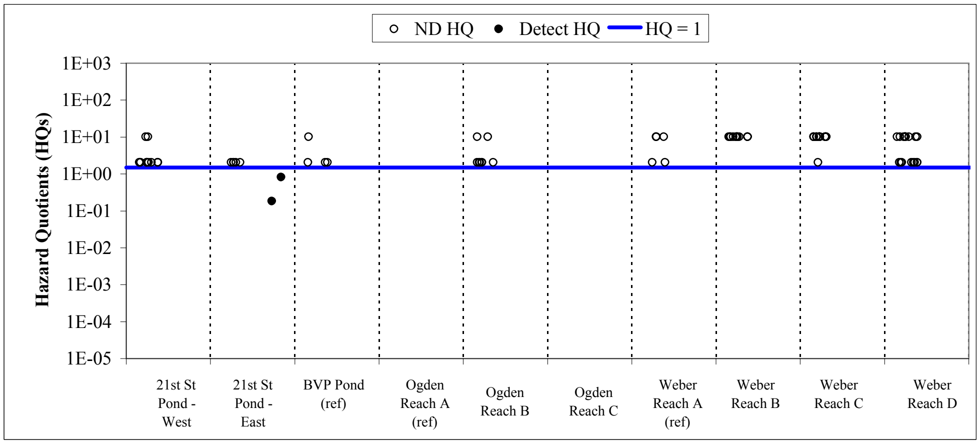
Appendix E-1
Aquatic Receptor HQs for Direct Contact with Surface Water

Baseline Ecological Risk Assessment for the Ogden Railyard Site

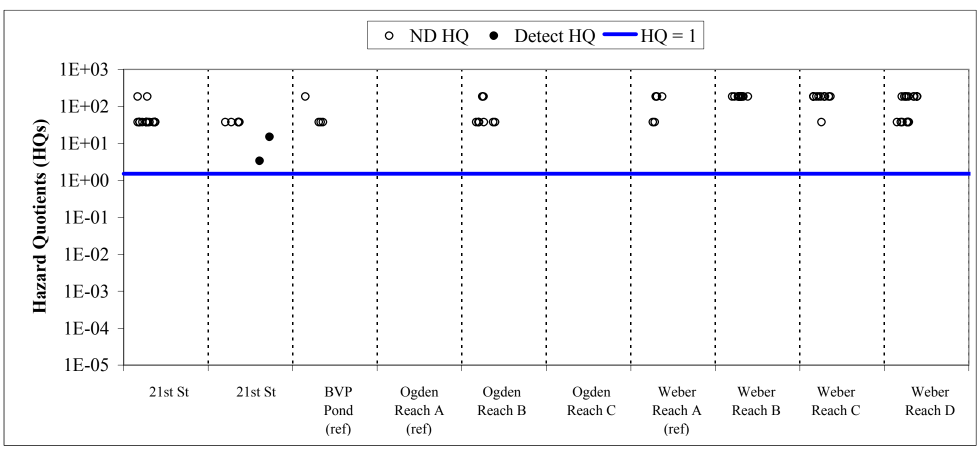
BENZO[A]ANTHRACENE

Based on the Acute Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	14	5	4	0	8	0	5	11	11	17
All HQs ≤ 1:	0	2	0	0	0	0	0	0	0	0
Detect Samples:	0	2	0	0	0	0	0	0	0	0
All Samples:	14	7	4	0	8	0	5	11	11	17
Risk Category:	**B**	**B**	**B**	**na**	**B**	**na**	**B**	**B**	**B**	**B**

Based on the Chronic Toxicity Benchmark

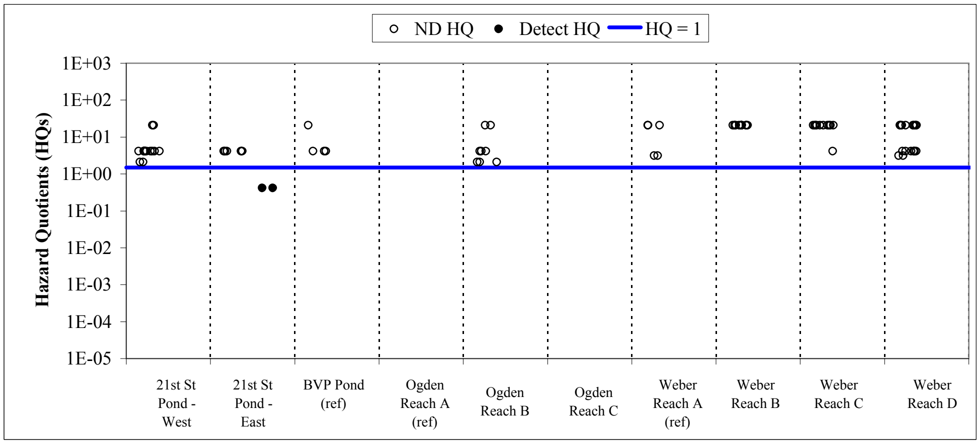


Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	2	0	0	0	0	0	0	0	0
ND HQs > 1:	14	5	4	0	8	0	5	11	11	17
All HQs ≤ 1:	0	0	0	0	0	0	0	0	0	0
Detect Samples:	0	2	0	0	0	0	0	0	0	0
All Samples:	14	7	4	0	8	0	5	11	11	17
Risk Category:	**B**	**A**	**B**	**na**	**B**	**na**	**B**	**B**	**B**	**B**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

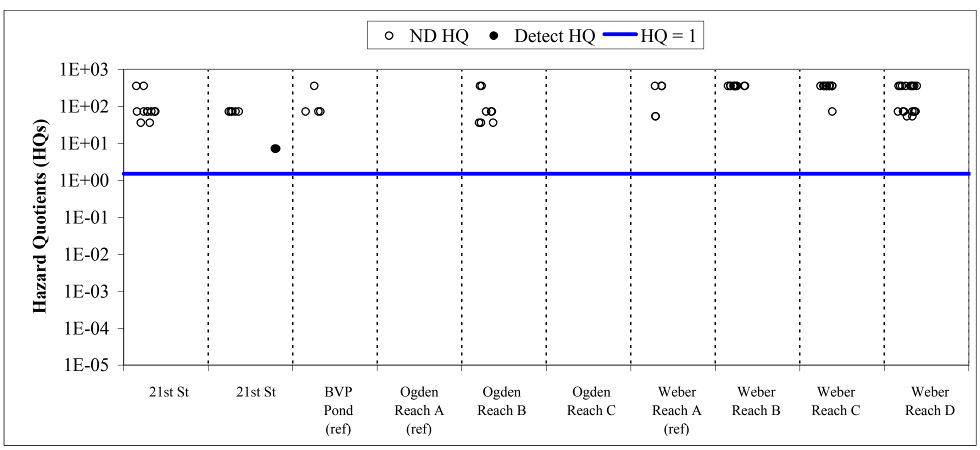
Appendix E-1
Aquatic Receptor HQs for Direct Contact with Surface Water
Baseline Ecological Risk Assessment for the Ogden Railyard Site
BENZO[A]PYRENE

Based on the Acute Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	14	5	4	0	8	0	5	11	11	17
All HQs ≤ 1:	0	2	0	0	0	0	0	0	0	0
Detect Samples:	0	2	0	0	0	0	0	0	0	0
All Samples:	14	7	4	0	8	0	5	11	11	17
Risk Category:	**B**	**B**	**B**	**na**	**B**	**na**	**B**	**B**	**B**	**B**

Based on the Chronic Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	2	0	0	0	0	0	0	0	0
ND HQs > 1:	14	5	4	0	8	0	5	11	11	17
All HQs ≤ 1:	0	0	0	0	0	0	0	0	0	0
Detect Samples:	0	2	0	0	0	0	0	0	0	0
All Samples:	14	7	4	0	8	0	5	11	11	17
Risk Category:	**B**	**A**	**B**	**na**	**B**	**na**	**B**	**B**	**B**	**B**

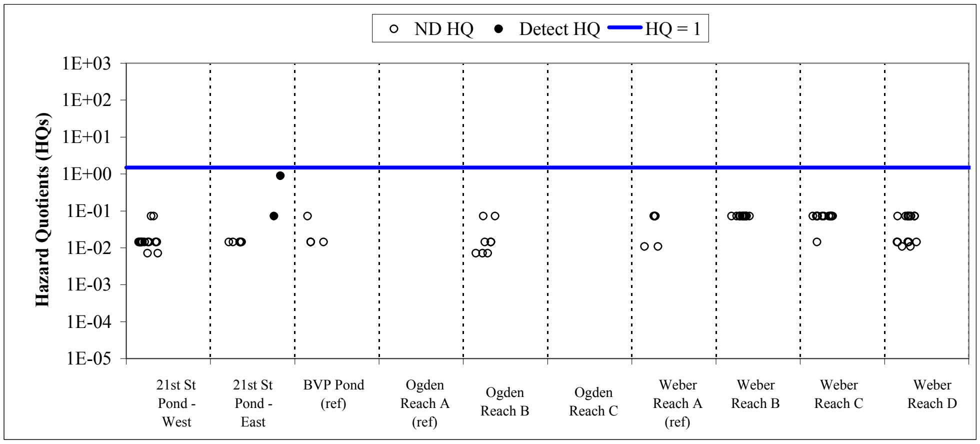
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-1
Aquatic Receptor HQs for Direct Contact with Surface Water

Baseline Ecological Risk Assessment for the Ogden Railyard Site

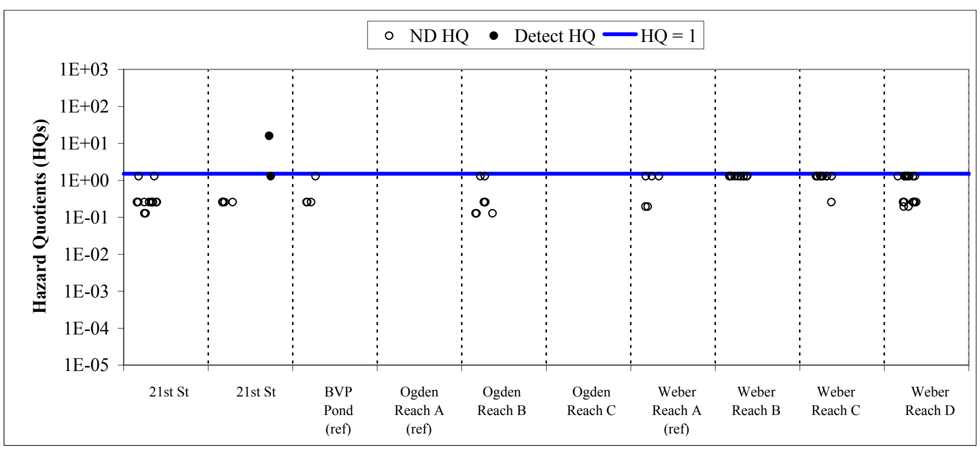
FLUORENE

Based on the Acute Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	14	7	4	0	8	0	5	11	11	17
Detect Samples:	0	2	0	0	0	0	0	0	0	0
All Samples:	14	7	4	0	8	0	5	11	11	17
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

Based on the Chronic Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	1	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	14	6	4	0	8	0	5	11	11	17
Detect Samples:	0	2	0	0	0	0	0	0	0	0
All Samples:	14	7	4	0	8	0	5	11	11	17
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

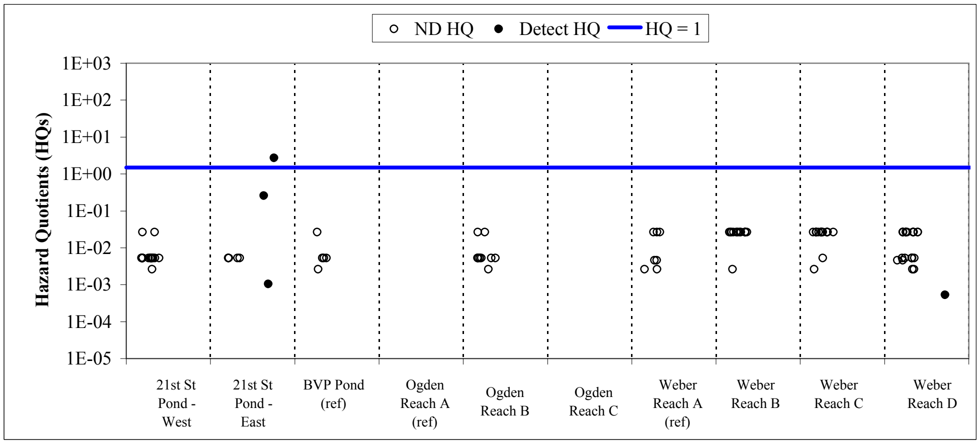
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-1
Aquatic Receptor HQs for Direct Contact with Surface Water

Baseline Ecological Risk Assessment for the Ogden Railyard Site

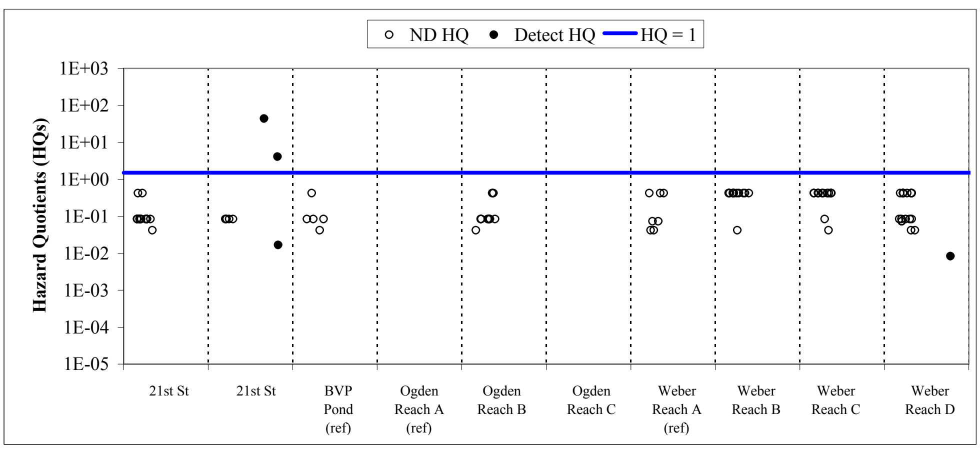
NAPHTHALENE

Based on the Acute Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	1	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	15	6	5	0	9	0	7	12	12	19
Detect Samples:	0	3	0	0	0	0	0	0	0	1
All Samples:	15	7	5	0	9	0	7	12	12	19
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

Based on the Chronic Toxicity Benchmark

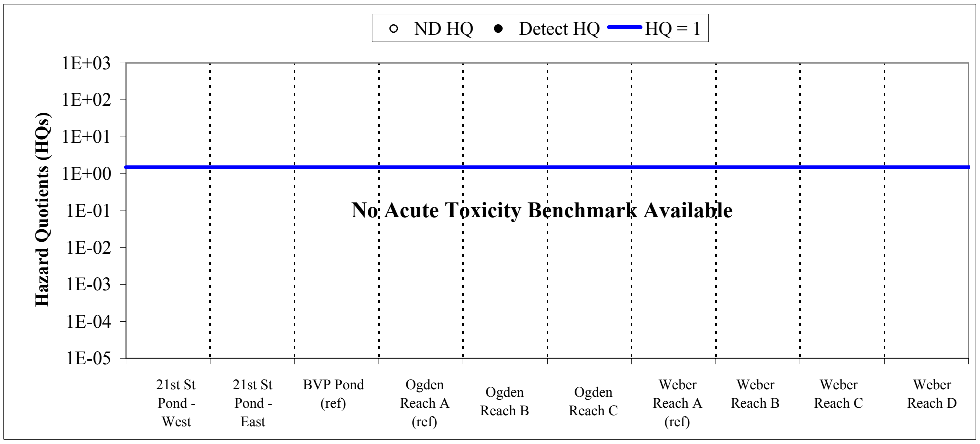


Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	2	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	15	5	5	0	9	0	7	12	12	19
Detect Samples:	0	3	0	0	0	0	0	0	0	1
All Samples:	15	7	5	0	9	0	7	12	12	19
Risk Category:	**C**	**A**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

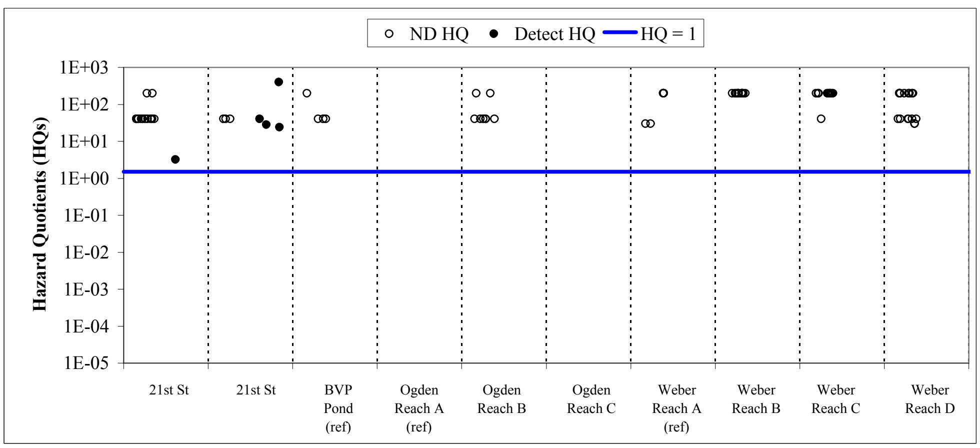
Appendix E-1
Aquatic Receptor HQs for Direct Contact with Surface Water
Baseline Ecological Risk Assessment for the Ogden Railyard Site
PYRENE

Based on the Acute Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	--	0	--	--	--	--	--	--	--	--
ND HQs > 1:	--	0	--	--	--	--	--	--	--	--
All HQs ≤ 1:	--	0	--	--	--	--	--	--	--	--
Detect Samples:	1	4	0	0	0	0	0	0	0	0
All Samples:	14	7	4	0	8	0	5	11	11	17
Risk Category:	**--**	**--**	**--**	**na**	**--**	**na**	**--**	**--**	**--**	**--**

Based on the Chronic Toxicity Benchmark

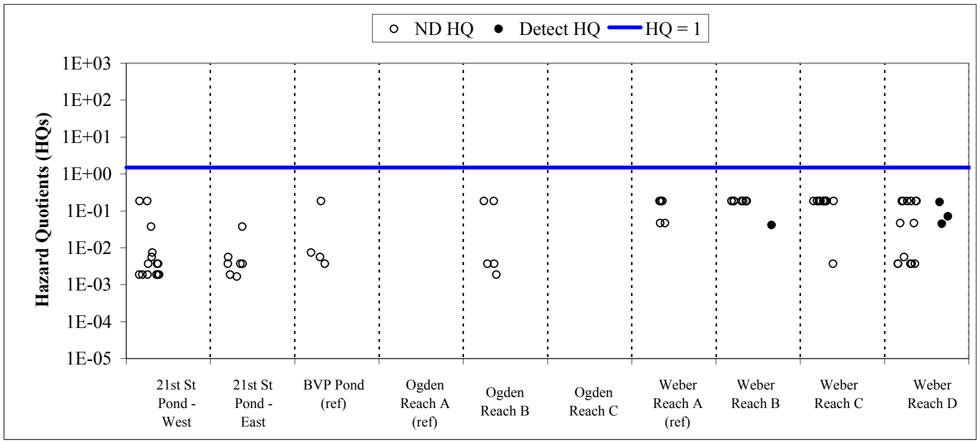


Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	1	4	0	0	0	0	0	0	0	0
ND HQs > 1:	13	3	4	0	8	0	5	11	11	17
All HQs ≤ 1:	0	0	0	0	0	0	0	0	0	0
Detect Samples:	1	4	0	0	0	0	0	0	0	0
All Samples:	14	7	4	0	8	0	5	11	11	17
Risk Category:	**B**	**A**	**B**	**na**	**B**	**na**	**B**	**B**	**B**	**B**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

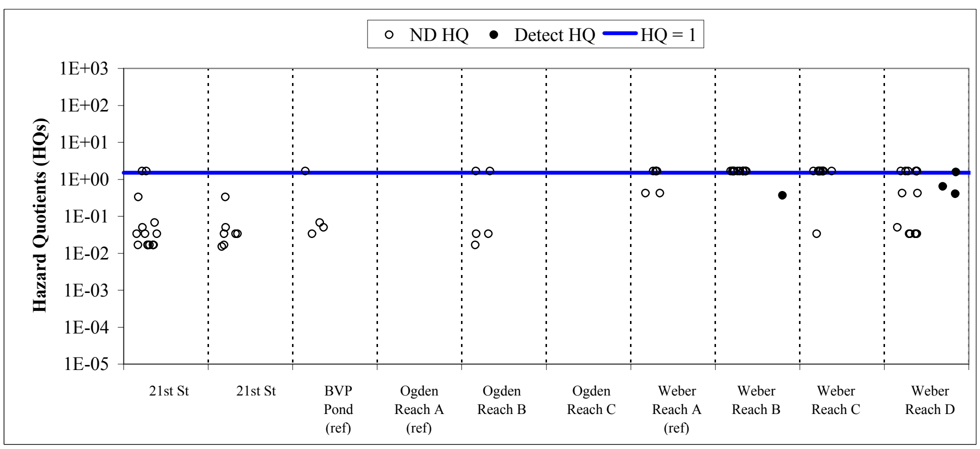
Appendix E-1
Aquatic Receptor HQs for Direct Contact with Surface Water
Baseline Ecological Risk Assessment for the Ogden Railyard Site
BIS(2-ETHYLHEXYL)PHTHALATE

Based on the Acute Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	14	7	4	0	5	0	5	11	11	17
Detect Samples:	0	0	0	0	0	0	0	1	0	3
All Samples:	14	7	4	0	5	0	5	11	11	17
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

Based on the Chronic Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	1
ND HQs > 1:	2	0	1	0	2	0	3	10	10	6
All HQs ≤ 1:	12	7	3	0	3	0	2	1	1	10
Detect Samples:	0	0	0	0	0	0	0	1	0	3
All Samples:	14	7	4	0	5	0	5	11	11	17
Risk Category:	**C**	**C**	**B**	**na**	**B**	**na**	**B**	**B**	**B**	**B**

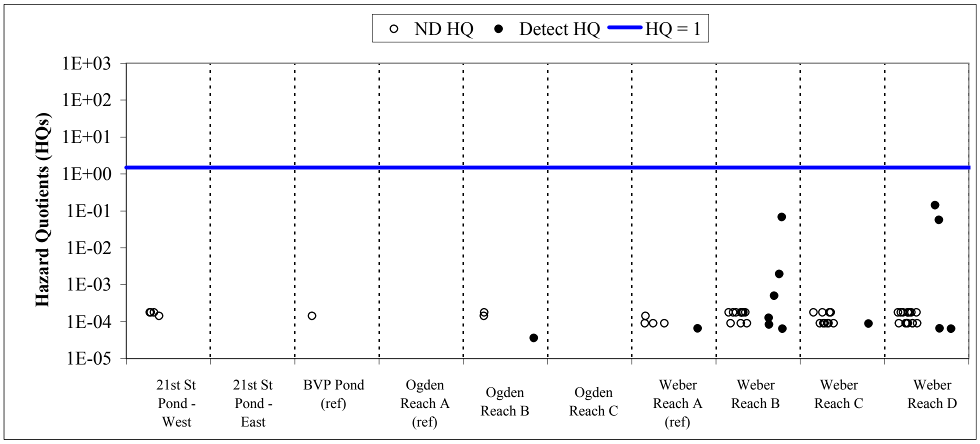
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-1
Aquatic Receptor HQs for Direct Contact with Surface Water

Baseline Ecological Risk Assessment for the Ogden Railyard Site

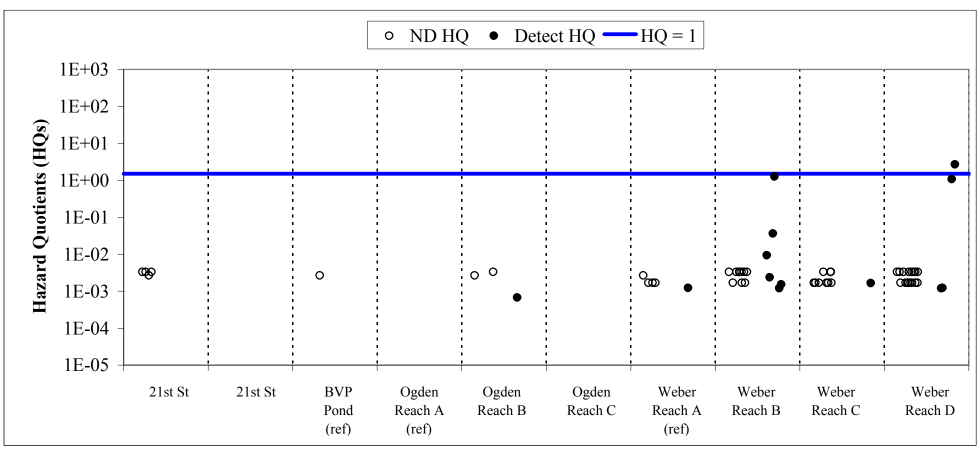
ACETONE

Based on the Acute Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	4	0	1	0	3	0	5	17	11	20
Detect Samples:	0	0	0	0	1	0	1	6	1	4
All Samples:	4	0	1	0	3	0	5	17	11	20
Risk Category:	**C**	**na**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

Based on the Chronic Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	1
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	4	0	1	0	3	0	5	17	11	19
Detect Samples:	0	0	0	0	1	0	1	6	1	4
All Samples:	4	0	1	0	3	0	5	17	11	20
Risk Category:	**C**	**na**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
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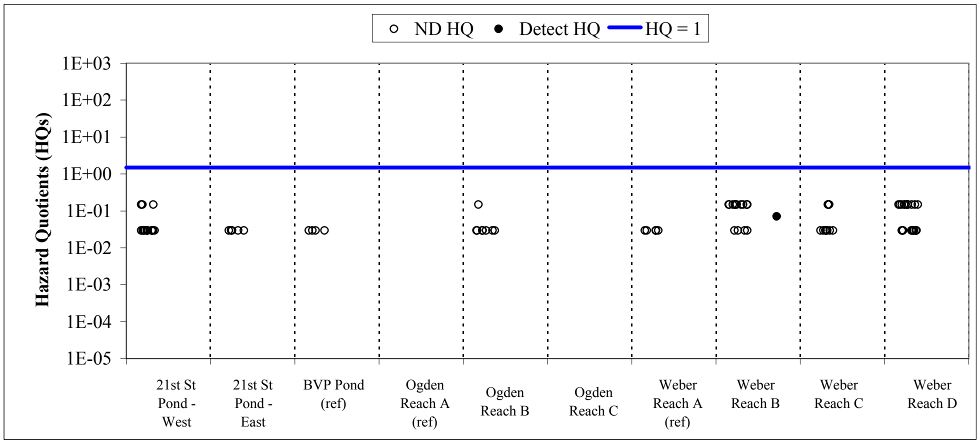
Appendix E-1
Aquatic Receptor HQs for Direct Contact with Surface Water

Baseline Ecological Risk Assessment for the Ogden Railyard Site

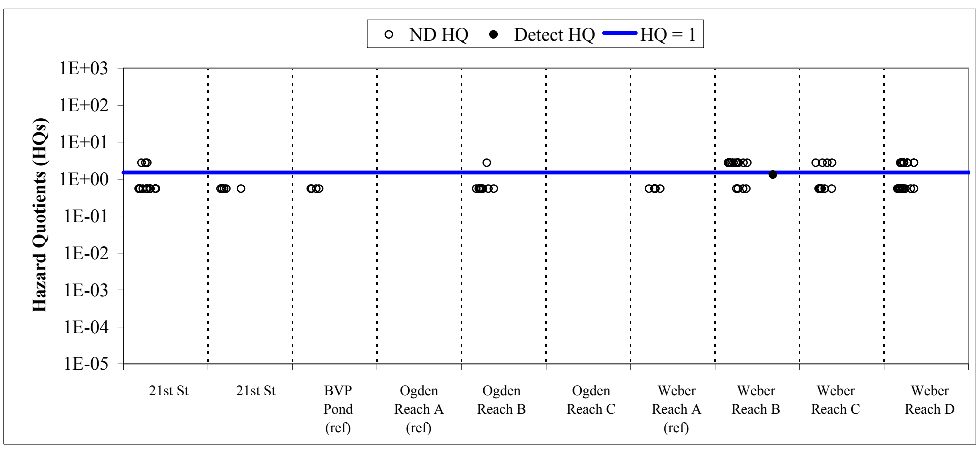
CARBON DISULFIDE

Based on the Acute Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs < 1:	14	5	4	0	8	0	5	17	11	20
Detect Samples:	0	0	0	0	0	0	0	1	0	0
All Samples:	14	5	4	0	8	0	5	17	11	20
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

Based on the Chronic Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	3	0	0	0	1	0	0	12	4	10
All HQs < 1:	11	5	4	0	7	0	5	5	7	10
Detect Samples:	0	0	0	0	0	0	0	1	0	0
All Samples:	14	5	4	0	8	0	5	17	11	20
Risk Category:	**B**	**C**	**C**	**na**	**C**	**na**	**C**	**B**	**B**	**B**

A = Risk to the sub-population at this location are possible
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C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
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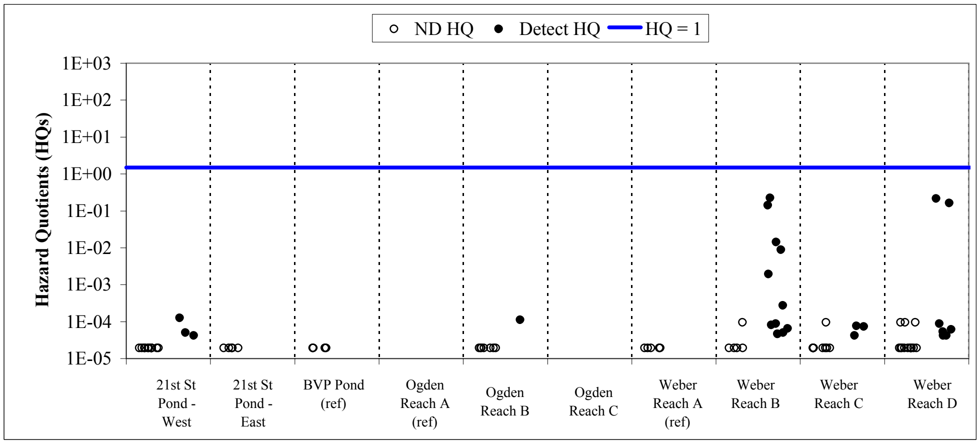
Appendix E-1
Aquatic Receptor HQs for Direct Contact with Surface Water

Baseline Ecological Risk Assessment for the Ogden Railyard Site

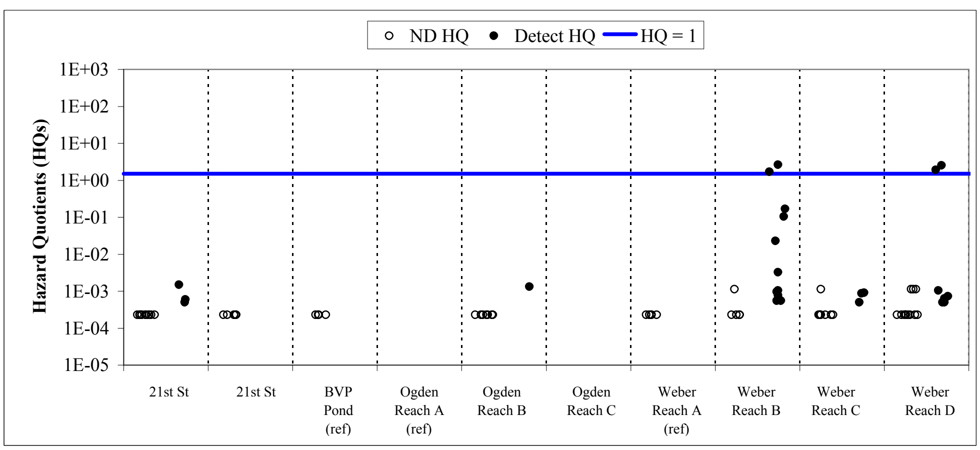
DICHLOROMETHANE

Based on the Acute Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	14	5	4	0	8	0	5	17	11	20
Detect Samples:	3	0	0	0	1	0	0	12	3	7
All Samples:	14	5	4	0	8	0	5	17	11	20
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

Based on the Chronic Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	2	0	2
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	14	5	4	0	8	0	5	15	11	18
Detect Samples:	3	0	0	0	1	0	0	12	3	7
All Samples:	14	5	4	0	8	0	5	17	11	20
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
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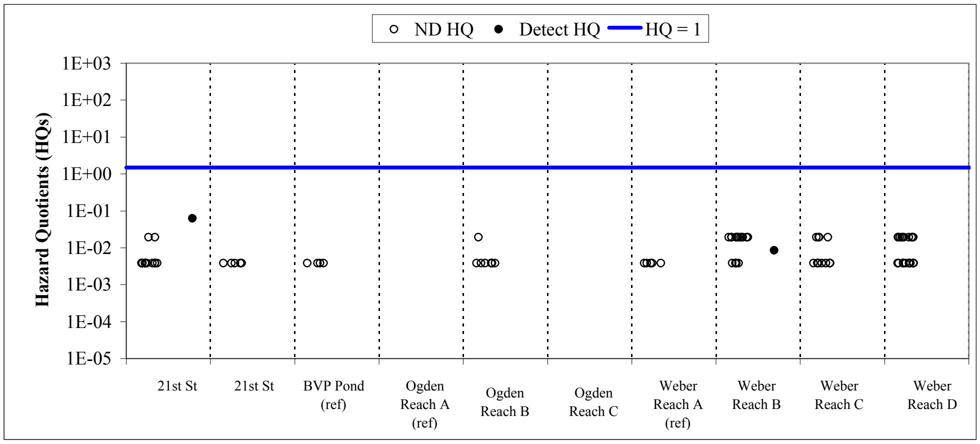
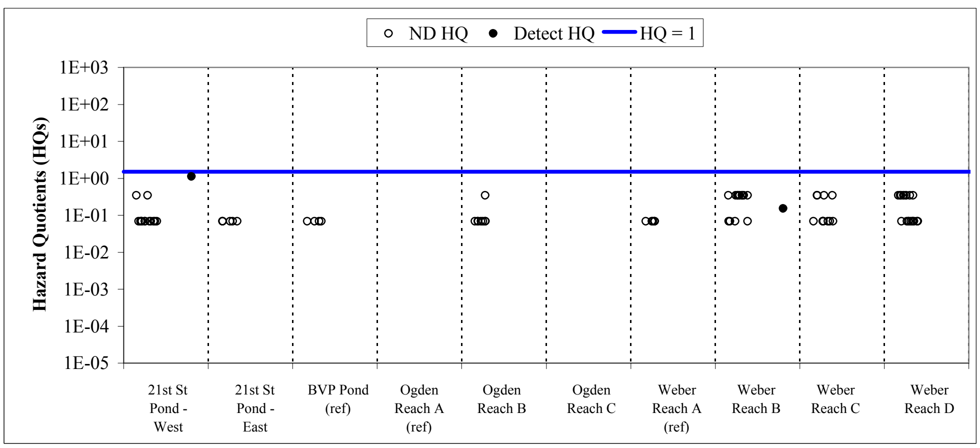
Appendix E-1
Aquatic Receptor HQs for Direct Contact with Surface Water
Baseline Ecological Risk Assessment for the Ogden Railyard Site
ETHYLBENZENE

Based on the Acute Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs $\leq$ 1:	14	5	4	0	8	0	5	17	11	20
Detect Samples:	1	0	0	0	0	0	0	1	0	0
All Samples:	14	5	4	0	8	0	5	17	11	20
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

Based on the Chronic Toxicity Benchmark



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs $\leq$ 1:	14	5	4	0	8	0	5	17	11	20
Detect Samples:	1	0	0	0	0	0	0	1	0	0
All Samples:	14	5	4	0	8	0	5	17	11	20
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

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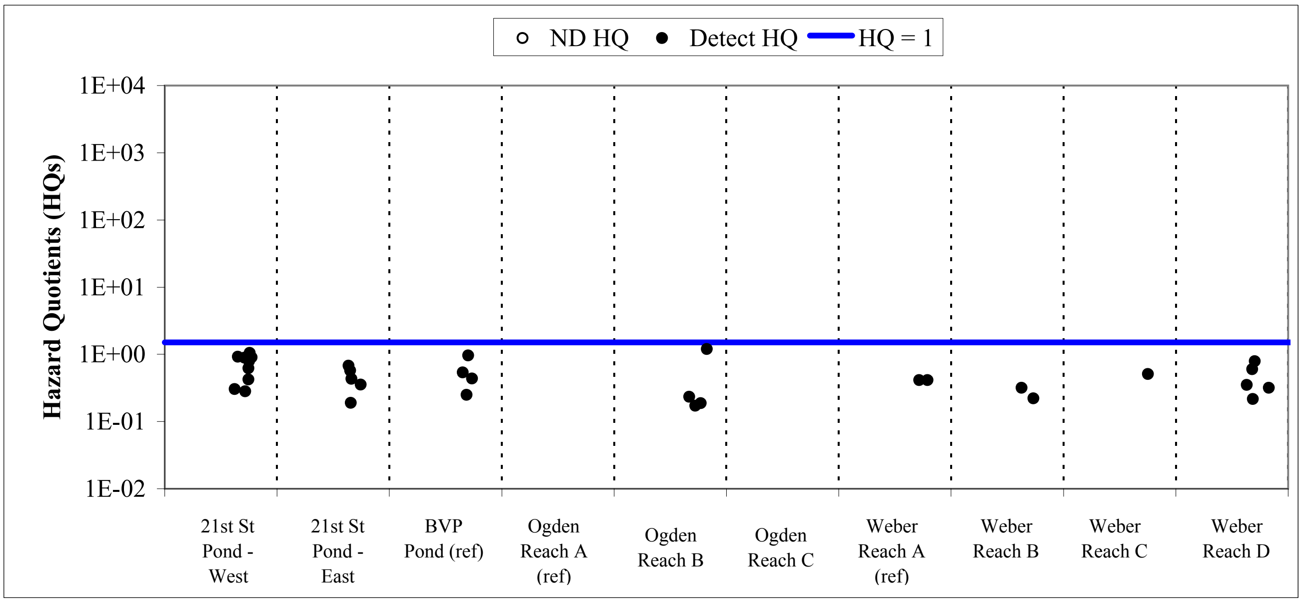
Appendix E-2
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

COPPER



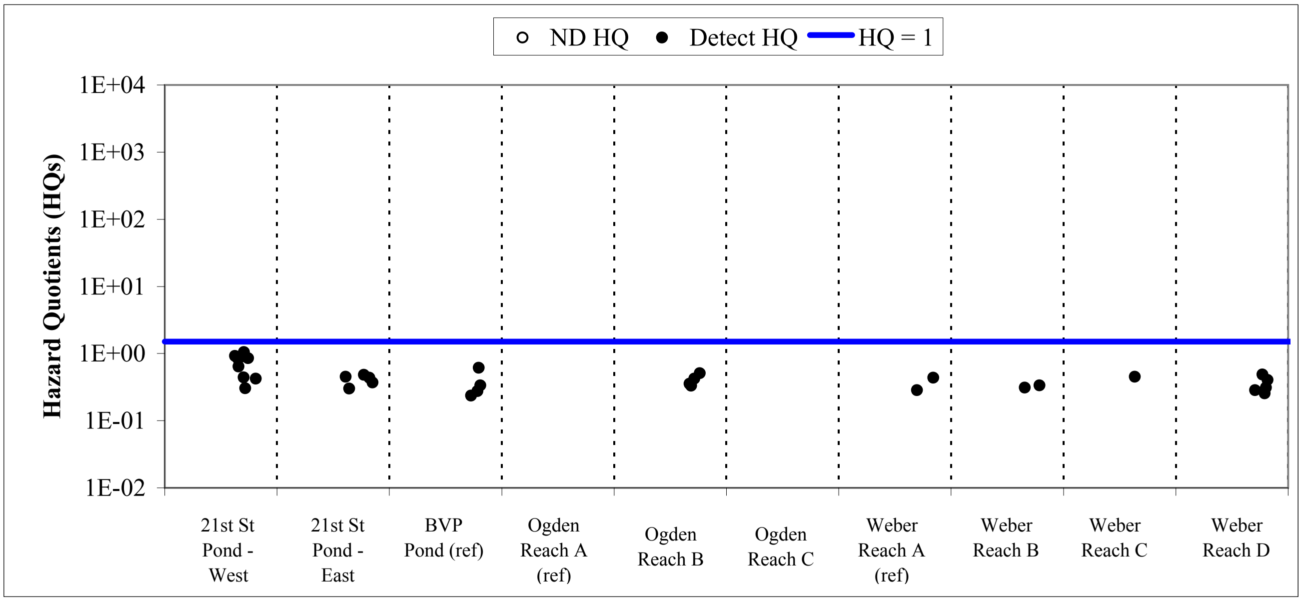
Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	9	5	4	0	4	0	2	2	1	5
Detect Samples:	9	5	4	0	4	0	2	2	1	5
All Samples:	9	5	4	0	4	0	2	2	1	5
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-2
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

IRON



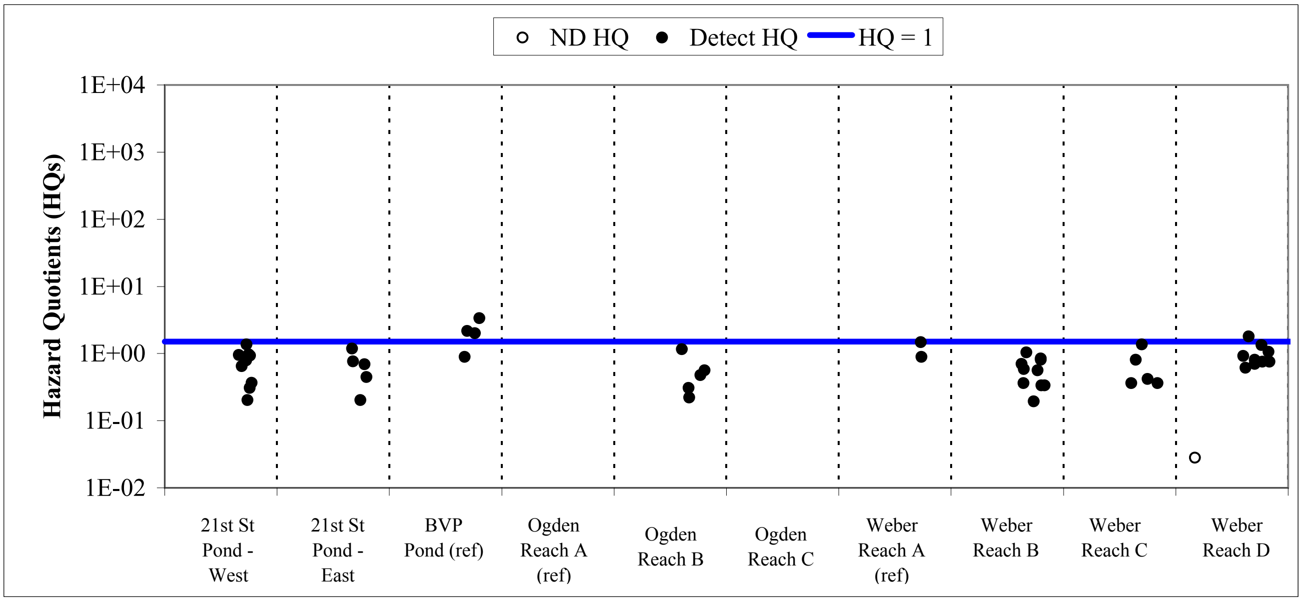
Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	9	5	4	0	4	0	2	2	1	5
Detect Samples:	9	5	4	0	4	0	2	2	1	5
All Samples:	9	5	4	0	4	0	2	2	1	5
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-2
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

LEAD



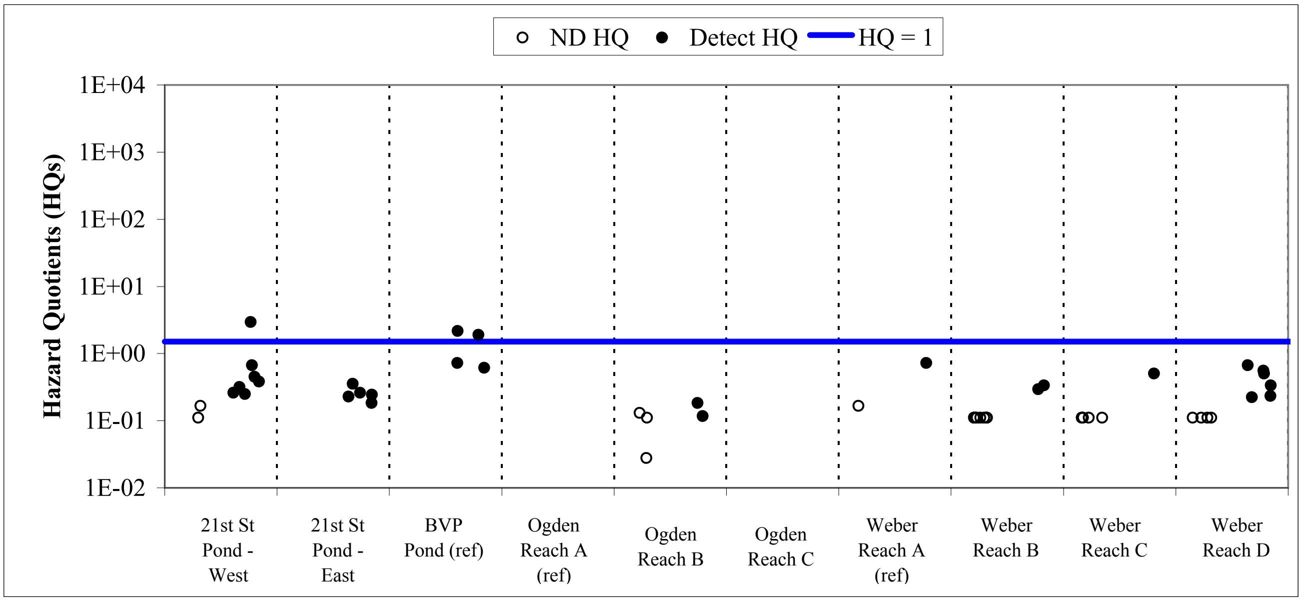
Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	3	0	0	0	0	0	0	1
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs $\leq$ 1:	9	5	1	0	5	0	2	10	5	9
Detect Samples:	9	5	4	0	5	0	2	10	5	9
All Samples:	9	5	4	0	5	0	2	10	5	10
Risk Category:	**C**	**C**	**A**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-2
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

MERCURY



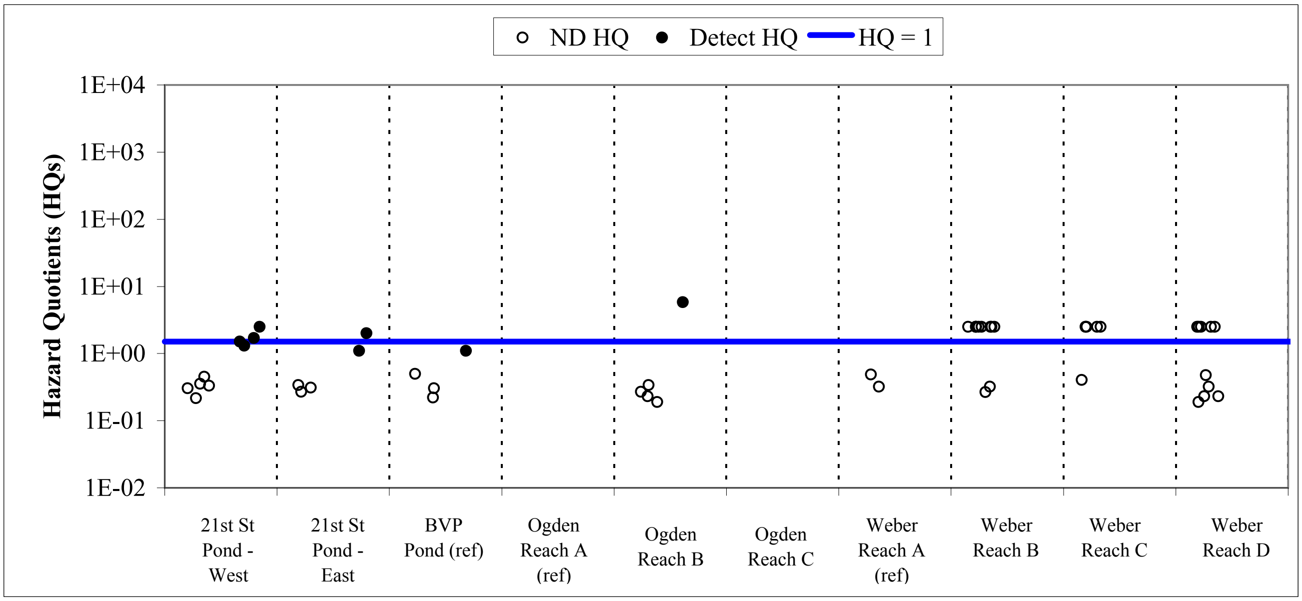
Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	1	0	2	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	8	5	2	0	5	0	2	10	5	10
Detect Samples:	7	5	4	0	2	0	1	2	1	6
All Samples:	9	5	4	0	5	0	2	10	5	10
Risk Category:	**C**	**C**	**A**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-2
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

SELENIUM



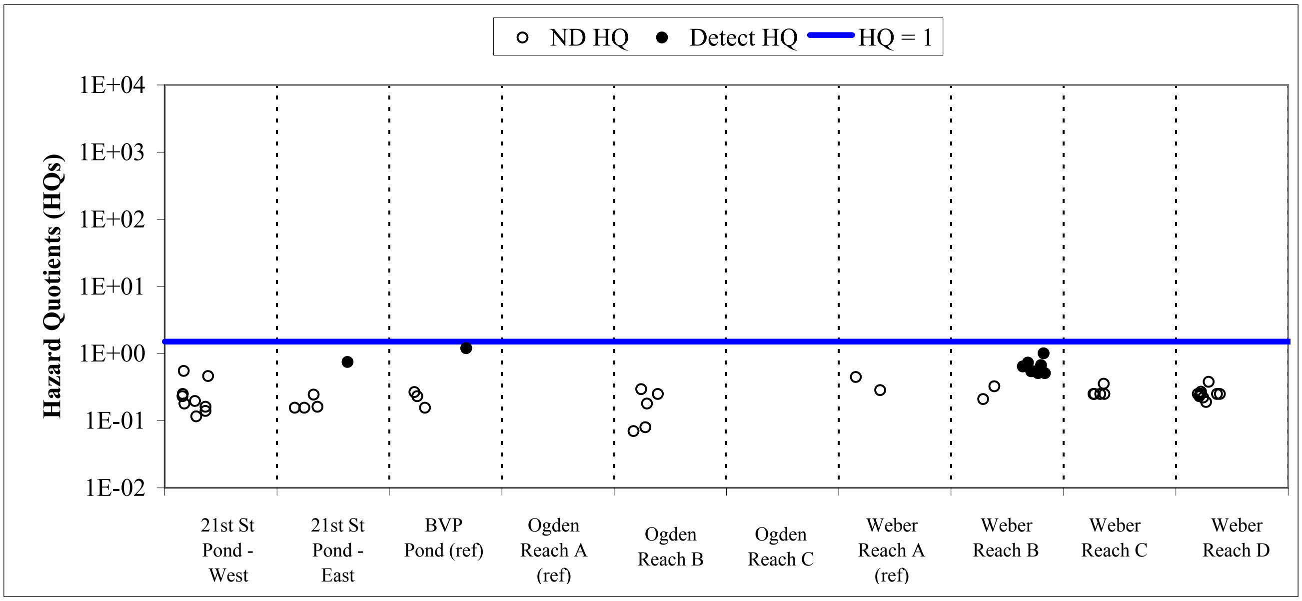
Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	3	1	0	0	1	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	8	4	5
All HQs ≤ 1:	6	4	4	0	4	0	2	2	1	5
Detect Samples:	4	2	1	0	1	0	0	0	0	0
All Samples:	9	5	4	0	5	0	2	10	5	10
Risk Category:	**A**	**C**	**C**	**na**	**C**	**na**	**C**	**B**	**B**	**B**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-2
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

SILVER



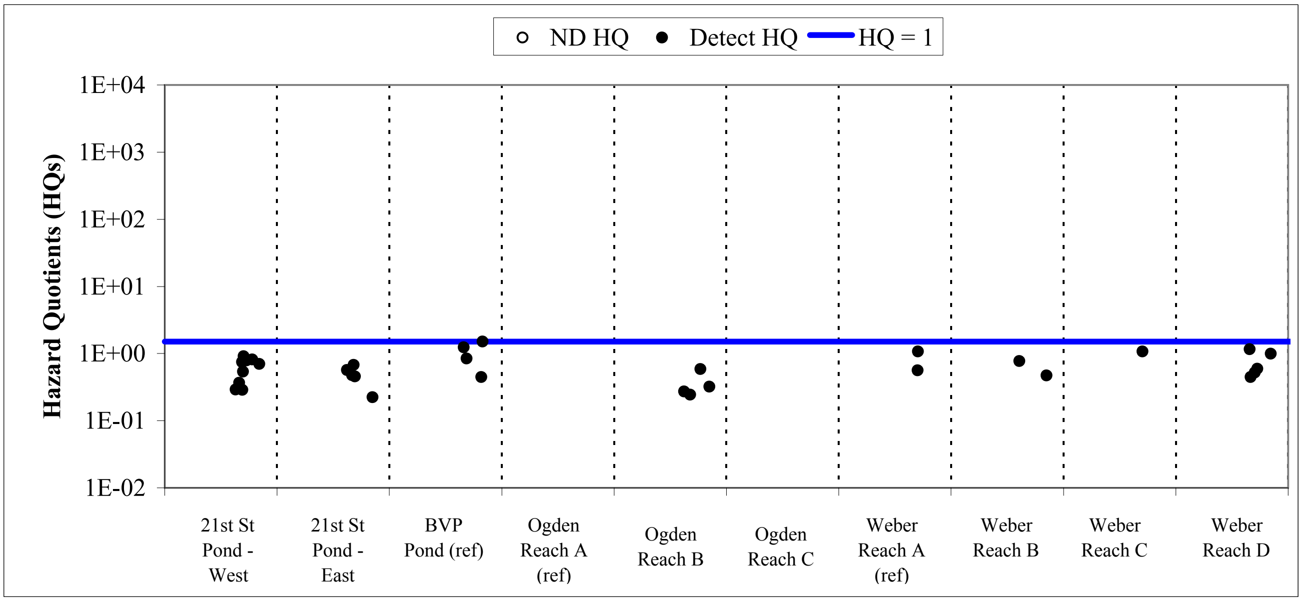
Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	9	5	4	0	5	0	2	10	5	10
Detect Samples:	0	1	1	0	0	0	0	8	0	0
All Samples:	9	5	4	0	5	0	2	10	5	10
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-2
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

ZINC



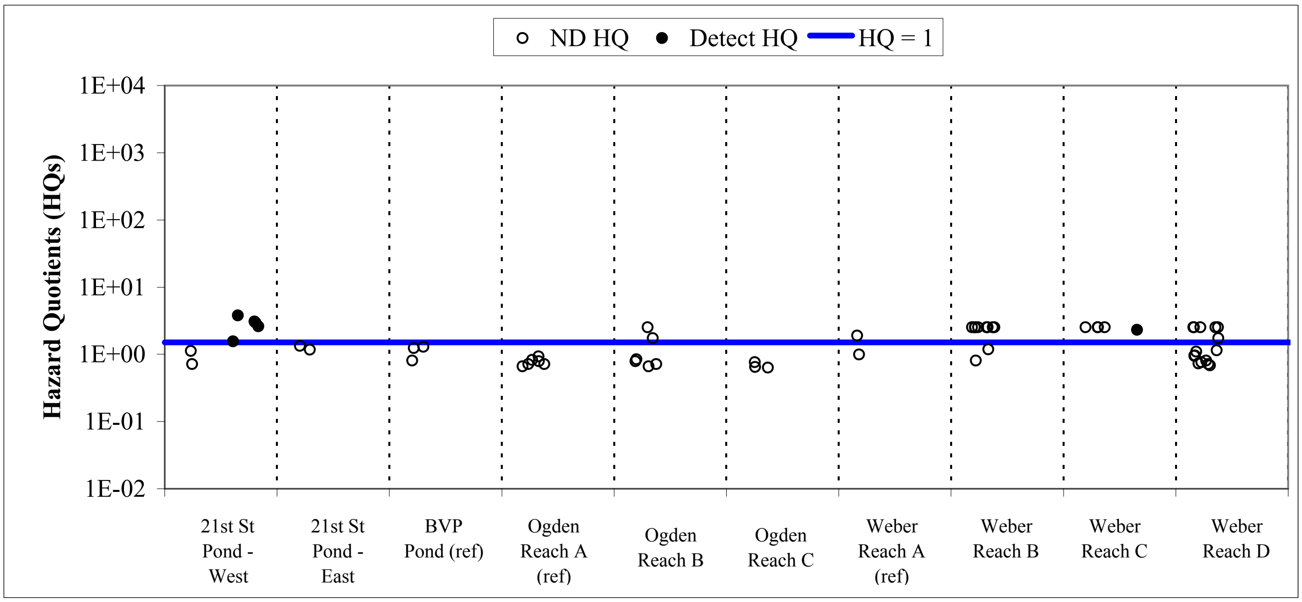
Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	1	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	9	5	3	0	4	0	2	2	1	5
Detect Samples:	9	5	4	0	4	0	2	2	1	5
All Samples:	9	5	4	0	4	0	2	2	1	5
Risk Category:	**C**	**C**	**A**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-2
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

4,4'-DDE



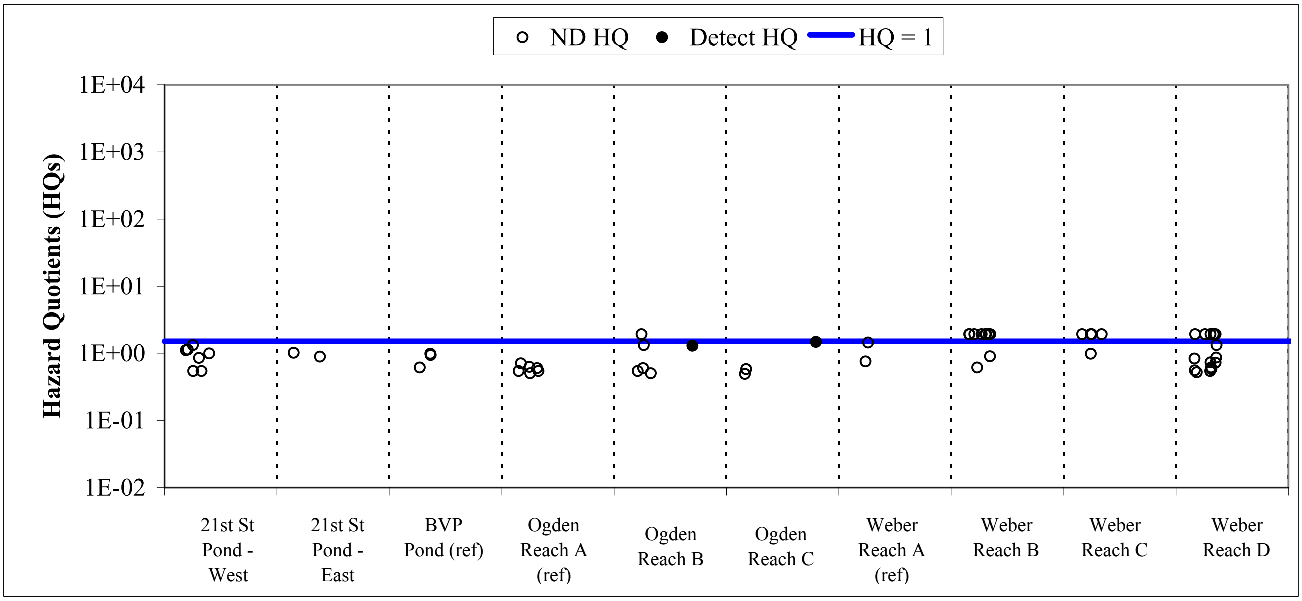
Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	5	0	0	0	0	0	0	0	1	0
ND HQs > 1:	0	0	0	0	2	0	1	8	4	6
All HQs $\leq$ 1:	2	2	3	6	4	3	1	2	0	9
Detect Samples:	5	0	0	0	0	0	0	0	1	0
All Samples:	7	2	3	6	6	3	2	10	5	15
Risk Category:	**A**	**C**	**C**	**C**	**B**	**C**	**B**	**B**	**B**	**B**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-2
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

4,4'-DDT



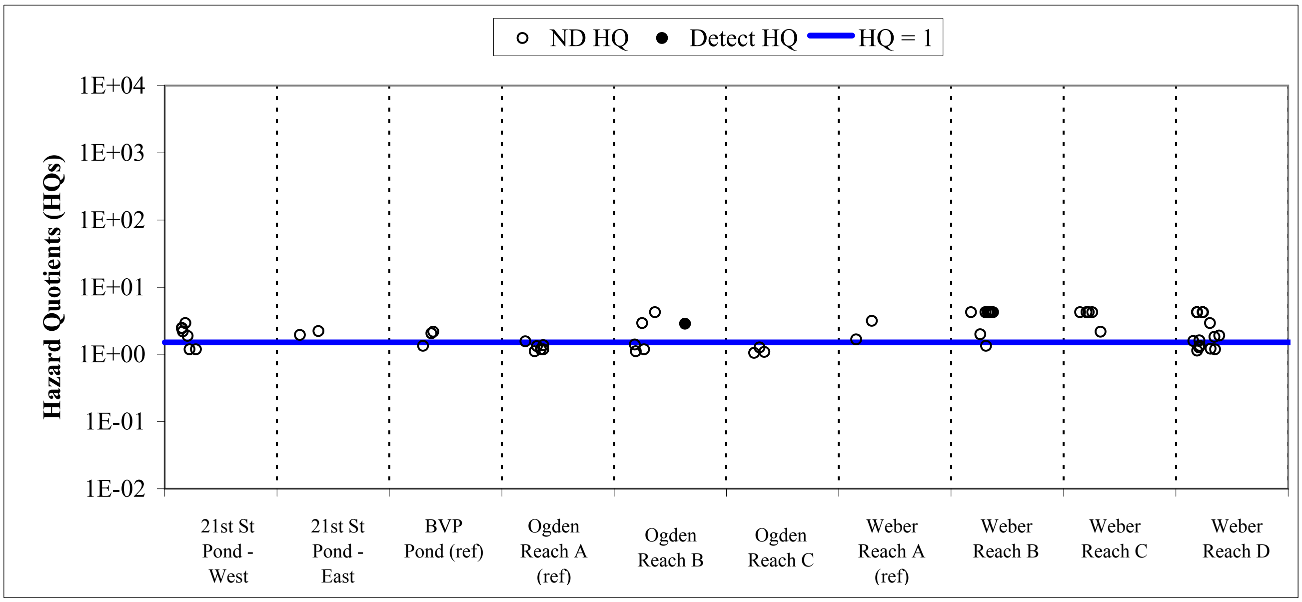
Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	1	0	0	8	4	5
All HQs $\leq$ 1:	7	2	3	6	5	3	2	2	1	10
Detect Samples:	0	0	0	0	1	1	0	0	0	0
All Samples:	7	2	3	6	6	3	2	10	5	15
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**B**	**B**	**B**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-2
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

DIELDRIN



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	1	0	0	0	0	0
ND HQs > 1:	5	2	2	1	2	0	2	9	5	10
All HQs ≤ 1:	2	0	1	5	3	3	0	1	0	5
Detect Samples:	0	0	0	0	1	0	0	0	0	0
All Samples:	7	2	3	6	6	3	2	10	5	15
Risk Category:	**B**	**B**	**B**	**C**	**B**	**C**	**B**	**B**	**B**	**B**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
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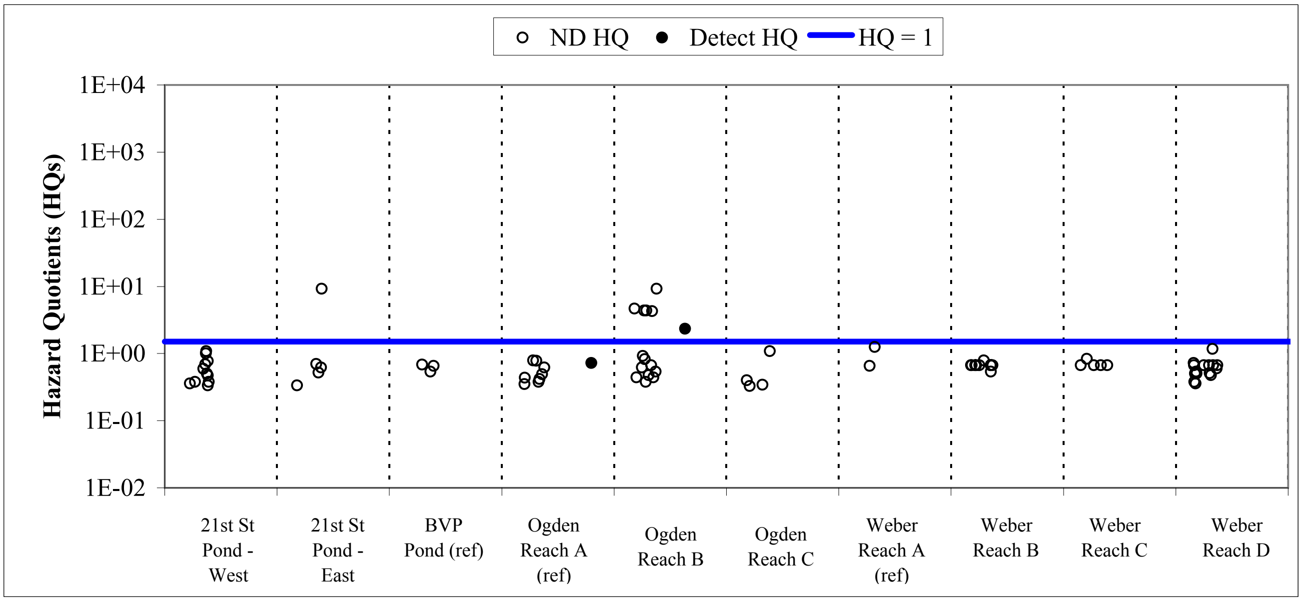
na = No data for this chemical in this location

Appendix E-2
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

AROCLOR-1254



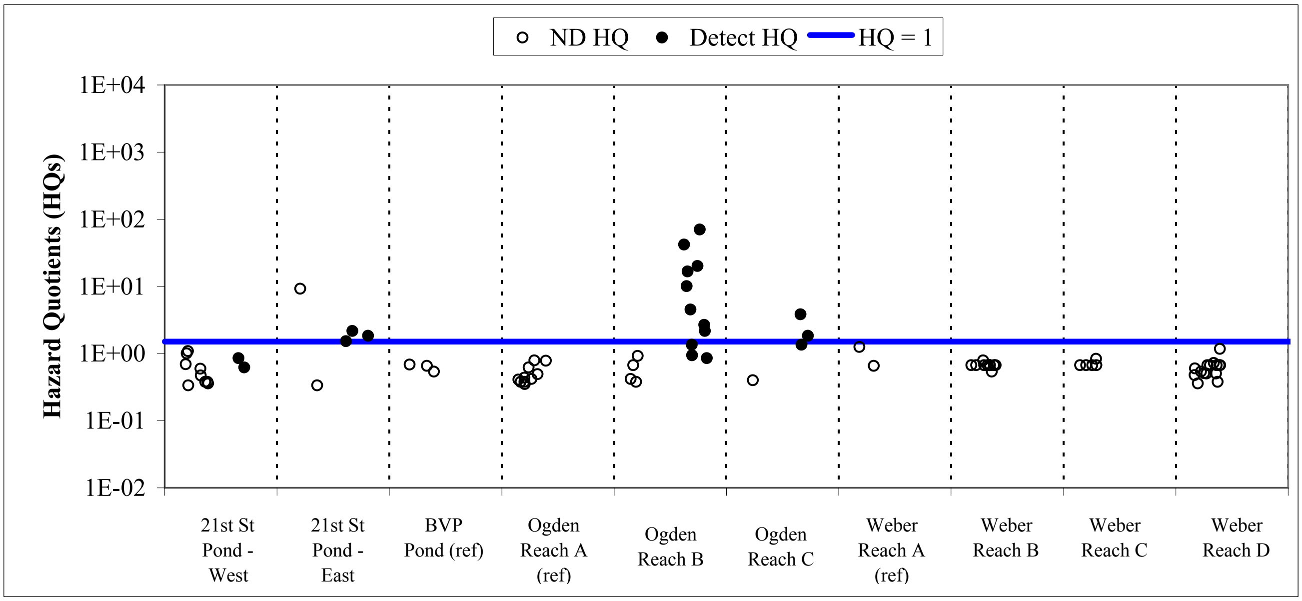
Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	1	0	0	0	0	0
ND HQs > 1:	0	1	0	0	5	0	0	0	0	0
All HQs ≤ 1:	11	4	3	9	9	4	2	10	5	15
Detect Samples:	0	0	0	1	1	0	0	0	0	0
All Samples:	11	5	3	9	15	4	2	10	5	15
Risk Category:	**C**	**C**	**C**	**C**	**B**	**C**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-2
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

AROCLOR-1260



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	3	0	0	8	2	0	0	0	0
ND HQs > 1:	0	1	0	0	0	0	0	0	0	0
All HQs ≤ 1:	11	1	3	10	7	2	2	10	5	15
Detect Samples:	2	3	0	0	11	3	0	0	0	0
All Samples:	11	5	3	10	15	4	2	10	5	15
Risk Category:	**C**	**A**	**C**	**C**	**A**	**A**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
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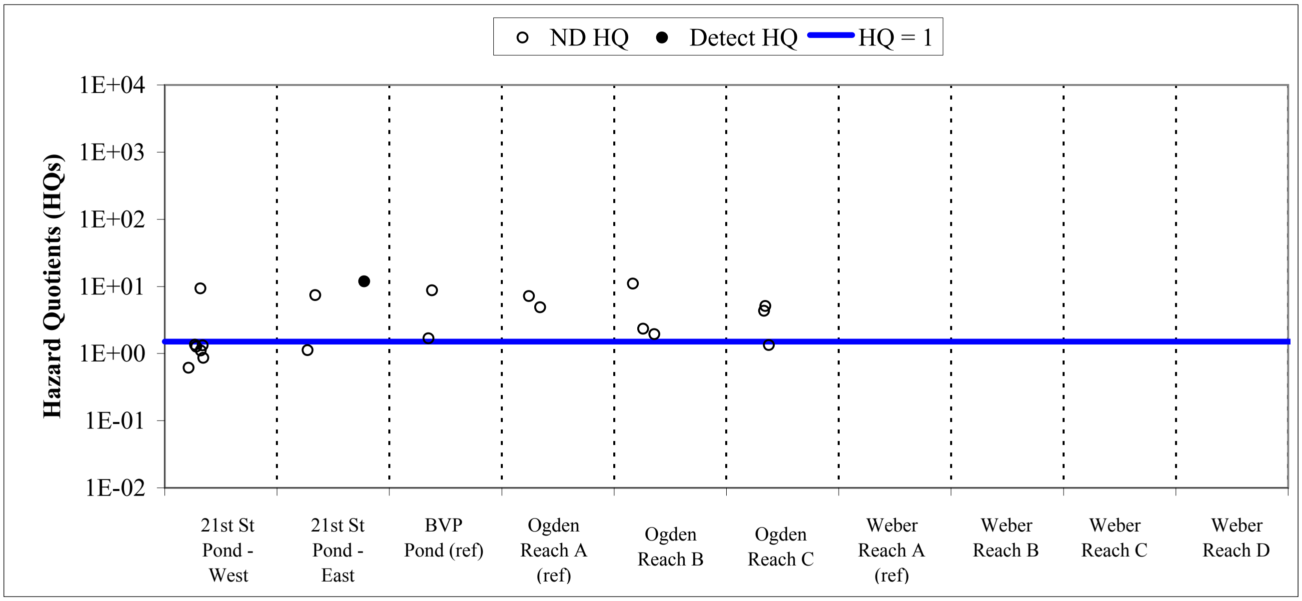
Appendix E-2
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

BIPHENYL



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	1	0	0	0	0	0	0	0	0
ND HQs > 1:	1	1	2	2	3	2	0	0	0	0
All HQs $\leq$ 1:	6	1	0	0	0	1	0	0	0	0
Detect Samples:	0	1	0	0	0	0	0	0	0	0
All Samples:	7	3	2	2	3	3	0	0	0	0
Risk Category:	**C**	**A**	**B**	**B**	**B**	**B**	**na**	**na**	**na**	**na**

A = Risk to the sub-population at this location are possible
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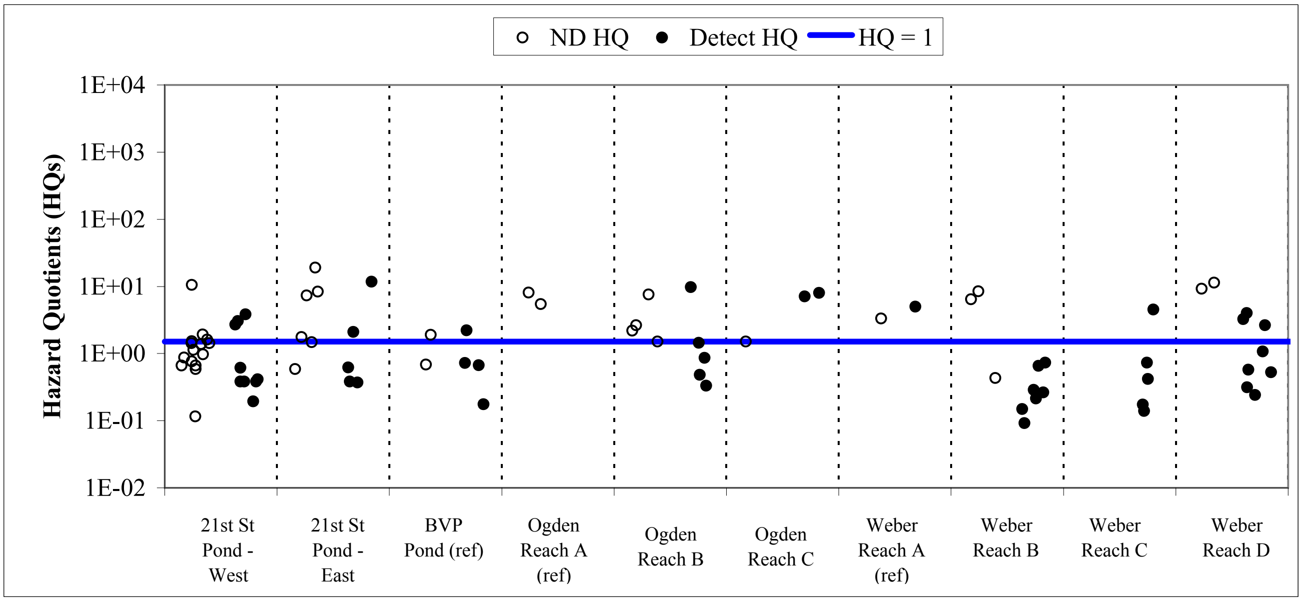
na = No data for this chemical in this location

Appendix E-2
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

BIS(2-ETHYLHEXYL)PHTHALATE



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	3	2	1	0	1	2	1	0	1	3
ND HQs > 1:	4	4	1	2	4	1	1	2	0	2
All HQs ≤ 1:	17	5	4	0	4	0	0	8	4	5
Detect Samples:	9	5	4	0	5	2	1	7	5	8
All Samples:	24	11	6	2	9	3	2	10	5	10
Risk Category:	**B**	**B**	**B**	**B**	**B**	**A**	**A**	**C**	**C**	**A**

A = Risk to the sub-population at this location are possible
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C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
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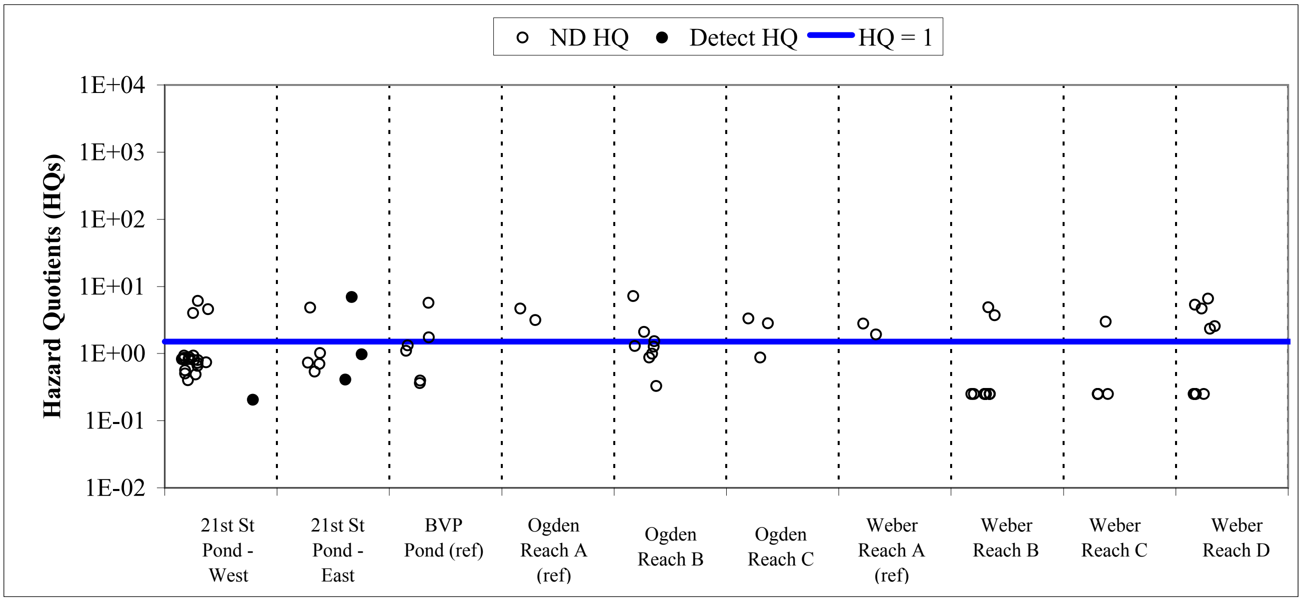
Appendix E-2
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

DIBENZOFURAN



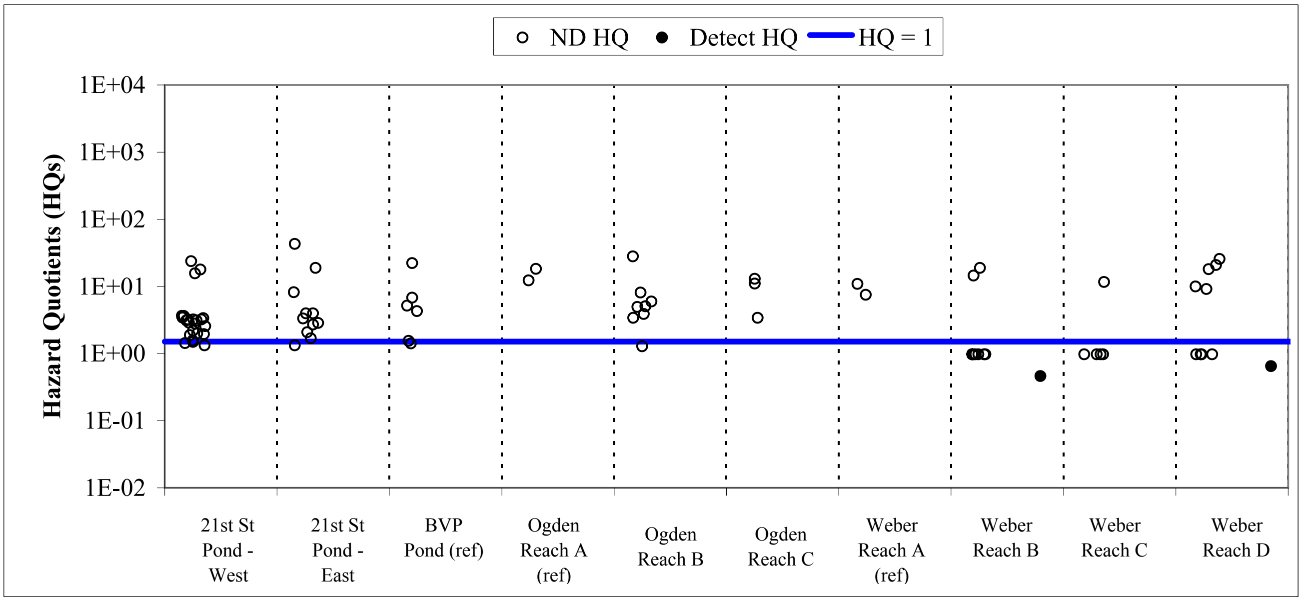
Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	1	0	0	0	0	0	0	0	0
ND HQs > 1:	3	1	2	2	3	2	2	2	1	5
All HQs ≤ 1:	17	6	4	0	5	1	0	8	4	5
Detect Samples:	1	3	0	0	0	0	0	0	0	0
All Samples:	20	8	6	2	8	3	2	10	5	10
Risk Category:	**C**	**B**	**B**	**B**	**B**	**B**	**B**	**C**	**C**	**B**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-2
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

PHENOL



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	20	10	5	2	7	3	2	2	1	5
All HQs ≤ 1:	4	1	1	0	1	0	0	8	4	5
Detect Samples:	0	0	0	0	0	0	0	1	0	1
All Samples:	24	11	6	2	8	3	2	10	5	10
Risk Category:	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**C**	**C**	**B**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
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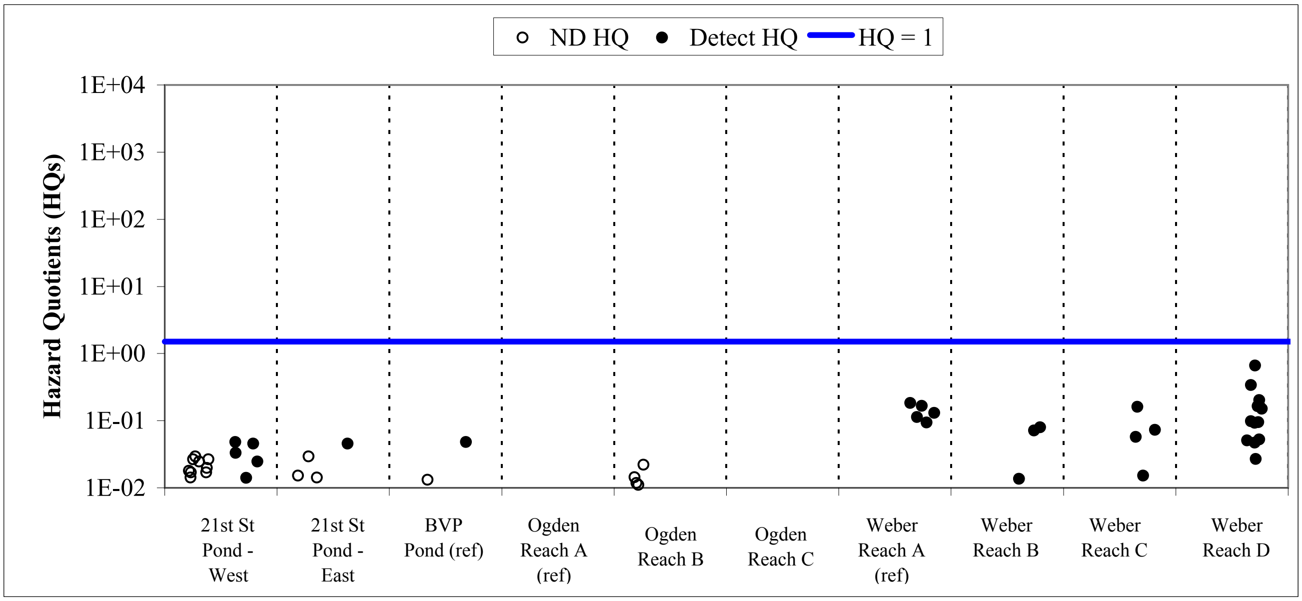
Appendix E-2
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

ACETONE



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs $\leq$ 1:	14	5	4	0	4	0	5	14	6	16
Detect Samples:	5	2	2	0	0	0	5	5	4	15
All Samples:	14	5	4	0	4	0	5	14	6	16
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
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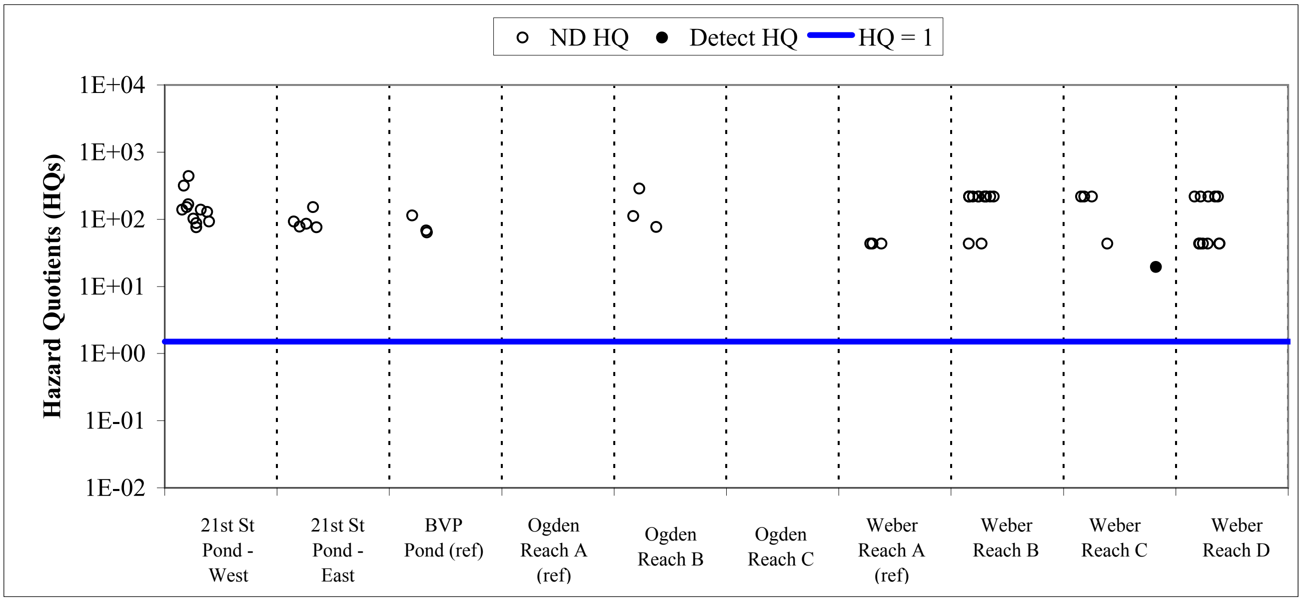
Appendix E-2
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

ACROLEIN



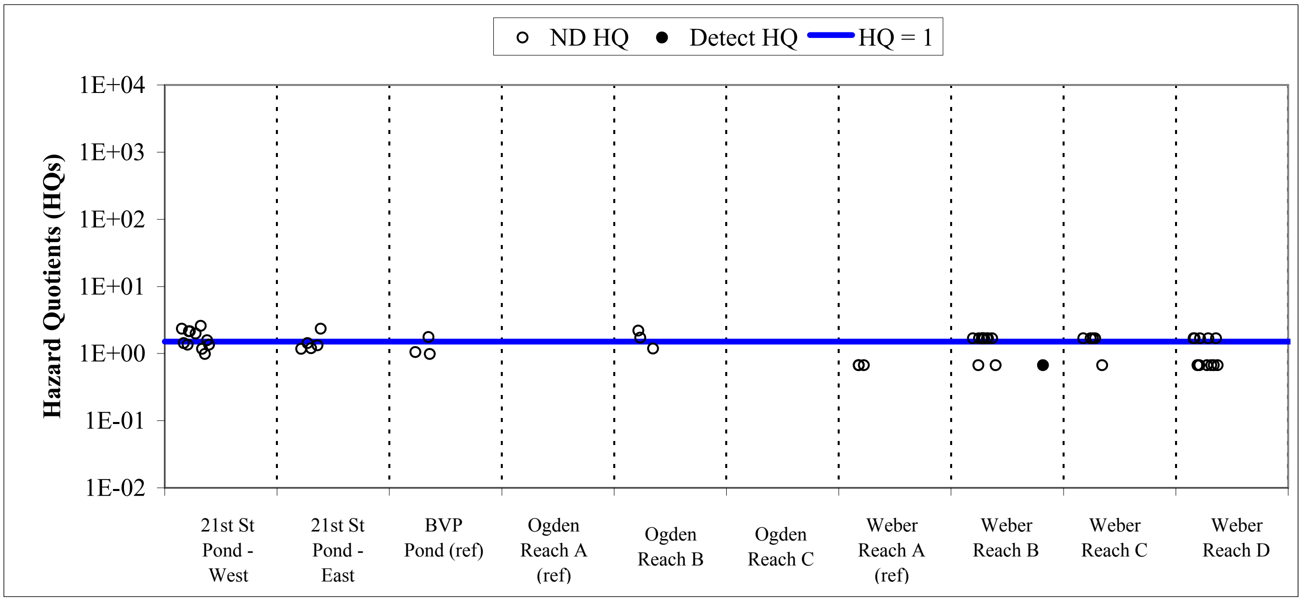
Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	1	0
ND HQs > 1:	11	5	3	0	3	0	3	12	4	11
All HQs ≤ 1:	0	0	0	0	0	0	0	0	0	0
Detect Samples:	0	0	0	0	0	0	0	0	1	0
All Samples:	11	5	3	0	3	0	3	12	5	11
Risk Category:	**B**	**B**	**B**	**na**	**B**	**na**	**B**	**B**	**B**	**B**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-2
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

ACRYLONITRILE



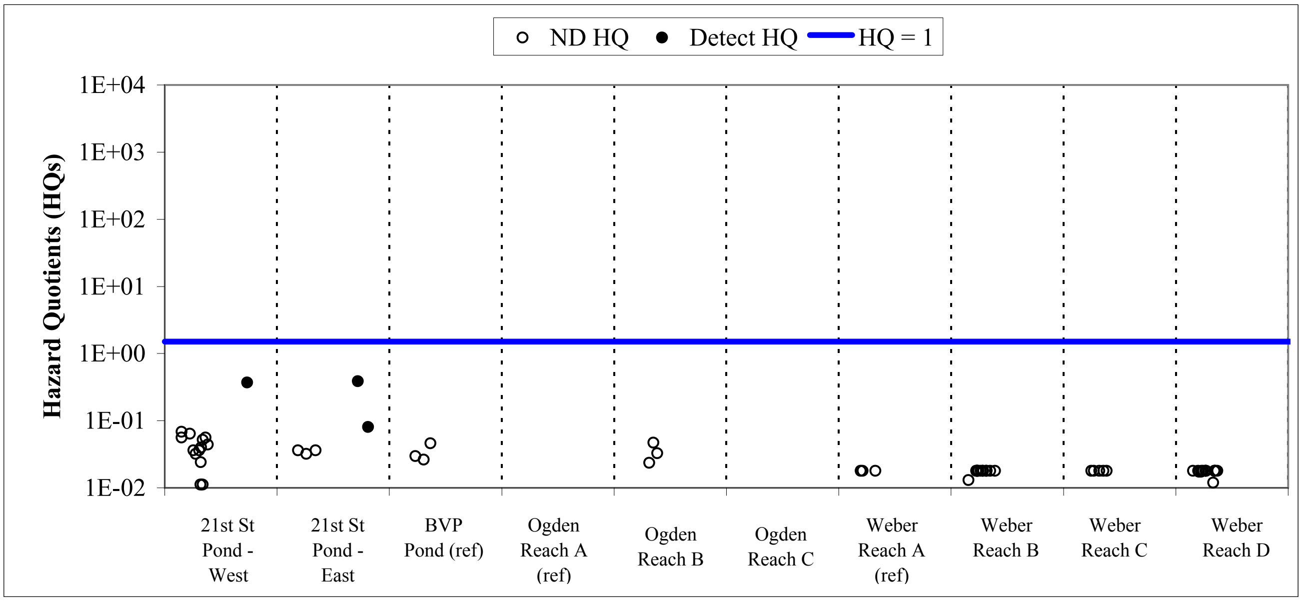
Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	6	1	1	0	2	0	0	9	4	5
All HQs $\leq$ 1:	5	4	2	0	1	0	3	3	1	6
Detect Samples:	0	0	0	0	0	0	0	1	0	0
All Samples:	11	5	3	0	3	0	3	12	5	11
Risk Category:	**B**	**C**	**B**	**na**	**B**	**na**	**C**	**B**	**B**	**B**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-2
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

BENZENE



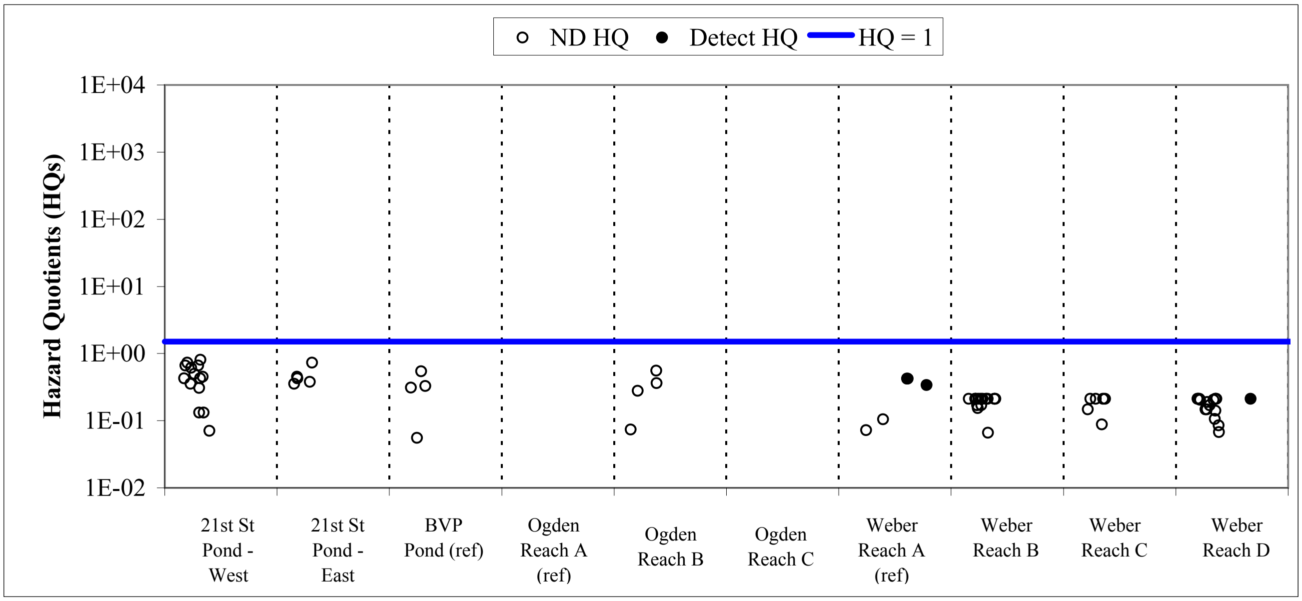
Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	14	5	4	0	4	0	5	14	6	16
Detect Samples:	1	2	0	0	0	0	0	0	0	0
All Samples:	14	5	4	0	4	0	5	14	6	16
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-2
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

BROMOMETHANE (METHYL BROMIDE)



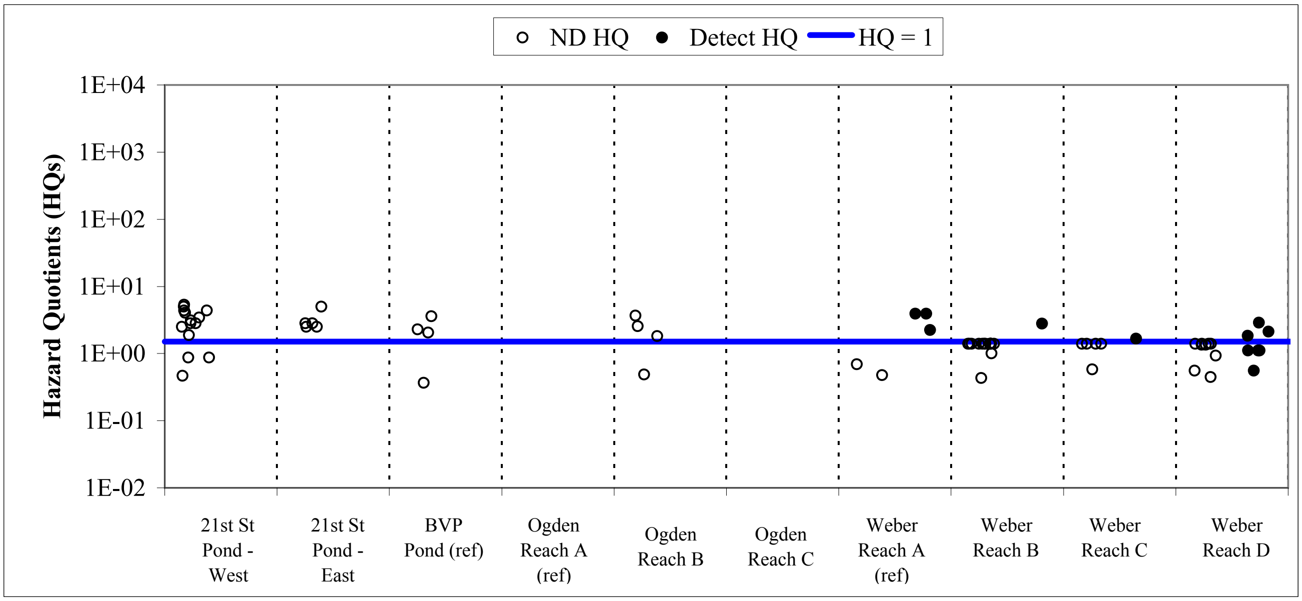
Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs $\leq$ 1:	14	5	4	0	4	0	5	14	6	16
Detect Samples:	0	0	0	0	0	0	3	0	0	1
All Samples:	14	5	4	0	4	0	5	14	6	16
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-2
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

CARBON DISULFIDE



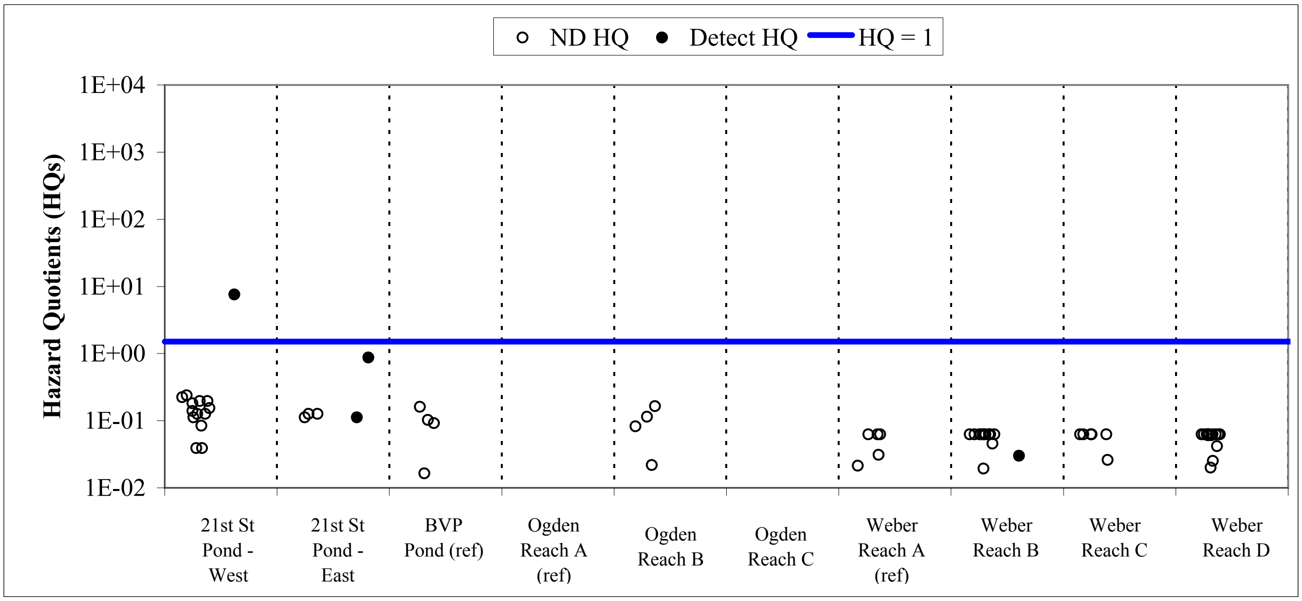
Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	3	1	1	3
ND HQs > 1:	11	5	3	0	3	0	0	0	0	0
All HQs ≤ 1:	3	0	1	0	1	0	2	13	5	13
Detect Samples:	0	0	0	0	0	0	3	1	1	7
All Samples:	14	5	4	0	4	0	5	14	6	16
Risk Category:	**B**	**B**	**B**	**na**	**B**	**na**	**A**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-2
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

ETHYLBENZENE



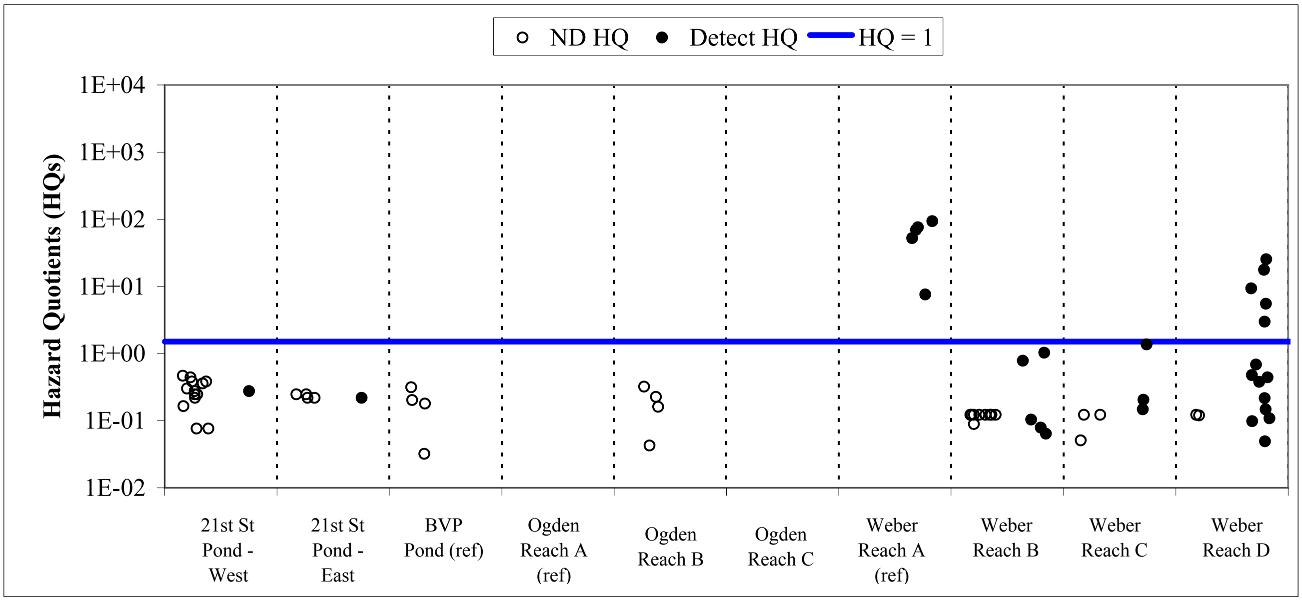
Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	1	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	13	5	4	0	4	0	5	14	6	16
Detect Samples:	1	2	0	0	0	0	0	1	0	0
All Samples:	14	5	4	0	4	0	5	14	6	16
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-2
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

TOLUENE



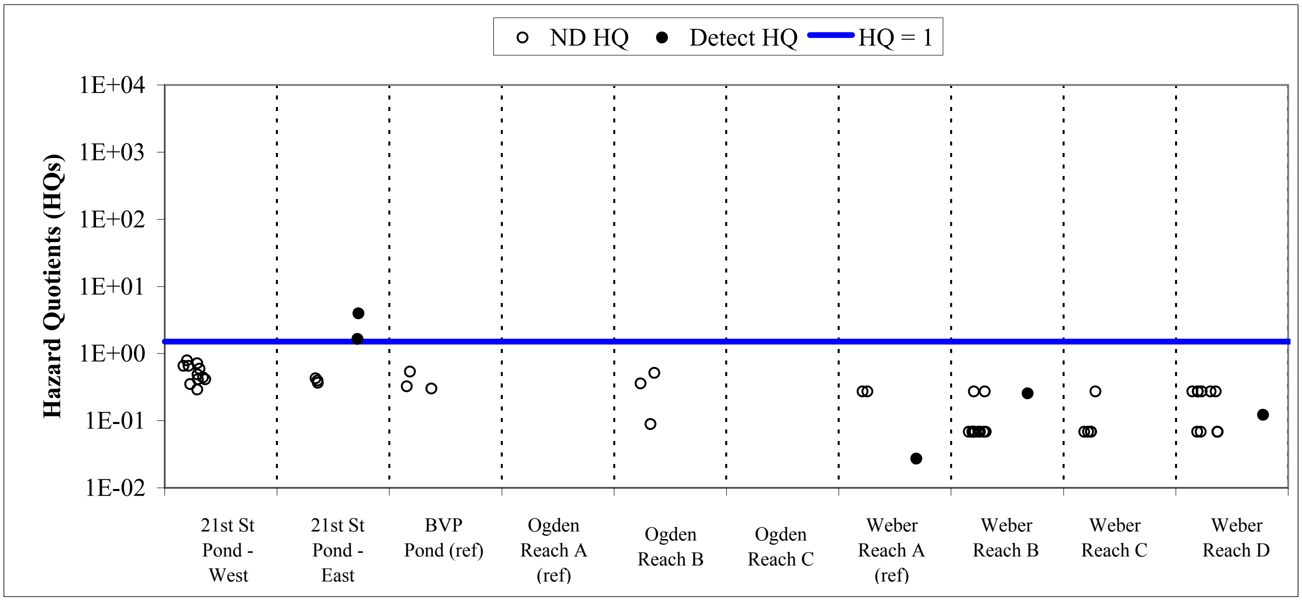
Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	0	0	5	0	0	5
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	14	5	4	0	4	0	0	14	6	11
Detect Samples:	1	1	0	0	0	0	5	5	3	14
All Samples:	14	5	4	0	4	0	5	14	6	16
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**A**	**C**	**C**	**A**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-2
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

XYLENES (TOTAL)



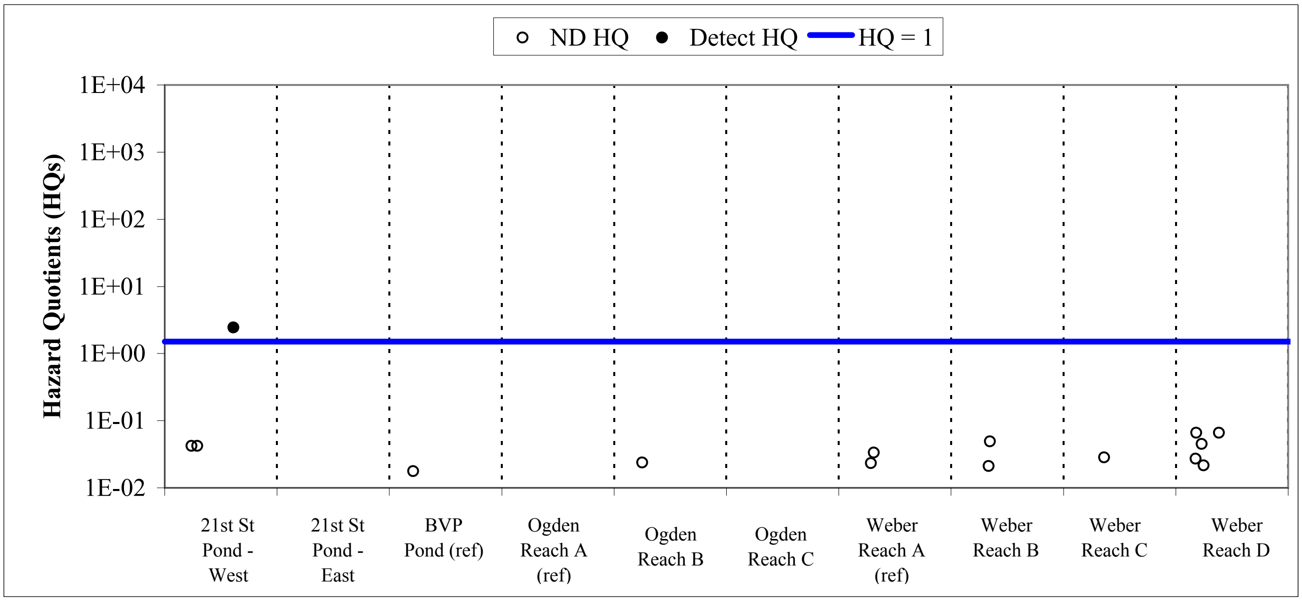
Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	2	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	11	3	3	0	3	0	3	12	5	11
Detect Samples:	0	2	0	0	0	0	1	1	0	1
All Samples:	11	5	3	0	3	0	3	12	5	11
Risk Category:	**C**	**A**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-2
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

O-XYLENE



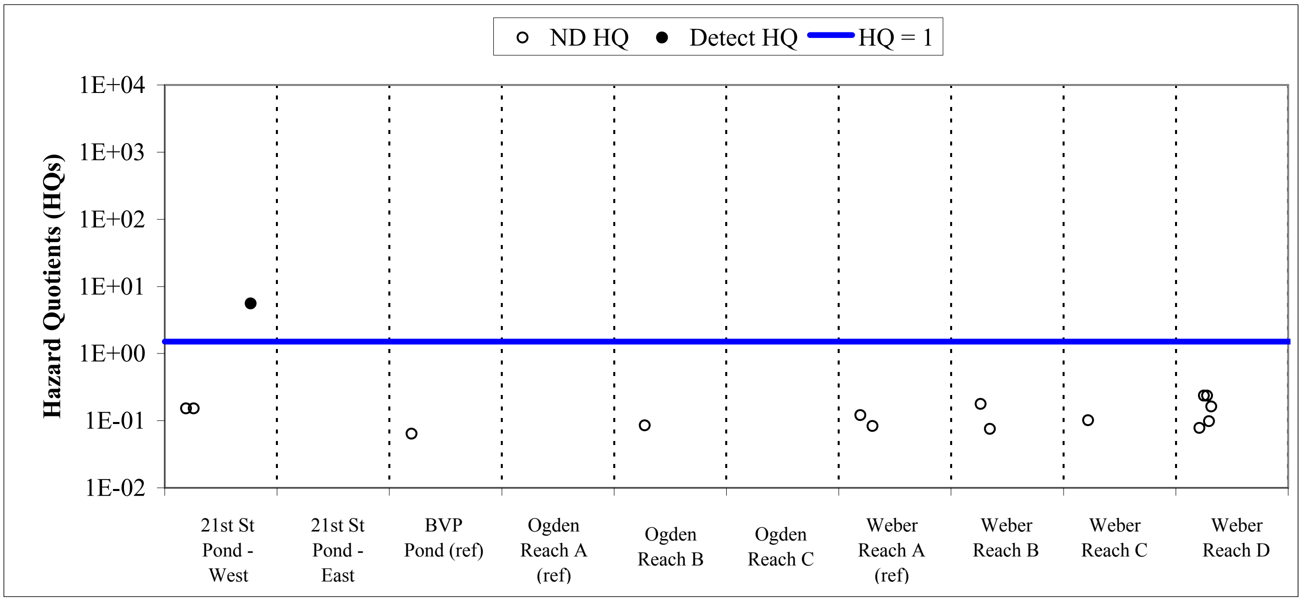
Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	1	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs ≤ 1:	2	0	1	0	1	0	2	2	1	5
Detect Samples:	1	0	0	0	0	0	0	0	0	0
All Samples:	3	0	1	0	1	0	2	2	1	5
Risk Category:	**A**	**na**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-2
Benthic Macroinvertebrate HQs for Direct Contact with Non-PAH Contaminants in Sediment

Baseline Ecological Risk Assessment for the Ogden Railyard Site

XYLENES-P,M



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	1	0	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
All HQs $\leq$ 1:	2	0	1	0	1	0	2	2	1	5
Detect Samples:	1	0	0	0	0	0	0	0	0	0
All Samples:	3	0	1	0	1	0	2	2	1	5
Risk Category:	**A**	**na**	**C**	**na**	**C**	**na**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

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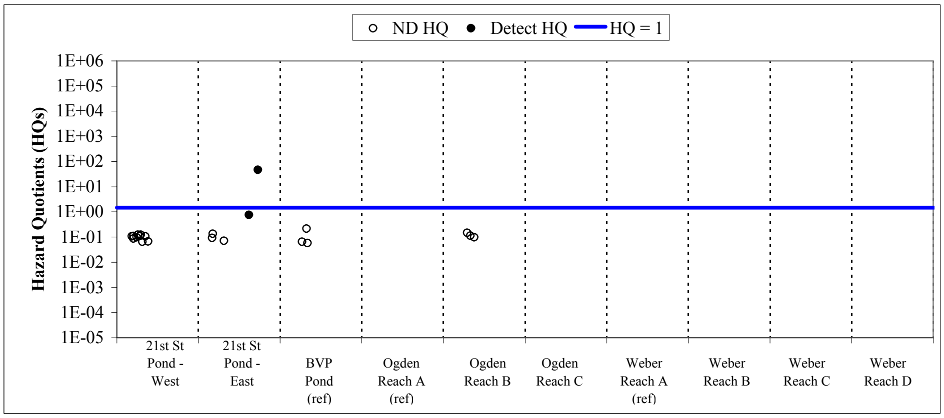
Appendix E-3
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment
(Based on Non-SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

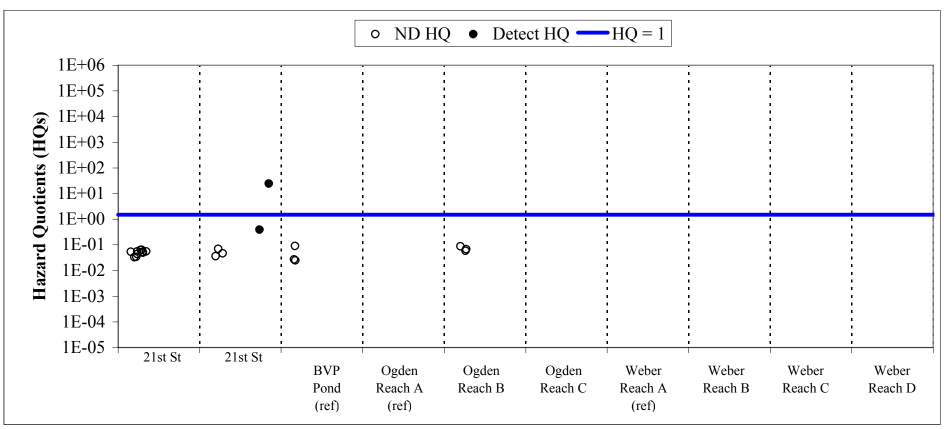
1-METHYLNAPHTHALENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	0	1	0	0	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
N All HQs ≤ 1:	10	4	3	0	3	0	0	0	0	0
N Detect Samples:	0	2	0	0	0	0	0	0	0	0
N Samples:	10	5	3	0	3	0	0	0	0	0
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**na**	**na**	**na**	**na**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	0	1	0	0	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
N All HQs ≤ 1:	10	4	3	0	3	0	0	0	0	0
N Detect Samples:	0	2	0	0	0	0	0	0	0	0
N Samples:	10	5	3	0	3	0	0	0	0	0
Risk Category:	**C**	**C**	**C**	**na**	**C**	**na**	**na**	**na**	**na**	**na**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
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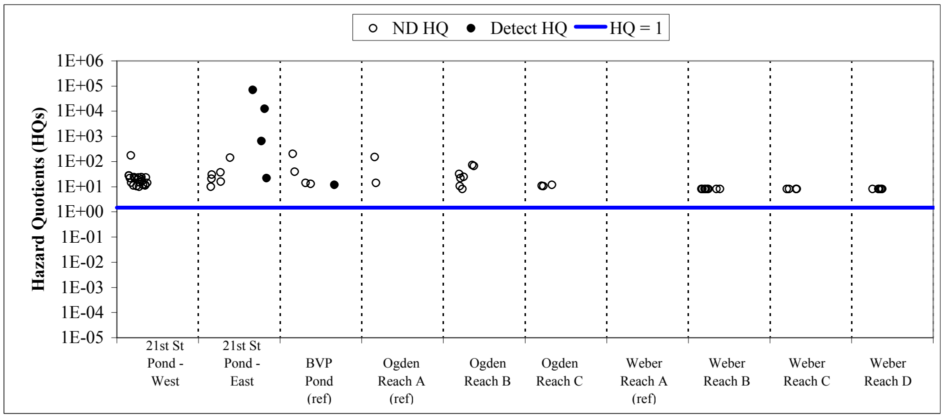
Appendix E-3
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment
(Based on Non-SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

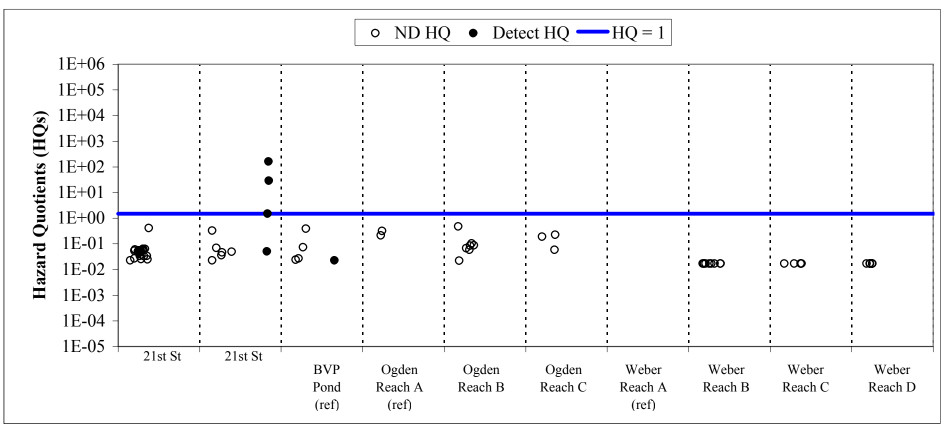
2-METHYLNAPHTHALENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	0	4	1	0	0	0	0	0	0	0
N ND HQs > 1:	21	6	4	2	7	3	0	8	4	5
N All HQs ≤ 1:	0	0	0	0	0	0	0	0	0	0
N Detect Samples:	0	4	1	0	0	0	0	0	0	0
N Samples:	21	10	5	2	7	3	0	8	4	5
Risk Category:	**B**	**A**	**B**	**B**	**B**	**B**	**na**	**B**	**B**	**B**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	0	2	0	0	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
N All HQs ≤ 1:	21	8	5	2	7	3	0	8	4	5
N Detect Samples:	0	4	1	0	0	0	0	0	0	0
N Samples:	21	10	5	2	7	3	0	8	4	5
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**	**na**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
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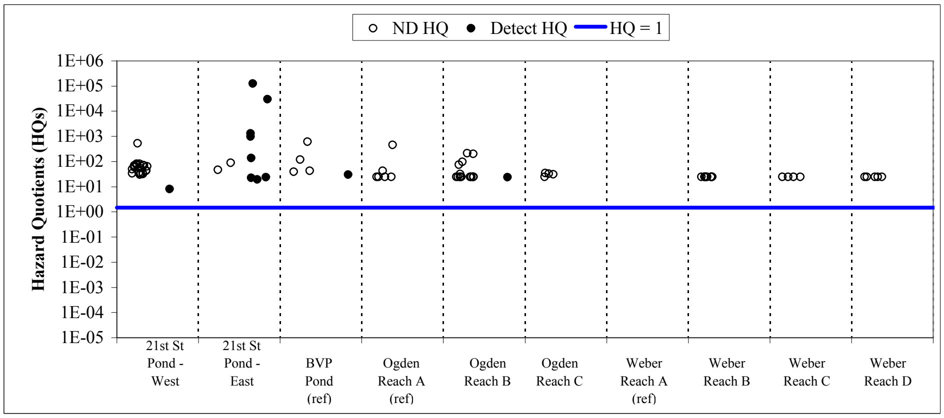
Appendix E-3
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment
(Based on Non-SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

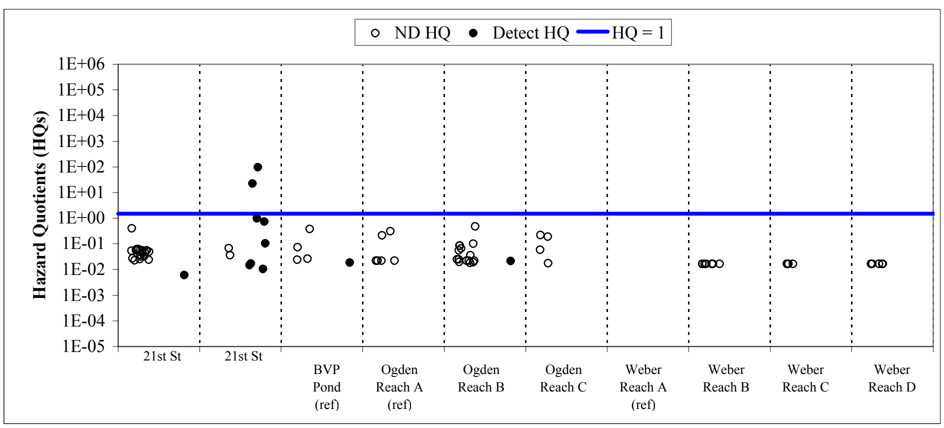
ACENAPHTHENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	1	8	1	0	1	0	0	0	0	0
N ND HQs > 1:	20	2	4	6	15	4	0	8	4	5
N All HQs ≤ 1:	0	0	0	0	0	0	0	0	0	0
N Detect Samples:	1	8	1	0	1	0	0	0	0	0
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**B**	**A**	**B**	**B**	**B**	**B**	**na**	**B**	**B**	**B**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	0	2	0	0	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
N All HQs ≤ 1:	21	8	5	6	16	4	0	8	4	5
N Detect Samples:	1	8	1	0	1	0	0	0	0	0
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**	**na**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
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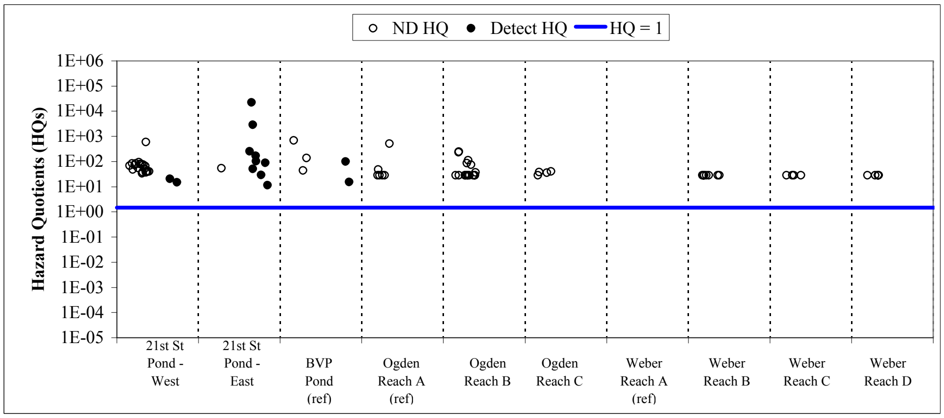
C = Risks to the sub-population at this location are expected to be minimal and are assumed t
na = No data for this chemical in this location

Appendix E-3
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment
(Based on Non-SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

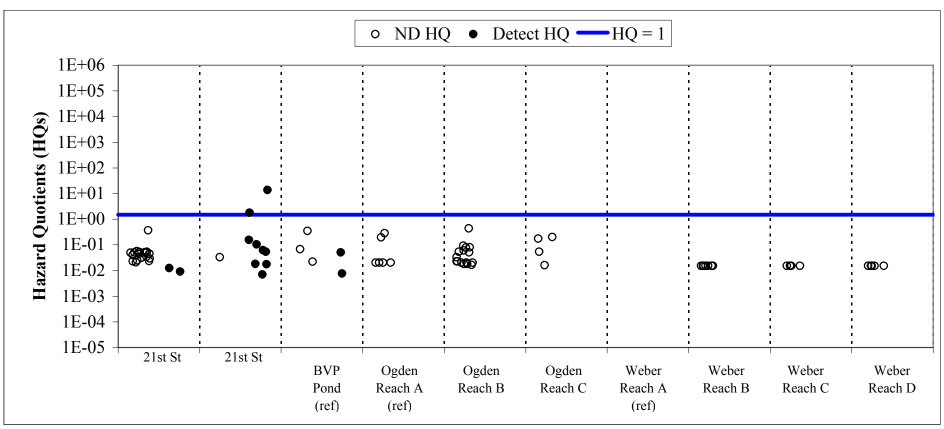
ACENAPHTHYLENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	2	9	2	0	0	0	0	0	0	0
N ND HQs > 1:	19	1	3	6	16	4	0	8	4	5
N All HQs ≤ 1:	0	0	0	0	0	0	0	0	0	0
N Detect Samples:	2	9	2	0	0	0	0	0	0	0
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**B**	**A**	**A**	**B**	**B**	**B**	**na**	**B**	**B**	**B**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	0	2	0	0	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
N All HQs ≤ 1:	21	8	5	6	16	4	0	8	4	5
N Detect Samples:	2	9	2	0	0	0	0	0	0	0
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**	**na**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
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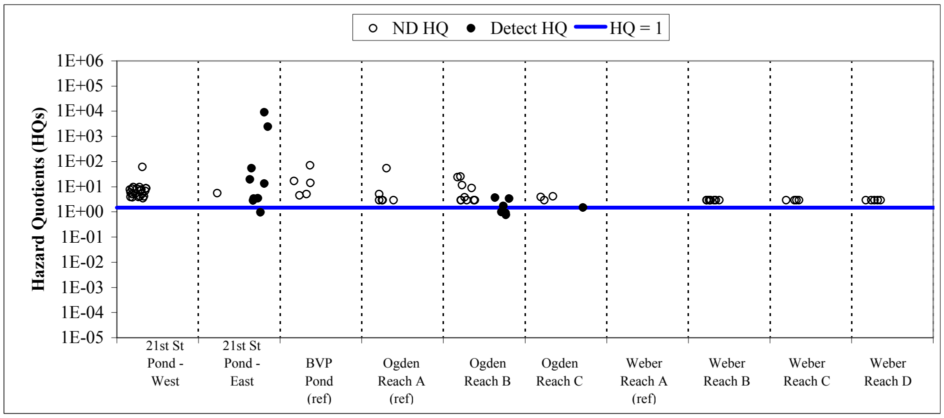
C = Risks to the sub-population at this location are expected to be minimal and are assumed t
na = No data for this chemical in this location

Appendix E-3
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment
(Based on Non-SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

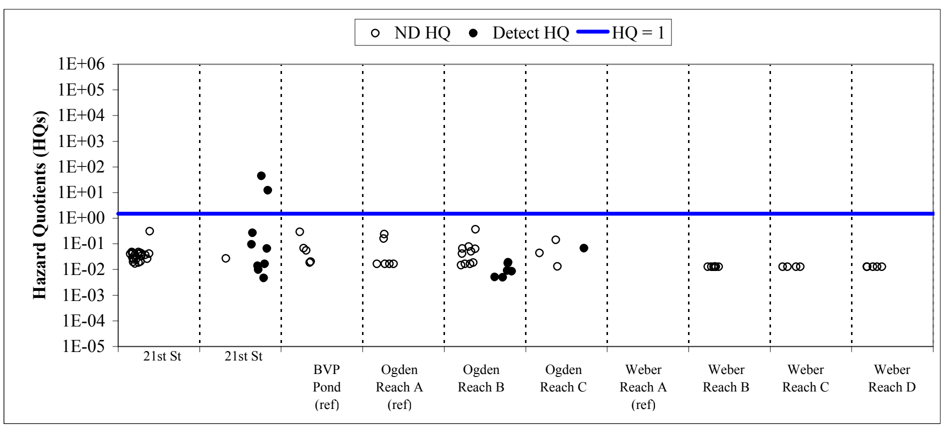
ANTHRACENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	0	8	0	0	3	0	0	0	0	0
N ND HQs > 1:	21	1	5	6	10	3	0	8	4	5
N All HQs ≤ 1:	0	1	0	0	3	1	0	0	0	0
N Detect Samples:	0	9	0	0	6	1	0	0	0	0
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**B**	**A**	**B**	**B**	**B**	**B**	**na**	**B**	**B**	**B**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	0	2	0	0	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
N All HQs ≤ 1:	21	8	5	6	16	4	0	8	4	5
N Detect Samples:	0	9	0	0	6	1	0	0	0	0
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**	**na**	**C**	**C**	**C**

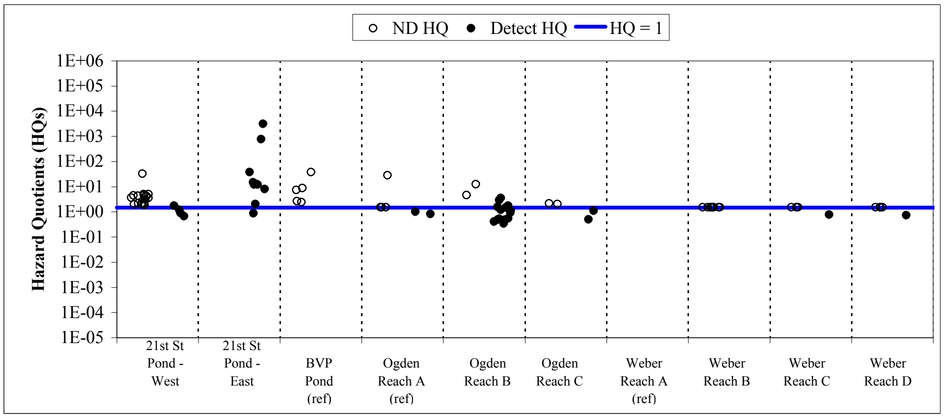
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed t
na = No data for this chemical in this location

Appendix E-3
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment
(Based on Non-SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

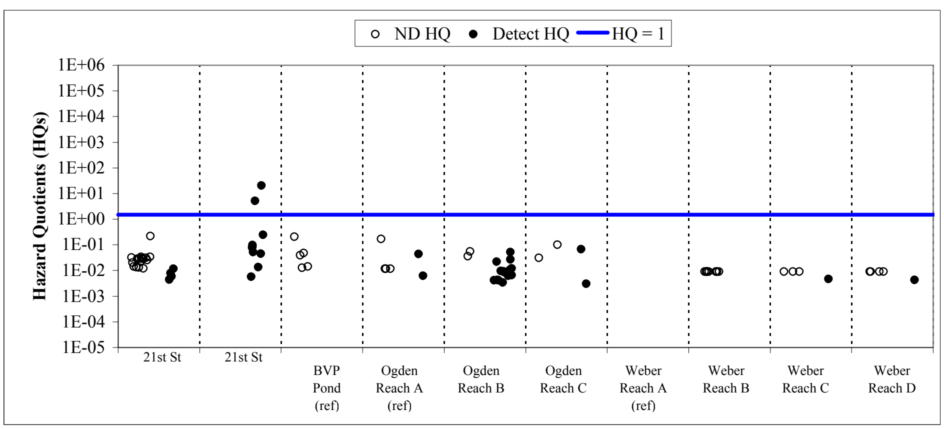
BENZO[A]ANTHRACENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	1	9	0	0	4	0	0	0	0	0
N ND HQs > 1:	17	0	5	4	2	2	0	8	3	4
N All HQs ≤ 1:	3	1	0	2	10	2	0	0	1	1
N Detect Samples:	4	10	0	2	14	2	0	0	1	1
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**B**	**A**	**B**	**B**	**A**	**B**	**na**	**B**	**B**	**B**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	0	2	0	0	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
N All HQs ≤ 1:	21	8	5	6	16	4	0	8	4	5
N Detect Samples:	4	10	0	2	14	2	0	0	1	1
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**	**na**	**C**	**C**	**C**

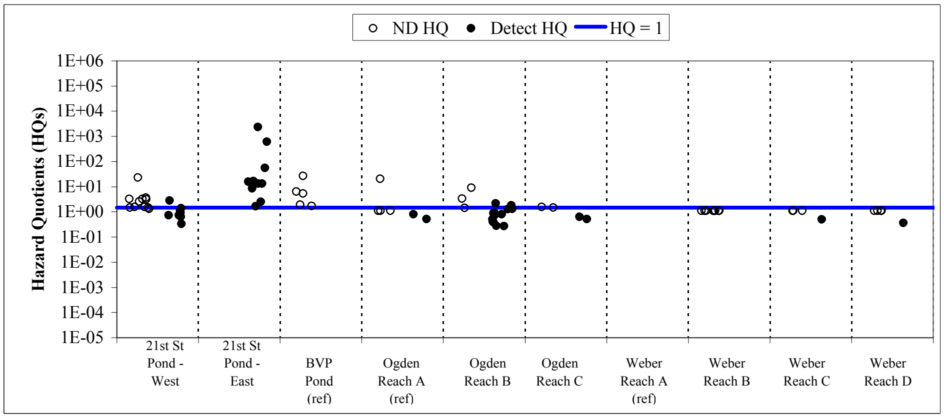
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed t
na = No data for this chemical in this location

Appendix E-3
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment
(Based on Non-SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

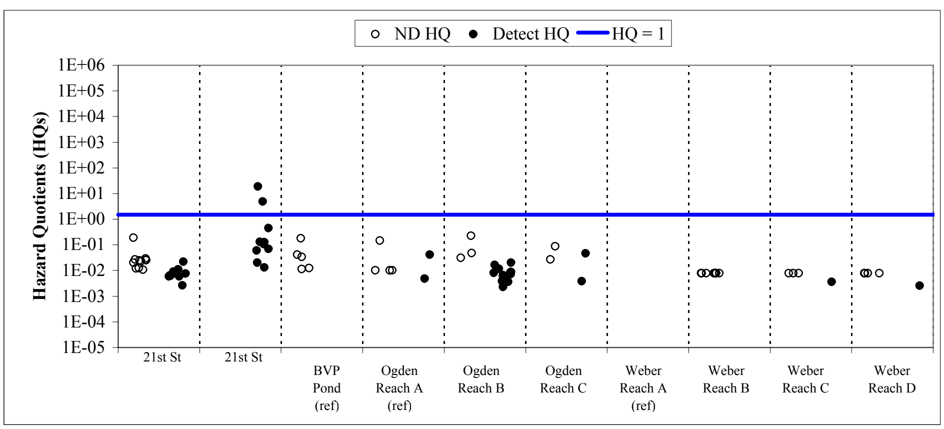
BENZO[A]PYRENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	1	10	0	0	2	0	0	0	0	0
N ND HQs > 1:	10	0	5	1	2	1	0	0	0	0
N All HQs ≤ 1:	10	0	0	5	12	3	0	8	4	5
N Detect Samples:	10	10	0	2	13	2	0	0	1	1
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**B**	**A**	**B**	**C**	**B**	**B**	**na**	**C**	**C**	**C**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	0	2	0	0	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
N All HQs ≤ 1:	21	8	5	6	16	4	0	8	4	5
N Detect Samples:	10	10	0	2	13	2	0	0	1	1
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**	**na**	**C**	**C**	**C**

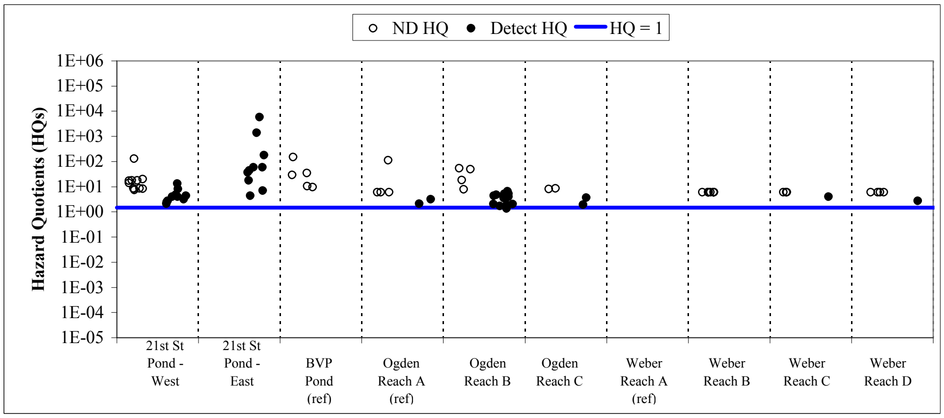
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed t
na = No data for this chemical in this location

Appendix E-3
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment
(Based on Non-SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

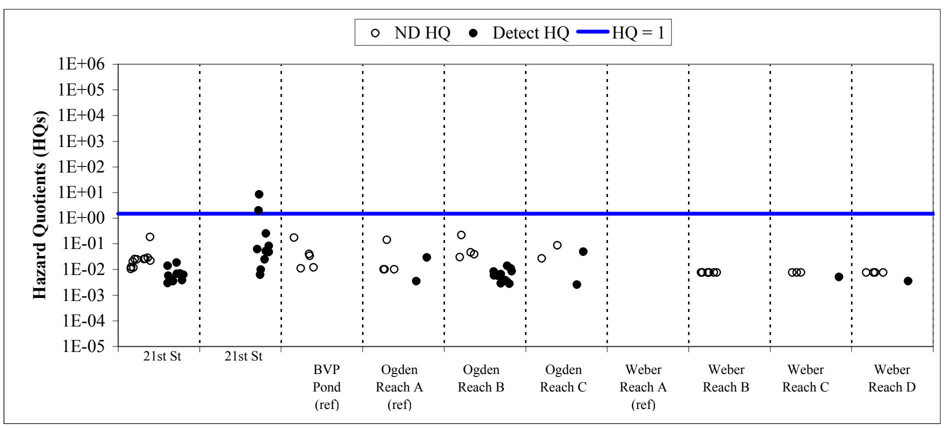
BENZO[B]FLUORANTHENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	10	10	0	2	11	2	0	0	1	1
N ND HQs > 1:	11	0	5	4	4	2	0	8	3	4
N All HQs ≤ 1:	0	0	0	0	1	0	0	0	0	0
N Detect Samples:	10	10	0	2	12	2	0	0	1	1
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**A**	**A**	**B**	**A**	**A**	**A**	**na**	**B**	**A**	**B**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	0	2	0	0	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
N All HQs ≤ 1:	21	8	5	6	16	4	0	8	4	5
N Detect Samples:	10	10	0	2	12	2	0	0	1	1
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**	**na**	**C**	**C**	**C**

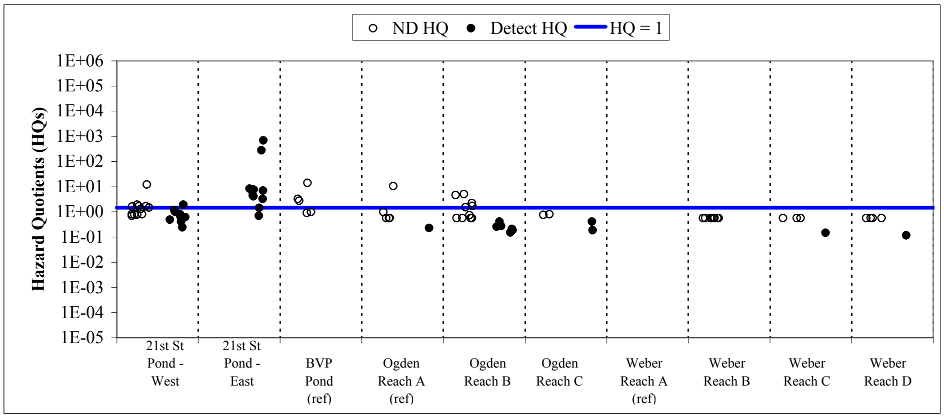
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed t
na = No data for this chemical in this location

Appendix E-3
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment
(Based on Non-SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

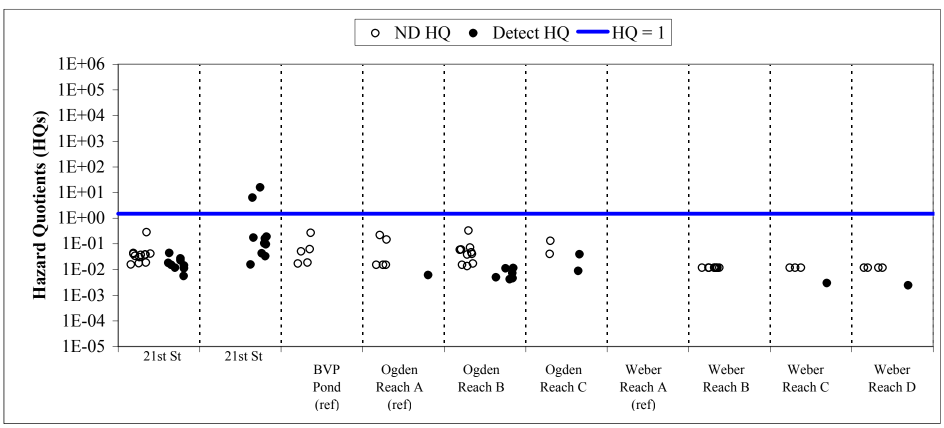
BENZO[G,H,I]PERYLENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	1	8	0	0	0	0	0	0	0	0
N ND HQs > 1:	5	0	3	1	5	0	0	0	0	0
N All HQs ≤ 1:	15	2	2	5	11	4	0	8	4	5
N Detect Samples:	9	10	0	1	6	2	0	0	1	1
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**B**	**A**	**B**	**C**	**B**	**C**	**na**	**C**	**C**	**C**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	0	2	0	0	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
N All HQs ≤ 1:	21	8	5	6	16	4	0	8	4	5
N Detect Samples:	9	10	0	1	6	2	0	0	1	1
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**	**na**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
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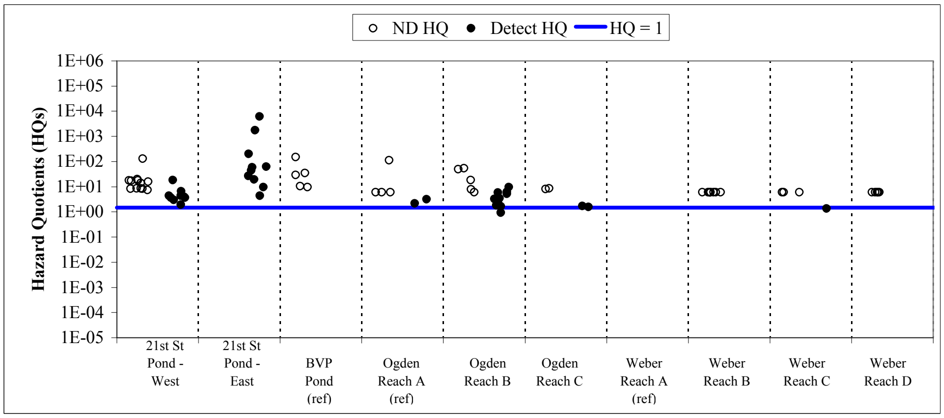
C = Risks to the sub-population at this location are expected to be minimal and are assumed t
na = No data for this chemical in this location

Appendix E-3
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment
(Based on Non-SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

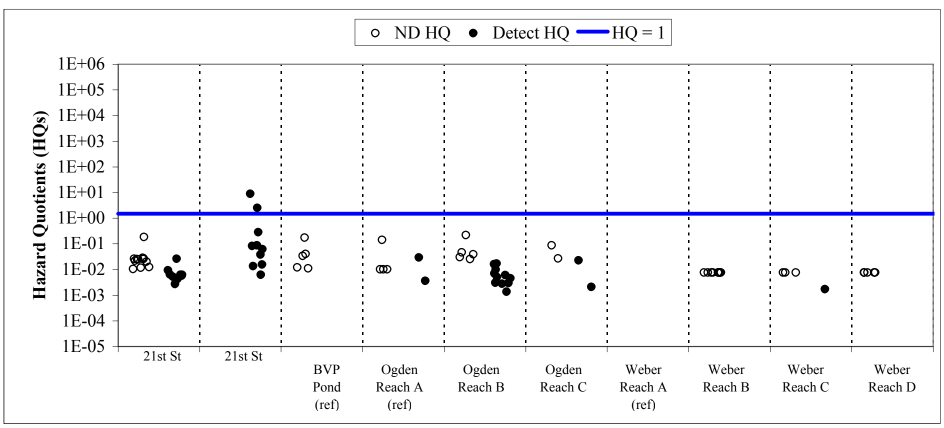
BENZO[K]FLUORANTHENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	9	10	0	2	10	2	0	0	0	0
N ND HQs > 1:	12	0	5	4	5	2	0	8	3	5
N All HQs ≤ 1:	0	0	0	0	1	0	0	0	1	0
N Detect Samples:	9	10	0	2	11	2	0	0	1	0
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**A**	**A**	**B**	**A**	**A**	**A**	**na**	**B**	**B**	**B**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	0	2	0	0	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
N All HQs ≤ 1:	21	8	5	6	16	4	0	8	4	5
N Detect Samples:	9	10	0	2	11	2	0	0	1	0
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**	**na**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
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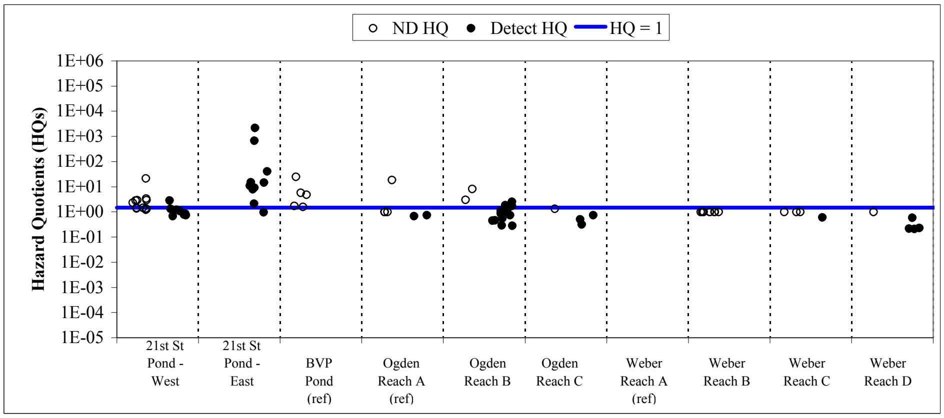
C = Risks to the sub-population at this location are expected to be minimal and are assumed t
na = No data for this chemical in this location

Appendix E-3
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment
(Based on Non-SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

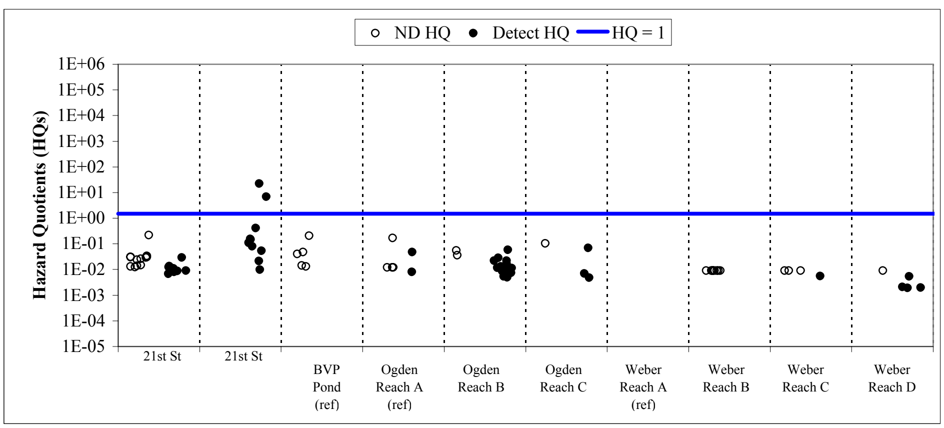
CHRYSENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	1	9	0	0	4	0	0	0	0	0
N ND HQs > 1:	6	0	5	1	2	0	0	0	0	0
N All HQs ≤ 1:	14	1	0	5	10	4	0	8	4	5
N Detect Samples:	9	10	0	2	14	3	0	0	1	4
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**B**	**A**	**B**	**C**	**A**	**C**	**na**	**C**	**C**	**C**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	0	2	0	0	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
N All HQs ≤ 1:	21	8	5	6	16	4	0	8	4	5
N Detect Samples:	9	10	0	2	14	3	0	0	1	4
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**	**na**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
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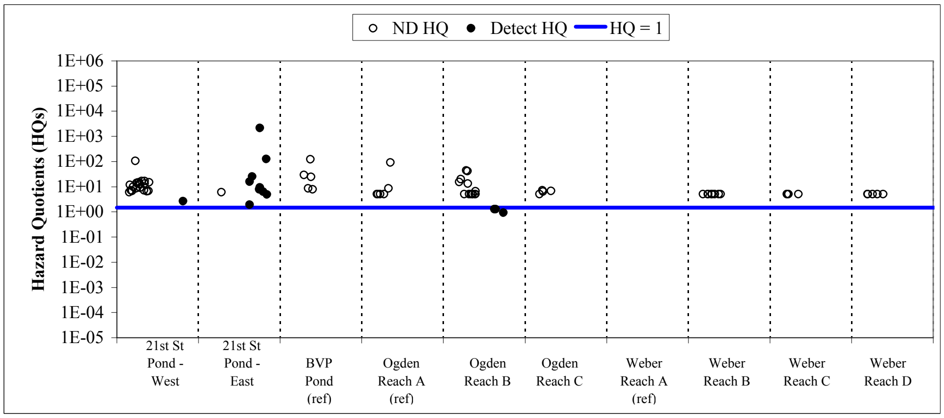
C = Risks to the sub-population at this location are expected to be minimal and are assumed t
na = No data for this chemical in this location

Appendix E-3
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment
(Based on Non-SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

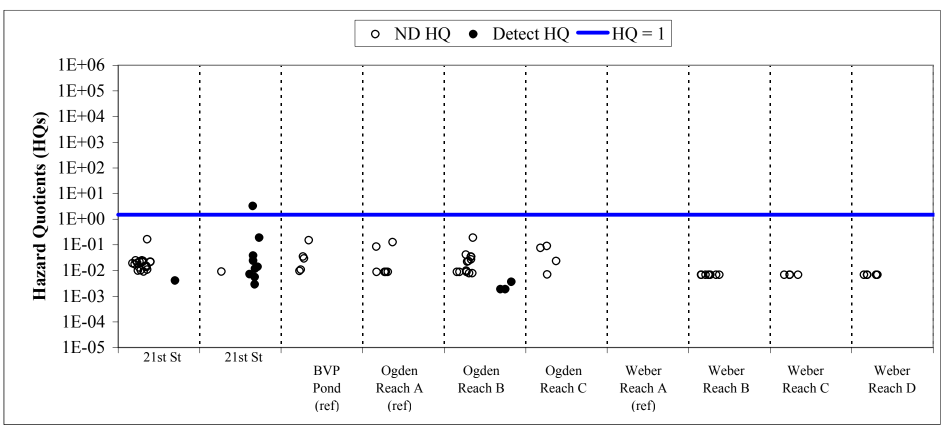
DIBENZ[A,H]ANTHRACENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	1	9	0	0	0	0	0	0	0	0
N ND HQs > 1:	20	1	5	6	13	4	0	8	4	5
N All HQs ≤ 1:	0	0	0	0	3	0	0	0	0	0
N Detect Samples:	1	9	0	0	3	0	0	0	0	0
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**B**	**A**	**B**	**B**	**B**	**B**	**na**	**B**	**B**	**B**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	0	1	0	0	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
N All HQs ≤ 1:	21	9	5	6	16	4	0	8	4	5
N Detect Samples:	1	9	0	0	3	0	0	0	0	0
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**	**na**	**C**	**C**	**C**

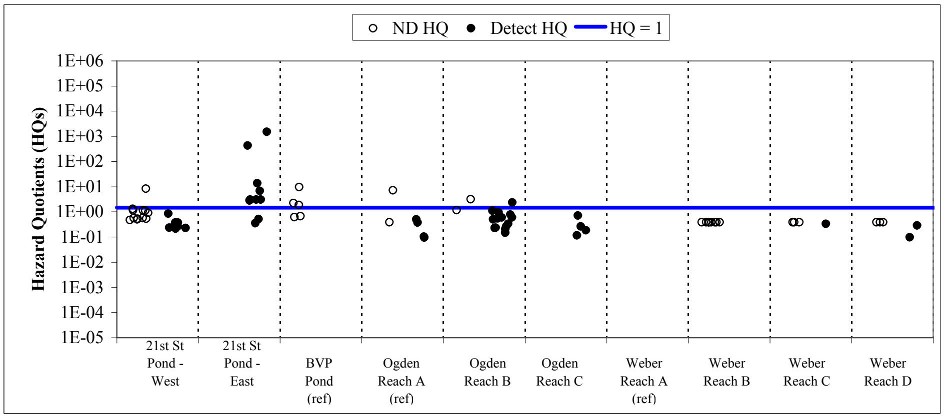
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed t
na = No data for this chemical in this location

Appendix E-3
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment
(Based on Non-SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

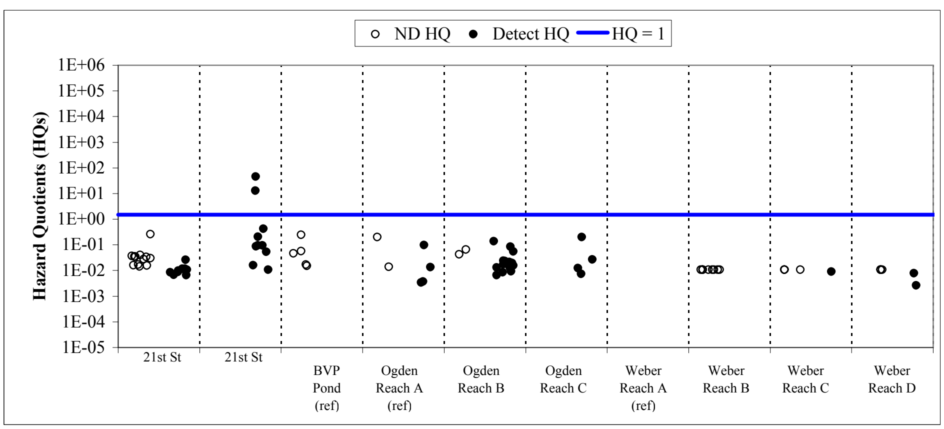
FLUORANTHENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	0	8	0	0	1	0	0	0	0	0
N ND HQs > 1:	1	0	3	1	1	0	0	0	0	0
N All HQs ≤ 1:	20	2	2	5	14	4	0	8	4	5
N Detect Samples:	9	10	0	4	14	4	0	0	1	2
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**C**	**A**	**B**	**C**	**C**	**C**	**na**	**C**	**C**	**C**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	0	2	0	0	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
N All HQs ≤ 1:	21	8	5	6	16	4	0	8	4	5
N Detect Samples:	9	10	0	4	14	4	0	0	1	2
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**	**na**	**C**	**C**	**C**

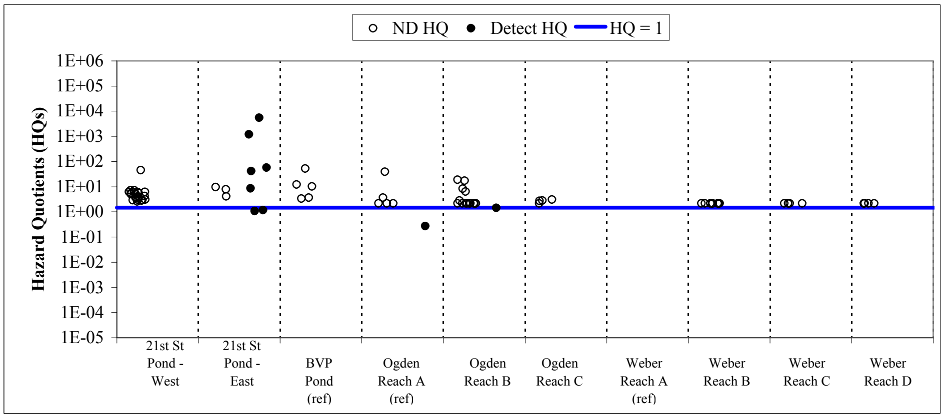
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed t
na = No data for this chemical in this location

Appendix E-3
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment
(Based on Non-SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

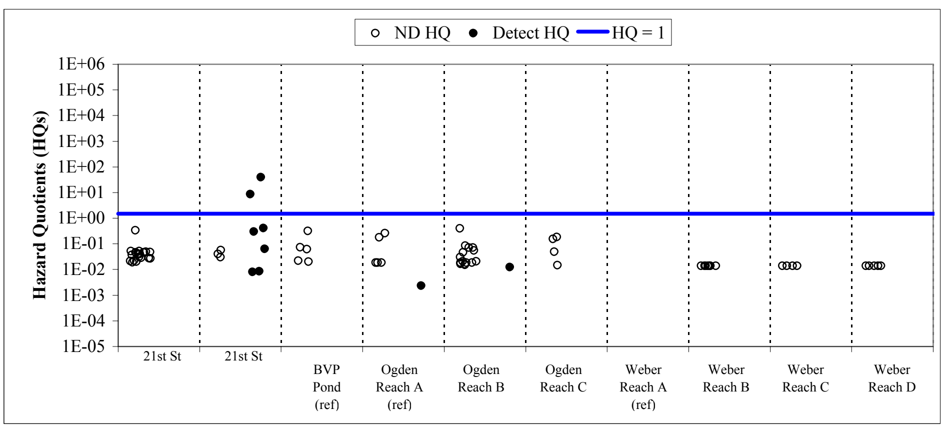
FLUORENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	0	5	0	0	0	0	0	0	0	0
N ND HQs > 1:	21	3	5	5	15	4	0	8	4	5
N All HQs ≤ 1:	0	2	0	1	1	0	0	0	0	0
N Detect Samples:	0	7	0	1	1	0	0	0	0	0
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**B**	**A**	**B**	**B**	**B**	**B**	**na**	**B**	**B**	**B**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	0	2	0	0	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
N All HQs ≤ 1:	21	8	5	6	16	4	0	8	4	5
N Detect Samples:	0	7	0	1	1	0	0	0	0	0
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**	**na**	**C**	**C**	**C**

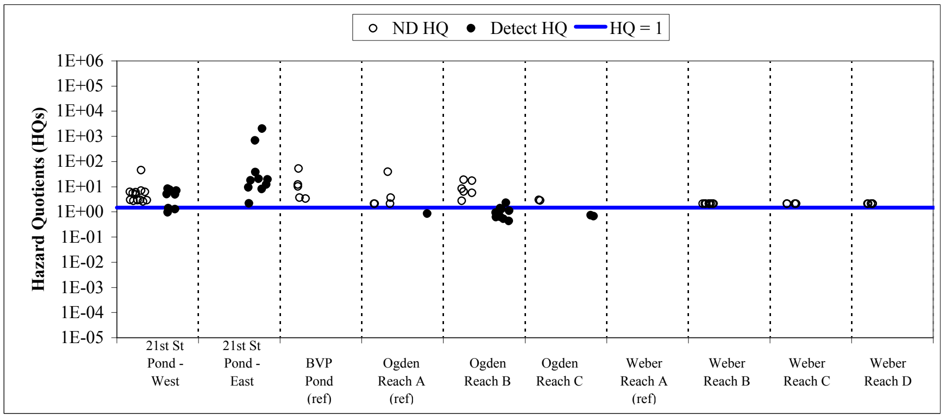
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed t
na = No data for this chemical in this location

Appendix E-3
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment
(Based on Non-SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

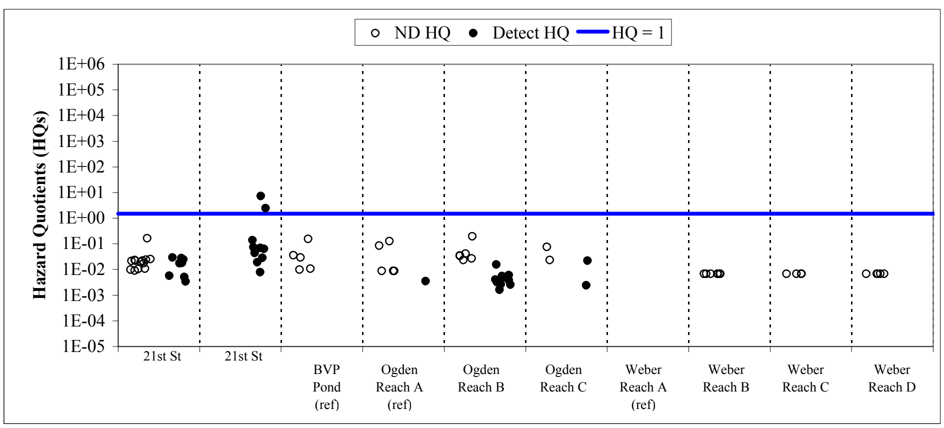
INDENO[1,2,3-C,D]PYRENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	5	10	0	0	1	0	0	0	0	0
N ND HQs > 1:	13	0	5	5	6	2	0	8	4	5
N All HQs ≤ 1:	3	0	0	1	9	2	0	0	0	0
N Detect Samples:	8	10	0	1	10	2	0	0	0	0
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**A**	**A**	**B**	**B**	**B**	**B**	**na**	**B**	**B**	**B**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	0	2	0	0	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
N All HQs ≤ 1:	21	8	5	6	16	4	0	8	4	5
N Detect Samples:	8	10	0	1	10	2	0	0	0	0
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**	**na**	**C**	**C**	**C**

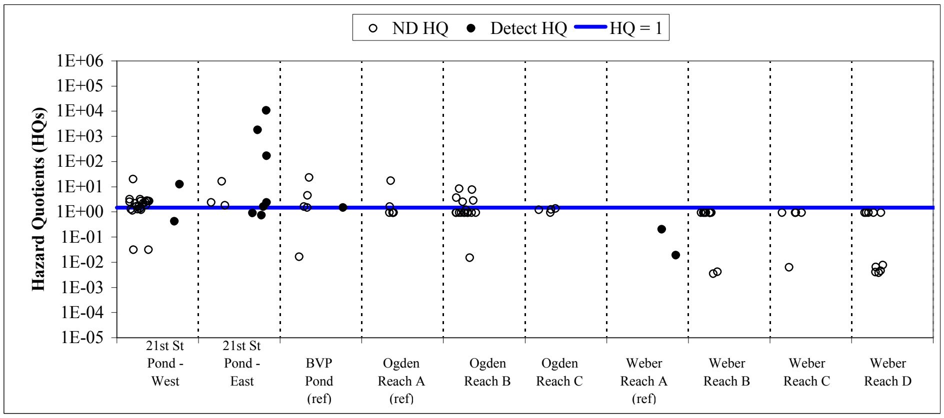
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed t
na = No data for this chemical in this location

Appendix E-3
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment
(Based on Non-SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

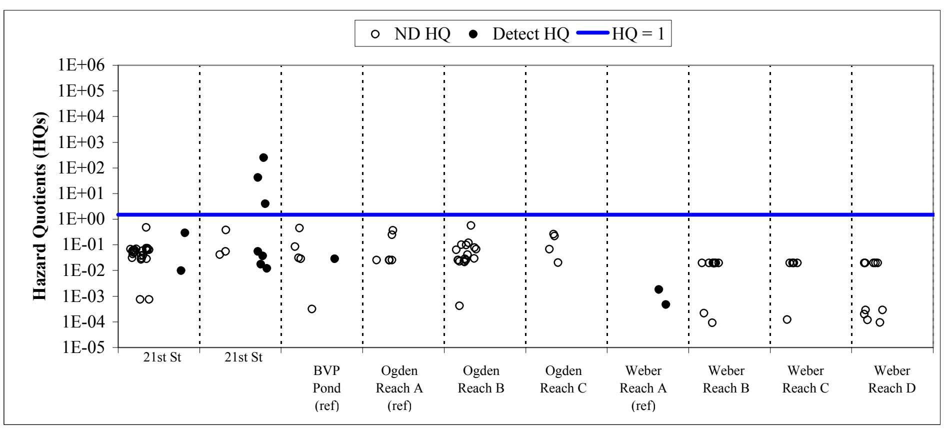
NAPHTHALENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	1	5	0	0	0	0	0	0	0	0
N ND HQs > 1:	14	3	3	2	5	0	0	0	0	0
N All HQs ≤ 1:	9	2	3	4	12	4	2	10	5	10
N Detect Samples:	2	7	1	0	0	0	2	0	0	0
N Samples:	24	10	6	6	17	4	2	10	5	10
Risk Category:	**B**	**A**	**B**	**B**	**B**	**C**	**C**	**C**	**C**	**C**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	0	3	0	0	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
N All HQs ≤ 1:	24	7	6	6	17	4	2	10	5	10
N Detect Samples:	2	7	1	0	0	0	2	0	0	0
N Samples:	24	10	6	6	17	4	2	10	5	10
Risk Category:	**C**	**A**	**C**	**C**	**C**	**C**	**C**	**C**	**C**	**C**

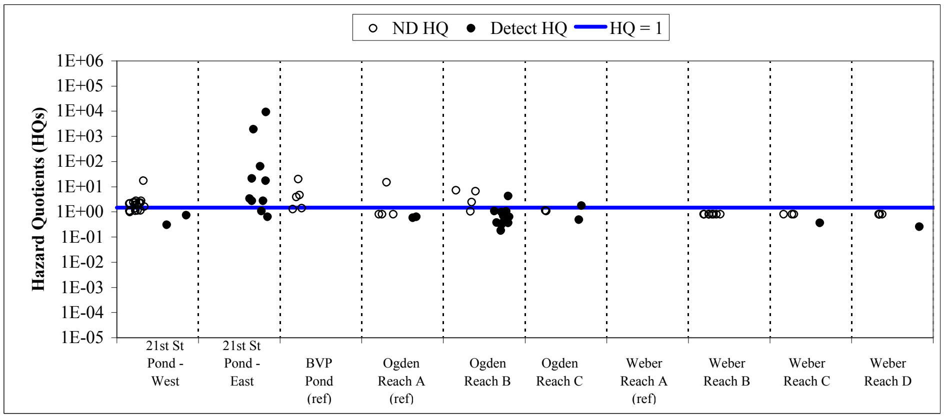
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed t
na = No data for this chemical in this location

Appendix E-3
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment
(Based on Non-SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

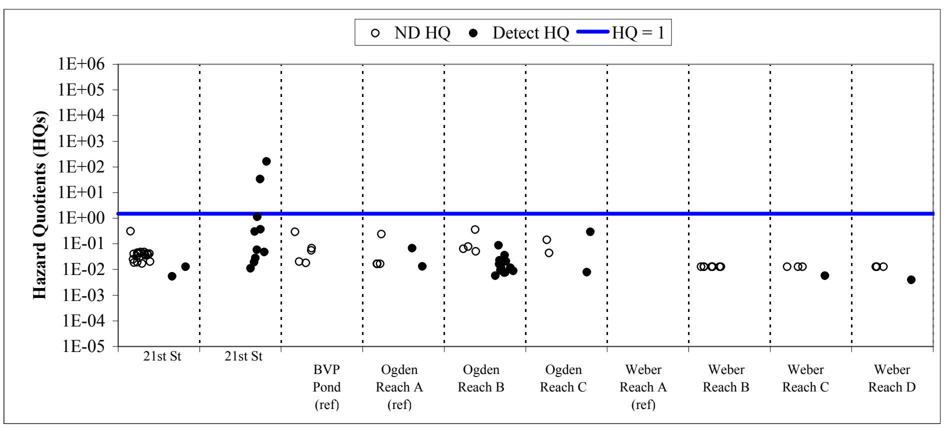
PHENANTHRENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	0	8	0	0	1	1	0	0	0	0
N ND HQs > 1:	12	0	3	1	3	0	0	0	0	0
N All HQs ≤ 1:	9	2	2	5	12	3	0	8	4	5
N Detect Samples:	2	10	0	2	12	2	0	0	1	1
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**B**	**A**	**B**	**C**	**B**	**A**	**na**	**C**	**C**	**C**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	0	2	0	0	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
N All HQs ≤ 1:	21	8	5	6	16	4	0	8	4	5
N Detect Samples:	2	10	0	2	12	2	0	0	1	1
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**	**na**	**C**	**C**	**C**

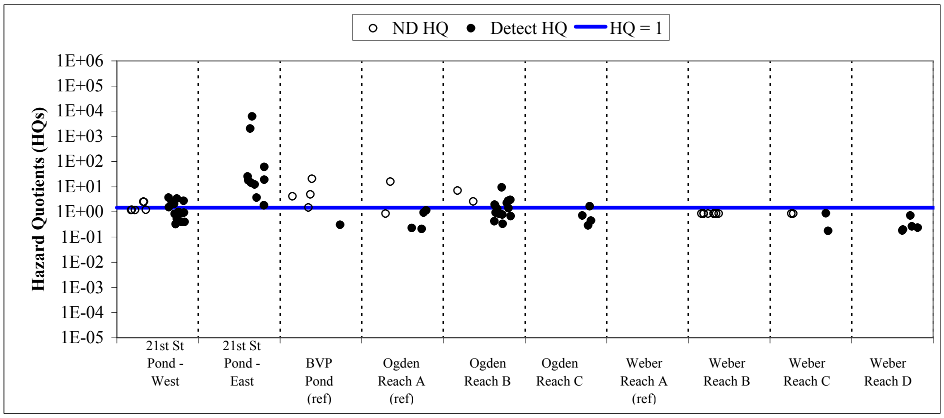
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed t
na = No data for this chemical in this location

Appendix E-3
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment
(Based on Non-SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

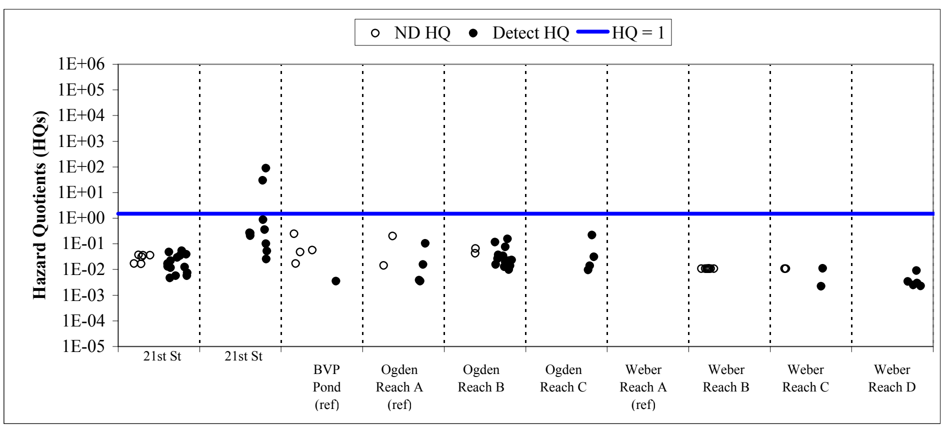
PYRENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	6	10	0	0	6	1	0	0	0	0
N ND HQs > 1:	2	0	3	1	2	0	0	0	0	0
N All HQs ≤ 1:	13	0	2	5	8	3	0	8	4	5
N Detect Samples:	15	10	1	4	14	4	0	0	2	5
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**A**	**A**	**B**	**C**	**A**	**A**	**na**	**C**	**C**	**C**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
N Detect HQs > 1:	0	2	0	0	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0	0	0	0	0
N All HQs ≤ 1:	21	8	5	6	16	4	0	8	4	5
N Detect Samples:	15	10	1	4	14	4	0	0	2	5
N Samples:	21	10	5	6	16	4	0	8	4	5
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**	**na**	**C**	**C**	**C**

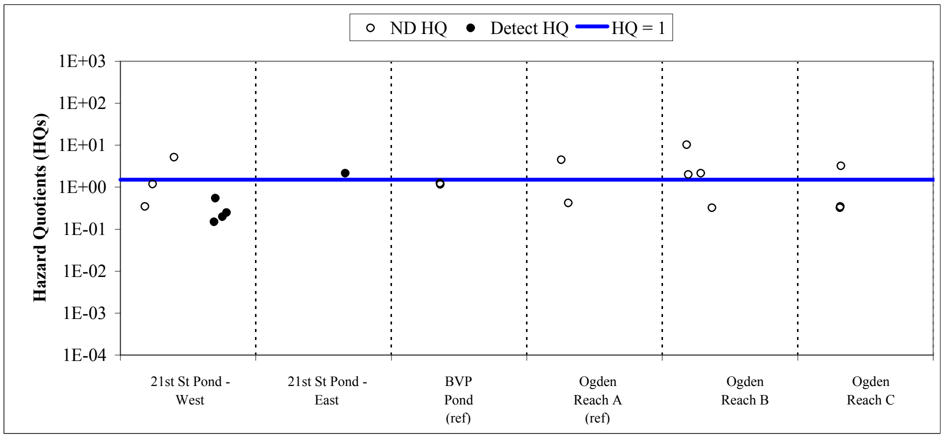
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed t
na = No data for this chemical in this location

Appendix E-4
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment (Based on SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

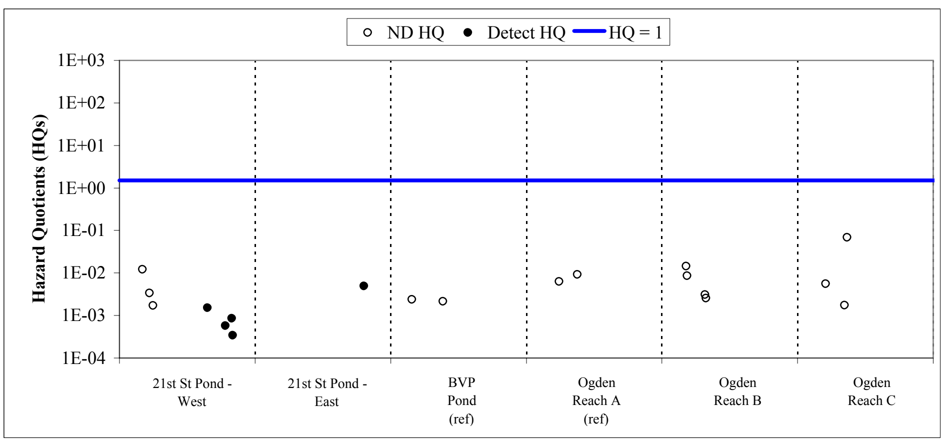
2-METHYLNAPHTHALENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	0	1	0	0	0	0
N ND HQs > 1:	1	0	0	1	3	1
N All HQs ≤ 1:	6	0	2	1	1	2
N Detect Samples:	4	1	0	0	0	0
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**A**	**C**	**B**	**B**	**B**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0
N All HQs ≤ 1:	7	1	2	2	4	3
N Detect Samples:	4	1	0	0	0	0
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**

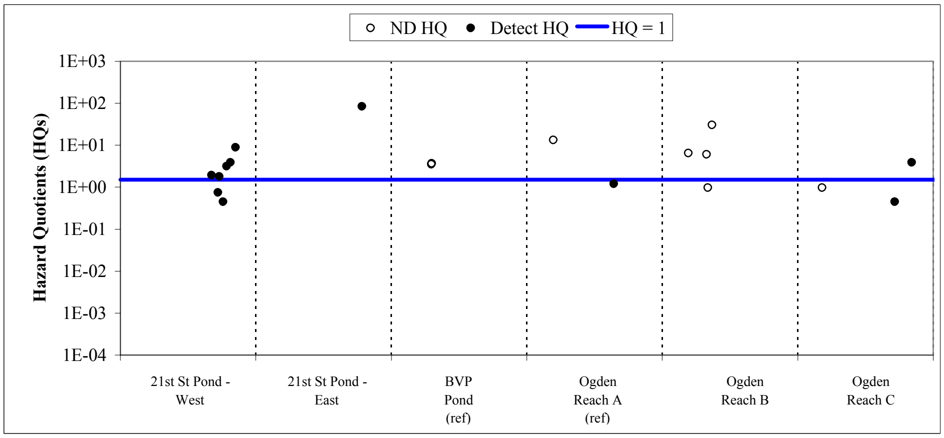
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-4
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment (Based on SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

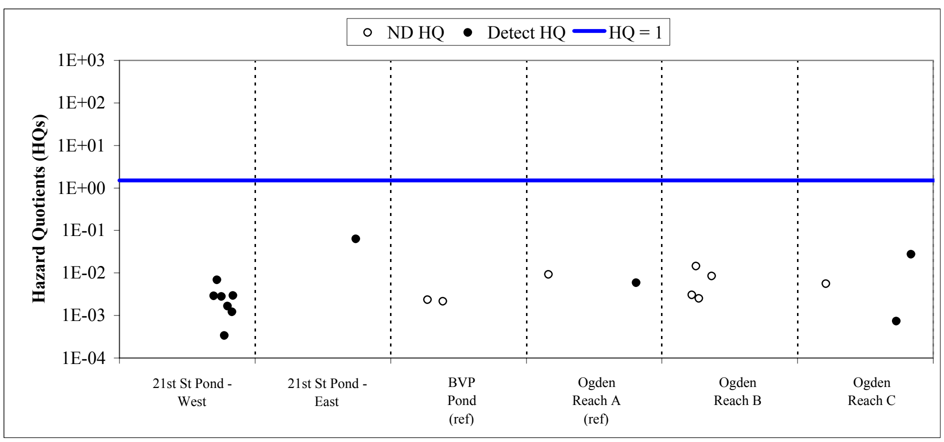
ACENAPHTHENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	5	1	0	0	0	1
N ND HQs > 1:	0	0	2	1	3	0
N All HQs ≤ 1:	2	0	0	1	1	2
N Detect Samples:	7	1	0	1	0	2
N Samples:	7	1	2	2	4	3
Risk Category:	**A**	**A**	**B**	**B**	**B**	**A**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0
N All HQs ≤ 1:	7	1	2	2	4	3
N Detect Samples:	7	1	0	1	0	2
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
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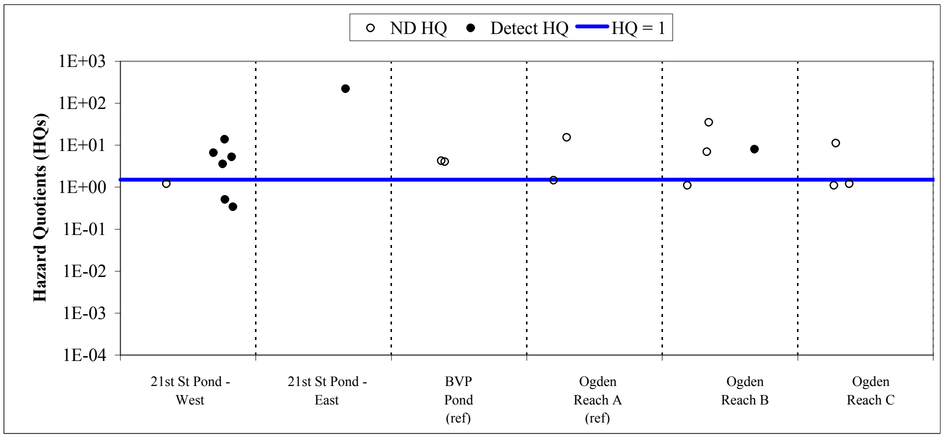
Appendix E-4
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment (Based on SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

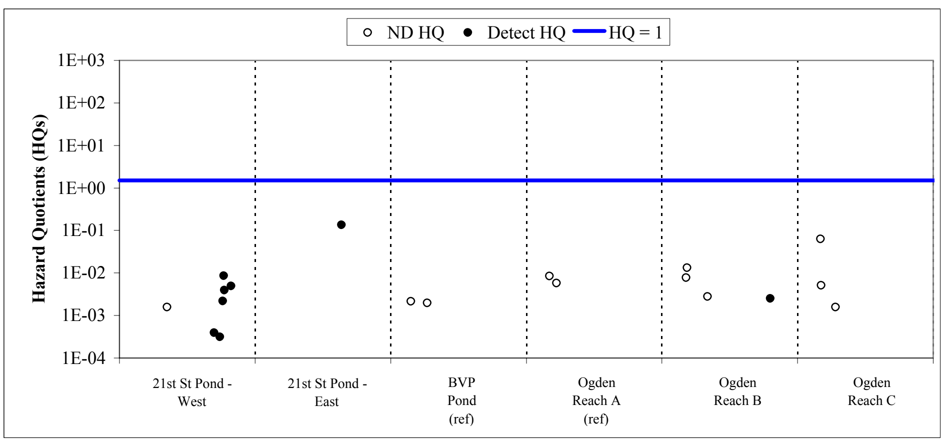
ACENAPHTHYLENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	4	1	0	0	1	0
N ND HQs > 1:	0	0	2	1	2	1
N All HQs ≤ 1:	3	0	0	1	1	2
N Detect Samples:	6	1	0	0	1	0
N Samples:	7	1	2	2	4	3
Risk Category:	**A**	**A**	**B**	**B**	**A**	**B**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0
N All HQs ≤ 1:	7	1	2	2	4	3
N Detect Samples:	6	1	0	0	1	0
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
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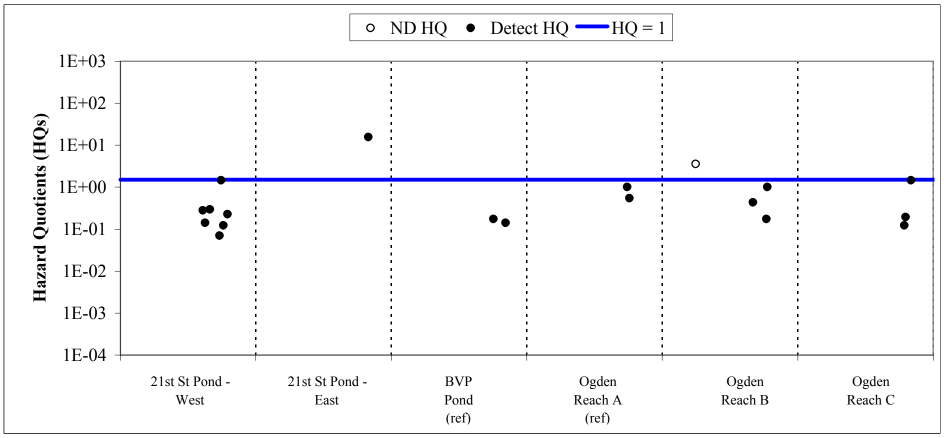
Appendix E-4
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment (Based on SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

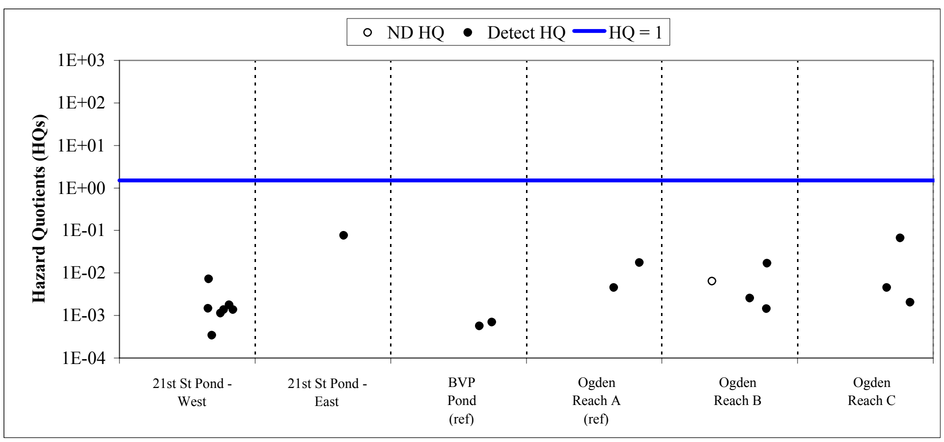
ANTHRACENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	0	1	0	0	0	0
N ND HQs > 1:	0	0	0	0	1	0
N All HQs ≤ 1:	7	0	2	2	3	3
N Detect Samples:	7	1	2	2	3	3
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**A**	**C**	**C**	**B**	**C**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0
N All HQs ≤ 1:	7	1	2	2	4	3
N Detect Samples:	7	1	2	2	3	3
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
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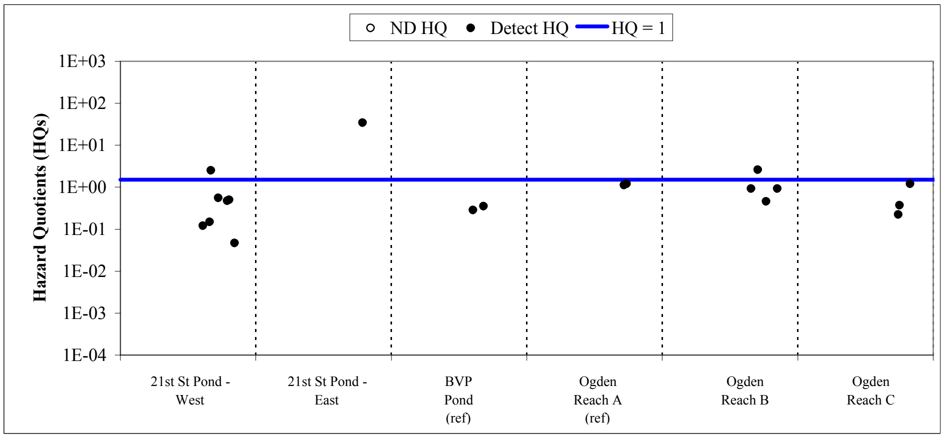
Appendix E-4
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment (Based on SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

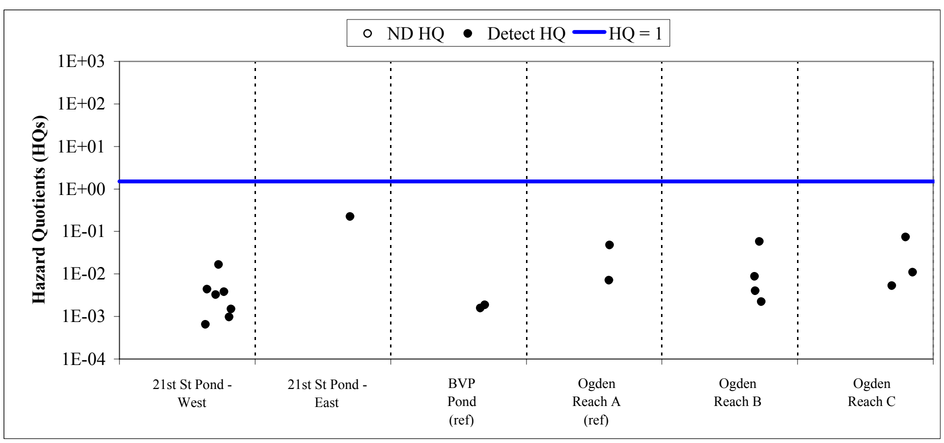
BENZO[A]ANTHRACENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	1	1	0	0	1	0
N ND HQs > 1:	0	0	0	0	0	0
N All HQs ≤ 1:	6	0	2	2	3	3
N Detect Samples:	7	1	2	2	4	3
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**A**	**C**	**C**	**A**	**C**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0
N All HQs ≤ 1:	7	1	2	2	4	3
N Detect Samples:	7	1	2	2	4	3
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**

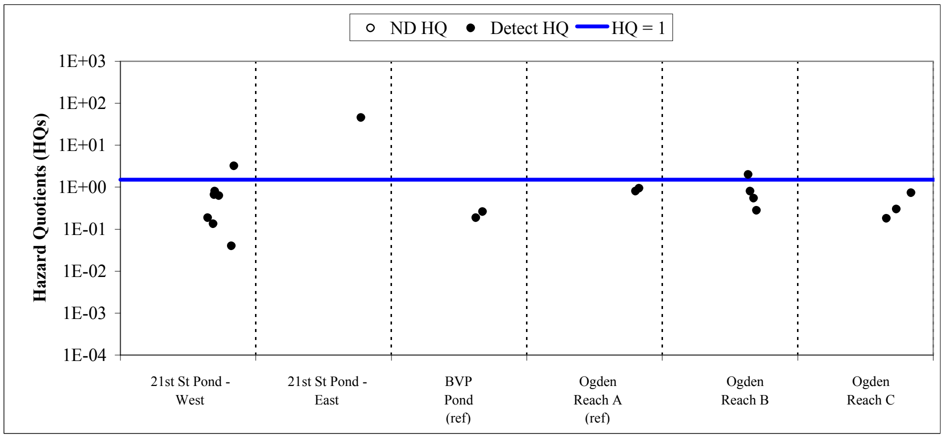
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-4
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment (Based on SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

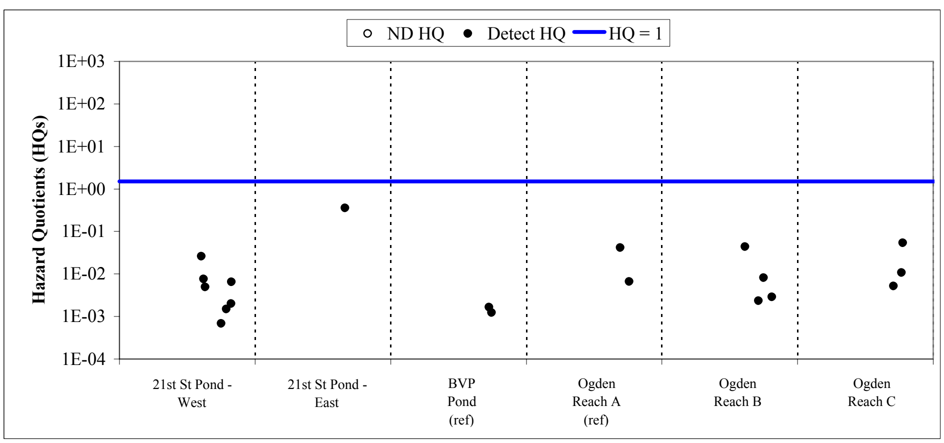
BENZO[A]PYRENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	1	1	0	0	1	0
N ND HQs > 1:	0	0	0	0	0	0
N All HQs ≤ 1:	6	0	2	2	3	3
N Detect Samples:	7	1	2	2	4	3
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**A**	**C**	**C**	**A**	**C**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0
N All HQs ≤ 1:	7	1	2	2	4	3
N Detect Samples:	7	1	2	2	4	3
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**

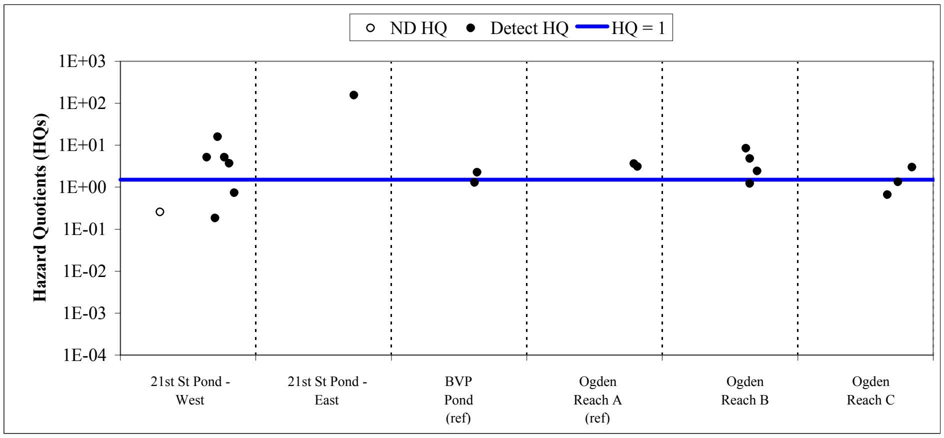
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-4
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment (Based on SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

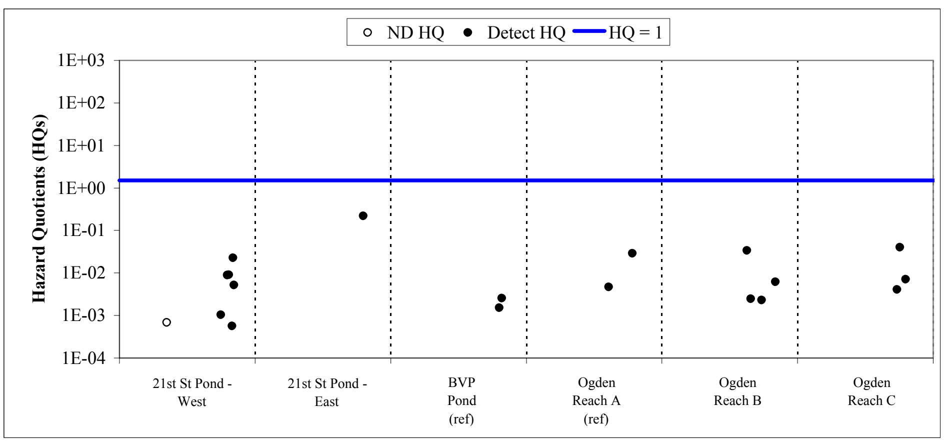
BENZO[B]FLUORANTHENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	4	1	1	2	3	1
N ND HQs > 1:	0	0	0	0	0	0
N All HQs < 1:	3	0	1	0	1	2
N Detect Samples:	6	1	2	2	4	3
N Samples:	7	1	2	2	4	3
Risk Category:	**A**	**A**	**A**	**A**	**A**	**A**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0
N All HQs < 1:	7	1	2	2	4	3
N Detect Samples:	6	1	2	2	4	3
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**

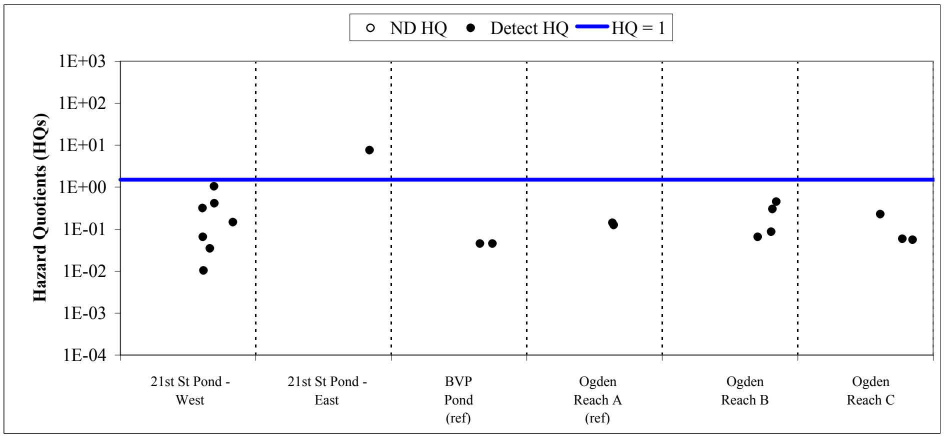
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-4
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment (Based on SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

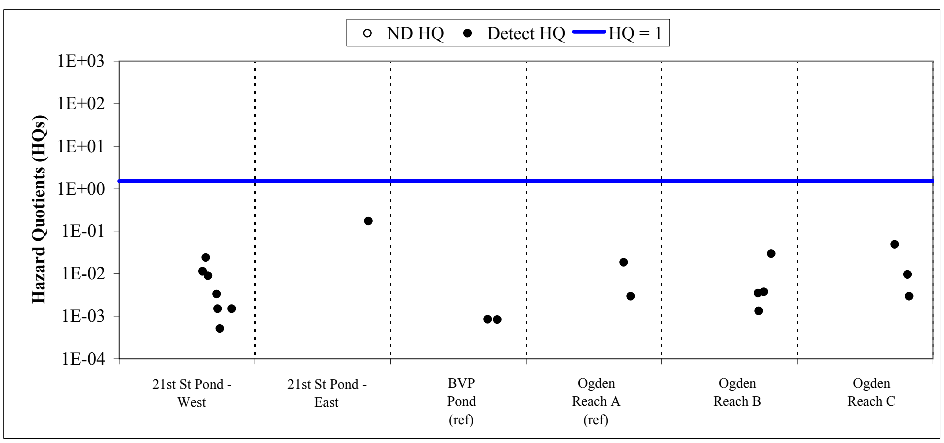
BENZO[G,H,I]PERYLENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	0	1	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0
N All HQs ≤ 1:	7	0	2	2	4	3
N Detect Samples:	7	1	2	2	4	3
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**A**	**C**	**C**	**C**	**C**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0
N All HQs ≤ 1:	7	1	2	2	4	3
N Detect Samples:	7	1	2	2	4	3
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**

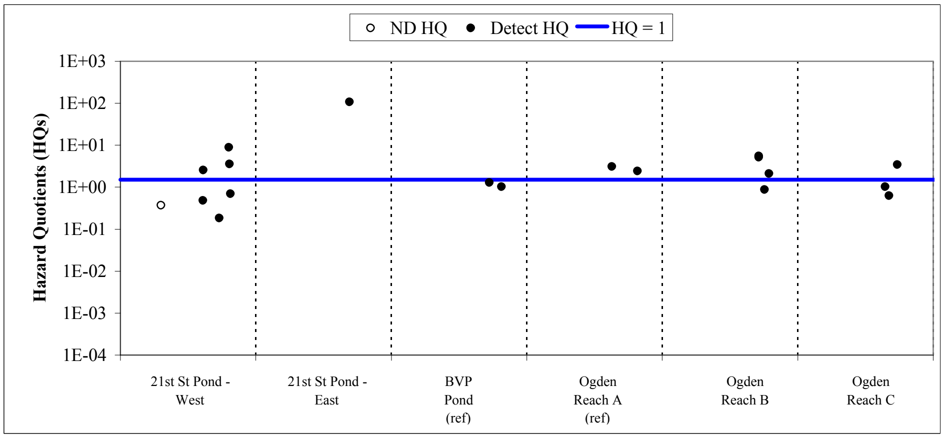
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-4
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment (Based on SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

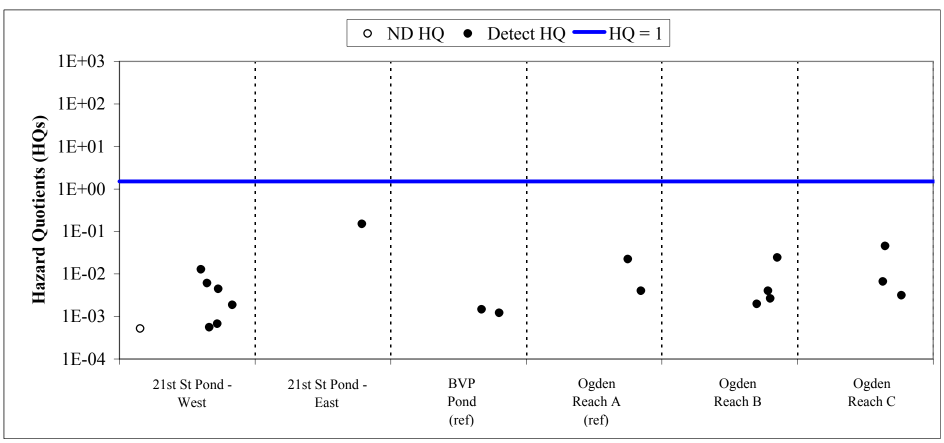
BENZO[K]FLUORANTHENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	3	1	0	2	3	1
N ND HQs > 1:	0	0	0	0	0	0
N All HQs ≤ 1:	4	0	2	0	1	2
N Detect Samples:	6	1	2	2	4	3
N Samples:	7	1	2	2	4	3
Risk Category:	**A**	**A**	**C**	**A**	**A**	**A**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0
N All HQs ≤ 1:	7	1	2	2	4	3
N Detect Samples:	6	1	2	2	4	3
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**

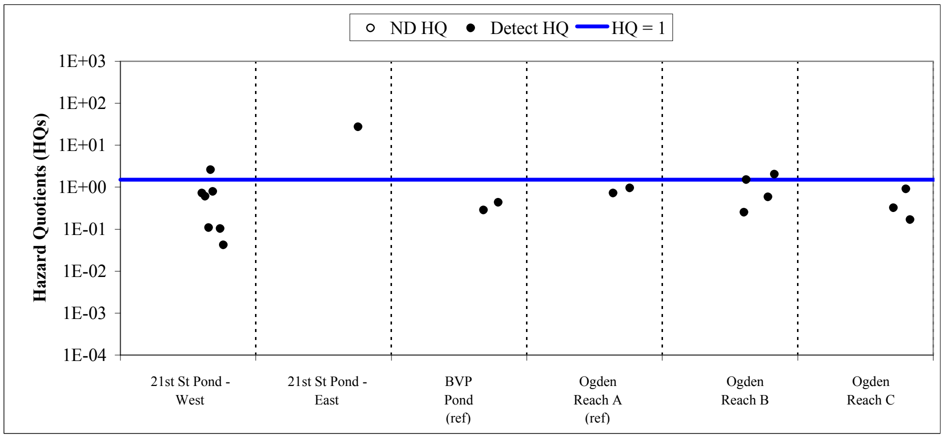
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-4
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment (Based on SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

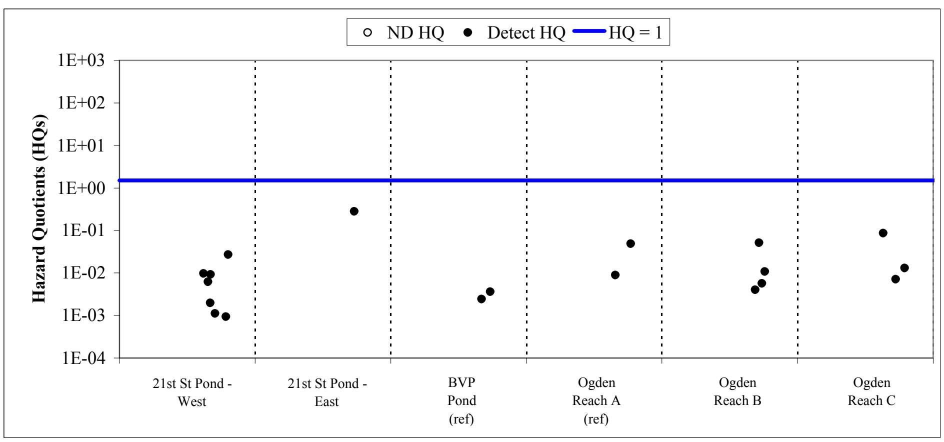
CHRYSENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	1	1	0	0	2	0
N ND HQs > 1:	0	0	0	0	0	0
N All HQs ≤ 1:	6	0	2	2	2	3
N Detect Samples:	7	1	2	2	4	3
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**A**	**C**	**C**	**A**	**C**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0
N All HQs ≤ 1:	7	1	2	2	4	3
N Detect Samples:	7	1	2	2	4	3
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**

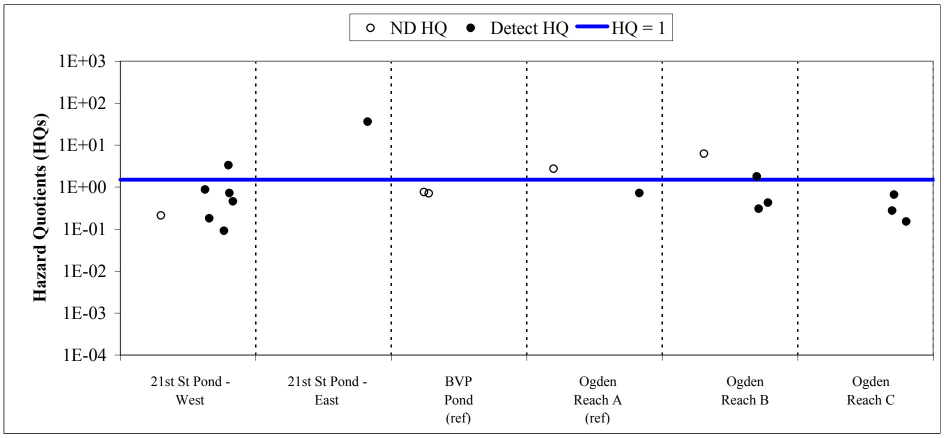
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-4
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment (Based on SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

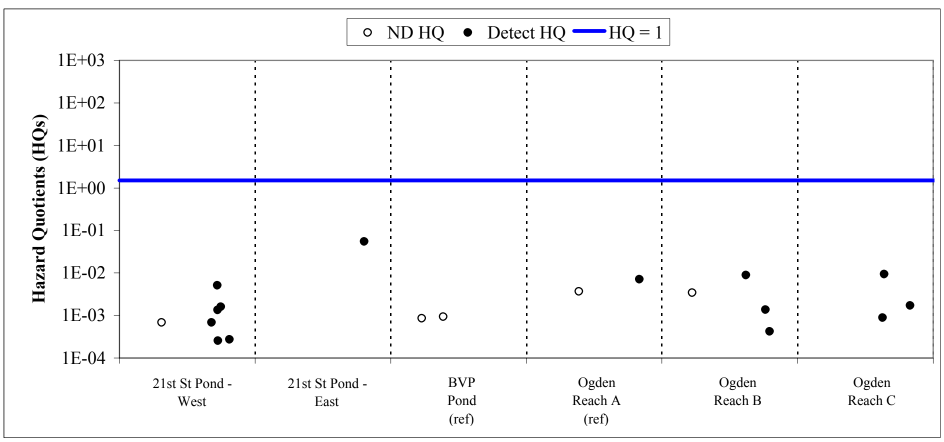
DIBENZ[A,H]ANTHRACENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	1	1	0	0	1	0
N ND HQs > 1:	0	0	0	1	1	0
N All HQs ≤ 1:	6	0	2	1	2	3
N Detect Samples:	6	1	0	1	3	3
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**A**	**C**	**B**	**A**	**C**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0
N All HQs ≤ 1:	7	1	2	2	4	3
N Detect Samples:	6	1	0	1	3	3
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**

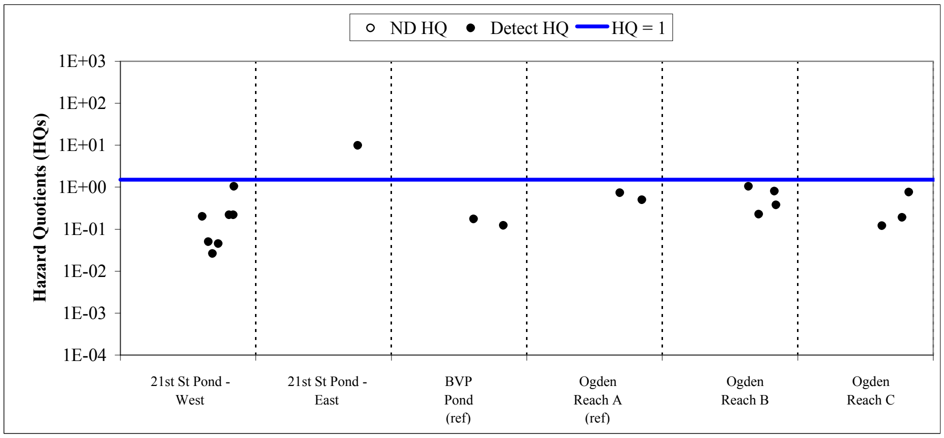
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-4
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment (Based on SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

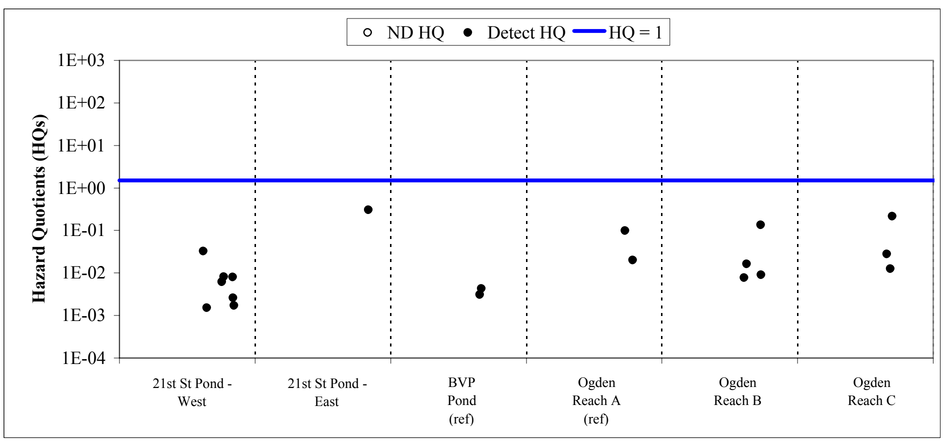
FLUORANTHENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	0	1	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0
N All HQs ≤ 1:	7	0	2	2	4	3
N Detect Samples:	7	1	2	2	4	3
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**A**	**C**	**C**	**C**	**C**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0
N All HQs ≤ 1:	7	1	2	2	4	3
N Detect Samples:	7	1	2	2	4	3
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**

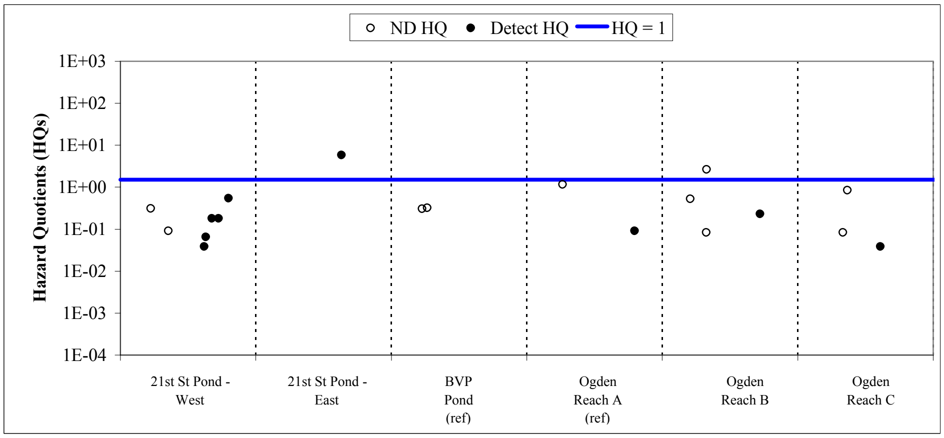
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-4
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment (Based on SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

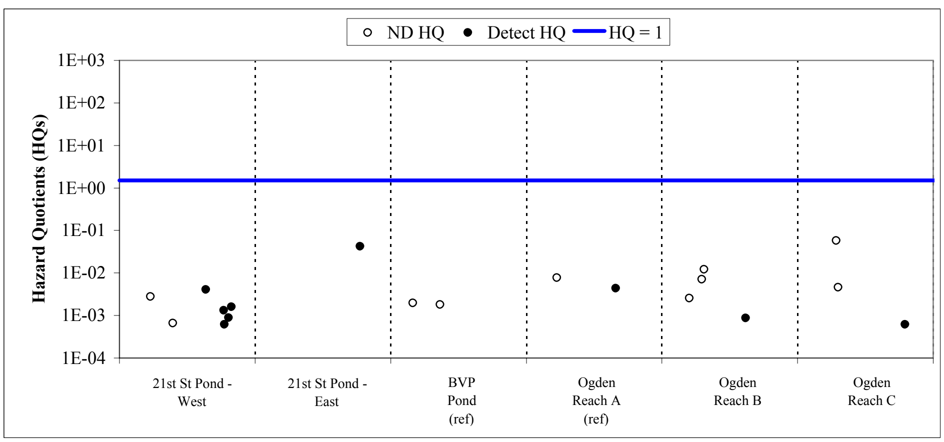
FLUORENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	0	1	0	0	0	0
N ND HQs > 1:	0	0	0	0	1	0
N All HQs ≤ 1:	7	0	2	2	3	3
N Detect Samples:	5	1	0	1	1	1
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**A**	**C**	**C**	**B**	**C**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0
N All HQs ≤ 1:	7	1	2	2	4	3
N Detect Samples:	5	1	0	1	1	1
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**

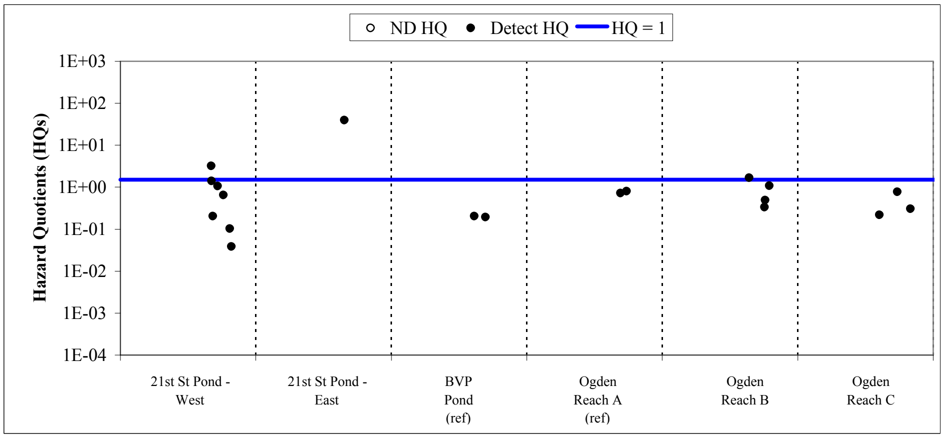
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-4
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment (Based on SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

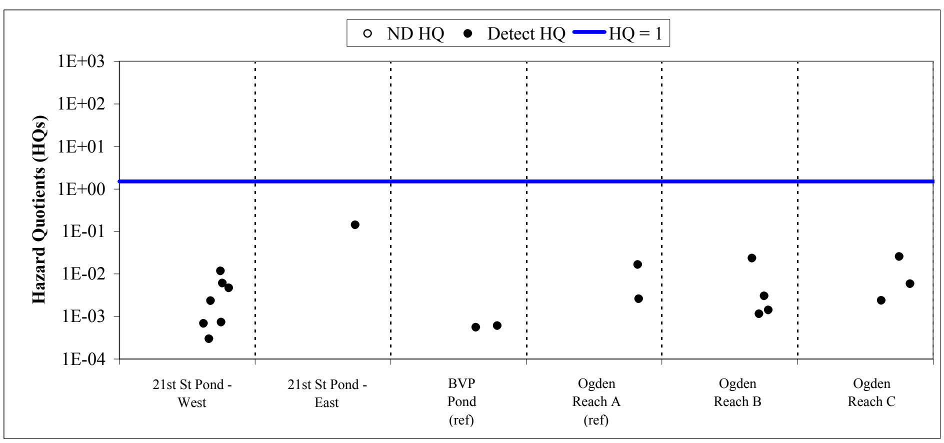
INDENO[1,2,3-C,D]PYRENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	1	1	0	0	1	0
N ND HQs > 1:	0	0	0	0	0	0
N All HQs ≤ 1:	6	0	2	2	3	3
N Detect Samples:	7	1	2	2	4	3
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**A**	**C**	**C**	**A**	**C**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0
N All HQs ≤ 1:	7	1	2	2	4	3
N Detect Samples:	7	1	2	2	4	3
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**

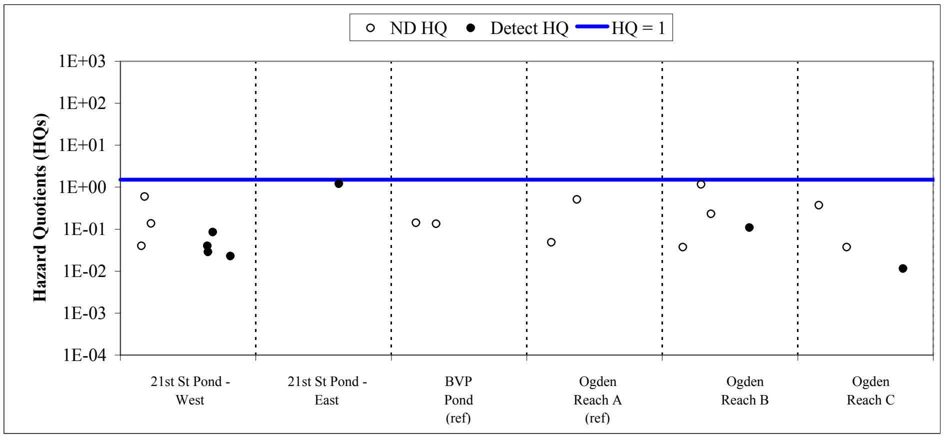
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-4
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment (Based on SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

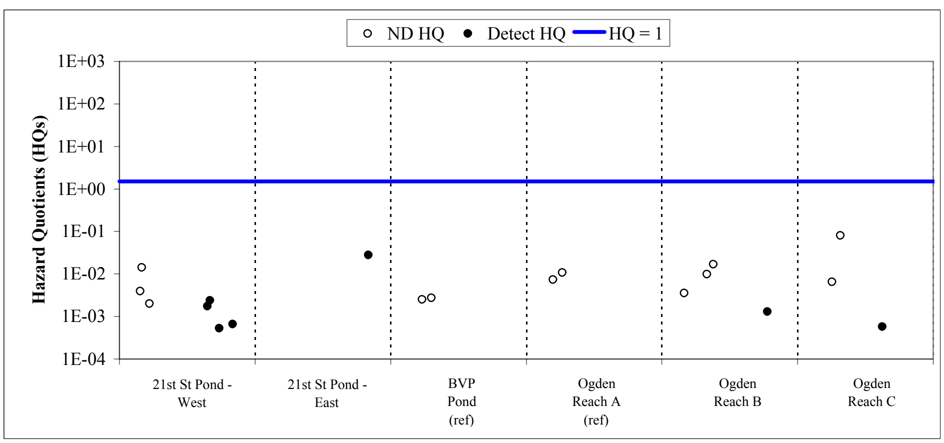
NAPHTHALENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0
N All HQs ≤ 1:	7	1	2	2	4	3
N Detect Samples:	4	1	0	0	1	1
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0
N All HQs ≤ 1:	7	1	2	2	4	3
N Detect Samples:	4	1	0	0	1	1
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**

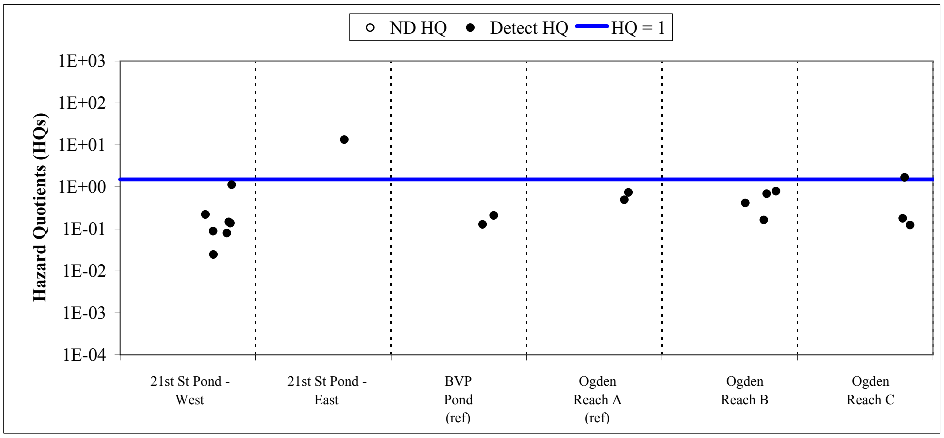
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-4
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment (Based on SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

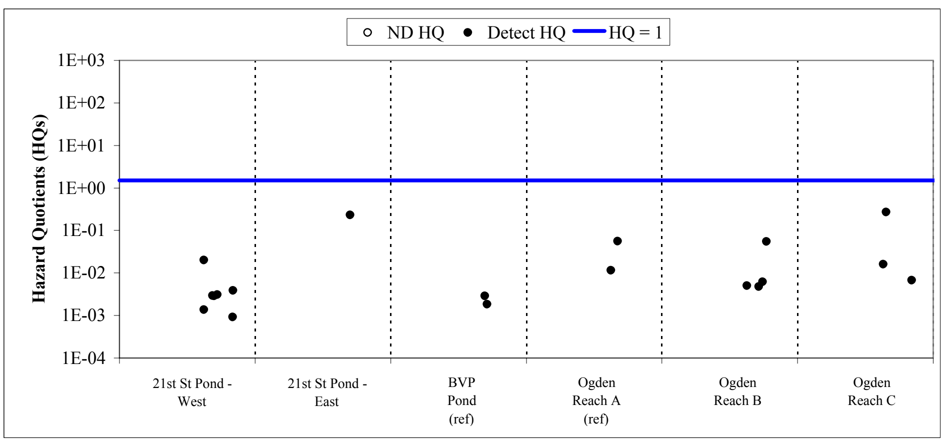
PHENANTHRENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	0	1	0	0	0	1
N ND HQs > 1:	0	0	0	0	0	0
N All HQs ≤ 1:	7	0	2	2	4	2
N Detect Samples:	7	1	2	2	4	3
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**A**	**C**	**C**	**C**	**A**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0
N All HQs ≤ 1:	7	1	2	2	4	3
N Detect Samples:	7	1	2	2	4	3
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**

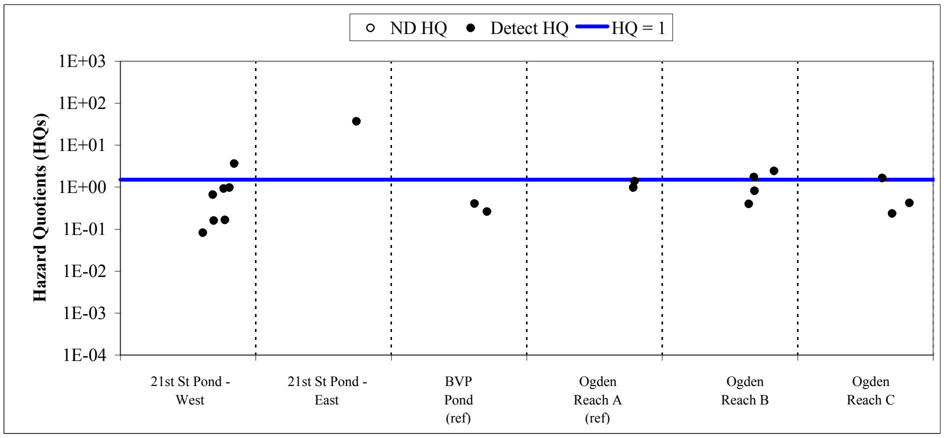
A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-4
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment (Based on SIM Analysis)

Baseline Ecological Risk Assessment for the Ogden Railyard Site

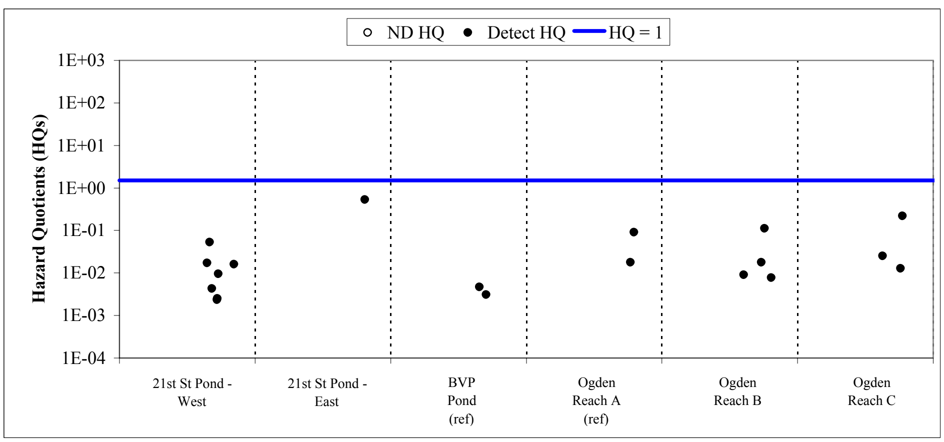
PYRENE

Based on the Sediment Effect Concentration (SEC)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	1	1	0	0	2	1
N ND HQs > 1:	0	0	0	0	0	0
N All HQs ≤ 1:	6	0	2	2	2	2
N Detect Samples:	7	1	2	2	4	3
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**A**	**C**	**C**	**A**	**A**

Based on the Equilibrium Partitioning Guideline (ESG)



Statistic	21st Street Pond - West	21st Street Pond - East	Buena Ventura Park Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C
N Detect HQs > 1:	0	0	0	0	0	0
N ND HQs > 1:	0	0	0	0	0	0
N All HQs ≤ 1:	7	1	2	2	4	3
N Detect Samples:	7	1	2	2	4	3
N Samples:	7	1	2	2	4	3
Risk Category:	**C**	**C**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

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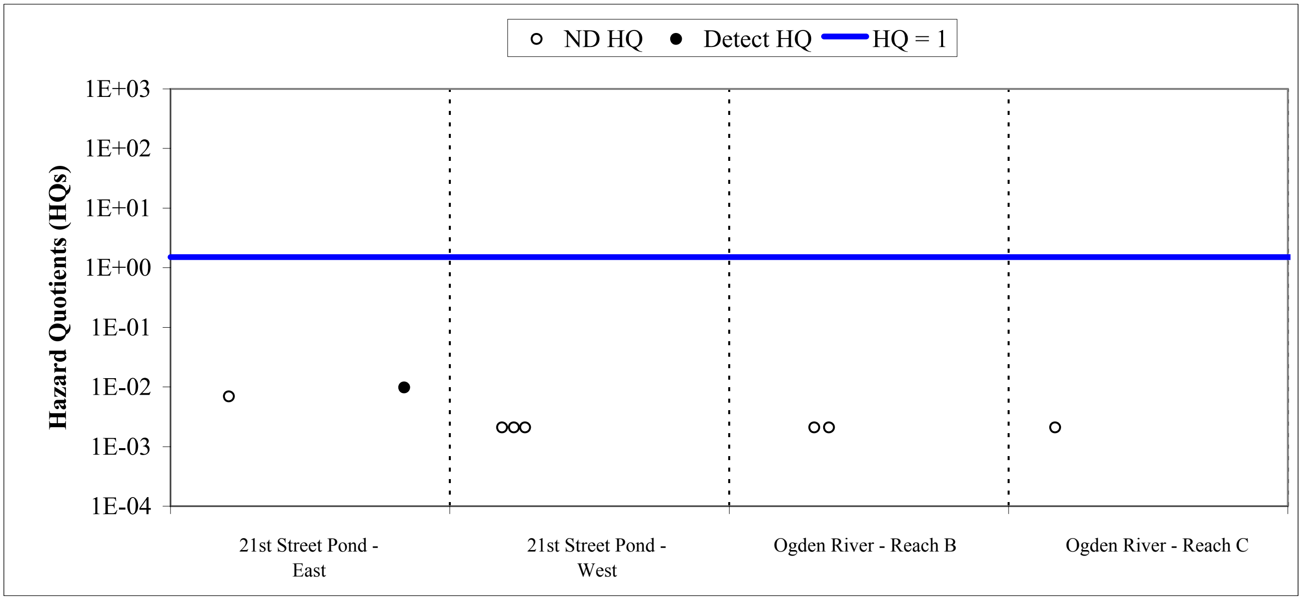
Appendix E-5
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment Porewater

Baseline Ecological Risk Assessment for the Ogden Railyard Site

2-METHYLNAPHTHALENE



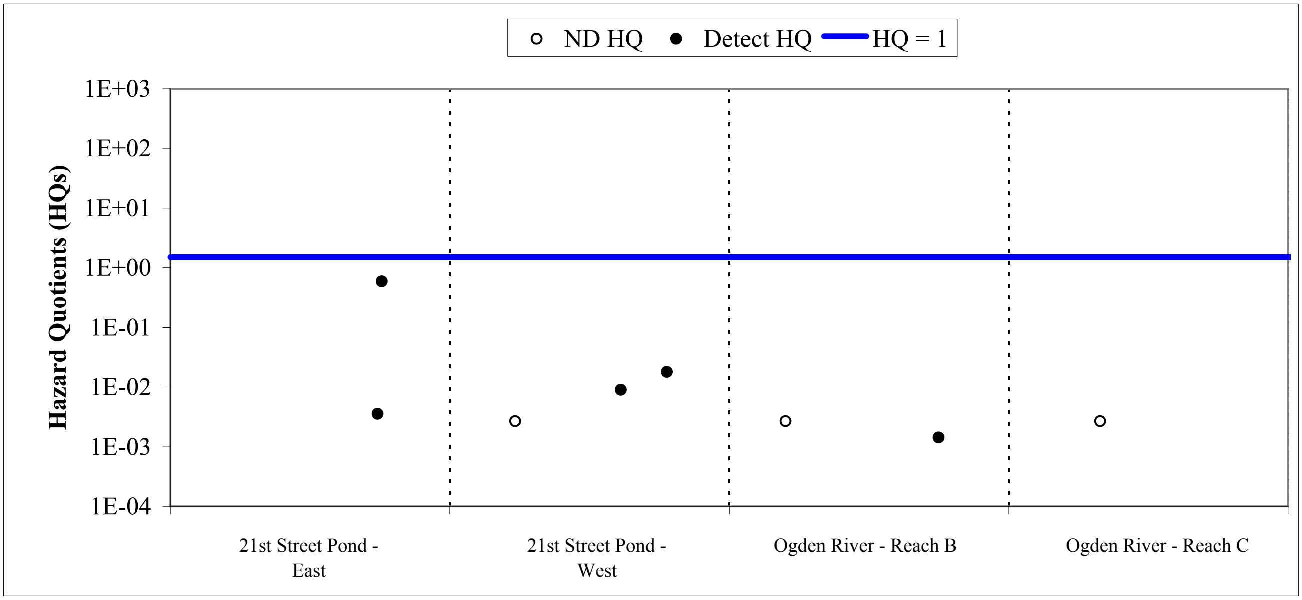
Statistic	21st Street Pond - East	21st Street Pond - West	Ogden River - Reach B	Ogden River - Reach C
Detect HQs > 1:	0	0	0	0
ND HQs > 1:	0	0	0	0
All HQs ≤ 1:	2	3	2	1
Detect Samples:	1	0	0	0
All Samples:	2	3	2	1
Risk Category:	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-5
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment Porewater

Baseline Ecological Risk Assessment for the Ogden Railyard Site

ACENAPHTHENE



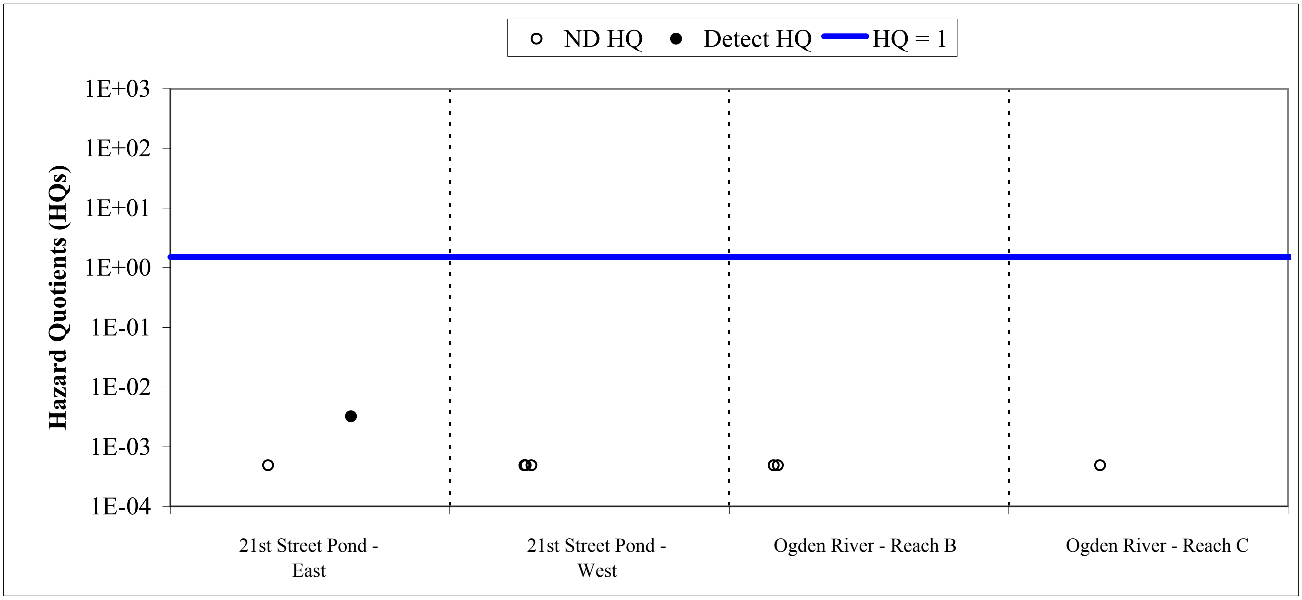
Statistic	21st Street Pond - East	21st Street Pond - West	Ogden River - Reach B	Ogden River - Reach C
Detect HQs > 1:	0	0	0	0
ND HQs > 1:	0	0	0	0
All HQs ≤ 1:	2	3	2	1
Detect Samples:	2	2	1	0
All Samples:	2	3	2	1
Risk Category:	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-5
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment Porewater

Baseline Ecological Risk Assessment for the Ogden Railyard Site

ACENAPHTHYLENE



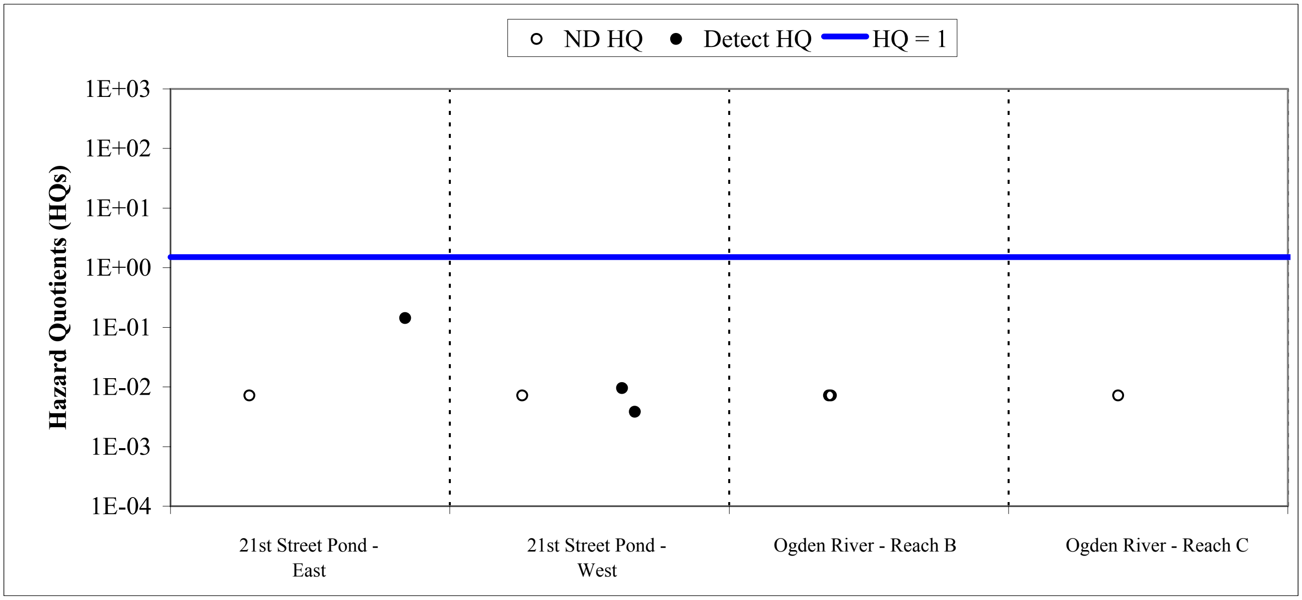
Statistic	21st Street Pond - East	21st Street Pond - West	Ogden River - Reach B	Ogden River - Reach C
Detect HQs > 1:	0	0	0	0
ND HQs > 1:	0	0	0	0
All HQs $\leq$ 1:	2	3	2	1
Detect Samples:	1	0	0	0
All Samples:	2	3	2	1
Risk Category:	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-5
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment Porewater

Baseline Ecological Risk Assessment for the Ogden Railyard Site

ANTHRACENE



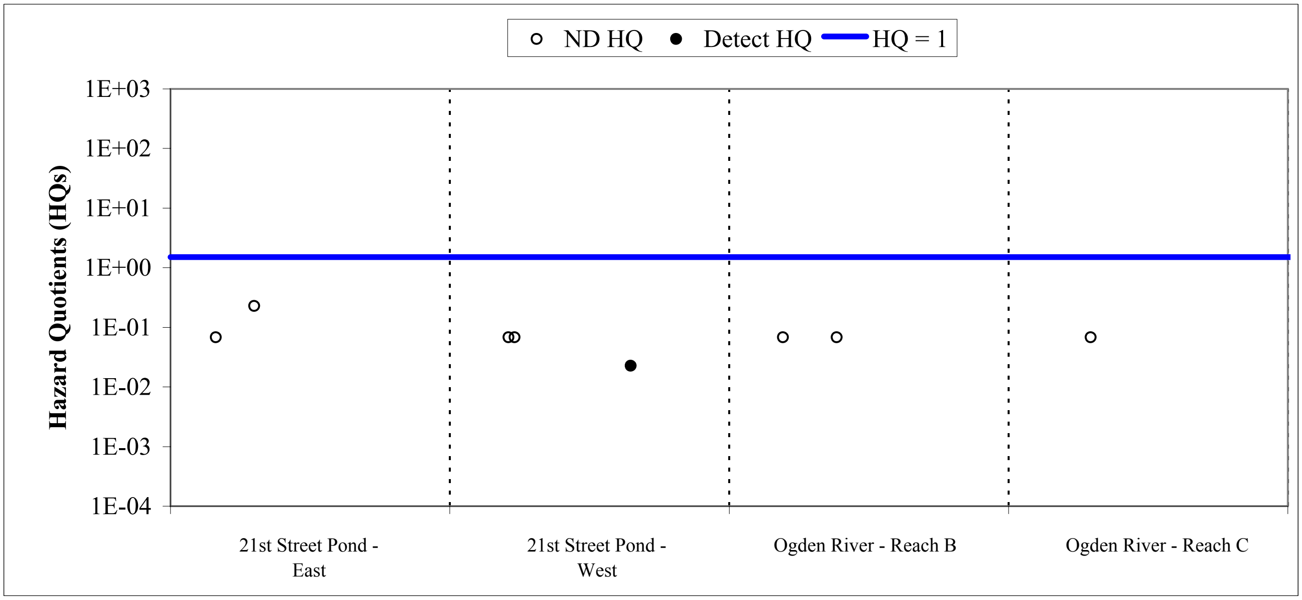
Statistic	21st Street Pond - East	21st Street Pond - West	Ogden River - Reach B	Ogden River - Reach C
Detect HQs > 1:	0	0	0	0
ND HQs > 1:	0	0	0	0
All HQs $\leq$ 1:	2	3	2	1
Detect Samples:	1	2	0	0
All Samples:	2	3	2	1
Risk Category:	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-5
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment Porewater

Baseline Ecological Risk Assessment for the Ogden Railyard Site

BENZO[A]ANTHRACENE



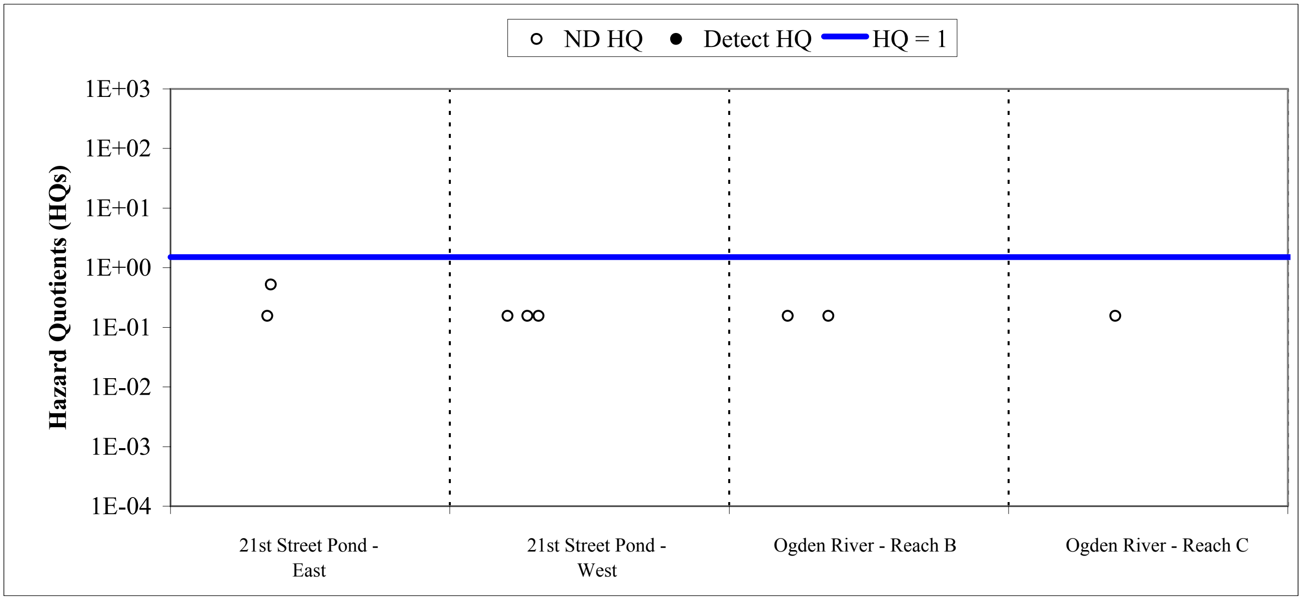
Statistic	21st Street Pond - East	21st Street Pond - West	Ogden River - Reach B	Ogden River - Reach C
Detect HQs > 1:	0	0	0	0
ND HQs > 1:	0	0	0	0
All HQs ≤ 1:	2	3	2	1
Detect Samples:	0	1	0	0
All Samples:	2	3	2	1
Risk Category:	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-5
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment Porewater

Baseline Ecological Risk Assessment for the Ogden Railyard Site

BENZO[A]PYRENE



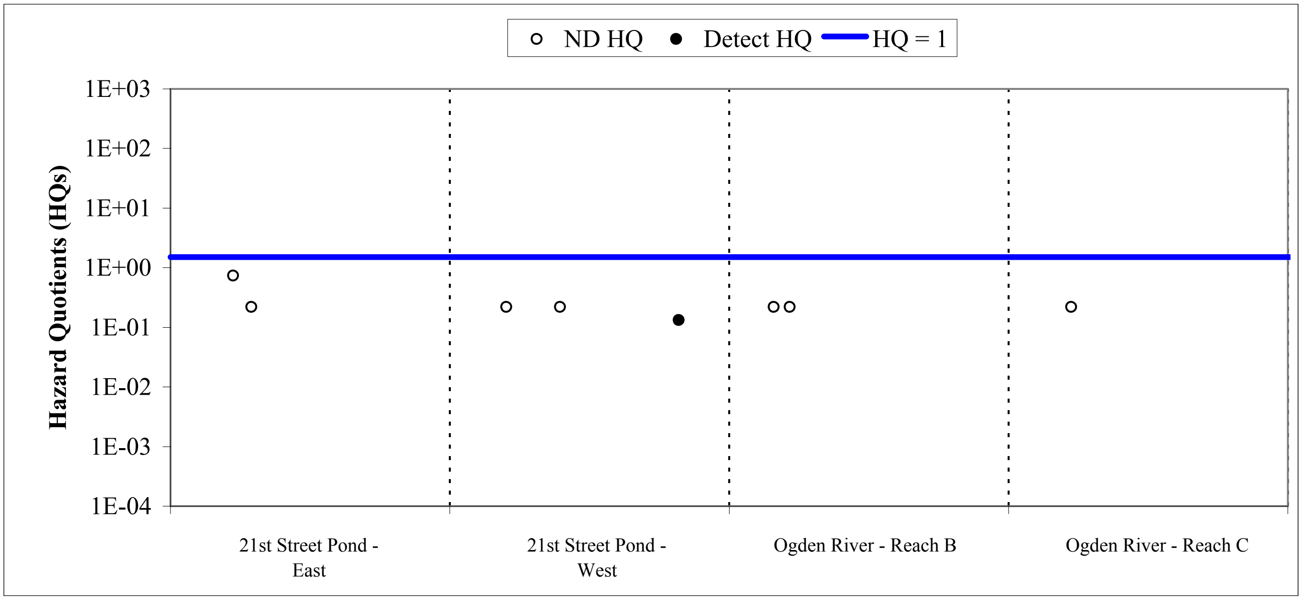
Statistic	21st Street Pond - East	21st Street Pond - West	Ogden River - Reach B	Ogden River - Reach C
Detect HQs > 1:	0	0	0	0
ND HQs > 1:	0	0	0	0
All HQs ≤ 1:	2	3	2	1
Detect Samples:	0	0	0	0
All Samples:	2	3	2	1
Risk Category:	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-5
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment Porewater

Baseline Ecological Risk Assessment for the Ogden Railyard Site

BENZO[B]FLUORANTHENE



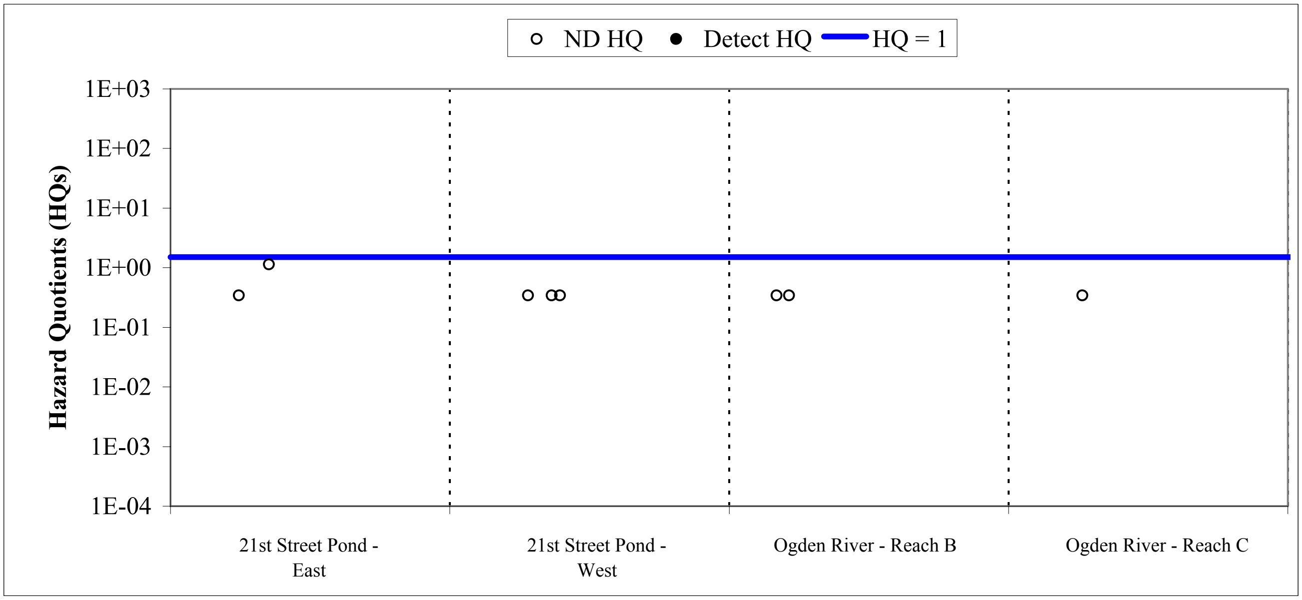
Statistic	21st Street Pond - East	21st Street Pond - West	Ogden River - Reach B	Ogden River - Reach C
Detect HQs > 1:	0	0	0	0
ND HQs > 1:	0	0	0	0
All HQs ≤ 1:	2	3	2	1
Detect Samples:	0	1	0	0
All Samples:	2	3	2	1
Risk Category:	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-5
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment Porewater

Baseline Ecological Risk Assessment for the Ogden Railyard Site

BENZO[G,H,I]PERYLENE



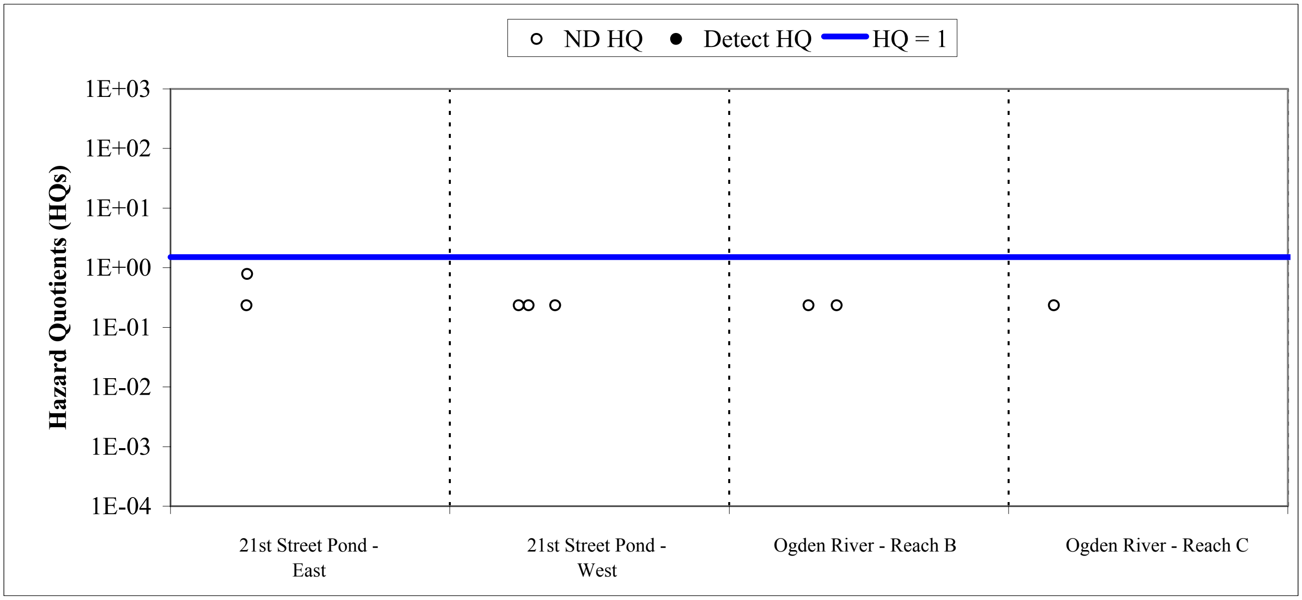
Statistic	21st Street Pond - East	21st Street Pond - West	Ogden River - Reach B	Ogden River - Reach C
Detect HQs > 1:	0	0	0	0
ND HQs > 1:	0	0	0	0
All HQs ≤ 1:	2	3	2	1
Detect Samples:	0	0	0	0
All Samples:	2	3	2	1
Risk Category:	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-5
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment Porewater

Baseline Ecological Risk Assessment for the Ogden Railyard Site

BENZO[K]FLUORANTHENE



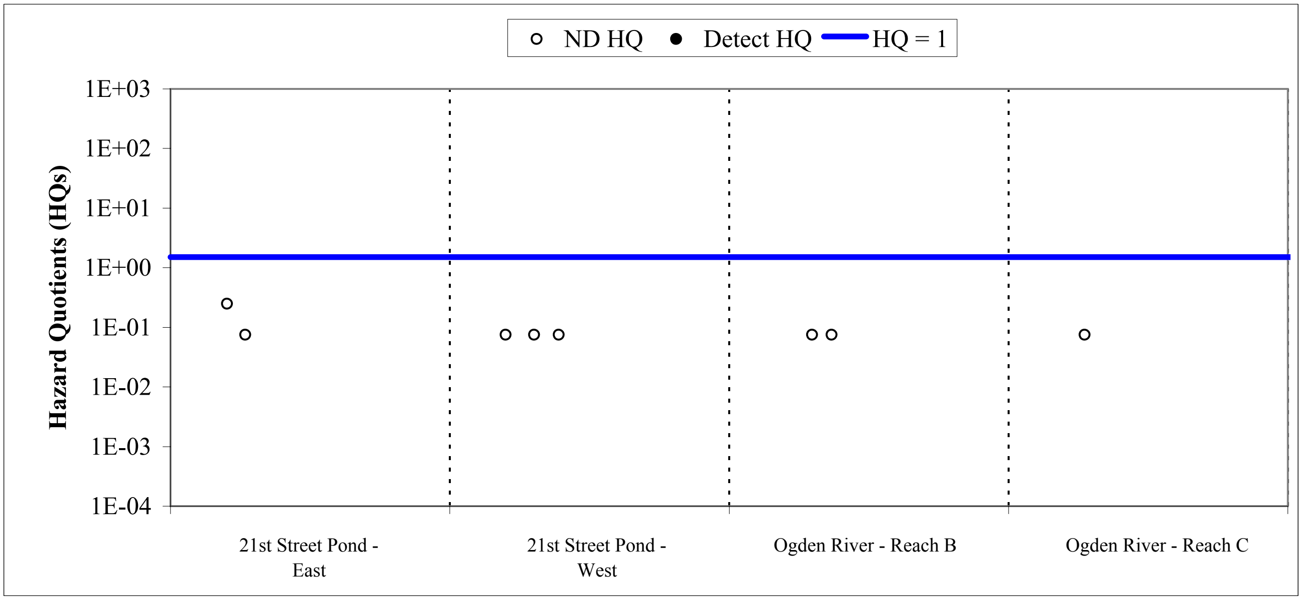
Statistic	21st Street Pond - East	21st Street Pond - West	Ogden River - Reach B	Ogden River - Reach C
Detect HQs > 1:	0	0	0	0
ND HQs > 1:	0	0	0	0
All HQs ≤ 1:	2	3	2	1
Detect Samples:	0	0	0	0
All Samples:	2	3	2	1
Risk Category:	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-5
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment Porewater

Baseline Ecological Risk Assessment for the Ogden Railyard Site

CHRYSENE



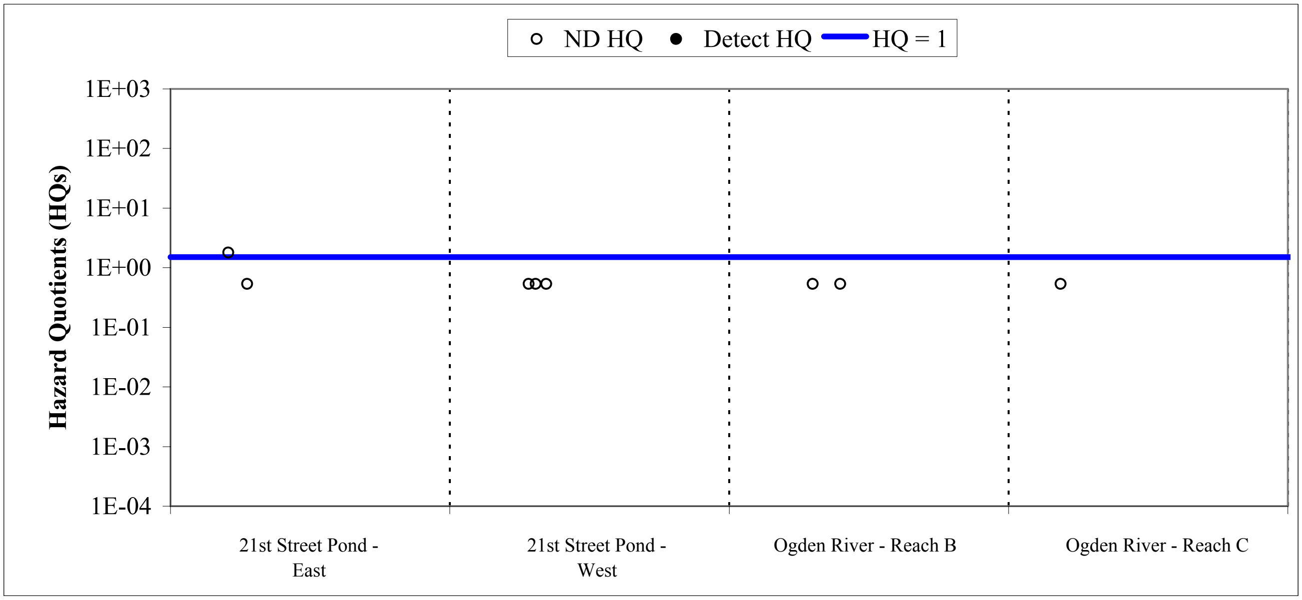
Statistic	21st Street Pond - East	21st Street Pond - West	Ogden River - Reach B	Ogden River - Reach C
Detect HQs > 1:	0	0	0	0
ND HQs > 1:	0	0	0	0
All HQs ≤ 1:	2	3	2	1
Detect Samples:	0	0	0	0
All Samples:	2	3	2	1
Risk Category:	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-5
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment Porewater

Baseline Ecological Risk Assessment for the Ogden Railyard Site

DIBENZ[A,H]ANTHRACENE



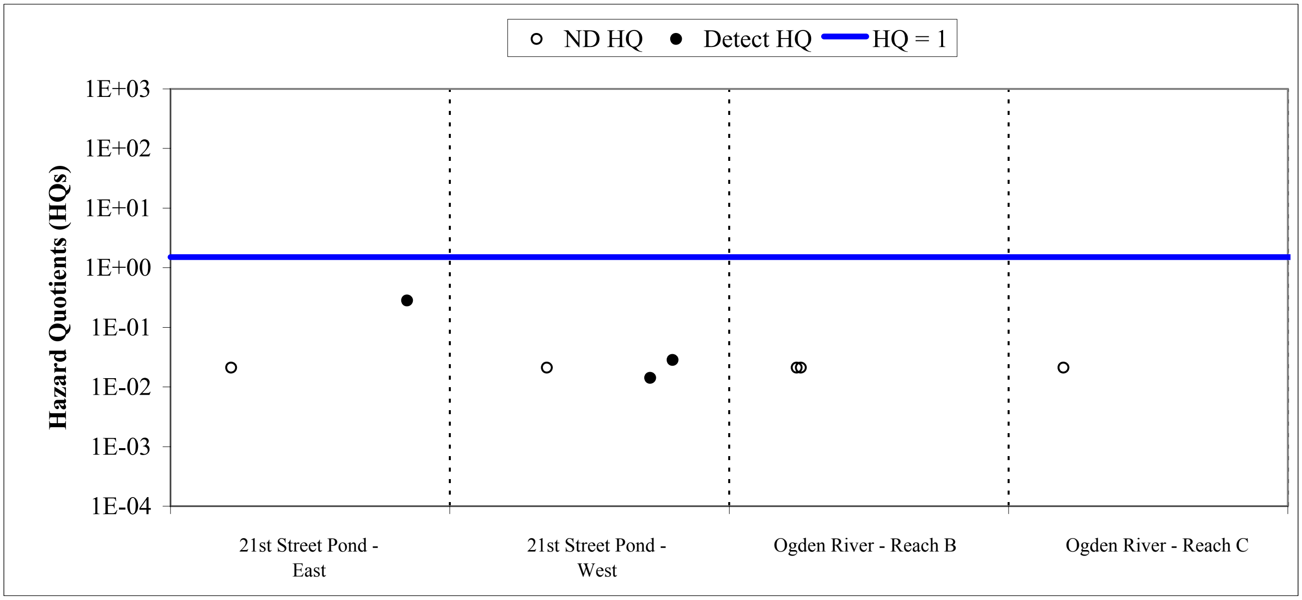
Statistic	21st Street Pond - East	21st Street Pond - West	Ogden River - Reach B	Ogden River - Reach C
Detect HQs > 1:	0	0	0	0
ND HQs > 1:	1	0	0	0
All HQs $\leq$ 1:	1	3	2	1
Detect Samples:	0	0	0	0
All Samples:	2	3	2	1
Risk Category:	**B**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-5
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment Porewater

Baseline Ecological Risk Assessment for the Ogden Railyard Site

FLUORANTHENE



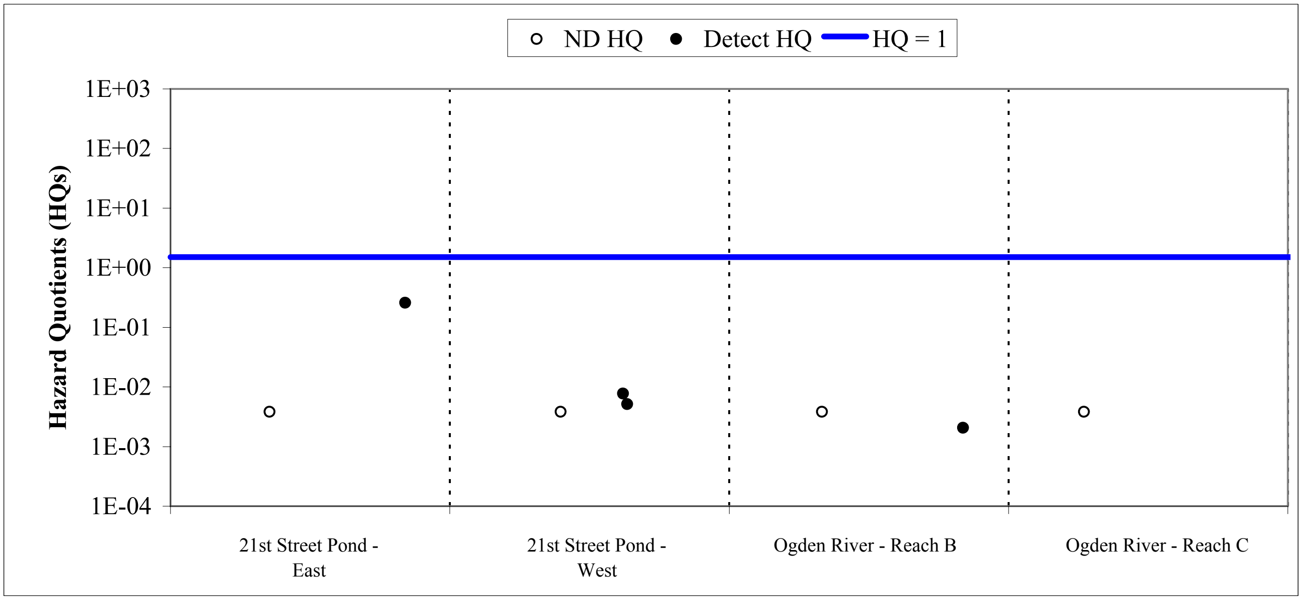
Statistic	21st Street Pond - East	21st Street Pond - West	Ogden River - Reach B	Ogden River - Reach C
Detect HQs > 1:	0	0	0	0
ND HQs > 1:	0	0	0	0
All HQs ≤ 1:	2	3	2	1
Detect Samples:	1	2	0	0
All Samples:	2	3	2	1
Risk Category:	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-5
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment Porewater

Baseline Ecological Risk Assessment for the Ogden Railyard Site

FLUORENE



Statistic	21st Street Pond - East	21st Street Pond - West	Ogden River - Reach B	Ogden River - Reach C
Detect HQs > 1:	0	0	0	0
ND HQs > 1:	0	0	0	0
All HQs ≤ 1:	2	3	2	1
Detect Samples:	1	2	1	0
All Samples:	2	3	2	1
Risk Category:	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
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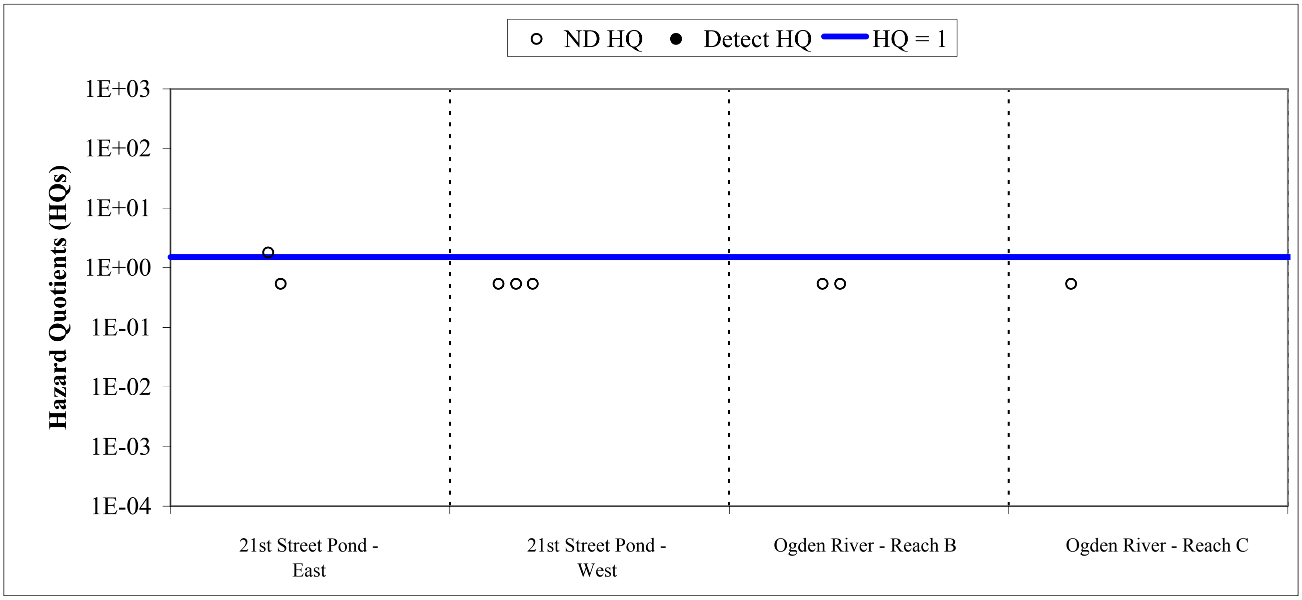
Appendix E-5
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment Porewater

Baseline Ecological Risk Assessment for the Ogden Railyard Site

INDENO[1,2,3-C,D]PYRENE



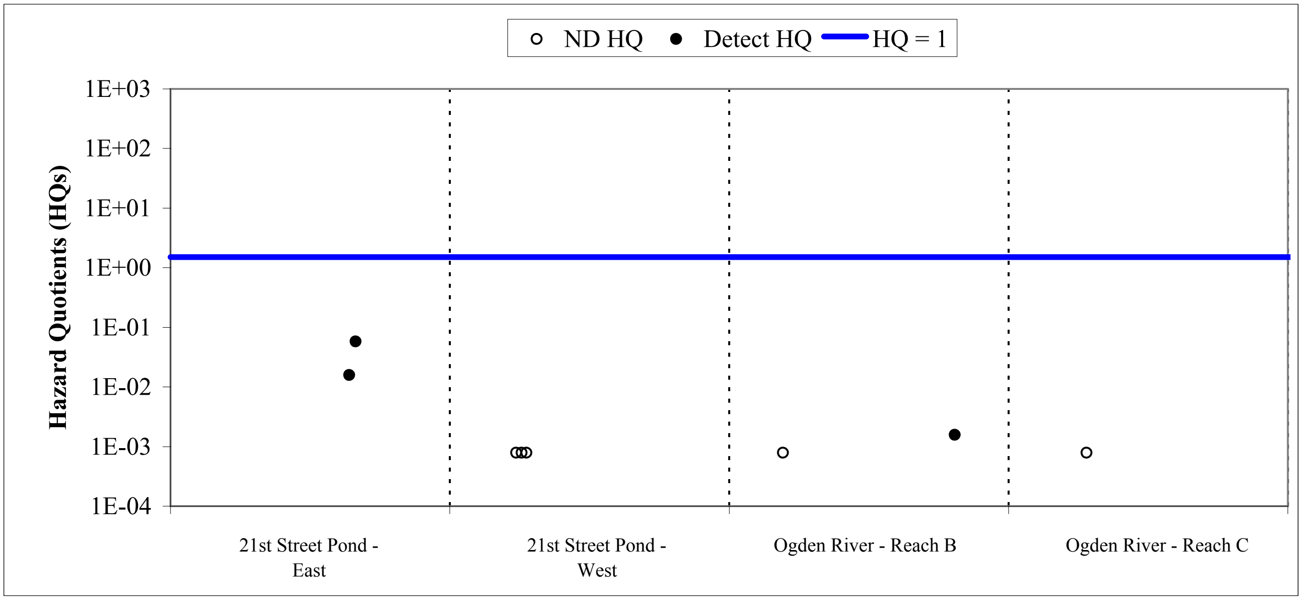
Statistic	21st Street Pond - East	21st Street Pond - West	Ogden River - Reach B	Ogden River - Reach C
Detect HQs > 1:	0	0	0	0
ND HQs > 1:	1	0	0	0
All HQs ≤ 1:	1	3	2	1
Detect Samples:	0	0	0	0
All Samples:	2	3	2	1
Risk Category:	**B**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-5
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment Porewater

Baseline Ecological Risk Assessment for the Ogden Railyard Site

NAPHTHALENE



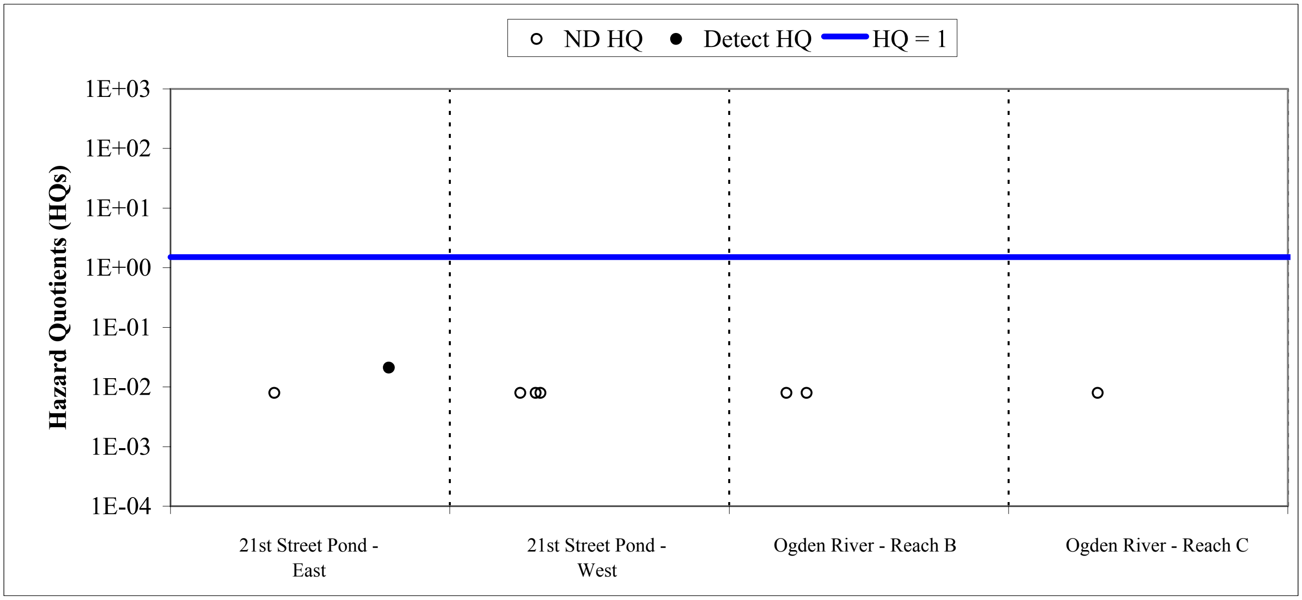
Statistic	21st Street Pond - East	21st Street Pond - West	Ogden River - Reach B	Ogden River - Reach C
Detect HQs > 1:	0	0	0	0
ND HQs > 1:	0	0	0	0
All HQs $\leq$ 1:	2	3	2	1
Detect Samples:	2	0	1	0
All Samples:	2	3	2	1
Risk Category:	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-5
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment Porewater

Baseline Ecological Risk Assessment for the Ogden Railyard Site

PHENANTHRENE



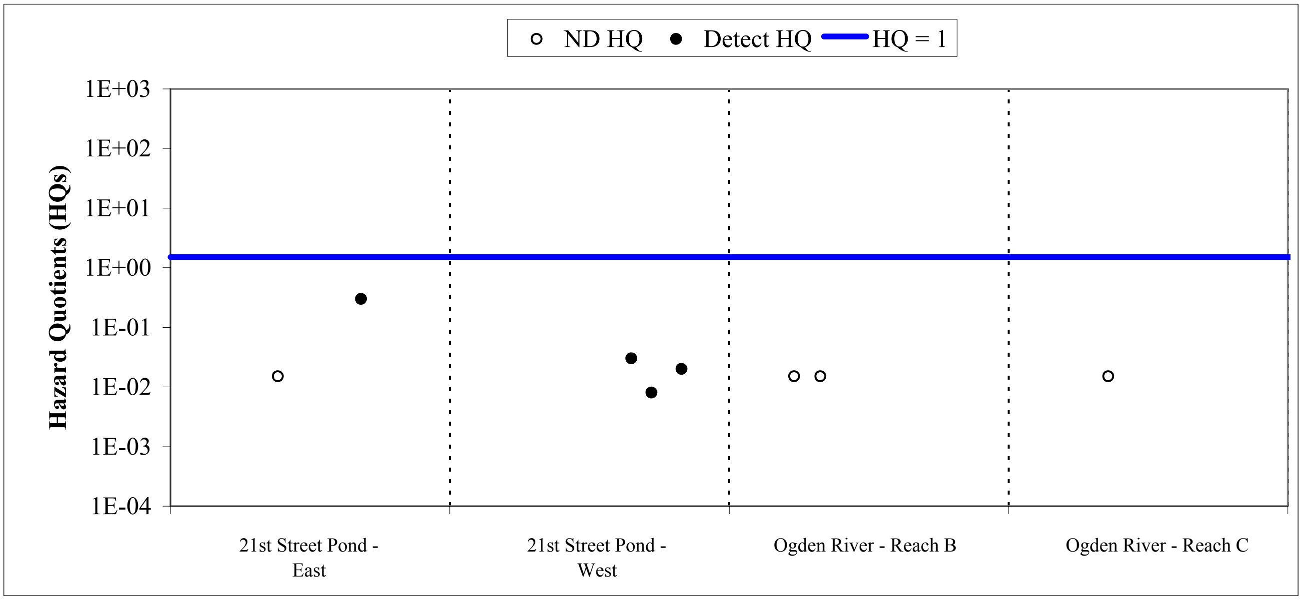
Statistic	21st Street Pond - East	21st Street Pond - West	Ogden River - Reach B	Ogden River - Reach C
Detect HQs > 1:	0	0	0	0
ND HQs > 1:	0	0	0	0
All HQs ≤ 1:	2	3	2	1
Detect Samples:	1	0	0	0
All Samples:	2	3	2	1
Risk Category:	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-5
Benthic Macroinvertebrate HQs for Direct Contact with PAHs in Sediment Porewater

Baseline Ecological Risk Assessment for the Ogden Railyard Site

PYRENE



Statistic	21st Street Pond - East	21st Street Pond - West	Ogden River - Reach B	Ogden River - Reach C
Detect HQs > 1:	0	0	0	0
ND HQs > 1:	0	0	0	0
All HQs $\leq$ 1:	2	3	2	1
Detect Samples:	1	3	0	0
All Samples:	2	3	2	1
Risk Category:	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

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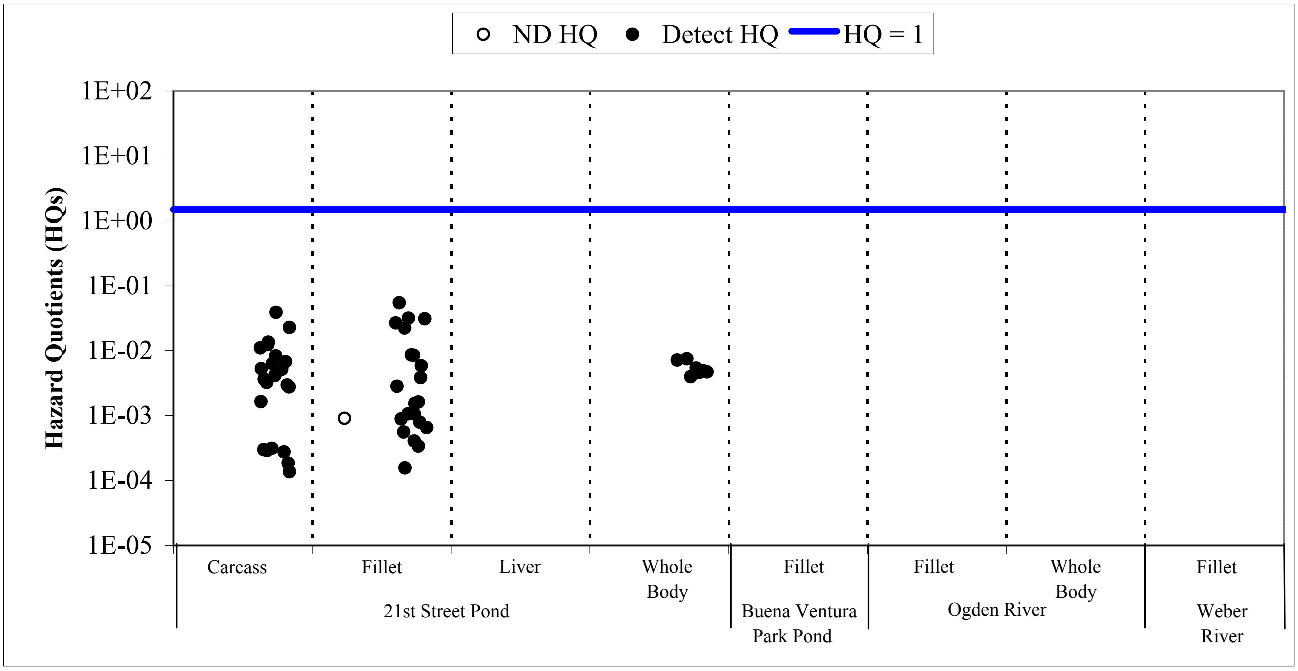
Appendix E-6
HQs for Fish Based on Fish Tissue Data

Baseline Ecological Risk Assessment for the Ogden Railyard Site

AROCLOR-1260



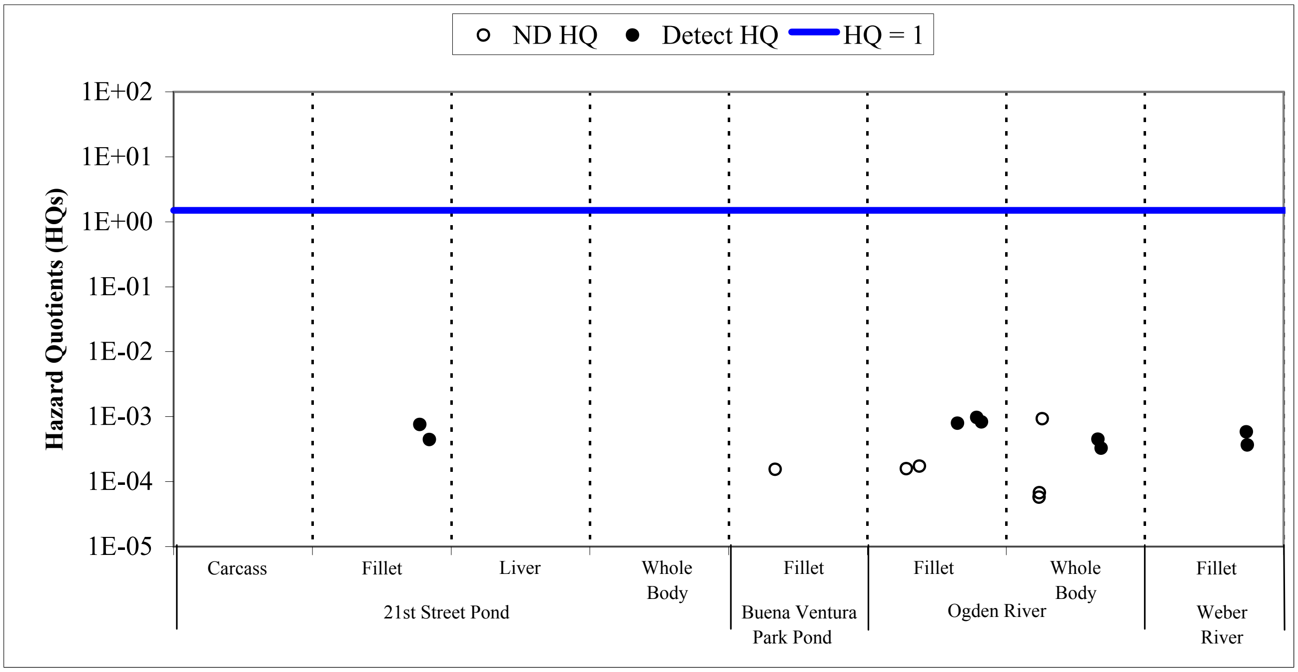
Statistic	21st Street Pond				Buena Ventura Park Pond	Ogden River		Weber River
	Carcass	Fillet	Liver	Body	Fillet	Fillet	Body	Fillet
Detect HQs > 1:	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0
All HQs ≤ 1:	22	22	0	7	0	0	0	0
Detect Samples:	22	21	0	7	0	0	0	0
All Samples:	22	22	0	7	0	0	0	0
Risk Category:	**C**	**C**	**na**	**C**	**na**	**na**	**na**	**na**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-6
HQs for Fish Based on Fish Tissue Data

Baseline Ecological Risk Assessment for the Ogden Railyard Site

PCB-126



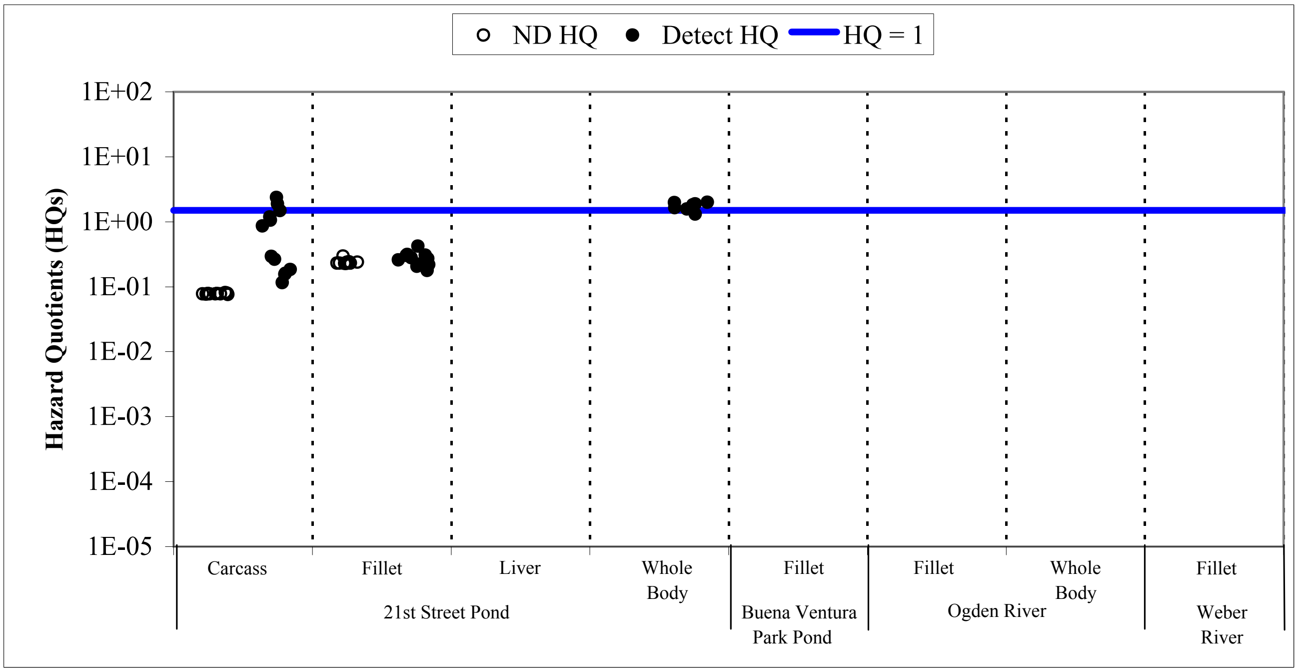
Statistic	21st Street Pond				Buena Ventura Park Pond	Ogden River		Weber River
	Carcass	Fillet	Liver	Body	Fillet	Fillet	Body	Fillet
Detect HQs > 1:	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0
All HQs ≤ 1:	0	2	0	0	1	5	5	2
Detect Samples:	0	2	0	0	0	3	2	2
All Samples:	0	2	0	0	1	5	5	2
Risk Category:	**na**	**C**	**na**	**na**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-6
HQs for Fish Based on Fish Tissue Data

Baseline Ecological Risk Assessment for the Ogden Railyard Site

4,4'-DDD



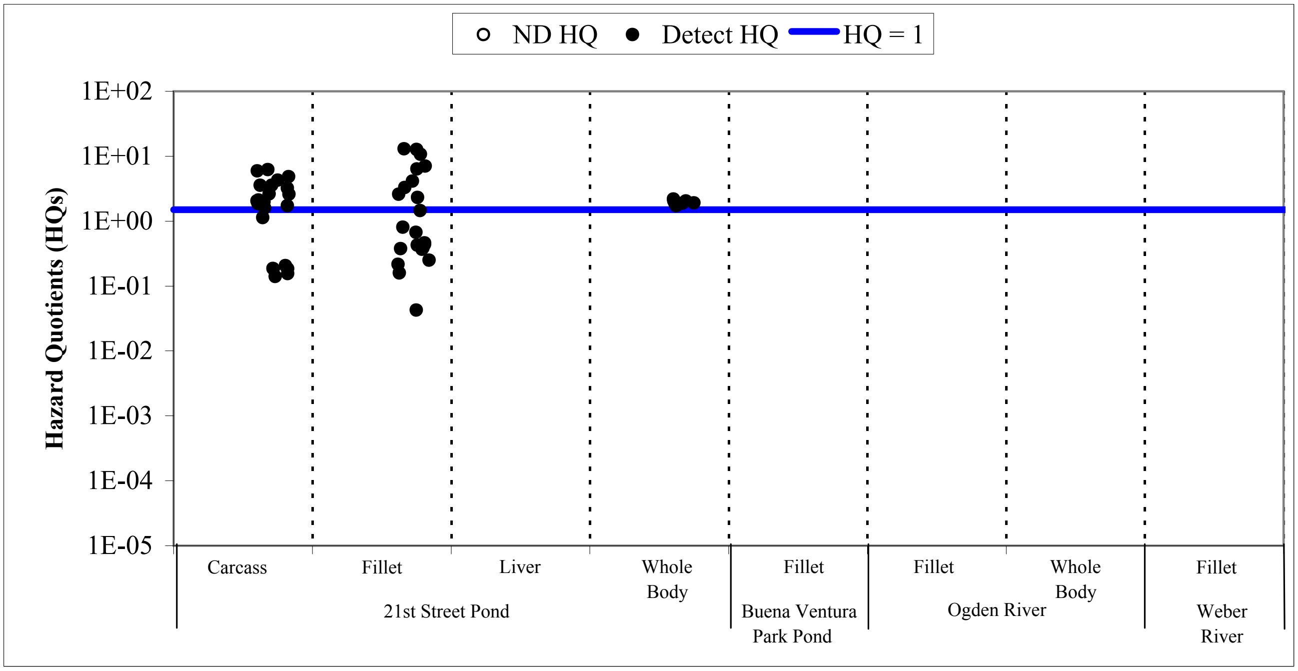
Statistic	21st Street Pond				Buena Ventura Park Pond	Ogden River		Weber River
	Carcass	Fillet	Liver	Body	Fillet	Fillet	Body	Fillet
Detect HQs > 1:	2	0	0	6	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0
All HQs ≤ 1:	20	22	0	1	0	0	0	0
Detect Samples:	12	11	0	7	0	0	0	0
All Samples:	22	22	0	7	0	0	0	0
Risk Category:	**C**	**C**	**na**	**A**	**na**	**na**	**na**	**na**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-6
HQs for Fish Based on Fish Tissue Data

Baseline Ecological Risk Assessment for the Ogden Railyard Site

4,4'-DDE



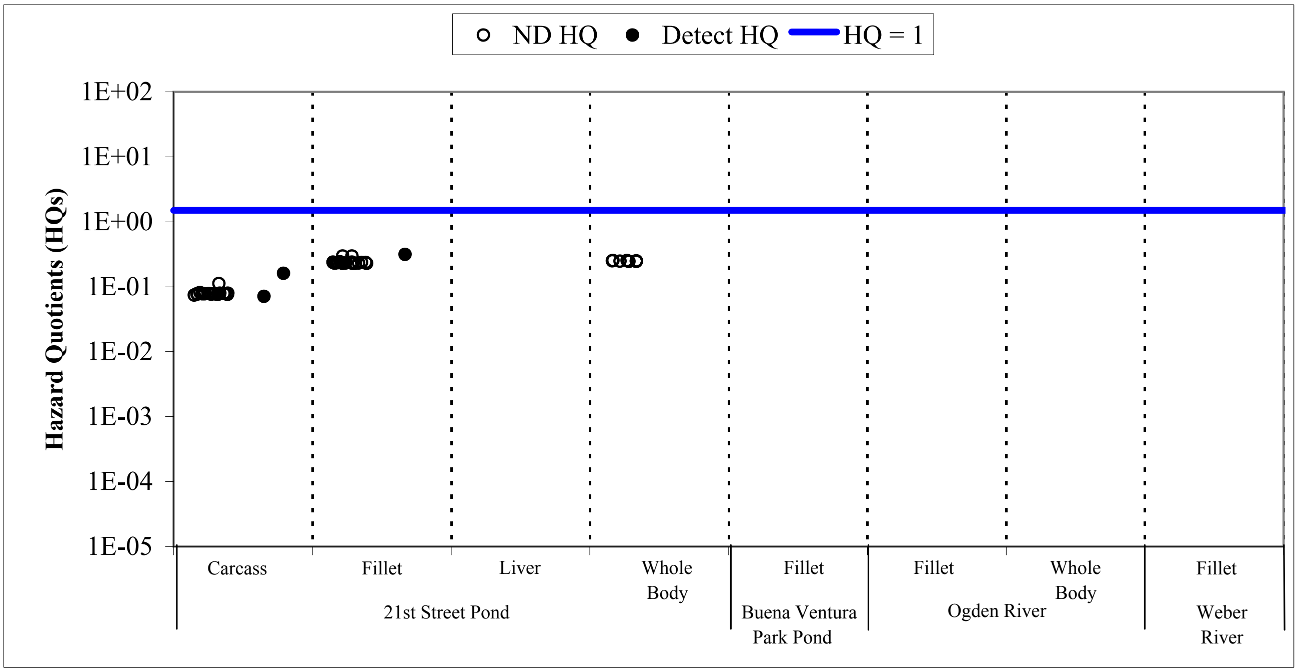
Statistic	21st Street Pond				Buena Ventura Park Pond	Ogden River		Weber River
	Carcass	Fillet	Liver	Body	Fillet	Fillet	Body	Fillet
Detect HQs > 1:	15	9	0	7	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0
All HQs ≤ 1:	7	13	0	0	0	0	0	0
Detect Samples:	22	22	0	7	0	0	0	0
All Samples:	22	22	0	7	0	0	0	0
Risk Category:	**A**	**A**	**na**	**A**	**na**	**na**	**na**	**na**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-6
HQs for Fish Based on Fish Tissue Data

Baseline Ecological Risk Assessment for the Ogden Railyard Site

4,4'-DDT



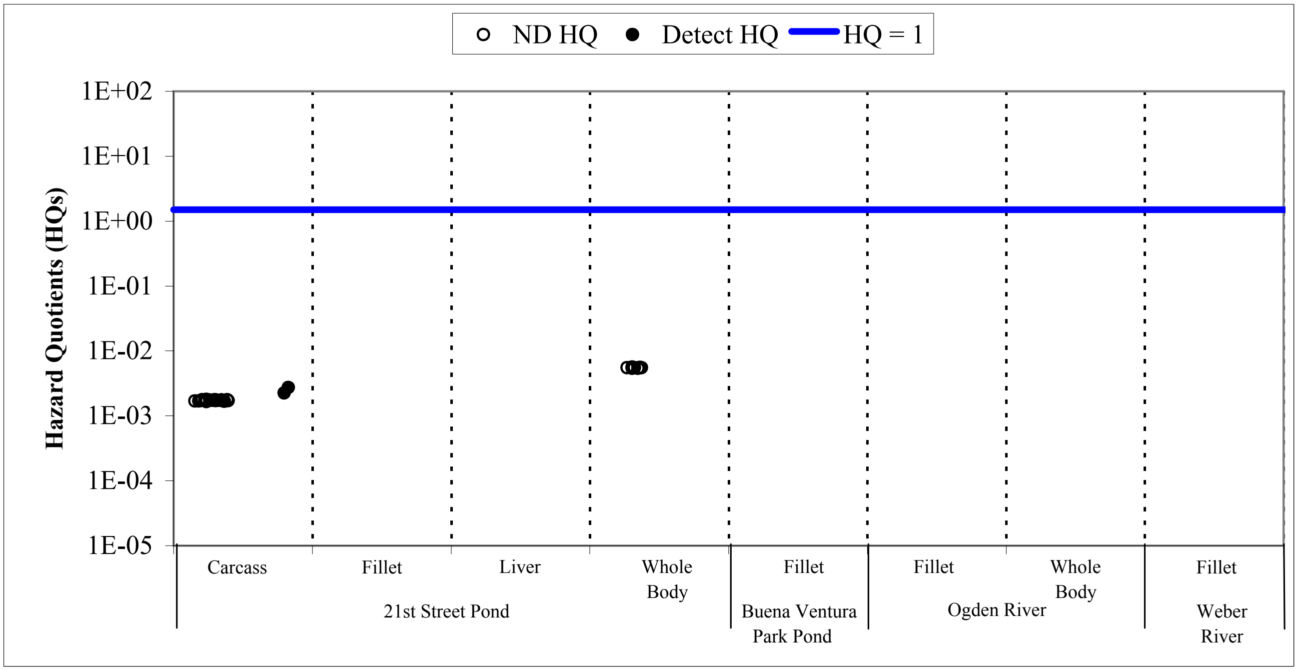
Statistic	21st Street Pond				Buena Ventura Park Pond	Ogden River		Weber River
	Carcass	Fillet	Liver	Body	Fillet	Fillet	Body	Fillet
Detect HQs > 1:	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0
All HQs ≤ 1:	22	22	0	7	0	0	0	0
Detect Samples:	2	1	0	0	0	0	0	0
All Samples:	22	22	0	7	0	0	0	0
Risk Category:	**C**	**C**	**na**	**C**	**na**	**na**	**na**	**na**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-6
HQs for Fish Based on Fish Tissue Data

Baseline Ecological Risk Assessment for the Ogden Railyard Site

DIELDRIN



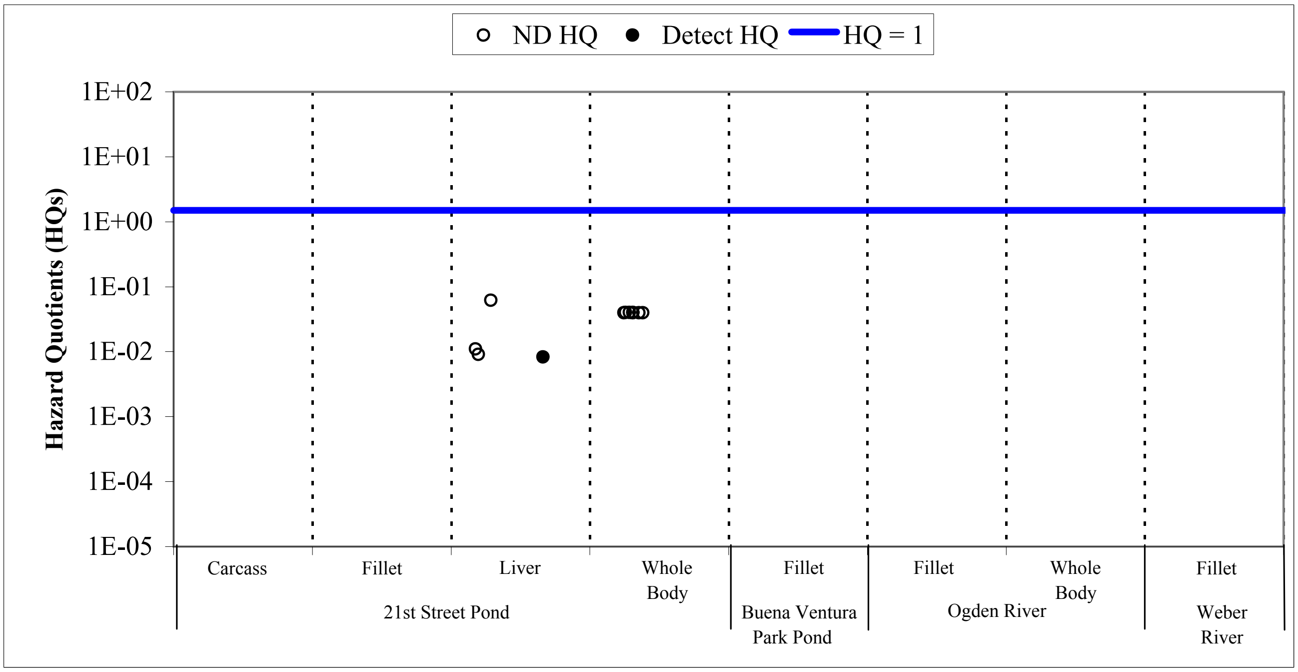
Statistic	21st Street Pond				Buena Ventura Park Pond	Ogden River		Weber River
	Carcass	Fillet	Liver	Body	Fillet	Fillet	Body	Fillet
Detect HQs > 1:	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0
All HQs ≤ 1:	22	0	0	7	0	0	0	0
Detect Samples:	2	0	0	0	0	0	0	0
All Samples:	22	22	0	7	0	0	0	0
Risk Category:	**C**	**B**	**na**	**C**	**na**	**na**	**na**	**na**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-6
HQs for Fish Based on Fish Tissue Data

Baseline Ecological Risk Assessment for the Ogden Railyard Site

PHENOL



Statistic	21st Street Pond				Buena Ventura Park Pond	Ogden River		Weber River
	Carcass	Fillet	Liver	Body	Fillet	Fillet	Body	Fillet
Detect HQs > 1:	0	0	0	0	0	0	0	0
ND HQs > 1:	0	0	0	0	0	0	0	0
All HQs $\leq$ 1:	0	0	4	7	0	0	0	0
Detect Samples:	0	0	1	0	0	0	0	0
All Samples:	21	23	4	7	0	0	0	0
Risk Category:	**B**	**B**	**C**	**C**	**na**	**na**	**na**	**na**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

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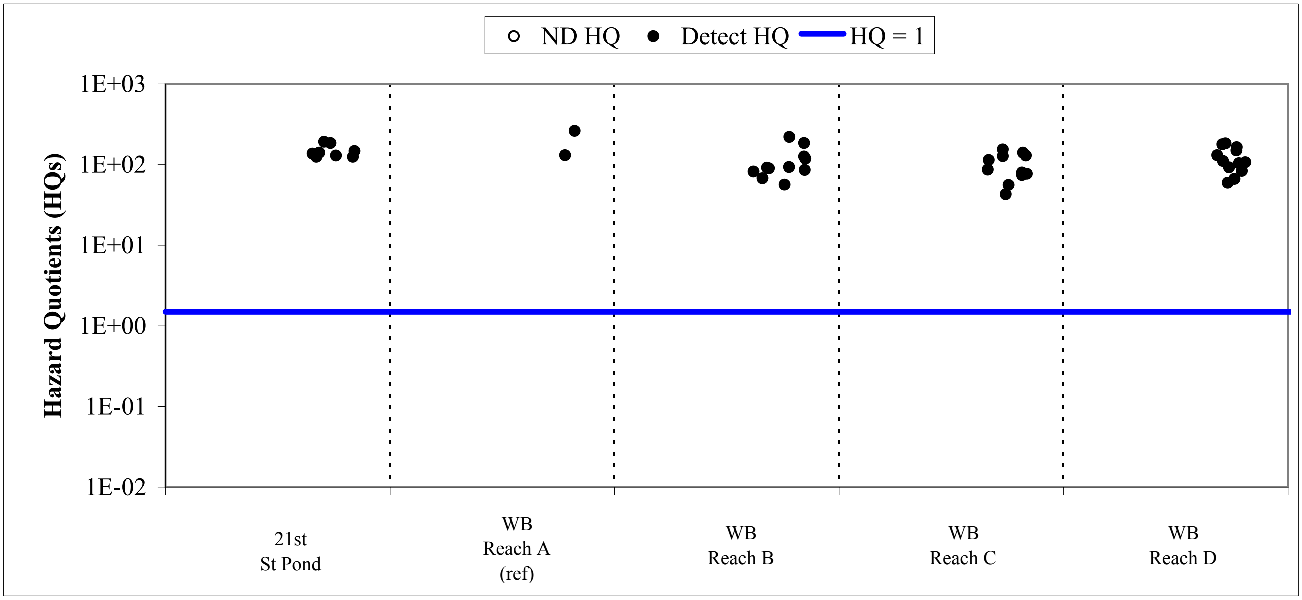
Appendix E-7
Terrestrial Receptor HQs for Direct Contact with Surface Soil

Baseline Ecological Risk Assessment for the Ogden Railyard Site

ALUMINUM



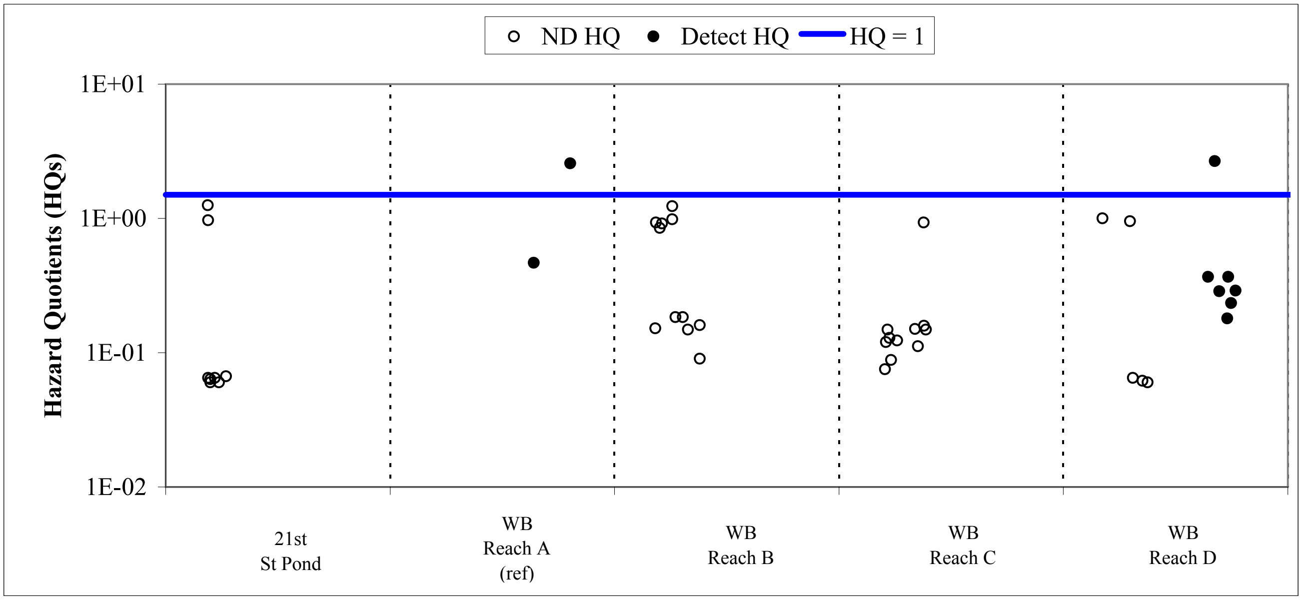
Statistic	21st Street Pond	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	8	2	11	11	12
ND HQs > 1:	0	0	0	0	0
All HQs ≤ 1:	0	0	0	0	0
Detect Samples:	8	2	11	11	12
All Samples:	8	2	11	11	12
Risk Category:	**A**	**A**	**A**	**A**	**A**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-7
Terrestrial Receptor HQs for Direct Contact with Surface Soil

Baseline Ecological Risk Assessment for the Ogden Railyard Site

ANTIMONY



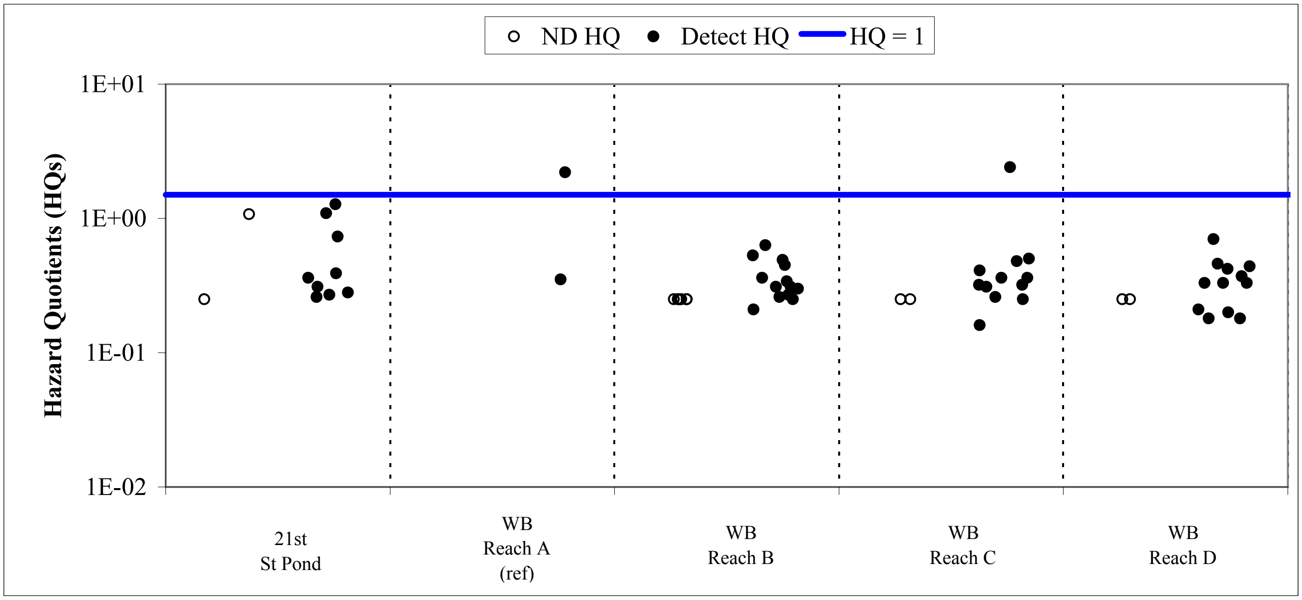
Statistic	21st Street Pond	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	1	0	0	1
ND HQs > 1:	0	0	0	0	0
All HQs ≤ 1:	8	1	11	11	11
Detect Samples:	0	2	0	0	7
All Samples:	8	2	11	11	12
Risk Category:	**C**	**A**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-7
Terrestrial Receptor HQs for Direct Contact with Surface Soil

Baseline Ecological Risk Assessment for the Ogden Railyard Site

ARSENIC



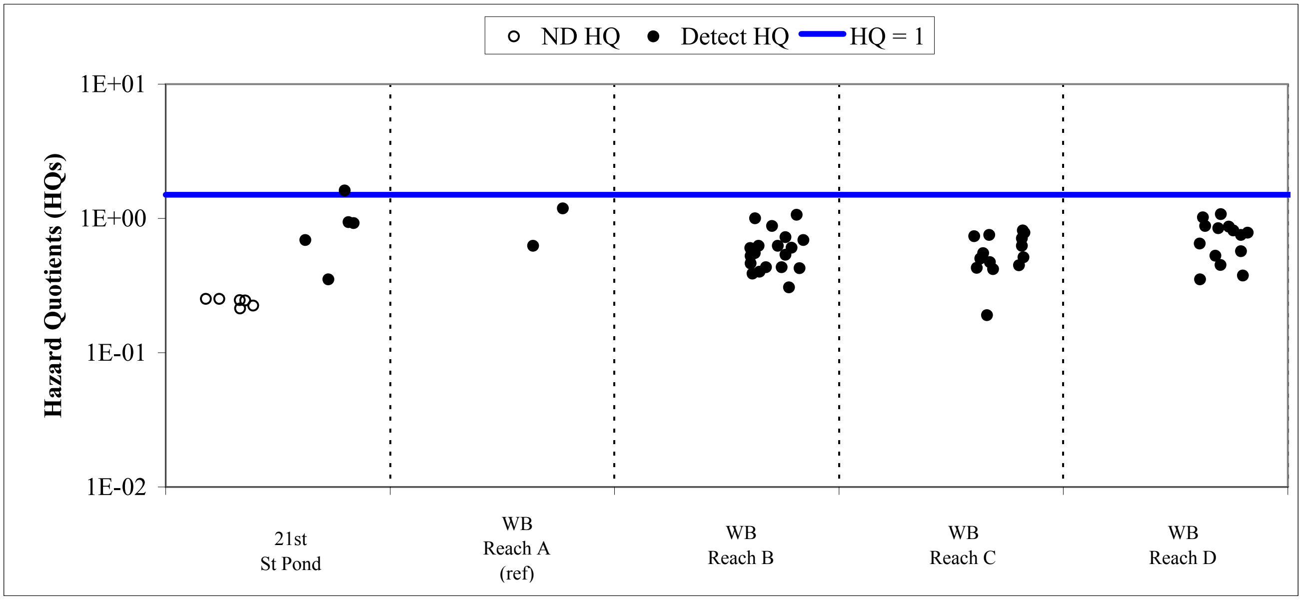
Statistic	21st Street Pond	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	1	0	1	0
ND HQs > 1:	0	0	0	0	0
All HQs ≤ 1:	11	1	19	13	14
Detect Samples:	9	2	13	12	12
All Samples:	11	2	19	14	14
Risk Category:	**C**	**A**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-7
Terrestrial Receptor HQs for Direct Contact with Surface Soil

Baseline Ecological Risk Assessment for the Ogden Railyard Site

BARIUM



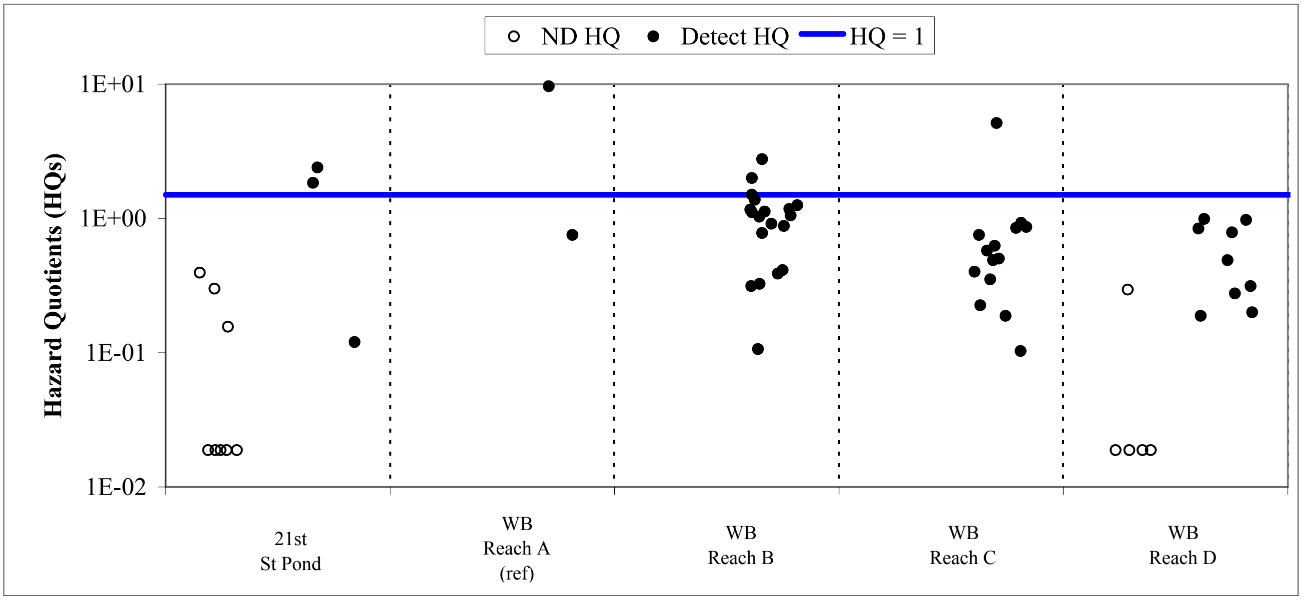
Statistic	21st Street Pond	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	1	0	0	0	0
ND HQs > 1:	0	0	0	0	0
All HQs $\leq$ 1:	10	2	19	14	14
Detect Samples:	5	2	19	14	14
All Samples:	11	2	19	14	14
Risk Category:	**C**	**C**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-7
Terrestrial Receptor HQs for Direct Contact with Surface Soil

Baseline Ecological Risk Assessment for the Ogden Railyard Site

CADMIUM



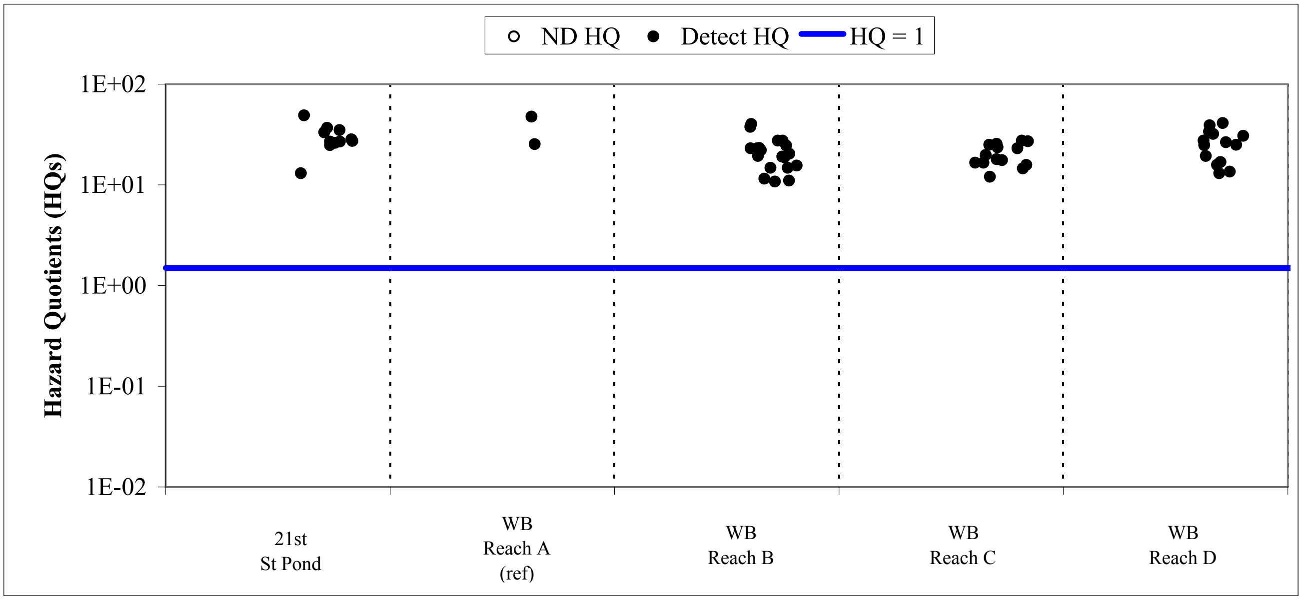
Statistic	21st Street Pond	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	2	1	3	1	0
ND HQs > 1:	0	0	0	0	0
All HQs ≤ 1:	9	1	16	13	14
Detect Samples:	3	2	19	14	9
All Samples:	11	2	19	14	14
Risk Category:	**C**	**A**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-7
Terrestrial Receptor HQs for Direct Contact with Surface Soil

Baseline Ecological Risk Assessment for the Ogden Railyard Site

CHROMIUM



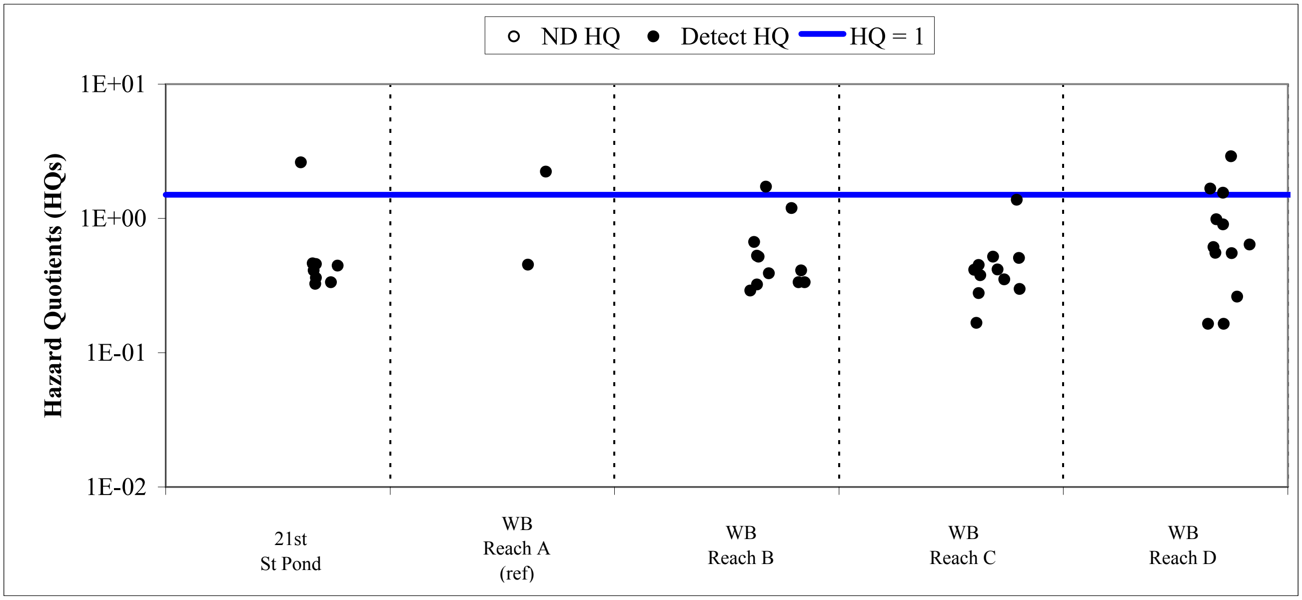
Statistic	21st Street Pond	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	11	2	19	14	14
ND HQs > 1:	0	0	0	0	0
All HQs ≤ 1:	0	0	0	0	0
Detect Samples:	11	2	19	14	14
All Samples:	11	2	19	14	14
Risk Category:	**A**	**A**	**A**	**A**	**A**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-7
Terrestrial Receptor HQs for Direct Contact with Surface Soil

Baseline Ecological Risk Assessment for the Ogden Railyard Site

COPPER



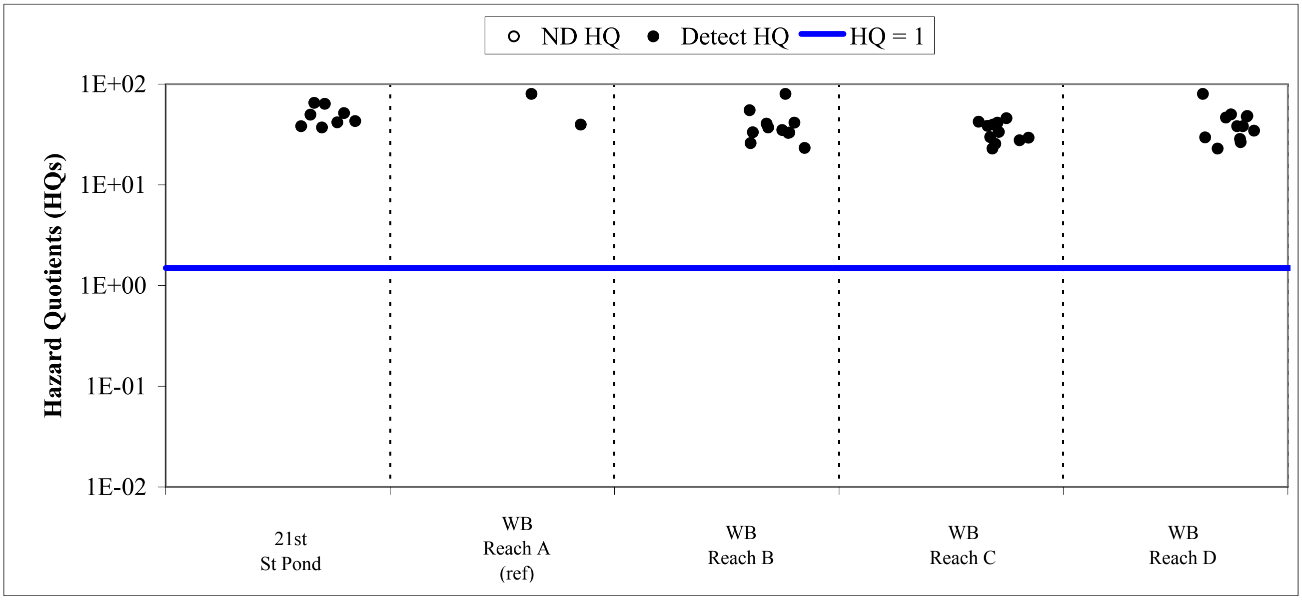
Statistic	21st Street Pond	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	1	1	1	0	3
ND HQs > 1:	0	0	0	0	0
All HQs ≤ 1:	7	1	10	11	9
Detect Samples:	8	2	11	11	12
All Samples:	8	2	11	11	12
Risk Category:	**C**	**A**	**C**	**C**	**A**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-7
Terrestrial Receptor HQs for Direct Contact with Surface Soil

Baseline Ecological Risk Assessment for the Ogden Railyard Site

IRON



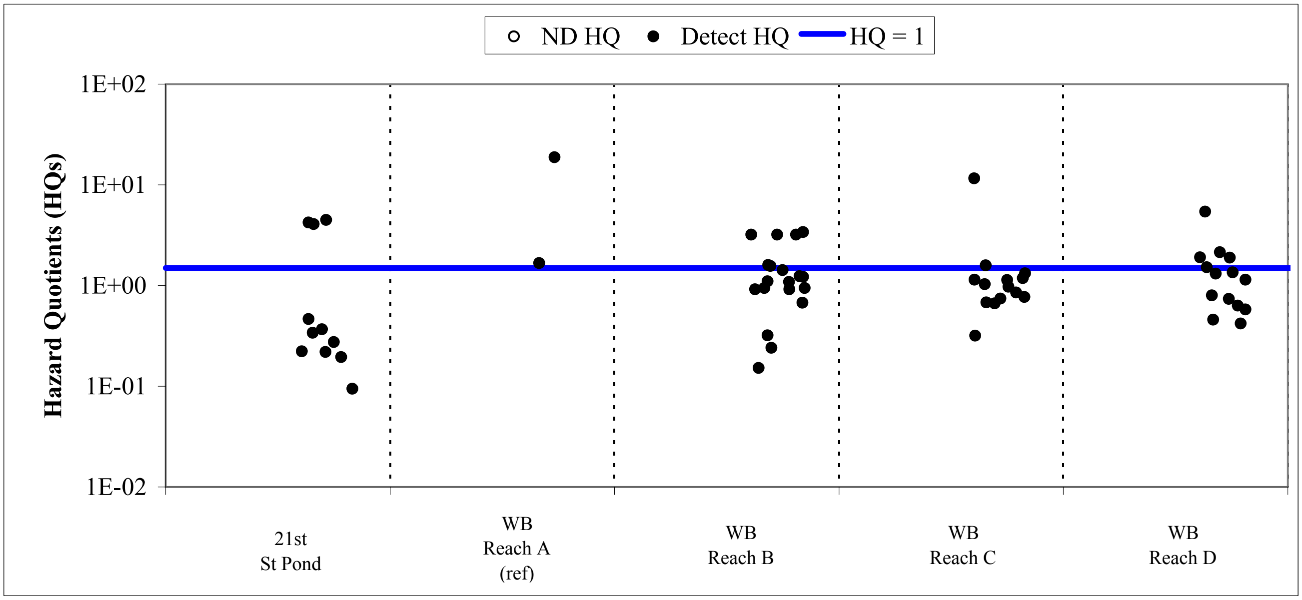
Statistic	21st Street Pond	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	8	2	11	11	12
ND HQs > 1:	0	0	0	0	0
All HQs ≤ 1:	0	0	0	0	0
Detect Samples:	8	2	11	11	12
All Samples:	8	2	11	11	12
Risk Category:	**A**	**A**	**A**	**A**	**A**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-7
Terrestrial Receptor HQs for Direct Contact with Surface Soil

Baseline Ecological Risk Assessment for the Ogden Railyard Site

LEAD



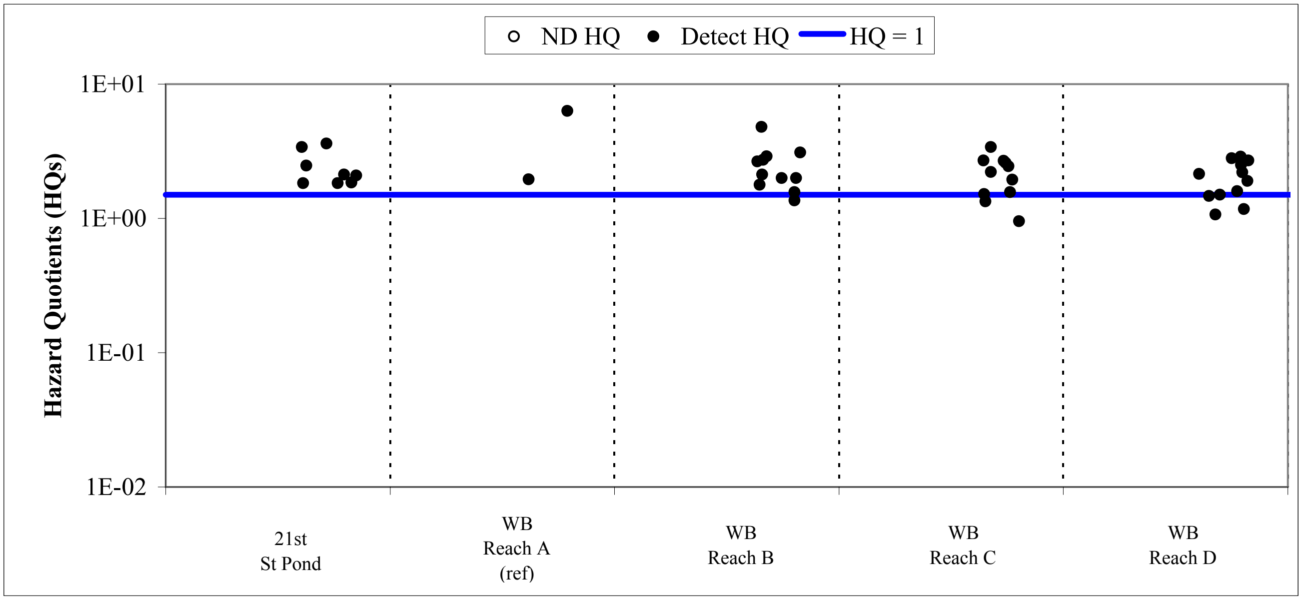
Statistic	21st Street Pond	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	3	2	6	2	5
ND HQs > 1:	0	0	0	0	0
All HQs $\leq$ 1:	8	0	13	12	9
Detect Samples:	11	2	19	14	14
All Samples:	11	2	19	14	14
Risk Category:	**A**	**A**	**A**	**C**	**A**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-7
Terrestrial Receptor HQs for Direct Contact with Surface Soil

Baseline Ecological Risk Assessment for the Ogden Railyard Site

MANGANESE



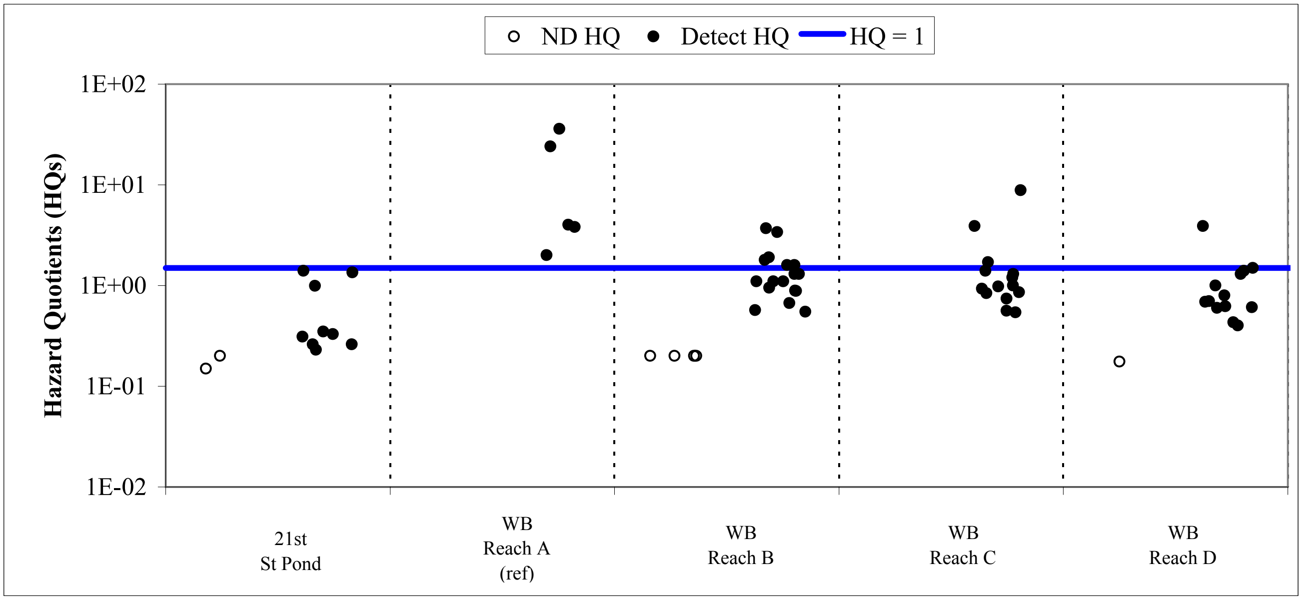
Statistic	21st Street Pond	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	8	2	10	9	9
ND HQs > 1:	0	0	0	0	0
All HQs ≤ 1:	0	0	1	2	3
Detect Samples:	8	2	11	11	12
All Samples:	8	2	11	11	12
Risk Category:	**A**	**A**	**A**	**A**	**A**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-7
Terrestrial Receptor HQs for Direct Contact with Surface Soil

Baseline Ecological Risk Assessment for the Ogden Railyard Site

MERCURY



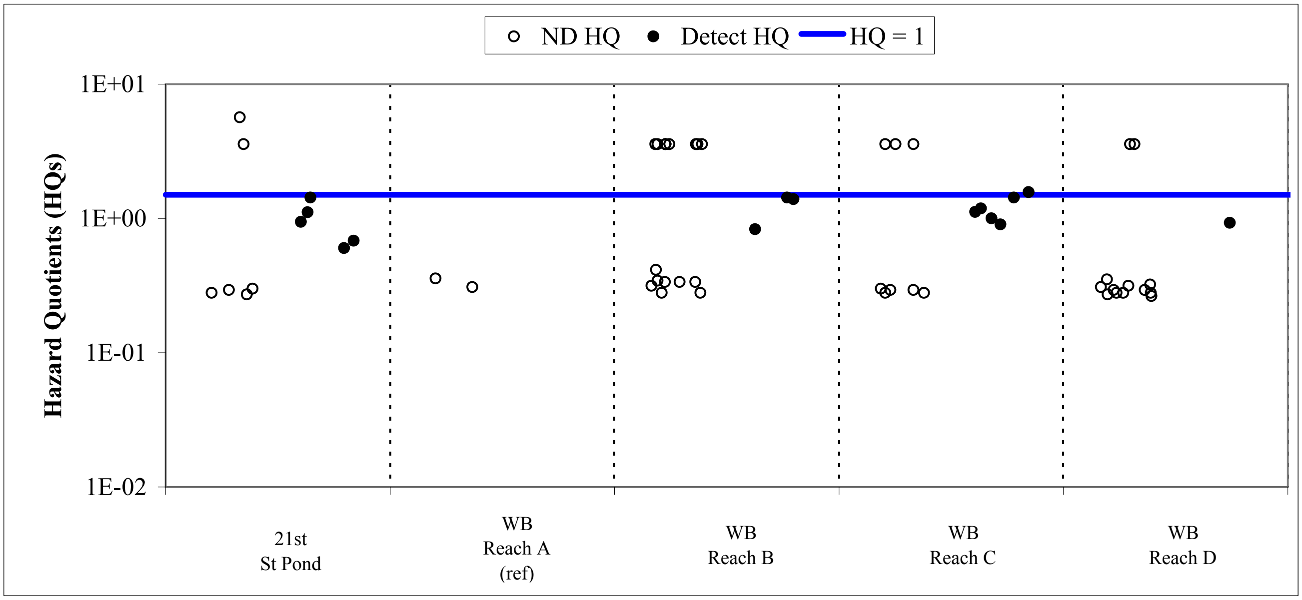
Statistic	21st Street Pond	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	5	6	3	2
ND HQs > 1:	0	0	0	0	0
All HQs ≤ 1:	11	0	15	11	12
Detect Samples:	9	5	17	14	13
All Samples:	11	5	21	14	14
Risk Category:	**C**	**A**	**A**	**A**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-7
Terrestrial Receptor HQs for Direct Contact with Surface Soil

Baseline Ecological Risk Assessment for the Ogden Railyard Site

SELENIUM



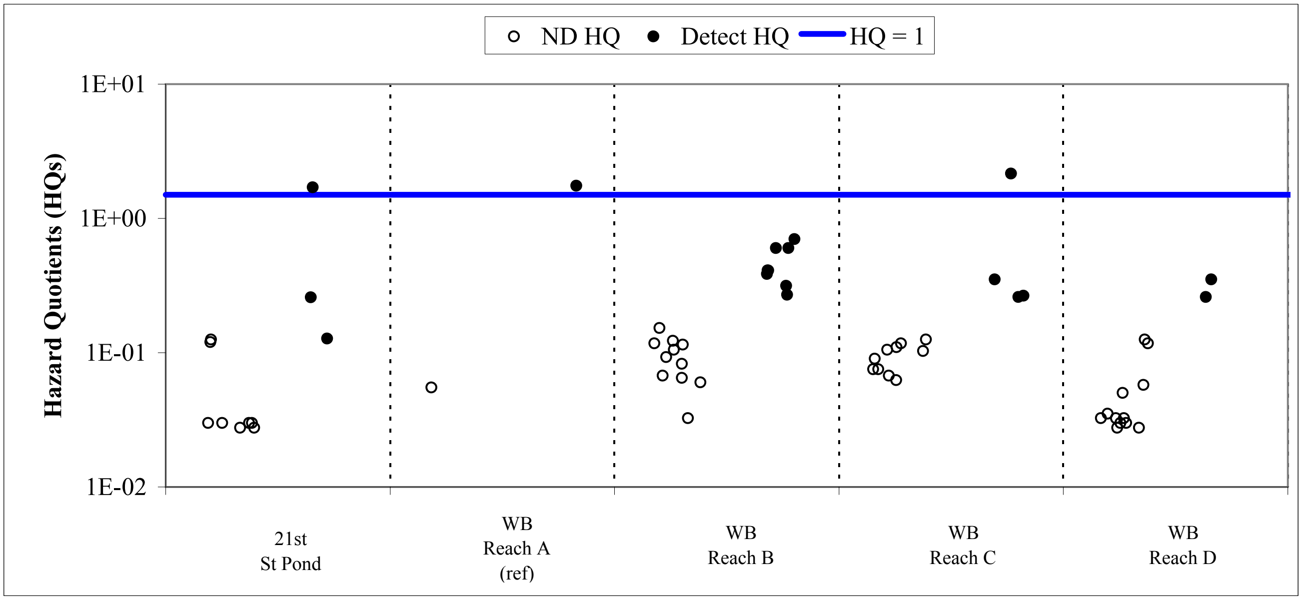
Statistic	21st Street Pond	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	1	0
ND HQs > 1:	2	0	8	3	2
All HQs < 1:	9	2	11	10	12
Detect Samples:	5	0	3	6	1
All Samples:	11	2	19	14	14
Risk Category:	**C**	**C**	**B**	**B**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-7
Terrestrial Receptor HQs for Direct Contact with Surface Soil

Baseline Ecological Risk Assessment for the Ogden Railyard Site

SILVER



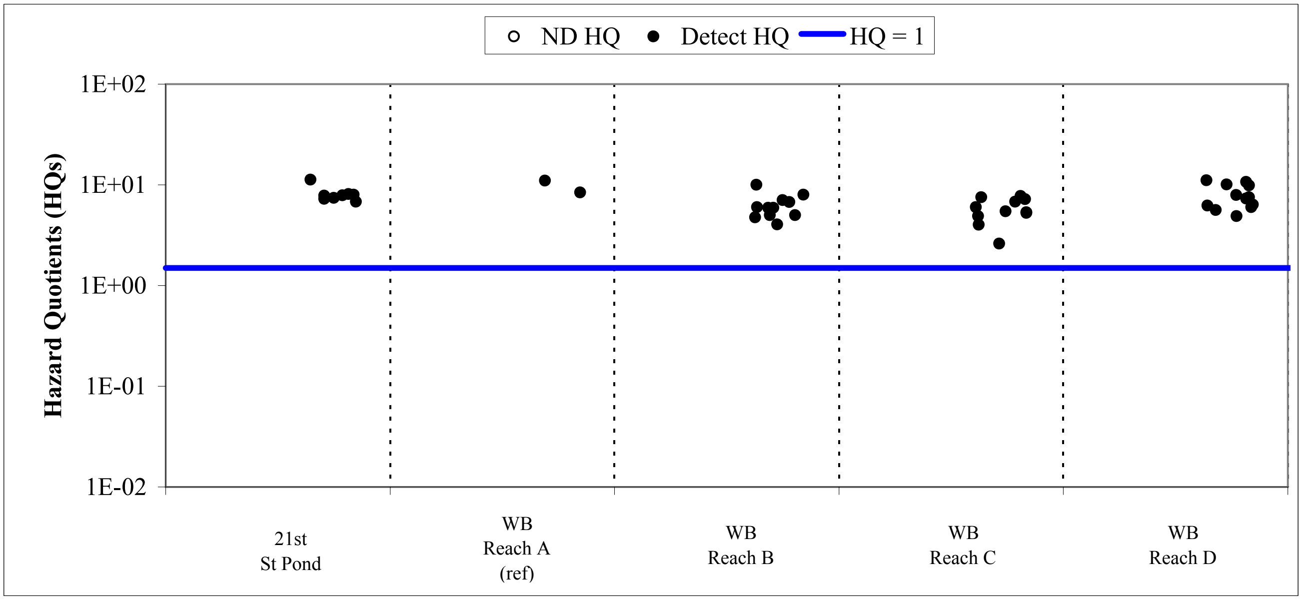
Statistic	21st Street Pond	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	1	1	0	1	0
ND HQs > 1:	0	0	0	0	0
All HQs ≤ 1:	10	1	19	13	14
Detect Samples:	3	1	8	4	2
All Samples:	11	2	19	14	14
Risk Category:	**C**	**A**	**C**	**C**	**C**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-7
Terrestrial Receptor HQs for Direct Contact with Surface Soil

Baseline Ecological Risk Assessment for the Ogden Railyard Site

VANADIUM



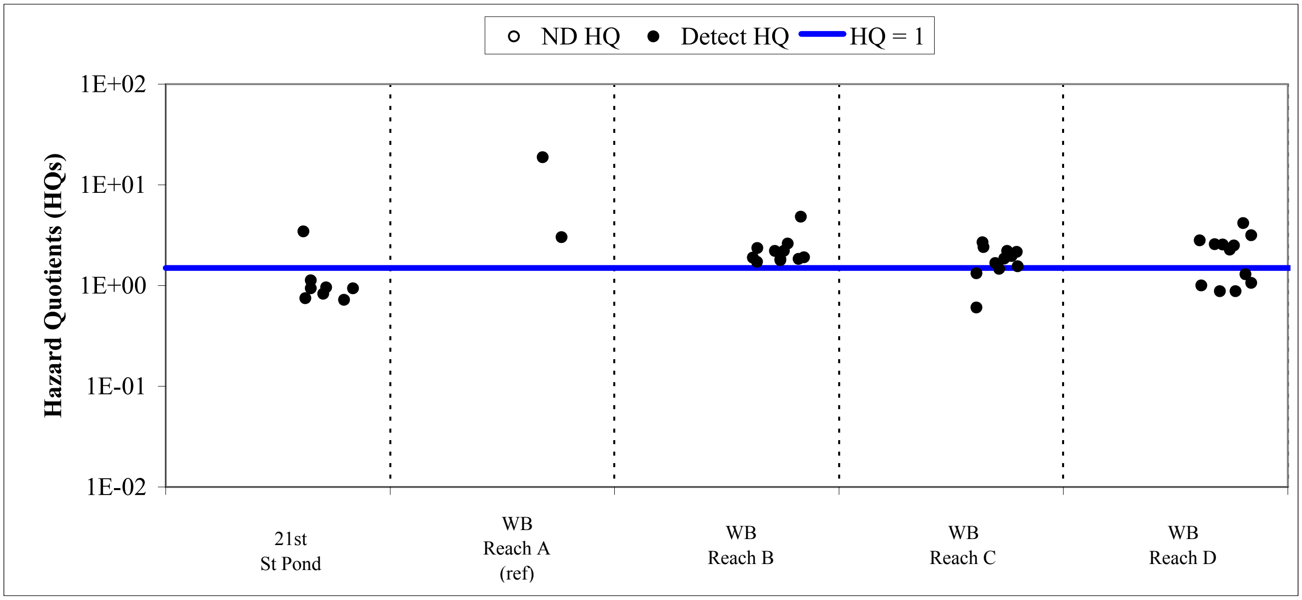
Statistic	21st Street Pond	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	8	2	11	11	12
ND HQs > 1:	0	0	0	0	0
All HQs $\leq$ 1:	0	0	0	0	0
Detect Samples:	8	2	11	11	12
All Samples:	8	2	11	11	12
Risk Category:	**A**	**A**	**A**	**A**	**A**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-7
Terrestrial Receptor HQs for Direct Contact with Surface Soil

Baseline Ecological Risk Assessment for the Ogden Railyard Site

ZINC



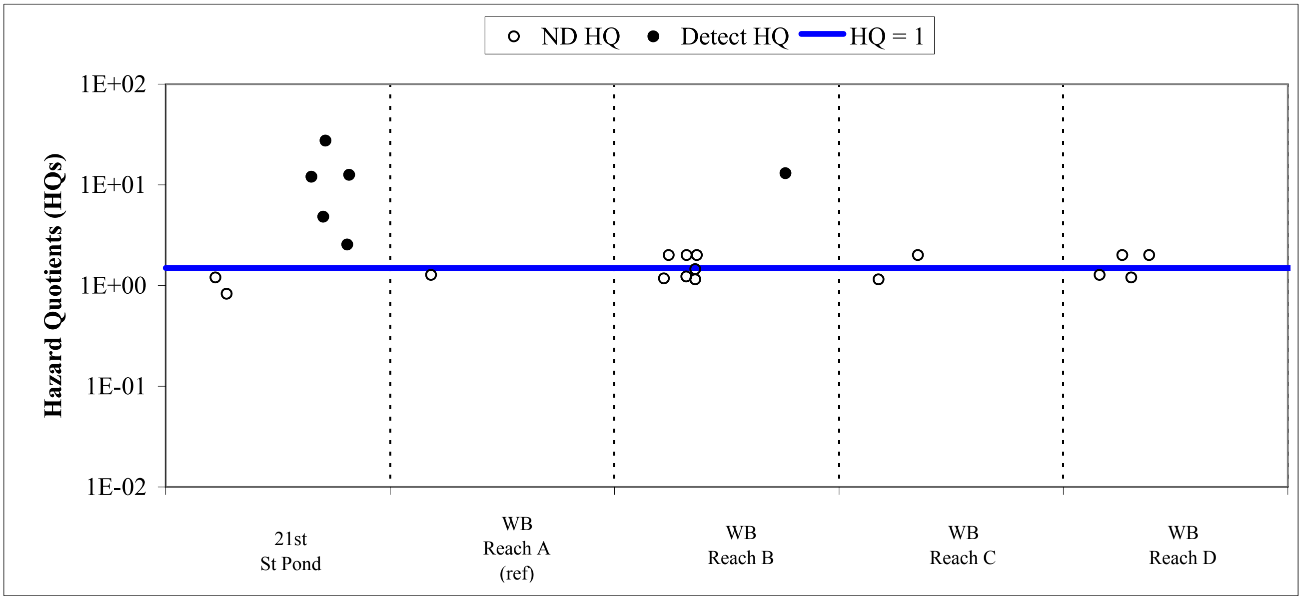
Statistic	21st Street Pond	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	1	2	11	8	7
ND HQs > 1:	0	0	0	0	0
All HQs $\leq$ 1:	7	0	0	3	5
Detect Samples:	8	2	11	11	12
All Samples:	8	2	11	11	12
Risk Category:	**C**	**A**	**A**	**A**	**A**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-7
Terrestrial Receptor HQs for Direct Contact with Surface Soil

Baseline Ecological Risk Assessment for the Ogden Railyard Site

AROCLOR-1260



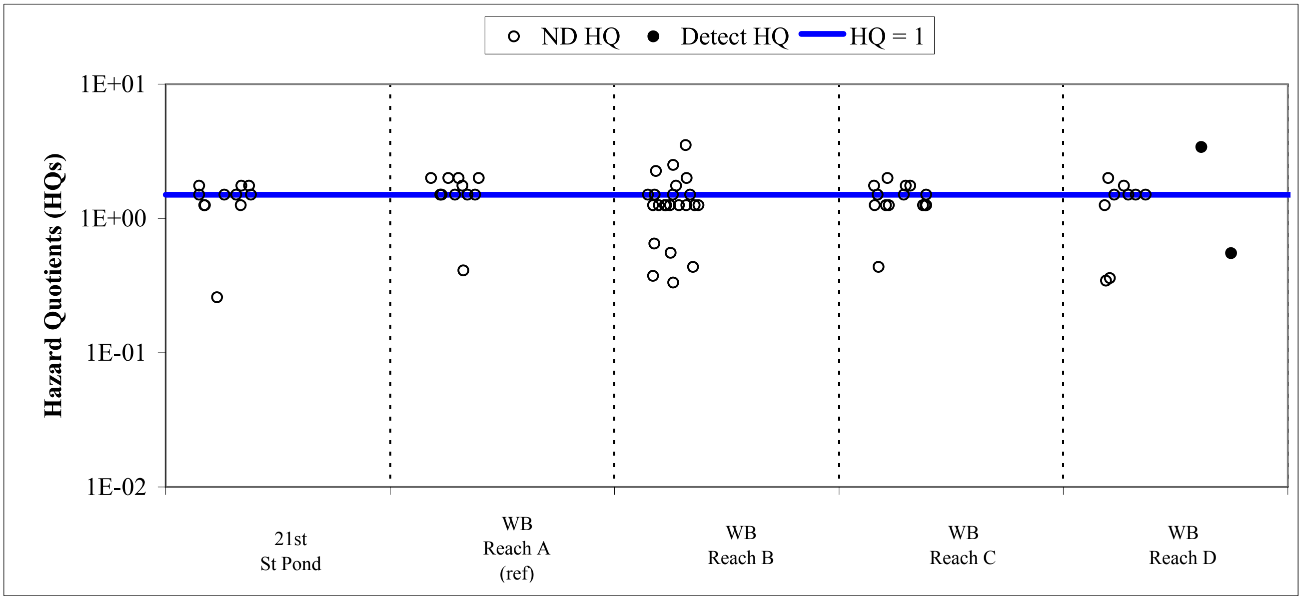
Statistic	21st Street Pond	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	5	0	1	0	0
ND HQs > 1:	0	0	3	1	2
All HQs $\leq$ 1:	2	1	4	1	2
Detect Samples:	5	0	1	0	0
All Samples:	7	1	8	2	4
Risk Category:	**A**	**C**	**B**	**B**	**B**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

Appendix E-7
Terrestrial Receptor HQs for Direct Contact with Surface Soil

Baseline Ecological Risk Assessment for the Ogden Railyard Site

TETRACHLOROETHENE



Statistic	21st Street Pond	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Detect HQs > 1:	0	0	0	0	1
ND HQs > 1:	7	10	9	7	6
All HQs ≤ 1:	4	1	14	7	4
Detect Samples:	0	0	0	0	2
All Samples:	11	11	23	14	11
Risk Category:	**B**	**B**	**B**	**B**	**B**

A = Risk to the sub-population at this location are possible
B = Risks to the sub-population at this location cannot be determined
C = Risks to the sub-population at this location are expected to be minimal and are assumed to be acceptable
na = No data for this chemical in this location

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Appendix E-8
Summary of Exposure Point Concentrations (EPCs) Used to Evaluate Risks to Wildlife Receptors

Medium	Type	COPC	Buena Ventura Park Pond	21st Street Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Sediment	Inorganics	Aluminum	1.21E+04	1.28E+04	--	5.61E+03	--	1.18E+04	6.80E+03	1.10E+04	6.60E+03
		Antimony	2.80E+00	1.39E+00	--	1.06E+00	--	3.61E+00	3.20E+00	4.25E+00	2.83E+00
		Arsenic	4.64E+00	7.83E+00	--	4.60E+00	--	4.00E+00	4.63E+00	9.20E+00	5.51E+00
		Barium	4.98E+02	2.22E+02	--	2.04E+02	--	2.20E+02	1.10E+02	2.30E+02	1.31E+02
		Cadmium	--	--	--	--	--	--	--	--	--
		Chromium	1.54E+01	1.75E+01	--	9.23E+00	--	9.40E+00	6.05E+00	9.40E+00	2.20E+01
		Copper	--	--	--	--	--	--	--	--	--
		Lead	1.20E+02	3.81E+01	--	4.16E+01	--	5.30E+01	3.12E+01	4.90E+01	6.40E+01
		Manganese	3.43E+02	7.01E+02	--	5.25E+02	--	4.40E+02	3.20E+02	4.50E+02	3.40E+02
		Mercury	3.90E-01	1.72E-01	--	6.60E-02	--	2.60E-01	8.06E-02	1.80E-01	1.20E-01
		Selenium	2.20E+00	4.93E+00	--	5.80E+00	--	4.03E-01	2.06E+00	2.08E+00	1.39E+00
		Thallium	7.90E-01	1.70E+00	--	8.20E-01	--	2.81E-01	2.26E-01	2.03E-01	2.42E-01
		Vanadium	2.23E+01	2.30E+01	--	1.27E+01	--	1.30E+01	1.00E+01	1.30E+01	1.36E+01
		Zinc	3.64E+02	1.03E+02	--	7.06E+01	--	1.36E+02	1.14E+02	2.60E+02	2.80E+02
	Pesticides	4,4'-DDE	3.52E-03	1.56E-02	2.44E-03	3.83E-03	1.75E-03	4.58E-03	7.03E-03	1.46E-02	4.68E-03
		4,4'-DDD	--	--	--	--	--	--	--	--	--
		4,4'-DDT	2.87E-03	3.88E-03	2.44E-03	1.08E-02	1.22E-02	4.58E-03	7.03E-03	7.22E-03	4.68E-03
	PAHs	Benzo[a]pyrene	7.80E-02	2.96E+01	2.40E-01	3.20E-01	1.54E-01	2.25E+00	4.52E-01	1.52E-01	1.08E-01
	PCBs	Aroclor-1254	3.73E-02	6.61E-02	5.00E-02	2.80E-01	3.23E-02	5.70E-02	3.99E-02	4.20E-02	3.63E-02
		Aroclor-1260	3.20E-02	2.43E-01	3.02E-02	8.40E+00	2.30E-01	5.70E-02	3.99E-02	3.80E-02	3.63E-02
	SVOCs	bis(2-Ethylhexyl)phthalate	1.82E+00	1.39E+00	1.67E+00	5.00E-01	5.20E-01	3.20E+00	5.60E-01	1.80E+00	1.70E+00
		Dibutylphthalate	1.98E-01	1.02E-01	9.05E-01	7.28E-01	2.22E-01	1.51E+00	3.57E-01	3.37E-01	1.06E-01
Soil	Inorganics	Aluminum	--	8.36E+03	--	--	--	1.30E+04	7.17E+03	6.44E+03	7.51E+03
		Antimony	--	9.74E-01	--	--	--	7.70E+00	1.59E+00	5.96E-01	5.75E+00
		Arsenic	--	9.16E+00	--	--	--	2.20E+01	3.73E+00	7.40E+00	4.15E+00
		Barium	--	1.50E+02	--	--	--	1.90E+02	1.09E+02	1.13E+02	1.39E+02
		Cadmium	--	1.91E+00	--	--	--	7.70E+00	1.35E+00	1.24E+00	7.90E-01
		Chromium	--	1.46E+01	--	--	--	1.90E+01	1.01E+01	9.25E+00	1.27E+01
		Copper	--	4.80E+01	--	--	--	8.00E+01	3.27E+01	2.37E+01	7.30E+01
		Lead	--	2.23E+02	--	--	--	9.40E+02	1.27E+02	1.53E+02	1.13E+02
		Manganese	--	3.00E+02	--	--	--	6.30E+02	3.09E+02	2.74E+02	2.45E+02
		Mercury	--	9.98E-02	--	--	--	3.60E+00	2.08E-01	2.80E-01	1.61E-01
		Selenium	--	1.00E+00	--	--	--	2.33E-01	1.00E+00	1.10E+00	6.50E-01
		Thallium	--	--	--	--	--	--	--	--	--
		Vanadium	--	1.81E+01	--	--	--	2.20E+01	1.46E+01	1.40E+01	1.83E+01
		Zinc	--	9.47E+01	--	--	--	9.40E+02	1.38E+02	1.19E+02	1.56E+02
	Pesticides	4,4'-DDE	--	--	--	--	--	--	--	--	--
		4,4'-DDD	--	--	--	--	--	--	--	--	--
		4,4'-DDT	--	1.50E-02	--	--	--	2.00E-03	4.29E-03	4.93E-03	5.00E-03
	PAHs	Benzo[a]pyrene	--	--	--	--	--	--	--	--	--
	PCBs	Aroclor-1254	--	--	--	--	--	--	--	--	--
		Aroclor-1260	--	5.50E-01	--	--	--	2.55E-02	1.41E-01	3.15E-02	3.24E-02
	SVOCs	bis(2-Ethylhexyl)phthalate	--	1.44E+00	--	--	--	2.66E-01	3.57E-01	2.59E-01	2.30E-01
		Dibutylphthalate	--	3.17E-01	--	--	--	9.00E-02	1.80E-01	2.20E-01	2.01E-01
Fish	Inorganics	Aluminum	--	--	--	--	--	--	--	--	--
		Antimony	--	--	--	--	--	--	--	--	--
		Arsenic	--	--	--	--	--	--	--	--	--
		Barium	--	--	--	--	--	--	--	--	--
		Cadmium	--	--	--	--	--	--	--	--	--
		Chromium	--	--	--	--	--	--	--	--	--
		Copper	--	--	--	--	--	--	--	--	--
		Lead	--	--	--	--	--	--	--	--	--
		Manganese	--	--	--	--	--	--	--	--	--
		Mercury	--	--	--	--	--	--	--	--	--
		Selenium	--	--	--	--	--	--	--	--	--
		Thallium	--	--	--	--	--	--	--	--	--
		Vanadium	--	--	--	--	--	--	--	--	--
		Zinc	--	--	--	--	--	--	--	--	--
	Pesticides	4,4'-DDE	--	5.62E-01	--	--	--	--	--	--	--
		4,4'-DDD	--	2.34E-03	--	--	--	--	--	--	--
		4,4'-DDT	--	2.15E-03	--	--	--	--	--	--	--
	PAHs	Benzo[a]pyrene	--	--	--	--	--	--	--	--	--
	PCBs	Aroclor-1254	--	--	--	--	--	--	--	--	--
		Aroclor-1260	--	1.54E+00	--	--	--	--	--	--	--
	SVOCs	bis(2-Ethylhexyl)phthalate	--	1.47E+00	--	--	--	--	--	--	--
		Dibutylphthalate	--	1.02E+00	--	--	--	--	--	--	--

-- = Not a COPC or no data available
All units are mg/kg

Appendix E-8
Estimated Risks to the Belted Kingfisher

where *HQ = Dose / TRV*

Medium	Type	COPC	Buena Ventura Park Pond	21st Street Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Sediment	Inorganics	Aluminum	1E-01	1E-01	--	6E-02	--	1E-01	7E-02	1E-01	7E-02
		Antimony	--	--	--	--	--	--	--	--	--
		Arsenic	2E-03	3E-03	--	2E-03	--	1E-03	2E-03	3E-03	2E-03
		Barium	5E-02	2E-02	--	2E-02	--	2E-02	1E-02	2E-02	1E-02
		Cadmium	--	--	--	--	--	--	--	--	--
		Chromium	2E-02	2E-02	--	1E-02	--	1E-02	7E-03	1E-02	3E-02
		Copper	--	--	--	--	--	--	--	--	--
		Lead	4E-02	1E-02	--	1E-02	--	2E-02	1E-02	2E-02	2E-02
		Manganese	4E-04	9E-04	--	6E-04	--	5E-04	4E-04	6E-04	4E-04
		Mercury	5E-02	2E-02	--	9E-03	--	3E-02	1E-02	2E-02	2E-02
		Selenium	1E-03	3E-03	--	4E-03	--	3E-04	1E-03	1E-03	9E-04
		Thallium	--	--	--	--	--	--	--	--	--
		Vanadium	2E-03	2E-03	--	1E-03	--	1E-03	1E-03	1E-03	1E-03
		Zinc	2E-02	6E-03	--	4E-03	--	8E-03	7E-03	2E-02	2E-02
	Pesticides	4,4'-DDE	1E-03	5E-03	7E-04	1E-03	5E-04	1E-03	2E-03	4E-03	1E-03
		4,4'-DDD	--	--	--	--	--	--	--	--	--
		4,4'-DDT	9E-04	1E-03	7E-04	3E-03	4E-03	1E-03	2E-03	2E-03	1E-03
	PAHs	Benzo[a]pyrene	--	--	--	--	--	--	--	--	--
	PCBs	Aroclor-1254	2E-04	3E-04	2E-04	1E-03	2E-04	3E-04	2E-04	2E-04	2E-04
		Aroclor-1260	2E-04	1E-03	1E-04	4E-02	1E-03	3E-04	2E-04	2E-04	2E-04
	SVOCs	bis(2-Ethylhexyl)phthalate	2E-03	2E-03	2E-03	5E-04	6E-04	4E-03	6E-04	2E-03	2E-03
		Dibutylphthalate	2E-03	8E-04	7E-03	6E-03	2E-03	1E-02	3E-03	3E-03	8E-04
Soil	Inorganics	Aluminum	--	--	--	--	--	--	--	--	--
		Antimony	--	--	--	--	--	--	--	--	--
		Arsenic	--	--	--	--	--	--	--	--	--
		Barium	--	--	--	--	--	--	--	--	--
		Cadmium	--	--	--	--	--	--	--	--	--
		Chromium	--	--	--	--	--	--	--	--	--
		Copper	--	--	--	--	--	--	--	--	--
		Lead	--	--	--	--	--	--	--	--	--
		Manganese	--	--	--	--	--	--	--	--	--
		Mercury	--	--	--	--	--	--	--	--	--
		Selenium	--	--	--	--	--	--	--	--	--
		Thallium	--	--	--	--	--	--	--	--	--
		Vanadium	--	--	--	--	--	--	--	--	--
		Zinc	--	--	--	--	--	--	--	--	--
	Pesticides	4,4'-DDE	--	--	--	--	--	--	--	--	--
		4,4'-DDD	--	--	--	--	--	--	--	--	--
		4,4'-DDT	--	--	--	--	--	--	--	--	--
	PAHs	Benzo[a]pyrene	--	--	--	--	--	--	--	--	--
	PCBs	Aroclor-1254	--	--	--	--	--	--	--	--	--
		Aroclor-1260	--	--	--	--	--	--	--	--	--
	SVOCs	bis(2-Ethylhexyl)phthalate	--	--	--	--	--	--	--	--	--
		Dibutylphthalate	--	--	--	--	--	--	--	--	--
Fish	Inorganics	Aluminum	--	--	--	--	--	--	--	--	--
		Antimony	--	--	--	--	--	--	--	--	--
		Arsenic	--	--	--	--	--	--	--	--	--
		Barium	--	--	--	--	--	--	--	--	--
		Cadmium	--	--	--	--	--	--	--	--	--
		Chromium	--	--	--	--	--	--	--	--	--
		Copper	--	--	--	--	--	--	--	--	--
		Lead	--	--	--	--	--	--	--	--	--
		Manganese	--	--	--	--	--	--	--	--	--
		Mercury	--	--	--	--	--	--	--	--	--
		Selenium	--	--	--	--	--	--	--	--	--
		Thallium	--	--	--	--	--	--	--	--	--
		Vanadium	--	--	--	--	--	--	--	--	--
		Zinc	--	--	--	--	--	--	--	--	--
	Pesticides	4,4'-DDE	--	**3E+01**	--	--	--	--	--	--	--
		4,4'-DDD	--	1E-01	--	--	--	--	--	--	--
		4,4'-DDT	--	1E-01	--	--	--	--	--	--	--
	PAHs	Benzo[a]pyrene	--	--	--	--	--	--	--	--	--
	PCBs	Aroclor-1254	--	--	--	--	--	--	--	--	--
		Aroclor-1260	--	1E+00	--	--	--	--	--	--	--
	SVOCs	bis(2-Ethylhexyl)phthalate	--	3E-01	--	--	--	--	--	--	--
		Dibutylphthalate	--	1E+00	--	--	--	--	--	--	--

Appendix E-8
Estimated Risks to the American Robin

where *HQ = Dose / TRV*

Medium	Type	COPC	Buena Ventura Park Pond	21st Street Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Sediment	Inorganics	Aluminum	--	--	--	--	--	--	--	--	--
		Antimony	--	--	--	--	--	--	--	--	--
		Arsenic	--	--	--	--	--	--	--	--	--
		Barium	--	--	--	--	--	--	--	--	--
		Cadmium	--	--	--	--	--	--	--	--	--
		Chromium	--	--	--	--	--	--	--	--	--
		Copper	--	--	--	--	--	--	--	--	--
		Lead	--	--	--	--	--	--	--	--	--
		Manganese	--	--	--	--	--	--	--	--	--
		Mercury	--	--	--	--	--	--	--	--	--
		Selenium	--	--	--	--	--	--	--	--	--
		Thallium	--	--	--	--	--	--	--	--	--
		Vanadium	--	--	--	--	--	--	--	--	--
		Zinc	--	--	--	--	--	--	--	--	--
	Pesticides	4,4'-DDE	--	--	--	--	--	--	--	--	--
		4,4'-DDD	--	--	--	--	--	--	--	--	--
		4,4'-DDT	--	--	--	--	--	--	--	--	--
	PAHs	Benzo[a]pyrene	--	--	--	--	--	--	--	--	--
	PCBs	Aroclor-1254	--	--	--	--	--	--	--	--	--
		Aroclor-1260	--	--	--	--	--	--	--	--	--
	SVOCs	bis(2-Ethylhexyl)phthalate	--	--	--	--	--	--	--	--	--
		Dibutylphthalate	--	--	--	--	--	--	--	--	--
Soil	Inorganics	Aluminum	--	5E-01	--	--	--	8E-01	4E-01	4E-01	5E-01
		Antimony	--	--	--	--	--	--	--	--	--
		Arsenic	--	3E-02	--	--	--	8E-02	1E-02	3E-02	1E-02
		Barium	--	8E-02	--	--	--	1E-01	6E-02	6E-02	7E-02
		Cadmium	--	5E-03	--	--	--	2E-02	4E-03	3E-03	2E-03
		Chromium	--	1E-01	--	--	--	1E-01	7E-02	6E-02	8E-02
		Copper	--	1E-02	--	--	--	2E-02	9E-03	7E-03	2E-02
		Lead	--	9E-01	--	--	--	**4E+00**	5E-01	6E-01	5E-01
		Manganese	--	2E-03	--	--	--	4E-03	2E-03	2E-03	2E-03
		Mercury	--	2E-03	--	--	--	8E-02	5E-03	7E-03	4E-03
		Selenium	--	3E-02	--	--	--	6E-03	3E-02	3E-02	2E-02
		Thallium	--	--	--	--	--	--	--	--	--
		Vanadium	--	1E-02	--	--	--	1E-02	8E-03	8E-03	1E-02
		Zinc	--	3E-02	--	--	--	3E-01	5E-02	4E-02	5E-02
	Pesticides	4,4'-DDE	--	--	--	--	--	--	--	--	--
		4,4'-DDD	--	--	--	--	--	--	--	--	--
		4,4'-DDT	--	3E-02	--	--	--	3E-03	7E-03	8E-03	8E-03
	PAHs	Benzo[a]pyrene	--	--	--	--	--	--	--	--	--
	PCBs	Aroclor-1254	--	--	--	--	--	--	--	--	--
		Aroclor-1260	--	1E-02	--	--	--	7E-04	4E-03	8E-04	8E-04
	SVOCs	bis(2-Ethylhexyl)phthalate	--	9E-03	--	--	--	2E-03	2E-03	2E-03	1E-03
		Dibutylphthalate	--	1E-02	--	--	--	4E-03	8E-03	9E-03	9E-03
Fish	Inorganics	Aluminum	--	--	--	--	--	--	--	--	--
		Antimony	--	--	--	--	--	--	--	--	--
		Arsenic	--	--	--	--	--	--	--	--	--
		Barium	--	--	--	--	--	--	--	--	--
		Cadmium	--	--	--	--	--	--	--	--	--
		Chromium	--	--	--	--	--	--	--	--	--
		Copper	--	--	--	--	--	--	--	--	--
		Lead	--	--	--	--	--	--	--	--	--
		Manganese	--	--	--	--	--	--	--	--	--
		Mercury	--	--	--	--	--	--	--	--	--
		Selenium	--	--	--	--	--	--	--	--	--
		Thallium	--	--	--	--	--	--	--	--	--
		Vanadium	--	--	--	--	--	--	--	--	--
		Zinc	--	--	--	--	--	--	--	--	--
	Pesticides	4,4'-DDE	--	--	--	--	--	--	--	--	--
		4,4'-DDD	--	--	--	--	--	--	--	--	--
		4,4'-DDT	--	--	--	--	--	--	--	--	--
	PAHs	Benzo[a]pyrene	--	--	--	--	--	--	--	--	--
	PCBs	Aroclor-1254	--	--	--	--	--	--	--	--	--
		Aroclor-1260	--	--	--	--	--	--	--	--	--
	SVOCs	bis(2-Ethylhexyl)phthalate	--	--	--	--	--	--	--	--	--
		Dibutylphthalate	--	--	--	--	--	--	--	--	--

Appendix E-8
Estimated Risks to the Mallard Duck

where *HQ = Dose / TRV*

Medium	Type	COPC	Buena Ventura Park Pond	21st Street Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Sediment	Inorganics	Aluminum	7E-02	7E-02	--	3E-02	--	6E-02	4E-02	6E-02	4E-02
		Antimony	--	--	--	--	--	--	--	--	--
		Arsenic	8E-04	1E-03	--	8E-04	--	7E-04	8E-04	2E-03	9E-04
		Barium	2E-02	1E-02	--	9E-03	--	1E-02	5E-03	1E-02	6E-03
		Cadmium	--	--	--	--	--	--	--	--	--
		Chromium	9E-03	1E-02	--	6E-03	--	6E-03	4E-03	6E-03	1E-02
		Copper	--	--	--	--	--	--	--	--	--
		Lead	4E-02	1E-02	--	2E-02	--	2E-02	1E-02	2E-02	2E-02
		Manganese	2E-04	4E-04	--	3E-04	--	3E-04	2E-04	3E-04	2E-04
		Mercury	3E-02	1E-02	--	4E-03	--	2E-02	5E-03	1E-02	8E-03
		Selenium	5E-03	1E-02	--	1E-02	--	9E-04	5E-03	5E-03	3E-03
		Thallium	--	--	--	--	--	--	--	--	--
		Vanadium	1E-03	1E-03	--	7E-04	--	7E-04	5E-04	7E-04	7E-04
		Zinc	1E-02	3E-03	--	2E-03	--	4E-03	3E-03	8E-03	9E-03
	Pesticides	4,4'-DDE	5E-04	2E-03	4E-04	6E-04	3E-04	7E-04	1E-03	2E-03	7E-04
		4,4'-DDD	--	--	--	--	--	--	--	--	--
		4,4'-DDT	4E-04	6E-04	4E-04	2E-03	2E-03	7E-04	1E-03	1E-03	7E-04
	PAHs	Benzo[a]pyrene	--	--	--	--	--	--	--	--	--
	PCBs	Aroclor-1254	9E-05	2E-04	1E-04	7E-04	8E-05	1E-04	9E-05	1E-04	8E-05
		Aroclor-1260	7E-05	6E-04	7E-05	2E-02	5E-04	1E-04	9E-05	9E-05	8E-05
	SVOCs	bis(2-Ethylhexyl)phthalate	1E-03	8E-04	9E-04	3E-04	3E-04	2E-03	3E-04	1E-03	9E-04
		Dibutylphthalate	8E-04	4E-04	3E-03	3E-03	8E-04	6E-03	1E-03	1E-03	4E-04
Soil	Inorganics	Aluminum	--	--	--	--	--	--	--	--	--
		Antimony	--	--	--	--	--	--	--	--	--
		Arsenic	--	--	--	--	--	--	--	--	--
		Barium	--	--	--	--	--	--	--	--	--
		Cadmium	--	--	--	--	--	--	--	--	--
		Chromium	--	--	--	--	--	--	--	--	--
		Copper	--	--	--	--	--	--	--	--	--
		Lead	--	--	--	--	--	--	--	--	--
		Manganese	--	--	--	--	--	--	--	--	--
		Mercury	--	--	--	--	--	--	--	--	--
		Selenium	--	--	--	--	--	--	--	--	--
		Thallium	--	--	--	--	--	--	--	--	--
		Vanadium	--	--	--	--	--	--	--	--	--
		Zinc	--	--	--	--	--	--	--	--	--
	Pesticides	4,4'-DDE	--	--	--	--	--	--	--	--	--
		4,4'-DDD	--	--	--	--	--	--	--	--	--
		4,4'-DDT	--	--	--	--	--	--	--	--	--
	PAHs	Benzo[a]pyrene	--	--	--	--	--	--	--	--	--
	PCBs	Aroclor-1254	--	--	--	--	--	--	--	--	--
		Aroclor-1260	--	--	--	--	--	--	--	--	--
	SVOCs	bis(2-Ethylhexyl)phthalate	--	--	--	--	--	--	--	--	--
		Dibutylphthalate	--	--	--	--	--	--	--	--	--
Fish	Inorganics	Aluminum	--	--	--	--	--	--	--	--	--
		Antimony	--	--	--	--	--	--	--	--	--
		Arsenic	--	--	--	--	--	--	--	--	--
		Barium	--	--	--	--	--	--	--	--	--
		Cadmium	--	--	--	--	--	--	--	--	--
		Chromium	--	--	--	--	--	--	--	--	--
		Copper	--	--	--	--	--	--	--	--	--
		Lead	--	--	--	--	--	--	--	--	--
		Manganese	--	--	--	--	--	--	--	--	--
		Mercury	--	--	--	--	--	--	--	--	--
		Selenium	--	--	--	--	--	--	--	--	--
		Thallium	--	--	--	--	--	--	--	--	--
		Vanadium	--	--	--	--	--	--	--	--	--
		Zinc	--	--	--	--	--	--	--	--	--
	Pesticides	4,4'-DDE	--	--	--	--	--	--	--	--	--
		4,4'-DDD	--	--	--	--	--	--	--	--	--
		4,4'-DDT	--	--	--	--	--	--	--	--	--
	PAHs	Benzo[a]pyrene	--	--	--	--	--	--	--	--	--
	PCBs	Aroclor-1254	--	--	--	--	--	--	--	--	--
		Aroclor-1260	--	--	--	--	--	--	--	--	--
	SVOCs	bis(2-Ethylhexyl)phthalate	--	--	--	--	--	--	--	--	--
		Dibutylphthalate	--	--	--	--	--	--	--	--	--

Appendix E-8
Estimated Risks to the Masked Shrew

where *HQ = Dose / TRV*

Medium	Type	COPC	Buena Ventura Park Pond	21st Street Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Sediment	Inorganics	Aluminum	--	--	--	--	--	--	--	--	--
		Antimony	--	--	--	--	--	--	--	--	--
		Arsenic	--	--	--	--	--	--	--	--	--
		Barium	--	--	--	--	--	--	--	--	--
		Cadmium	--	--	--	--	--	--	--	--	--
		Chromium	--	--	--	--	--	--	--	--	--
		Copper	--	--	--	--	--	--	--	--	--
		Lead	--	--	--	--	--	--	--	--	--
		Manganese	--	--	--	--	--	--	--	--	--
		Mercury	--	--	--	--	--	--	--	--	--
		Selenium	--	--	--	--	--	--	--	--	--
		Thallium	--	--	--	--	--	--	--	--	--
		Vanadium	--	--	--	--	--	--	--	--	--
		Zinc	--	--	--	--	--	--	--	--	--
	Pesticides	4,4'-DDE	--	--	--	--	--	--	--	--	--
		4,4'-DDD	--	--	--	--	--	--	--	--	--
		4,4'-DDT	--	--	--	--	--	--	--	--	--
	PAHs	Benzo[a]pyrene	--	--	--	--	--	--	--	--	--
	PCBs	Aroclor-1254	--	--	--	--	--	--	--	--	--
		Aroclor-1260	--	--	--	--	--	--	--	--	--
	SVOCs	bis(2-Ethylhexyl)phthalate	--	--	--	--	--	--	--	--	--
		Dibutylphthalate	--	--	--	--	--	--	--	--	--
Soil	Inorganics	Aluminum	--	**5E+01**	--	--	--	**8E+01**	**4E+01**	**4E+01**	**4E+01**
		Antimony	--	9E-02	--	--	--	7E-01	1E-01	5E-02	5E-01
		Arsenic	--	8E-01	--	--	--	**2E+00**	3E-01	7E-01	4E-01
		Barium	--	6E-01	--	--	--	8E-01	4E-01	5E-01	6E-01
		Cadmium	--	4E-02	--	--	--	2E-01	3E-02	3E-02	2E-02
		Chromium	--	2E-04	--	--	--	2E-04	1E-04	1E-04	1E-04
		Copper	--	3E-01	--	--	--	4E-01	2E-01	1E-01	4E-01
		Lead	--	6E-01	--	--	--	**3E+00**	4E-01	4E-01	3E-01
		Manganese	--	1E-01	--	--	--	3E-01	1E-01	1E-01	1E-01
		Mercury	--	1E-01	--	--	--	**4E+00**	2E-01	3E-01	2E-01
		Selenium	--	6E-02	--	--	--	1E-02	6E-02	7E-02	4E-02
		Thallium	--	--	--	--	--	--	--	--	--
		Vanadium	--	1E+00	--	--	--	1E+00	9E-01	9E-01	1E+00
		Zinc	--	3E-02	--	--	--	3E-01	4E-02	4E-02	5E-02
	Pesticides	4,4'-DDE	--	--	--	--	--	--	--	--	--
		4,4'-DDD	--	--	--	--	--	--	--	--	--
		4,4'-DDT	--	6E-04	--	--	--	8E-05	2E-04	2E-04	2E-04
	PAHs	Benzo[a]pyrene	--	--	--	--	--	--	--	--	--
	PCBs	Aroclor-1254	--	--	--	--	--	--	--	--	--
		Aroclor-1260	--	2E-01	--	--	--	8E-03	5E-02	1E-02	1E-02
	SVOCs	bis(2-Ethylhexyl)phthalate	--	2E-03	--	--	--	3E-04	4E-04	3E-04	3E-04
		Dibutylphthalate	--	2E-05	--	--	--	6E-06	1E-05	2E-05	1E-05
Fish	Inorganics	Aluminum	--	--	--	--	--	--	--	--	--
		Antimony	--	--	--	--	--	--	--	--	--
		Arsenic	--	--	--	--	--	--	--	--	--
		Barium	--	--	--	--	--	--	--	--	--
		Cadmium	--	--	--	--	--	--	--	--	--
		Chromium	--	--	--	--	--	--	--	--	--
		Copper	--	--	--	--	--	--	--	--	--
		Lead	--	--	--	--	--	--	--	--	--
		Manganese	--	--	--	--	--	--	--	--	--
		Mercury	--	--	--	--	--	--	--	--	--
		Selenium	--	--	--	--	--	--	--	--	--
		Thallium	--	--	--	--	--	--	--	--	--
		Vanadium	--	--	--	--	--	--	--	--	--
		Zinc	--	--	--	--	--	--	--	--	--
	Pesticides	4,4'-DDE	--	--	--	--	--	--	--	--	--
		4,4'-DDD	--	--	--	--	--	--	--	--	--
		4,4'-DDT	--	--	--	--	--	--	--	--	--
	PAHs	Benzo[a]pyrene	--	--	--	--	--	--	--	--	--
	PCBs	Aroclor-1254	--	--	--	--	--	--	--	--	--
		Aroclor-1260	--	--	--	--	--	--	--	--	--
	SVOCs	bis(2-Ethylhexyl)phthalate	--	--	--	--	--	--	--	--	--
		Dibutylphthalate	--	--	--	--	--	--	--	--	--

Appendix E-8
Estimated Risks to the Mink

where *HQ = Dose / TRV*

Medium	Type	COPC	Buena Ventura Park Pond	21st Street Pond	Ogden River - Reach A	Ogden River - Reach B	Ogden River - Reach C	Weber River - Reach A	Weber River - Reach B	Weber River - Reach C	Weber River - Reach D
Sediment	Inorganics	Aluminum	4E-01	4E-01	--	2E-01	--	4E-01	2E-01	4E-01	2E-01
		Antimony	1E-03	7E-04	--	5E-04	--	2E-03	2E-03	2E-03	1E-03
		Arsenic	2E-03	4E-03	--	2E-03	--	2E-03	2E-03	5E-03	3E-03
		Barium	1E-02	5E-03	--	5E-03	--	5E-03	2E-03	5E-03	3E-03
		Cadmium	--	--	--	--	--	--	--	--	--
		Chromium	1E-06	1E-06	--	6E-07	--	6E-07	4E-07	6E-07	1E-06
		Copper	--	--	--	--	--	--	--	--	--
		Lead	2E-03	6E-04	--	7E-04	--	8E-04	5E-04	8E-04	1E-03
		Manganese	9E-04	2E-03	--	1E-03	--	1E-03	8E-04	1E-03	9E-04
		Mercury	8E-03	4E-03	--	1E-03	--	5E-03	2E-03	4E-03	2E-03
		Selenium	8E-04	2E-03	--	2E-03	--	1E-04	7E-04	7E-04	5E-04
		Thallium	3E-04	6E-04	--	3E-04	--	1E-04	8E-05	7E-05	8E-05
		Vanadium	8E-03	8E-03	--	4E-03	--	5E-03	4E-03	5E-03	5E-03
		Zinc	6E-04	2E-04	--	1E-04	--	2E-04	2E-04	5E-04	5E-04
	Pesticides	4,4'-DDE	8E-07	3E-06	5E-07	9E-07	4E-07	1E-06	2E-06	3E-06	1E-06
		4,4'-DDD	--	--	--	--	--	--	--	--	--
		4,4'-DDT	6E-07	9E-07	5E-07	2E-06	3E-06	1E-06	2E-06	2E-06	1E-06
	PAHs	Benzo[a]pyrene	3E-05	1E-02	8E-05	1E-04	5E-05	8E-04	2E-04	5E-05	4E-05
	PCBs	Aroclor-1254	5E-05	9E-05	6E-05	4E-04	4E-05	7E-05	5E-05	5E-05	5E-05
		Aroclor-1260	4E-05	3E-04	4E-05	1E-02	3E-04	7E-05	5E-05	5E-05	5E-05
	SVOCs	bis(2-Ethylhexyl)phthalate	1E-05	1E-05	1E-05	3E-06	4E-06	2E-05	4E-06	1E-05	1E-05
		Dibutylphthalate	8E-08	4E-08	4E-07	3E-07	9E-08	6E-07	1E-07	1E-07	4E-08
Soil	Inorganics	Aluminum	--	--	--	--	--	--	--	--	--
		Antimony	--	--	--	--	--	--	--	--	--
		Arsenic	--	--	--	--	--	--	--	--	--
		Barium	--	--	--	--	--	--	--	--	--
		Cadmium	--	--	--	--	--	--	--	--	--
		Chromium	--	--	--	--	--	--	--	--	--
		Copper	--	--	--	--	--	--	--	--	--
		Lead	--	--	--	--	--	--	--	--	--
		Manganese	--	--	--	--	--	--	--	--	--
		Mercury	--	--	--	--	--	--	--	--	--
		Selenium	--	--	--	--	--	--	--	--	--
		Thallium	--	--	--	--	--	--	--	--	--
		Vanadium	--	--	--	--	--	--	--	--	--
		Zinc	--	--	--	--	--	--	--	--	--
	Pesticides	4,4'-DDE	--	--	--	--	--	--	--	--	--
		4,4'-DDD	--	--	--	--	--	--	--	--	--
		4,4'-DDT	--	--	--	--	--	--	--	--	--
	PAHs	Benzo[a]pyrene	--	--	--	--	--	--	--	--	--
	PCBs	Aroclor-1254	--	--	--	--	--	--	--	--	--
		Aroclor-1260	--	--	--	--	--	--	--	--	--
	SVOCs	bis(2-Ethylhexyl)phthalate	--	--	--	--	--	--	--	--	--
		Dibutylphthalate	--	--	--	--	--	--	--	--	--
Fish	Inorganics	Aluminum	--	--	--	--	--	--	--	--	--
		Antimony	--	--	--	--	--	--	--	--	--
		Arsenic	--	--	--	--	--	--	--	--	--
		Barium	--	--	--	--	--	--	--	--	--
		Cadmium	--	--	--	--	--	--	--	--	--
		Chromium	--	--	--	--	--	--	--	--	--
		Copper	--	--	--	--	--	--	--	--	--
		Lead	--	--	--	--	--	--	--	--	--
		Manganese	--	--	--	--	--	--	--	--	--
		Mercury	--	--	--	--	--	--	--	--	--
		Selenium	--	--	--	--	--	--	--	--	--
		Thallium	--	--	--	--	--	--	--	--	--
		Vanadium	--	--	--	--	--	--	--	--	--
		Zinc	--	--	--	--	--	--	--	--	--
	Pesticides	4,4'-DDE	--	5E-02	--	--	--	--	--	--	--
		4,4'-DDD	--	2E-04	--	--	--	--	--	--	--
		4,4'-DDT	--	2E-04	--	--	--	--	--	--	--
	PAHs	Benzo[a]pyrene	--	--	--	--	--	--	--	--	--
	PCBs	Aroclor-1254	--	--	--	--	--	--	--	--	--
		Aroclor-1260	--	8E-01	--	--	--	--	--	--	--
	SVOCs	bis(2-Ethylhexyl)phthalate	--	4E-03	--	--	--	--	--	--	--
		Dibutylphthalate	--	2E-04	--	--	--	--	--	--	--