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Phase 1 Data Summary Report for the Clinch River Remedial Investigation: Health Risk and Ecological Risk Screening Assessment

ChemRisk Document No. 1078

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Oak Ridge, Tennessee

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Energy Systems Environmental Restoration Program
Clinch River Environmental Restoration Program

Phase 1 Data Summary Report for the Clinch River Remedial Investigation: Health Risk and Ecological Risk Screening Assessment

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Date Issued—December 1992

Prepared by
Environmental Sciences Division
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ESD Publication 4021

Prepared for
U.S. Department of Energy
Office of Environmental Restoration and Waste Management
under budget and reporting code EW 20

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for the
U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-84OR21400

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ABBREVIATIONS

AA	atomic absorption
BB	Braden Branch
BCF	bioconcentration factor
BMAP	Biological Monitoring and Abatement Program
CAS	Chemical Abstract Service
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CR	Clinch River
CR-ERP	Clinch River Environmental Restoration Program
CRM	Clinch River mile
CRRFI	Clinch River RCRA Facility Investigation
CRRI	Clinch River Remedial Investigation
CR/WBR	Clinch River/Watts Bar Reservoir
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
DL	detection limit
DOE	U.S. Department of Energy
EFPC	East Fork Poplar Creek
EPA	U.S. Environmental Protection Agency
ER-L	effects range—low
ER-M	effects range—median
ESD	Environmental Sciences Division
FDA	U.S. Food and Drug Administration
FFA	Federal Facilities Agreement
foc	fractional organic matter content
HDPE	high-density polyethylene
HSWA	Hazardous and Solid Wastes Amendments
ICP	inductively coupled plasma emission spectroscopy
Koc	organic matter/water partitioning coefficient
Kp	partitioning coefficient
LCV	lowest chronic value
LTV	lowest toxic value
NAWQC	National Ambient Water Quality Criteria
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NWQC	National Water Quality Criteria
ORAU	Oak Ridge Associated Universities
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
PCB	polychlorinated biphenyl
PCK	Poplar Creek kilometer
QA	quality assurance
QA/QC	quality assurance/quality control
RCRA	Resource Conservation and Recovery Act of 1976

RfD	reference dose
RI	remedial investigation
SARA	Superfund Amendments and Reauthorization Act of 1986
SI	screening indices
SQL	sample quantitation limit
TDEC	Tennessee Department of Environment and Conservation
TRM	Tennessee River mile
TVA	Tennessee Valley Authority
UCL	upper confidence limit
WBR	Watts Bar Reservoir
WOCE	White Oak Creek Embayment

EXECUTIVE SUMMARY

The Clinch River Remedial Investigation (CRRI) is designed to address the transport, fate, and distribution of waterborne contaminants released from the U.S. Department of Energy's (DOE's) Oak Ridge Reservation (ORR) and to assess potential risks to human health and the environment associated with these contaminants. The contaminants released since the early 1940s include a variety of radionuclides, metals, and organic compounds. Primary areas of investigation are Melton Hill Reservoir, the Clinch River from Melton Hill Dam to its confluence with the Tennessee River, Poplar Creek, and Watts Bar Reservoir. The receiving river-reservoir system encompasses 140 river miles in length and 44,000 acres in surface area and is used for municipal water supply, sport fishing, navigation, boating, swimming, tourism, and residential development. The contaminants identified in the Clinch River/Watts Bar Reservoir (CR/WBR) downstream of the ORR are those associated with the water, suspended particles, deposited sediments, aquatic organisms, and wildlife feeding on aquatic organisms.

A phased remedial investigation of the CR/WBR system is underway to (1) define the nature and extent of the off-site contamination, (2) evaluate associated environmental and human health risks, and (3) preliminarily identify and evaluate potential remediation alternatives. The purpose of this report is to summarize the results of Phase 1 of the CRRI.

Phase 1 of the CRRI was a preliminary sampling and analysis of fish, sediment, and water in selected areas of the CR/WBR chosen to represent differing levels of media contamination. Specifically, Phase 1 was designed to (1) obtain high-quality data to confirm existing historical data for contaminant levels in fish, sediment, and water from the CR/WBR; (2) determine the range of contaminant concentrations present in the river-reservoir system; (3) identify specific contaminants of concern; and (4) establish the reference (background) concentrations for those contaminants. Previously, scoping studies were conducted to provide an initial determination of contaminant distribution, in the sediments of Watts Bar Reservoir (Olsen et al. 1992) and to preliminarily assess potential human health and ecological risk (Suter 1991; Hoffman et al. 1991).

For Phase 1 of the CRRI, the CR/WBR system was divided into ten reaches, six of which are potentially affected by releases from the ORR. The other four reaches serve as reference areas. Contaminant concentrations for fish, sediment, and water were summarized for each of the 10 reaches. Analytes detected at least once in a reach were evaluated separately from those never measured above their analytical detection limit (i.e., nondetected).

In water samples collected during Phase 1, inorganic and organic constituents with the potential to pose a risk to human health or the environment were within the ranges reported previously in monitoring reports (e.g., Kornegay et al. 1991). Each inorganic contaminant detected during the Phase 1 investigation is well below the water quality criteria promulgated by the Tennessee Department of Environment and Conservation (rules of the Tennessee Department of Environment and Conservation, Chapter 1200-4-3).

The majority of potential contaminants of concern in Phase 1 water samples were detected between White Oak Creek and Poplar Creek on the Clinch River (reach 2) and in

the Poplar Creek downstream of the confluence with East Fork Poplar Creek, which receive effluents from several ORR sources for these contaminants. Total copper and zinc were detected in reach 2 surface waters and had values in the range of those previously observed (Kornegay et al. 1991). Dissolved lead, observed in water samples from Poplar Creek upstream of the confluence with East Fork Poplar Creek, may originate from an upstream source.

The Oak Ridge Y-12 Plant, the city of Oak Ridge wastewater treatment facility, and Oak Ridge K-25 Site operations are among the possible sources for mercury, silver, and lead detected in water samples from Poplar Creek downstream of the confluence with East Fork Poplar Creek. Elevated levels of cadmium and lead in water samples from the Clinch River between Poplar Creek and the confluence with the Tennessee River may originate from several sources in and upstream from this reach.

Concentrations of all radiological constituents in Phase 1 water samples were within the ranges of those observed during environmental monitoring (Kornegay et al. 1991) and with previous scoping investigations (Olsen et al. 1992). Dissolved ^{137}Cs and particle-associated ^{137}Cs were detected in the Clinch River arm of Watts Bar Reservoir and Watts Bar Reservoir downstream of the confluence with the Clinch River, with values similar to those reported previously for these reaches. Dissolved ^{137}Cs was detected in Poplar Creek downstream of the confluence with East Fork Poplar Creek, possibly a result of backflow from the Clinch River. Cobalt-60 in Watts Bar Reservoir below the entry of the Clinch was detected at levels comparable with those reported previously. Average ^{90}Sr values for all reaches never exceeded drinking water standards. Each of these radionuclides is currently released in permitted discharges from the ORR to surface waters.

Data resulting from the measurement of inorganic, organic, and radiological contaminants from the Phase 1 water sampling, in combination with historical data, indicate that a focused characterization effort in Phase 2 is warranted for Poplar Creek downstream of the confluence with East Fork Poplar Creek and for the Clinch River arm of Watts Bar Reservoir. Additionally, a more thorough characterization of reference sites is needed to rigorously establish background concentrations in surface water.

Concentrations of ^{137}Cs in surface sediments (0 to 10 cm) in near-shore areas of Norris, Melton Hill Reservoirs, and the Tennessee River arm of Watts Bar Reservoir should represent background levels (<1.0 pCi/g) because they are upstream of ORR and only received fallout from atmospheric testing of nuclear weapons. Concentrations in Poplar Creek and the Emory River average 1 pCi/g, which is consistent with background concentrations. Cesium-137 concentrations in the near-shore surface sediments in the Clinch River arm of Watts Bar Reservoir are between 2 and 3 pCi/g. Concentrations in Watts Bar Reservoir below the confluence of the Tennessee and Clinch rivers are usually less than 1 pCi/g, which are equivalent to background concentrations. Three areas within the Clinch River arm of Watts Bar Reservoir had concentrations between 10 and 34 pCi/g in surface sediment and will be targeted for sampling and analysis during Phase 2 of the CRRI. Samples collected at these areas will be analyzed for the contaminants identified by the risk screening as requiring further research.

Patterns of inorganic contaminants in sediment core samples indicate that there are multiple sources for these contaminants. Arsenic, beryllium, cadmium, chromium, copper, and mercury in Poplar Creek and the downstream portion of the Clinch River arm of Watts Bar Reservoir appear to be originating, at least in part, from Poplar Creek. Mercury releases from the Oak Ridge Y-12 Plant into the Poplar Creek system are well documented (Olsen et al. 1992, Turner et al. 1985). The other metals may be derived from disposal of coal fly-ash material and photographic processing chemicals from the Oak Ridge K-25 Site or from the municipal wastewater treatment facility for the city of Oak Ridge. Concentrations of cadmium, lead, and zinc are higher in the sediments in Watts Bar Reservoir below the confluence of the Tennessee River and Clinch River than elsewhere in the system, suggesting that there are sources of these contaminants to the Tennessee River arm of the reservoir or to WBR below the confluence of the two rivers. Phase 2 sampling and analysis will focus on locating any areas where concentrations of these contaminants pose an elevated risk to human health and the environment.

The lack of detectable quantities in sediment samples of most of the 92 organic chemicals for which analyses were conducted allows significant reduction in the list of organic contaminants requiring further study. Flouranthene, phenanthrene, and pyrene were found in Poplar Creek downstream of the confluence with East Fork Poplar Creek and in the Clinch River arm of Watts Bar Reservoir. Aroclor 1254 was found only in sediments at Clinch River Mile 9.5, which is immediately downstream of Poplar Creek. Potential sources for these contaminants in sediment are ORNL, the Y-12 Plant, the K-25 Site, and the municipal wastewater treatment facility. Sampling and analysis for these contaminants in Poplar Creek downstream of the confluence with East Fork Poplar Creek and in the Clinch River arm of Watts Bar Reservoir will continue in Phase 2 with the objective of identifying and delineating any areas requiring remediation.

Alpha-emitting radionuclides were detected in every site sampled for sediments. However, concentrations were all at or near background concentrations, except in Poplar Creek downstream of the confluence with East Fork Poplar Creek. Concentrations of ^{234}U, ^{235}U, and ^{238}U in Poplar Creek sediments were above background levels. Poplar Creek downstream of the confluence with East Fork Poplar Creek will be the focus of study for these contaminants during Phase 2 activities.

In order to characterize the nature and extent of contamination in the biota of the CR/WBR system, 126 bluegill sunfish, 119 channel catfish, and 43 largemouth bass were sampled from 15 sites in 8 reaches. These fish species were chosen for sampling by virtue of their positions in the foodweb, their migration/mobility behavior, and relative availability. Of the 77 organic and 13 inorganic analytes, a majority (63 organics and 7 inorganics) were not detected in fish at any site. Of the radionuclides, only ^{137}Cs, ^{60}Co, and ^{90}Sr were detected in fish. Four analytes were rarely detected, occurring in less than 5% of the samples. Seventeen analytes were detected in more than 5% of the samples, with only three of those (^{90}Sr, mercury, and zinc) detectable in all samples.

In general, the Phase 1 maxima (individual maximum concentration of an analyte at each site) for fish are lower than those from previous sampling. Exceptions to this generality are mercury, selenium, and Aroclor 1260. Maximum values of mercury in fish collected in Phase 1 were higher than historical values only in lower Watts Bar Reservoir, and at no sites did the

maximum mercury concentration exceed the Food and Drug Administration's (FDA's) action level of 1.0 mg/kg. Selenium maxima in fish exceeded historical values in Poplar Creek downstream of the confluence with East Fork Poplar Creek and in the Clinch River upstream of Poplar Creek and below Melton Hill Reservoir. Aroclor 1260 (a PCB congener) maxima exceeded historical values in Poplar Creek downstream of the confluence with East Fork Poplar Creek and in the Clinch River below Poplar Creek. Average values of Aroclor 1260 in fish did not exceed 1.0 mg/kg at any site or within any reach, but Aroclor 1260 maxima in fish exceeded the FDA action level of 2.0 mg/kg at one site in Melton Hill Reservoir, one site in Poplar Creek, and three sites in the Clinch River arm of WBR.

Mean concentrations of some contaminants in fish at some CR/WBR sites were higher than the concentrations at the reference site (Norris Reservoir). Arsenic concentrations were significantly ($P < 0.05$) higher than concentrations at the reference site at only one location (CRM 0.5). In Poplar Creek below the confluence with East Fork Poplar Creek and at the first site downstream of the confluence of Poplar Creek and the Clinch River (Brashear Island), mercury concentrations in fish were predictably higher than those of the reference sites. Selenium concentrations in fish were higher than those in the reference site in main channel sites in the upper part of the system (Upper Melton Hill to Brashear Island). Zinc concentrations in fish at 5 of the 12 sites were higher than those at the reference site, but no obvious spatial distribution was evident. Chlordane concentrations in fish from Upper Melton Hill to the mouth of the Clinch River were higher than reference concentrations. Total PCB concentrations at all CR/WBR sites were higher than those in fish from the reference site (Norris Reservoir). Cesium-137 levels for all fish species were usually higher than the reference, particularly below the confluence of White Oak Creek and the Clinch River. Concentrations of ^{137}Cs and mercury in fish are both elevated at sites downstream of known sources of these contaminants, White Oak Creek and East Fork Poplar Creek, respectively. No such patterns of downstream gradients of chlordane or PCBs in fish are evident.

A screening assessment of ecological effects in the CR/WBR was conducted concurrently with the health screening assessment. The ecological screening assessment considered potential toxic effects on aquatic biota due to exposure to contaminants in water, potential toxic effects to benthic and epibenthic organisms due to contaminants in sediment, and risks to piscivorous wildlife due to ingestion of contaminants in fish flesh. The assessment was performed by comparing chemical concentrations in media to screening benchmarks that are either regulatory criteria or concentrations that are estimated to have minimal effects on the abundance or production of exposed populations. The screening ecological risk assessment for Phase 1 identified 14 contaminants of concern among the chemicals that were analyzed for and detected in water, sediment, or fish fillets. In addition, 19 chemicals that were not detected were identified as potential contaminants of concern because their limits of detection exceed screening benchmarks.

Comparison of media concentrations to toxicological benchmarks produced ambiguous results because of the large number of chemicals that were not detected but had limits of detection higher than potentially toxic concentrations. However, the number of potential contaminants of concern is much lower than in previous screening assessments because of generally lower contaminant concentrations than in the historical data, use of bioavailable (dissolved) concentrations of metals in water rather than total concentrations, and use of better screening benchmarks for metals in sediment.

A screening analysis using human health risk methodology similar to the approach used in Hoffman et al. (1991) to screen historical data was conducted with data collected during Phase 1 of the CRRI. The purpose of this screening exercise, along with the results obtained in Hoffman et al. (1991), is to help guide the development of the Phase 2 sampling plan, which will focus the collection of data on contaminants of concern. A future baseline risk assessment will be completed when data from the Phase 2 sampling are available.

Conservatively biased risk estimates were used to identify contaminants, exposure pathways, and river and reservoir reaches that have a low priority for further investigations. It is highly unlikely that these conservative estimates will underestimate the potential maximum exposure to an individual residing in the vicinity of the Clinch River where it receives releases of effluents from the ORR. Nonconservative estimates of risk were used to identify contaminants, pathways, and reaches that have a high priority for further investigation. These nonconservative estimates are more realistic than the conservatively biased estimates and should not substantially overestimate maximum exposures to local populations or subgroups.

The primary pathways examined were exposure to three media: fish, near-shore surface sediments, and surface water. Currently, there is not a realistic direct exposure pathway to deep sediment, where the highest concentrations of particle-reactive contaminants have been observed (Olsen et al. 1992). However, a dredging scenario was included in the screening analysis to evaluate potential exposure pathways if the sediment should be dredged and placed up on the shore. In addition to the direct exposure pathways from exposed sediment (ingestion and external exposure to radionuclides) included in the dredging scenario, secondary pathways were also considered (ingestion of meat, milk, and vegetables produced on dredged sediments). The dredging scenario depended on mathematical models to determine the concentration of contaminants in the agricultural products. Because the models are designed to increase the conservatism of the results, the dredging scenario was used only to identify contaminants of low priority for further investigation.

Nonconservative screening of data for the fish ingestion pathway identified Aroclor 1260, a carcinogenic PCB, as a high-priority contaminant requiring immediate consideration for further investigation and potential remedial action for all reaches except reference reach 10 (Norris Reservoir). This contaminant was identified previously in Hoffman et al. (1991) as a high-priority contaminant. Other investigations have shown that PCBs contaminate most eastern Tennessee rivers and lakes, and although ORR is a probable source, it is not the only source of PCBs for the Clinch River and Tennessee River system. The Tennessee Department of Environment and Conservation has issued fish consumption advisories for several eastern Tennessee reservoirs (e.g., Fort Loudoun, Watts Bar, Melton Hill) as a result of PCB contamination.

None of the noncarcinogens that were analyzed in fish were identified as high priority contaminants. Conservative screening indicated that radionuclides (^{60}Co, ^{137}Cs, and ^{90}Sr) found in fish sampled during Phase 1 could be assigned a low priority for future consideration in all reaches except for ^{137}Cs in the Clinch River arm of Watts Bar Reservoir. Conservative screening identified several carcinogens and noncarcinogens that had been identified previously (Hoffman et al. 1991) as requiring further investigation in fish (i.e., Aroclor 1254, chlordane, arsenic, beryllium, mercury, and selenium).

Nonconservative screening of the ^{137}Cs and ^{60}Co data from surface-sediment samples from near-shore areas did not identify these radionuclides as high priority contaminants. Conservative screening identified ^{60}Co and ^{137}Cs, the only contaminants for which the samples were analyzed, as low priority in all reaches for the ingestion and inhalation pathways. In the external exposure pathway, ^{137}Cs was identified in Poplar Creek downstream of the mouth of East Fork Poplar Creek and in Melton Hill and Watts Bar reservoirs, and ^{60}Co in Poplar Creek and the Clinch River arm of Watts Bar Reservoir as contaminants requiring further investigation. However, Melton Hill Reservoir and the Tennessee River arm of WBR do not receive effluents from the ORR; therefore, the levels of ^{137}Cs found in the surface sediments of these reaches are background levels. A known source of ^{60}Co exists on the Clinch River upstream of the ORR, and it probably influences the screening indices for ^{60}Co in the Clinch River (Appendix G).

The results of the screening analysis for the water ingestion pathway should be viewed with caution because of the limited numbers of samples and because source monitoring data were used as estimates of concentrations in the reservoir. Thorium-228 was tentatively designated as a high priority contaminant in Poplar Creek downstream of the confluence with East Fork Poplar Creek in the water ingestion pathway. However, this designation results from including data from source monitoring sites. The monitoring data should be evaluated further before ^{228}Th, which is a daughter of ^{232}U and naturally occurring ^{232}Th, is designated a high priority contaminant. Screening of the water ingestion pathway showed that Poplar Creek, which receives effluents from the K-25 Site and from the Y-12 Plant and the city of Oak Ridge west-end sewage treatment plant via East Fork Poplar Creek, has the greatest number of contaminants that require further investigation. In the other reaches, most of the contaminant values were below detection limits or are considered low priority for further investigation.

In the dredging scenario, conservative screening was conducted on two direct pathways—external exposure and ingestion—and three secondary pathways—ingestion of meat, milk, and vegetables. Conservative screening of the secondary pathways identified many organic and inorganic contaminants in all reaches that could be assigned low priority for further investigation. Except for ^{137}Cs and to a lesser extent ^{60}Co and ^{90}Sr, most radionuclides for which data were available were assigned low priority for the secondary pathways in all reaches.

Nonconservative screening was conducted for contaminants that had concentrations below analytical detection limits to identify contaminants for which either better analytical methodology is needed or for which source-term data are needed.

Results from Phase 1 of the CRRI indicate that Poplar Creek and the Clinch River arm of Watts Bar Reservoir are the reaches of greatest concern based on the number of contaminants that need further evaluation during Phase 2 of the remedial investigation.

The screening assessment of risk to the environment for Phase 1 indicates that cadmium, mercury and silver in water need to be further investigated to determine the risk to aquatic biota in the CR/WBR system. Arsenic, lead, mercury, and zinc in sediments of the CR/WBR system, which may pose a risk to benthic dwelling organisms, need to be further assessed

during Phase 2. More detailed sampling, analysis, and assessment are needed during Phase 2 of the CRRI to conduct the baseline assessment for ecological risk.

For assessment of the risk to human health, the Phase 1 fish data are the most complete. The Phase 2 sampling for fish should concentrate on providing statistically valid data for a future baseline assessment of human health risk. Additional samples of water need to be collected and analyzed in surface water areas proximate to the ORR outfalls and sources to provide data for the baseline assessment of human health risk. Organic and inorganic contaminants common to eastern Tennessee and other metropolitan areas should be identified through further analysis of the available data for downstream and reference reaches. Analysis of organic contaminants in water and sediment should concentrate on those contaminants that are routinely released or have been released in the past from the ORR. The Phase 2 sampling and analysis should concentrate on previously identified contaminants in Poplar Creek downstream of the mouth of East Fork Poplar Creek and in the Clinch River arm of Watts Bar Reservoir to provide statistically valid data for a baseline risk assessment.

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1. INTRODUCTION

The purpose of this report is to present and discuss the results of Phase 1 of the Department of Energy's (DOE) remedial investigation (RI) of the Clinch River/Watts Bar Reservoir (CR/WBR) system. A screening risk assessment for human and ecological risk is used to identify contaminants, environmental pathways, and sites in the river and reservoir that require further investigation during Phase 2 of the RI.

The Clinch River RI (CRRI) focuses on the portions of the Clinch and Tennessee rivers that may have been adversely affected by contaminants that were released from DOE's Oak Ridge Reservation (ORR) from the mid-1940s to present. The contaminants released from the ORR to the Clinch and Tennessee rivers originated from research, industrial, and waste disposal activities conducted on the ORR at Oak Ridge National Laboratory (ORNL), the Oak Ridge Gaseous Diffusion Plant (now known as the K-25 Site), and the Y-12 Plant. The contaminants released from these facilities into the Clinch River include a variety of radionuclides, metals, and organic compounds.

Melton Hill Reservoir and the Clinch River, downstream from Melton Hill Dam, form the southern and eastern boundaries of the ORR (Fig. 1.1). All surface water draining the ORR eventually enters the Clinch River system. The Clinch River flows into the Tennessee River system of multiple-purpose impoundments near Kingston, Tennessee, 34 km downstream from the ORR (Fig. 1.1). Watts Bar Reservoir extends from Watts Bar Dam at Tennessee River Mile (TRM) 529.9 to Fort Loudoun Dam at TRM 602.3, and up the Clinch River to Melton Hill Dam at Clinch River Mile (CRM) 23.1. Chickamauga Reservoir is the next mainstream impoundment downstream of Watts Bar Dam. Watts Bar Reservoir is large, encompassing 140 river miles in length and 44,000 acres in surface area, and is used for municipal water supply, sport fishing, boating, swimming, tourism, and residential development. The CR/WBR system receives effluents from DOE facilities on the ORR, as well as effluents from municipal and industrial water treatment facilities and runoff from agricultural and urban areas.

DOE's ORR was added to the National Priority List (NPL) in December 1989. A Federal Facilities Agreement (FFA) [under Sect. 120 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendment and Reauthorization Act (SARA) and Sect. 6001 of the Resource Conservation and Recovery Act (RCRA) of 1976] between DOE, the U.S. Environmental Protection Agency (EPA) Region IV, and the Tennessee Department of Environment and Conservation (TDEC) became effective on January 1, 1992. These parties intend to coordinate DOE's CERCLA/RCRA response obligation with corrective measures required and conducted by DOE under its current permit under the Hazardous and Solid Waste Amendments (HSWA) to RCRA of 1984. Section 3004(v) of the HSWA of RCRA specifically addresses requirements for corrective actions for releases of hazardous wastes or constituents beyond the boundaries of RCRA-permitted sites. In addition TDEC, DOE, and EPA expect that the response actions under the FFA, together with corrective measures, will achieve comprehensive remediation of releases and potential releases of contaminants from the ORR. The CRRI is being conducted in compliance with the FFA and with Sect. 3004(v) of RCRA.

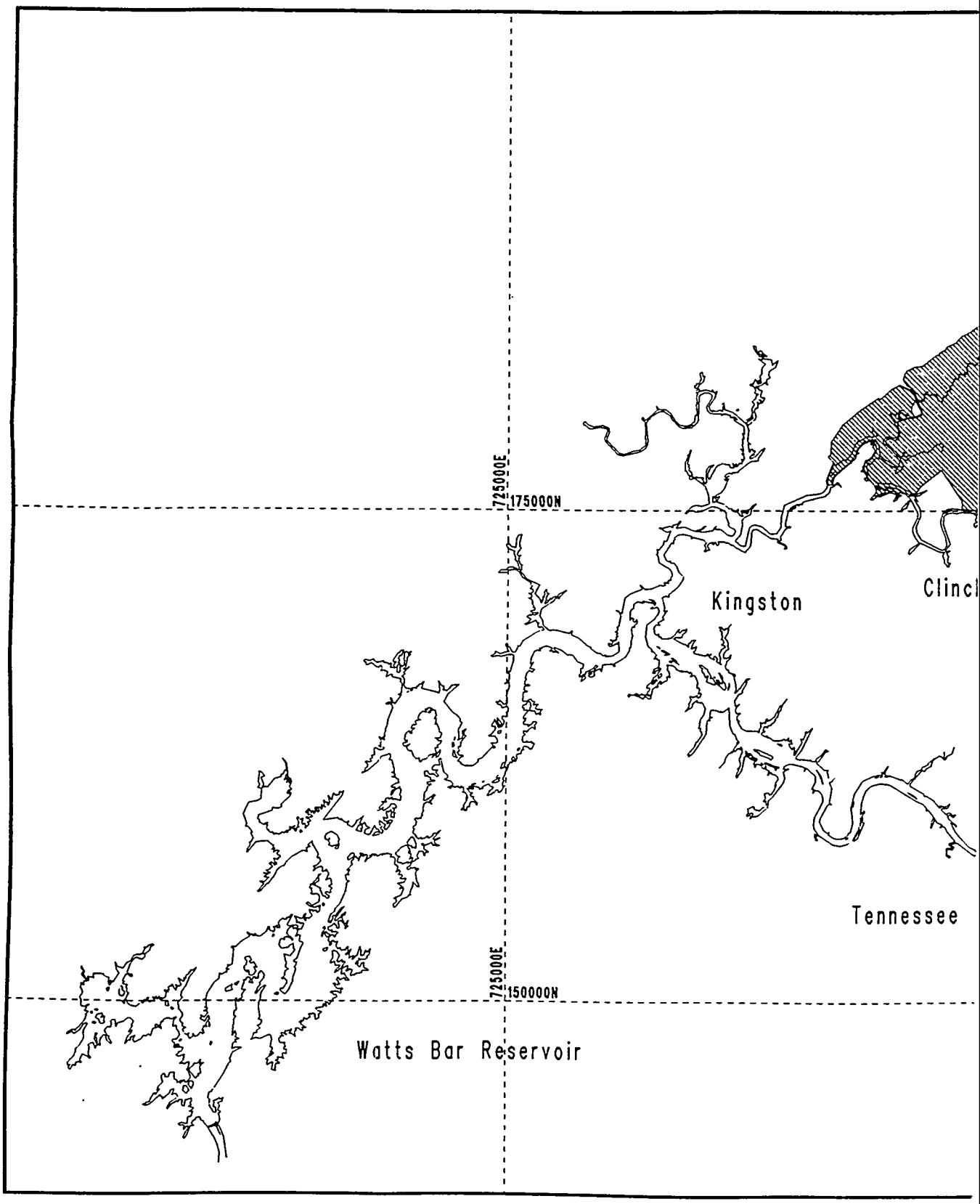
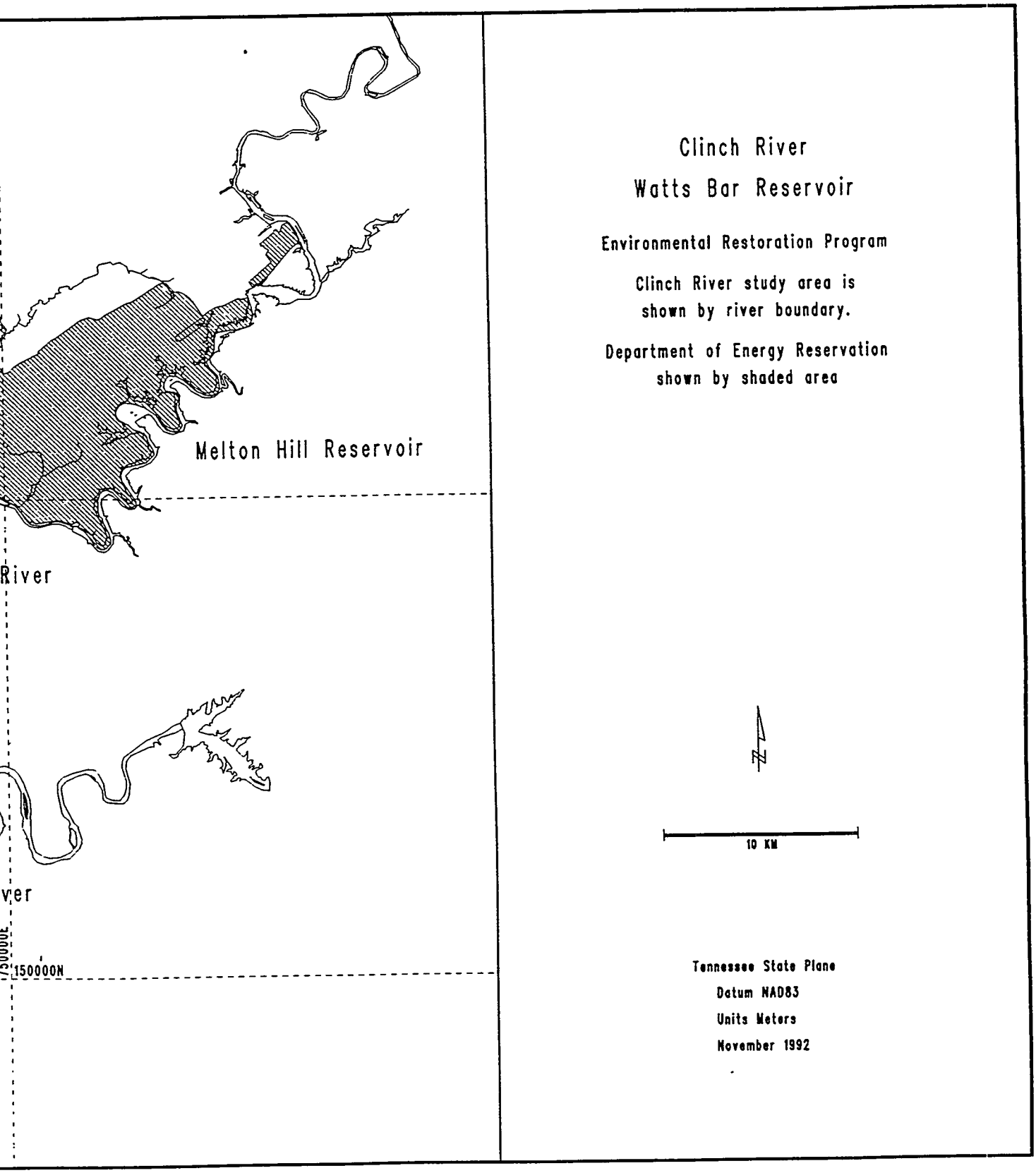


Fig. 1.1. Map showing the location of the Clinch R



er, Watts Bar Reservoir, and DOE's Oak Ridge Reservation.

1.1 OBJECTIVES AND APPROACH OF THE CLINCH RIVER REMEDIAL INVESTIGATION

The primary objectives of the CRRI (Martin Marietta Energy Systems 1990) are to

- define the nature and extent of contamination of the off-site surface water and sediment environment downstream from the ORR, which resulted from operations and waste disposal activities at DOE's facilities on the ORR;
- quantify any risk to human health and to the environment resulting from the existing off-site contamination; and
- preliminarily identify and evaluate potential corrective measures and remedial action alternatives.

A phased approach is being employed in the CRRI because a large number of samples potentially may be required to characterize such a large and complex river and reservoir system. The phased approach relies heavily on iterative screening-level risk analysis for estimating human and ecological health and is based on obtaining the data needed for risk analyses and for evaluating remediation alternatives (Fig. 1.2). Primary components of the phased approach include scoping, Phase 1, and Phase 2 studies.

The scoping studies were performed before the work plan for the CRRI was developed and approved. In the scoping studies, extant data were synthesized and used in a screening-level risk analysis, which served to (1) preliminarily identify contaminants of concern in the CR/WBR system and (2) identify areas of the river and reservoir in which additional data collection was necessary for site characterization, risk assessment, and evaluation of remediation alternatives. The scoping studies were summarized in Olsen et al. (1992), Suter (1992), and Hoffman et al. (1991).

The Phase 1 study followed the scoping study and consisted of a preliminary sampling and analysis in areas selected to represent differing levels of contamination (including reference sites located upstream from the ORR). The objectives of the Phase 1 study were to (1) obtain high-quality data to confirm and modify preliminary results from the scoping study, (2) determine the range of contaminant concentrations present in the off-site environment, (3) identify the contaminants of concern, and (4) establish the reference concentrations for those contaminants. The Phase 1 study has been completed and is summarized in this report.

The objectives of the Phase 2 study are to (1) perform iterative risk analyses as additional data become available, (2) quantitatively estimate potential risks to human health and the environment, and (3) focus additional sampling efforts. These risk analyses will guide more extensive sampling and analysis and risk assessment, ultimately leading to a baseline risk assessment presented in a final RI report. In addition, the Phase 2 study will include a preliminary evaluation of potential remediation alternatives and identification of effective and acceptable corrective measures. The Phase 2 study is presently in the planning stages.

After the Phase 1 sampling and analysis began, a task was initiated to characterize the near-shore sediment in the CR/WBR. The primary objective of the near-shore sediment task is to provide information on the risks posed to human health from surface sediments (between 0 and 10 cm depth in the sediments) in shallow waters of the near-shore areas.

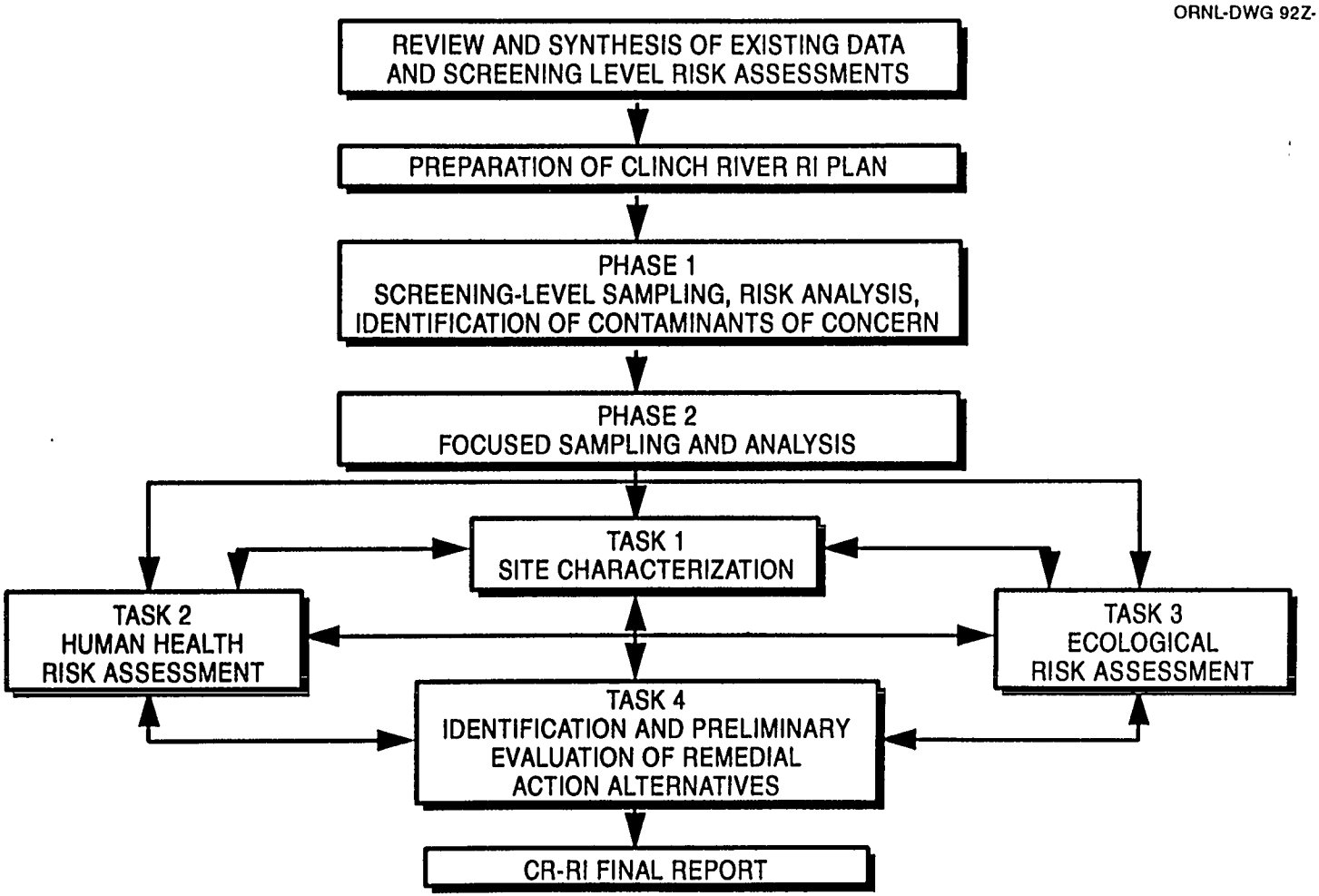


Fig. 1.2. The phased approach used in the Clinch River Remedial Investigation.

These sediments are exposed to the air during the winter season, when the water levels in these reservoirs are lowered as part of the water management activities of the Tennessee Valley Authority (TVA). This task supports the efforts of the TVA and the U.S. Army Corps of Engineers to evaluate permit applications for sediment-disturbing activities (e.g., dredging for private boat access channels, installation of boat docks, shoreline stabilization). An interagency working group composed of the TVA, the Corps of Engineers, DOE, TDEC, EPA, and staff from the CRRI preliminarily evaluates the levels of contamination prior to TVA and the Corps performing their evaluation. Almost 600 surface sediment samples in near-shore areas of Watts Bar Reservoir and the Clinch River were collected as part of this task and are discussed in Sects. 3 and 4.

1.2 SUMMARY OF THE SITE CONCEPTUAL MODEL

A site conceptual model was formulated in Martin Marietta Energy Systems (1990) to identify and summarize the current knowledge and understanding of contaminant sources, the potential environmental pathways of contaminant exposure (including transport media and exposure routes), and the potential receptors for contaminants that may have been released from the ORR to downstream surface waters.

A complicating factor in identifying sources and media for the CRRI site conceptual model is that there also may be non-DOE sources of contaminants to the CR/WBR. The Clinch and Tennessee rivers receive inputs from municipalities, agricultural activities, and industries that may contribute contaminants to the media, pathways, and endpoints of concern.

Operations and waste disposal activities at the Y-12 Plant, ORNL, and the K-25 Site on the ORR have been sources of a variety of airborne, liquid, and solid contaminants. Some of these contaminants have affected local streams that ultimately drain into the CR/WBR. For the CRRI, the contaminants identified in the CR/WBR were transported by surface water from the point of release on the ORR to the location being investigated. Therefore, the media of concern in the CRRI are those associated with the surface water environment downstream from the ORR: the water itself, suspended particles and sediments, deposited sediments, aquatic organisms, and wildlife feeding on aquatic organisms.

The deposited sediments also serve as a secondary source of contaminants. For many contaminants found in deposited sediments (i.e., particle-reactive contaminants), the largest releases occurred 20 to 40 years ago (Martin Marietta Energy Systems 1990). These contaminated sediments were buried by sediments that contain much lower levels of contaminants (Turner et al. 1985; Olsen et al. 1992). Unusual storm events or dredging activities may resuspend these deeply buried contaminated sediments and reintroduce contaminants into the water column or into the aquatic food chain.

In the CR/WBR system, the highest potential exposure to contaminants released from the ORR occurs at several spatial scales. The highest potential exposure to dissolved contaminants in off-site surface waters should occur at the ORR boundary, where surface water flows from the reservation to the public domain. Exposure points with lower predicted chemical concentrations, but larger potentially exposed receptor populations, are locations of municipal water supply intakes. Points of high potential exposure to particle-associated

contaminants occur at points of sediment deposition and accumulation. A major effort of the planned Phase 2 study in the CRRI is to locate areas of high rates of sediment and contaminant accumulation.

The primary exposure routes for the environment (aquatic biota and wildlife feeding on aquatic biota) are uptake and metabolism of dissolved contaminants, direct contact or exposure, absorption, and ingestion of contaminated food organisms or particulate matter. The primary exposure routes of greatest potential risk to human health are ingestion of contaminated water, ingestion of contaminated food (e.g., fish, waterfowl, or vegetables grown on contaminated sediment or soil), direct ingestion of contaminated sediment or soil), and direct exposure to contaminated sediment or soil.

The results of the scoping studies conducted by the CRRI confirm this conceptual site model and further indicate that ingestion of contaminated biota and direct exposure to contaminated sediments are the greatest potential exposure pathways.

1.3 REPORT ORGANIZATION

The CRRI Phase 1 Data Summary Report is organized to provide the flow of information from the objectives and phased approach of the CRRI, to the description of Phase 1 data, and to discussion of the screening risk assessment.

In the first volume, Sect. 1 introduces the objectives and approach of the study and provides the regulatory background. Section 2 presents (1) a description of the study area and sampling sites for fish, sediment, and water; (2) methods used for sample collection and analysis; and (3) a brief description of the quality assurance program for Phase 1.

The contaminant concentrations in fish, sediment, and water, based on the Phase 1 data, is summarized in Sect. 3. The risk screening analyses are presented in Sect. 4 for human and ecological health. Section 5 summarizes the Phase 1 results and describes how these results lead to program activities in Phase 2. Supporting information about Phase 1, including summary tables of the analytical data, are collected in Appendixes A through G.

2. PHASE 1 SAMPLE COLLECTION AND ANALYSIS

This section briefly summarizes the rationale and methods for the collection and analysis of water, sediment, and fish samples for Phase 1 of the CRRI. A complete description of the rationale and methods may be found in the Clinch River RCRA Facility Investigation Work Plan (Martin Marietta Energy Systems 1990).

The primary areas of investigation during Phase 1 of the CRRI were the Melton Hill and Watts Bar Reservoirs, with particular emphasis on the Clinch River arm of Watts Bar Reservoir (Melton Hill to the Clinch River—Tennessee River confluence) and Poplar Creek. Phase 1 sampling from these areas occurred from December 1989 to February 1990 for water, October 1989 to April 1990 for fish, and December 1989 to July 1990 for sediment. For the purposes of sampling and analysis, the CR/WBR system was partitioned into reaches (Fig. 2.1, Table 2.1), following those identified by Hoffman et al. (1991). The number of samples collected in each reach for each medium type (water, fish, and sediment) is listed in Table 2.2 and in the section corresponding to that medium. A list of analytes for each medium, with cross-reference to its Chemical Abstract Service (CAS) number, is found in Appendix A.

2.1 WATER

Surface water is the primary transport pathway for contaminants leaving the reservation. It is also the principal exposure medium for the initial introduction of dissolved (non-particle-associated) contaminants into the food web. The complex hydrodynamics and spatial heterogeneity of the CR/WBR system make it difficult to adequately estimate the temporal and spatial extent of surface water contamination, even with a large number of samples (Martin Marietta Energy Systems 1990). The monitoring of NPDES permitted discharges from the ORR for NPDES and DOE Order 5400.1 provides considerable additional information on contaminant concentrations near discharge points.

Phase 1 sampling of water was undertaken to confirm suspected low dissolved concentrations of contaminants that were identified in scoping studies (Suter 1991, Hoffman et al. 1991, Olsen et al. 1992). Accordingly, characterization of the nature and extent of surface water contamination in the CR/WBR system during Phase 1 of the CRRI was limited to a single sampling event for each station (Fig. 2.2). The focus of the first phase of CRRI sample collection was sediment and biota.

Water samples were analyzed for inorganic, radiochemical and organic constituents, as listed in Table 2.3. Field chain-of-custody was established for these samples at the time of collection and maintained throughout processing, handling, transport, and transfer to other analytical laboratories. All sample collection devices were cleaned following appropriate procedures identified in Martin Marietta Energy Systems 1990. Water samples were collected from Norris Reservoir; upper Melton Hill Reservoir; Solway; lower Melton Hill Reservoir; Jones Island; the mouth of Grassy Creek mbayment; Poplar Creek at the Hartland Bridge; four sites within Poplar Creek below the mouth of East Fork; Brashear Island; Kingston City park; and upper, mid and lower Watts Bar Reservoir (Table 2.4). Additional samples for contaminant screening from public water intake structures and beaches in the CR/WBR system were collected by the TVA in 1991 (TVA 1991). Samples were collected using clean

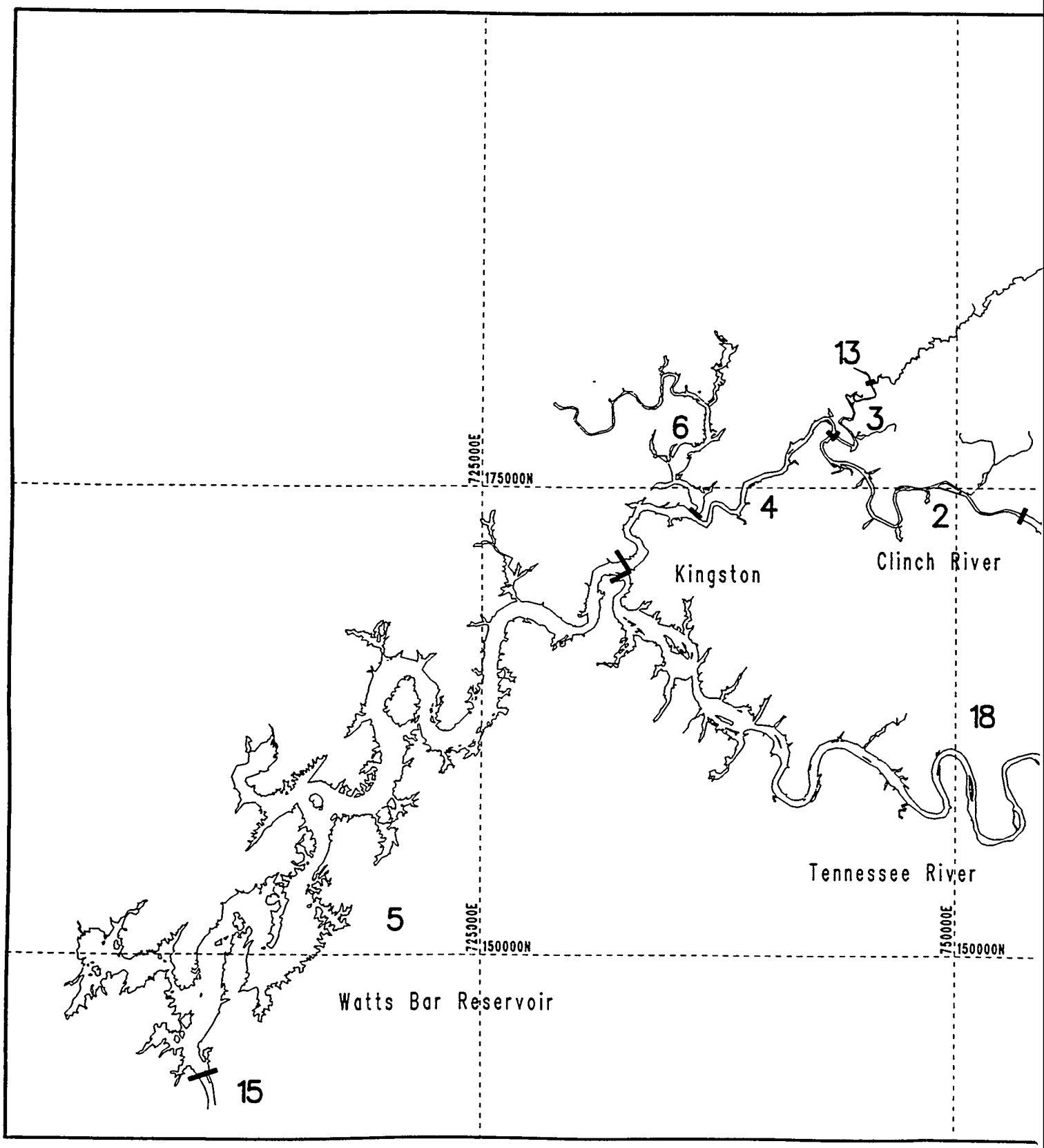
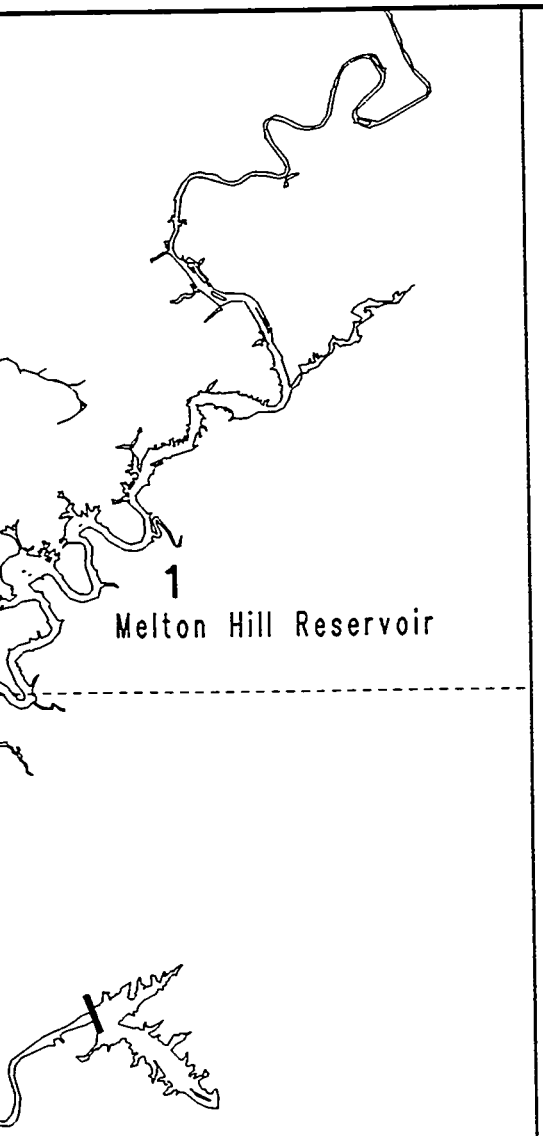


Fig. 2.1. Locations of reaches used in Phase 1 sam



STUDY REACHES

1 Clinch River
from Melton Hill Dam
to Norris Dam

2 Clinch River
from Poplar Creek
to Melton Hill Dam

3 Poplar Creek
from East Fork Poplar
to Clinch River

4 Clinch River
from Tennessee River
to Poplar Creek

5 Tennessee River
from Watts Bar Dam
to Clinch River

6 Emory River

13 Poplar Creek
above confluence
with East Fork Poplar

15 Chickamauga Reservoir

18 Tennessee River
from Clinch River
to Loudon Dam

N

10 KM

Tennessee State Plane
Datum NAD83
Units Meters
November 1992

ling, analysis, and risk assessment.

Table 2.1. Stream and river reaches used in the CRRI site characterization and screening risk assessment

Reach number	Reach name (description)	River mile/km[a]
1	Melton Hill Reservoir (from the Oak Ridge Marina to Melton Hill Dam)	CRM 52.0–23.1
2	Clinch (Clinch River from Melton Hill Dam to Poplar Creek)	CRM 23.0–12.1
3	Poplar Creek embayment (Poplar Creek below the confluence of the East Fork)	PCK 8.9–0.0
4	Poplar Creek Clinch (the Clinch River from the mouth of Poplar Creek to the confluence with the Tennessee River)	CRM 12.0–0.0
5	Watts Bar Reservoir (the Tennessee River from the confluence of the Clinch River to Watts Bar Dam)	TRM 567.5–530.0
6	Emory River	ERM 14.0–0.0
10	Norris Reservoir (the Clinch and Powell Rivers above Norris Dam)	
13	Poplar Creek (Poplar Creek above the confluence of the East Fork)	PCK 11.0–9.0
15	Chickamauga Reservoir (below Watts Bar Dam)	TRM 529.9–515.0
18	Tennessee River arm of WBR (from Fort Loudon and Tellico Dams to the confluence of the Clinch River)	TRM 602.0–567.6

[a]CRM = Clinch River mile, PCK = Poplar Creek kilometer, TRM = Tennessee River mile, and ERM = Emory River mile.

Table 2.2. Matrices sampled in each reach during Phase 1 of the CRRI (validated and accepted data). Entries with an "X" indicate that a particular reach was sampled for that matrix. Blanks indicate that no sample was collected from the reach for the particular matrix.

	Matrix			
Reach	Fish	Sediment core	Surface grab sediment	Water
1: Melton Hill Reservoir	X	X	X	X
2: Clinch R.: Poplar Ck -> Melton Hill Dam	X	X	X	X
3: Poplar Ck -> East Fork Confluence	X	X	X	X
4: Clinch R.: Mouth -> Poplar Ck Confluence	X	X	X	X
5: Watts Bar Reservoir	X	X	X	X
6: Emory River			X	
10: Norris Reservoir	X	X	X	X
13: Poplar Creek Above East Fork Confluence	X			X
15: Chickamauga Reservoir	X			
18: Tennessee R: Clinch R. Confl -> Ft. Loudon			X	
Total number of reaches sampled	8	6	8	7

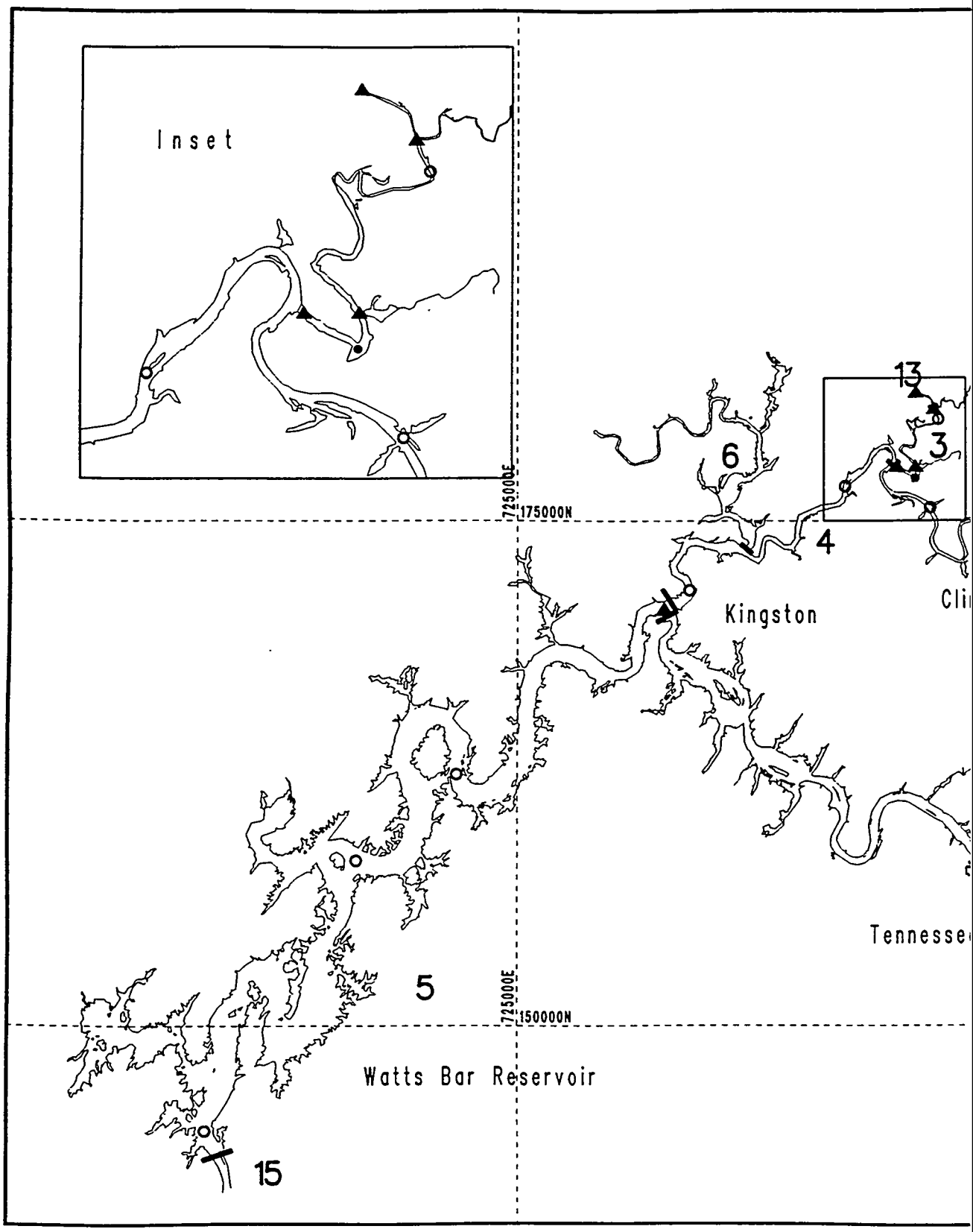
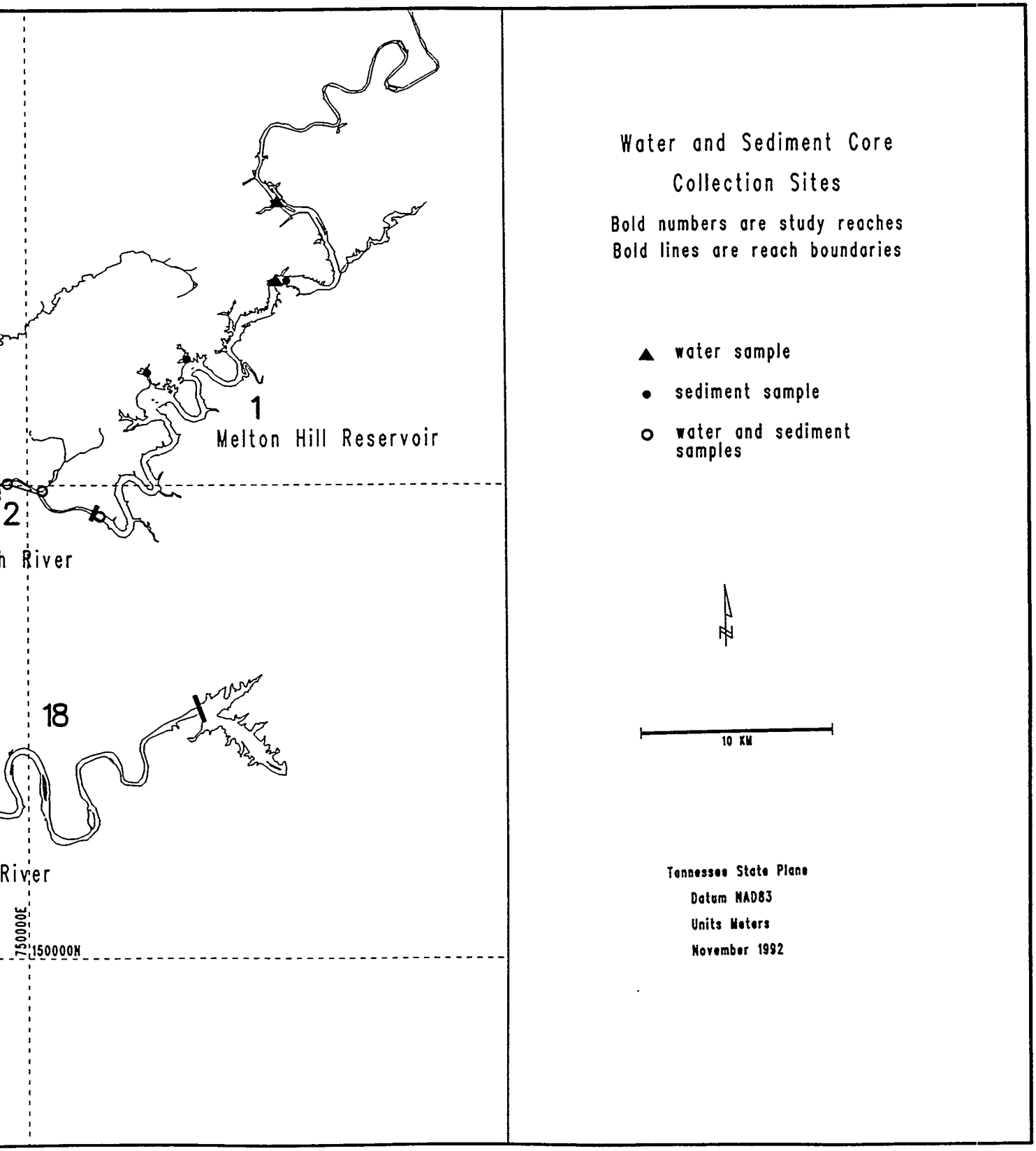


Fig. 2.2. Location of sample sites for Phase 1 wa



and sediment core collections in Clinch River/Watts Bar System.

Table 2.3. Summary of surface water analysis for the contaminants of concern. Analysis level from ESP-700 Section (Kimbrough et al. 1988).

Parameter	Analytical level	Container[a] and processing specifics	Analytical Procedure
^{3}H	IV	4 L Cubitainer, chill return to lab and acidify (HNO_3) pH < 2	Method 906.0[b]
^{90}Sr	IV	4 L Cubitainer, chill return to lab and acidify (HNO_3) pH < 2	Method 905.0[b]
Gamma emitting radionuclides		**21 L Cubitainer, chill to be used for:**	
Particle-Associated	IV	filter all of Gamma, collect, air dry filters	
Dissolved	IV	filtrate from Gamma, evaporate to 90 mL	
Inorganics		**4 L Cubitainer, chill, to be used for:**	
Total metals	IV	1 L PPE bottle, HNO_3 pH < 2, chill	CLP SOW[c]
Dissolved metals	IV	Filter[d] into 1 L PPE bottle, HNO_3 pH < 2, chill	CLP SOW[e]
Organics (as listed in Table 4.1, Martin Marietta Energy Systems 1990)	IV	2.3 L Amber glass bottle, teflon lined, chill	CLP SOW[e]

[a]All containers precleaned to EPA specifications. Cubitainers are manufactured from polycarbonate materials.

[b]EPA-600/4-80-032 1980.

[c]EPA 1987.

[d]Filter through nitric acid washed, 0.45 μm diameter effective pore size filters.

[e]EPA 1988.

Table 2.4. Number of Clinch River RI water samples, by site and type of analysis (validated & accepted data). Dissolved portion includes both inorganic filtered and gamma spec. evaporate samples. See text for details.

			Water Sample Matrix			
Reach	Site	Type of Analysis	Dissolved	Residue	Total	Subtotal
1	Upper Melton Hill	Inorganics	1	0	1	2
		Organics	0	0	1	1
		Radionuclides	1	1	1	3
1	Solway	Inorganics	1	0	1	2
		Organics	0	0	1	1
		Radionuclides	1	1	1	3
1	Lower Melton Hill	Inorganics	1	0	1	2
		Organics	0	0	1	1
		Radionuclides	1	1	1	3
2	Jones Island	Inorganics	1	0	1	2
		Organics	0	0	1	1
		Radionuclides	1	1	1	3
2	Grassy Creek	Inorganics	1	0	1	2
		Organics	0	0	1	1
		Radionuclides	1	1	1	3
3	PC/Mouth of East Fork	Inorganics	1	0	1	2
		Organics	0	0	1	1
		Radionuclides	1	0	1	2
3	K-1007	Inorganics	1	0	1	2
		Organics	0	0	1	1
		Radionuclides	1	1	1	3
3	Lower Poplar Creek	Inorganics	1	0	1	2
		Organics	0	0	1	1
		Radionuclides	1	1	1	3
4	Brashear Island	Inorganics	1	0	1	2
		Organics	0	0	1	1
		Radionuclides	1	1	1	3
4	Kingston City Park	Inorganics	2	0	2	4
		Organics	0	0	2	2
		Radionuclides	1	1	0	2
5	Upper Watts Bar	Inorganics	1	0	1	2
		Organics	0	0	1	1
		Radionuclides	1	1	0	2
5	Mid Watts Bar	Inorganics	2	0	2	4
		Organics	0	0	2	2
		Radionuclides	2	1	2	5
5	Lower Watts Bar	Inorganics	1	0	1	2
		Organics	0	0	1	1
		Radionuclides	1	1	1	3
10	Norris Reservoir	Inorganics	2	0	2	4
		Organics	0	0	2	2
		Radionuclides	2	1	2	5
13	Hartland Bridge	Inorganics	1	0	1	2
		Organics	0	0	1	1
		Radionuclides	1	1	1	3
Total			37	15	54	106

sample devices, constructed from stainless steel for organic analytes and PVC plastic for inorganic and radiological analytes. Samples were collected using the following criteria. All samples were collected during winter conditions to ensure nearly uniform physical-chemical parameters (such as temperature, pH, dissolved oxygen, or water flow) throughout the water column. With the exception of Norris Reservoir, a single sample was collected from 1.0 m below the water's surface for each station. Samples were processed in a manner compatible with the requested analyses (Sect. 9.6.2, Martin Marietta Energy Systems 1990). Samples were collected from 1.5 and 16.5 m deep in Norris Reservoir (reach 10).

Water samples were apportioned for contaminant analysis as follows: (1) gamma-emitting radionuclide samples were filtered, and the filtrate was collected; both filter residue (particle-associated) and dissolved filtrate, evaporated to 90 mL) portions were analyzed for gamma spectrometry; (2) inorganic samples were split into two aliquots for total and dissolved trace metals; dissolved were passed through a 0.45 μm effective pore size filter, acidified following filtration, and chilled, while total were only acidified and chilled; and (3) organic samples were chilled upon collection (Table 2.3). The complete scheme for apportionment and analysis of samples, including water quality and nutrient analyses, is given in Sect. 9.6.3 and Fig. 9.7 of Martin Marietta Energy Systems (1990). Nineteen individual samples were collected from 16 stations in 7 reaches (Fig. 2.2), with the resulting verification, validation, and acceptance of 106 results. Not all analyses were completed for each individual sample. Additionally, field water-quality parameters were measured at each station using a Hydrolab Surveyor II multiparameter water quality monitoring device. All samples were stored, refrigerated over night, and delivered to the analytical laboratory the following morning.

The water concentration values used in the Phase 1 human health and ecological risk screening (Sect. 4) were supplemented with environmental monitoring samples, including routine NPDES monitoring and grab samples collected by environmental monitoring and compliance personnel at each ORR site. Additionally, these data are the current benchmark against which Phase 1 water data are compared in Sect. 3.2.

2.2 SEDIMENT

Sediments may be the short- and long-term repository for particle-associated contaminants. Contaminated surface sediments are also a direct source of particle-associated contaminants to aquatic biota. Through the continuous process of sediment accumulation, sediments preserve a record of the depositional history for particle-associated contaminants, which may be directly proportional to the contaminant release histories. Vertical profiles of contaminants in the sediments can be used to reconstruct past releases of particle-associated contaminants. Data from contaminant surveys of Watts Bar Reservoir (Turner et al. 1985; Olsen et al. 1992) show higher concentrations of ^{137}Cs and mercury at greater depth in the sediment than at the sediment surface. These higher values were associated with the relatively large releases of these contaminants from the ORR in the mid- to late 1950s and early 1960s.

Both surface sediment grab and sediment core samples were collected from all sites, following the criteria established in Sect. 9.5.2 of the CRRFI Plan (Fig. 2.2). Samples were collected from December 1989 through July 1990. Sediment core samples were collected from Norris Reservoir; Solway; lower Melton Hill Reservoir; Jones Island; the mouth of Grassy Creek Embayment; Poplar Creek at the mouth of Mitchell Branch; lower Poplar Creek;

Brashear Island; Kingston Steam Plant; Kingston City park; and upper, mid, and lower Watts Bar Reservoir. In addition to these sites, surface sediment grab samples were collected from Melton Hill Park, Walker Branch Embayment, Grubb Island, the K-770 area, Campbell Bend, Sugar Grove, the Emory River, and Webster Bluff. Samples were sent to several analytical laboratories for analysis of inorganic and organic chemicals and radionuclides. Surface sediment grab samples were collected using a ponar grab sampler. Sediment cores for contaminant profile determinations were collected using either a free-fall gravity corer (at stations with water depths greater than 5 m) or a vibracore device (for shallow water stations), using tubing appropriate to the requested analyses. Sediment cores were sectioned by removing the overlying water, extruding the core vertically, and slicing the core into segments as specified in Sect. 9.5.2 of the CRRFI Plan. All sections were placed in containers appropriate to the requested analyses (glass for organics, glass or plastic for metals, and aluminum cans for radiological analyses). Seventy-one sediment cores, split into 1027 samples (Fig. 2.2), and 487 surface sediment grab samples (Fig. 2.3) were collected from 16 stations in 7 reaches (Table 2.5).

An extensive project of surface sediment grab sample collections from near-shore areas of the CR/WBR system was initiated in July 1990 to assess the extent of surface sediment contamination. This sampling was initiated at the request of an interagency working group on Watts Bar Reservoir contaminated-sediment dredging. This sampling is limited to near-shore sediments in Watts Bar Reservoir, which may be (1) contaminated from past ORR operations or (2) susceptible to sediment disturbing activities. The results of this sampling have been reported regularly to the Watts Bar Interagency Working Group.

Sediment samples were also collected from Braden Branch and the White Oak Creek Embayment (WOCE) areas in conjunction with Phase 1 of the CRRI. Contamination observed in Braden Branch is associated with a state of Tennessee superfund site, not related to DOE ORR operations. Braden Branch was sampled in order to confirm a source of radiological contamination to Melton Hill, above the ORR. Braden Branch data are summarized in Appendix G for informational purposes only. They are not included in the risk screening for human and ecological health (Sect. 4), but are the focus of a separate risk assessment in Appendix G.

Sediment data from WOCE that were collected as part of Phase 1 sampling are summarized in Blaylock et al. (1992). These Phase 1 data led directly to the accelerated site characterization of this area, with the subsequent decision to construct a coffer cell-sediment retention structure at the mouth of the embayment to prevent erosion and transport from WOCE to the Clinch River. The rationale and the activities undertaken by the WOCE project are summarized in Leslie and Kimmel (1992) and Blaylock et al. (1992).

2.3 FISH

The objectives of the Phase 1 fish sampling and analysis were to

1. obtain high quality data to confirm or modify existing data for contaminant levels in fish from the CR/WBR system,
2. determine the range of contaminant concentrations in CR/WBR fish and the spatial distributions of these concentrations in reference to ORR,

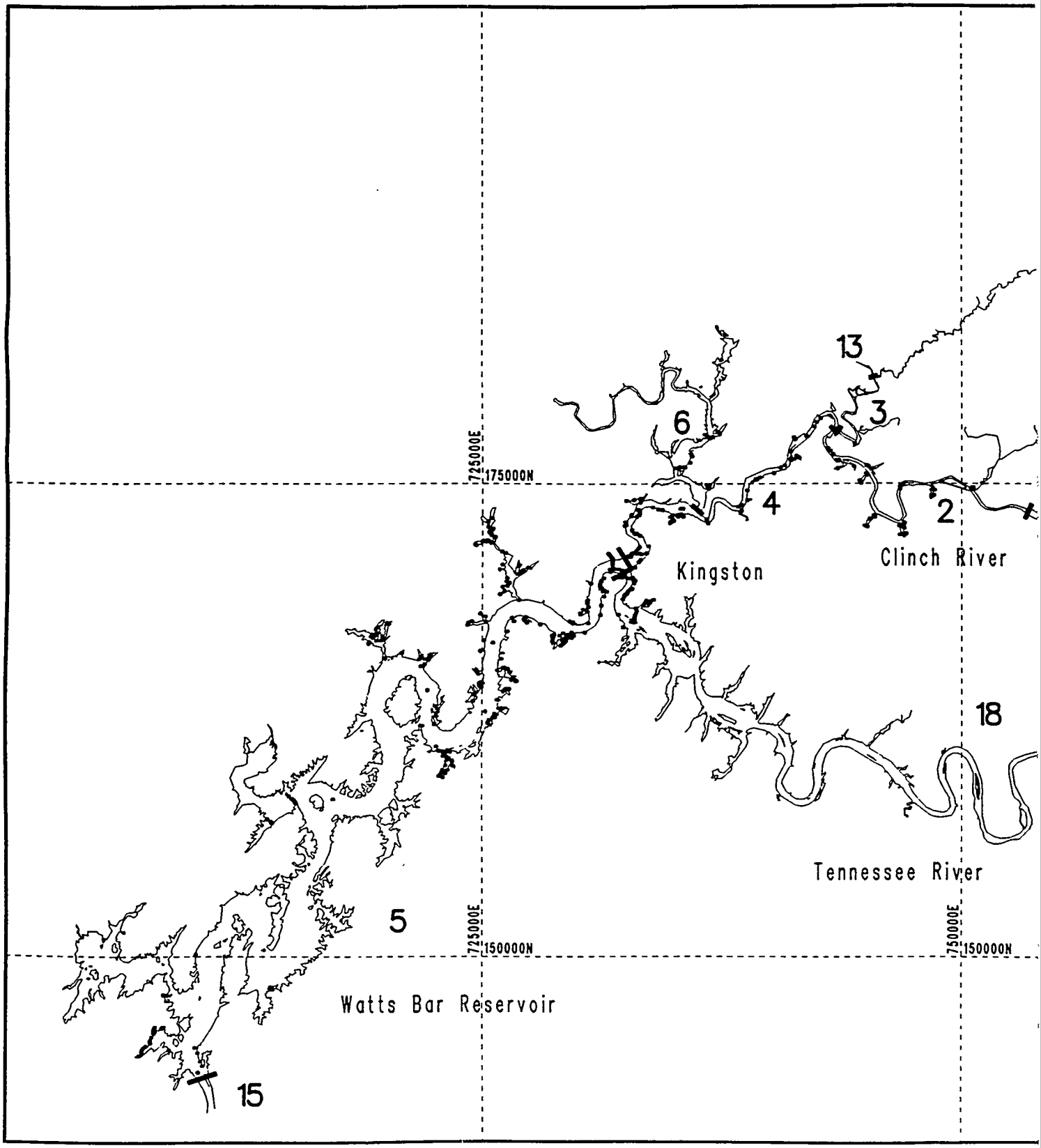
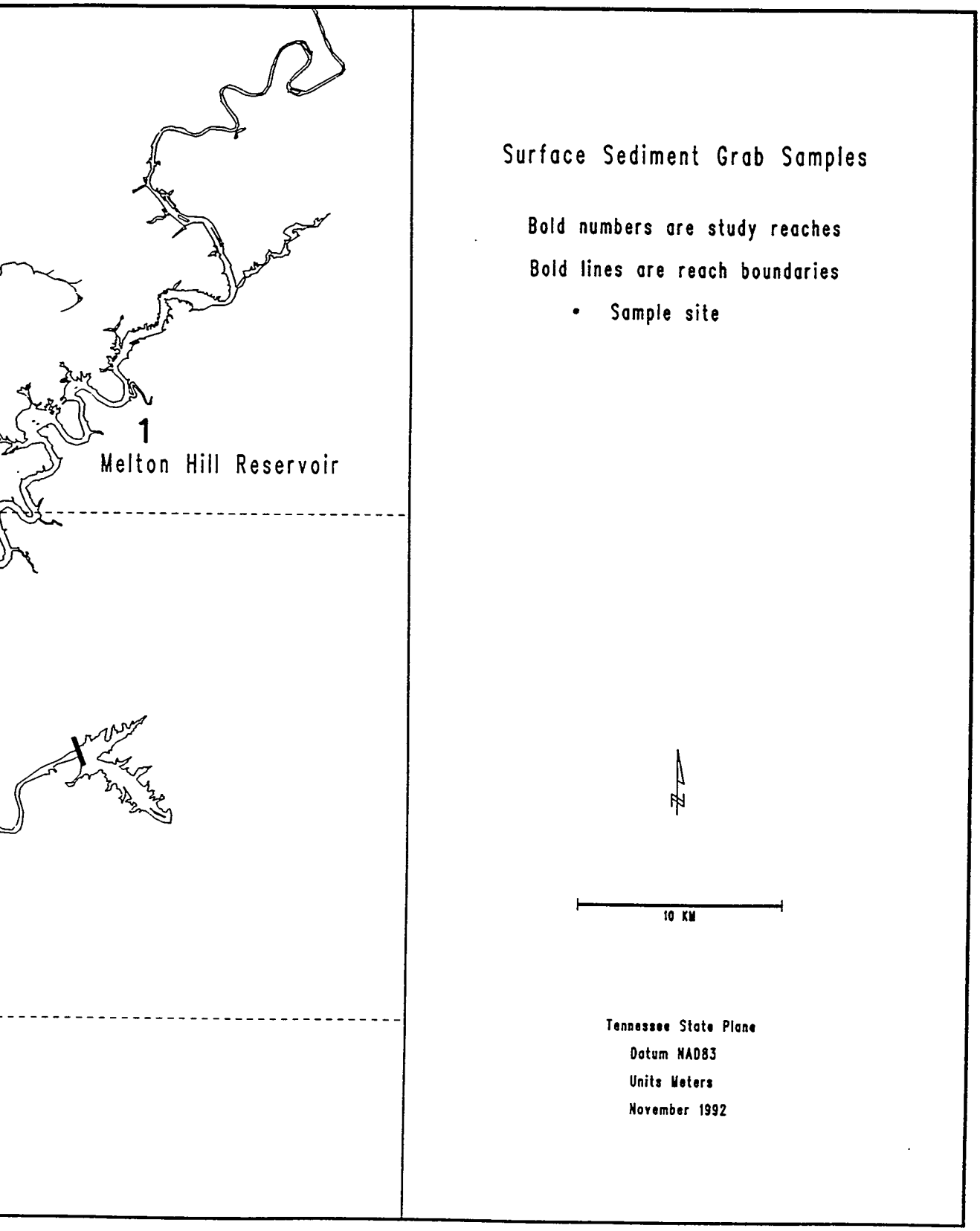


Fig. 2.3. Location of sites for Phase 1 surface sediment grab sa



le collection in Clinch River/Watts Bar system.

Table 2.5. Number of Clinch River ERP sediment samples, by reach and type of analysis (validated & accepted data)

Reach	Site	Type of Analysis	Sample Matrix: Core Section	Sample Matrix: Surface Grab	Subtotal
1	Melton Hill Reservoir	Inorganics	49	0	49
		Organics	25	0	25
		Radionuclides	28	13	41
2	Clinch River: Melton Hill Dam to Poplar Creek	Inorganics	59	0	59
		Organics	46	0	46
		Radionuclides	58	46	104
3	Poplar Creek: East Fork Confluence to Poplar Creek Mouth	Inorganics	79	0	79
		Organics	64	0	64
		Radionuclides	80	3	83
4	Clinch River: Poplar Creek Confluence to Clinch River Mouth	Inorganics	52	0	52
		Organics	59	0	59
		Radionuclides	110	93	203
5	Watts Bar Reservoir	Inorganics	70	0	70
		Organics	63	0	63
		Radionuclides	119	277	396
6	Emory River	Radionuclides	0	31	31
10	Norris Reservoir	Inorganics	23	0	23
		Organics	22	0	22
		Radionuclides	21	1	22
18	Tennessee River: Ft. Loudoun Dam to Clinch River Confluence	Radionuclides	0	23	23
Total			1027	487	1514

3. provide the necessary data required to perform human health and ecological screening risk assessments to refine the list of contaminants of concern, and
4. establish reference (background) concentrations for contaminants of concern for comparison to those sites impacted by releases from ORR.

Because fish accumulate contaminants from water, sediments, and food, they are integrators of many types of environmental conditions (Adams and McLean 1985). Characterization of the nature and extent of contamination in the aquatic biota in the CR/WBR system included the collection of 288 fish (representing three species) from 15 sites in 8 reaches. To characterize the spatial distribution of contaminants in fish, samples were collected from six sites on the Clinch River, three sites on the Tennessee River downstream of its confluence with the Clinch River, five sites on tributaries of the Clinch River, and one reference site (Norris Reservoir) also in the Clinch River system, but upstream of any influence of ORR (Fig. 2.4, Table 2.6). WOCE was also sampled as part of Phase 1 and these results are presented in Blaylock et al. (1992).

Three species representing different trophic levels were sampled with electrofishing gear and gillnets from August 1989 to April 1990. This sampling effort resulted in the collection of 126 bluegill sunfish (*Lepomis macrochirus*), 119 channel catfish (*Ictalurus punctatus*), and 43 largemouth bass (*Micropterus salmoides*), hereafter referred to as bluegill, catfish, and bass. The target sample size of 8 to 10 of each species at each site was achieved at nearly every site for bluegill and catfish, but rarely for bass because of their unavailability at some sites (Table 2.7). Catfish at four sites (CRM 24.0, CRM 20.6, Poplar Creek Mile (PCK) 7.4, and CRM 9.5) were originally collected as part of the Biological Monitoring and Abatement Plan (BMAP) sampling program on the Clinch River.

Field and laboratory processing of the fish followed procedures described in the CRRFI Plan. Fish fillets were analyzed for a total of 85 chemical constituents (Table A.1) including 13 metals, 2 PCB congeners, 5 pesticides (and derivatives), and 65 semivolatile compounds. Catfish fillets were submitted for analysis of the organic analytes and bass and bluegill for the inorganic analytes. Radionuclide analysis included measuring ^{90}Sr in catfish vertebrae and gamma emitters in the fillets of all three species. The inorganic and organic analyses were performed by two laboratories in the Analytical Chemistry Division of ORNL, and the ^{90}Sr and gamma emitters analyses were performed by Oak Ridge Associated Universities (ORAU) and the Environmental Sciences Division (ESD), respectively. Sample batches consisted of 10 to 20 samples and usually included one duplicate sample, one matrix blank sample, and one matrix spiked sample.

2.4 QA/QC PROGRAM FOR THE PHASE 1 DATA COLLECTION

2.4.1 General

The quality assurance program for Phase I was designed to comply with both the U.S. Environmental Protection Agency (EPA) QAMS-005/80 and the ANSI/ASME NQA-1 guidelines. The QA objectives for the data follow.

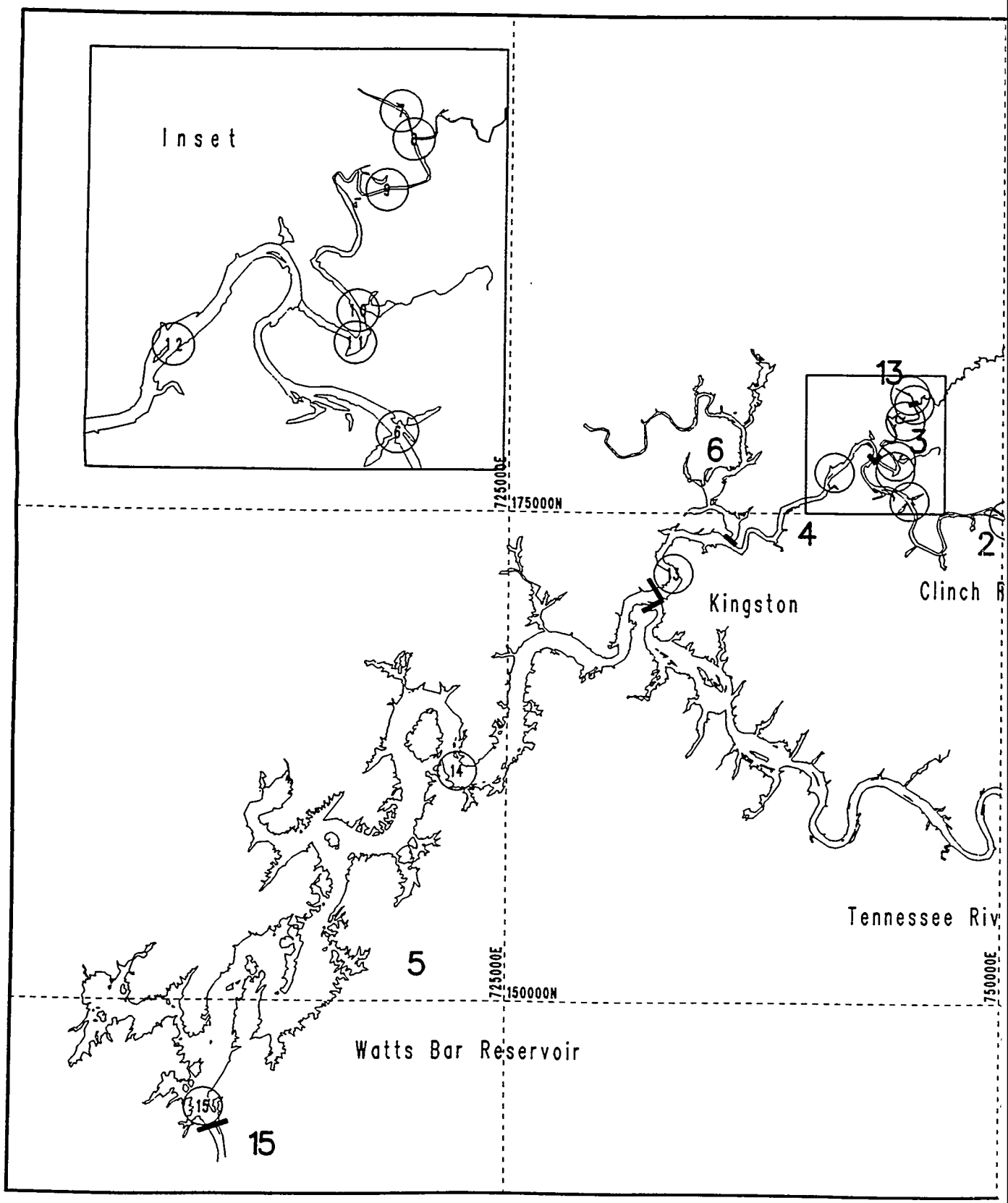
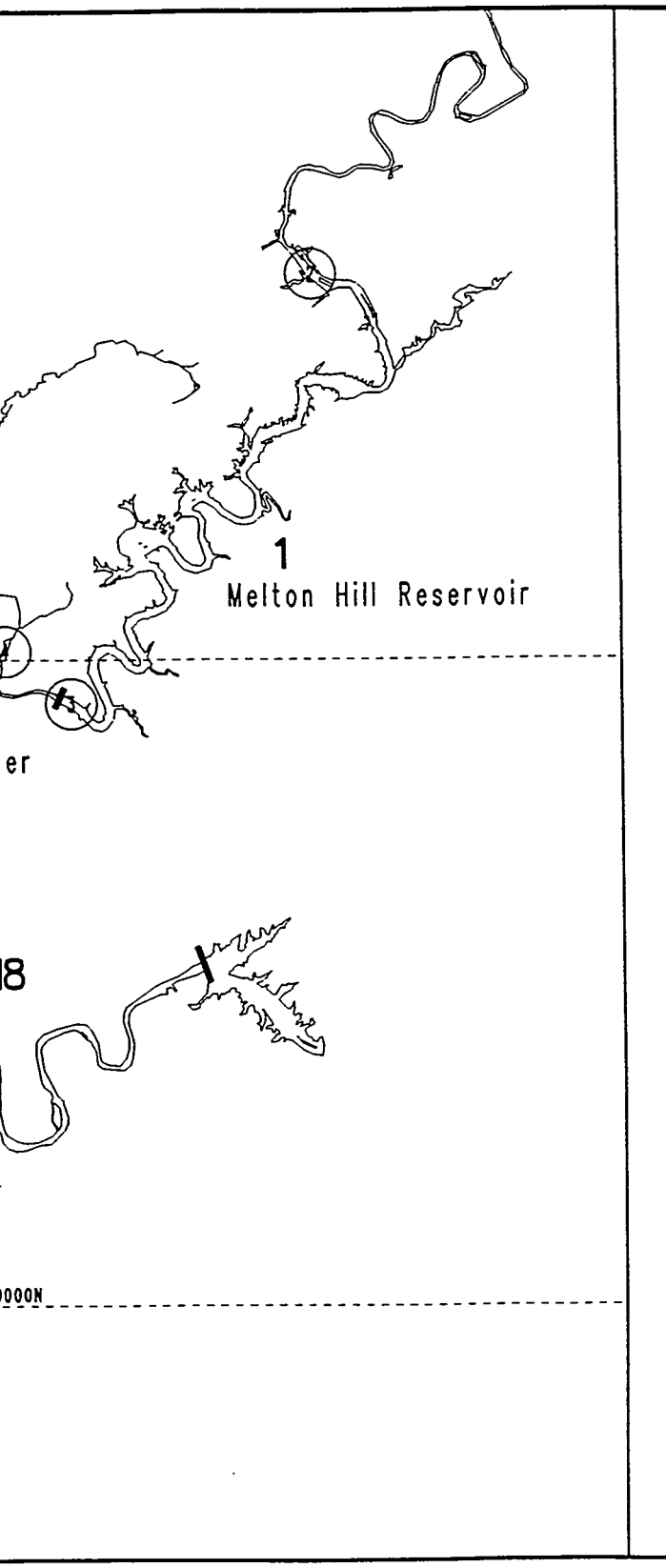


Fig. 2.4. Location of sample sites for Phase 1 fish



Fish Collection Sites

Bold numbers are study reaches

Bold lines are reach boundaries

(2) Site identifier shown by numbers within circles

N

10 KM

Tennessee State Plane
Datum NAD83
Units Meters
November 1992

collection in Clinch River/Watts Bar Reservoir system.

Table 2.6. Sample sites for Phase I fish collection in Clinch River/Watts Bar Reservoir system

Site No.	Reach segment[a]	River mile or km	Name
1	10.1	CRM 105.0[b]	Norris Reservoir (reference site)
2	1.1	CRM 51.0	Upper Melton Hill Reservoir
3	1.5	CRM 24.0	Lower Melton Hill Reservoir
5	2.3	CRM 20.6	Jones Island
6	2.5	CRM 14.7	Grassy Creek mouth[c]
7	13.1	PCK 9.6	Poplar Cr. at Hartland Bridge
8	3.1	PCK 8.6	Poplar Cr. at East Fork Poplar Cr. mouth
9	3.2	PCK 7.4	Poplar Cr. at Mitchell Branch mouth
10	3.3	PCK 2.2	Poplar Cr. at K-1007B pond outfall
11[d]	3.4	PCK 0.8	Lower Poplar Cr. embayment
12	4.2	CRM 9.5	Brashear Island
13	4.5	CRM 0.5	Kingston city park
14	5.2	TRM 557.0	Mid Watts Bar Reservoir
15	5.3	TRM 530.5	Lower Watts Bar Reservoir
16	15.1	TRM 518.0	Upper Chickamauga Reservoir

[a]Reach segments are divisions of reaches. The number to the left of the decimal is the reach and the number to the right of the decimal indicates the segment.

[b]Channel catfish were collected in the Powell River arm of Norris Reservoir at PRM 30.

[c]Only channel catfish were collected at the Grassy Creek site.

[d]Fish at sites 10 and 11 were sometimes combined because of small sample sizes.

Table 2.7. Number of regular samples (i.e., does not include QC samples) submitted for analysis for each analytical group by species (BLG, bluegill; LMB, largemouth bass; and CHC, channel catfish) and by sampling location

	Metals		Pest/ PCBs	Semi-vols.	Gamma rads			SR-90
Site	BLG	LMB	CHC	CHC	CHC	BLG	LMB	CHC
Norris Res.	10	5	8	8	8	5	4	8
Upper Melton Hill	10	5	8	8	8	2	5	8
Lower Melton Hill	10	3	8	8	8	2	3	
Jones Island	11	2	8	8	8	11	2	
Grassy Cr.	-	-	6	6	6	-	-	6
PC/Hartland Br.	10	-	4	4	4	2	-	4
PC/EFPC mouth	9	-	8	7	8	4	-	8
PC/Mitchell Br.	9	4	8	8	8	2	4	
PC-K-1007	2	3	10	10	10	5	3	10
PC Embayment	8	-	10	9	10	-	-	10
Brashear Island	9	3	8	8	8	9	3	
Kingston Park	10	5	10	10	10	5	5	10
Mid Watts Bar	10	2	9	9	9	2	2	9
Lower Watts Bar	10	3	10	10	10	2	3	10
Chickamauga Res.	8	8	4	4	4	2	8	4
Total	126	43	119	117	119	53	42	87

- Scientific data generated would withstand scientific scrutiny.
- Data would be gathered using appropriate procedures for field sampling, chain-of-custody, laboratory analyses, and data reporting.
- Data would be of known precision and accuracy.

Audits and surveillances were performed by DOE-OR, MMES Central QA, and others to review and evaluate the adequacy of field and laboratory performance, and to ascertain whether the QA/QC Plan was completely and uniformly implemented. Results of these audits and surveillances weredocumented and reported to management. Follow-up action was taken and corrective actions monitored by the Clinch River QAS.

The CRRI samples were analyzed for potential contaminants of concern using established procedures.

Water samples were analyzed for metals, semivolatiles, and pesticide/PCBs by the K-25 ACD. All sediment metals analyses were subcontracted to IT laboratories by the K-25 ACD. The following inorganic elements were reported for sediment: Sb, As, Be, Cd, Cr, Cu, Pb, Hg, Ni, Se, Ag, Tl, and Zn. Inorganic elements that were reported for water were as follows: Ca, Fe, Mg, K, Na, Sb, As, Be, Cd, Cr, Cu, Pb, Hg, Ni, Se, Ag, Tl, and Zn. Organic sediment analyses were performed both by the K-25 ACD and by IT. Metals were analyzed by Contract Laboratory Program (CLP) Statement of Work (SOW) 7/87 or 7/88. Organics were analyzed by CLP SOW 2/88, with the exception that K-25 did not use a second column confirmation for the pesticides/PCBs analyses.

Fish samples were analyzed for semivolatiles and pesticides/PCBs by the Organic Analysis Laboratory (OAL) at ORNL. Semivolatiles were analyzed using a modified GC/MS procedure with no acid surrogates or matrix spike/matrix spike duplicate samples. Laboratory quality control elements that were utilized were method blanks, internal standardization, initial calibration, continuing calibration, and GC/MS tuning. Pesticide/PCB samples were extracted by sonication in hexane with sodium sulfate. Samples were spiked with tetrachloro-m-xylene and decachlorobiphenyl. Extracts were concentrated using Kuderna-Danish concentrators and nitrogen-blowdown. Pesticide extracts were acid washed using concentrated sulfuric acid. Percent lipids were determined on all samples. A method blank (sodium sulfate) was extracted with each group of samples. One sample in each batch was spiked with a matrix spike solution containing 0.5 ppm alpha-chlordane, 0.5 ppm gamma-chlordane and 5 ppm Aroclor 1260. The extracts were analyzed on a DB-5 capillary column and a DB-1701 megabore column using electron capture detection.

Additional PCB analyses, as well as metals analyses were performed by the ORNL Inorganic Analysis Group (IAG). An internal procedure was used for sample preparation and analysis for PCBs and lipids. An International Atomic Energy Agency (IAEA) fish homogenate was used as a laboratory control sample. Mercury was analyzed by the ORNL $HNO_3/HClO_4$ method (AC-MM10915) for sample preparation and a cold vapor atomic absorption method (AC-MM1214922) for the analysis of Hg. The cold vapor method measures mercury using a standard addition technique. A National Institute of Standards and Technology (NIST) standard was used for the standard addition. For analysis of metals, ICP/MS was used to measure As, Be, Tl, and ICP/OES was used to measure Sb, Cd, Cr, Cu, Pb, Ni, Se, Ag, and Zn. An internal method was used for sample preparation. A VG Plasma Quad P02 was used for the ICP/MS analyses and a JY-48 instrument was used for the

ICP/OES analyses. The ICP/MS measurements were made using the standard addition technique.

The Oak Ridge Associated University (ORAU) Radiological Laboratory provided radiochemical analytical services for the alpha-beta radionuclide analysis of all samples. QA activities were identifed in Weaver (1988) and standard laboratory procedures were described in Weaver et al. (1988). The Oak Ridge National Laboratory-Environmental Sciences Division (ORNL-ESD) was responsible for analysis of gamma emitting radionuclides (gamma spectroscopy) of biota, sediment, and water.

The QA objectives for precision and accuracy in the laboratory were defined by control limits established for the EPA Contract Laboratory Program. Acceptance criteria for the radiological analyses were generated by each laboratory.

The CRRI program required the independent review and validation of the analytical laboratory data for all Phase I analyses. The review and validation was conducted by a subcontractor following EPA and/or project-specified guidelines to ensure uniformity and comprehensiveness of the review.

2.4.2 Field Quality Control

Quality Control in field operations, including selection of sampling locations, field data recording and sample collection, were implemented to meeting the Phase 1 project objectives (outlined in Sect. 1.1). Sampling sites for each matrix (fish, sediment or water) and QC sample collection frequencies were specified by the CRRFI Plan, with final determination of each site, and QC sample collection the responsibility of the sample team leader. Methodologies followed for the major categories of field activities, including record keeping, establishment and maintenance of sample custody, instrument calibration, and sample identification were specified in standard operating procedures (SOPs); sample collection procedures followed those of Kimbrough et al. (1990).

All field activities followed standard record keeping, chain-of-custody procedures. These included recording of site specific information in water-proof notebooks, with routine reviews of the notebooks. Sample custody was established by the sampling team upon collection, through the use of standard chain-of-custody forms, and was maintained throughout sample processing, and delivery to analytical services. The goal for submittal of quality control samples was once for every 20 samples, as appropriate. Quality control samples include field duplicates, matrix spikes, equipment cleaning rinse samples and field rinse water blanks. Matrix specific field quality control activities are discussed below.

Fish. Site selection was dependent upon the species targeted for collection. Sampling occurred during the fall and spring, when fish were available. Duplicate samples from different halves of the fish were submitted for the requested analysis. Matrix spikes, fish flesh spiked with known quantities of analytes of interest were submitted for organic analysis approximately once every 20 routine samples. Replicate samples were submitted for organic and inorganic analysis approximately once every twenty samples.

Sediment. Criteria for selection of sample collection sites included those that were representative of sediment deposition zones, as defined in Martin Marietta Energy

Systems (1990). Reference material, consisting either of homogenized sediment, stored in a deep freeze, or NBS standard material, was submitted for each sediment core, for inorganic and organic analyses. Approximately one set of duplicate sections for each sediment core was submitted for each requested analysis group.

Water. Samples were collected from mid-channel in the same vicinity as other media. Due to the small number of samples collected, one field duplicate sample, and one equipment cleaning blank was collected per week of sampling. Field blanks and trip blanks were collected approximately once every twenty samples.

2.4.3 Laboratory Quality Control Program

The laboratory quality control program must ensure that all data generated and reported are scientifically valid, consistent with accepted methods, and of known accuracy. An accurate method will produce precise and unbiased results. Results from quality control samples are used to document data quality, verify that the analytical system is functioning for a given matrix/analyte, indicate that an instrument is functioning properly, identify when additional corrections need to be made to the analytical system, and determine the effect of these corrections. The QC data provide an important indication of how well the data quality objectives were met. The types of quality control samples used during Phase I are summarized below.

Radiological check sources were used to determine general performance of the counting system and to ensure that the efficiency of the system had not changed.

2.4.4 Data Validation

Analytical results from the laboratories were received by the project database manager in either electronic or hard copy format and merged into a large working database. Analytical results included the concentration of the analyte in the sample if it was present and measurable. When an analyte was not detected in a sample, the sample quantitation limit (SQL) for that particular sample was reported as the result accompanied by a "U" prefix. When spectral data indicated the presence of a compound that met the identification criteria but the result was less than the sample quantitation limit, a "J" flag was assigned indicating that the result was an estimated value. In data analyses, these "J" values were treated as normal results.

The primary goal of the Clinch River Environmental Restoration Quality Assurance (QA) Program is to ensure that the analysis of all environmental samples produces data of known quality. According to EPA, "the quality of data is known when all components associated with its derivation are thoroughly documented, with such documentation being verifiable and defensible" (USEPA, 1990). In fulfillment of this goal, a subcontractor, independent of the analytical laboratory that generated the data, was employed by the CR-ERP to validate the analytical results from Phase 1. Organic data packages were assessed by "Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses" (USEPA), and inorganic data packages were assessed by "Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses" (USEPA), as applicable. Radiological parameters were assessed by SAIC's "Laboratory Data Validation Guidelines for Evaluating Radionuclides Analysis," revision 3. The validation process included an assessment

of a variety of Quality Assurance/Quality Control (QA/QC) practices, including holding times, matrix spike recovery rates, surrogate recovery rates, calibration standards, and method blanks. Validation flags (or qualifiers) were assigned by the reviewer to each result depending on the quality of the data as determined by the reviewer. A total of 268 data packages, containing approximately 1700 inorganic samples, 1500 organic samples, and 2200 radiological samples were validated. As a result of the external validation some data were rejected as unusable and others were flagged as estimated values. Table 2.8 summarizes the various data qualifier combinations which were attached to each result by the analytical laboratory and/or the validators. Additional data checking was performed as the data were summarized and evaluated for the health and ecological screening assessment.

2.4.5 Data Assessment

All data deficiencies uncovered in the data validation process were reported to the CR-ERP by the subcontractor's nonconformance process. The CR-ERP reported all nonconformances to laboratory or program personnel for resolution. A nonconformance database was established to track resolution and trends. Two major areas for nonconformances were method use and missing data information. Other areas for nonconformances were illegability, missing quality control information, matrix spikes missing or recoveries outside limits, and logbooks or worksheets missing or incorrect.

The number of rejected samples is summarized in Table 2.9. All pesticide/PCB and semivolatile analysis of sediment samples that were analyzed by IT were rejected due to missed holding times. Approximately 50% of the ORNL semivolatile data was rejected because of multiple problems affecting analytical performance, including surrogate recoveries outside of limits, surrogates not added, and inadequate quality control. The QA completeness objective for the project was to obtain valid analytical results for at least 95% of the samples collected. Overall completeness for all Phase 1 media and analyses combined was 87.8% valid data. If all the data is considered except for the analysis of semivolatiles in fish (which had the highest refection rate, 48%), then the overall completeness is 96%.

Table 2.8. Data qualifiers

Qualifier	Definition
U	Compound was analyzed for but not detected. Sample quantitation limit was reporter as the result.
J	Indicates an estimated value either because of laboratory estimation of concentration or because of validation deficiency.
UJ	Compound was analyzed for but not detected, and detection limit was qualified as an estimate due to validation deficiency.
NJ	Tentative compound identification only and estimated concentration. No second column confirmation of pesticides.
X	Fish tissue which was held frozen while awaiting extraction exceeded allowable holding time for water samples. However, these criteria are not applicable to biological samples, and results are considered valid.
UX	Compound was analyzed for but not detected, and water holding times were exceeded (see X definition).
V/V	Indicates that the result has been verified and is a valid result.

Note: Data qualifiers applied to the sample analysis result by the analytical laboratories and/or independent data validator. In cases where there was no data qualifier required, "V/V" has been inserted in the data qualifier field.

Table 2.9. Summary of the number of rejected samples as a result of the validation of laboratory analyses

Analysis class	Analysis type	Laboratory	Total no. of analyses	No. of accepted analyses	No. of rejected analyses	Percent rejected of total
INORGANICS	METALS	K25	664	660	4	0.6%
		K25/ IT	4313	3818	495	11.5%
		ORNL/ CPA	2027	1933	94	4.6%
	MERCURY	ORNL/ EAL	169	169	0	0.0%
ORGANICS	PEST/ PCB	K25	7830	7205	625	8.0%
		K25/ IT	27	0	27	100%
		ORNL/ CPA	238	225	13	5.5%
		ORNL/ OAL	1160	1123	37	3.2%
	SEMI-VOLS	K25	19306	19234	72	0.4%
		K25/ IT	65	0	65	100%
		ORNL/ OAL	7539	3930	3609	47.9%
RADIO-NUCLIDES		ORAU	941	904	37	3.9%
		ORNL/ ESD	2339	2336	3	0.1%
TOTAL NUMBER OF SAMPLES			46618	41537	5081	12.2%

3. SITE CHARACTERIZATION

3.1 INTRODUCTION

The purpose of this section is to discuss contaminant concentrations observed in Phase 1 of the CRRI across the system and in each reach. While data tables referred to in this section include all contaminants for which analyses were performed and accepted through the verification and validation process, discussions are limited to the contaminants identified by the risk screening analysis as high priority contaminants or those contaminants requiring further study. This information is presented in individual sections for each medium type (water, sediment, and fish).

All of the summary tables referred to in this report include data qualifier flags (Table 2.8). It is important to recognize that the derivation of the reported data is dependent on understanding these qualifiers. Contaminants that were not detected at all, or that were detected but not quantifiable, have reported concentrations that are estimates, based upon the detection limits of the instruments used. Assigning the value of the "limit of detection" to compounds that were not detected yields a conservatively high "estimated concentration" for those contaminants.

3.2 WATER

Surface water, the primary transport pathway for all contaminants leaving the reservation, is also the principal exposure medium for the initial introduction of dissolved (non-particle-associated) contaminants into the food web. The complex hydrodynamics and spatial heterogeneity of the CR/WBR system make it exceedingly difficult to adequately estimate the temporal and spatial extent of surface water contamination, even with a large number of samples. The NPDES monitoring of permitted discharges provides considerable information on contaminant concentrations near discharge points.

Phase 1 sampling of water was undertaken to (1) obtain high-quality data to confirm or modify suspected low concentrations of contaminants that were identified in scoping studies (Suter 1991, Hoffman et al. 1991, Olsen et al. 1992), (2) determine the range of contaminant concentrations present in the river-reservoir system, (3) provide data for the identification of contaminants of concern, and (4) establish reference concentrations for those contaminants. Accordingly, characterization of the nature and extent of surface water contamination in the CR/WBR system during Phase 1 of the CRRI was limited to a single sampling event for each station. This single water sample from each station was collected during winter conditions of uniform physical-chemical parameters. Samples were analyzed for inorganic, radiochemical, and organic constituents. These data were collected to confirm the results of scoping studies and monitoring reports and they will be supplemented with NPDES monitoring data to evaluate human and ecological risk on a screening level. The intent is to focus sampling and analyses on specific areas and contaminants during Phase 2 of the CRRI.

3.2.1 Discussion of Contaminants for the System

The following results reflect the outcome of analyses of total dissolved (filtered) water samples for metals, PCB/pesticides, semivolatile organic compounds, and radionuclides. Few

contaminants were detected in Phase 1 water samples. Organic, inorganic, and radiological analytes that were observed, verified, and validated as acceptable values are included in the data tables, the text, and this discussion. The detected analytes are listed by descending frequency of occurrence in Appendix B.

The most prevalent analytes, observed in both total and dissolved portions of all samples submitted, are the cations calcium, magnesium, potassium, and sodium. Total and dissolved iron were observed less frequently.

Constituents with the potential to pose a risk to human health or the environment rarely met all of the quality criteria for acceptance into the database. Potential contaminants of concern include total and dissolved lead, total copper, dissolved cadmium, total and dissolved zinc, dissolved mercury, and total and dissolved silver (Appendix B). The distribution of these contaminants is discussed in Sect. 3.2.2. Inorganic contaminant values that were averaged over the whole CR/WBR system, with one exception (zinc), were in the ranges expected based on previous monitoring reports (Kornegay et al. 1991). Each inorganic contaminant detected during the Phase 1 investigation is well below the Tennessee Water Quality Criteria for Designated Water Uses (rules of the TDEC, Chapter 1200-4-3). The observed values for zinc (1 total and 1 filtered) are greater than the maximum reported for environmental monitoring of the Clinch River. Bis-(2-ethylhexyl)-phthalate was the only organic contaminant observed in any of the samples collected for Phase 1 site characterization (Appendix B).

Radiological constituents observed include ^{90}Sr, particle-associated and dissolved (evaporate) ^{137}Cs, and dissolved ^{60}Co (Appendix B). Radionuclides that have been observed, verified and validated were more common than organic or most inorganic contaminants. For the dissolved and total water phase radionuclides, observed values were within and below the range of values reported for environmental monitoring data (Kornegay et al. 1991). Analogous values for particle-associated ^{137}Cs are not present in the environmental monitoring report; however, values from Appendix B are within the range of those reported by Olsen et al. (1992).

3.2.2 Discussion of Contaminants by Study Reach

The discussion of patterns in the distribution of organic, inorganic, and radiological analytes is restricted to listing the contaminants found in particular reaches; there are too few observations to adequately address variability of the surface water environment. The data for this section are compiled in Appendix B.

Dissolved zinc was detected only at the Norris Reservoir reference site (reach 10). This observation should be investigated further, since no other values for dissolved zinc were detected in Phase 1 data. Dissolved cadmium and total and dissolved lead were observed in upper Melton Hill Reservoir (reach 1), upstream from all active ORR inputs to the CR/WBR system. The majority of the potential contaminants of concern for which observations have been verified, validated, and accepted were located downstream from ORNL operations (reach 2, between White Oak Creek and Poplar Creek on the Clinch River) and in the vicinity of the K-25 Site (reach 3, Poplar Creek Embayment). Total copper and zinc were detected in reach 2 surface waters, with values in the range previously detected for environmental monitoring (Kornegay et al. 1991).

Values for dissolved lead, observed in Poplar Creek upstream from the East Fork confluence (reach 13), were comparable to those reported previously (Kornegay et al. 1991); however, dissolved lead was not detected in any Phase 1 sample from reach 3, downstream in Poplar Creek. Dissolved mercury, total and dissolved silver, and total lead were all observed in upper portions of reach 3 (Appendix B). Mercury and lead values are within the range previously reported for this reach, though silver values are greater than previously reported (Kornegay et al. 1991). Dissolved cadmium and dissolved and total lead values in the Clinch River above the confluence of the Clinch and Tennessee rivers (reach 4) are greater than those observed for environmental monitoring.

Gamma-emitting radionuclides were not observed in water samples from any of the reference reaches, including Norris Reservoir and Poplar Creek. Additionally, none were detected in Melton Hill Reservoir. Both dissolved and particle-associated ^{137}Cs were detected in reaches 2, 4, and 5 (Appendix B); all values were similar to those reported by Olsen et al. (Table 5 in Olsen et al. 1992) and Kornegay et al. (1991). Only dissolved ^{137}Cs was detected in Poplar Creek (Appendix B). Cobalt-60 was detected in a single filtered sample from reach 5 (Appendix B) at levels comparable with those reported by Olsen et al. (Table 5). Though ^{90}Sr was reported as present in all reaches, the average values for each reach were less than the standard deviation of the measurements (Appendix B). Concentrations of radionuclides in surface waters are comparable with values for both surface sediments and current releases from the ORR (Olsen et al. 1992; Kornegay et al. 1991).

3.2.3 Summary

The cations calcium, magnesium, potassium, and sodium—the most prevalent analytes—are constituents of weathered rock and are commonly observed in surface waters. Values for the CR/WBR system are comparable with those observed in routine monitoring near the ORR and in other freshwater ecosystems (Kornegay et al. 1991; Table 10.1, Goldman and Horne 1983). The concentrations of these cations and shifts in their relative abundance within the system affect the geochemistry of the surface water, influencing contaminant availability and the ability of the ecosystem to respond to perturbation.

Inorganic and organic constituents with the potential to pose a risk to human health or the environment were in the ranges expected, based upon previous monitoring reports (eg. Kornegay et al. 1991). The majority of potential contaminants of concern were detected between White Oak Creek and Poplar Creek on the Clinch River (reach 2) and in the Poplar Creek Embayment (reach 3), both of which drain several ORR contaminant sources. Total copper and zinc were detected in reach 2 surface waters, with values in the range previously observed for environmental monitoring (Kornegay et al. 1991). Dissolved lead, observed in samples from the Poplar Creek reference reach (reach 13), may originate from an upstream contamination source.

The Y-12 Plant, the city of Oak Ridge waste water treatment facility, and the K-25 Site operations are among the possible sources for mercury, silver, and lead in detected in reach 3. The elevated levels of cadmium and lead in the Clinch River between Poplar Creek and the Tennessee River confluence may come from several sources in and upstream from this reach.

Phase 1 values for all radiological constituents were comparable with the mean values reported for environmental monitoring (Kornegay et al. 1991) and previous field

investigations (Olsen et al. 1992). These values should be used with caution as they may exaggerate the ^{137}Cs concentration observed for surface water systems. The methodology used (Sect 2.2) is sensitive to low concentrations of suspended solids and tends to overrepresent any ^{137}Cs detected on the filters. Concentrations of ^{137}Cs on suspended particles should be compared only generally with those observed for surface sediments, as the latter is a much more accurate measurement.

Dissolved and particle-associated ^{137}Cs were detected in reaches 2, 4, and 5, with values similar to those reported previously for these reaches. The dissolved ^{137}Cs detected in Poplar Creek, was possibly due to backflow from the Clinch River. Cobalt-60 in reach 5 was detected at levels comparable with those reported previously. Average ^{90}Sr values for all reaches are below levels of concern. Currently, each of these radionuclides is released from the ORR to surface waters. Though comparable with surface sediment values, these surface water radionuclides likely do not result from resuspension of surface sediments in the CR/WBR system.

High quality data confirming the contaminant concentrations observed in the scoping studies, the first objective of the Phase 1 sampling, was achieved for the limited sampling performed. Additionally the range of contaminant concentrations present in the CR/WBR system, the second objective of the Phase 1 sampling was determined, relative to the sampling conducted. The bulk of observations were comparable with those observed previously, and they did demonstrate the range of contaminant concentrations observed within the system. However, more high quality information will be collected as part of Phase 2 of the CRRI in order to determine the spatial-temporal patterns in contaminant concentrations.

Phase 1 water sampling did provide data, augmented with source monitoring data from NPDES and DOE Order 5400.1, for identification of contaminants of concern. In order to more fully support the identification of contaminants of concern, the second sampling phase must characterize the relationship between routine monitoring results and ambient surface water conditions, as well as refining the temporal-spatial concentration range for possible contaminants of concern. Contaminant concentrations from reference stations must also be assessed over time in order to provide relevance to values for contaminants of concern.

The inorganic, organic, and radiological results from these Phase 1 water samples, in combination with historic data, indicate that a greater effort must be made to characterize the Clinch River, Poplar Creek Embayment, and Kingston areas. The sampling and analysis plan for Phase 2 will have a much greater emphasis on the investigation of surface waters.

3.3 SEDIMENT

Many of the potential contaminants of concern identified in the screening phase of the CRRI are particle reactive and thus are associated with sediment particles; therefore, the scoping phase of the CRRI focused on identifying sediment deposition areas below the ORR. Because mercury and ^{137}Cs had known release histories and ^{137}Cs is easily analyzed, they were the only constituents analyzed in sediment during the scoping phase. The goal of the scoping phase was to identify areas of contaminated sediment accumulation in the CR/WBR. The results from the scoping phase indicated that sediment with contaminants originating from the ORR were predominantly found in the deep channel sediments of Watts Bar Reservoir. Previous studies (Oakes et al. 1982, Turner et al. 1985) also indicated that contaminated

sediment accumulated in deep channels of the Clinch River arm of Watts Bar Reservoir. Sediment core samples during Phase 1 were collected from these deep channel areas and other suspected sediment deposition zones and analyzed for potential contaminants of concern. Because sampling occurred in areas of known contamination, the Phase 1 sampling was biased towards "hot spots" and yielded conservatively high estimates of average concentrations for reaches. These data provide the information needed to evaluate human and ecological risk on a screening level. The intent was to further focus sampling and analyses during Phase 2 to specific areas and specific contaminants.

Near-shore surface sediment characterization sampling was initiated during Phase 1 to provide the data necessary to evaluate human health risks from direct exposure to sediment. This was a concern because near-shore sediment in Watts Bar Reservoir is exposed for parts of each year, and most of the sediment disturbing activities (e.g., dredging and dock construction) occur in this zone of the reservoir. Therefore, as part of the permitting process conducted by the U.S. Army Corps of Engineers and TVA for (sediment disturbing activities), samples were collected to evaluate human health risk on a permit-by-permit basis. Near-shore sediment samples were only analyzed for gamma-emitting radionuclides. The rationale for this approach follows that of the phased approach described for the sediment sampling and analysis. If concentrations of ^{137}Cs or ^{60}Co were high enough to indicate a human health risk resulting from deposition of contaminants originating from the ORR, additional analyses would be performed to determine concentrations of the other contaminants.

3.3.1 Discussion of Contaminants for the System

3.3.1.1 Near-shore sediment samples

Cesium-137 was present in detectable quantities in 99% of the 487 samples that were analyzed. Cobalt-60 was present in detectable quantities in 58% of the 488 samples that were analyzed (Appendix C.3). Of all the analyses performed on these samples, less than 4% were rejected (Table 2.9). This satisfies the completeness requirement of 95% defined in the Work Plan. One limitation with this data set is that only one grab sample was collected in Norris Reservoir (reach 10); therefore, a reference concentration average was calculated from the single grab sample and the top layer (3 cm) of the sediment core taken in reach 10. Data from 23 grab samples from the Tennessee River above the confluence with the Clinch River (reach 18) also provide a reference for surface sediment concentrations of gamma-emitting radionuclides (Appendix C.4).

3.3.1.2 Sediment cores

Sediment cores were collected to provide data for evaluating secondary pathways of human health risk and ecological risk. The exposure pathways resulted from a dredging scenario where deep sediment is dredged and spread on the nearby land. Cores were sectioned in 3- to 6-cm intervals and analyses were performed on each section. The summary tables report core averages and/or reach averages when more than one core was collected in a reach (Appendix C.2).

Detectable concentrations were reported for all 13 inorganic contaminants for which analyses were conducted; however, selenium, antimony, and thallium were detected in less than 30% of the samples (Appendix C.1). Some maximum values are estimates based on

detection limits; thus, in some cases, concentrations used in the risk screening analyses may be conservatively high. The number of inorganic samples rejected was less than 12% (Table 2.9). This does not satisfy the completeness requirement defined in the Work Plan. However 9 of the 13 inorganic contaminants had less than 1% rejected samples. Antimony, mercury, selenium, and silver all had greater than 10% but less than 50% of the samples rejected.

Twenty-two of the 92 organic analytes were detected in at least one sample. Eighteen of these were detected in less than 7% of the samples. The highest percentage (36%) of detected organics in core samples was for bis(2-ethylhexyl)phthalate, which is a plasticizer found in many environmental samples as a common artifact. Twenty percent of the samples analyzed had detectable quantities of Aroclor 1254. Fifteen percent had detectable levels of fluoranthene, 11% had detectable quantities of pyrene, and less than 7% had detectable levels of phenanthrene (Appendix C.1). Because of the small percentages of detected organic contaminants reported, minimum, maximum, and average values are almost always estimated values. These are indicated by the "U" or "U/J" codes in the data qualifier fields in the tables. Less than 1.0% of the semi-volatile organic analyses were rejected during the validation procedure (Table 2.9). This is well within the completeness requirement of 95% as outlined in the Work Plan. Eight percent of the PCB/pesticide organic analyses were rejected.

Samples were analyzed for alpha-emitting and gamma-emitting radionuclides. Every sample for which analysis for alpha-emitters was performed had detectable, though not always quantifiable, levels. Because of the low values observed, many of the concentrations listed in the tables are estimated from detection limits. Therefore, the risk screening analysis is based on estimated concentrations that are conservatively high. For gamma-emitters, ^{137}Cs was present in detectable quantities in 93% of the samples analyzed, and ^{60}Co was detected in 36% of the samples analyzed (Appendix C.1). Only 3% of the radionuclide analyses were rejected during the validation procedure (Table 2.9). This is within the completeness requirements defined in the Work Plan.

3.3.2 Discussion of Contaminants by Study Reach

3.3.2.1 Near-shore sediment samples

Cesium-137 concentrations in the near-shore sediments follow an expected geographic trend (Fig. 3.1). Norris Reservoir (reach 10) and Melton Hill Reservoir (reach 1) show background concentrations (0.33 and 0.26 pCi/g, respectively). The Clinch River between the White Oak Creek confluence and Poplar Creek confluence (reach 2) has the highest average concentrations and the highest individual values in the CR/WBR system. The Clinch River below Poplar Creek and above the confluence with the Tennessee River (reach 4) has a slightly lower average ^{137}Cs concentration than reach 2. Poplar Creek (reach 3) and the Emory River (reach 6), both of which are tributaries to the Clinch River, have concentrations above background but approximately 2.5 times lower than reaches 2 and 4. Slightly elevated levels of ^{137}Cs in these reaches are not unexpected due to the reversing flows into both Poplar Creek and the Emory River resulting from TVA reservoir operations for peak electrical power. Concentrations of ^{137}Cs in the Tennessee River arm of WBR (reach 18) are at background levels. The near-shore surface sediments in the main body of Watts Bar Reservoir (reach 5) have an average concentration below 1 pCi/g, which approaches background concentration levels (NCRP 1978).

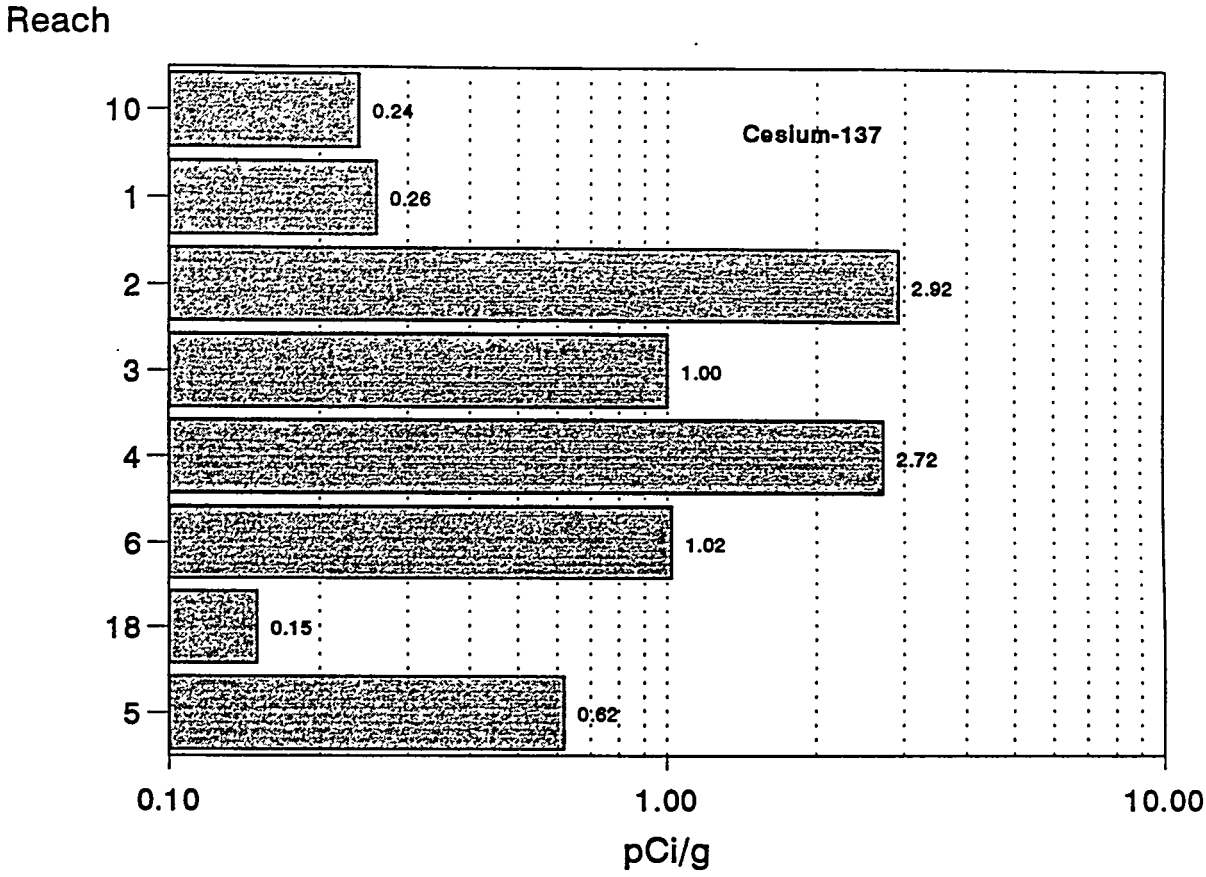


Fig. 3.1. Average ^{137}Cs concentration in surface sediment grabs within each reach. Value for reach 10 is not an average. It is the concentration of the single sample collected in this reach during Phase 1 sampling. Reaches are arranged from upstream on the top to downstream on the bottom.

The average ^{60}Co concentrations within the study reaches show the same geographic trend as ^{137}Cs, with two exceptions (Fig. 3.2). First, ^{60}Co was not detected in Norris Reservoir. Second, the average ^{60}Co concentration in reach 1 is higher than background levels. This can be explained by releases from a closed medical supply facility in Braden Branch that acts as a source within reach 1 but was not part of the ORR operations. This source is discussed in further detail in Appendix G.

3.3.2.2 Core sediment samples

Summary results for sediment cores are presented in Appendix C.2. The arithmetic averages for each reach, reported in Appendix C.2, were calculated using all sections of all cores within a reach and detection limits as actual values when concentrations were below detection limits. For the sake of comparison, if a contaminant was detected in any reach, the average concentration for that contaminant is reported for all reaches even if that contaminant was not detected in all reaches. Again, the data qualifier flags indicate if reported concentrations are estimates. Average concentrations are discussed, rather than minimum and/or maximum concentrations, because in a dredging scenario, exposure would be to well-mixed sediment. The averaging of concentrations across core sections and within reaches mathematically approximates the mixing of sediment as a result of dredging.

Inorganics

There are several spatial patterns in the distributions of average core concentrations of inorganic contaminants. These patterns are shown in Figs. 3.3 through 3.7, which portray average contaminant concentrations for sediment cores arranged along hydrologic continuum. Presenting the averages by site rather than by reach, but still along a downstream continuum, provides more insight to possible sources of contaminants and will help determine where to focus sampling during Phase 2. Arsenic (Fig. 3.3), beryllium (Fig. 3.4), chromium and copper (Fig. 3.5), and mercury (Fig. 3.6) all show a peak concentration in Poplar Creek (reach 3) or at Brashear Island immediately downstream Poplar Creek (first bar in reach 4), suggesting that Poplar Creek is a source of these contaminants into Watts Bar Reservoir. Concentrations of thallium were detected in Poplar Creek (reach 3) and in McCoy Branch (reach 7), both of which are downstream of a coal ash-pile disposal areas. Average concentrations of arsenic, beryllium, and mercury decrease in downstream sediment core samples, with some concentration averages approaching reference levels in reach 5. Zinc (Fig. 3.3); cadmium (Fig. 3.4); and chromium, copper, and lead (Fig. 3.5) all have peak average concentrations in reach 5 (Watts Bar Reservoir). The location of these peaks suggests that there is a source of these contaminants downstream of the ORR either on the Tennessee River arm or below the confluence of the Tennessee and Clinch rivers. There are two superfund sites in Rockwood that drain into Caney Creek above the three sampling sites in reach 5. Additionally, historic metal processing operations based in Rockwood may explain the elevated levels of these metals in Watts Bar Reservoir. Industrial activities on the Tennessee River arm of Watts Bar Reservoir could also be responsible for these contaminants. Future sampling will focus on determining the source of these metals. There are no distinctive patterns in the vertical profiles of the inorganic contaminants with the exception of mercury. Concentration peaks of mercury between 40 and 80 cm deep are apparent in sediment cores from sites in and downstream of Poplar Creek. These peaks coincide with releases of mercury during the mid- to late 1950s and have been well documented by Olsen et al. (1992) and Turner et al. (1985).

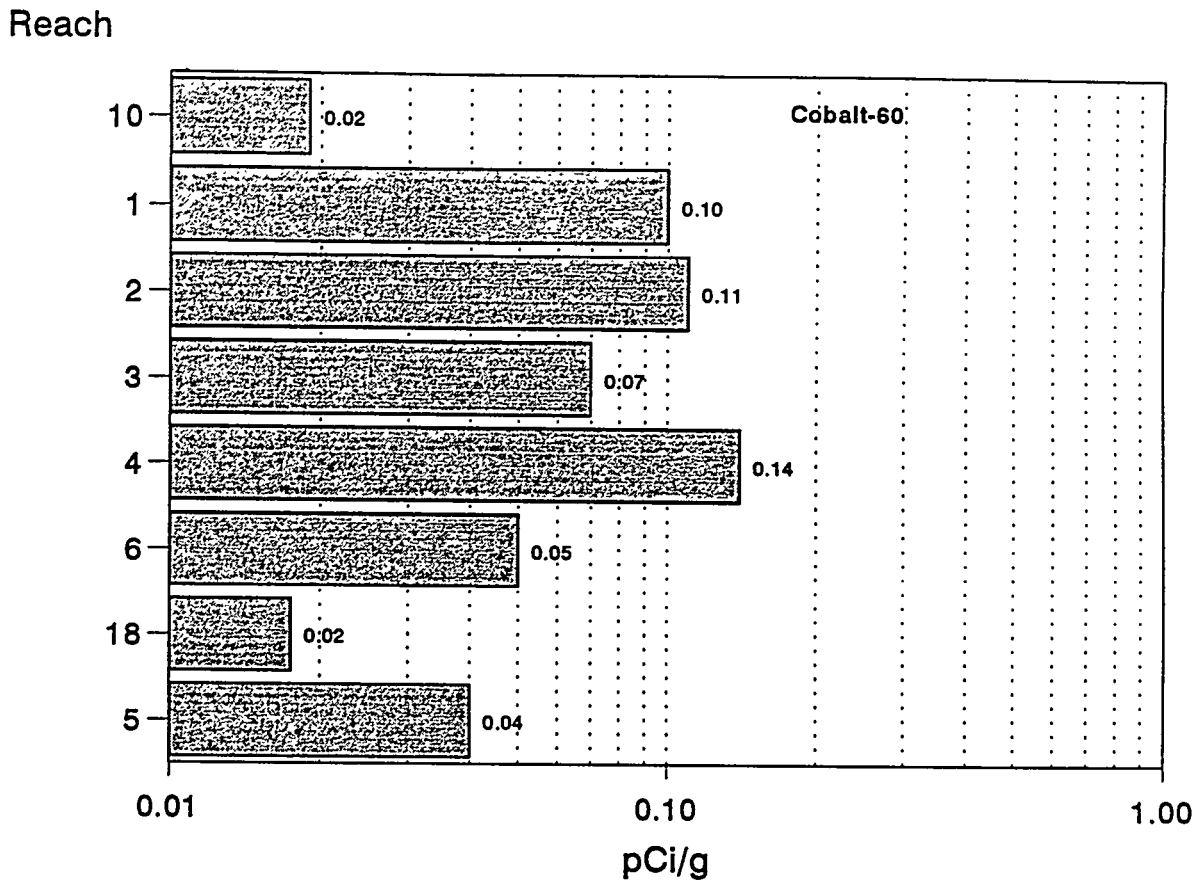


Fig. 3.2. Average ^{60}Co concentration in surface sediment grabs within each reach. Value for reach 10 is not an average. It is the concentration of the single sample collected in this reach during Phase 1 sampling. Reaches are arranged from upstream on the top to downstream on the bottom.

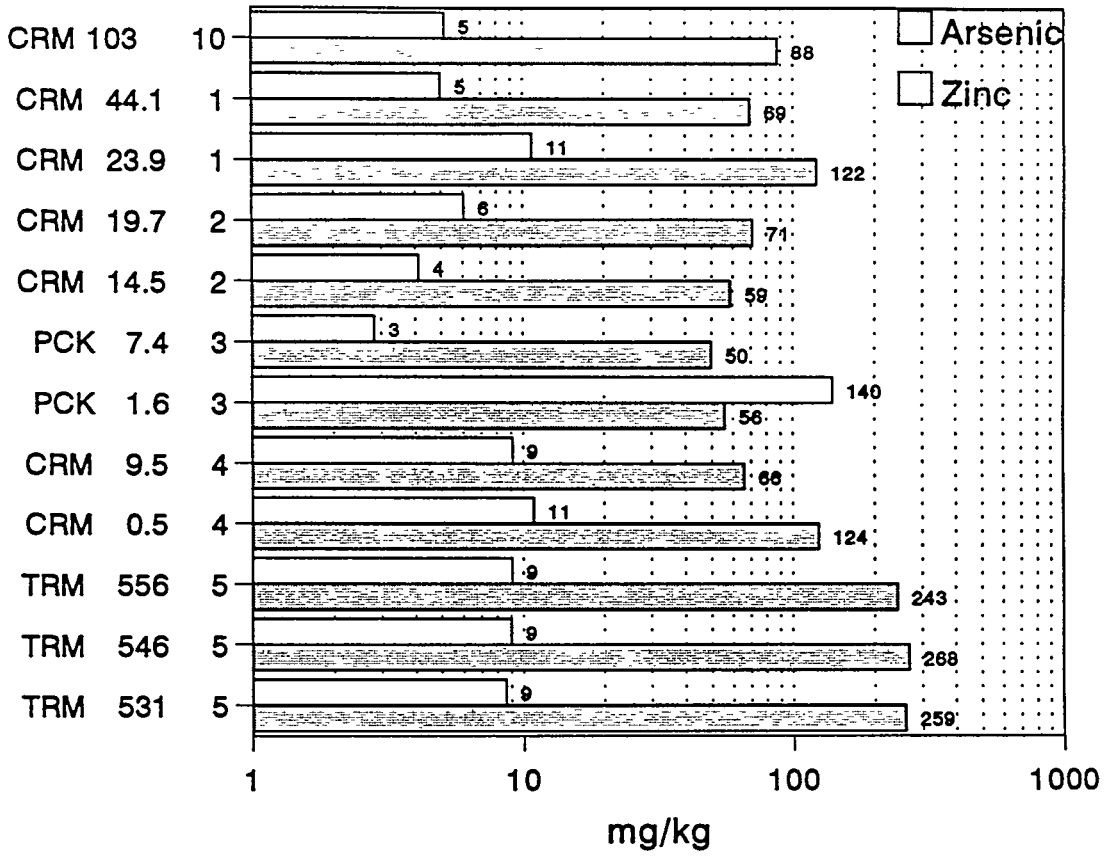


Fig. 3.3. Average concentrations of arsenic and zinc for cores sampling sites. Reaches and cores sampling sites within reaches are arranged from upstream on the top to downstream on the bottom.

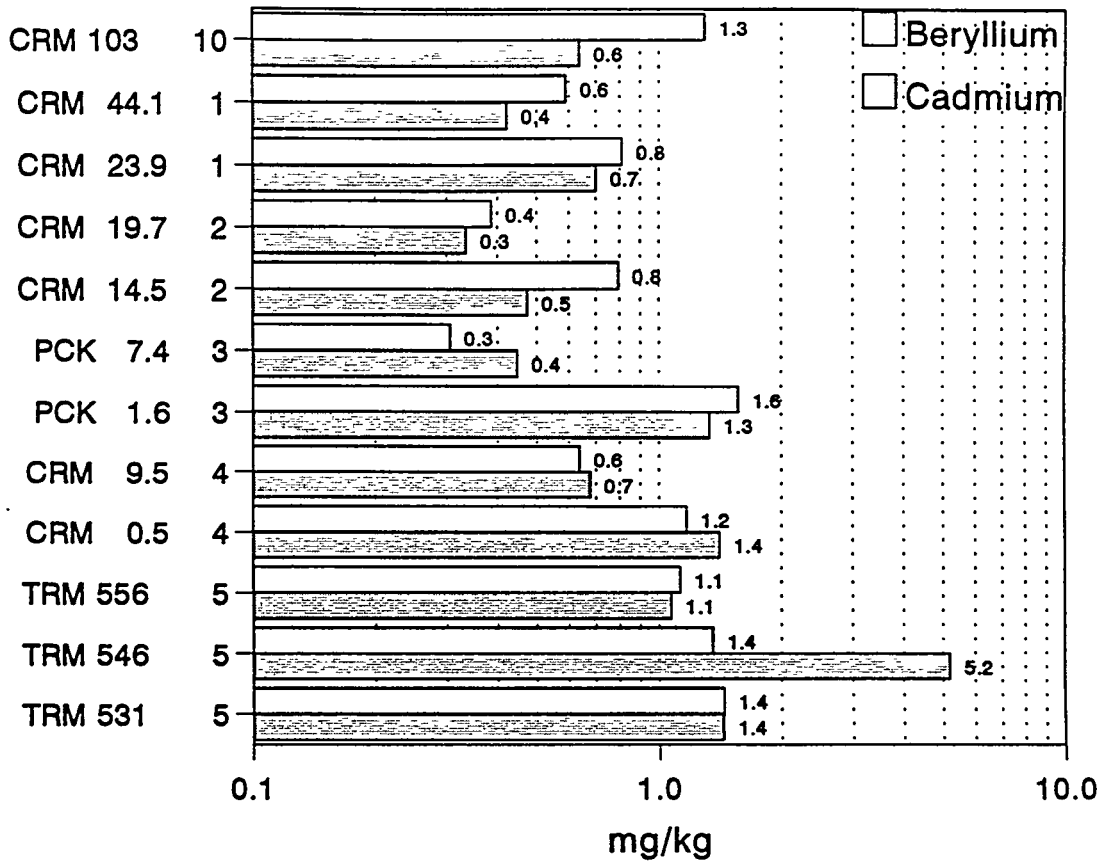


Fig. 3.4. Average concentrations of beryllium and cadmium for cores sampling sites. Reaches and cores within reaches are arranged from upstream on the top to downstream on the bottom.

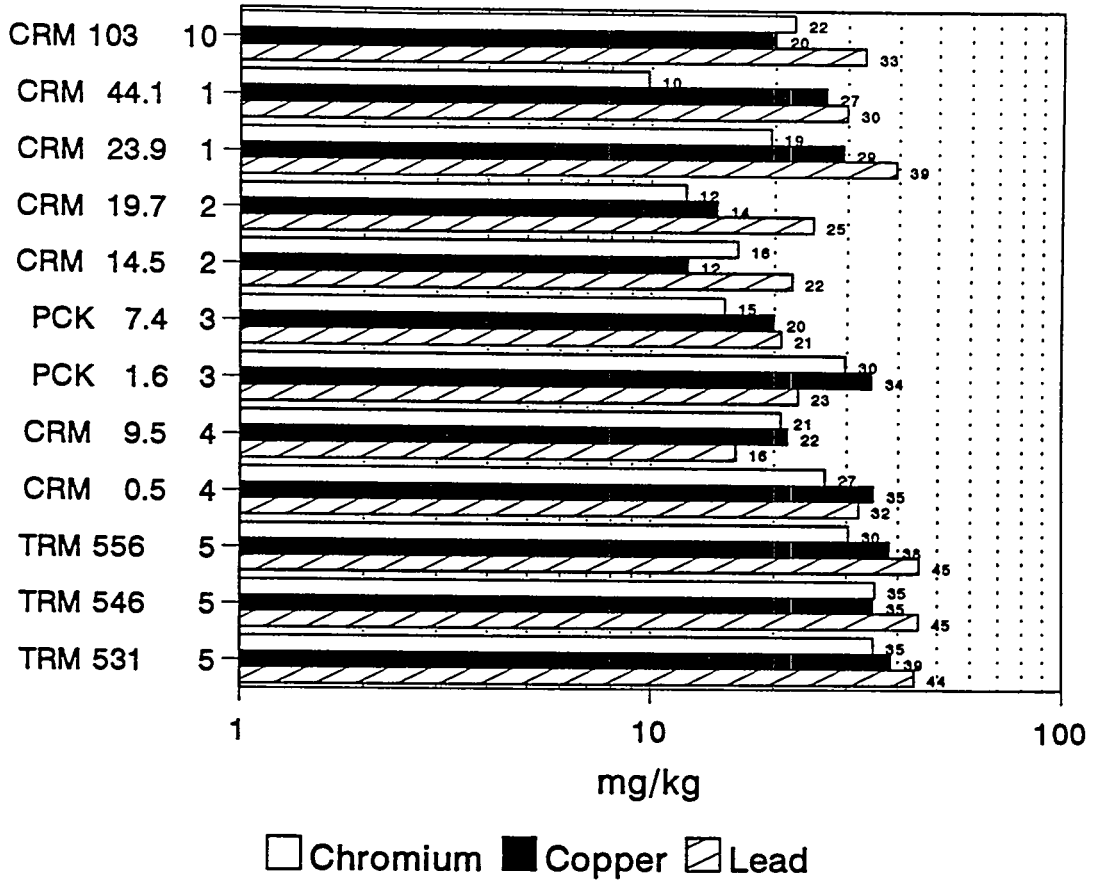


Fig. 3.5. Average concentrations of chromium, copper, and lead for cores sampling sites. Reaches and cores within reaches are arranged from upstream on the top to downstream on the bottom.

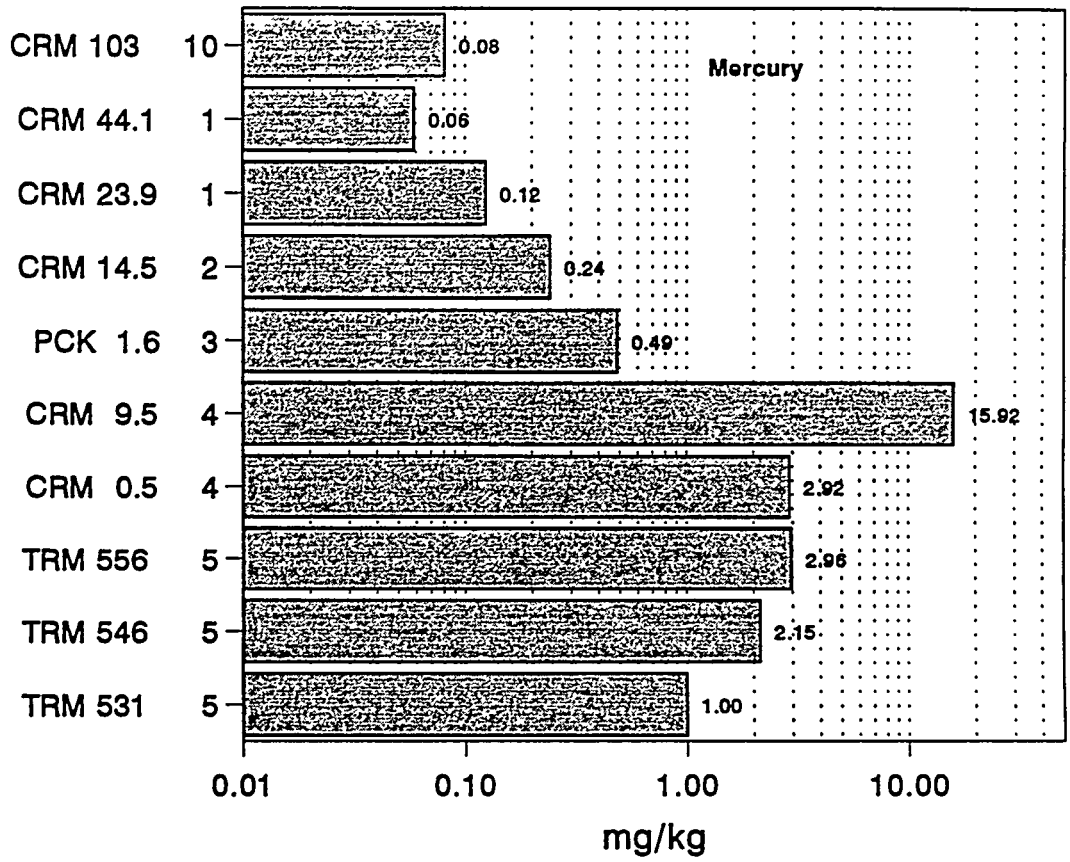


Fig. 3.6. Average concentrations of mercury for cores sampling sites. Reaches and cores within reaches are arranged from upstream on the top to downstream on the bottom.

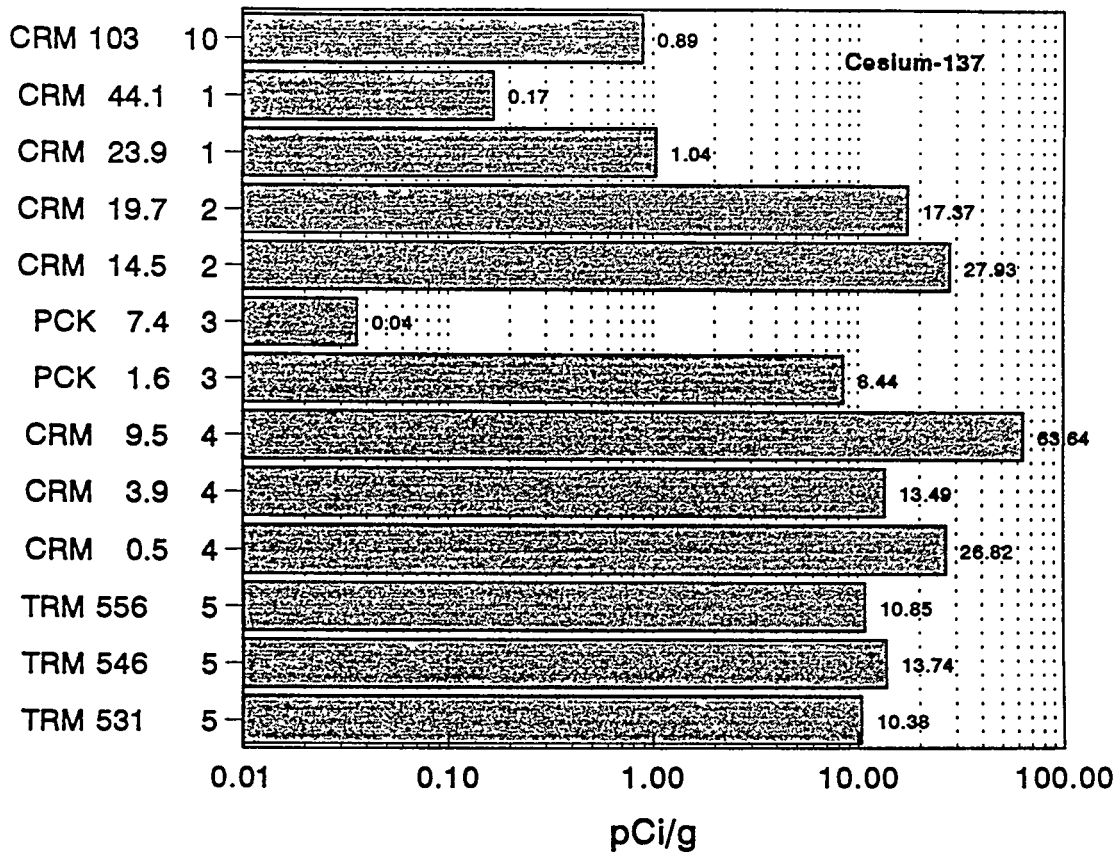


Fig. 3.7. Average concentrations of ^{137}Cs for cores sampling sites. Reaches and cores within reaches are arranged from upstream on the top to downstream on the bottom.

Organics

It is somewhat difficult to interpret the concentrations of organic compounds in the sediment cores because the variability associated with individual estimated averages are often larger than the averages themselves (Appendix C.2). These large variances are a result of ambient concentrations at or below analytical detection limits and indicate generally low concentrations of organics in sediments throughout the system.

Aroclor 1254 was detected only in reaches 2 (once), 3 (twice), and 4 (51 times). Aroclor 1254 was found almost exclusively in reach 4, specifically in the core at CRM 9.5. This suggests an upstream source and could include the ORR from Poplar Creek or the municipal wastewater treatment facilities for the City of Oak Ridge or Oliver Springs. Aroclor 1260 was detected in reach 2 once.

Bis(2-ethylhexyl)phthalate was observed in detectable quantities in reaches 2, 3, 4, 5, and 10. This compound is a plasticizer and is commonly found in sediments in industrial countries. Flouranthene, phenanthrene, and pyrene in the CR/WBR system were detected in reach 2 and 3 and to a lesser degree in reach 4. This implies that these compounds originated from the ORR or another upstream source. These polycyclic aromatic hydrocarbons are contaminants commonly found in streams receiving industrial effluent.

Radionuclides

All of the alpha-emitting radionuclide values for sediment cores were estimates because they were reported as being present but not in high enough concentrations to be quantifiable. Whereas average concentrations of ^{234}U, ^{235}U, and ^{238}U are higher in reach 3, the ratios of $^{235}U/^{238}U$ (0.04) and $^{234}U/^{238}U$ (1.10) are close to what is expected in undisturbed regions ($^{235}U/^{238}U$ = 0.046 and $^{234}U/^{238}U$ = 1.0) (NCRP 1978, Olsen et al. 1989). Average ^{90}Sr concentrations are highest (0.396 pCi/g) in reach 3 also but are well below soil concentrations expected from fallout (1 pCi/g) (NCRP 1978). Higher concentrations of these radionuclides would be expected in Poplar Creek given the proximity to the Y-12 Plant and the K-25 Site. Sampling and analysis during Phase 2 will focus on these contaminants in Poplar Creek.

The gamma-emitting radionuclides show expected spatial trends in core average concentrations (Fig. 3.7). Background concentrations of ^{137}Cs are found in reaches 10 and 1 which are both upstream of White Oak Creek, the primary source of this contaminant. Immediately downstream of the Clinch River and White Oak Creek confluence, average core concentrations of ^{137}Cs are above background concentrations. Poplar Creek (reach 3) shows background levels at the site just downstream East Fork Poplar Creek and slightly elevated concentrations at the lower site, which is influenced by backflow from the Clinch River and the K-25 coal-fired power plant which took Clinch River water for cooling and discharged it into Poplar Creek. The highest average concentration and individual concentration are found at the Brashear Island core. This area is the first major depositional zone downstream of White Oak Creek and Poplar Creek. Average ^{137}Cs concentrations drop downstream but remain above background levels. It is important to recognize that the concentrations in the surface layers for these samples are relatively low and that the averages are dominated by large peak ^{137}Cs concentrations that are typically 50 to 80 cm deep in the sediment (Olsen et al. 1992). These peaks are associated with relatively large releases of ^{137}Cs from White Oak Lake in the mid- to late 1950s (DOE 1988).

Average concentrations of ^{60}Co follow a similar trend as ^{137}Cs concentrations except for slightly higher levels in reach 1 (Fig. 3.8). However, because ^{60}Co was detected in only 36% of all samples, many of the concentrations reported in Appendix C are estimates based on detection limits. These higher concentrations probably result from releases from the off-site medical equipment productions facility discussed in Appendix G.

3.3.3 Summary

Concentrations of ^{137}Cs in near-shore surface sediments in Norris, Melton Hill reservoirs, and the Tennessee River arm of Watts Bar Reservoir represent background levels (<1.0) because they are upstream of ORR and only received radioactive fallout from atmospheric testing of nuclear weapons. Concentrations in Poplar Creek and the Emory River average 1 pCi/g, which is consistent with background concentrations. Cesium-137 concentrations in the near-shore surface sediments in the Clinch River arm of Watts Bar reservoir are between 2.7 and 3 pCi/g. Concentrations in Watts Bar Reservoir below the confluence of the Tennessee and Clinch rivers are below 1 pCi/g, again within background concentrations. To date, no sediment disturbance permit that was evaluated by TVA, ACOE, and DOE were rejected on the basis of radiological contamination. Three sites within the Clinch River arm of Watts Bar Reservoir had concentrations between 10 and 34 pCi/g and will be targeted for sampling and analysis during Phase 2 of the CRRI. Samples collected at these areas will be analyzed for the contaminants identified by the risk screening as requiring further research.

Patterns of inorganic contaminants in sediment core samples indicate that there are multiple sources for these contaminants. Arsenic, beryllium, cadmium, chromium, copper, and mercury in Poplar Creek and the downstream portion of the Clinch River arm of Watts Bar Reservoir appear to be originating, at least in part, from Poplar Creek. Mercury releases from the Y-12 processing plant into Poplar Creek are well documented (Olsen et al. 1992, Turner et al. 1985). Other inorganic contaminants likely result from disposal of coal fly-ash material and photographic processing chemicals from the K-25 Site or the municipal wastewater treatment facilities for the cities of Oak Ridge and Oliver Springs. Concentrations of cadmium, lead, and zinc are higher in the sediments in Watts Bar Reservoir below the confluence of the Tennessee River and Clinch River arms, suggesting that there is a source of these contaminants either within the Tennessee River arm of the reservoir or below the confluence of the two rivers. Phase 2 sampling and analysis will focus on locating areas where concentrations of these contaminants are above acceptable levels.

The lack of detectable quantities of most of the 92 organic chemicals for which analyses were conducted allows significant reduction of the list of organic contaminants to be studied. Flouranthene, phenanthrene, and pyrene were found almost exclusively in the Clinch River arm of Watts Bar Reservoir. Aroclor 1254 was only found at CRM 9.5, which is immediately downstream of Poplar Creek. Likely sources for these contaminants are the Y-12 Plant, the K-25 site, or the municipal wastewater treatment facility. Sampling and analysis for these contaminants in Poplar Creek and the Clinch River arm of Watts Bar Reservoir will continue in Phase 2 with the objective of identifying and delineating any areas requiring remediation.

Quantities of alpha-emitting radionuclides were at or near background concentrations for almost every site sampled. Concentrations of ^{234}U, ^{235}U, and ^{238}U in Poplar Creek were above background levels. Poplar Creek will be the focus of study for these contaminants during Phase 2 activities.

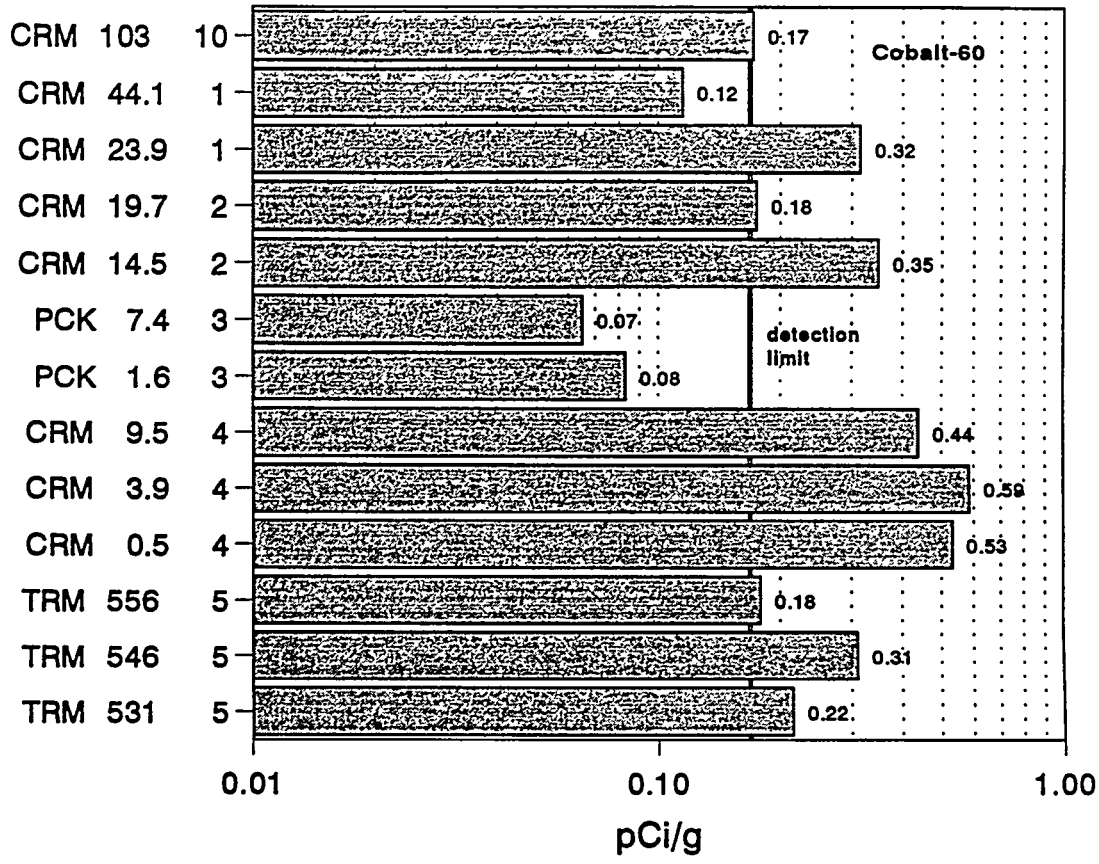


Fig. 3.8. Average concentrations of ^{60}Co for core sampling sites. Reaches and cores within reaches are arranged from upstream on the top to downstream on the bottom.

Phase 1 sediment sampling and analysis was conducted to:

- Obtain high quality data to confirm or modify existing data for contaminant levels in sediment.

This goal was met. Results from Phase 1 are consistent with previous studies (Olsen et al. 1992, Ashwood et al. 1986, and Oakes et al. 1982). Patterns of organics and radionuclides concentrations were similar to previous studies. Inorganic concentrations in Poplar Creek were found to be somewhat lower than previous studies indicated (Ashwood et al. 1986).

- Determine the range of contaminant concentrations present in the system.

This goal was met. We now have a working knowledge of concentrations levels of contaminants throughout the system.

- Identify contaminants of concern.

This goal was met. The Risk Analysis sections (Sect. 4.1 and 4.2) discuss this in detail. However, Phase 1 results allowed the list of contaminants of concern to be reduced significantly. Phase 1 data also strengthens level of confidence for establishing low- and high-priority contaminants.

- Establish reference (background) concentrations for contaminants.

This goal was partially met. Whereas Phase 1 sampling and analysis results provide some insight to reference concentrations, statistical comparability is not yet possible for sediment core data. Additional sampling and analysis during Phase 2 to provide the necessary reference data is the highest priority.

3.4 FISH ANALYSIS

In order to characterize the nature and extent of contamination in the principal biota of the CR/WBR system, three species of fish representing different trophic levels were sampled during the fall of 1989 and spring of 1990. Sampling included 126 bluegill sunfish, 119 channel catfish, and 43 largemouth bass. Sampling was conducted at 15 sites throughout the CR/WBR system in order to (1) bracket the entire geographic extent of this system into the sampling design and (2) focus on certain areas of the CR/WBR system such as the upper Clinch River below Melton Hill Dam and Poplar Creek where certain contaminants were known to be elevated. Results of the contaminant analysis in these three species of fish are summarized for all sites combined and individually by site.

The data validation process documented the quality of the data and determined that most of it (>95% of the metals, PCBs/pesticides, and radionuclides) met the quality standards established by the CR-ERP (see Table 2.9). One exception was the analysis of semivolatiles which was found to be deficient a large portion of the time, resulting in the rejection of nearly 50% of those results. The proportion of semivolatiles that was judged acceptable included very few detectable results, and is probably not of sufficient quantity to meet the program objectives without additional sampling.

3.4.1 Discussion of Contaminants for the System

Appendix D (Table D.1) summarizes the results of the fish analyses for all sites combined. Of the 77 organic and 13 inorganic analytes, a majority (63 organics and 7 inorganics) were not detected at any site. Of the radionuclides, only ^{137}Cs, ^{60}Co, and ^{90}Sr were detected. Four analytes were rarely detected, occurring in less than 5% of the samples. Seventeen analytes were detected in more than 5% of the samples, with only three of those (^{90}Sr, mercury, and zinc) detectable in all samples.

If either of the Aroclors was not detected, the detection limit value was included in the sum. Total PCB was calculated by summing the reported values of Aroclor 1254 and Aroclor 1260. Total chlordane was calculated by summing the concentrations of the detectable chlordane congeners. The six congeners measured in this study were α-chlordane, γ-chlordane, α-chlordene, γ-chlordene, chlordene, and oxychlordane. At least one chlordane congener and one Aroclor were detected in every sample submitted for analysis; therefore, total chlordane and total PCB were considered to be detected 100% of the time. Both total PCB and the individual Aroclors were included in further analysis because of possible point source differences for the two congeners.

Because a preliminary risk assessment was performed on historical contaminant data from the CR/WBR (Hoffman et al. 1991), a comparison of the Phase 1 data with the historical data provides a preliminary indication of any new areas of concern regarding contaminant concentrations and human health risk. Of the 24 detected analytes in Phase 1, four were not reported in the historical database (Hoffman et al. 1991): bis(2-ethylhexyl)phthalate, di-n-octylphthalate, aldrin, and 4,4'-DDE. Bis(2-ethylhexyl)phthalate and di-n-octylphthalate were detected in only one sample each. Although bis(2-ethylhexyl)phthalate was not previously detected in fish, it was detected in the sediment in past studies. According to the analytical chemists who performed the analyses, aldrin, 4,4'-DDE, and 4,4'-DDD values are suspect because of the difficulty involved in measuring these compounds when high levels of PCB and chlordane are present (personal communication, L. Wachter, May 31, 1990). Four of the analytes that were reported at detectable levels in the historical data but that were not detected in the Phase 1 sampling are antimony, chromium, silver, and thallium.

3.4.2 Discussion of Contaminants by Study Reach

A summary of the concentrations of those analytes that were detected at least once is found in Appendix D (Table D.2). For the most part, the Phase 1 maxima are lower than those from the historical data which were summarized by reach in Hoffman et al. (1991). Maximum values of mercury in fish collected in Phase 1 were higher than historical values only at reach 5, and at no sites did the maximum mercury concentration exceed the Food and Drug Administration's (FDA's) action level of 1.0 mg/kg or EPA's acceptable fish tissue concentration which is also 1.0 mg/kg. Selenium maxima exceeded historical values in reaches 2 and 3; Aroclor 1260 maxima exceeded historical values in reaches 3 and 4. Aroclor 1260 maxima exceeded the FDA action level of 2.0 mg/kg at five sites in reaches 2, 3, and 4, but average values did not exceed 1.0 mg/kg at any site or within any reach. Maximum and average values of both Aroclors 1260 and 1254 exceeded the EPA's 10^{-6} cancer risk concentration of 0.0014 mg/kg at all sites.

Because fish are mobile organisms (some species more than others), the degree to which their contaminant body burden is representative of the site in which they were collected from may be highly dependent on how long they have been residents of that area and the heterogeneity in contaminant concentrations in the surrounding environment. This along with other factors (e.g., such as size and diet) can contribute to a high degree of variability in a sample of several fish from a single site. A large amount of variation within sites is evident in both the mercury and the Aroclor 1260 results in the Phase 1 data (see standard deviations in Table D.2). The greatest variation in mercury concentrations within a site occurred in Poplar Creek at PCK 9.6 (Hartland Bridge upstream of the influence of ORR) and PCK 8.6 (mouth of EFPC). Because of the short distance between Hartland Bridge and EFPC (the source of mercury to Poplar Creek) the occurrence of a few fish with high mercury concentrations at Hartland Bridge can probably be explained by the movement of fish from the lower contaminated reaches of Poplar Creek into the upstream areas. The Hartland Bridge site was originally chosen as a potential reference site, but given this information, it should not be considered as a reference outside of the influence of releases from ORR.

The spatial distributions of total chlordane, total PCBs, mercury, and ^{137}Cs in fish are illustrated in Figs. 3.9 through 3.12, respectively. Concentrations of ^{137}Cs and mercury in fish are elevated at sites downstream of known sources of these contaminants, White Oak Creek and East Fork Poplar Creek, respectively. No such patterns of downstream gradients of chlordane or PCBs in fish are evident.

There are only a few analytes for which mean concentrations at any of the study sites exceeded those of the reference site (Norris Reservoir) by more than a factor of 2: mean mercury concentrations at two of the Poplar Creek sites and at Brashear Island, and mean copper levels at mid Watts Bar. Elevated levels of mercury at Poplar Creek and Brashear Island are not unexpected since the main source of mercury to the CR/WBR is the Y-12 facility via East Fork Poplar Creek (EFPC). Copper values are somewhat suspect for two reasons. First, elevated copper was detected at only one site in the entire system, and one fish had an abnormal concentration of 170 mg/kg. Second, copper is a well-regulated nutrient element which does not accumulate in muscle tissue even when exposure concentrations are high (Benoit 1975). Total chlordane concentrations were more than twice the reference values at nearly every site, while Aroclor 1254 and Aroclor 1260 concentrations at the affected sites ranged from 3 to 33 times higher than reference concentrations.

Using pairwise statistical tests, we compared the mean concentrations of detected analytes from each CR/WBR site with the reference site. When the data are from censored distributions, the usual analysis-of-variance techniques for comparing equality of the means of k distributions do not apply. However, if there are some *a priori* comparisons of particular sites that are of interest (e.g., each affected site with the reference site), a z-test can be used. Because this comparison was made with the means of two lognormal distributions, a statistical procedure was developed especially for this analysis (Appendix D).

The results of these site-to-reference comparisons are summarized in Table 3.1. Arsenic concentrations were significantly ($P < 0.05$) higher than concentrations at the reference site at only one location (Kingston Park). Mercury concentrations were predictably higher than those of the reference sites in Poplar Creek below the confluence with EFPC and at the first site downstream of the confluence of Poplar Creek and the Clinch River (Brashear Island).

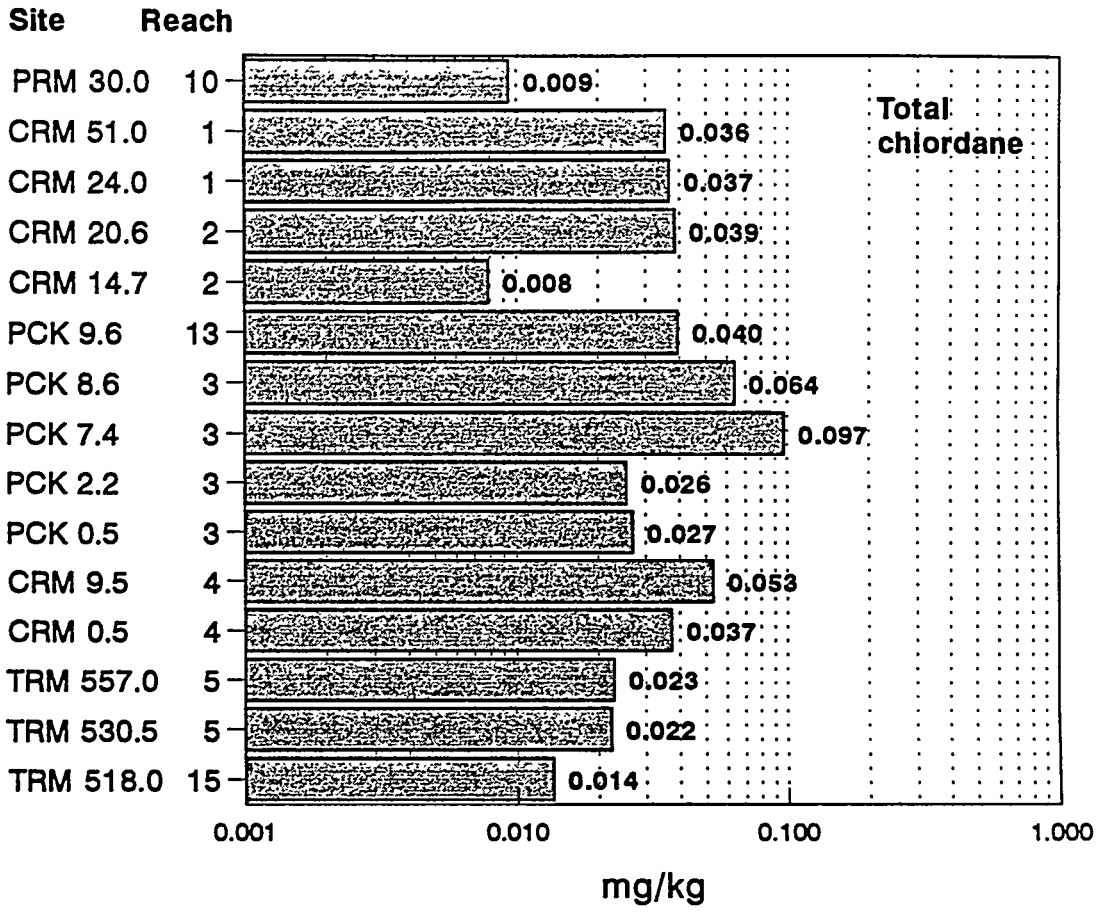


Fig. 3.9. Arithmetic mean concentrations of total chlordane in Clinch River/Watts Bar fish tissue for all sample sites.

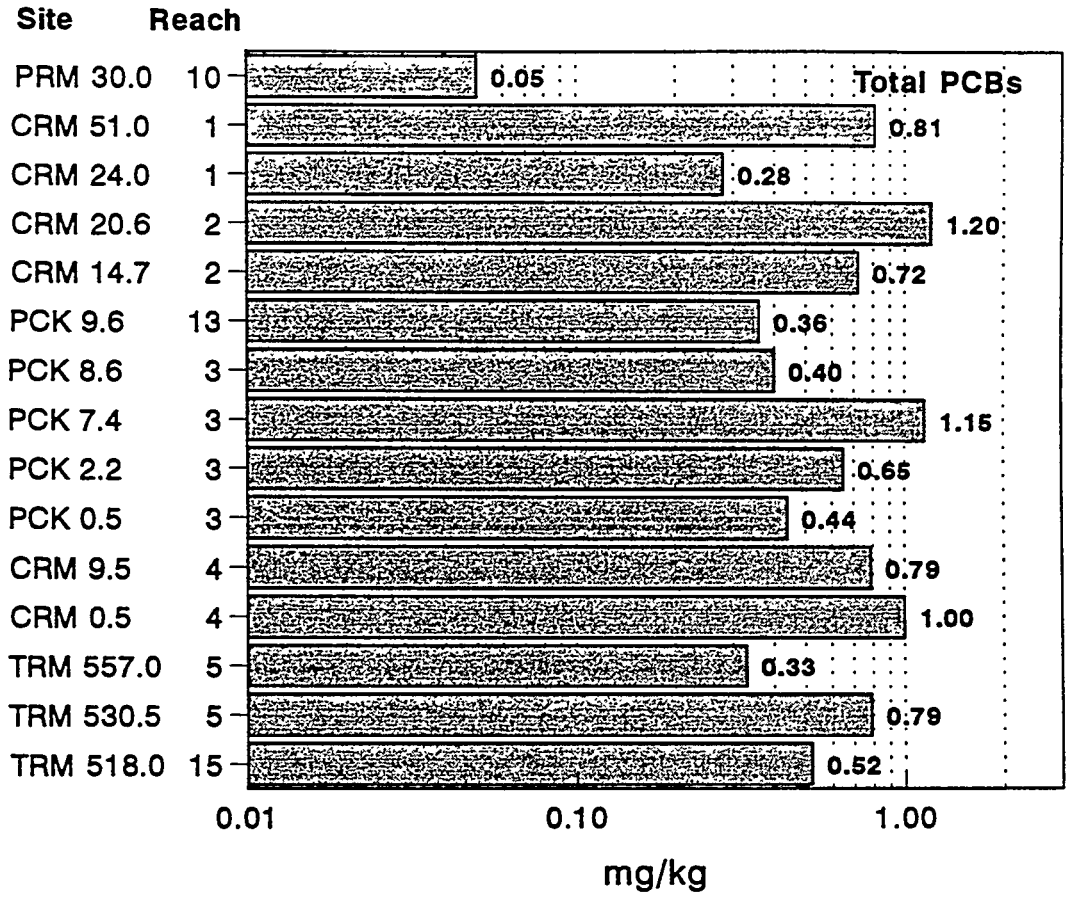


Fig. 3.10. Arithmetic mean concentrations of total PCBs in Clinch River/Watts Bar fish tissue for each site sampled in Phase 1.

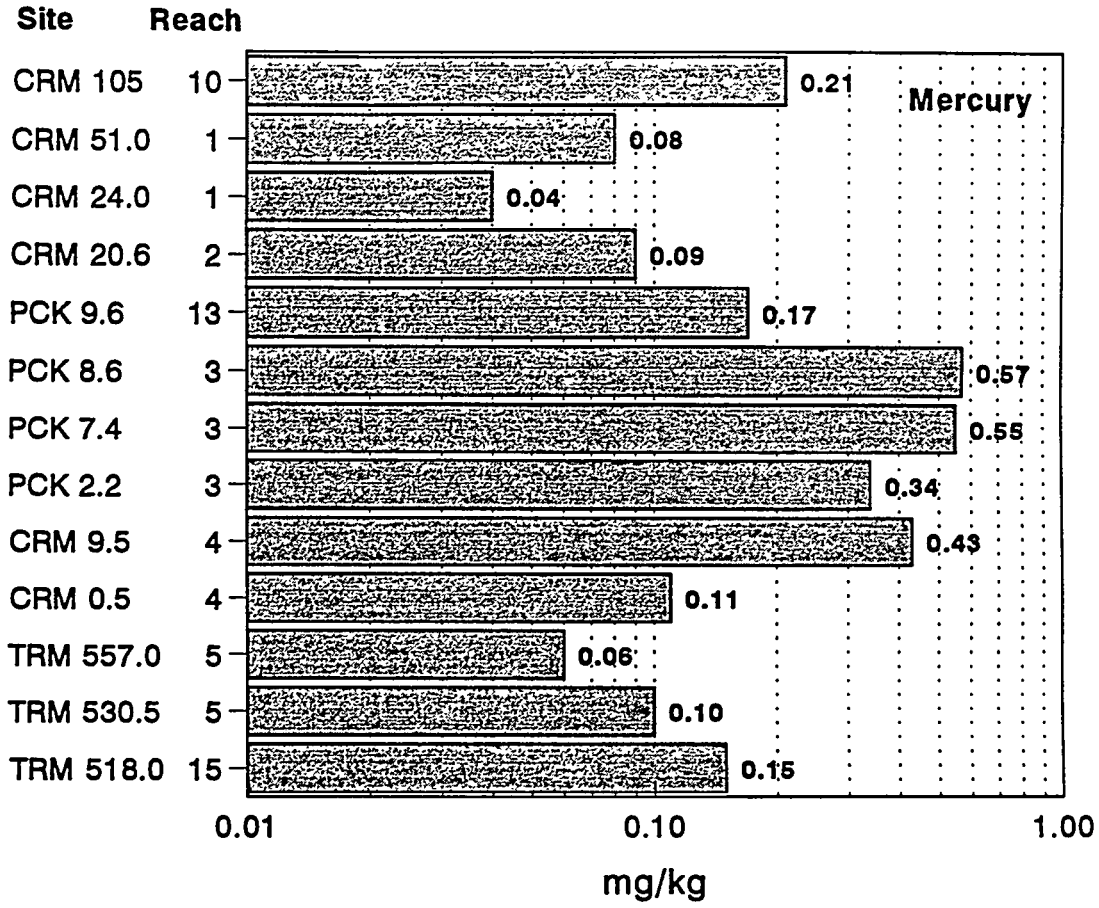


Fig. 3.11. Arithmetic mean concentrations of mercury in Clinch River/Watts Bar fish tissue samples from each Phase 1 site.

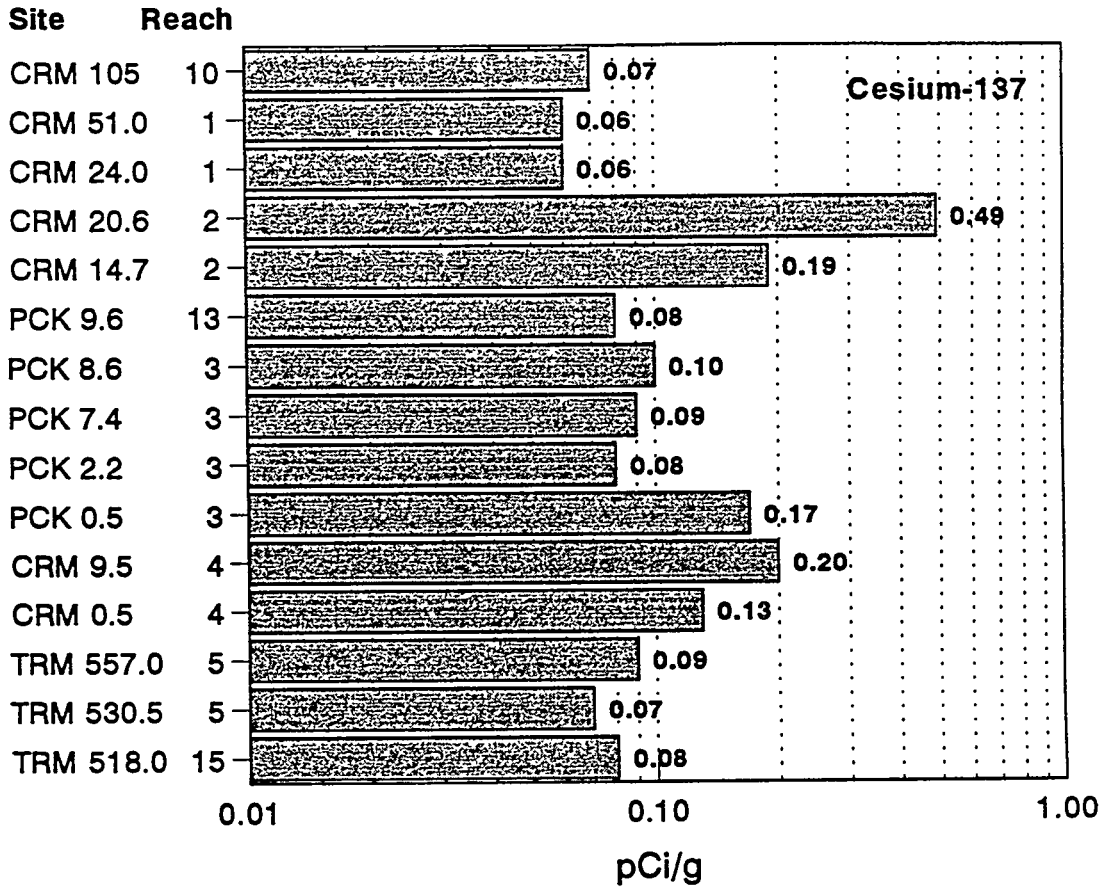


Fig. 3.12. Arithmetic mean concentrations of ^{137}Cs in Clinch River/Watts Bar fish tissue sampled from each Phase 1 site. Fish analyzed for ^{137}Cs from reach 10 were collected from the Powell River arm of Norris Reservoir (PRM 30) as well as the Clinch River arm.

Table 3.1. Summary of study site-to-reference site comparisons for fish tissue results[a]

Affected site	As	Hg	Se	Zn	Aroclor 1254	Aroclor 1260	Total PCB	Total chlordane	^{137}Cs
2 Upper Melton Hill			**	**		**	**	**	*
3 Lower Melton Hill			**	**	**	**	**	**	
5 Jones Island			**		**	**	**	**	**
6 Grassy Creek	–	–	–	–		**	**		**
7 PC/Hartland Br.				**		**	**		**
8 PC/EFPC mouth		**			**	**	**	**	**
9 PC/Mitchell Br.		**			**	**	**	**	**
10 PC/K-1007		**		**	*	**	**	**	**
11 PC embayment	–	–	–	–	**	**	**	**	a
12 Brashear Island		**	**			**	**	**	**
13 Kingston Park	*				**	**	**	**	**
14 Mid Watts Bar					*	**	**		**
15 Lower Watts Bar				**	**	**	**	*	**
16 Chickamauga Res.					**	**	**		

[a]Analysis type was either z-test or confidence interval (CI) comparison as described in Appendix D (Pairwise Statistical Comparison). Final result was either (*) - concentrations from affected site significantly higher than reference site at $0.01<P<0.05$, (**) - concentrations from affected site significantly higher than reference site at $P<0.01$, (a) - concentrations from study site apparently higher than reference site based on CI comparison, or (no symbol) no apparent difference in concentrations from study site and reference site. A dash (–) means no fish were analyzed for that analyte at that site. As, Hg, Se, and Zn values were from bluegill and bass only; Aroclor 1254, Aroclor 1260, total PCB, total chlordane were from catfish only; and ^{137}Cs was from all three species.

Selenium concentrations were higher than the reference site concentrations in main channel sites in the upper part of the CR/WBR (Upper Melton Hill to Brashear Island). Zinc concentrations at 5 of the 12 sites were higher than the those at the reference site, but no obvious spatial distribution was evident. Chlordane concentrations were higher than reference concentrations from Upper Melton Hill to Kingston Park. Total PCB concentrations at all affected sites were higher than the reference site concentrations. At nearly all sites, ^{137}Cs levels for all species were higher than the reference site levels and especially below the White Oak Creek confluence with the Clinch River.

3.4.3 Summary

The sampling plan for fish in Phase 1 of the CRRI was designed to characterize the extent of contamination in some major fish species in the CR/WBR system. The extent to which Phase 1 objectives as described at the beginning of this section were achieved is summarized below.

1. Data validation/verification exercises indicated that a majority of the data was acceptable for site characterization. At least 95% of the analyses performed for inorganic, PCBs/pesticides, and radionuclide analyses were judged acceptable by the validators. Analyses of semivolatiles were less reliable; nearly 50% were rejected due to validation deficiencies. Based on the acceptable data, a majority of the 90 plus analytes were never or rarely

detected. Except for aldrin, 4,4'-DDE (which are possible analytical artifacts) and the two organic compounds detected once each, the Phase 1 study did not identify any contaminants in fish tissue that were not already known from previous studies. In addition, of those analytes that were detected during Phase 1, concentrations were not markedly higher than those reported historically. The Phase 1 data set is markedly more complete and accurate than the historical data, however, and allows a much more comprehensive characterization, particularly on a spatial basis, of biota contamination in the CR/WBR system. Since the semivolatile data set was not complete, more samples should be collected for analysis of those compounds to support the finding that semivolatiles are rarely detected in fish tissue.

2. The data provided preliminary information on the spatial distribution of several contaminants in fish. Some of the contaminants (PCBs and chlordane) are widespread throughout the system and have no apparent spatial relationship to ORR. While others (mercury and ^{137}Cs) show a distinct relationship between downstream concentrations and distance from known contaminant sources. This information suggests that future sampling should be concentrated in those areas nearest ORR, Poplar Creek and the Clinch River arm of Watts Bar Reservoir.

3. Most of the data resulting from the analysis of fish samples was of sufficient quantity and quality for the screening risk assessment. The quality of the analysis of some pesticides (aldrin, DDT, and DDE) and copper are questionable, and these should be reinvestigated in future sampling. A discussion of the refinement of the contaminants of concern list will be reported in the risk assessment section of this document.

4. Fish samples collected from Norris Reservoir, the primary reference site, provided enough quality data for a preliminary characterization of that area. A pair-wise statistical analysis that compared the Norris Reservoir results to those of the study sites found that mercury, selenium, zinc, total chlordane, PCBs, and ^{137}Cs occur at some of the CR/WBR sites at significantly higher concentrations than at the reference site. Samples were also collected from a site in Reach 13 (Poplar Creek upstream of the influence of ORR, PCK 9.8) for evaluation as an additional reference site. After evaluation of the data, the usefulness of this site as a reference site for fish is questionable. Although the site is upstream of any ORR contamination sources, it is close enough to the mouth of EFPC that fish could move into the upstream site after residing in contaminated areas downstream. Other reference areas should be sampled in Phase 2 to better characterize background concentrations of contaminants of concern.

4. SCREENING RISK ASSESSMENT

4.1 SCREENING ASSESSMENT FOR HUMAN EXPOSURE

4.1.1 Approach

The objective of the screening assessment, which is based on human health risk methodology, is to utilize data collected in Phase 1 of the CRRI to (1) identify reaches and contaminants that are high priority for further evaluation and (2) identify reaches and contaminants that have a low priority for further investigation.

The screening approaches used in this assessment are similar to those employed in Hoffman et al. (1991), Blaylock et al. (1992a), and Blaylock et al. (1992b) reports. The first approach is the use of conservatively biased calculations to identify contaminants, exposure pathways, and reaches that have a low priority for further investigation. It is unlikely that these conservative calculations will underestimate the potential maximum exposures to an individual residing in the vicinity of the CR/WBR, which receives releases from the ORR. The second approach uses nonconservative calculations and assumptions to identify contaminants, pathways, and reaches that have a high priority for further investigation. These nonconservative risk estimates are more realistic than the conservative estimates and should not substantially overestimate maximum exposures to local population subgroups. Results of this screening assessment do not constitute a baseline risk assessment and are not intended to address issues regarding compliance with regulatory limits. The purpose of this screening exercise, along with the results obtained in Hoffman et al. (1991), is to help guide the development of the Phase 2 sampling plan, which will focus the collection of data on contaminants of concern. A future baseline risk assessment will be completed when data from the Phase 2 field sampling are available.

4.1.2 Exposure Pathways

The screening assessment was conducted on data from five reaches on the Clinch and Tennessee River system, which receives contaminant releases from the ORR (Fig. 2.4) and two reference reaches—Norris Reservoir and Poplar Creek above the confluence with East Fork Poplar Creek. Conservative and nonconservative screening analyses are performed for selected media in both primary and secondary exposure pathways.

Primary exposure pathways are the most realistic and currently the most likely to be encountered by a potential receptor. The primary pathways represent exposure to three media: fish, near-shore surface sediment, and surface water. The primary exposure pathways are: (1) ingestion of fish, (2) external exposure to radionuclides in surface sediment, (3) inadvertent ingestion of surface sediment, (4) inhalation of contaminated air resulting from resuspension of surface sediment, and (5) ingestion of surface water.

Secondary pathways are less likely scenarios and represent potential or future pathways of exposure. The scenario for secondary exposure pathways assumes that sediment from the Clinch and Tennessee River system is dredged and that the dredged material is placed on land where it supports agricultural activities including growing pasture as forage for cows and garden vegetables for human consumption. The pasture-to-cow pathway results in human

exposure via consumption of milk and meat. Direct analytical measurements of contaminants are not available for the dredging scenario except for the concentrations of contaminants in the dredged sediments. Environmental pathway models that incorporate generic transfer coefficients from sediment are used to predict the concentrations of contaminants in the other exposure media.

Model-predicted concentrations of contaminants have a much higher degree of uncertainty than concentrations based on actual measurements. An irrigation scenario was not considered in this screening analysis because the number of Phase 1 water samples was too limited to reliably extrapolate from water to other media. For the same reason, the consumption of surface water by cows was not included in the cow-meat-milk pathway. Pathways for the dredging scenario include (1) external exposure to dredged sediments, (2) inadvertent ingestion of dredged sediment, (3) inhalation of air contaminated by resuspension of sediments, and (4) ingestion of agricultural products (meat, milk, and vegetables).

4.1.3 Usage and Exposure Factors

Usage and exposure factors for conservative and nonconservative screening are listed in Appendix E, Table E.2. These factors are similar to the ones used by Hoffman et al. (1991) and Blaylock et al. (1992a, 1992b); however, various intake rates, exposure times, toxicity values, and other parameters for both carcinogens and noncarcinogens have been modified since the publication of these reports. For example, EPA has reconsidered the maximum exposure duration and now recommends a residential exposure period of 350 d/year for 30 years instead of the previous recommendation of 365 d/year for 70 years (OSWER 1991).

4.1.4 Data Bases

All data used in this screening analysis were collected in the Phase 1 sampling effort except for the surface water. Because of the limited number of Phase 1 water samples, data from source monitoring sites were also included in the data base (Table E.1). The source monitoring program collects and analyzes water from discharge points, before the effluent readies the surface water body, for NPDES and DOE Order 5400.1 permits. See Appendices B, C, and D for summaries of the Phase 1 data.

More than 500 near-shore grab samples of surface-sediment (Sect. 2) were taken to aid several agencies, including the regulators, TVA, and the U.S. Army Corps of Engineers, in evaluating permit applications for activities that would disturb near-shore sediment. The majority of these samples were taken in shallow water where the sediment would be exposed during winter months when the water level in Watts Bar Reservoir is low. These samples were analyzed for gamma-emitting radionuclides only, primarily ^{60}Co and ^{137}Cs. Data from these samples were used in this screening analysis for primary sediment exposure pathways (i.e., external exposure, inadvertent ingestion of sediment, and inhalation of resuspended material).

Currently there is not a realistic direct pathway for human exposure to deep sediment where the highest concentrations of contaminants have been observed (Olsen et al. 1992). However, a dredging scenario was included in the screening analysis to consider potential exposure pathways if the sediment should be placed upon shore. This scenario would insure

that elevated concentrations of contaminants in deep sediments are considered in the screening analysis (Sect. 3.3). Data from the Phase 1 sediment cores that were used in this analysis are summarized in Appendix C.

The data were divided into two categories—detected and nondetected contaminants. Contaminants for which at least one measurement was above the level of detection for a medium and reach were included in the detected data base. Contaminants for which all measurements in a reach and medium were below the detection limit were included in the nondetected data base. For conservative screening, the upper 95% confidence limit of the arithmetic mean (UCL) for each contaminant in the detectable data set was computed. The UCL was compared with the actual maximum detected value, and the smaller of the two values was used in the risk calculations, as directed in *Risk Assessment Guidance for Superfund* (RAGS) (EPA 1989). For nonconservative screening, the geometric mean of each contaminant in the detected data set and the lowest detection limit in the nondetected data set were used as the contaminant concentration in the environmental medium.

4.1.5 Screening Criteria

4.1.5.1 Screening indices

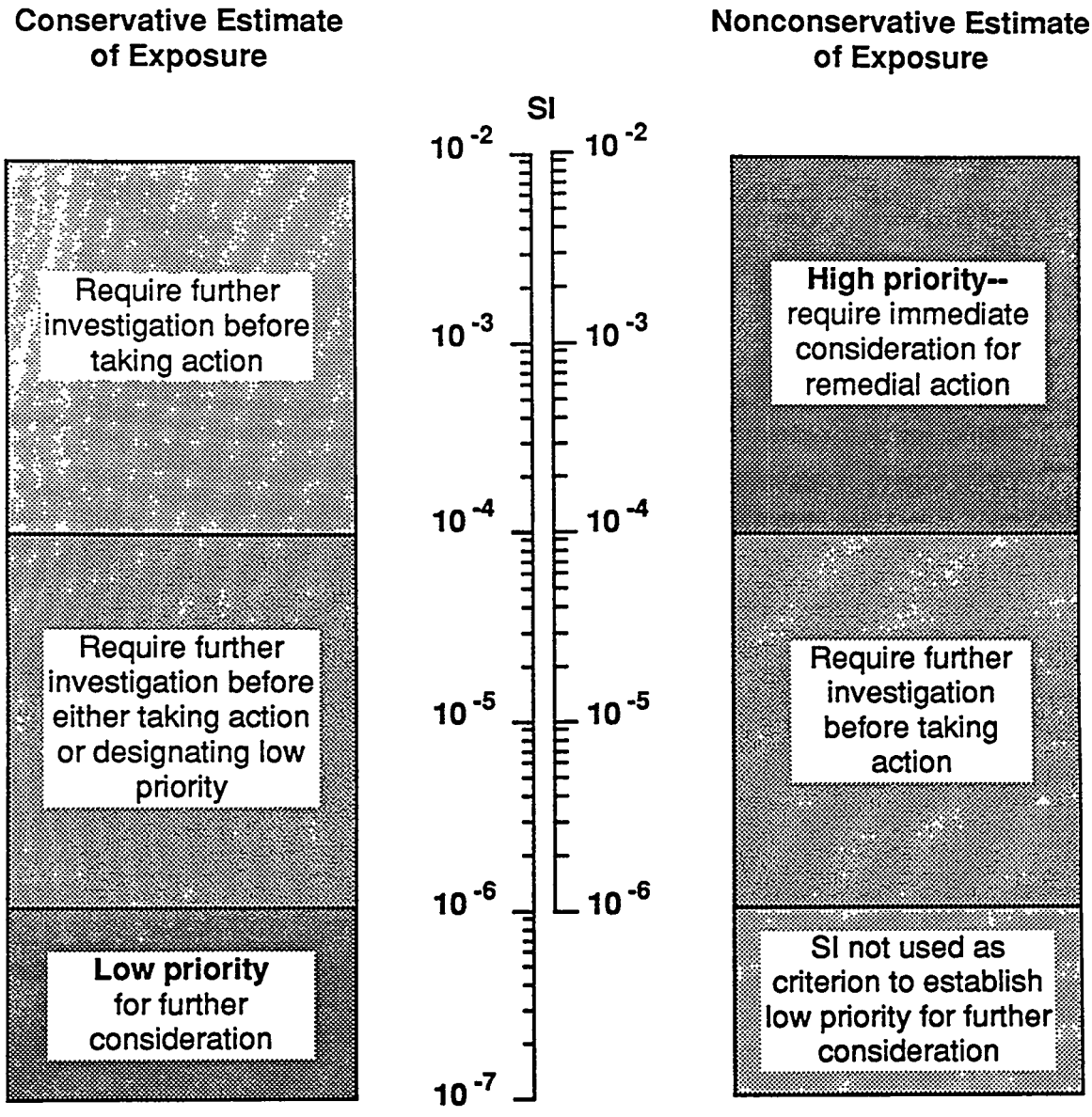
Screening indices (SIs) for carcinogens and noncarcinogens are calculated for contaminants of potential concern to human health. These indices are based upon EPA-approved or -suggested cancer slope factors and toxicity reference doses (RfDs). The slope factor is based upon an estimate of the lifetime risk of an incremental cancer incidence per unit of exposure. The RfD is an exposure level (threshold) below which no adverse health effects should occur. Tables E.3 and E.5 list the slope factors and RfDs for contaminants evaluated in this report.

The screening index for carcinogens is calculated by multiplying an estimate of exposure to a contaminant via external exposure, ingestion, or inhalation by an EPA slope factor. This index indicates the potential lifetime risk of developing additional cancer (EPA 1992, 1990a) above and beyond the normal incidence of cancer. The screening index for noncarcinogens is the ratio of the estimated daily ingestion or inhalation of a contaminant divided by the contaminant-specific RfD.

To estimate the potential risk from all contaminants in a particular reach, the screening indices are summed for all contaminants in the reach. This summation has been termed a "total reach screening index" throughout this report. Summation is conducted separately for carcinogens and noncarcinogens.

4.1.5.2 Screening criteria for carcinogens

Conservative and nonconservative screening criteria are applied to the EPA action level (*Federal Register* March 8, 1990) to categorize carcinogenic contaminants as low priority, high priority, or requiring further investigation before designating high or low priority. *Low priority* indicates that a carcinogen is of little concern for further investigation; *high priority* requires either immediate consideration for remedial action or further analysis; and contaminants identified as neither low nor high priority must be evaluated further before this determination can be made. Figure 4.1 summarizes the screening criteria for carcinogens used in this report.



Screening index (SI) = exposure multiplied by a lifetime cancer slope factor

Fig. 4.1. Screening criteria for carcinogens.

For conservative screening, carcinogens having screening indices $<10^{-6}$ are considered low priority contaminants for further consideration. Carcinogens with screening indices between 10^{-6} and 10^{-4} require further investigation before either taking action or designating these substances as high or low priority. Carcinogens with conservative screening indices $\geq 10^{-4}$ require further investigation before taking action.

For nonconservative screening of carcinogens, substances having screening indices $\geq 10^{-4}$ are high priority carcinogens that require immediate consideration for remedial action. Carcinogens with screening indices between 10^{-4} and 10^{-6} require further investigation before action is taken (i.e., re-examination of the data base, checking of parameter values, or recalculation of screening indices, etc.). Because nonconservative screening employs parameter values that should not greatly overestimate maximum exposures to a contaminant (and in some cases could underestimate maximum exposure), nonconservative screening is not used to identify contaminants with low priority for further consideration.

4.1.5.3 Screening criteria for noncarcinogens

The screening criteria used for noncarcinogens are summarized in Fig. 4.2. For conservative screening, contaminants with screening indices <0.1 are low priority for further consideration, and contaminants with screening indices between 0.1 and 1.0 require further investigation before designating these substances as high or low priority. Noncarcinogens with conservative screening indices ≥ 1.0 require further investigation before action is taken.

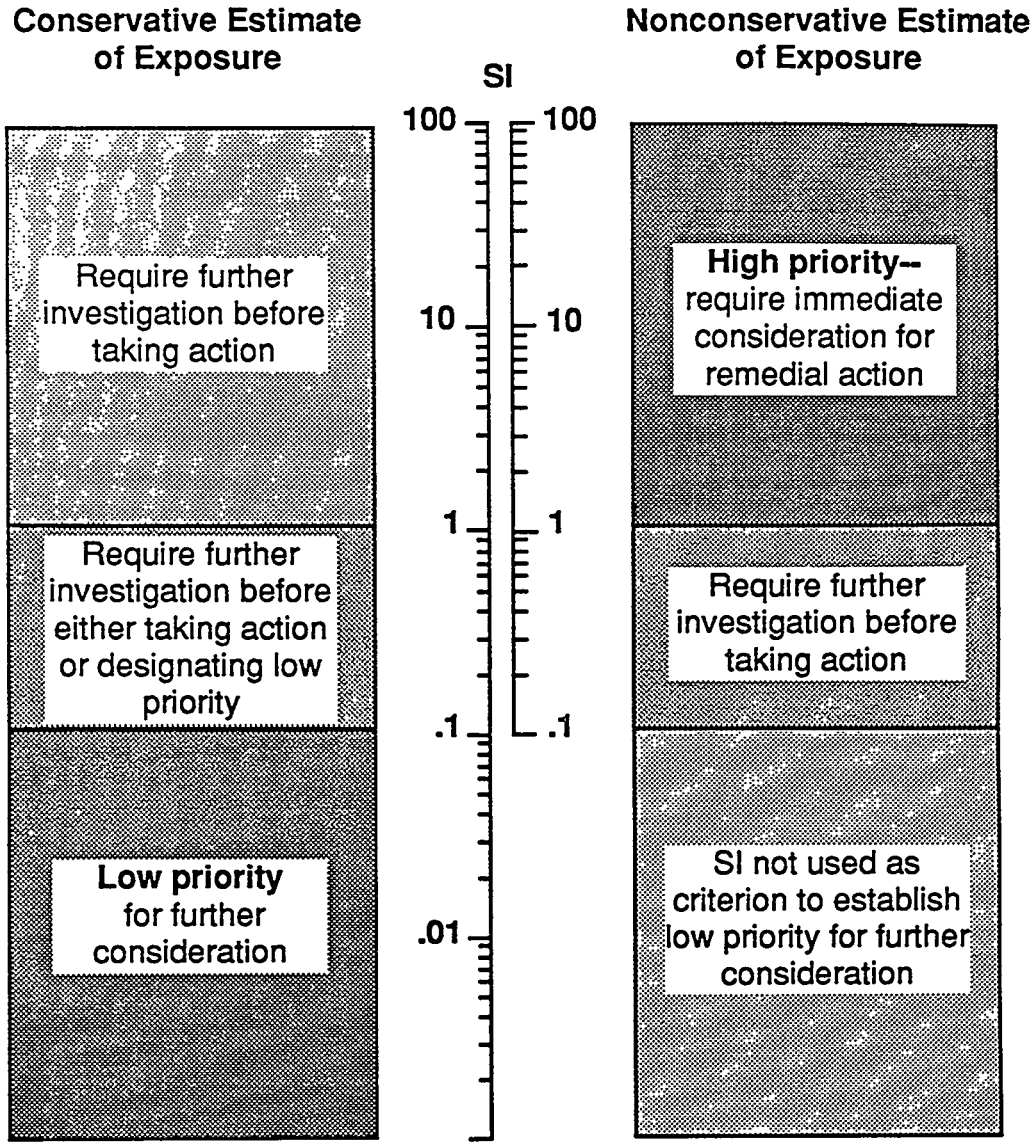
For nonconservative screening of noncarcinogens, contaminants with screening indices ≥ 1.0 are high priority substances requiring immediate consideration for remedial action, and contaminants with screening indices between 1.0 and 0.1 require further investigation before taking action. Nonconservative screening indices <0.1 are not used to designate low priority contaminants because nonconservative screening employs parameter values that, under some circumstances, may underestimate maximum exposures to a contaminant.

4.1.6 Contaminant Screening Results for Primary Exposure Pathways

Screening results for individual contaminants for each primary exposure pathway and each reach are given in Appendix E, Tables E.8 through E.12. The pathways considered to be primary pathways for this screening exercise are: (1) ingestion of fish, (2) external exposure to gamma-emitting radionuclides present in surface sediment, (3) inadvertent ingestion of surface sediment, (4) inhalation of contaminated air (via either dust resuspension, volatilization, or vaporization of contaminants), and (5) ingestion of surface water. Tables 4.1 through 4.5 summarize the results for carcinogens and noncarcinogens in each exposure pathway for both the conservative and nonconservative screening approaches. These tables identify the high priority contaminants, low priority contaminants, and contaminants requiring further investigation; they also show the reaches where no adverse health effects are expected and those where no data were available.

4.1.6.1 Fish ingestion pathway

Carcinogens. Listed in Table 4.1 are the results of the conservative and nonconservative screening analyses for carcinogens in the fish ingestion pathway. Nonconservative screening identified the PCB Aroclor 1260 in all reaches except reach 1 (Melton Hill Reservoir) and



Screening index (SI) = exposure divided by reference dose factor (RfD)

Fig. 4.2. Screening criteria for noncarcinogens.

Table 4.1. Summary of adult screening results for carcinogens in the fish ingestion pathway

Carcinogen	Reach 1	2	3	4	5	10	13
Organics							
4,4'-DDE							
4,4'-DDT	N		N			N	N
Aldrin	N		N			N	
Aroclor 1254						N	
Aroclor 1260		X	X	X	X		X
Bis(2-ethylhexyl) phthalate	N	N		N	S	S	S
Chlordane							
Inorganics							
Arsenic							
Beryllium		N		N			N
Radionuclides							
^{60}Co		N		N	N		
^{137}Cs							
^{90}Sr							

X — Carcinogens having nonconservative screening indices > 10^{-4} that require immediate consideration.

Carcinogens with conservative or nonconservative screening indices between 10^{-6} and 10^{-4} that further investigation before either taking action or designating as low priority.

Carcinogens having conservative screening indices < 10^{-6} and can be designated as low priority.

N — Nondetects - contaminant concentrations were below detection limits.

S — No data available.

Table 4.2. Summary of screening results for noncarcinogens in the fish ingestion pathways

Contaminant	Reach						
	1	2	3	4	5	10	13
Organics							
4,4'-DDT	N		N			N	N
Aldrin	N		N			N	
Bis(2-ethylhexyl phthalate)	N	N		N	S	S	S
Chlordane							
Di-n-octylphthalate	N	N		N	S	S	S
Inorganics							
Arsenic							
Beryllium		N		N			N
Copper	N	N	N	N		N	N
Mercury							
Selenium					N		N
Zinc							

X — Contaminants with adult nonconservative screening indices ≥ 1.0 that require immediate consideration.

Contaminants with child conservative screening indices between 0.1 and 1.0 that require further investigation before either taking action or designating as low priority.

Contaminants having child conservative screening indices < 0.1 and can be designated as low priority.

N — Nondetects - contaminant concentrations were below detection limits.

S — No data available.

Table 4.3. Summary of adult screening results for radionuclides in near-shore surface sediment exposure

	Reach							
External Exposure	1	2	3	4	5	10	13	18
^{60}Co						S	S	
^{137}Cs						S	S	
Ingestion Exposure								
^{60}Co						S	S	
^{137}Cs						S	S	
Inhalation Pathway								
^{60}Co						S	S	
^{137}Cs						S	S	

X — Carcinogens with nonconservative screening indices $\geq 10^{-4}$ that require immediate consideration.

Carcinogens with screening indices between 10^{-6} and 10^{-4} that require further investigation before designating as low priority.

Carcinogens having conservative screening indices $< 10^{-6}$ and can be designated as low priority.

N — Nondetects - contaminant concentrations were below detection limits.

S — No data available.

Table 4.4. Summary of adult screening results for carcinogens in the water ingestion pathway

Contaminant	Reach 1	2	3	4	5	10	13
Organics							
1,2-Dichloroethane	S	N		N	S	S	N
1,2-Dichloropropane	S		N	N	S	S	N
1,4-Dichlorobenzene	N	N		N	N	N	N
Anthracene	N	N		N	N	N	N
Aroclor 1254	N	N		N	N	N	S
Benzene	S	N		N	S	S	N
Benzo(a)anthracene	N	N		N	N	N	N
Bis(2-ethylhexyl)phthalate	N	N		N	N		N
Bromoform	S	N		N	S	S	N
Chlorodibromomethane	S	N		N	S	S	N
Chloroform	S			N	S	S	N
Chrysene	N	N		N	N	N	N
Dichlorobromomethane	S	N		N	S	S	N
1,1-Dichloroethylene							
Fluoranthene	N	N		N	N	N	N
Methylene Chloride	S			N	S	S	N
N-nitro-di-n-propylamine	N	N		N	N	N	N
Phenanthrene	N	N		N	N	N	N
Pyrene	N	N		N	N	N	N
Tetrachloroethylene	S			N	S	S	N
Trans-1,3-dichloropropene	S	N		N	S	S	N
Trichloroethylene	S	N		N	S	S	N
Vinyl Chloride	S	N		N	S	S	N
Inorganics							
Arsenic		N		N	N	N	N
Beryllium		N		N	N	N	N

Table 4.4 (continued)

Contaminant	Reach 1	2	3	4	5	10	13
Radionuclides							
^{60}Co			N		N	N	N
^{137}Cs						N	
^{3}H	S		S		S	S	S
^{237}Np	S			S	S	S	S
^{191}Os	S		S	S	S	S	S
^{234}Pa	S				S	S	S
^{238}Pu	S				S	S	S
^{239}Pu		S			S	S	S
^{90}Sr						S	S
^{99}Tc	S				S	S	
^{228}Th	S		X		S	S	
^{234}Th	S				S	S	
^{234}U					S	S	S
^{235}U					S	S	S
^{236}U	S	S			S	S	S
^{238}U					S	S	S

X — Carcinogens having nonconservative screening indices > 10^{-4} that require immediate consideration.

Carcinogens with conservative or nonconservative screening indices between 10^{-6} and 10^{-4} that further investigation before designating as low priority.

Carcinogens having conservative screening indices < 10^{-6} and can be designated as low priority.

N — Nondetects - contaminant concentrations were below detection limits.

S — No data available.

Table 4.5. Summary of screening results for noncarcinogens in the water ingestion pathway

Contaminant	Reach						
	1	2	3	4	5	10	13
Organics							
1,1-Dichloroethane	S	N		N	S	S	N
1,1,1-Trichloroethane	S	N		N	S	S	N
2,4-Dichlorophenol	N	N		N	N	N	N
Acetone	S		N	S	S	S	S
Anthracene	N	N		N	N	N	N
Bis(2-ethylhexyl)phthalate	N	N		N	N		N
Bromoform	S	N		N	S	S	N
Butylbenzylphthalate	N	N		N	N	N	N
Carbon Disulfide	S		S	S	S	S	S
Chlorobenzene	S	N		N	S	S	N
Chlorodibromomethane	S	N		N	S	S	N
Chloroform	S			N	S	S	N
Di-n-butylphthalate	N	N		N	N	N	N
Dichlorobromomethane	S	N		N	S	S	N
Diethylphthalate	N	N		N	N	N	N
Dimethylphthalate	N	N		N	N	N	N
Ethylbenzene	S	N		N	S	S	N
Fluoranthene	N	N		N	N	N	N
Methylene Chloride	S			N	S	S	N
Phenol	N				N	N	N
Pyrene	N	N		N	N	N	N
Tetrachloroethylene	S			N	S	S	N
Toluene	S			N	S	S	N
Trans-1,2-Dichloroethene	S	N		N	S	S	N
Trans-1,3-dichloropropene	S	N		N	S	S	N
Xylene	S		N	S	S	S	S

Table 4.5 (continued)

Contaminant	Reach 1	2	3	4	5	10	13
Inorganics							
Antimony		N	N	N	N	N	N
Arsenic		N		N	N	N	N
Barium					S	S	S
Beryllium		N		N	N	N	N
Boron	N	N			S	S	S
Cadmium		N		N	N	N	N
Chromium		N			N	N	
Copper					N	N	N
Cyanide	S				S	S	
Manganese					S	S	
Mercury		N			N	N	N
Molybdenum	N	N		N	S	S	
Nickel					N	N	
Selenium				N	N	N	N
Silver	N	N		N	N	N	N
Strontium			S	S	S	S	S
Tin	N	N		N	S	S	S
Uranium	S				S	S	N
Vanadium		N	N	S	S	S	S
Zinc					N	N	

Noncarcinogens having adult nonconservative screening indices ≥1.0 that require immediate consideration.

Noncarcinogens with child conservative screening indices between 0.1 and 1.0 that require further investigation before either taking action or designating as low priority.

Noncarcinogens having child conservative screening indices <0.1 and can be designated as low priority.

N Nondetects - contaminant concentrations were below detection limits.

S No data available.

reach 10 (Norris Reservoir) as a high priority contaminant requiring immediate consideration for remedial action. In addition, Aroclor 1254 was identified as requiring further study in all reaches except reach 10. In a previous screening analysis of historical data (Hoffman et al. 1991), PCBs were identified as a potentially high priority contaminant (screening index between 10^{-4} and 10^{-3}). Other investigations have shown that PCBs are a common pollutant in East Tennessee rivers and reservoirs. Although the ORR is a known source of PCBs, it is not the only one contributing PCBs to the Clinch River/Watts Bar Reservoir system.

Several contaminants were identified as requiring further investigation (screening indices between 10^{-4} and 10^{-6}) before action is taken or they are designated as low priority (Table 4.1). Arsenic and chlordane in all reaches, including reference reach 10 (Norris Reservoir), were identified as requiring further investigation. These contaminants were identified in Hoffman et al. (1991) as potentially high priority contaminants. Arsenic is a common pollutant resulting from industrial operations and fossil fuel use in East Tennessee, especially metropolitan areas. A special study is being conducted under the sponsorship of the CRRI to document the concentration of arsenic in water and sediment in areas receiving effluents from the ORR (Byrd 1991). Beryllium was identified in all reaches except 2, 4, and 13, and ^{137}Cs was identified in reaches 2 and 4 as requiring further study.

Several pesticides found in fish (4,4'-DDE, 4,4'-DDT, and Aldrin) were identified as requiring further investigation. These are common agricultural pesticides that were identified in only a few reaches but will require further investigation; however, the occurrence of these contaminants in fish may be the result of analytical procedures.

Noncarcinogens. Exposure parameters for a child were used to identify the low priority noncarcinogens in the fish ingestion pathway because the child scenario is more conservative than the adult and would eliminate fewer contaminants. Results of both conservative (child) and nonconservative (adult) screening analyses for noncarcinogens in the fish ingestion pathway are summarized in Table 4.2. None of the noncarcinogens were identified by nonconservative screening as high priority contaminants that would require immediate consideration for remedial action. Also, none of the sums of the conservative screening indices for the reaches were <0.1, including reference reach 10 (Norris Reservoir) (see Tables E.9 and E.12 in Appendix E), thus, no reach could be eliminated from further consideration. Contaminants that were classified as requiring further investigation in most reaches are chlordane, arsenic, mercury, and selenium. These contaminants are ubiquitous in East Tennessee aquatic systems, and, with the exception of mercury, which was released from the Y-12 Plant in large quantities in the past, are common industrial pollutants and not unique to the ORR.

4.1.6.2 Near-shore surface sediments

Results of conservative and nonconservative screening analyses for the near-shore surface sediment for the ingestion, inhalation, and exposure pathways are given in Table 4.3. Nonconservative screening indices were $<10^{-4}$ for all pathways and reaches. Conservative screening indices for the ingestion and inhalation pathways were $<10^{-6}$ for all reaches and can be assigned low priority for consideration for further investigation. Therefore, ^{60}Co and ^{137}Cs, the only contaminants for which the near-shore surface sediment samples were analyzed, are assigned low priority for further consideration in ingestion and inhalation pathways for all reaches.

For the external exposure pathway, ^{60}Co in reaches 1–4 and ^{137}Cs in reaches 1–5 and 18 were identified as contaminants with screening indices of $>10^{-6}$. These radionuclides require further investigation before action is taken or they are assigned low priority. In most reaches, the concentrations of ^{60}Co and ^{137}Cs were <1 and 4 pCi/g, respectively, in the near-shore surface sediment. Three samples had concentrations >10 pCi/g (Section 3.3.1.1); however, these samples came from relatively deep water.

4.1.6.3 Water ingestion pathway

Carcinogens. Because of the limited number of Phase 1 water samples and the use of source monitoring data, which included NPDES data, the screening results for water should be used primarily to guide future sampling and analysis of the surface water. Although source monitoring data are useful in identifying contaminants that are released into the surface water, it is unlikely that these data represent the actual contaminant concentrations in the receiving body of water. Results of the screening analysis for the ingestion of carcinogens in surface water are summarized in Table 4.4. This table shows that reach 3 (Poplar Creek), which receives effluents from the K-25 Site, East Fork Poplar Creek, and the City of Oak Ridge west-end sewage treatment plant, has a large number of contaminants that require consideration for further investigation. Thorium-228, a daughter of ^{232}U and naturally occuring ^{232}Th, was reported in reach 3 at concentrations that produced a screening index $>10^{-3}$. By the current screening criteria, ^{228}Th would be classified as a high priority contaminant requiring immediate consideration for remedial action; however, the ^{228}Th was measured at only surface water monitoring sites, and these measurements are representative of a point source rather than of the downstream surface water. In the other six reaches shown in Table 4.4, either most of the organic and inorganic contaminants in water were below detection limits, or the contaminants were not measured.

In addition to reach 3, reaches 2 and 4, which are immediately downstream from ORNL and the K-25 Site, respectively, have concentrations of radionuclides that require further investigation. Many of these radionuclides are isotopes of uranium or their daughter products that occur in nature. In reach 2, ^{191}Os was detected once but probably will not be detected again because it is an isotope that is used in nuclear medicine and is not routinely released from ORNL. The tritium (^{3}H) concentration for reach 2 is from surface water monitoring data taken at White Oak Dam and is not representative of water in the Clinch River. Although ^{99}Tc is identified in reaches 3 and 13 as being a contaminant of concern, the analytical methodology may be questionable when applied to environmental samples. The ^{99}Tc data probably represent gross beta activity rather than the actual activity of ^{99}Tc.

Noncarcinogens. Only two organic noncarcinogens in water in reach 3 are identified in Table 4.5 as contaminants that would require further consideration for investigation. However, a relatively large number of inorganic noncarcinogens in reaches 1 and 3 were identified as requiring further investigation. Because the water data are composed of a limited number of Phase 1 samples and are supplemented by NPDES monitoring data that represent point sources of contaminants, results of the screening analyses performed on these limited data are inconclusive. Unless a methodology can be developed to convert the available monitoring data to concentrations representative of the concentrations in the receiving water, additional data for all contaminants in water will be needed for future assessment of the water ingestion pathway.

4.1.7 Dredging Scenario

Conservative screening was used in the dredging scenario to identify contaminants found in buried sediments that require further investigation before designation as high priority contaminants, i.e., carcinogens with screening indices between 10^{-4} and 10^{-6} and noncarcinogens with a screening indices between 1.0 and 0.1. Screening indices for the carcinogens are given in Table E.13 and for the noncarcinogens in Table E.14. Screening indices for some inorganics in all pathways were $>10^{-6}$, which indicates that they require further investigation.

Carcinogens and noncarcinogens in the direct and secondary exposure pathways that had screening indices $>10^{-6}$ or >0.1, respectively, are summarized in Table 4.6. Reach 3 had the largest number of organic contaminants that require further investigation in both the direct and secondary exposure pathways. Arsenic, beryllium, and chromium in all reaches were identified as requiring further investigation. Mercury and nickel were identified in the screening analysis of the secondary pathways as requiring further investigation in all pathways. Cobalt-60 and ^{137}Cs were identified in the screening analysis of the direct pathways as requiring further investigation in all reaches. Most of the inorganics in the direct and indirect exposure pathways listed in Table 4.6 require further investigation for reach 5 (Watts Bar Reservoir). Further investigation should be conducted to determine the original source of the metals that have relatively high concentrations in reach 5 sediment.

Although no contaminant was identified in the dredging scenario as a high priority contaminant requiring immediate consideration, a relatively large number of organic and inorganic contaminants were identified in most reaches as requiring further investigation. Therefore, dredging should be strictly limited, if not prohibited, in these reaches.

Conservative screening was used in the dredging scenario to identify low priority contaminants, i.e., carcinogens with a screening index of $<10^{-6}$ and noncarcinogens with a screening index of <0.1. Screening results for carcinogens in the secondary pathways are summarized in Table E.6 in Appendix E. Eleven organic and five inorganic carcinogens had screening indices that were $<10^{-6}$ in at least one pathway; but only bis(2-ethylhexyl)phthalate and cadmium can be designated low priority for all reaches. The remaining carcinogens should be considered candidates for future investigation. Ten radionuclides had screening indices that were $<10^{-6}$ in one or more pathways and five of these, ^{241}Am, $^{243,244}Cm$, ^{238}Pu, $^{239,240}Pu$, and ^{235}U, can be eliminated from further consideration based on the dredging scenario.

A summary of the noncarcinogens in the dredging scenario that were identified as low priority in one or more pathways is presented in Table E.7 in Appendix E. All nine of the organics had screening indices that were <0.1 and can be designated low priority for all pathways and reaches. None of the ten inorganics can be designated low priority because their screening indices for one or more pathways was >0.1. Total screening indices for the inhalation pathway for organic and inorganic noncarcinogens were <0.1 for all reaches, indicating that this pathway can be assigned low priority; however, only mercury has an inhalation RfD (Table E.14 in Appendix E). Total screening indices for the ingestion of meat, milk, and vegetable pathways were >0.1 and cannot be considered low priority.

Table 4.6. Summary by reach of contaminants in the dredging scenario identified by conservative screening as requiring further investigation before taking action or designating as low priority

	Reaches					
Contaminants	**1**	**2**	**3**	**4**	**5**	**10**
Sediment exposure via direct pathways (Ingestion, inhalation, and external exposure)						
Organic						
Anthracene			X			
Aroclor-1254		X	X			
Aroclor-1260		X				
Benzo(a)pyrene		X	X			
Fluoranthene	X	X	X	X		X
N-Nitro-di-n-propylamine				X		
Phenanthrene		X	X	X		X
Pyrene	X	X	X	X		X
Toxaphene		X				
Inorganic						
Arsenic	X	X	X	X	X	X
Beryllium	X	X	X	X	X	X
Chromium	X		X	X	X	X
Radionuclides						
^{60}Co	X	X	X	X	X	
^{137}Cs	X	X	X	X	X	X
^{238}U			X			
Additional contaminants identified from sediment exposure via secondary pathways (Ingestion of milk, meat, and vegetables produced on sediment)						
Organic						
Aroclor-1254				X		
4,4'-DDD	X					
4,4'-DDT	X					
Benzo(a)anthracene	X	X	X			
Benzo(b)flouranthene		X	X			

Table 4.6 (continued)

	Reaches					
Contaminants	**1**	**2**	**3**	**4**	**5**	**10**
Organic (continued)						
Benzo(k)fluoranthene	X		X			
Chrysene						X
Indeno(1,2,2-cd)pyrene		X				
Inorganic						
Cadmium	X	X	X	X	X	X
Copper	X	X	X	X	X	X
Mercury	X	X	X	X	X	X
Nickel	X	X	X	X	X	X
Selenium	X	X	X	X		
Silver			X	X	X	
Thallium			X			
Uranium			X			
Zinc	X	X	X	X	X	X
Radionuclides						
^{90}Sr		X	X	X	X	X
^{234}U			X			

4.1.8 Comparison of the Phase 1 Screening Analysis with a Previous Screening Analysis of Historical Data

The results of the screening analysis of the historical data base (Hoffman et al. 1991) were helpful in identifying areas and contaminants that required immediate consideration for remedial action. The screening analysis also helped guide the Phase 1 sampling, which was designed to confirm the areas and contaminants that will require more comprehensive sampling in Phase 2. White Oak Creek Embayment, previously included in reach 2, was identified in Hoffman et al. (1991) as an area requiring immediate attention. Results of intense sampling efforts by the CRRI staff led to the implementation of remedial measures to abate the release of contaminants from the embayment. The White Oak Creek Embayment remediation measures have been completed (Leslie and Kimmel 1992), and this area is no longer considered part of the CRRI. As a result of this remediation, ^{137}Cs, which was a high priority contaminant in the previous screening assessment, has been given a lower priority in reach 2 in the current screening assessment.

Generally, the results of the Phase 1 screening analysis are in agreement with results obtained from the earlier human health screening efforts. The screening methodologies used in the two reports are similar; however, modification of several exposure parameters, changes in some EPA-approved risk assessment factors and criteria, and the use of maximum instead of mean concentrations for some media have contributed to the differences in the screening results for the two reports. The identification of ^{228}Th as a high priority contaminant in water from Poplar Creek (reach 3) in the current screening assessments was the most notable difference between the two screening analyses. This result is probably biased and not representative of the entire reach because of the use of source monitoring data to supplement the Phase 1 water data. The source monitoring data should be investigated to document the concentrations of ^{228}Th reported in these data.

PCBs were identified in the fish ingestion pathway as potentially high priority pollutants (screening index between 10^{-4} and 10^{-3}) in Hoffman et al. (1991). The PCB Aroclor 1260 was identified in the current screening assessment as a high priority contaminant in fish (screening index $\geq 10^{-4}$) requiring immediate consideration for remedial action. A large number of inorganic and organic contaminants were identified as potentially high priority contaminants in the secondary pathways in the dredging scenario in Hoffman et al. (1991). Similar results were obtained for the secondary pathways in the dredging scenario in the current screening assessment, but the number of problem contaminants was smaller. For the dredging scenario, the maximum concentrations for the contaminants found in the sediment cores were used as the sediment concentration in Hoffman et al. (1991) whereas the mean concentration, which is a more realistic value, was used in the current screening assessment. Because of improved analytical procedures, more pesticides and polycyclic aromatic hydrocarbons were detected in the Phase 1 samples than were reported for samples in the historical data base. Several of the contaminants that were not reported in the historical data base are classified in the current screening assessment as requiring further evaluation. However, these contaminants are found in most streams that receive industrial and domestic waste and are not unique to streams that receive effluents from ORR.

4.1.9 Nondetected Contaminants

The nondetected contaminant data base contained several times as many contaminants as the detected contaminant data base. The screening analysis would not be complete without including the nondetected contaminants; however, caution should be exercised in interpreting the results because of the uncertainty associated with the reported contaminant concentrations.

Only the nonconservative screening approach was employed for the nondetected contaminants. This approach was used to identify contaminants that have a high priority for action to improve (lower) the detection limits (DLs) or, alternatively, those for which source-term data are needed to determine whether even extremely small quantities of these contaminants have been released from the ORR in the past. Results of the adult nonconservative screening for carcinogens and noncarcinogens in the nondetectable data base are given in Tables E.15–E.18 in Appendix E. Screening indices for individual contaminants are listed according to exposure pathway and reach. Concentrations used in the screening calculations were the minimum DL recorded for a medium across each reach. Screening indices were not summed for contaminant type, pathway, or reach because the uncertainty resulting from using DLs would make the sums overly conservative.

4.1.9.1 Carcinogens

For nondetected carcinogens, a nonconservative screening index $\geq 10^{-4}$ indicated the need to improve the DL of the contaminant for future samples. For organics in fish, the DLs for the same 11 contaminants in reaches 1, 2, and 4 produced screening indices $\geq 10^{-4}$, and four of these contaminants had screening indices of $>10^{-4}$ in reach 3 (Table 4.7). Screening indices for six organic contaminants in water indicated a need for lower detection limits. No radionuclides in water or fish and no carcinogens in the deep core sediments had DLs that produced high priority screening indices (Tables E.15 and E.17 in Appendix E). Near-shore surface sediment grab samples had no problems with DLs.

4.1.9.2 Noncarcinogens

A noncarcinogen in the nondetected data base was assigned a high priority for improvement in analytical methodology if the screening index was ≥ 1.0. In the fish and water exposure pathways, the detection limit for 4,6-dinitro-2-methylphenol produced screening indices >1.0 in most reaches (Table 4.7). None of the DLs for noncarcinogens in sediment produced high priority screening indices (Table E.18 in Appendix E).

4.1.10 Contaminants Having No Available Toxicity Values

The number of contaminants that can be quantitatively evaluated in this risk assessment was limited by the availability of chemical-specific, EPA-approved dose/response information. Contaminants for which no slope or reference dose factors are currently available and were therefore not included in the screening assessment are listed in Table E.19 of Appendix E. Of these contaminants, some are essential nutrients that should have little or no toxic effects at the reported concentrations.

Table 4.7. Contaminants for which the use of detection limits produced screening indices $>10^{-4}$ for carcinogens or >1.0 for noncarcinogens by nonconservative screening

Contaminants	Reaches	
Carcinogens	**Fish pathway**	**Water pathway**
Acenaphthene	1, 2, 3, 4	1,2,3,4,5,10,13
Acenaphthylene	1, 2, 3, 4	1,2,3,4,5,10,13
Anthracene	1, 2, 4	
Benzo(a)pyrene	1, 2, 4	
Benzidine		2,3,4,13
Benzo(g,h,i)perylene	1, 2, 4	
Dibenz(a,h)anthracene	1, 2, 3, 4	1,2,3,4,5,10,13
Fluoranthene	1, 2, 4	
Fluorene	1, 2, 3, 4	1,2,3,4,5,10,13
N-Nitroso-di-n-propylamine	1, 2, 4	
N-Nitrosodimethylamine		2,3,4,13
Phenanthrene	1, 2, 4	
Pyrene	1, 2, 4	
Noncarcinogens		
4,6-Dinitro-2-methylphenol	1,2,4,5,13	1,2,3,4,5,10,13

4.1.11 Special Case—Lead

Although an action level of 0.015 mg/L for lead has been adopted by EPA (EPA 1991), specific toxicity values are not presently available for risk assessment; instead, an EPA Uptake/Biokinetic Model (Version 0.50) designated for a target population of children (0 to 6 years old) was used to evaluate the risk from lead. The critical value for lead in the blood of young children is 10.0 μg/dL. Lead concentrations in the various media for the conservative exposure scenario were input to the model for each reach, and the percentage of the target population estimated to have lead levels greater than the critical value was calculated. EPA Region IV considers an area to be at risk if more than 5% of the population exceeds the critical value. Only reach 1 (Melton Hill Reservoir), with 6.4% of the population calculated to exceed the critical value, should be considered of marginal concern for lead exposure. Water concentrations appear to have the most influence on the model results and the model used the direct ingestion of surface water for drinking purposes.

4.1.12 High Priority Contaminants and Contaminants Requiring Further Investigation

The PCB Aroclor 1260 was identified as a high priority contaminant in the fish ingestion pathway (Section 4.1.6.1). Total PCB concentrations (i.e., Aroclor 1260, Aroclor 1254, and other formulations) should be considered when determining risk to human health; therefore, PCBs in the Clinch River/Watts Bar Reservoir should be considered high priority contaminants. The average concentration for PCBs in fish in the reaches of the Clinch and Tennessee River system used in this screening analysis (Appendix E) is less than the FDA action level of 2.0 ppm (mg/kg) in fish tissue.

Thorium-228 was identified as a high priority contaminant in the water ingestion pathway in reach 3, Poplar Creek embayment. Because of the limited water data and because the ^{228}Th

concentrations came from source monitoring data (see Sect. 4.1.6.3), ^{228}Th is not designated as a high priority contaminant in this screening analysis. The concentration of ^{228}Th from the source monitoring data which resulted in a screening index of $>10^{-4}$, for the water ingestion pathway, point out the need for collecting additional water samples and suggest that the source data should be investigated to document the concentrations of ^{228}Th reported in these data.

A listing of the contaminants requiring further investigation is provided in Table 4.8. Results of the water ingestion pathway are not included in this list because of the limited data available for analyses. The contaminants found in the sediments used for the dredging scenario are listed by direct and secondary exposure pathways. The uncertainty associated with results of the screening analysis increases in order from the fish ingestion pathway, to the direct exposure to sediment pathways, to the secondary (modeled) pathways. However, copper is an artifact in the fish ingestion pathway (see Sect. 2.4) and can be designated low priority. In addition, many of the contaminants were detected in less than 5% of the samples analyzed [i.e., bis(2-ethylhexyl)phthalate in the fish ingestion pathway]. For the organics listed in the secondary pathways, only Aroclor 1260, phenanthrene, and pyrene were detected in more than 5% of the samples analyzed. Therefore, additional analyses of these data and the methodology used in detecting these contaminants in environmental samples can undoubtedly reduce the number of contaminants listed in Table 4.8.

4.1.13 Summary for Screening Risk Assessment

The human health screening analysis of the Phase 1 data, in general, confirms the results of the previous screening of historical data (Hoffman et al. 1991). Interim remedial action has been completed on the White Oak Creek Embayment, which excludes it from the present study area; therefore, data from the embayment were not included in this report except for NPDES water monitoring data collected at White Oak Dam. The Phase 1 conclusions for the screening analysis for human health are listed here.

- Only two contaminants were identified by nonconservative screening as high priority contaminants requiring immediate consideration for remedial action. The PCB Aroclor 1260 was found in fish from the mouth of Poplar Creek to above the confluence with East Fork Poplar Creek, the Clinch River arm of Watts Bar Reservoir, Watts Bar Reservoir below the mouth of the Clinch River, and Chicamauga Reservoir at concentrations that classified it as a high priority contaminant; however, PCBs are found in most Tennessee rivers and lakes. Although the ORR is a probable source of PCBs, it is not the only one for the CR/WBR system.

- Thorium-228 was tentatively identified in Poplar Creek as a high priority contaminant in the water ingestion pathway. Thorium-228 was measured only at source monitoring sites at K-25, and the concentrations probably do not represent concentrations in the main body of water. Additionally, ^{228}Th is a daughter of ^{232}U or naturally occurring ^{232}Th, which were not reported in the monitoring data. The absence of either parent radionuclides indicate that the data or analytical methodology used for sample analyses are in need of reevaluation.

Table 4.8. Summary of contaminants requiring further investigation before taking action or designating as low priority based on fish ingestion and dredging scenarios

Contaminants	Pathways[a]		
Organic contaminants	**Fish**	**Direct**	**Secondary**
4,4'-DDD[b]	G		M, L
4,4'-DDE[b]	G		
4,4'-DDT[b]	G		M, L
Aldrin[b]	G		
Anthracene[c]		G	M, L, V
Aroclor 1254	G	G	M, L, V
Aroclor 1260		G	M, L, V
Benzo(a)anthracene[c]			M, L, V
Benzo(a)pyrene[c]		G	M, L, V
Benzo(b)fluoranthene[c]			M, L, V
Benzo(k)fluoranthene[c]			M, L
Bis(2-ethylhexyl)phthalate	G		
Chlordane[b]	G		
Chrysene			M, L, V
Fluoranthene		G	M, L, V
Indeno(1,2,3-cd)pyrene			M, L
N-nitro-di-n-propylamine[c]		G	M, L, V
Phenanthrene[c]		G	M, L, V
Pyrene[c]		G	M, L, V
Toxaphene[b]		G	M, L, V
Inorganic contaminants			
Arsenic	G	G,H	M, V
Beryllium	G	G	M, V
Cadmium			M, L, V
Chromium		H	M, L, V
Copper	G		M, L, V
Mercury	G		M, L, V
Nickel			V
Selenium	G		M, L, V
Silver			L, V
Thallium			M, L, V
Uranium			M
Zinc			M, L, V
Radionuclides			
^{60}Co		X	
^{137}Cs	G	X	M, L, V
^{90}Sr			L, V
^{234}U			M
^{238}U		X	M

[a]Exposure Pathways:
G=Ingestion H=Inhalation
X=External Exposure M=Meat Ingestion
L=Milk Ingestion V=Vegetable Ingestion

[b]Insecticides

[c]Polycyclic Aromatic Hydrocarbons

- Results of the screening of the surface water data are inconclusive because of the limited number of Phase 1 samples and the uncertainty associated with using the source monitoring data to predict the concentrations of the contaminants in the different reaches. The water results should be viewed in terms of general patterns rather than results for individual contaminants. The results of the screening analysis indicate that a large number of organic contaminants in Poplar Creek would require further investigation; however, most of these contaminants are common industrial or laboratory chemicals or pesticides that are not unique to the ORR facilities.

- Screening of the contaminants in the fish ingestion pathway identified the PCB Aroclor 1260 as a high priority contaminant. Aroclor 1254, several pesticides (4,4'-DDE, aldrin, and chlordane) that are ubiquitous contaminants in East Tennessee aquatic environments, arsenic, beryllium, mercury, and selenium were identified as contaminants in fish that needed further evaluation. The only radionuclide in the fish ingestion pathway that was identified as needing additional evaluation was ^{137}Cs in the Clinch River arm of Watts Bar Reservoir.

- A conservative screening of near-shore surface-sediment data identified ^{60}Co and ^{137}Cs as low priority contaminants in the ingestion and inhalation pathways. In the external exposure pathway, ^{60}Co and ^{137}Cs were identified as contaminants that would require further investigation. However, because the concentrations at all sites are relatively low and the screening index from all pathways, including external exposure, is $<10^{-4}$, further evaluation of the data will probably classify these contaminants as low priority.

- Screening based on the dredging scenario identified a relatively large number of organic contaminants in Poplar Creek and the Clinch River arm of Watts Bar Reservoir above the mouth of Poplar Creek which would require further investigation. Many of these organic contaminants are common industrial and laboratory chemicals, or by-products of fossil fuel burning, and are not unique to the ORR.

- Conservative screening of Phase 1 sediment data in the dredging scenario eliminated all radionuclides that were identified from all pathways from further consideration except ^{60}Co, ^{137}Cs, and ^{238}U in the external exposure pathway; ^{90}Sr in the vegetation and milk ingestion pathways; ^{234}U and ^{238}U in the meat ingestion pathways; and ^{137}Cs in the milk, meat, and vegetable ingestion pathways.

4.2 ECOLOGICAL RISK

This preliminary screening ecological risk assessment is structured in terms of the standard paradigm for risk assessment (National Research Council, 1983, Risk Assessment in the Federal Government: Managing the Process, Washington, DC: National Academy Press, Suter 1992, Risk Assessment Forum 1992). It begins with a hazard definition phase (also termed hazard identification or problem formulation) that defines the contaminant sources, the receiving environment, and the assessment endpoints. It follows with an analytical phase consisting of exposure assessment and effects assessment. The results of these analyses are then combined in a risk characterization. Finally, the results of this screening ecological risk assessment are compared to a prior screening ecological risk assessment performed for the off-site RI (Suter 1991). This assessment constitutes initial screening of the Phase 1 data. The

assessment is intended to provide an interpretive summary of the data with respect to ecological risks and to guide additional sampling and analysis during the initial stages of Phase 2. Additional risk assessments of the Phase 1 data set will be conducted later.

4.2.1 Hazard Definition

The purpose of this screening assessment is to determine which of the contaminants detected in the off-site environment occur in forms and concentrations that constitute a hazard to the nonhuman biota of the Clinch River downstream of contaminant releases from the ORR. Those contaminants will be the focus of attention in the Phase 2 sampling and analysis program.

The ultimate sources of the contaminants considered in this assessment are the DOE's operations of the ORR, including waste disposal, spills, and use of chemicals such as pesticides. The intermediate sources are the streams that drain the ORR, all of which are tributaries of the Clinch River. The proximate sources are the contaminated media in the Clinch River: water, sediment, and fish tissues. Other contaminant sources occur on the Clinch and Tennessee rivers and their tributaries, which contribute to ambient concentrations; however, they are not objects of this assessment.

The assessment endpoints for this assessment are

1. a 20% or greater reduction in the abundance or production of any species of fish, and
2. a 20% or greater reduction in the abundance or production of any species of aquatic wildlife.

These endpoints are taken from the strategy for ecological risk assessment on the ORR (Suter et al. 1992a). The 20% level of effect is based on EPA regulatory precedents and practical limitations on the detection of ecological effects. Fish are chosen as the aquatic endpoint species because of their societal importance and because fish integrate direct toxic effects and effects on lower levels in the aquatic food web. All fish are included as potential endpoint species, but special emphasis is placed on the largemouth bass (*Micropterus salmoides*) because of its recreational importance and because it is a top carnivore (Suter et al. 1992b). The endpoint wildlife species are mink (*Mustela vison*) and great blue heron (*Ardea herodias*). These species were chosen on the basis of the prior screening ecological risk assessment, which showed the major risk to wildlife to be due to consumption of contaminated fish and showed that mink are particularly sensitive to the most hazardous contaminants and that great blue herons are the most abundant piscivorous bird in the Clinch River near the ORR (Suter 1991).

4.2.2 Exposure Assessment

Exposure assessment estimates the concentrations of contaminants to which organisms are exposed, taking into consideration (as far as possible) the spatial and temporal distributions of those concentrations. For detected chemicals, mean and upper 95% confidence limits on concentrations are considered. The mean concentration is assumed to represent typical chronic exposures. Upper 95% confidence limits may represent local extreme chronic concentrations or acute exposures; the data are not sufficient to determine which. For undetected chemicals, the minimum detection limit and the upper 95% confidence limits on

the detection limits are considered. The derivation of these exposure concentrations and the actual values are presented in Appendix F.

4.2.2.1 Aqueous exposures

The aquatic biota are assumed to be exposed to the dissolved fraction of the chemicals in water, because that is the bioavailable form (HECD 1992). Dissolved (i.e., 0.45 μm filtered) aqueous concentrations are available for inorganic chemicals, but only total concentrations are available for organic chemicals in the CRRI samples. Because only a few CRRI samples are available, NPDES samples are also included and are analyzed and discussed separately. The NPDES analyses are all from total (i.e., unfiltered) samples. In addition, fish tissue concentrations are used to estimate the concentrations of contaminants to which fish have been exposed. This is done by dividing the reported concentrations in fish fillets by the bioconcentration factors (BCFs) provided by the EPA in the water quality criteria support documents.

4.2.2.2 Sediment exposures

Two different measures of exposure are used for sediments. First, whole sediment concentrations are used for comparison to screening benchmarks expressed as sediment concentrations. Second, for organic chemicals concentrations of chemicals in pore water are estimated by using the equilibrium partitioning approach. Pore-water concentrations of neutral (nonionic) organic chemicals can be calculated by assuming equilibrium partitioning between the pore water and the organic matter fraction of the sediment (OWRS 1989). The partitioning coefficient (K_p) is the product of the organic matter/water partitioning coefficient (K_{oc}) and the fractional organic matter content of the sediment (f_{oc}). Because sediment-dwelling organisms are approximately as sensitive to chemicals in water as the population of species used to derive the National Water Quality Criteria (NWQC) (OWRS 1989), the same screening criteria can be used as for water but corrected for partitioning. The formula is

$$C_s = K_p C_w$$

or

$$C_s = K_{oc} f_{oc} C_w$$

where C_s and C_w are equivalent concentrations in sediment and water, respectively. K_{oc} is seldom available, but it is quite accurately approximated by the octanol/water partitioning coefficient (K_{ow}) (DiToro 1985). This approach is being used by EPA to derive sediment quality criteria (OWRS 1988). This approach does not produce accurate predictions of pore water concentrations for ionic organic chemicals. However, it is used for all organic chemicals in this assessment because it is conservative for ionic chemicals (i.e., it somewhat overestimates pore water concentrations) and because alternative methods are not available for ionic organic chemicals.

4.2.2.3 Wildlife dietary exposures

Piscivorous wildlife are exposed through consumption of contaminated fish. The fish flesh concentrations reported are for filets rather than the whole fish consumed by a heron or mink. Because many contaminants concentrate in fat or in organs other than muscle, these concentrations are likely to be underestimates of the exposure experienced by piscivorous

wildlife. The error due to this factor is approximately a factor of 1.5 to 2 for metals and 2 to 3 for organic chemicals (Suter 1991). Therefore, the wildlife screening benchmarks (Sect. 4.2.3) include a factor of 2 for metals and 3 for organic chemicals to conservatively correct for this extrapolation.

4.2.3 Effects Assessment: Screening Benchmarks

In this screening assessment, effects are expressed as toxicological benchmarks: concentrations in media which are indicative of acceptable effects (lower screening benchmarks) or unacceptable effects (upper screening benchmarks). Only lower benchmarks were needed for this assessment, and they are presented in Appendix F.

4.2.3.1 Aquatic biota

The screening benchmarks for aquatic biota are taken from Suter et al. (1992b). Because there are no standard screening benchmarks, sets of alternative benchmarks were calculated. For the upper screening benchmark, they are the acute National Ambient Water Quality Criterion (ANAWQC) or, for chemicals with no criterion value, the lowest reported acute LCSO or ECSO. The alternative chronic benchmarks are the chronic NAWQC (NAWQC ACTUAL); the chronic pesticide screening value, a concentration that is estimated with 95% confidence not to exceed the unknown chronic NAWQC for those chemicals with no NAWQC (NAWQC ADVISORY); the lowest chronic values for fish (LCV FISH) and daphnids (LCV DAPHNIDS); the lowest EC20 (concentration causing a 20% reduction in survival, growth, or fecundity) for fish (LTV EC20 FISH) and daphnids (LTV EC20 DAPHNID) from chronic toxicity tests; the estimated EC20 for a sensitive species (SS EC20); and the concentration estimated to cause a 20% reduction in the recruit abundance of largemouth bass (EC20 POPULATION). The methods of derivation and source data for these benchmarks are provided in Suter et al. (1992b).

4.2.3.2 Sediments

Two types of benchmarks were used with sediment concentrations. First, NOAA's Effects Range—Low (ER-L) and Effects Range—Median (ER-M) concentrations were used for the 43 chemicals for which they are available (Long and Morgan 1991). The ER-L and ER-M are concentrations in whole sediment that appeared to cause toxic effects in no more than 10% and 50% of sediments, respectively.

The second type of sediment screening benchmark is based on equilibrium partitioning of organic chemicals between sediments and pore water (Sect. 4.2.2). Because it is assumed that the exposure is due to exposure to the pore water, the aqueous screening benchmarks discussed above are used.

4.2.3.3 Wildlife

The screening criteria for wildlife are the same as the prior off-site screening ecological risk assessment (Suter 1991). Because there is not a set of consistent toxicity test data for wildlife as there is for aquatic biota, the screening benchmarks for wildlife are based on expert judgement concerning the best available test endpoint for wildlife found in the literature for each chemical. Wildlife toxicity data were preferred, but data for laboratory rodents and other

domestic animals were included in the review. Data for ruminants were excluded because of the influence of their unique digestive system on uptake. Data on cancer induction were also excluded because low frequencies of tumors have no effects on population endpoints. Toxicological benchmarks expressed as dietary concentrations are preferred and can be used without conversions. When benchmarks are expressed as acute doses, equivalent dietary concentrations are estimated by assuming that an acute dose is equivalent to one day's consumption and that the consumption rate is 8% of body weight per day.

Unlike the screening criteria that are based on NWQC, these criteria do not reflect the diversity of organisms that are exposed by this route. If chronic sublethal effects data are available for either mammals or birds but not both, a correction factor of 10 for differences in sensitivity is applied. This factor is based on limited studies that indicate that birds and mammals can differ in sensitivity by more than an order of magnitude and either can be more sensitive (Sigal and Suter 1989). If there are data for both birds and mammals, but fewer than five species including at least two avian species, we assume that the variance in sensitivity of the test species approximates the variance in all avian and mammalian species and apply no factor for differences among species. If the most sensitive test end point is death or another severe effect (e.g., reproductive failure), a factor of 5 is applied to estimate the threshold for effects on individuals that could result in population reductions (Tucker and Lietzke 1979). These factors are not applied to the upper criterion, which is intended to be a concentration at which effects are certain. The derivation of wildlife benchmarks for individual chemicals is presented in Suter (1991).

4.2.4 Risk Characterization: Contaminant Screening Results

The quotient method is used to integrate exposure and effects in screening assessments. That is, the environmental concentrations are divided by the screening benchmarks and the decision is based on the magnitude of the quotient. If the quotient is <1 for a lower screening benchmark, that indicates a nonhazardous exposure level. If the quotient is >1 for an upper screening benchmark, that indicates a clearly hazardous exposure. Chemical concentrations falling between those benchmarks indicate that a hazard worthy of additional investigation exists. All chemicals that have concentrations greater than lower screening benchmarks are potential "contaminants of concern."

Although the use of multiple upper and lower screening benchmarks increases confidence in the results of the screening assessment, it complicates interpretation of results. Because the alternative screening benchmarks are based on different assumptions, and none of the benchmarks has been shown to consistently estimate thresholds for significant effects, greater confidence in the screening results can be obtained by considering multiple benchmarks. However, interpretation of conflicting results requires expert judgement. The following interpretation rules are applied to the aqueous concentrations, including the estimated pore water concentrations for organics in sediment.

1. If the mean water concentration for a chemical exceeds its chronic NAWQC, then that chemical is a contaminant of concern.
2. If the maximum water concentration for a chemical exceeds its acute NAWQC, then that chemical is a contaminant of concern.
3. If two or more lower screening benchmarks are exceeded by the mean concentration, then that chemical is a contaminant of concern.

4. If a mean concentration exceeds a single lower screening criterion or a maximum concentration exceeds a single upper screening criterion, then the magnitude of the quotient and the conservatism of the benchmark will be considered in deciding whether to include the chemical as a contaminant of concern. However, a chemical is not a contaminant of concern when only the advisory concentration is exceeded.
5. Because of the uncertainty concerning the applicability of the EPA's bioconcentration factors (BCFs) to the field, aqueous concentrations estimated from fish concentrations are used only as supporting evidence.

Metals in sediment are considered to be contaminants of concern if the mean concentration exceeds the ERL or ERM or if the upper confidence limit concentration exceeds the ERM. Chemicals in fish fillets are considered to be contaminants of concern if their mean concentrations exceed lower screening benchmarks for piscivorous wildlife. The screening calculations and their results are presented in Appendix F. The potential contaminants of concern are discussed below, and the selected contaminants of concern are listed in Table 4.9.

4.2.4.1 Potential contaminants of concern in water

Aluminum. Aluminum concentrations in NPDES samples from reaches 1, 2, 3, and 4 exceed NAWQC and one or more other benchmarks. However, these concentrations are almost certainly due to particulate forms that are not bioavailable. Aluminum toxicity is not known to occur in circumneutral ambient waters (Baker et al. 1990).

Cadmium. In reaches 1 and 4, dissolved cadmium was detected in one of three samples. The dissolved concentrations in each reach were greater than the lowest chronic value for daphnids and the sensitive species EC20. These benchmarks were also exceeded by the limits of detection in the reaches where it was not detected. Mean cadmium concentrations in NPDES samples (i.e., total rather than bioavailable concentrations) from reach 1 exceeded all seven benchmarks, including the NAWQC, and in reach 3 exceeded all but the population EC20. Cadmium was not detected in fish fillets, but the detection limits were high relative to toxic concentrations.

Copper. Copper concentrations in fish tissues from reach 5 suggest exposure to extremely high aqueous concentrations. The high mean and upper confidence limit values are due to one extremely high value that is likely to be in error (Sect. 3.4.2). Mean copper concentrations in NPDES samples (i.e., total rather than bioavailable concentrations) exceed seven benchmarks in reach 3 (including the NAWQC), five benchmarks in reaches 1 and 2, and three benchmarks in reach 4. Copper was not detected in dissolved fraction analyses but detection limits exceeded four benchmarks in all reaches.

Cyanide. Mean cyanide concentrations in NPDES samples (i.e., total rather than bioavailable concentrations) exceed all five benchmarks in reaches 2, 3, 4, and 13 (including the NAWQC). Cyanide was not included among the dissolved water or fish analysis results for Phase 1.

Iron. Mean iron concentrations in NPDES samples (i.e., total rather than bioavailable concentrations) exceed two benchmarks in reaches 1, 2, 3, and 4 and the NAWQC in reach 3. Iron was detected in dissolved water analyses from reaches 2, and 5 but not 1, 3, 4, or 10.

Table 4.9. Contaminants of concern for ecological risk assessment

Detected	Undetected
Arsenic	Acenaphthene
Bis(2-ethylhexyl)phthalate	Anthracene
Cadmium	Aroclor 1248
Copper	Aroclor 1254
Cyanide	Benzo(a)anthracene
DDT	Benzo(a)pyrene
Iron	Boron
Lead	Chlordane
Mercury	Chromium
Nickel	Cobalt
PCBs (Aroclors)	Vanadium
Selenium	2-methylphenol
Silver	Benzoic acid
Zinc	Benzyl alcohol
	Lindane
	Heptachlor
	n-Nitrosodiphenylamine
	Phenol
	2,4-Dinitrophenol
	2-Methylphenol
	2-Nitrophenol

Both the detected concentrations and the detection limits were low. Iron was not measured in fish tissues because it is a macronutrient.

Lead. Mean lead concentrations in NPDES samples (i.e., total rather than bioavailable concentrations) exceed five benchmarks in reach 1 and two benchmarks in reaches 2 and 3 including the NAWQC in all three. Lead was detected in dissolved water analyses from reaches 1, 4, and 13 but not 2, 3, 5, or 10. Both the detected concentrations and the detection limits were low. Lead was not detected in fish fillets, and the detection limits were low.

Mercury. Mercury was detected in one dissolved-phase sample from reach 3. The mean concentration exceeded four of six benchmarks. Mean total mercury concentrations in NPDES samples from reaches 1 and 3 also exceed those benchmarks, and in reach 4 it exceeds three benchmarks. Mean aqueous detection limits in reaches 1, 2, 4, 5, 10, and 13 exceed three benchmarks. However, water concentrations estimated from fish fillet concentrations and EPA BCFs suggest aqueous exposure levels much lower than measured values in water. The benchmarks for methyl mercury were used for all of these calculations for conservatism. The relative abundance of organic and inorganic mercury in these samples is unknown.

Nickel. Mean nickel concentrations in NPDES samples (i.e., total rather than bioavailable concentrations) exceed five benchmarks in reach 3 and two benchmarks in reaches 1, 2 and 4. Nickel was not detected in dissolved water samples at a detection limit that was 12% of the NAWQC but above two out of seven benchmarks in all reaches. Nickel was not detected in fish tissues, and the detection limit was lower than all benchmarks.

Selenium. Mean selenium concentrations in fish tissues suggest that the fish were exposed to aqueous concentrations that were higher than two or more benchmarks in all reaches. In reaches 1, 2, 4, 10, and 15, the estimated mean aqueous concentration was greater than the NAWQC. However, selenium was not detected in the dissolved phase of water from any reach even though the detection limit was below the NAWQC and all other benchmarks, and total concentrations in NPDES samples were low. This discrepancy is likely to result from use of the EPA's BCF for this metal. There is now considerable evidence that, in the field, selenium is bioaccumulated through diet, which would make an aqueous concentration estimated using a BCF too high (Lemly 1985).

Silver. Dissolved silver was detected in one of four samples from reach 3. The concentration was greater than all seven lower benchmarks for that metal. In all other reaches silver was undetected, but the limits of detection exceeded all but one of the lower benchmarks. Mean concentrations of total silver in NPDES samples from reach 3 were greater than all seven benchmarks.

4.2.4.2 Potential contaminants of concern in sediment

Arsenic. The upper confidence limit arsenic concentration in sediment exceeds the ERM in reach 3 and the ERL in reaches 1 and 4.

Bis(2-ethylhexyl)phthalate. The estimated mean pore water concentration of this phthalate ester exceeds the lowest chronic value and the lowest EC20 for daphnids as well

as the advisory concentration in reach 5. The upper confidence limit estimated pore water concentration exceeds those three benchmarks in reaches 2, 3, and 5.

Lead. The mean sediment concentration exceeds the ER-L in reaches 5 and 10 and the upper confidence limit concentration exceeds the ER-M in reach 4 and the ER-L in reaches 1, 2, and 3.

Mercury. The mean mercury concentration in sediment exceeds the ER-M in reaches 3 and 4 and exceeds the ER-L in reaches 2 and 5. The upper confidence limit mercury concentration in sediment exceeds the ER-L in reach 1. The ER-L and ER-M values are based on naturally occurring mixtures of organic and inorganic mercury.

Zinc. The mean zinc concentration in sediment exceeds the ER-L in reach 5. The upper confidence limit zinc concentration in sediment exceeds the ER-M in reaches 1 and 4 and the ER-L in reach 3.

4.2.4.3 Potential contaminants of concern for wildlife

Aroclors. Mean concentrations of Aroclor 1254 in reaches 2, 3, 4, 5, 13, and 15 and of Arochlor 1260 in reaches 1, 2, 3, 4, 5, 13, and 15 exceeded the lower piscivore benchmark for PCBs. In addition, upper confidence limit concentrations of Aroclor 1254 in reach 1 and of Aroclor 1260 in reach 10 exceed the lower benchmark. That benchmark is a dietary concentration causing significant reductions in mink reproduction divided by a factor of 5 for an effects threshold and of 3 for fillet to whole fish conversion.

Copper. The upper confidence limit copper concentration in reach 5 exceeds the lower wildlife benchmark. However, this value is suspect (see Sect. 3.4).

4,4'-DDT and Metabolites. Mean DDE in reach 4 exceeded the lower piscivore benchmark, which is the lowest dietary concentration causing significant reductions in avian reproduction divided by a factor of 5 for an effects threshold and of 3 for fillet to whole fish conversion. Upper confidence limit fish exceeded that benchmark for DDE in reaches 1, 2, 4, and 5 for DDD in reaches 3 and 15, and for DDT in reach 4 and exceeded concentrations observed to cause reproductive effects in reaches 4 and 15. DDT is not known to be associated with ORR effluents or wastes, but the highest concentrations are found in fish from the Clinch River downstream from Poplar Creek (reach 4).

Mercury. Mean mercury concentrations in fish from all reaches exceeded the lower piscivore benchmark, which is the lowest dietary concentration causing significant reductions in avian reproduction divided by a factor of 2 for fillet to whole fish conversion. Mean fish fillets from reaches 3, 4, 10, 13, and 15 exceeded the 0.1 mg/kg concentration observed to cause reduced reproduction in mallard ducks. The highest mean concentrations in fish were found in lower Poplar Creek (reach 3), but the second highest concentrations were found in Norris Reservoir (reach 10).

Selenium. Mean selenium concentrations in fish from reaches 1, 2, 4, 5, 10, 13, and 15 barely exceeded the lower piscivore benchmark, which is the lowest dietary concentration causing significant reductions in avian reproduction divided by a factor of 2 for fillet to whole fish conversion. None of the mean or upper confidence limit fish exceeded concentrations

observed to cause toxic effects in toxicity tests. The highest mean concentrations in fish were found in Melton Hill Reservoir (reach 1), and the second highest concentrations were found immediately below the reservoir but above Poplar Creek in reach 2.

4.2.4.4 Undetected potential contaminants of concern

Some contaminants were not detected in water, but the detection limits were high enough that they would be contaminants of concern if the actual concentrations were just below the detection limit. In a few cases, such as chlordane and lead, detection limits were above NAWQC.

4.2.5 Comparison to Previous Results

Because of declines in reported concentrations of most chemicals in most media, the number of potential contaminants of concern decreased greatly compared to the screening assessment based on historic data (Suter 1991). Mercury in fish tissues is an exception, having declined only slightly.

Data needs identified in the previous assessment have been met in part (Suter 1991). Concentrations of dissolved metals, which were not available before, were available for this assessment; the data are now consistent across reaches; and monitoring of contaminants in great blue heron eggs and nestlings has begun. However, some data needs identified in the previous assessment are still not filled. These include analyses of whole fish, of sediment pore water, and of certain species for arsenic, mercury, and chromium. In addition, indicators of response to chemical exposures other than body burdens have been monitored in herons but not fish.

5. SUMMARY

This report presents and discusses the results of Phase 1 of DOE's remedial investigation of the CR/WBR system. The approach in this report is to use a screening assessment for human health and ecological risk to identify contaminants, environmental pathways, and sites in the river-reservoir system that will require further investigation during Phase 2 of the CRRI. In addition, the screening assessment will identify contaminants that can be assigned a low priority for further investigation.

The CRRI is designed to address the transport, fate, and distribution of waterborne contaminants released from the ORR and to assess potential risks to human health and the environment associated with these contaminants. The contaminants released since the early 1940s include a variety of radionuclides, metals, and organic compounds. Primary areas of investigation are Melton Hill Reservoir, the Clinch River from Melton Hill Dam to its confluence with the Tennessee River, Poplar Creek, and Watts Bar Reservoir. The contaminants identified in the CR/WBR downstream of the ORR are those associated with the water, suspended particles, deposited sediments, aquatic organisms, and wildlife feeding on aquatic organisms.

A phased remedial investigation of the CR/WBR system is under way to (1) define the nature and extent of the off-site contamination, (2) evaluate associated environmental and human health risks, and (3) preliminarily identify and evaluate potential remediation alternatives.

Phase 1 of the CRRI was an initial sampling and analysis of fish, sediment, and water in selected areas of the CR/WBR chosen to represent differing levels of media contamination. Specifically, Phase 1 was designed to (1) obtain high-quality data to confirm existing historical data for contaminant levels in fish, sediment, and water from the CR/WBR; (2) determine the range of contaminant concentrations present in the river-reservoir system; (3) identify specific contaminants of concern; and (4) establish the reference (background) concentrations for those contaminants. Previously, scoping studies were conducted to provide an initial determination of contaminant distribution in the sediments of WBR (Olsen et al. 1992) and to preliminarily assess potential human health and ecological risk (Suter 1991; Hoffman et al. 1991) in the CR/WBR system.

For Phase 1 of the CRRI, the CR/WBR system was divided into ten reaches, six of which are potentially affected by releases from the ORR. The other four reaches serve as reference areas. Contaminant concentrations for fish, sediment, and water were summarized for each of the ten reaches. Analytes detected at least once in a reach were evaluated separately from those never measured above their analytical detection limit (i.e., nondetected).

Surface water samples were collected for Phase 1 during winter conditions and analyzed for inorganic, radiochemical, and organic constituents to confirm suspected low concentrations of contaminants in the CR/WBR system. Characterization of the nature and extent of surface water contamination in the CR/WBR system during Phase 1 of the CRRI was limited to a single sampling event for each station. The primary conclusions from the collection and analysis of surface water during Phase 1 are listed here.

- Inorganic and organic constituents that may pose a risk to human health or the environment had concentrations comparable to those reported previously and were well below the Tennessee Water Quality Criteria.

- Values for all radiological constituents in surface water were comparable with the mean values found in other investigations. Each of these radionuclides has been or is currently being released from the ORR to surface waters.

- The results from Phase 1 water samples, in combination with source monitoring and historical data, indicate that additional work is needed to characterize Poplar Creek below the mouth of East Fork Poplar Creek and the Clinch River arm of Watts Bar Reservoir.

The primary conclusions from the sediments collected and analyzed during Phase 1 and the near-shore sediment task are listed here.

- Concentrations of ^{137}Cs in the near-shore surface sediment of Watts Bar Reservoir below the mouth of the Clinch River are comparable to background levels. However, concentrations within the Clinch River arm of the reservoir are above background and warrant further study.

- Patterns of ^{137}Cs and ^{60}Co in sediment cores confirm previous studies and indicate that these contaminants are deep in the sediment throughout the system with highest concentrations in the Clinch River arm of the reservoir.

- Concentrations of ^{234}U, ^{235}U, and ^{238}U in sediment cores from Poplar Creek are about 5 times higher than background.

- Concentrations of arsenic, beryllium, cadmium, chromium, copper, and mercury in sediments are above background levels in the Clinch River arm of Watts Bar Reservoir and in Poplar Creek.

- Concentrations of cadmium, lead, and zinc in sediments are higher in the main body of Watts Bar Reservoir, below the mouth of the Clinch River, than in upstream areas.

- Detectable quantities of Aroclor 1254 were only found in sediments at Clinch River Mile 9.5, which is downstream of the confluence of the Clinch River and Poplar Creek.

- Detectable quantities of flouranthene, phenanthrene, and pyrene were found in sediments in Poplar Creek and in the Clinch River between Melton Hill Dam and the mouth of Poplar Creek.

To characterize the nature and extent of contamination in fish in the CR/WBR system, contaminants were analyzed in three species (channel catfish, largemouth bass, and bluegill sunfish) representing three trophic levels. The primary conclusions from the fish sampling and analyses conducted during Phase 1 are listed here.

- Of the 77 organic and 13 inorganic contaminants that were analyzed in fish, a majority (63 organics and 7 inorganics) were not detected from any CR/WBR site.

- Three of the contaminants (^{90}Sr, mercury, and zinc) were detected in all fish samples; 17 analytes were detected in greater than 5% of all fish samples. PCBs and chlordane were detected in fish at all CR/WBR sites, and ^{137}Cs was detected in 60% of the sites.

- Mercury and ^{137}Cs in fish were elevated at sites downstream of known sources of contaminant inputs, East Fork Poplar Creek and White Oak Creek, respectively. No pattern of downstream gradients of PCBs or chlordane was evident in fish collected in Phase 1.

- Phase 1 data for fish are not markedly different from previous historical data on contaminant levels in fish from the CR/WBR system.

- Mean mercury concentrations in fish were significantly higher in Poplar Creek below the confluence with East Fork Poplar Creek and at the first site downstream of the confluence of Poplar Creek and the Clinch River than at the reference site (Norris Reservoir). Mean selenium concentrations in Melton Hill Reservoir and the Clinch River arm of Watts Bar Reservoir were higher than those at the reference sites.

- Mean total PCB concentrations in fish at all CR/WBR sites were significantly higher than those at the reference, whereas mean chlordane concentrations were higher than reference concentrations at sites in Melton Hill Reservoir and the Clinch River arm of Watts Bar Reservoir.

The conclusions of the screening assessment for ecological risk for Phase 1 are listed here.

- The assessment of new data confirms the finding of the assessment of historical data that mercury and PCBs in fish constitute a significant risk to piscivorous wildlife.

- Phase 1 analytical data for dissolved (i.e., bioavailable) concentrations of inorganic chemicals in water greatly reduced the number of metals that appear to be hazardous to aquatic life relative to historical data or to source monitoring (e.g., National Pollutant Discharge Elimination System data).

- Cadmium, mercury, and silver appear to be hazardous to aquatic life in water from some reaches, but the number of samples in which they were detected is extremely small. In addition, the assessment of mercury conservatively assumed that all mercury in water was present as methyl mercury.

- Arsenic, lead, mercury, and zinc in sediments from some reaches exceed concentrations that have been found by the U.S. National Oceanic and Atmospheric Administration to cause effects on benthic communities at some sites.

- PCBs and several other organic chemicals that appeared to be hazardous to aquatic life because of their historical concentrations in sediments and water were not detected in those media in the Phase 1 investigation.

- Because this is a preliminary screening assessment of ecological risks, more detailed analyses will follow.

The human health screening analysis of the Phase 1 data, in general, confirms the results of the previous screening of historical data (Hoffman et al. 1991). The Phase 1 conclusions for the screening analysis for human health are listed here.

- Only two contaminants were identified by nonconservative screening as high priority contaminants requiring further investigation. The PCB Aroclor 1260 was found in fish from the mouth of Poplar Creek to above the confluence with East Fork Poplar Creek, the Clinch River arm of Watts Bar Reservoir, Watts Bar Reservoir below the mouth of the Clinch River, and Chicamauga Reservoir at concentrations that classified it as a high priority contaminant; however, PCBs are found in most Tennessee rivers and lakes. Although the ORR is a probable source of PCBs, it is not the only one for the CR/WBR system.

- Thorium-228 was tentatively identified in Poplar Creek as a high priority contaminant in the water ingestion pathway. Thorium-228 was detected only at source monitoring sites at K-25, and the concentrations probably do not represent concentrations in the main body of water. Additionally, ^{228}Th is a daughter of ^{232}U or naturally occurring ^{232}Th, which were not reported in the monitoring data. The absence of either parent radionuclides along with the ^{232}Th indicate that the data or analytical methodology used for sample analyses are in need of reevaluation.

- Results of the screening of the surface water data are inconclusive because of the limited number of Phase 1 samples and the uncertainty associated with using the source monitoring data to predict the concentrations of the contaminants in the river/reservoir system. The water results should be viewed in terms of general patterns rather than results for individual contaminants. The results of the screening analysis indicate that a large number of organic contaminants in Poplar Creek would require further investigation; however, most of these contaminants are common industrial or laboratory chemicals or pesticides that are not unique to the ORR facilities.

- Screening of the contaminants in the fish ingestion pathway identified the PCB Aroclor 1260 as a high priority contaminant. The Tennessee Department of Environment and Conservation has issued fish consumption advisories for several eastern Tennessee reservoirs (e.g., Fort Loudoun, Watts Bar, Melton Hill) as a result of PCB contamination. Aroclor 1254, several pesticides (4,4'-DDE, aldrin, and chlordane) that are ubiquitous contaminants in eastern Tennessee aquatic environments, arsenic, beryllium, mercury, and selenium were identified as contaminants in fish that needed further evaluation. The only radionuclide in the fish ingestion pathway that was identified as needing additional evaluation was ^{137}Cs in the Clinch River arm of Watts Bar Reservoir.

- A conservative screening of near-shore surface-sediment data identified ^{60}Co and ^{137}Cs as low priority contaminants in the ingestion and inhalation pathways. In the external exposure pathway, ^{60}Co and ^{137}Cs were identified as contaminants that would require further investigation. However, because the concentrations at all sites are relatively low

and the screening index from all pathways, including external exposure, is $<10^{-4}$, further evaluation of the data will probably classify these contaminants as low priority.

- Screening based on the dredging scenario identified a relatively large number of organic contaminants in Poplar Creek and the Clinch River arm of Watts Bar Reservoir above the mouth of Poplar Creek which would require further investigation. Many of these organic contaminants are common industrial and laboratory chemicals, or by-products of fossil fuel burning, and are not unique to the ORR.

- Conservative screening of Phase 1 sediment data in the dredging scenario eliminated all radionuclides that were identified from all pathways from further consideration except ^{60}Co, ^{137}Cs, and ^{238}U in the external exposure pathway; ^{90}Sr in the vegetation and milk ingestion pathways; ^{234}U and ^{238}U in the meat ingestion pathways; and ^{137}Cs in the milk, meat, and vegetable ingestion pathways.

Results from Phase 1 of the CRRI provide the following guidance for the collection and analysis of samples during Phase 2:

- Poplar Creek below the mouth of East Fork Poplar Creek and the Clinch River arm of Watts Bar Reservoir are the reaches of greatest concern based of the number of contaminants that need further evaluation.

- Additional data are required on bioavailable inorganic contaminants (i.e., cadmium, copper, cyanide, lead, mercury, nickel, selenium, and silver) in water to determine their risk to aquatic biota.

- Further sampling and analysis is required for bis(2-ethylhexyl)phthalate, arsenic, lead, mercury, and zinc in sediments. These contaminants may pose a risk to benthic dwelling organisms.

- Potential contaminants of concern for wildlife, identified from the Phase 1 data are Aroclor 1254, Aroclor 1260, 4,4'-DDT and its metabolites (4,4'DDD and 4,4'DDE), mercury and selenium.

- Data for the fish ingestion pathway are the most complete. Phase 2 sampling should concentrate on providing statistically valid data for a future baseline risk assessment for human health. Fish tissue analyses should concentrate on the evaluation of contaminants that are routinely released or have been released in the past from the ORR.

- The available data from the Phase 1 water sampling had to be augmented with source monitoring data in order to perform a screening assessment for human health. Additional water data for contaminants will be required, particularly in surface water areas proximate to ORR outfalls and sources, to provide data for the baseline risk assessment. Data from existing monitoring programs will be evaluated for use in Phase 2 of the CRRI.

- Organic and inorganic contaminants common to eastern Tennessee and other metropolitan areas should be identified through further analysis of the available data for downstream and reference reaches. Analyses of organic contaminants in water and

sediment should concentrate on those contaminants that are routinely released or have been released in the past from the ORR. In addition, analytical methods providing lower detection limits need to be evaluated and used for the analysis of organic contaminants.

- Phase 2 sediment sampling should concentrate on Poplar Creek below the mouth of East Fork Poplar Creek and on the Clinch River arm of Watts Bar Reservoir to provide statistically valid data for a baseline risk assessment. Analyses of sediment samples should concentrate on the contaminants identified in the screening analysis as needing further evaluation.

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Appendix A

LISTING OF ALL ANALYTES WITH CAS NUMBERS

CONTENTS OF APPENDIX A

Table A.1 Listing of all analytes with CAS numbers and matrices analyzed for each analyte A-3

TABLE A.1
LISTING OF ALL ANALYTES WITH CAS NUMBERS AND MATRICIES ANALYZED FOR EACH ANALYTE

TYPE OF ANALYSIS	ANALYTE	CHEMICAL ABSTRACT SERVICE NUMBER	ANALYZED IN (FISH/SEDIMENT/WATER)
INORGANICS	ANTIMONY	7440-36-0	F/S/W
	ARSENIC	7440-38-2	F/S/W
	BERYLLIUM	7440-41-7	F/S/W
	CADMIUM	7440-43-9	F/S/W
	CALCIUM	7440-70-2	./S/W
	CHROMIUM	7440-47-3	F/S/W
	COPPER	7440-50-8	F/S/W
	IRON	7439-89-6	./S/W
	LEAD	7439-92-1	F/S/W
	MAGNESIUM	7439-95-4	./S/W
	MERCURY	7439-97-6	F/S/W
	NICKEL	7440-02-0	F/S/W
	POTASSIUM	7440-09-7	./S/W
	SELENIUM	7782-49-2	F/S/W
	SILVER	7440-22-4	F/S/W
	SODIUM	7440-23-5	./S/W
	THALLIUM	7440-28-0	F/S/W
	ZINC	7440-66-6	F/S/W
ORGANICS	ACENAPHTHENE	83-32-9	F/S/W
	ACENAPHTHYLENE	208-96-8	F/S/W
	ALDRIN	309-00-2	F/S/W
	ALPHA-BHC	319-84-6	./S/W
	ALPHA-CHLORDANE	5103-71-9	F/S/W
	ALPHA-CHLORDENE	56534-02-2	F/./.
	ANTHRACENE	120-12-7	F/S/W
	AROCLOR-1016	12674-11-2	./S/W
	AROCLOR-1221	11104-28-2	./S/W
	AROCLOR-1232	11141-16-5	./S/W
	AROCLOR-1242	53469-21-9	./S/W
	AROCLOR-1248	12672-29-6	./S/W
	AROCLOR-1254	11097-69-1	F/S/W
	AROCLOR-1260	11096-82-5	F/S/W
	BENZO(A)ANTHRACENE	56-55-3	F/S/W
	BENZO(A)PYRENE	50-32-8	F/S/W
	BENZO(B)FLUORANTHENE	205-99-2	F/S/W
	BENZO(G,H,I)PERYLENE	191-24-2	F/S/W
	BENZO(K)FLUORANTHENE	207-08-9	F/S/W
	BENZOIC ACID	65-85-0	F/S/W
	BENZYL ALCOHOL	100-51-6	F/S/W
	BETA-BHC	319-85-7	./S/W
	BIS(2-CHLOROETHOXY)METHANE	111-91-1	F/S/W
	BIS(2-CHLOROETHYL)ETHER	111-44-4	F/S/W
	BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	F/S/W
	BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	F/S/W
	BUTYLBENZYLPHTHALATE	85-68-7	F/S/W
	CHLORDENE	3734-48-3	F/./.
	CHRYSENE	218-01-9	F/S/W
	DELTA-BHC	319-86-8	./S/W
	DI-N-BUTYLPHTHALATE	84-74-2	F/S/W
	DI-N-OCTYLPHTHALATE	117-84-0	F/S/W
	DIBENZ(A,H)ANTHRACENE	53-70-3	F/S/W
	DIBENZOFURAN	132-64-9	F/S/W
	DIELDRIN	60-57-1	./S/W
	DIETHYLPHTHALATE	84-66-2	F/S/W
	DIMETHYLPHTHALATE	131-11-3	F/S/W
	ENDOSULFAN I	959-98-8	./S/W
	ENDOSULFAN II	33213-65-9	./S/W

TABLE A.1
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TYPE OF ANALYSIS	ANALYTE	CHEMICAL ABSTRACT SERVICE NUMBER	ANALYZED IN (FISH/SEDIMENT/WATER)
ORGANICS	ENDOSULFAN SULFATE	1031-07-8	./S/W
	ENDRIN	72-20-8	./S/W
	ENDRIN KETONE	53494-70-5	./S/W
	FLUORANTHENE	206-44-0	F/S/W
	FLUORENE	86-73-7	F/S/W
	GAMMA-BHC (LINDANE)	58-89-9	./S/W
	GAMMA-CHLORDANE	5103-74-2	F/S/W
	GAMMA-CHLORDENE	56641-38-4	F/./.
	HEPTACHLOR	76-44-8	./S/W
	HEPTACHLOR EPOXIDE	1024-57-3	./S/W
	HEXACHLOROBENZENE	118-74-1	F/S/W
	HEXACHLOROBUTADIENE	87-68-3	F/S/W
	HEXACHLOROCYCLOPENTADIENE	77-47-4	F/S/W
	HEXACHLOROETHANE	67-72-1	F/S/W
	INDENO(1,2,3-CD)PYRENE	193-39-5	F/S/W
	ISOPHORONE	78-59-1	F/S/W
	METHOXYCHLOR	72-43-5	./S/W
	N-NITROSO-DI-N-PROPYLAMINE	621-64-7	F/S/W
	N-NITROSODIPHENYLAMINE	86-30-6	F/S/W
	NAPHTHALENE	91-20-3	F/S/W
	NITROBENZENE	98-95-3	F/S/W
	OXYCHLORDANE	27304-13-8	F/./.
	PENTACHLOROPHENOL	87-86-5	F/S/W
	PHENANTHRENE	85-01-8	F/S/W
	PHENOL	108-95-2	F/S/W
	PYRENE	129-00-0	F/S/W
	TOXAPHENE	8001-35-2	./S/W
	1,2-DICHLOROBENZENE	95-50-1	F/S/W
	1,2,4-TRICHLOROBENZENE	120-82-1	F/S/W
	1,3-DICHLOROBENZENE	541-73-1	F/S/W
	1,4-DICHLOROBENZENE	106-46-7	F/S/W
	2-CHLORONAPHTHALENE	91-58-7	F/S/W
	2-CHLOROPHENOL	95-57-8	F/S/W
	2-METHYLNAPHTHALENE	91-57-6	F/S/W
	2-METHYLPHENOL	95-48-7	F/S/W
	2-NITROANILINE	88-74-4	F/S/W
	2-NITROPHENOL	88-75-5	F/S/W
	2,4-DICHLOROPHENOL	120-83-2	F/S/W
	2,4-DIMETHYLPHENOL	105-67-9	F/S/W
	2,4-DINITROPHENOL	51-28-5	F/S/W
	2,4-DINITROTOLUENE	121-14-2	F/S/W
	2,4,5-TRICHLOROPHENOL	95-95-4	F/S/W
	2,4,6-TRICHLOROPHENOL	88-06-2	F/S/W
	2,6-DINITROTOLUENE	606-20-2	F/S/W
	3-NITROANILINE	99-09-2	F/S/W
	3,3'-DICHLOROBENZIDINE	91-94-1	F/S/W
	4-BROMOPHENYL-PHENYLETHER	101-55-3	F/S/W
	4-CHLORO-3-METHYLPHENOL	59-50-7	F/S/W
	4-CHLOROANILINE	106-47-8	F/S/W
	4-CHLOROPHENYL-PHENYLETHER	7005-72-3	F/S/W
	4-METHYLPHENOL	106-44-5	F/S/W
	4-NITROANILINE	100-01-6	F/S/W
	4-NITROPHENOL	100-02-7	F/S/W
	4,4'-DDD	72-54-8	F/S/W
	4,4'-DDE	72-55-9	F/S/W
	4,4'-DDT	50-29-3	F/S/W
	4,6-DINITRO-2-METHYLPHENOL	534-52-1	F/S/W

TABLE A.1
LISTING OF ALL ANALYTES WITH CAS NUMBERS AND MATRICIES ANALYZED FOR EACH ANALYTE

TYPE OF ANALYSIS	ANALYTE	CHEMICAL ABSTRACT SERVICE NUMBER	ANALYZED IN (FISH/SEDIMENT/WATER)
RAD	AM-241	14596-10-2	./S/.
	CM-243,244	15757-87-6	./S/.
	CM-245,246	15621-76-8	./S/.
	CM-248	15758-33-5	./S/.
	CO-60	10198-40-0	F/S/W
	CS-137	10045-97-3	F/S/W
	H-3	10028-17-8	././W
	PU-238	13981-16-3	./S/.
	PU-239,240		./S/.
	SR-90	10098-97-2	F/S/W
	U-234	13966-29-5	./S/.
	U-235	15117-96-1	./S/.
	U-238	7440-61-1	./S/.

Appendix B

SUMMARY STATISTICS FOR WATER SAMPLES

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Table B.1 Summary statistics for water data summarized for all reaches sorted by type of analysis and decreasing percentage detected B-3

Table B.2 Summary statistics for water data detected compounds summarized by reach sorted by type of analysis, analysis, and reach B-7

TABLE B.1
SUMMARY STATISTICS FOR WATER DATA
SUMMARIZED FOR ALL REACHES
SORTED BY TYPE OF ANALYSIS & DECREASING %-DETECTED

TYPE OF ANALYSIS=INORGANICS

ANALYSIS	SAMPLE MATRIX	NO. OF OBS.	NO. DETECTED	% DETECTED	MINIMUM VALUE	MIN QUAL.	MAXIMUM VALUE	MAX QUAL.	AVERAGE VALUE	STD. DEV.	SAMPLE UNITS
CALCIUM, DISS.	FILTRATE	18	18	100.00	17700.00	V/V	34800.00	V/V	27316.67	7150.83	UG/L
CALCIUM, TOTAL	WATER	18	18	100.00	17600.00	V/V	35400.00	V/V	27305.56	7256.44	UG/L
MAGNESIUM, DISS.	FILTRATE	18	18	100.00	4550.000	V/V	10500.00	V/V	7986.67	2306.53	UG/L
MAGNESIUM, TOTAL	WATER	18	18	100.00	4520.000	V/V	10500.00	V/V	8018.89	2332.06	UG/L
POTASSIUM, DISS.	FILTRATE	18	18	100.00	1300.000	V/V	1840.00	V/V	1542.22	178.87	UG/L
POTASSIUM, TOTAL	WATER	18	18	100.00	1250.000	V/V	1840.00	V/V	1540.56	190.65	UG/L
SODIUM, DISS.	FILTRATE	18	18	100.00	2640.000	V/V	5260.00	V/V	4370.00	822.88	UG/L
SODIUM, TOTAL	WATER	18	18	100.00	2440.000	V/V	5240.00	V/V	4320.56	846.88	UG/L
IRON, TOTAL	WATER	18	16	88.89	15.000	U	745.00	J	268.39	208.95	UG/L
LEAD, TOTAL	WATER	19	4	21.05	0.360	U	11.00	U	1.90	2.49	UG/L
LEAD, DISS.	FILTRATE	19	3	15.79	0.360	U	2.50	U	1.25	0.80	UG/L
IRON, DISS.	FILTRATE	15	2	13.33	5.600	U	80.00	U	17.39	21.55	UG/L
COPPER, TOTAL	WATER	18	2	11.11	4.400	U	6.50	V/V	4.52	0.49	UG/L
CADMIUM, DISS.	FILTRATE	19	2	10.53	0.210	U	0.39	V/V	0.22	0.05	UG/L
BERYLLIUM, TOTAL	WATER	18	1	5.56	3.900	U	3.90	V/V	3.90	0.00	UG/L
ZINC, DISS.	FILTRATE	18	1	5.56	3.400	U	21.00	V/V	8.68	5.53	UG/L
ZINC, TOTAL	WATER	18	1	5.56	3.400	U	52.00	V/V	11.22	11.08	UG/L
MERCURY, DISS.	FILTRATE	19	1	5.26	0.200	U	0.52	V/V	0.22	0.07	UG/L
SILVER, DISS.	FILTRATE	19	1	5.26	0.740	U	13.00	V/V	1.39	2.81	UG/L
SILVER, TOTAL	WATER	19	1	5.26	0.740	U	4.80	V/V	0.95	0.93	UG/L
ANTIMONY, DISS.	FILTRATE	19	0	0.00	1.900	U	1.90	UJ	1.90	0.00	UG/L
ANTIMONY, TOTAL	WATER	19	0	0.00	1.900	U	1.90	UJ	1.90	0.00	UG/L
ARSENIC, DISS.	FILTRATE	19	0	0.00	1.300	U	1.30	UJ	1.30	0.00	UG/L
ARSENIC, TOTAL	WATER	19	0	0.00	1.300	U	1.30	UJ	1.30	0.00	UG/L
BERYLLIUM, DISS.	FILTRATE	18	0	0.00	3.900	U	3.90	U	3.90	0.00	UG/L
CADMIUM, TOTAL	WATER	19	0	0.00	0.210	U	0.31	U	0.22	0.02	UG/L
CHROMIUM, DISS.	FILTRATE	18	0	0.00	9.800	U	9.80	U	9.80	0.00	UG/L
CHROMIUM, TOTAL	WATER	18	0	0.00	9.800	U	9.80	U	9.80	0.00	UG/L
COPPER, DISS.	FILTRATE	18	0	0.00	4.400	U	4.40	U	4.40	0.00	UG/L
MERCURY, TOTAL	WATER	19	0	0.00	0.200	U	0.20	U	0.20	0.00	UG/L
NICKEL, DISS.	FILTRATE	18	0	0.00	19.000	U	19.00	U	19.00	0.00	UG/L
NICKEL, TOTAL	WATER	18	0	0.00	19.000	U	19.00	U	19.00	0.00	UG/L
SELENIUM, DISS.	FILTRATE	19	0	0.00	0.970	U	0.97	UJ	0.97	0.00	UG/L
SELENIUM, TOTAL	WATER	19	0	0.00	0.970	U	0.97	UJ	0.97	0.00	UG/L
THALLIUM, DISS.	FILTRATE	18	0	0.00	2.700	U	2.70	U	2.70	0.00	UG/L
THALLIUM, TOTAL	WATER	19	0	0.00	2.700	U	2.70	U	2.70	0.00	UG/L

TYPE OF ANALYSIS=ORGANICS

ANALYSIS	SAMPLE MATRIX	NO. OF OBS.	NO. DETECTED	% DETECTED	MINIMUM VALUE	MIN QUAL.	MAXIMUM VALUE	MAX QUAL.	AVERAGE VALUE	STD. DEV.	SAMPLE UNITS
BIS(2-ETHYLHEXYL)PHTHALATE	WATER	18	1	5.56	3.000	U	10.00	UJ	8.94	2.46	UG/L
ACENAPHTHENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
ACENAPHTHYLENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
ALDRIN	WATER	12	0	0.00	0.050	U	0.05	U	0.05	0.00	UG/L

TABLE B.1
SUMMARY STATISTICS FOR WATER DATA
SUMMARIZED FOR ALL REACHES
SORTED BY TYPE OF ANALYSIS & DECREASING %-DETECTED

TYPE OF ANALYSIS=ORGANICS
(CONTINUED)

ANALYSIS	SAMPLE MATRIX	NO. OF OBS.	NO. DETECTED	% DETECTED	MINIMUM VALUE	MIN QUAL.	MAXIMUM VALUE	MAX QUAL.	AVERAGE VALUE	STD. DEV.	SAMPLE UNITS
ALPHA-BHC	WATER	12	0	0.00	0.050	U	0.05	U	0.05	0.00	UG/L
ALPHA-CHLORDANE	WATER	12	0	0.00	0.500	U	0.50	U	0.50	0.00	UG/L
ANTHRACENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
AROCLOR-1016	WATER	12	0	0.00	0.500	U	0.50	U	0.50	0.00	UG/L
AROCLOR-1221	WATER	12	0	0.00	0.500	U	0.50	U	0.50	0.00	UG/L
AROCLOR-1232	WATER	12	0	0.00	0.500	U	0.50	U	0.50	0.00	UG/L
AROCLOR-1242	WATER	12	0	0.00	0.500	U	0.50	U	0.50	0.00	UG/L
AROCLOR-1248	WATER	12	0	0.00	0.500	U	0.50	U	0.50	0.00	UG/L
AROCLOR-1254	WATER	12	0	0.00	1.000	U	1.00	U	1.00	0.00	UG/L
AROCLOR-1260	WATER	12	0	0.00	1.000	U	1.00	U	1.00	0.00	UG/L
BENZO(A)ANTHRACENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
BENZO(A)PYRENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
BENZO(B)FLUORANTHENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
BENZO(G,H,I)PERYLENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
BENZO(K)FLUORANTHENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
BENZOIC ACID	WATER	18	0	0.00	50.000	U	50.00	UJ	50.00	0.00	UG/L
BENZYL ALCOHOL	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
BETA-BHC	WATER	12	0	0.00	0.050	U	0.05	U	0.05	0.00	UG/L
BIS(2-CHLOROETHOXY)METHANE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
BIS(2-CHLOROETHYL)ETHER	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
BIS(2-CHLOROISOPROPYL)ETHE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
BUTYLBENZYLPHTHALATE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
CHRYSENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
DELTA-BHC	WATER	12	0	0.00	0.050	U	0.05	U	0.05	0.00	UG/L
DI-N-BUTYLPHTHALATE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
DI-N-OCTYLPHTHALATE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
DIBENZ(A,H)ANTHRACENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
DIBENZOFURAN	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
DIELDRIN	WATER	12	0	0.00	0.100	U	0.10	U	0.10	0.00	UG/L
DIETHYLPHTHALATE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
DIMETHYLPHTHALATE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
ENDOSULFAN I	WATER	12	0	0.00	0.050	U	0.05	U	0.05	0.00	UG/L
ENDOSULFAN II	WATER	12	0	0.00	0.100	U	0.10	U	0.10	0.00	UG/L
ENDOSULFAN SULFATE	WATER	12	0	0.00	0.100	U	0.10	U	0.10	0.00	UG/L
ENDRIN	WATER	12	0	0.00	0.100	U	0.10	U	0.10	0.00	UG/L
ENDRIN KETONE	WATER	12	0	0.00	0.100	U	0.10	U	0.10	0.00	UG/L
FLUORANTHENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
FLUORENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
GAMMA-BHC (LINDANE)	WATER	12	0	0.00	0.050	U	0.05	U	0.05	0.00	UG/L
GAMMA-CHLORDANE	WATER	12	0	0.00	0.500	U	0.50	U	0.50	0.00	UG/L
HEPTACHLOR	WATER	12	0	0.00	0.050	U	0.05	U	0.05	0.00	UG/L
HEPTACHLOR EPOXIDE	WATER	12	0	0.00	0.050	U	0.05	U	0.05	0.00	UG/L
HEXACHLOROBENZENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
HEXACHLOROBUTADIENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
HEXACHLOROCYCLOPENTADIENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
HEXACHLOROETHANE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L

TABLE B.1
SUMMARY STATISTICS FOR WATER DATA
SUMMARIZED FOR ALL REACHES
SORTED BY TYPE OF ANALYSIS & DECREASING %-DETECTED

TYPE OF ANALYSIS=ORGANICS
(CONTINUED)

ANALYSIS	SAMPLE MATRIX	NO. OF OBS.	NO. DETECTED	% DETECTED	MINIMUM VALUE	MIN QUAL.	MAXIMUM VALUE	MAX QUAL.	AVERAGE VALUE	STD. DEV.	SAMPLE UNITS
INDENO(1,2,3-CD)PYRENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
ISOPHORONE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
METHOXYCHLOR	WATER	12	0	0.00	0.500	U	0.50	U	0.50	0.00	UG/L
N-NITROSO-DI-N-PROPYLAMINE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
N-NITROSODIPHENYLAMINE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
NAPHTHALENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
NITROBENZENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
PENTACHLOROPHENOL	WATER	17	0	0.00	50.000	U	50.00	UJ	50.00	0.00	UG/L
PHENANTHRENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
PHENOL	WATER	17	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
PYRENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
TOXAPHENE	WATER	12	0	0.00	1.000	U	1.00	U	1.00	0.00	UG/L
1,2-DICHLOROBENZENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
1,2,4-TRICHLOROBENZENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
1,3-DICHLOROBENZENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
1,4-DICHLOROBENZENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
2-CHLORONAPHTHALENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
2-CHLOROPHENOL	WATER	17	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
2-METHYLNAPHTHALENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
2-METHYLPHENOL	WATER	17	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
2-NITROANILINE	WATER	18	0	0.00	50.000	U	50.00	UJ	50.00	0.00	UG/L
2-NITROPHENOL	WATER	17	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
2,4-DICHLOROPHENOL	WATER	17	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
2,4-DIMETHYLPHENOL	WATER	17	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
2,4-DINITROPHENOL	WATER	17	0	0.00	50.000	U	50.00	UJ	50.00	0.00	UG/L
2,4-DINITROTOLUENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
2,4,5-TRICHLOROPHENOL	WATER	15	0	0.00	50.000	U	50.00	UJ	50.00	0.00	UG/L
2,4,6-TRICHLOROPHENOL	WATER	15	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
2,6-DINITROTOLUENE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
3-NITROANILINE	WATER	18	0	0.00	50.000	U	50.00	UJ	50.00	0.00	UG/L
3,3'-DICHLOROBENZIDINE	WATER	18	0	0.00	20.000	U	20.00	UJ	20.00	0.00	UG/L
4-BROMOPHENYL-PHENYLETHER	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
4-CHLORO-3-METHYLPHENOL	WATER	17	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
4-CHLOROANILINE	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
4-CHLOROPHENYL-PHENYLETHER	WATER	18	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
4-METHYLPHENOL	WATER	17	0	0.00	10.000	U	10.00	UJ	10.00	0.00	UG/L
4-NITROANILINE	WATER	18	0	0.00	50.000	U	50.00	UJ	50.00	0.00	UG/L
4-NITROPHENOL	WATER	17	0	0.00	50.000	U	50.00	UJ	50.00	0.00	UG/L
4,4'-DDD	WATER	12	0	0.00	0.100	U	0.10	U	0.10	0.00	UG/L
4,4'-DDE	WATER	12	0	0.00	0.100	U	0.10	U	0.10	0.00	UG/L
4,4'-DDT	WATER	12	0	0.00	0.100	U	0.10	U	0.10	0.00	UG/L
4,6-DINITRO-2-METHYLPHENOL	WATER	17	0	0.00	50.000	U	50.00	UJ	50.00	0.00	UG/L

TABLE B.1
SUMMARY STATISTICS FOR WATER DATA
SUMMARIZED FOR ALL REACHES
SORTED BY TYPE OF ANALYSIS & DECREASING %-DETECTED

TYPE OF ANALYSIS=RAD

ANALYSIS	SAMPLE MATRIX	NO. OF OBS.	NO. DETECTED	% DETECTED	MINIMUM VALUE	MIN QUAL.	MAXIMUM VALUE	MAX QUAL.	AVERAGE VALUE	STD. DEV.	SAMPLE UNITS
SR-90	WATER	16	16	100.00	-0.500	J	1.50	J	-0.01	0.53	PCI/L
CS-137	EVAPORATE	18	7	38.89	0.009	V/V	0.22	V/V	0.12	0.05	PCI/L
CS-137	RESIDUE	15	3	20.00	2.578	UJ	57.10	UJ	14.12	12.92	PCI/G
CO-60	EVAPORATE	18	1	5.56	0.067	UJ	0.29	UJ	0.15	0.06	PCI/L
CO-60	RESIDUE	15	0	0.00	3.284	UJ	67.55	UJ	21.25	16.45	PCI/G

TABLE B.2
SUMMARY STATISTICS FOR WATER DATA
DETECTED COMPOUNDS SUMMARIZED BY REACH
SORTED BY TYPE OF ANALYSIS, ANALYSIS & REACH

TYPE OF ANALYSIS=INORGANICS

ANALYSIS	SAMPLE MATRIX	REACH	NO. OF OBS.	NO. DETECTED	% DETECTED	MIN VALUE	MIN QUAL.	MAX VALUE	MAX QUAL.	AVG. VALUE	STD. DEV.	SAMPLE UNITS
BERYLLIUM, TOTAL	WATER	1	3	0	0.00	3.900	U	3.90	U	3.90	0.00	UG/L
BERYLLIUM, TOTAL	WATER	2	2	0	0.00	3.900	U	3.90	U	3.90	0.00	UG/L
BERYLLIUM, TOTAL	WATER	3	4	1	25.00	3.900	U	3.90	V/V	3.90	0.00	UG/L
BERYLLIUM, TOTAL	WATER	4	2	0	0.00	3.900	U	3.90	U	3.90	0.00	UG/L
BERYLLIUM, TOTAL	WATER	5	4	0	0.00	3.900	U	3.90	U	3.90	0.00	UG/L
BERYLLIUM, TOTAL	WATER	10	2	0	0.00	3.900	U	3.90	U	3.90	0.00	UG/L
BERYLLIUM, TOTAL	WATER	13	1	0	0.00	3.900	U	3.90	U	3.90	.	UG/L
CADMIUM, DISS.	FILTRATE	1	3	1	33.33	0.210	U	0.39	V/V	0.27	0.10	UG/L
CADMIUM, DISS.	FILTRATE	2	2	0	0.00	0.210	U	0.21	U	0.21	0.00	UG/L
CADMIUM, DISS.	FILTRATE	3	4	0	0.00	0.210	U	0.21	U	0.21	0.00	UG/L
CADMIUM, DISS.	FILTRATE	4	3	1	33.33	0.210	U	0.31	V/V	0.24	0.06	UG/L
CADMIUM, DISS.	FILTRATE	5	4	0	0.00	0.210	U	0.21	U	0.21	0.00	UG/L
CADMIUM, DISS.	FILTRATE	10	2	0	0.00	0.210	U	0.21	U	0.21	0.00	UG/L
CADMIUM, DISS.	FILTRATE	13	1	0	0.00	0.210	U	0.21	U	0.21	.	UG/L
CALCIUM, DISS.	FILTRATE	1	3	3	100.00	33900.00	V/V	34300.00	V/V	34166.67	230.94	UG/L
CALCIUM, DISS.	FILTRATE	2	2	2	100.00	33600.00	V/V	34500.00	V/V	34050.00	636.40	UG/L
CALCIUM, DISS.	FILTRATE	3	4	4	100.00	21100.00	V/V	24600.00	V/V	22075.00	1685.97	UG/L
CALCIUM, DISS.	FILTRATE	4	2	2	100.00	24600.00	V/V	34000.00	V/V	29300.00	6646.80	UG/L
CALCIUM, DISS.	FILTRATE	5	4	4	100.00	18000.00	V/V	33000.00	V/V	21975.00	7353.17	UG/L
CALCIUM, DISS.	FILTRATE	10	2	2	100.00	33800.00	V/V	34800.00	V/V	34300.00	707.11	UG/L
CALCIUM, DISS.	FILTRATE	13	1	1	100.00	17700.00	V/V	17700.00	V/V	17700.00	.	UG/L
CALCIUM, TOTAL	WATER	1	3	3	100.00	34100.00	V/V	35400.00	V/V	34566.67	723.42	UG/L
CALCIUM, TOTAL	WATER	2	2	2	100.00	33600.00	V/V	33800.00	V/V	33700.00	141.42	UG/L
CALCIUM, TOTAL	WATER	3	4	4	100.00	21000.00	V/V	24900.00	V/V	22175.00	1855.40	UG/L
CALCIUM, TOTAL	WATER	4	2	2	100.00	23500.00	V/V	33800.00	V/V	28650.00	7283.20	UG/L
CALCIUM, TOTAL	WATER	5	4	4	100.00	17800.00	V/V	33100.00	V/V	21925.00	7455.81	UG/L
CALCIUM, TOTAL	WATER	10	2	2	100.00	34300.00	V/V	34800.00	V/V	34550.00	353.55	UG/L
CALCIUM, TOTAL	WATER	13	1	1	100.00	17600.00	V/V	17600.00	V/V	17600.00	.	UG/L
COPPER, TOTAL	WATER	1	3	1	33.33	4.400	U	4.40	V/V	4.40	0.00	UG/L
COPPER, TOTAL	WATER	2	2	1	50.00	4.400	U	6.50	V/V	5.45	1.48	UG/L
COPPER, TOTAL	WATER	3	4	0	0.00	4.400	U	4.40	U	4.40	0.00	UG/L
COPPER, TOTAL	WATER	4	2	0	0.00	4.400	U	4.40	U	4.40	0.00	UG/L
COPPER, TOTAL	WATER	5	4	0	0.00	4.400	U	4.40	U	4.40	0.00	UG/L
COPPER, TOTAL	WATER	10	2	0	0.00	4.400	U	4.40	U	4.40	0.00	UG/L
COPPER, TOTAL	WATER	13	1	0	0.00	4.400	U	4.40	U	4.40	.	UG/L
IRON, DISS.	FILTRATE	1	2	0	0.00	9.000	U	80.00	U	44.50	50.20	UG/L
IRON, DISS.	FILTRATE	2	2	1	50.00	5.600	U	54.00	V/V	29.80	34.22	UG/L
IRON, DISS.	FILTRATE	3	4	0	0.00	6.700	U	10.00	U	7.82	1.48	UG/L
IRON, DISS.	FILTRATE	4	2	0	0.00	5.600	U	9.20	U	7.40	2.55	UG/L
IRON, DISS.	FILTRATE	5	3	1	33.33	12.000	U	29.00	V/V	18.33	9.29	UG/L
IRON, DISS.	FILTRATE	10	2	0	0.00	5.600	U	5.60	U	5.60	0.00	UG/L
IRON, TOTAL	WATER	1	3	3	100.00	100.000	V/V	295.00	V/V	170.33	108.26	UG/L
IRON, TOTAL	WATER	2	2	2	100.00	120.000	V/V	150.00	V/V	135.00	21.21	UG/L
IRON, TOTAL	WATER	3	4	4	100.00	328.000	J	745.00	J	465.25	190.38	UG/L
IRON, TOTAL	WATER	4	2	2	100.00	202.000	V/V	218.00	V/V	210.00	11.31	UG/L
IRON, TOTAL	WATER	5	4	4	100.00	121.000	V/V	575.00	J	277.75	211.03	UG/L
IRON, TOTAL	WATER	10	2	0	0.00	15.000	U	22.00	U	18.50	4.95	UG/L

TABLE B.2
SUMMARY STATISTICS FOR WATER DATA
DETECTED COMPOUNDS SUMMARIZED BY REACH
SORTED BY TYPE OF ANALYSIS, ANALYSIS & REACH

TYPE OF ANALYSIS=INORGANICS
(CONTINUED)

ANALYSIS	SAMPLE MATRIX	REACH	NO. OF OBS.	NO. DETECTED	% DETECTED	MIN VALUE	MIN QUAL.	MAX VALUE	MAX QUAL.	AVG. VALUE	STD. DEV.	SAMPLE UNITS
IRON, TOTAL	WATER	13	1	1	100.00	621.000	J	621.00	J	621.00	.	UG/L
LEAD, DISS.	FILTRATE	1	3	1	33.33	0.700	U	2.40	V/V	1.80	0.95	UG/L
LEAD, DISS.	FILTRATE	2	2	0	0.00	2.000	U	2.50	U	2.25	0.35	UG/L
LEAD, DISS.	FILTRATE	3	4	0	0.00	0.360	U	1.80	U	1.34	0.70	UG/L
LEAD, DISS.	FILTRATE	4	3	1	33.33	0.600	U	1.50	U	0.97	0.47	UG/L
LEAD, DISS.	FILTRATE	5	4	0	0.00	0.360	U	2.40	U	0.96	0.98	UG/L
LEAD, DISS.	FILTRATE	10	2	0	0.00	0.500	U	0.70	U	0.60	0.14	UG/L
LEAD, DISS.	FILTRATE	13	1	1	100.00	0.600	V/V	0.60	V/V	0.60	.	UG/L
LEAD, TOTAL	WATER	1	3	1	33.33	0.900	U	2.30	U	1.73	0.74	UG/L
LEAD, TOTAL	WATER	2	2	0	0.00	0.360	U	0.40	U	0.38	0.03	UG/L
LEAD, TOTAL	WATER	3	4	2	50.00	0.360	U	1.60	UJ	1.09	0.53	UG/L
LEAD, TOTAL	WATER	4	3	1	33.33	1.000	V/V	1.50	U	1.30	0.26	UG/L
LEAD, TOTAL	WATER	5	4	0	0.00	0.360	U	11.00	U	3.77	4.98	UG/L
LEAD, TOTAL	WATER	10	2	0	0.00	0.600	U	1.00	U	0.80	0.28	UG/L
LEAD, TOTAL	WATER	13	1	0	0.00	5.200	U	5.20	U	5.20	.	UG/L
MAGNESIUM, DISS.	FILTRATE	1	3	3	100.00	9550.000	V/V	10400.00	V/V	10050.00	444.41	UG/L
MAGNESIUM, DISS.	FILTRATE	2	2	2	100.00	10200.00	V/V	10500.00	V/V	10350.00	212.13	UG/L
MAGNESIUM, DISS.	FILTRATE	3	4	4	100.00	6170.000	V/V	6310.00	V/V	6255.00	60.28	UG/L
MAGNESIUM, DISS.	FILTRATE	4	2	2	100.00	7030.000	V/V	10300.00	V/V	8665.00	2312.24	UG/L
MAGNESIUM, DISS.	FILTRATE	5	4	4	100.00	4550.000	V/V	9580.00	V/V	5930.00	2440.26	UG/L
MAGNESIUM, DISS.	FILTRATE	10	2	2	100.00	10100.00	V/V	10400.00	V/V	10250.00	212.13	UG/L
MAGNESIUM, DISS.	FILTRATE	13	1	1	100.00	6340.000	V/V	6340.00	V/V	6340.00	.	UG/L
MAGNESIUM, TOTAL	WATER	1	3	3	100.00	10000.00	V/V	10500.00	V/V	10233.33	251.66	UG/L
MAGNESIUM, TOTAL	WATER	2	2	2	100.00	10200.00	V/V	10300.00	V/V	10250.00	70.71	UG/L
MAGNESIUM, TOTAL	WATER	3	4	4	100.00	6160.000	V/V	6450.00	V/V	6335.00	134.29	UG/L
MAGNESIUM, TOTAL	WATER	4	2	2	100.00	6790.000	V/V	10300.00	V/V	8545.00	2481.94	UG/L
MAGNESIUM, TOTAL	WATER	5	4	4	100.00	4520.000	V/V	9600.00	V/V	5920.00	2460.31	UG/L
MAGNESIUM, TOTAL	WATER	10	2	2	100.00	10200.00	V/V	10500.00	V/V	10350.00	212.13	UG/L
MAGNESIUM, TOTAL	WATER	13	1	1	100.00	6330.000	V/V	6330.00	V/V	6330.00	.	UG/L
MERCURY, DISS.	FILTRATE	1	3	0	0.00	0.200	U	0.20	U	0.20	0.00	UG/L
MERCURY, DISS.	FILTRATE	2	2	0	0.00	0.200	U	0.20	U	0.20	0.00	UG/L
MERCURY, DISS.	FILTRATE	3	4	1	25.00	0.200	U	0.52	V/V	0.28	0.16	UG/L
MERCURY, DISS.	FILTRATE	4	3	0	0.00	0.200	U	0.20	U	0.20	0.00	UG/L
MERCURY, DISS.	FILTRATE	5	4	0	0.00	0.200	U	0.20	U	0.20	0.00	UG/L
MERCURY, DISS.	FILTRATE	10	2	0	0.00	0.200	U	0.20	U	0.20	0.00	UG/L
MERCURY, DISS.	FILTRATE	13	1	0	0.00	0.200	U	0.20	U	0.20	.	UG/L
POTASSIUM, DISS.	FILTRATE	1	3	3	100.00	1680.000	V/V	1710.00	V/V	1690.00	17.32	UG/L
POTASSIUM, DISS.	FILTRATE	2	2	2	100.00	1550.000	V/V	1750.00	V/V	1650.00	141.42	UG/L
POTASSIUM, DISS.	FILTRATE	3	4	4	100.00	1340.000	V/V	1360.00	V/V	1355.00	10.00	UG/L
POTASSIUM, DISS.	FILTRATE	4	2	2	100.00	1530.000	V/V	1730.00	V/V	1630.00	141.42	UG/L
POTASSIUM, DISS.	FILTRATE	5	4	4	100.00	1340.000	V/V	1660.00	V/V	1485.00	140.59	UG/L
POTASSIUM, DISS.	FILTRATE	10	2	2	100.00	1710.000	V/V	1840.00	V/V	1775.00	91.92	UG/L
POTASSIUM, DISS.	FILTRATE	13	1	1	100.00	1300.000	V/V	1300.00	V/V	1300.00	.	UG/L
POTASSIUM, TOTAL	WATER	1	3	3	100.00	1730.000	V/V	1840.00	V/V	1773.33	58.59	UG/L
POTASSIUM, TOTAL	WATER	2	2	2	100.00	1560.000	V/V	1770.00	V/V	1665.00	148.49	UG/L
POTASSIUM, TOTAL	WATER	3	4	4	100.00	1250.000	V/V	1510.00	V/V	1385.00	109.09	UG/L

TABLE 8.2
SUMMARY STATISTICS FOR WATER DATA
DETECTED COMPOUNDS SUMMARIZED BY REACH
SORTED BY TYPE OF ANALYSIS, ANALYSIS & REACH

TYPE OF ANALYSIS=INORGANICS
(CONTINUED)

ANALYSIS	SAMPLE MATRIX	REACH	NO. OF OBS.	NO. DETECTED	% DETECTED	MIN VALUE	MIN QUAL.	MAX VALUE	MAX QUAL.	AVG. VALUE	STD. DEV.	SAMPLE UNITS
POTASSIUM, TOTAL	WATER	4	2	2	100.00	1480.000	V/V	1630.00	V/V	1555.00	106.07	UG/L
POTASSIUM, TOTAL	WATER	5	4	4	100.00	1250.000	V/V	1790.00	V/V	1465.00	238.54	UG/L
POTASSIUM, TOTAL	WATER	10	2	2	100.00	1600.000	V/V	1640.00	V/V	1620.00	28.28	UG/L
POTASSIUM, TOTAL	WATER	13	1	1	100.00	1330.000	V/V	1330.00	V/V	1330.00	.	UG/L
SILVER, DISS.	FILTRATE	1	3	0	0.00	0.740	U	0.74	UJ	0.74	0.00	UG/L
SILVER, DISS.	FILTRATE	2	2	0	0.00	0.740	U	0.74	U	0.74	0.00	UG/L
SILVER, DISS.	FILTRATE	3	4	1	25.00	0.740	U	13.00	V/V	3.81	6.13	UG/L
SILVER, DISS.	FILTRATE	4	3	0	0.00	0.740	U	0.74	UJ	0.74	0.00	UG/L
SILVER, DISS.	FILTRATE	5	4	0	0.00	0.740	U	0.74	U	0.74	0.00	UG/L
SILVER, DISS.	FILTRATE	10	2	0	0.00	0.740	U	0.74	U	0.74	0.00	UG/L
SILVER, DISS.	FILTRATE	13	1	0	0.00	0.740	U	0.74	U	0.74	.	UG/L
SILVER, TOTAL	WATER	1	3	0	0.00	0.740	UJ	0.74	UJ	0.74	0.00	UG/L
SILVER, TOTAL	WATER	2	2	0	0.00	0.740	U	0.74	U	0.74	0.00	UG/L
SILVER, TOTAL	WATER	3	4	1	25.00	0.740	U	4.80	V/V	1.76	2.03	UG/L
SILVER, TOTAL	WATER	4	3	0	0.00	0.740	U	0.74	UJ	0.74	0.00	UG/L
SILVER, TOTAL	WATER	5	4	0	0.00	0.740	U	0.74	UJ	0.74	0.00	UG/L
SILVER, TOTAL	WATER	10	2	0	0.00	0.740	U	0.74	U	0.74	0.00	UG/L
SILVER, TOTAL	WATER	13	1	0	0.00	0.740	U	0.74	U	0.74	.	UG/L
SODIUM, DISS.	FILTRATE	1	3	3	100.00	4490.000	V/V	5260.00	V/V	4910.00	389.74	UG/L
SODIUM, DISS.	FILTRATE	2	2	2	100.00	4780.000	V/V	5220.00	V/V	5000.00	311.13	UG/L
SODIUM, DISS.	FILTRATE	3	4	4	100.00	3080.000	V/V	4150.00	V/V	3440.00	484.22	UG/L
SODIUM, DISS.	FILTRATE	4	2	2	100.00	3760.000	V/V	4910.00	V/V	4335.00	813.17	UG/L
SODIUM, DISS.	FILTRATE	5	4	4	100.00	4310.000	V/V	5140.00	V/V	4715.00	339.26	UG/L
SODIUM, DISS.	FILTRATE	10	2	2	100.00	4940.000	V/V	5060.00	V/V	5000.00	84.85	UG/L
SODIUM, DISS.	FILTRATE	13	1	1	100.00	2640.000	V/V	2640.00	V/V	2640.00	.	UG/L
SODIUM, TOTAL	WATER	1	3	3	100.00	4720.000	V/V	5240.00	V/V	4926.67	275.92	UG/L
SODIUM, TOTAL	WATER	2	2	2	100.00	4760.000	V/V	5130.00	V/V	4945.00	261.63	UG/L
SODIUM, TOTAL	WATER	3	4	4	100.00	3050.000	V/V	4180.00	V/V	3420.00	516.07	UG/L
SODIUM, TOTAL	WATER	4	2	2	100.00	3820.000	V/V	4830.00	V/V	4225.00	855.60	UG/L
SODIUM, TOTAL	WATER	5	4	4	100.00	4120.000	V/V	5100.00	V/V	4650.00	402.82	UG/L
SODIUM, TOTAL	WATER	10	2	2	100.00	4900.000	V/V	5030.00	V/V	4965.00	91.92	UG/L
SODIUM, TOTAL	WATER	13	1	1	100.00	2440.000	V/V	2440.00	V/V	2440.00	.	UG/L
ZINC, DISS.	FILTRATE	1	3	0	0.00	3.400	U	14.00	U	9.13	5.35	UG/L
ZINC, DISS.	FILTRATE	2	2	0	0.00	3.400	U	12.00	U	7.70	6.08	UG/L
ZINC, DISS.	FILTRATE	3	4	0	0.00	3.400	U	15.00	U	8.63	5.35	UG/L
ZINC, DISS.	FILTRATE	4	2	0	0.00	3.400	U	3.40	U	3.40	0.00	UG/L
ZINC, DISS.	FILTRATE	5	4	0	0.00	3.400	U	16.00	U	7.55	5.94	UG/L
ZINC, DISS.	FILTRATE	10	2	1	50.00	7.900	U	21.00	V/V	14.45	9.26	UG/L
ZINC, DISS.	FILTRATE	13	1	0	0.00	13.000	U	13.00	U	13.00	.	UG/L
ZINC, TOTAL	WATER	1	3	0	0.00	3.400	U	11.00	U	6.37	4.06	UG/L
ZINC, TOTAL	WATER	2	2	1	50.00	8.400	U	52.00	V/V	30.20	30.83	UG/L
ZINC, TOTAL	WATER	3	4	0	0.00	5.300	U	15.00	U	10.50	5.23	UG/L
ZINC, TOTAL	WATER	4	2	0	0.00	3.400	U	5.90	U	4.65	1.77	UG/L
ZINC, TOTAL	WATER	5	4	0	0.00	3.400	U	13.00	U	8.03	4.05	UG/L
ZINC, TOTAL	WATER	10	2	0	0.00	10.000	U	11.00	U	10.50	0.71	UG/L
ZINC, TOTAL	WATER	13	1	0	0.00	18.000	U	18.00	U	18.00	.	UG/L

TABLE B.2
SUMMARY STATISTICS FOR WATER DATA
DETECTED COMPOUNDS SUMMARIZED BY REACH
SORTED BY TYPE OF ANALYSIS, ANALYSIS & REACH

TYPE OF ANALYSIS=ORGANICS

ANALYSIS	SAMPLE MATRIX	REACH	NO. OF OBS.	NO. DETECTED	% DETECTED	MIN VALUE	MIN QUAL.	MAX VALUE	MAX QUAL.	AVG. VALUE	STD. DEV.	SAMPLE UNITS
BIS(2-ETHYLHEXYL)PHTHALATE	WATER	1	3	0	0.00	10.000	U	10.00	U	10.00	0.00	UG/L
BIS(2-ETHYLHEXYL)PHTHALATE	WATER	2	2	0	0.00	10.000	U	10.00	U	10.00	0.00	UG/L
BIS(2-ETHYLHEXYL)PHTHALATE	WATER	3	4	0	0.00	10.000	U	10.00	U	10.00	0.00	UG/L
BIS(2-ETHYLHEXYL)PHTHALATE	WATER	4	2	0	0.00	10.000	U	10.00	U	10.00	0.00	UG/L
BIS(2-ETHYLHEXYL)PHTHALATE	WATER	5	4	0	0.00	3.000	U	10.00	U	6.50	4.04	UG/L
BIS(2-ETHYLHEXYL)PHTHALATE	WATER	10	2	1	50.00	5.000	J	10.00	UJ	7.50	3.54	UG/L
BIS(2-ETHYLHEXYL)PHTHALATE	WATER	13	1	0	0.00	10.000	U	10.00	U	10.00	.	UG/L

TYPE OF ANALYSIS=RAD

ANALYSIS	SAMPLE MATRIX	REACH	NO. OF OBS.	NO. DETECTED	% DETECTED	MIN VALUE	MIN QUAL.	MAX VALUE	MAX QUAL.	AVG. VALUE	STD. DEV.	SAMPLE UNITS
CO-60	EVAPORATE	1	3	0	0.00	0.083	UJ	0.15	UJ	0.12	0.04	PCI/L
CO-60	EVAPORATE	2	2	0	0.00	0.152	UJ	0.28	UJ	0.22	0.10	PCI/L
CO-60	EVAPORATE	3	4	0	0.00	0.109	UJ	0.24	UJ	0.16	0.06	PCI/L
CO-60	EVAPORATE	4	2	0	0.00	0.152	UJ	0.16	UJ	0.16	0.01	PCI/L
CO-60	EVAPORATE	5	4	1	25.00	0.080	UJ	0.18	V/V	0.14	0.04	PCI/L
CO-60	EVAPORATE	10	2	0	0.00	0.087	UJ	0.10	UJ	0.09	0.03	PCI/L
CO-60	EVAPORATE	13	1	0	0.00	0.217	UJ	0.22	UJ	0.22	.	PCI/L
CS-137	EVAPORATE	1	3	0	0.00	0.083	UJ	0.13	UJ	0.11	0.02	PCI/L
CS-137	RESIDUE	1	3	0	0.00	6.375	UJ	14.42	UJ	10.62	4.04	PCI/G
CS-137	EVAPORATE	2	2	1	50.00	0.009	V/V	0.18	UJ	0.08	0.11	PCI/L
CS-137	RESIDUE	2	2	1	50.00	11.943	V/V	15.72	UJ	13.83	2.67	PCI/G
CS-137	EVAPORATE	3	4	3	75.00	0.095	J	0.22	V/V	0.15	0.05	PCI/L
CS-137	RESIDUE	3	3	0	0.00	2.578	UJ	5.63	UJ	4.06	1.53	PCI/G
CS-137	EVAPORATE	4	2	2	100.00	0.077	J	0.13	J	0.10	0.04	PCI/L
CS-137	RESIDUE	4	2	1	50.00	12.990	UJ	19.67	V/V	16.33	4.72	PCI/G
CS-137	EVAPORATE	5	4	1	25.00	0.050	V/V	0.14	UJ	0.10	0.04	PCI/L
CS-137	RESIDUE	5	3	1	33.33	11.338	UJ	17.34	UJ	14.57	3.03	PCI/G
CS-137	EVAPORATE	10	2	0	0.00	0.075	UJ	0.12	UJ	0.10	0.03	PCI/L
CS-137	RESIDUE	10	1	0	0.00	57.102	UJ	57.10	UJ	57.10	.	PCI/G
CS-137	EVAPORATE	13	1	0	0.00	0.205	UJ	0.21	UJ	0.21	.	PCI/L
CS-137	RESIDUE	13	1	0	0.00	6.669	UJ	6.67	UJ	6.67	.	PCI/G
SR-90	WATER	1	3	3	100.00	0.200	J	1.50	J	0.70	0.70	PCI/L
SR-90	WATER	2	2	2	100.00	-0.500	J	-0.10	J	-0.30	0.28	PCI/L
SR-90	WATER	3	4	4	100.00	-0.400	J	0.20	J	-0.13	0.28	PCI/L
SR-90	WATER	4	1	1	100.00	-0.400	J	-0.40	J	-0.40	.	PCI/L
SR-90	WATER	5	3	3	100.00	-0.400	J	0.70	J	-0.00	0.61	PCI/L
SR-90	WATER	10	2	2	100.00	-0.400	J	-0.30	J	-0.35	0.07	PCI/L
SR-90	WATER	13	1	1	100.00	-0.100	J	-0.10	J	-0.10	.	PCI/L

Appendix C

SUMMARY STATISTICS FOR SEDIMENT SAMPLES

CONTENTS OF APPENDIX C

Table C.1 Summary statistics for sediment core data summarized for all reaches sorted by type of analysis and decreasing percentage detected C-3

Table C.2 Summary statistics for sediment core data detected compounds summarized by reach sorted by type of analysis, analysis, and reach C-6

Table C.3 Summary statistics for sediment grab data summarized for all reaches sorted by type of analysis and decreasing percentage detected C-13

Table C.4 Summary statistics for sediment grab data detected compounds summarized by reach sorted by type of analysis, analysis, and reach ... C-14

TABLE C.1
SUMMARY STATISTICS FOR SEDIMENT CORE DATA
SUMMARIZED FOR ALL REACHES
SORTED BY TYPE OF ANALYSIS & DECREASING %-DETECTED

TYPE OF ANALYSIS=INORGANICS

ANALYSIS	NO. OF OBS.	NO. DETECTED	% DETECTED	MINIMUM VALUE	MIN QUAL.	MAXIMUM VALUE	MAX QUAL.	AVERAGE VALUE	STD. DEV.	SAMPLE UNITS
CHROMIUM, TOTAL	332	332	100.00	3.000	J	74.30	V/V	21.55	10.44	MG/KG
LEAD, TOTAL	332	332	100.00	0.720	J	92.80	V/V	27.40	14.31	MG/KG
NICKEL, TOTAL	332	332	100.00	2.400	V/V	64.00	V/V	19.10	9.23	MG/KG
ZINC, TOTAL	332	332	100.00	14.500	J	725.00	J	110.66	89.16	MG/KG
ARSENIC, TOTAL	331	328	99.09	0.400	UJ	202.00	V/V	18.60	39.29	MG/KG
BERYLLIUM, TOTAL	332	321	96.69	0.200	U	2.20	V/V	0.92	0.45	MG/KG
COPPER, TOTAL	332	318	95.78	6.000	J	61.50	J	24.12	11.78	MG/KG
MERCURY, TOTAL	217	189	87.10	0.030	V/V	160.00	V/V	2.86	11.95	MG/KG
SILVER, TOTAL	174	136	78.16	0.020	U	3.00	J	0.31	0.37	MG/KG
CADMIUM, TOTAL	332	248	74.70	0.200	U	8.50	J	0.97	1.09	MG/KG
SELENIUM, TOTAL	273	76	27.84	0.200	UJ	14.30	J	0.83	1.49	MG/KG
ANTIMONY, TOTAL	169	21	12.43	0.040	U	1.50	J	0.39	0.13	MG/KG
THALLIUM, TOTAL	330	28	8.48	0.200	U	2.60	V/V	0.48	0.40	MG/KG

TYPE OF ANALYSIS=ORGANICS

ANALYSIS	NO. OF OBS.	NO. DETECTED	% DETECTED	MINIMUM VALUE	MIN QUAL.	MAXIMUM VALUE	MAX QUAL.	AVERAGE VALUE	STD. DEV.	SAMPLE UNITS
BIS(2-ETHYLHEXYL)PHTHALATE	279	101	36.20	0.180	J	10.00	U	1.26	1.38	MG/KG
AROCLOR-1254	275	54	19.64	0.033	NJ	43.00	UJ	5.16	7.51	MG/KG
FLUORANTHENE	279	41	14.70	0.060	UJ	10.00	U	1.23	1.60	MG/KG
PYRENE	279	32	11.47	0.084	J	10.00	U	1.23	1.59	MG/KG
PHENANTHRENE	279	19	6.81	0.059	J	10.00	U	1.24	1.59	MG/KG
BENZO(B)FLUORANTHENE	279	5	1.79	0.170	UJ	10.00	U	1.27	1.60	MG/KG
CHRYSENE	279	5	1.79	0.170	UJ	10.00	U	1.25	1.58	MG/KG
BENZO(K)FLUORANTHENE	279	4	1.43	0.160	UJ	10.00	U	1.27	1.60	MG/KG
DI-N-BUTYLPHTHALATE	279	4	1.43	0.058	J	10.00	U	1.27	1.60	MG/KG
2-METHYLNAPHTHALENE	279	4	1.43	0.042	J	10.00	U	1.27	1.60	MG/KG
4,4'-DDD	273	3	1.10	0.016	NJ	4.30	UJ	0.62	0.75	MG/KG
BENZO(A)ANTHRACENE	278	3	1.08	0.170	UJ	10.00	U	1.28	1.60	MG/KG
NAPHTHALENE	279	3	1.08	0.039	J	10.00	U	1.27	1.60	MG/KG
4,4'-DDT	273	2	0.73	0.019	UJ	4.30	UJ	0.62	0.75	MG/KG
ANTHRACENE	279	2	0.72	0.059	UJ	10.00	U	1.26	1.58	MG/KG
BENZO(A)PYRENE	279	2	0.72	0.170	UJ	10.00	U	1.27	1.60	MG/KG
TOXAPHENE	261	1	0.38	0.190	UJ	43.00	UJ	5.68	6.99	MG/KG
AROCLOR-1260	273	1	0.37	0.190	UJ	43.00	UJ	6.20	7.52	MG/KG
DIETHYLPHTHALATE	279	1	0.36	0.076	U	10.00	U	1.27	1.60	MG/KG
DIMETHYLPHTHALATE	279	1	0.36	0.170	UJ	10.00	U	1.27	1.60	MG/KG
INDENO(1,2,3-CD)PYRENE	279	1	0.36	0.170	UJ	10.00	U	1.27	1.60	MG/KG
N-NITROSO-DI-N-PROPYLAMINE	279	1	0.36	0.170	UJ	10.00	U	1.27	1.60	MG/KG
ACENAPHTHENE	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
ACENAPHTHYLENE	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
ALDRIN	241	0	0.00	0.009	UJ	1.80	UJ	0.24	0.31	MG/KG
ALPHA-BHC	241	0	0.00	0.009	UJ	1.80	UJ	0.24	0.31	MG/KG
ALPHA-CHLORDANE	241	0	0.00	0.095	UJ	18.00	UJ	2.38	3.08	MG/KG

TABLE C.1
SUMMARY STATISTICS FOR SEDIMENT CORE DATA
SUMMARIZED FOR ALL REACHES
SORTED BY TYPE OF ANALYSIS & DECREASING %-DETECTED

TYPE OF ANALYSIS=ORGANICS (CONTINUED)

ANALYSIS	NO. OF OBS.	NO. DETECTED	% DETECTED	MINIMUM VALUE	MIN QUAL.	MAXIMUM VALUE	MAX QUAL.	AVERAGE VALUE	STD. DEV.	SAMPLE UNITS
AROCLOR-1016	241	0	0.00	0.095	UJ	18.00	UJ	2.38	3.08	MG/KG
AROCLOR-1221	241	0	0.00	0.095	UJ	18.00	UJ	2.38	3.08	MG/KG
AROCLOR-1232	241	0	0.00	0.095	UJ	18.00	UJ	2.38	3.08	MG/KG
AROCLOR-1242	241	0	0.00	0.095	UJ	18.00	UJ	2.38	3.08	MG/KG
AROCLOR-1248	241	0	0.00	0.095	UJ	18.00	UJ	2.38	3.08	MG/KG
BENZO(G,H,I)PERYLENE	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
BENZOIC ACID	279	0	0.00	0.400	UJ	51.00	U	6.17	7.78	MG/KG
BENZYL ALCOHOL	271	0	0.00	0.170	UJ	10.00	U	1.29	1.62	MG/KG
BETA-BHC	241	0	0.00	0.009	UJ	1.80	UJ	0.24	0.31	MG/KG
BIS(2-CHLOROETHOXY)METHANE	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
BIS(2-CHLOROETHYL)ETHER	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
BIS(2-CHLOROISOPROPYL)ETHE	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
BUTYLBENZYLPHTHALATE	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
DELTA-BHC	241	0	0.00	0.009	UJ	1.80	UJ	0.24	0.31	MG/KG
DI-N-OCTYLPHTHALATE	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
DIBENZ(A,H)ANTHRACENE	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
DIBENZOFURAN	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
DIELDRIN	273	0	0.00	0.019	UJ	4.30	UJ	0.62	0.75	MG/KG
ENDOSULFAN I	241	0	0.00	0.009	UJ	1.80	UJ	0.24	0.31	MG/KG
ENDOSULFAN II	273	0	0.00	0.019	UJ	4.30	UJ	0.62	0.75	MG/KG
ENDOSULFAN SULFATE	273	0	0.00	0.019	UJ	4.30	UJ	0.62	0.75	MG/KG
ENDRIN	273	0	0.00	0.019	UJ	4.30	UJ	0.62	0.75	MG/KG
ENDRIN KETONE	273	0	0.00	0.019	UJ	4.30	UJ	0.62	0.75	MG/KG
FLUORENE	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
GAMMA-BHC (LINDANE)	241	0	0.00	0.009	UJ	1.80	UJ	0.24	0.31	MG/KG
GAMMA-CHLORDANE	241	0	0.00	0.095	UJ	18.00	UJ	2.38	3.08	MG/KG
HEPTACHLOR	241	0	0.00	0.009	UJ	1.80	UJ	0.24	0.31	MG/KG
HEPTACHLOR EPOXIDE	241	0	0.00	0.009	UJ	1.80	UJ	0.24	0.31	MG/KG
HEXACHLOROBENZENE	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
HEXACHLOROBUTADIENE	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
HEXACHLOROCYCLOPENTADIENE	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
HEXACHLOROETHANE	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
ISOPHORONE	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
METHOXYCHLOR	273	0	0.00	0.095	UJ	21.00	UJ	3.08	3.72	MG/KG
N-NITROSODIPHENYLAMINE	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
NITROBENZENE	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
PENTACHLOROPHENOL	279	0	0.00	0.830	UJ	51.00	U	6.18	7.77	MG/KG
PHENOL	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
1,2-DICHLOROBENZENE	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
1,2,4-TRICHLOROBENZENE	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
1,3-DICHLOROBENZENE	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
1,4-DICHLOROBENZENE	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
2-CHLORONAPHTHALENE	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
2-CHLOROPHENOL	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
2-METHYLPHENOL	271	0	0.00	0.170	UJ	10.00	U	1.29	1.62	MG/KG
2-NITROANILINE	279	0	0.00	0.830	UJ	51.00	U	6.18	7.77	MG/KG

TABLE C.1
SUMMARY STATISTICS FOR SEDIMENT CORE DATA
SUMMARIZED FOR ALL REACHES
SORTED BY TYPE OF ANALYSIS & DECREASING %-DETECTED

TYPE OF ANALYSIS=ORGANICS (CONTINUED)

ANALYSIS	NO. OF OBS.	NO. DETECTED	% DETECTED	MINIMUM VALUE	MIN QUAL.	MAXIMUM VALUE	MAX QUAL.	AVERAGE VALUE	STD. DEV.	SAMPLE UNITS
2-NITROPHENOL	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
2,4-DICHLOROPHENOL	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
2,4-DIMETHYLPHENOL	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
2,4-DINITROPHENOL	256	0	0.00	0.830	UJ	51.00	U	6.48	8.05	MG/KG
2,4-DINITROTOLUENE	279	0	0.00	0.170	UJ	10.00	U	1.28	1.59	MG/KG
2,4,5-TRICHLOROPHENOL	279	0	0.00	0.830	UJ	51.00	U	6.18	7.77	MG/KG
2,4,6-TRICHLOROPHENOL	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
2,6-DINITROTOLUENE	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
3-NITROANILINE	279	0	0.00	0.830	UJ	51.00	U	6.18	7.77	MG/KG
3,3'-DICHLOROBENZIDINE	279	0	0.00	0.330	UJ	21.00	U	2.55	3.20	MG/KG
4-BROMOPHENYL-PHENYLETHER	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
4-CHLORO-3-METHYLPHENOL	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
4-CHLOROANILINE	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
4-CHLOROPHENYL-PHENYLETHER	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
4-METHYLPHENOL	279	0	0.00	0.170	UJ	10.00	U	1.27	1.60	MG/KG
4-NITROANILINE	279	0	0.00	0.830	UJ	51.00	U	6.18	7.77	MG/KG
4-NITROPHENOL	266	0	0.00	0.830	UJ	51.00	U	6.24	7.83	MG/KG
4,4'-DDE	273	0	0.00	0.019	UJ	4.30	UJ	0.62	0.75	MG/KG
4,6-DINITRO-2-METHYLPHENOL	279	0	0.00	0.830	UJ	51.00	U	6.18	7.77	MG/KG

TYPE OF ANALYSIS=RAD

ANALYSIS	NO. OF OBS.	NO. DETECTED	% DETECTED	MINIMUM VALUE	MIN QUAL.	MAXIMUM VALUE	MAX QUAL.	AVERAGE VALUE	STD. DEV.	SAMPLE UNITS
AM-241	92	92	100.00	0.010	J	0.88	J	0.14	0.13	PCI/G (DRY)
CM-243,244	92	92	100.00	0.000	J	0.11	J	0.02	0.01	PCI/G (DRY)
CM-245,246	35	35	100.00	0.013	J	0.08	J	0.02	0.02	PCI/G (DRY)
CM-248	34	34	100.00	0.013	J	0.08	J	0.03	0.02	PCI/G (DRY)
PU-238	91	91	100.00	0.010	J	0.23	J	0.02	0.03	PCI/G (DRY)
PU-239,240	91	91	100.00	0.010	J	1.57	J	0.14	0.22	PCI/G (DRY)
SR-90	93	93	100.00	-0.060	J	1.25	J	0.25	0.28	PCI/G (DRY)
U-234	91	91	100.00	0.290	J	8.91	J	2.43	1.85	PCI/G (DRY)
U-235	91	91	100.00	0.010	J	0.69	J	0.10	0.10	PCI/G (DRY)
U-238	91	91	100.00	0.330	J	6.92	J	2.16	1.64	PCI/G (DRY)
CS-137	416	385	92.55	0.003	V/V	423.75	V/V	12.37	30.93	PCI/G (DRY)
CO-60	366	130	35.52	0.014	UJ	2.44	V/V	0.23	0.23	PCI/G (DRY)

TABLE C.2
SUMMARY STATISTICS FOR SEDIMENT CORE DATA
DETECTED COMPOUNDS SUMMARIZED BY REACH
SORTED BY TYPE OF ANALYSIS, ANALYSIS & REACH

TYPE OF ANALYSIS=INORGANICS

ANALYSIS	REACH	NO. OF OBS.	NO. DETECTED	% DETECTED	MIN VALUE	MIN QUAL.	MAX VALUE	MAX QUAL.	AVG. VALUE	STD. DEV.	SAMPLE UNITS
ANTIMONY, TOTAL	1	14	0	0.00	0.300	U	0.70	U	0.46	0.12	MG/KG
ANTIMONY, TOTAL	3	29	11	37.93	0.300	U	0.40	V/V	0.31	0.04	MG/KG
ANTIMONY, TOTAL	4	35	1	2.86	0.270	UJ	0.60	UJ	0.35	0.07	MG/KG
ANTIMONY, TOTAL	5	40	2	5.00	0.260	UJ	1.50	J	0.46	0.20	MG/KG
ANTIMONY, TOTAL	7	28	6	21.43	0.190	V/V	0.61	J	0.32	0.10	MG/KG
ANTIMONY, TOTAL	10	23	1	4.35	0.040	U	0.70	UJ	0.43	0.11	MG/KG
ARSENIC, TOTAL	1	21	20	95.24	3.400	V/V	20.60	J	9.14	3.99	MG/KG
ARSENIC, TOTAL	2	58	58	100.00	2.400	V/V	10.60	J	5.88	2.05	MG/KG
ARSENIC, TOTAL	3	79	79	100.00	0.700	J	202.00	V/V	51.21	71.22	MG/KG
ARSENIC, TOTAL	4	52	52	100.00	2.800	J	20.30	J	10.26	3.90	MG/KG
ARSENIC, TOTAL	5	70	70	100.00	3.100	J	15.30	J	8.62	2.38	MG/KG
ARSENIC, TOTAL	7	28	28	100.00	4.200	V/V	20.10	V/V	11.46	4.26	MG/KG
ARSENIC, TOTAL	10	23	21	91.30	0.400	UJ	8.80	V/V	5.20	2.12	MG/KG
BERYLLIUM, TOTAL	1	21	21	100.00	0.320	V/V	1.00	V/V	0.74	0.15	MG/KG
BERYLLIUM, TOTAL	2	59	48	81.36	0.200	U	1.60	V/V	0.70	0.30	MG/KG
BERYLLIUM, TOTAL	3	79	79	100.00	0.200	V/V	2.20	V/V	0.76	0.65	MG/KG
BERYLLIUM, TOTAL	4	52	52	100.00	0.300	V/V	1.60	V/V	0.80	0.29	MG/KG
BERYLLIUM, TOTAL	5	70	70	100.00	0.430	V/V	2.10	V/V	1.25	0.29	MG/KG
BERYLLIUM, TOTAL	7	28	28	100.00	0.640	V/V	1.70	V/V	1.04	0.26	MG/KG
BERYLLIUM, TOTAL	10	23	23	100.00	0.890	V/V	1.80	V/V	1.29	0.21	MG/KG
CADMIUM, TOTAL	1	21	13	61.90	0.300	U	1.30	V/V	0.63	0.35	MG/KG
CADMIUM, TOTAL	2	59	35	59.32	0.200	U	0.70	V/V	0.38	0.13	MG/KG
CADMIUM, TOTAL	3	79	65	82.28	0.200	U	3.60	J	0.76	0.63	MG/KG
CADMIUM, TOTAL	4	52	48	92.31	0.240	V/V	2.20	V/V	0.86	0.49	MG/KG
CADMIUM, TOTAL	5	70	69	98.57	0.430	V/V	8.50	J	2.16	1.75	MG/KG
CADMIUM, TOTAL	7	28	4	14.29	0.260	U	1.80	J	0.60	0.33	MG/KG
CADMIUM, TOTAL	10	23	14	60.87	0.400	U	1.40	V/V	0.64	0.23	MG/KG
CHROMIUM, TOTAL	1	21	21	100.00	7.100	V/V	24.00	V/V	16.14	5.33	MG/KG
CHROMIUM, TOTAL	2	59	59	100.00	5.000	V/V	28.00	V/V	14.34	4.12	MG/KG
CHROMIUM, TOTAL	3	79	79	100.00	3.000	J	40.00	J	17.48	10.48	MG/KG
CHROMIUM, TOTAL	4	52	52	100.00	5.800	V/V	47.70	V/V	21.08	10.06	MG/KG
CHROMIUM, TOTAL	5	70	70	100.00	16.000	V/V	51.90	V/V	31.70	7.20	MG/KG
CHROMIUM, TOTAL	7	28	28	100.00	17.300	V/V	74.30	V/V	27.30	11.54	MG/KG
CHROMIUM, TOTAL	10	23	23	100.00	12.600	V/V	33.60	V/V	22.24	4.69	MG/KG
COPPER, TOTAL	1	21	21	100.00	15.000	V/V	52.00	J	28.43	8.01	MG/KG
COPPER, TOTAL	2	59	59	100.00	6.000	J	32.00	V/V	15.24	5.13	MG/KG
COPPER, TOTAL	3	79	79	100.00	6.000	J	47.00	J	19.52	12.87	MG/KG
COPPER, TOTAL	4	52	52	100.00	9.400	V/V	53.80	V/V	25.08	9.79	MG/KG
COPPER, TOTAL	5	70	70	100.00	13.000	J	57.50	V/V	34.36	8.23	MG/KG
COPPER, TOTAL	7	28	28	100.00	10.400	V/V	48.40	V/V	28.31	10.31	MG/KG
COPPER, TOTAL	10	23	9	39.13	11.700	U	61.50	J	20.37	11.35	MG/KG
LEAD, TOTAL	1	21	21	100.00	19.600	J	47.80	J	36.42	7.02	MG/KG
LEAD, TOTAL	2	59	59	100.00	8.600	V/V	44.30	V/V	27.81	9.11	MG/KG
LEAD, TOTAL	3	79	79	100.00	0.800	J	69.90	J	14.83	10.50	MG/KG
LEAD, TOTAL	4	52	52	100.00	5.700	V/V	37.60	J	20.74	8.60	MG/KG
LEAD, TOTAL	5	70	70	100.00	0.720	J	92.80	V/V	43.95	12.08	MG/KG
LEAD, TOTAL	7	28	28	100.00	3.600	J	35.90	J	21.39	7.05	MG/KG

TABLE C.2
SUMMARY STATISTICS FOR SEDIMENT CORE DATA
DETECTED COMPOUNDS SUMMARIZED BY REACH
SORTED BY TYPE OF ANALYSIS, ANALYSIS & REACH

TYPE OF ANALYSIS=INORGANICS
(CONTINUED)

ANALYSIS	REACH	NO. OF OBS.	NO. DETECTED	% DETECTED	MIN VALUE	MIN QUAL.	MAX VALUE	MAX QUAL.	AVG. VALUE	STD. DEV.	SAMPLE UNITS
LEAD, TOTAL	10	23	23	100.00	24.300	J	45.30	J	33.24	5.75	MG/KG
MERCURY, TOTAL	1	21	21	100.00	0.040	V/V	0.17	V/V	0.10	0.04	MG/KG
MERCURY, TOTAL	2	14	14	100.00	0.040	J	0.79	J	0.25	0.26	MG/KG
MERCURY, TOTAL	3	28	28	100.00	0.030	V/V	4.59	V/V	0.38	1.00	MG/KG
MERCURY, TOTAL	4	52	52	100.00	0.081	V/V	160.00	V/V	9.66	23.12	MG/KG
MERCURY, TOTAL	5	51	51	100.00	0.090	V/V	10.93	V/V	1.86	2.43	MG/KG
MERCURY, TOTAL	7	28	0	0.00	0.050	U	0.34	U	0.16	0.09	MG/KG
MERCURY, TOTAL	10	23	23	100.00	0.050	V/V	0.14	V/V	0.08	0.02	MG/KG
NICKEL, TOTAL	1	21	21	100.00	10.000	V/V	32.00	V/V	20.14	6.02	MG/KG
NICKEL, TOTAL	2	59	59	100.00	4.000	V/V	28.00	V/V	13.73	4.62	MG/KG
NICKEL, TOTAL	3	79	79	100.00	3.000	V/V	64.00	V/V	14.29	11.11	MG/KG
NICKEL, TOTAL	4	52	52	100.00	2.400	V/V	57.70	V/V	22.55	10.63	MG/KG
NICKEL, TOTAL	5	70	70	100.00	13.000	V/V	51.00	V/V	22.90	6.60	MG/KG
NICKEL, TOTAL	7	28	28	100.00	14.600	V/V	46.70	V/V	25.77	6.25	MG/KG
NICKEL, TOTAL	10	23	23	100.00	14.100	V/V	30.30	V/V	20.90	3.58	MG/KG
SELENIUM, TOTAL	1	21	12	57.14	0.300	UJ	1.70	J	0.63	0.36	MG/KG
SELENIUM, TOTAL	2	59	5	8.47	0.300	U	1.30	UJ	0.33	0.13	MG/KG
SELENIUM, TOTAL	3	79	31	39.24	0.200	UJ	14.30	J	1.34	2.50	MG/KG
SELENIUM, TOTAL	4	29	8	27.59	0.270	UJ	2.00	J	0.63	0.51	MG/KG
SELENIUM, TOTAL	5	40	0	0.00	0.300	UJ	0.82	UJ	0.47	0.11	MG/KG
SELENIUM, TOTAL	7	28	20	71.43	0.270	UJ	5.50	J	1.59	1.30	MG/KG
SELENIUM, TOTAL	10	17	0	0.00	0.400	UJ	0.70	UJ	0.46	0.08	MG/KG
SILVER, TOTAL	1	21	21	100.00	0.160	V/V	0.42	V/V	0.25	0.07	MG/KG
SILVER, TOTAL	2	59	43	72.88	0.030	U	3.00	J	0.31	0.43	MG/KG
SILVER, TOTAL	3	14	12	85.71	0.020	UJ	1.60	J	0.30	0.46	MG/KG
SILVER, TOTAL	4	2	2	100.00	1.800	J	1.80	J	1.80	0.00	MG/KG
SILVER, TOTAL	5	50	39	78.00	0.140	UJ	1.10	J	0.39	0.26	MG/KG
SILVER, TOTAL	7	28	19	67.86	0.020	U	0.93	V/V	0.14	0.22	MG/KG
THALLIUM, TOTAL	1	21	0	0.00	0.300	U	0.70	U	0.41	0.12	MG/KG
THALLIUM, TOTAL	2	59	0	0.00	0.300	U	0.40	U	0.31	0.03	MG/KG
THALLIUM, TOTAL	3	79	27	34.18	0.200	U	2.60	V/V	0.75	0.74	MG/KG
THALLIUM, TOTAL	4	52	0	0.00	0.270	U	0.60	U	0.34	0.06	MG/KG
THALLIUM, TOTAL	5	68	0	0.00	0.300	U	0.82	UJ	0.47	0.11	MG/KG
THALLIUM, TOTAL	7	28	1	3.57	0.210	U	0.83	V/V	0.42	0.13	MG/KG
THALLIUM, TOTAL	10	23	0	0.00	0.400	U	0.70	U	0.44	0.07	MG/KG
ZINC, TOTAL	1	21	21	100.00	59.300	V/V	183.00	J	104.60	31.98	MG/KG
ZINC, TOTAL	2	59	59	100.00	26.300	J	167.00	J	73.98	22.08	MG/KG
ZINC, TOTAL	3	79	79	100.00	14.500	J	725.00	J	54.92	78.77	MG/KG
ZINC, TOTAL	4	52	52	100.00	34.100	V/V	185.00	J	82.98	32.88	MG/KG
ZINC, TOTAL	5	70	70	100.00	94.700	V/V	437.00	J	246.51	69.15	MG/KG
ZINC, TOTAL	7	28	28	100.00	41.000	V/V	116.00	J	80.33	20.85	MG/KG
ZINC, TOTAL	10	23	23	100.00	55.500	V/V	134.00	V/V	87.75	17.01	MG/KG

TABLE C.2
SUMMARY STATISTICS FOR SEDIMENT CORE DATA
DETECTED COMPOUNDS SUMMARIZED BY REACH
SORTED BY TYPE OF ANALYSIS, ANALYSIS & REACH

TYPE OF ANALYSIS=ORGANICS

ANALYSIS	REACH	NO. OF OBS.	NO. DETECTED	% DETECTED	MIN VALUE	MIN QUAL.	MAX VALUE	MAX QUAL.	AVG. VALUE	STD. DEV.	SAMPLE UNITS
ANTHRACENE	1	25	0	0.00	0.470	UJ	2.10	UJ	0.71	0.33	MG/KG
ANTHRACENE	2	46	0	0.00	0.330	UJ	0.63	UJ	0.51	0.06	MG/KG
ANTHRACENE	3	64	1	1.56	0.059	UJ	0.69	UJ	0.44	0.07	MG/KG
ANTHRACENE	4	59	0	0.00	0.170	UJ	8.00	U	1.61	1.67	MG/KG
ANTHRACENE	5	63	0	0.00	0.490	UJ	6.60	U	1.41	1.54	MG/KG
ANTHRACENE	10	22	1	4.55	0.460	V/V	10.00	U	4.43	1.88	MG/KG
AROCLOR-1254	1	23	0	0.00	0.230	UJ	10.00	UJ	2.75	2.24	MG/KG
AROCLOR-1254	2	47	1	2.13	0.220	UJ	10.00	UJ	2.70	2.17	MG/KG
AROCLOR-1254	3	63	2	3.17	0.190	UJ	9.70	UJ	1.29	1.44	MG/KG
AROCLOR-1254	4	57	51	89.47	0.033	NJ	14.00	U	0.69	2.14	MG/KG
AROCLOR-1254	5	63	0	0.00	0.560	UJ	43.00	UJ	11.64	9.36	MG/KG
AROCLOR-1254	10	22	0	0.00	1.600	UJ	41.00	UJ	17.12	6.94	MG/KG
AROCLOR-1260	1	23	0	0.00	0.230	UJ	10.00	UJ	2.75	2.24	MG/KG
AROCLOR-1260	2	47	1	2.13	0.220	UJ	10.00	UJ	2.70	2.17	MG/KG
AROCLOR-1260	3	63	0	0.00	0.190	UJ	9.70	UJ	1.35	1.46	MG/KG
AROCLOR-1260	4	55	0	0.00	0.230	UJ	22.00	U	5.61	5.50	MG/KG
AROCLOR-1260	5	63	0	0.00	0.560	UJ	43.00	UJ	11.64	9.36	MG/KG
AROCLOR-1260	10	22	0	0.00	1.600	UJ	41.00	UJ	17.12	6.94	MG/KG
BENZO(A)ANTHRACENE	1	25	1	4.00	0.470	UJ	2.10	UJ	0.71	0.33	MG/KG
BENZO(A)ANTHRACENE	2	46	1	2.17	0.330	UJ	0.63	UJ	0.50	0.06	MG/KG
BENZO(A)ANTHRACENE	3	63	1	1.59	0.210	UJ	0.69	UJ	0.44	0.06	MG/KG
BENZO(A)ANTHRACENE	4	59	0	0.00	0.170	UJ	8.00	U	1.61	1.67	MG/KG
BENZO(A)ANTHRACENE	5	63	0	0.00	0.490	UJ	6.60	U	1.41	1.54	MG/KG
BENZO(A)ANTHRACENE	10	22	0	0.00	2.300	U	10.00	U	4.65	1.66	MG/KG
BENZO(A)PYRENE	1	25	0	0.00	0.470	UJ	2.10	UJ	0.71	0.33	MG/KG
BENZO(A)PYRENE	2	46	1	2.17	0.330	UJ	0.63	UJ	0.50	0.06	MG/KG
BENZO(A)PYRENE	3	64	1	1.56	0.180	UJ	0.69	UJ	0.44	0.06	MG/KG
BENZO(A)PYRENE	4	59	0	0.00	0.170	UJ	8.00	U	1.61	1.67	MG/KG
BENZO(A)PYRENE	5	63	0	0.00	0.490	UJ	6.60	U	1.41	1.54	MG/KG
BENZO(A)PYRENE	10	22	0	0.00	2.300	U	10.00	U	4.65	1.66	MG/KG
BENZO(B)FLUORANTHENE	1	25	0	0.00	0.470	UJ	2.10	UJ	0.71	0.33	MG/KG
BENZO(B)FLUORANTHENE	2	46	3	6.52	0.190	J	0.63	UJ	0.49	0.07	MG/KG
BENZO(B)FLUORANTHENE	3	64	2	3.13	0.180	J	0.69	UJ	0.44	0.07	MG/KG
BENZO(B)FLUORANTHENE	4	59	0	0.00	0.170	UJ	8.00	U	1.61	1.67	MG/KG
BENZO(B)FLUORANTHENE	5	63	0	0.00	0.490	UJ	6.60	U	1.41	1.54	MG/KG
BENZO(B)FLUORANTHENE	10	22	0	0.00	2.300	U	10.00	U	4.65	1.66	MG/KG
BENZO(K)FLUORANTHENE	1	25	1	4.00	0.470	UJ	2.10	UJ	0.71	0.33	MG/KG
BENZO(K)FLUORANTHENE	2	46	1	2.17	0.330	UJ	0.63	UJ	0.51	0.06	MG/KG
BENZO(K)FLUORANTHENE	3	64	2	3.13	0.160	UJ	0.69	UJ	0.44	0.07	MG/KG
BENZO(K)FLUORANTHENE	4	59	0	0.00	0.170	UJ	8.00	U	1.61	1.67	MG/KG
BENZO(K)FLUORANTHENE	5	63	0	0.00	0.490	UJ	6.60	U	1.41	1.54	MG/KG
BENZO(K)FLUORANTHENE	10	22	0	0.00	2.300	U	10.00	U	4.65	1.66	MG/KG
BIS(2-ETHYLHEXYL)PHTHALATE	1	25	0	0.00	0.390	UJ	3.40	U	1.23	0.79	MG/KG
BIS(2-ETHYLHEXYL)PHTHALATE	2	46	30	65.22	0.180	J	1.10	U	0.48	0.20	MG/KG
BIS(2-ETHYLHEXYL)PHTHALATE	3	64	16	25.00	0.180	J	2.60	U	0.63	0.43	MG/KG
BIS(2-ETHYLHEXYL)PHTHALATE	4	59	29	49.15	0.320	U	8.00	U	1.31	1.46	MG/KG
BIS(2-ETHYLHEXYL)PHTHALATE	5	63	24	38.10	0.580	UJ	7.50	J	1.66	1.23	MG/KG

TABLE C.2
SUMMARY STATISTICS FOR SEDIMENT CORE DATA
DETECTED COMPOUNDS SUMMARIZED BY REACH
SORTED BY TYPE OF ANALYSIS, ANALYSIS & REACH

TYPE OF ANALYSIS=ORGANICS
(CONTINUED)

ANALYSIS	REACH	NO. OF OBS.	NO. DETECTED	% DETECTED	MIN VALUE	MIN QUAL.	MAX VALUE	MAX QUAL.	AVG. VALUE	STD. DEV.	SAMPLE UNITS
BIS(2-ETHYLHEXYL)PHTHALATE	10	22	2	9.09	0.610	J	10.00	U	3.49	2.32	MG/KG
CHRYSENE	1	25	1	4.00	0.470	UJ	2.10	UJ	0.71	0.33	MG/KG
CHRYSENE	2	46	2	4.35	0.330	UJ	0.63	UJ	0.50	0.08	MG/KG
CHRYSENE	3	64	1	1.56	0.210	UJ	0.69	UJ	0.44	0.08	MG/KG
CHRYSENE	4	59	0	0.00	0.170	UJ	8.00	U	1.61	1.67	MG/KG
CHRYSENE	5	63	0	0.00	0.250	UJ	6.60	U	1.40	1.55	MG/KG
CHRYSENE	10	22	1	4.55	0.740	V/V	10.00	U	4.45	1.85	MG/KG
DI-N-BUTYLPHTHALATE	1	25	0	0.00	0.470	UJ	2.10	UJ	0.71	0.33	MG/KG
DI-N-BUTYLPHTHALATE	2	46	3	6.52	0.060	J	0.63	UJ	0.47	0.12	MG/KG
DI-N-BUTYLPHTHALATE	3	64	1	1.56	0.058	J	0.69	UJ	0.44	0.07	MG/KG
DI-N-BUTYLPHTHALATE	4	59	0	0.00	0.170	UJ	8.00	U	1.61	1.67	MG/KG
DI-N-BUTYLPHTHALATE	5	63	0	0.00	0.490	UJ	6.60	U	1.41	1.54	MG/KG
DI-N-BUTYLPHTHALATE	10	22	0	0.00	2.300	U	10.00	U	4.65	1.66	MG/KG
DIETHYLPHTHALATE	1	25	0	0.00	0.470	UJ	2.10	UJ	0.71	0.33	MG/KG
DIETHYLPHTHALATE	2	46	1	2.17	0.140	J	0.63	UJ	0.50	0.08	MG/KG
DIETHYLPHTHALATE	3	64	0	0.00	0.076	U	0.70	UJ	0.44	0.08	MG/KG
DIETHYLPHTHALATE	4	59	0	0.00	0.170	UJ	8.00	U	1.61	1.67	MG/KG
DIETHYLPHTHALATE	5	63	0	0.00	0.490	UJ	6.60	U	1.41	1.54	MG/KG
DIETHYLPHTHALATE	10	22	0	0.00	2.300	U	10.00	U	4.65	1.66	MG/KG
DIMETHYLPHTHALATE	1	25	0	0.00	0.470	UJ	2.10	UJ	0.71	0.33	MG/KG
DIMETHYLPHTHALATE	2	46	0	0.00	0.330	UJ	0.63	UJ	0.51	0.08	MG/KG
DIMETHYLPHTHALATE	3	64	1	1.56	0.390	UJ	0.69	UJ	0.44	0.05	MG/KG
DIMETHYLPHTHALATE	4	59	0	0.00	0.170	UJ	8.00	U	1.61	1.67	MG/KG
DIMETHYLPHTHALATE	5	63	0	0.00	0.490	UJ	6.60	U	1.41	1.54	MG/KG
DIMETHYLPHTHALATE	10	22	0	0.00	2.300	U	10.00	U	4.65	1.66	MG/KG
FLUORANTHENE	1	25	1	4.00	0.470	UJ	2.10	UJ	0.72	0.33	MG/KG
FLUORANTHENE	2	46	21	45.65	0.085	J	0.58	UJ	0.39	0.16	MG/KG
FLUORANTHENE	3	64	11	17.19	0.060	UJ	0.90	J	0.41	0.13	MG/KG
FLUORANTHENE	4	59	7	11.86	0.170	UJ	8.00	U	1.60	1.68	MG/KG
FLUORANTHENE	5	63	0	0.00	0.490	UJ	6.60	U	1.41	1.54	MG/KG
FLUORANTHENE	10	22	1	4.55	0.610	V/V	10.00	U	4.44	1.86	MG/KG
INDENO(1,2,3-CD)PYRENE	1	25	0	0.00	0.470	UJ	2.10	UJ	0.71	0.33	MG/KG
INDENO(1,2,3-CD)PYRENE	2	46	1	2.17	0.280	J	0.63	UJ	0.50	0.06	MG/KG
INDENO(1,2,3-CD)PYRENE	3	64	0	0.00	0.390	UJ	0.69	UJ	0.44	0.05	MG/KG
INDENO(1,2,3-CD)PYRENE	4	59	0	0.00	0.170	UJ	8.00	U	1.61	1.67	MG/KG
INDENO(1,2,3-CD)PYRENE	5	63	0	0.00	0.490	UJ	6.60	U	1.41	1.54	MG/KG
INDENO(1,2,3-CD)PYRENE	10	22	0	0.00	2.300	U	10.00	U	4.65	1.66	MG/KG
N-NITROSO-DI-N-PROPYLAMINE	1	25	0	0.00	0.470	UJ	2.10	UJ	0.71	0.33	MG/KG
N-NITROSO-DI-N-PROPYLAMINE	2	46	0	0.00	0.330	UJ	0.63	UJ	0.51	0.08	MG/KG
N-NITROSO-DI-N-PROPYLAMINE	3	64	0	0.00	0.390	UJ	0.69	UJ	0.44	0.05	MG/KG
N-NITROSO-DI-N-PROPYLAMINE	4	59	1	1.69	0.170	UJ	8.00	U	1.61	1.67	MG/KG
N-NITROSO-DI-N-PROPYLAMINE	5	63	0	0.00	0.490	UJ	6.60	U	1.41	1.54	MG/KG
N-NITROSO-DI-N-PROPYLAMINE	10	22	0	0.00	2.300	U	10.00	U	4.65	1.66	MG/KG
NAPHTHALENE	1	25	0	0.00	0.470	UJ	2.10	UJ	0.71	0.33	MG/KG
NAPHTHALENE	2	46	2	4.35	0.039	J	0.63	UJ	0.49	0.09	MG/KG
NAPHTHALENE	3	64	1	1.56	0.047	J	0.69	UJ	0.44	0.07	MG/KG

TABLE C.2
SUMMARY STATISTICS FOR SEDIMENT CORE DATA
DETECTED COMPOUNDS SUMMARIZED BY REACH
SORTED BY TYPE OF ANALYSIS, ANALYSIS & REACH

TYPE OF ANALYSIS=ORGANICS
(CONTINUED)

ANALYSIS	REACH	NO. OF OBS.	NO. DETECTED	% DETECTED	MIN VALUE	MIN QUAL.	MAX VALUE	MAX QUAL.	AVG. VALUE	STD. DEV.	SAMPLE UNITS
NAPHTHALENE	4	59	0	0.00	0.170	UJ	8.00	U	1.61	1.67	MG/KG
NAPHTHALENE	5	63	0	0.00	0.490	UJ	6.60	U	1.41	1.54	MG/KG
NAPHTHALENE	10	22	0	0.00	2.300	U	10.00	U	4.65	1.66	MG/KG
PHENANTHRENE	1	25	0	0.00	0.470	UJ	2.10	UJ	0.71	0.33	MG/KG
PHENANTHRENE	2	46	9	19.57	0.059	J	0.63	UJ	0.44	0.15	MG/KG
PHENANTHRENE	3	64	8	12.50	0.072	J	0.51	J	0.41	0.10	MG/KG
PHENANTHRENE	4	59	1	1.69	0.170	UJ	8.00	U	1.61	1.67	MG/KG
PHENANTHRENE	5	63	0	0.00	0.490	UJ	6.60	U	1.41	1.54	MG/KG
PHENANTHRENE	10	22	1	4.55	0.640	V/V	10.00	U	4.44	1.86	MG/KG
PYRENE	1	25	1	4.00	0.470	UJ	2.10	UJ	0.72	0.33	MG/KG
PYRENE	2	46	17	36.96	0.094	J	0.58	UJ	0.41	0.15	MG/KG
PYRENE	3	64	10	15.63	0.094	J	0.68	J	0.41	0.09	MG/KG
PYRENE	4	59	3	5.08	0.170	UJ	8.00	U	1.60	1.68	MG/KG
PYRENE	5	63	0	0.00	0.490	UJ	6.60	U	1.41	1.54	MG/KG
PYRENE	10	22	1	4.55	0.650	V/V	10.00	U	4.44	1.86	MG/KG
TOXAPHENE	1	23	0	0.00	0.230	UJ	10.00	UJ	2.75	2.24	MG/KG
TOXAPHENE	2	47	1	2.13	0.220	UJ	10.00	UJ	2.70	2.17	MG/KG
TOXAPHENE	3	63	0	0.00	0.190	UJ	9.70	UJ	1.35	1.46	MG/KG
TOXAPHENE	4	54	0	0.00	0.230	UJ	22.00	U	5.57	5.55	MG/KG
TOXAPHENE	5	63	0	0.00	0.560	UJ	43.00	UJ	11.64	9.36	MG/KG
TOXAPHENE	10	11	0	0.00	13.000	UJ	21.00	UJ	15.64	2.58	MG/KG
2-METHYLNAPHTHALENE	1	25	0	0.00	0.470	UJ	2.10	UJ	0.71	0.33	MG/KG
2-METHYLNAPHTHALENE	2	46	2	4.35	0.042	J	0.63	UJ	0.49	0.11	MG/KG
2-METHYLNAPHTHALENE	3	64	2	3.13	0.074	J	0.69	UJ	0.43	0.08	MG/KG
2-METHYLNAPHTHALENE	4	59	0	0.00	0.170	UJ	8.00	U	1.61	1.67	MG/KG
2-METHYLNAPHTHALENE	5	63	0	0.00	0.490	UJ	6.60	U	1.41	1.54	MG/KG
2-METHYLNAPHTHALENE	10	22	0	0.00	2.300	U	10.00	U	4.65	1.66	MG/KG
4,4'-DDD	1	23	3	13.04	0.018	NJ	1.00	UJ	0.28	0.22	MG/KG
4,4'-DDD	2	47	0	0.00	0.022	UJ	1.00	UJ	0.27	0.22	MG/KG
4,4'-DDD	3	63	0	0.00	0.019	UJ	0.97	UJ	0.14	0.15	MG/KG
4,4'-DDD	4	55	0	0.00	0.023	UJ	2.20	U	0.56	0.55	MG/KG
4,4'-DDD	5	63	0	0.00	0.056	UJ	4.30	UJ	1.16	0.94	MG/KG
4,4'-DDD	10	22	0	0.00	0.160	UJ	4.10	UJ	1.71	0.69	MG/KG
4,4'-DDT	1	23	2	8.70	0.023	UJ	1.00	UJ	0.28	0.22	MG/KG
4,4'-DDT	2	47	0	0.00	0.022	UJ	1.00	UJ	0.27	0.22	MG/KG
4,4'-DDT	3	63	0	0.00	0.019	UJ	0.97	UJ	0.14	0.15	MG/KG
4,4'-DDT	4	55	0	0.00	0.023	UJ	2.20	U	0.56	0.55	MG/KG
4,4'-DDT	5	63	0	0.00	0.056	UJ	4.30	UJ	1.16	0.94	MG/KG
4,4'-DDT	10	22	0	0.00	0.160	UJ	4.10	UJ	1.71	0.69	MG/KG

TABLE C.2
SUMMARY STATISTICS FOR SEDIMENT CORE DATA
DETECTED COMPOUNDS SUMMARIZED BY REACH
SORTED BY TYPE OF ANALYSIS, ANALYSIS & REACH

TYPE OF ANALYSIS=RAD

ANALYSIS	REACH	NO. OF OBS.	NO. DETECTED	% DETECTED	MIN VALUE	MIN QUAL.	MAX VALUE	MAX QUAL.	AVG. VALUE	STD. DEV.	SAMPLE UNITS
AM-241	2	28	28	100.00	0.020	J	0.45	J	0.16	0.12	PCI/G (DRY)
AM-241	3	17	17	100.00	0.010	J	0.25	J	0.11	0.07	PCI/G (DRY)
AM-241	4	18	18	100.00	0.020	J	0.88	J	0.20	0.23	PCI/G (DRY)
AM-241	5	23	23	100.00	0.010	V/V	0.30	J	0.10	0.07	PCI/G (DRY)
AM-241	10	6	6	100.00	0.010	J	0.09	J	0.06	0.03	PCI/G (DRY)
CM-243,244	2	28	28	100.00	0.013	J	0.03	V/V	0.01	0.00	PCI/G (DRY)
CM-243,244	3	17	17	100.00	0.013	J	0.01	V/V	0.01	0.00	PCI/G (DRY)
CM-243,244	4	18	18	100.00	0.013	J	0.11	J	0.02	0.02	PCI/G (DRY)
CM-243,244	5	23	23	100.00	0.013	J	0.04	J	0.02	0.01	PCI/G (DRY)
CM-243,244	10	6	6	100.00	0.000	J	0.04	J	0.01	0.01	PCI/G (DRY)
CM-245,246	2	7	7	100.00	0.013	V/V	0.03	V/V	0.01	0.00	PCI/G (DRY)
CM-245,246	3	6	6	100.00	0.013	V/V	0.03	V/V	0.02	0.01	PCI/G (DRY)
CM-245,246	4	8	8	100.00	0.013	J	0.08	J	0.03	0.02	PCI/G (DRY)
CM-245,246	5	8	8	100.00	0.013	J	0.06	V/V	0.04	0.02	PCI/G (DRY)
CM-245,246	10	6	6	100.00	0.013	J	0.03	J	0.02	0.01	PCI/G (DRY)
CM-248	2	7	7	100.00	0.013	V/V	0.06	V/V	0.03	0.02	PCI/G (DRY)
CM-248	3	7	7	100.00	0.013	J	0.04	V/V	0.02	0.01	PCI/G (DRY)
CM-248	4	8	8	100.00	0.013	J	0.06	J	0.03	0.02	PCI/G (DRY)
CM-248	5	6	6	100.00	0.013	J	0.06	V/V	0.03	0.02	PCI/G (DRY)
CM-248	10	6	6	100.00	0.013	J	0.08	J	0.04	0.03	PCI/G (DRY)
CO-60	1	20	4	20.00	0.016	UJ	0.66	V/V	0.24	0.16	PCI/G (DRY)
CO-60	2	51	19	37.25	0.021	UJ	0.75	V/V	0.16	0.15	PCI/G (DRY)
CO-60	3	55	3	5.45	0.014	UJ	0.16	V/V	0.06	0.03	PCI/G (DRY)
CO-60	4	110	68	61.82	0.014	V/V	2.44	V/V	0.34	0.34	PCI/G (DRY)
CO-60	5	101	31	30.69	0.016	V/V	1.21	UJ	0.23	0.14	PCI/G (DRY)
CO-60	7	8	2	25.00	0.055	UJ	0.65	V/V	0.20	0.19	PCI/G (DRY)
CO-60	10	21	3	14.29	0.081	UJ	0.26	UJ	0.18	0.05	PCI/G (DRY)
CS-137	1	20	18	90.00	0.056	V/V	2.01	V/V	0.68	0.59	PCI/G (DRY)
CS-137	2	58	58	100.00	0.073	V/V	106.01	V/V	16.39	25.31	PCI/G (DRY)
CS-137	3	80	65	81.25	0.003	V/V	17.22	V/V	3.52	4.67	PCI/G (DRY)
CS-137	4	110	103	93.64	0.009	V/V	423.75	V/V	25.78	53.95	PCI/G (DRY)
CS-137	5	119	116	97.48	0.004	J	32.64	V/V	8.71	7.42	PCI/G (DRY)
CS-137	7	8	8	100.00	0.319	V/V	1.47	V/V	0.69	0.44	PCI/G (DRY)
CS-137	10	21	17	80.95	0.068	NJ	3.59	V/V	1.08	1.04	PCI/G (DRY)
PU-238	2	28	28	100.00	0.010	J	0.15	V/V	0.02	0.03	PCI/G (DRY)
PU-238	3	19	19	100.00	0.010	J	0.04	V/V	0.02	0.01	PCI/G (DRY)
PU-238	4	18	18	100.00	0.010	J	0.07	J	0.02	0.02	PCI/G (DRY)
PU-238	5	22	22	100.00	0.010	J	0.23	J	0.03	0.05	PCI/G (DRY)
PU-238	10	4	4	100.00	0.010	J	0.01	J	0.01	0.00	PCI/G (DRY)
PU-239,240	2	28	28	100.00	0.010	J	0.69	V/V	0.20	0.19	PCI/G (DRY)
PU-239,240	3	19	19	100.00	0.010	J	0.03	J	0.02	0.01	PCI/G (DRY)

TABLE C.2
SUMMARY STATISTICS FOR SEDIMENT CORE DATA
DETECTED COMPOUNDS SUMMARIZED BY REACH
SORTED BY TYPE OF ANALYSIS, ANALYSIS & REACH

TYPE OF ANALYSIS=RAD
(CONTINUED)

ANALYSIS	REACH	NO. OF OBS.	NO. DETECTED	% DETECTED	MIN VALUE	MIN QUAL.	MAX VALUE	MAX QUAL.	AVG. VALUE	STD. DEV.	SAMPLE UNITS
PU-239,240	4	18	18	100.00	0.010	J	1.57	J	0.26	0.38	PCI/G (DRY)
PU-239,240	5	22	22	100.00	0.010	J	0.45	J	0.10	0.13	PCI/G (DRY)
PU-239,240	10	4	4	100.00	0.010	J	0.04	J	0.03	0.02	PCI/G (DRY)
SR-90	2	28	28	100.00	0.010	J	1.25	J	0.38	0.37	PCI/G (DRY)
SR-90	3	19	19	100.00	0.020	J	0.18	J	0.08	0.04	PCI/G (DRY)
SR-90	4	18	18	100.00	0.070	J	1.09	J	0.40	0.31	PCI/G (DRY)
SR-90	5	23	23	100.00	-0.060	J	0.39	J	0.15	0.11	PCI/G (DRY)
SR-90	10	5	5	100.00	0.040	J	0.34	J	0.12	0.12	PCI/G (DRY)
U-234	2	28	28	100.00	0.290	J	1.99	J	1.13	0.42	PCI/G (DRY)
U-234	3	17	17	100.00	2.850	J	8.91	J	5.82	1.28	PCI/G (DRY)
U-234	4	18	18	100.00	1.050	J	5.47	J	2.21	0.98	PCI/G (DRY)
U-234	5	23	23	100.00	0.890	J	3.08	J	1.96	0.49	PCI/G (DRY)
U-234	10	5	5	100.00	1.050	J	1.27	J	1.19	0.09	PCI/G (DRY)
U-235	2	28	28	100.00	0.010	J	0.11	J	0.05	0.03	PCI/G (DRY)
U-235	3	17	17	100.00	0.060	J	0.30	J	0.20	0.08	PCI/G (DRY)
U-235	4	18	18	100.00	0.010	J	0.69	J	0.12	0.16	PCI/G (DRY)
U-235	5	23	23	100.00	0.010	J	0.37	J	0.08	0.08	PCI/G (DRY)
U-235	10	5	5	100.00	0.010	J	0.15	J	0.08	0.05	PCI/G (DRY)
U-238	2	28	28	100.00	0.330	J	1.83	J	1.03	0.41	PCI/G (DRY)
U-238	3	17	17	100.00	2.910	J	8.92	J	5.28	0.91	PCI/G (DRY)
U-238	4	18	18	100.00	0.940	J	4.03	J	1.88	0.75	PCI/G (DRY)
U-238	5	23	23	100.00	0.590	J	2.45	J	1.66	0.46	PCI/G (DRY)
U-238	10	5	5	100.00	1.020	J	1.79	J	1.32	0.29	PCI/G (DRY)

TABLE C.3
SUMMARY STATISTICS FOR SEDIMENT GRAB DATA
SUMMARIZED FOR ALL REACHES
SORTED BY TYPE OF ANALYSIS & DECREASING %-DETECTED

TYPE OF ANALYSIS=RAD

ANALYSIS	NO. OF OBS.	NO. DETECTED	% DETECTED	MINIMUM VALUE	MIN QUAL.	MAXIMUM VALUE	MAX QUAL.	AVERAGE VALUE	STD. DEV.	SAMPLE UNITS
CS-137	487	482	98.97	0.005	V/V	34.13	V/V	1.23	2.31	PCI/G (DRY)
CO-60	488	283	57.99	0.001	J	0.52	J	0.07	0.08	PCI/G (DRY)

TABLE C.4
SUMMARY STATISTICS FOR SEDIMENT GRAB DATA
DETECTED COMPOUNDS SUMMARIZED BY REACH
SORTED BY TYPE OF ANALYSIS, ANALYSIS & REACH

TYPE OF ANALYSIS=RAD

ANALYSIS	REACH	NO. OF OBS.	NO. DETECTED	% DETECTED	MIN VALUE	MIN QUAL.	MAX VALUE	MAX QUAL.	AVG. VALUE	STD. DEV.	SAMPLE UNITS
CO-60	1	4	4	100.00	0.023	V/V	0.24	J	0.10	0.10	PCI/G (DRY)
CO-60	2	46	44	95.65	0.018	J	0.30	J	0.11	0.08	PCI/G (DRY)
CO-60	3	3	3	100.00	0.013	V/V	0.14	V/V	0.07	0.08	PCI/G (DRY)
CO-60	4	95	93	97.89	0.023	V/V	0.52	J	0.15	0.11	PCI/G (DRY)
CO-60	5	277	116	41.88	0.007	UJ	0.27	UJ	0.04	0.04	PCI/G (DRY)
CO-60	6	30	15	50.00	0.001	J	0.26	J	0.05	0.07	PCI/G (DRY)
CO-60	7	9	7	77.78	0.027	UJ	0.12	V/V	0.06	0.03	PCI/G (DRY)
CO-60	10	1	0	0.00	0.020	UJ	0.02	UJ	0.02	.	PCI/G (DRY)
CO-60	18	23	1	4.35	0.005	UJ	0.04	J	0.02	0.01	PCI/G (DRY)
CS-137	1	4	4	100.00	0.133	V/V	0.40	V/V	0.26	0.14	PCI/G (DRY)
CS-137	2	46	46	100.00	0.256	V/V	34.13	V/V	2.92	5.11	PCI/G (DRY)
CS-137	3	3	3	100.00	0.346	V/V	2.23	V/V	1.00	1.06	PCI/G (DRY)
CS-137	4	93	93	100.00	0.214	V/V	9.49	V/V	2.72	2.52	PCI/G (DRY)
CS-137	5	277	274	98.92	0.016	V/V	10.32	V/V	0.62	1.00	PCI/G (DRY)
CS-137	6	31	31	100.00	0.005	V/V	6.88	V/V	1.02	1.58	PCI/G (DRY)
CS-137	7	9	8	88.89	0.029	UJ	0.47	V/V	0.30	0.14	PCI/G (DRY)
CS-137	10	1	1	100.00	0.241	V/V	0.24	V/V	0.24	.	PCI/G (DRY)
CS-137	18	23	22	95.65	0.028	V/V	0.51	V/V	0.15	0.13	PCI/G (DRY)

Appendix D

STATISTICAL PROCEDURE FOR PAIRWISE COMPARISON OF FISH TISSUE RESULTS

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D.1 DATA DISTRIBUTION AND TRANSFORMATION

Before appropriate analytical methods and statistical tests can be selected and performed on the contaminant concentration data, there should be some basis for assuming a particular form of data distribution (e.g., normal or lognormal). One possible choice for the distribution is the lognormal, because the observations are bounded on the lower side by zero and their distribution tends to be positively skewed with a tail to the right—both properties that are compatible with the lognormal distribution. Because tests for normality or lognormality (e.g., the Shapiro-Wilk or Kolmogorov tests) are not formulated to manage censored observations, we restricted the analysis to combinations of site, analyte, and species for which censored observations were not present. This restriction resulted in our analyzing only Aroclor 1260 for catfish and mercury for bluegill. The data distribution of Aroclor 1260 was thus assumed to be representative of the organic analytes and mercury of the inorganic analytes. That is, if the distribution for PCB or mercury was a member of a particular family of distributions (e.g., lognormal), then the other analytes within that group of analytes were assumed to be of the same family. In order to increase the sample size for evaluating the distribution types, sites were grouped together based on expectations of similar results due to their respective proximity to each other and contaminant point sources. Tests for normality and lognormality were performed on data from each group of sites. Except for one data set, the test for normality on the untransformed data was significant ($P < 0.01$), indicating a non-normal distribution. When the data were log transformed, the normality test statistic increased in all cases to the point at which the lognormal distribution seemed appropriate, except for the single case mentioned previously. Based on these results, the assumption of lognormality for the distribution of the organic and inorganic analytes seemed appropriate, and this distribution was assumed for all subsequent analyses.

D.2 ESTIMATING MEANS FROM CENSORED DATA SETS

Censored data sets are those which contain some observations reported only as greater or less than some value (less than an SQL in this case). Although various methods are available to obtain estimates of the mean and variance of censored data sets (such as replacing the censored observations with a value of 0, half the SQL, or the SQL itself, and then proceeding as if the observations were uncensored), many of these methods make inefficient use of the available data. When the distribution of the censored data set can be assumed to be of a particular form (e.g., normal, lognormal, etc.), the maximum likelihood (ML) method is known to be an efficient method of obtaining these estimates. ML estimates of the mean and variance of the analyte concentrations can be obtained with a method similar to that developed by Cohen (1963) for progressively censored samples. The results from an analysis of the PCB and mercury data distributions form the basis for assuming that the fish body burden data measured in Phase 1 are lognormally distributed. This assumption makes it possible to specify the distribution function needed in the likelihood function. The ML estimates of the unknown parameters needed to specify the lognormal distribution were obtained using the LIFEREG procedure from SAS (Version 6.06).

As the proportion of censoring increases and/or the sample size decreases, the confidence in the estimates of the distribution parameters decreases. This relationship is reflected in the general increase in the standard errors for the different parameter estimates as either of these occur. A plot of the relationship between the proportion of censoring and the relative

standard error (std. error/mean) from the Phase 1 data suggests that the reliability of the ML method begins to decrease for those data sets where the censoring exceeds 60 to 70%. The number of detectable observations in a sample is a simple measure which can also indicate a high degree of censoring or a small sample size (or both), either of which can produce less reliable ML estimates. Given this information, we considered the ML method inappropriate for calculating useful standard errors when the proportion of censoring exceeded 60% or when the number of detectable observations was less than three. When these criteria were exceeded, we deemed the estimation of a mean and variance by any method for the purpose of statistical analyses to be unsuitable.

D.3 PAIR-WISE COMPARISON OF CONTAMINANT CONCENTRATIONS

We adapted current statistical procedures to evaluate the difference in concentration between each affected site and the reference site on a pair-wise basis. A description of this method follows. Let $\hat{m}_i$, the estimates of the means of the two lognormal distributions, be

$$\hat{m}_i = \exp(\hat{\mu}_i + \frac{\hat{\sigma}_i^2}{2}), \tag{1}$$

where

$i = 1, 2,$

$\hat{\mu}_i$ = estimated mean for the transformed (log) data at site i,

and

$\hat{\sigma}_i^2$ = estimated variance for the transformed log data at site i.

The two means of interest correspond to the affected and reference sites. Since differences in the $\hat{m}_i$'s would be reflected by differences in the terms $\hat{\mu}_i + \hat{\sigma}_i^2/2$, the comparison of the two distributions will be done in terms of these latter quantities. An asymptotic z-test was used to compare the two means with the test statistic calculated as

$$z = \frac{\ln(\hat{m}_1) - \ln(\hat{m}_2)}{\sqrt{(\hat{s}_1)^2 + (\hat{s}_2)^2}} \tag{2}$$

where

$$\hat{s}_i = s.e.(\hat{\mu}_i + \frac{\hat{\sigma}_i^2}{2}) \tag{3}$$

The z value was then compared with a standard normal distribution. This test was adequate only when a reliable mean and s.e. could be calculated for both sites i and j. That is, either by standard procedures if there was no censoring, or by the maximum likelihood method for censored data if censoring did not exceed 60% and the number of detectable results was greater than 2.

If a reliable mean and s.e. could only be calculated for either site i or j (but not both), then a second method of site comparison was required. First, a 95% confidence interval on the mean of the untransformed data was calculated for the site with the reliable mean. If none of the individual values for the other site fell within the confidence interval, we concluded that there was a strong indication that the two sites were different. Otherwise we concluded that the data was insufficient to determine any significant difference between the two sites.

Lastly, if reliable means and s.e.'s were not attainable for both sites which were being compared, we considered the data to be insufficient to draw any conclusions about the similarity of the two sites.

D.4 REFERENCE FOR APPENDIX D

Cohen, A.C. 1963. Progressively censored samples in life testing. *Technometrics* 5:327-339.

TABLE D.1
SUMMARY STATISTICS FOR FISH TISSUE DATA
SUMMARIZED FOR ALL REACHES
SORTED BY TYPE OF ANALYSIS & DECREASING %-DETECTED

TYPE OF ANALYSIS=INORGANICS

ANALYSIS	SAMPLE MATRIX	NO. OF OBS.	NO. DETECTED	% DETECTED	MINIMUM VALUE	MIN QUAL.	MAXIMUM VALUE	MAX QUAL.	AVERAGE VALUE	STD. DEV.	SAMPLE UNITS
MERCURY	FISH	169	169	100.00	0.019	J	0.88	J	0.21	0.21	MG/KG
ZINC	FISH	168	168	100.00	2.200	J	71.00	J	6.54	5.28	MG/KG
ARSENIC	FISH	169	117	69.23	0.050	UJ	0.24	J	0.08	0.04	MG/KG
SELENIUM	FISH	169	69	40.83	0.390	UJ	1.10	J	0.62	0.15	MG/KG
BERYLLIUM	FISH	154	19	12.34	0.003	UJ	0.04	J	0.00	0.00	MG/KG
COPPER	FISH	169	6	3.55	0.280	UJ	170.00	J	1.55	13.04	MG/KG
ANTIMONY	FISH	169	0	0.00	0.280	UJ	0.63	UJ	0.50	0.06	MG/KG
CADMIUM	FISH	169	0	0.00	0.110	UJ	0.28	UJ	0.20	0.03	MG/KG
CHROMIUM	FISH	169	0	0.00	0.280	UJ	0.63	UJ	0.51	0.07	MG/KG
LEAD	FISH	119	0	0.00	0.280	UJ	0.61	UJ	0.50	0.07	MG/KG
NICKEL	FISH	149	0	0.00	0.280	UJ	1.10	UJ	0.50	0.08	MG/KG
SILVER	FISH	169	0	0.00	0.110	UJ	0.25	UJ	0.20	0.03	MG/KG
THALLIUM	FISH	160	0	0.00	0.020	UJ	0.02	UJ	0.02	0.00	MG/KG

TYPE OF ANALYSIS=ORGANICS

ANALYSIS	SAMPLE MATRIX	NO. OF OBS.	NO. DETECTED	% DETECTED	MINIMUM VALUE	MIN QUAL.	MAXIMUM VALUE	MAX QUAL.	AVERAGE VALUE	STD. DEV.	SAMPLE UNITS
AROCLOR-1260	FISH	119	117	98.32	0.010	NJ	3.60	NJ	0.55	0.60	MG/KG
ALPHA-CHLORDANE	FISH	109	102	93.58	0.001	NJ	0.13	J	0.01	0.02	MG/KG
GAMMA-CHLORDANE	FISH	110	94	85.45	0.000	NJ	0.07	J	0.01	0.01	MG/KG
AROCLOR-1254	FISH	106	88	83.02	0.010	U	0.77	NJ	0.11	0.11	MG/KG
4,4'-DDE	FISH	113	73	64.60	0.000	J	0.20	UX	0.03	0.05	MG/KG
OXYCHLORDANE	FISH	110	65	59.09	0.000	NJ	0.20	UX	0.02	0.04	MG/KG
GAMMA-CHLORDENE	FISH	113	61	53.98	0.000	NJ	0.20	J	0.02	0.04	MG/KG
ALPHA-CHLORDENE	FISH	113	34	30.09	0.000	NJ	0.20	UX	0.02	0.05	MG/KG
4,4'-DDD	FISH	114	31	27.19	0.000	J	0.20	UX	0.03	0.05	MG/KG
ALDRIN	FISH	111	8	7.21	0.000	J	0.20	UX	0.03	0.05	MG/KG
4,4'-DDT	FISH	114	8	7.02	0.000	J	0.20	UX	0.03	0.05	MG/KG
CHLORDENE	FISH	116	8	6.90	0.000	NJ	0.20	UX	0.03	0.05	MG/KG
BIS(2-ETHYLHEXYL)PHTHALATE	FISH	56	1	1.79	0.047	J	1.90	UX	0.57	0.34	MG/KG
DI-N-OCTYLPHTHALATE	FISH	56	1	1.79	0.024	J	1.90	UX	0.55	0.35	MG/KG
ACENAPHTHENE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
ACENAPHTHYLENE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
ANTHRACENE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
BENZO(A)ANTHRACENE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
BENZO(A)PYRENE	FISH	56	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
BENZO(B)FLUORANTHENE	FISH	56	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
BENZO(G,H,I)PERYLENE	FISH	55	0	0.00	0.190	UX	1.90	UX	0.58	0.34	MG/KG
BENZO(K)FLUORANTHENE	FISH	56	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
BENZOIC ACID	FISH	50	0	0.00	0.930	UX	9.30	UX	2.75	1.76	MG/KG
BENZYL ALCOHOL	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
BIS(2-CHLOROETHOXY)METHANE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
BIS(2-CHLOROETHYL)ETHER	FISH	58	0	0.00	0.190	UX	1.90	UX	0.57	0.33	MG/KG
BIS(2-CHLOROISOPROPYL)ETHE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG

TABLE D.1
SUMMARY STATISTICS FOR FISH TISSUE DATA
SUMMARIZED FOR ALL REACHES
SORTED BY TYPE OF ANALYSIS & DECREASING %-DETECTED

TYPE OF ANALYSIS=ORGANICS
(CONTINUED)

ANALYSIS	SAMPLE MATRIX	NO. OF OBS.	NO. DETECTED	% DETECTED	MINIMUM VALUE	MIN QUAL.	MAXIMUM VALUE	MAX QUAL.	AVERAGE VALUE	STD. DEV.	SAMPLE UNITS
BUTYLBENZYLPHTHALATE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
CHRYSENE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
DI-N-BUTYLPHTHALATE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
DIBENZ(A,H)ANTHRACENE	FISH	56	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
DIBENZOFURAN	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
DIETHYLPHTHALATE	FISH	57	0	0.00	0.080	UX	1.90	UX	0.55	0.33	MG/KG
DIMETHYLPHTHALATE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
FLUORANTHENE	FISH	58	0	0.00	0.190	UX	1.90	UX	0.57	0.33	MG/KG
FLUORENE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
HEXACHLOROBENZENE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
HEXACHLOROBUTADIENE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
HEXACHLOROCYCLOPENTADIENE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
HEXACHLOROETHANE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
INDENO(1,2,3-CD)PYRENE	FISH	56	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
ISOPHORONE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
N-NITROSO-DI-N-PROPYLAMINE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
N-NITROSODIPHENYLAMINE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
NAPHTHALENE	FISH	58	0	0.00	0.057	UJ	1.90	UX	0.56	0.34	MG/KG
NITROBENZENE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
PENTACHLOROPHENOL	FISH	76	0	0.00	0.930	UJ	9.30	UX	3.04	1.48	MG/KG
PHENANTHRENE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
PHENOL	FISH	76	0	0.00	0.190	UJ	1.90	UX	0.61	0.30	MG/KG
PYRENE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
1,2-DICHLOROBENZENE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
1,2,4-TRICHLOROBENZENE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
1,3-DICHLOROBENZENE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
1,4-DICHLOROBENZENE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
2-CHLORONAPHTHALENE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
2-CHLOROPHENOL	FISH	77	0	0.00	0.190	UJ	1.90	UX	0.61	0.30	MG/KG
2-METHYLNAPHTHALENE	FISH	60	0	0.00	0.035	UJ	1.90	UX	0.54	0.35	MG/KG
2-METHYLPHENOL	FISH	76	0	0.00	0.190	UJ	1.90	UX	0.61	0.30	MG/KG
2-NITROANILINE	FISH	56	0	0.00	0.930	UX	9.30	UX	2.83	1.67	MG/KG
2-NITROPHENOL	FISH	76	0	0.00	0.190	UJ	1.90	UX	0.61	0.30	MG/KG
2,4-DICHLOROPHENOL	FISH	77	0	0.00	0.190	UJ	1.90	UX	0.61	0.30	MG/KG
2,4-DIMETHYLPHENOL	FISH	77	0	0.00	0.190	UJ	1.90	UX	0.61	0.30	MG/KG
2,4-DINITROPHENOL	FISH	76	0	0.00	0.930	UJ	9.30	UX	3.04	1.48	MG/KG
2,4-DINITROTOLUENE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
2,4,5-TRICHLOROPHENOL	FISH	76	0	0.00	0.930	UJ	9.30	UX	3.04	1.48	MG/KG
2,4,6-TRICHLOROPHENOL	FISH	76	0	0.00	0.190	UJ	1.90	UX	0.61	0.30	MG/KG
2,6-DINITROTOLUENE	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
3-NITROANILINE	FISH	35	0	0.00	0.930	UX	4.30	UJ	2.23	0.87	MG/KG
3,3'-DICHLOROBENZIDINE	FISH	57	0	0.00	0.370	UX	3.70	UX	1.14	0.66	MG/KG
4-BROMOPHENYL-PHENYLETHER	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG
4-CHLORO-3-METHYLPHENOL	FISH	76	0	0.00	0.190	UJ	1.90	UX	0.61	0.30	MG/KG
4-CHLOROANILINE	FISH	51	0	0.00	0.190	UX	1.80	UJ	0.50	0.25	MG/KG
4-CHLOROPHENYL-PHENYLETHER	FISH	57	0	0.00	0.190	UX	1.90	UX	0.57	0.34	MG/KG

TABLE D.1
SUMMARY STATISTICS FOR FISH TISSUE DATA
SUMMARIZED FOR ALL REACHES
SORTED BY TYPE OF ANALYSIS & DECREASING %-DETECTED

TYPE OF ANALYSIS=ORGANICS (CONTINUED)

ANALYSIS	SAMPLE MATRIX	NO. OF OBS.	NO. DETECTED	% DETECTED	MINIMUM VALUE	MIN QUAL.	MAXIMUM VALUE	MAX QUAL.	AVERAGE VALUE	STD. DEV.	SAMPLE UNITS
4-METHYLPHENOL	FISH	77	0	0.00	0.190	UJ	1.90	UX	0.61	0.30	MG/KG
4-NITROANILINE	FISH	50	0	0.00	0.930	UX	9.30	UX	2.75	1.78	MG/KG
4-NITROPHENOL	FISH	76	0	0.00	0.930	UJ	9.30	UX	3.04	1.48	MG/KG
4,6-DINITRO-2-METHYLPHENOL	FISH	75	0	0.00	0.930	UJ	9.30	UX	3.03	1.49	MG/KG

TYPE OF ANALYSIS=RAD

ANALYSIS	SAMPLE MATRIX	NO. OF OBS.	NO. DETECTED	% DETECTED	MINIMUM VALUE	MIN QUAL.	MAXIMUM VALUE	MAX QUAL.	AVERAGE VALUE	STD. DEV.	SAMPLE UNITS
SR-90	FISH	87	87	100.00	-0.300	J	1.00	J	0.19	0.21	PCI/G (BONE)
CS-137	FISH	214	127	59.35	0.005	V/V	2.31	V/V	0.14	0.22	PCI/G (WET)
CO-60	FISH	211	4	1.90	0.005	UJ	1.21	UJ	0.14	0.15	PCI/G (WET)

TABLE D.2
SUMMARY STATISTICS FOR FISH TISSUE DATA
DETECTED COMPOUNDS SUMMARIZED BY SUBREACH
SORTED BY TYPE OF ANALYSIS, ANALYSIS, REACH & SUBREACH

TYPE OF ANALYSIS=INORGANICS

ANALYSIS	SAMPLE MATRIX	REACH SEGMENT	NO. OF OBS.	NO. DETECTED	% DETECTED	MIN VALUE	MIN QUAL.	MAX VALUE	MAX QUAL.	AVG. VALUE	STD. DEV.	SAMPLE UNITS
ARSENIC	FISH	1.1	15	9	60.00	0.050	UJ	0.17	J	0.08	0.04	MG/KG
ARSENIC	FISH	1.5	13	8	61.54	0.050	UJ	0.18	J	0.08	0.04	MG/KG
ARSENIC	FISH	2.3	13	5	38.46	0.050	UJ	0.20	J	0.07	0.04	MG/KG
ARSENIC	FISH	3.1	9	5	55.56	0.050	UJ	0.07	J	0.06	0.01	MG/KG
ARSENIC	FISH	3.2	13	3	23.08	0.050	UJ	0.14	J	0.07	0.03	MG/KG
ARSENIC	FISH	3.3	13	11	84.62	0.050	UJ	0.12	J	0.08	0.03	MG/KG
ARSENIC	FISH	4.2	12	10	83.33	0.050	UJ	0.15	J	0.09	0.03	MG/KG
ARSENIC	FISH	4.5	15	15	100.00	0.050	J	0.14	J	0.10	0.02	MG/KG
ARSENIC	FISH	5.2	12	12	100.00	0.060	J	0.17	J	0.08	0.04	MG/KG
ARSENIC	FISH	5.3	13	11	84.62	0.050	UJ	0.13	J	0.08	0.03	MG/KG
ARSENIC	FISH	10.1	15	14	93.33	0.050	UJ	0.24	J	0.08	0.05	MG/KG
ARSENIC	FISH	13.1	10	4	40.00	0.050	UJ	0.08	J	0.05	0.01	MG/KG
ARSENIC	FISH	15.1	16	10	62.50	0.050	UJ	0.17	J	0.08	0.04	MG/KG
BERYLLIUM	FISH	1.1	15	3	20.00	0.003	UJ	0.01	J	0.00	0.00	MG/KG
BERYLLIUM	FISH	1.5	10	1	10.00	0.003	UJ	0.01	J	0.00	0.00	MG/KG
BERYLLIUM	FISH	2.3	13	0	0.00	0.003	UJ	0.00	UJ	0.00	0.00	MG/KG
BERYLLIUM	FISH	3.1	9	0	0.00	0.003	UJ	0.00	UJ	0.00	0.00	MG/KG
BERYLLIUM	FISH	3.2	13	4	30.77	0.003	UJ	0.01	J	0.00	0.00	MG/KG
BERYLLIUM	FISH	3.3	13	3	23.08	0.003	UJ	0.02	J	0.00	0.00	MG/KG
BERYLLIUM	FISH	4.2	12	0	0.00	0.003	UJ	0.00	UJ	0.00	0.00	MG/KG
BERYLLIUM	FISH	4.5	15	0	0.00	0.003	UJ	0.00	UJ	0.00	0.00	MG/KG
BERYLLIUM	FISH	5.2	12	0	0.00	0.003	UJ	0.00	UJ	0.00	0.00	MG/KG
BERYLLIUM	FISH	5.3	13	2	15.38	0.003	UJ	0.03	J	0.01	0.01	MG/KG
BERYLLIUM	FISH	10.1	10	1	10.00	0.003	UJ	0.04	J	0.01	0.01	MG/KG
BERYLLIUM	FISH	13.1	3	0	0.00	0.003	UJ	0.00	UJ	0.00	0.00	MG/KG
BERYLLIUM	FISH	15.1	16	5	31.25	0.003	UJ	0.02	J	0.01	0.01	MG/KG
COPPER	FISH	1.1	15	0	0.00	0.290	UJ	0.55	UJ	0.44	0.09	MG/KG
COPPER	FISH	1.5	13	0	0.00	0.280	UJ	0.58	UJ	0.48	0.09	MG/KG
COPPER	FISH	2.3	13	0	0.00	0.460	UJ	0.60	UJ	0.52	0.04	MG/KG
COPPER	FISH	3.1	9	0	0.00	0.480	UJ	0.59	UJ	0.53	0.03	MG/KG
COPPER	FISH	3.2	13	0	0.00	0.300	UJ	0.58	UJ	0.51	0.08	MG/KG
COPPER	FISH	3.3	13	0	0.00	0.440	UJ	0.57	UJ	0.48	0.04	MG/KG
COPPER	FISH	4.2	12	0	0.00	0.480	UJ	0.61	UJ	0.55	0.05	MG/KG
COPPER	FISH	4.5	15	0	0.00	0.480	UJ	0.58	UJ	0.53	0.03	MG/KG
COPPER	FISH	5.2	12	2	16.67	0.480	UJ	0.68	J	0.55	0.06	MG/KG
COPPER	FISH	5.3	13	4	30.77	0.460	UJ	170.00	J	14.05	46.87	MG/KG
COPPER	FISH	10.1	15	0	0.00	0.350	UJ	0.61	UJ	0.48	0.07	MG/KG
COPPER	FISH	13.1	10	0	0.00	0.450	UJ	0.59	UJ	0.52	0.05	MG/KG
COPPER	FISH	15.1	16	0	0.00	0.350	UJ	0.57	UJ	0.48	0.05	MG/KG
MERCURY	FISH	1.1	15	15	100.00	0.029	J	0.20	J	0.08	0.05	MG/KG
MERCURY	FISH	1.5	13	13	100.00	0.019	J	0.07	J	0.04	0.02	MG/KG
MERCURY	FISH	2.3	13	13	100.00	0.037	J	0.37	J	0.09	0.10	MG/KG
MERCURY	FISH	3.1	9	9	100.00	0.202	J	0.88	J	0.57	0.22	MG/KG
MERCURY	FISH	3.2	13	13	100.00	0.088	J	0.75	J	0.55	0.19	MG/KG
MERCURY	FISH	3.3	13	13	100.00	0.072	J	0.58	J	0.34	0.12	MG/KG
MERCURY	FISH	4.2	12	12	100.00	0.186	J	0.77	J	0.43	0.18	MG/KG
MERCURY	FISH	4.5	15	15	100.00	0.044	J	0.22	J	0.11	0.06	MG/KG

TABLE D.2
SUMMARY STATISTICS FOR FISH TISSUE DATA
DETECTED COMPOUNDS SUMMARIZED BY SUBREACH
SORTED BY TYPE OF ANALYSIS, ANALYSIS, REACH & SUBREACH

TYPE OF ANALYSIS=INORGANICS (CONTINUED)

ANALYSIS	SAMPLE MATRIX	REACH SEGMENT	NO. OF OBS.	NO. DETECTED	% DETECTED	MIN VALUE	MIN QUAL.	MAX VALUE	MAX QUAL.	AVG. VALUE	STD. DEV.	SAMPLE UNITS
MERCURY	FISH	5.2	12	12	100.00	0.033	J	0.16	J	0.06	0.04	MG/KG
MERCURY	FISH	5.3	13	13	100.00	0.032	J	0.25	J	0.10	0.08	MG/KG
MERCURY	FISH	10.1	15	15	100.00	0.107	J	0.39	J	0.21	0.10	MG/KG
MERCURY	FISH	13.1	10	10	100.00	0.040	J	0.62	J	0.17	0.22	MG/KG
MERCURY	FISH	15.1	16	16	100.00	0.061	J	0.38	J	0.15	0.09	MG/KG
SELENIUM	FISH	1.1	15	14	93.33	0.500	J	1.00	J	0.69	0.15	MG/KG
SELENIUM	FISH	1.5	13	12	92.31	0.670	J	1.10	J	0.87	0.12	MG/KG
SELENIUM	FISH	2.3	13	11	84.62	0.540	UJ	1.10	J	0.75	0.15	MG/KG
SELENIUM	FISH	3.1	9	0	0.00	0.480	UJ	0.59	UJ	0.53	0.03	MG/KG
SELENIUM	FISH	3.2	13	1	7.69	0.390	UJ	1.10	U	0.59	0.17	MG/KG
SELENIUM	FISH	3.3	13	1	7.69	0.440	UJ	0.65	J	0.49	0.06	MG/KG
SELENIUM	FISH	4.2	12	11	91.67	0.540	UJ	0.97	J	0.77	0.11	MG/KG
SELENIUM	FISH	4.5	15	3	20.00	0.480	UJ	0.64	J	0.54	0.05	MG/KG
SELENIUM	FISH	5.2	12	0	0.00	0.480	UJ	0.63	UJ	0.53	0.04	MG/KG
SELENIUM	FISH	5.3	13	0	0.00	0.460	UJ	0.62	UJ	0.54	0.04	MG/KG
SELENIUM	FISH	10.1	15	8	53.33	0.480	UJ	0.72	J	0.56	0.08	MG/KG
SELENIUM	FISH	13.1	10	0	0.00	0.450	UJ	0.59	UJ	0.52	0.05	MG/KG
SELENIUM	FISH	15.1	16	8	50.00	0.450	UJ	0.80	J	0.61	0.12	MG/KG
ZINC	FISH	1.1	15	15	100.00	4.500	J	11.00	J	6.92	2.12	MG/KG
ZINC	FISH	1.5	13	13	100.00	4.900	J	11.00	J	6.69	1.63	MG/KG
ZINC	FISH	2.3	13	13	100.00	3.900	J	8.10	J	5.84	1.11	MG/KG
ZINC	FISH	3.1	9	9	100.00	2.200	J	7.10	J	5.22	1.34	MG/KG
ZINC	FISH	3.2	13	13	100.00	3.900	J	7.60	J	5.58	1.14	MG/KG
ZINC	FISH	3.3	13	13	100.00	4.100	J	8.60	J	6.82	1.31	MG/KG
ZINC	FISH	4.2	12	12	100.00	4.200	J	7.40	J	5.92	1.03	MG/KG
ZINC	FISH	4.5	15	15	100.00	4.000	J	9.50	J	5.91	1.78	MG/KG
ZINC	FISH	5.2	11	11	100.00	3.900	J	8.10	J	6.19	1.13	MG/KG
ZINC	FISH	5.3	13	13	100.00	3.100	J	71.00	J	12.05	18.01	MG/KG
ZINC	FISH	10.1	15	15	100.00	3.500	J	7.30	J	5.32	1.05	MG/KG
ZINC	FISH	13.1	10	10	100.00	5.200	J	7.60	J	6.36	0.82	MG/KG
ZINC	FISH	15.1	16	16	100.00	4.000	J	11.00	J	5.97	1.74	MG/KG

TYPE OF ANALYSIS=ORGANICS

ANALYSIS	SAMPLE MATRIX	REACH SEGMENT	NO. OF OBS.	NO. DETECTED	% DETECTED	MIN VALUE	MIN QUAL.	MAX VALUE	MAX QUAL.	AVG. VALUE	STD. DEV.	SAMPLE UNITS
ALDRIN	FISH	1.1	8	0	0.00	0.010	UX	0.10	UX	0.04	0.05	MG/KG
ALDRIN	FISH	1.5	8	0	0.00	0.010	UJ	0.20	UJ	0.13	0.08	MG/KG
ALDRIN	FISH	2.3	8	0	0.00	0.010	UX	0.10	UX	0.09	0.03	MG/KG
ALDRIN	FISH	2.5	6	2	33.33	0.000	J	0.01	UX	0.01	0.01	MG/KG
ALDRIN	FISH	3.1	7	0	0.00	0.008	UJ	0.01	UJ	0.01	0.00	MG/KG
ALDRIN	FISH	3.2	8	0	0.00	0.008	UX	0.01	UJ	0.01	0.00	MG/KG
ALDRIN	FISH	3.3	10	0	0.00	0.008	UX	0.01	UX	0.01	0.00	MG/KG
ALDRIN	FISH	3.4	9	0	0.00	0.008	UX	0.01	UX	0.01	0.00	MG/KG

TABLE D.2
SUMMARY STATISTICS FOR FISH TISSUE DATA
DETECTED COMPOUNDS SUMMARIZED BY SUBREACH
SORTED BY TYPE OF ANALYSIS, ANALYSIS, REACH & SUBREACH

TYPE OF ANALYSIS=ORGANICS
(CONTINUED)

ANALYSIS	SAMPLE MATRIX	REACH SEGMENT	NO. OF OBS.	NO. DETECTED	% DETECTED	MIN VALUE	MIN QUAL.	MAX VALUE	MAX QUAL.	AVG. VALUE	STD. DEV.	SAMPLE UNITS
ALDRIN	FISH	4.2	4	2	50.00	0.001	J	0.01	UJ	0.01	0.01	MG/KG
ALDRIN	FISH	4.5	10	0	0.00	0.010	UX	0.20	UX	0.04	0.06	MG/KG
ALDRIN	FISH	5.2	9	0	0.00	0.010	UX	0.10	UX	0.02	0.03	MG/KG
ALDRIN	FISH	5.3	9	2	22.22	0.000	J	0.01	UX	0.01	0.00	MG/KG
ALDRIN	FISH	10.1	8	0	0.00	0.010	UX	0.01	UX	0.01	0.00	MG/KG
ALDRIN	FISH	13.1	3	2	66.67	0.001	J	0.01	UX	0.00	0.01	MG/KG
ALDRIN	FISH	15.1	4	0	0.00	0.050	UX	0.20	UX	0.14	0.08	MG/KG
ALPHA-CHLORDANE	FISH	1.1	7	7	100.00	0.003	J	0.05	J	0.02	0.02	MG/KG
ALPHA-CHLORDANE	FISH	1.5	8	3	37.50	0.003	U	0.01	J	0.01	0.00	MG/KG
ALPHA-CHLORDANE	FISH	2.3	8	7	87.50	0.004	J	0.05	J	0.02	0.02	MG/KG
ALPHA-CHLORDANE	FISH	2.5	2	2	100.00	0.002	J	0.00	J	0.00	0.00	MG/KG
ALPHA-CHLORDANE	FISH	3.1	7	7	100.00	0.006	J	0.03	J	0.01	0.01	MG/KG
ALPHA-CHLORDANE	FISH	3.2	8	8	100.00	0.007	J	0.03	J	0.02	0.01	MG/KG
ALPHA-CHLORDANE	FISH	3.3	10	10	100.00	0.002	J	0.01	J	0.01	0.00	MG/KG
ALPHA-CHLORDANE	FISH	3.4	9	9	100.00	0.003	J	0.01	J	0.01	0.00	MG/KG
ALPHA-CHLORDANE	FISH	4.2	8	7	87.50	0.003	J	0.05	J	0.02	0.01	MG/KG
ALPHA-CHLORDANE	FISH	4.5	10	10	100.00	0.001	J	0.06	J	0.02	0.02	MG/KG
ALPHA-CHLORDANE	FISH	5.2	9	9	100.00	0.001	NJ	0.13	J	0.02	0.04	MG/KG
ALPHA-CHLORDANE	FISH	5.3	9	9	100.00	0.003	J	0.03	J	0.01	0.01	MG/KG
ALPHA-CHLORDANE	FISH	10.1	8	8	100.00	0.001	J	0.01	J	0.00	0.00	MG/KG
ALPHA-CHLORDANE	FISH	13.1	2	2	100.00	0.005	J	0.01	J	0.01	0.00	MG/KG
ALPHA-CHLORDANE	FISH	15.1	4	4	100.00	0.004	J	0.01	J	0.01	0.00	MG/KG
ALPHA-CHLORDENE	FISH	1.1	7	3	42.86	0.001	J	0.10	UX	0.02	0.04	MG/KG
ALPHA-CHLORDENE	FISH	1.5	8	3	37.50	0.000	J	0.20	UJ	0.09	0.10	MG/KG
ALPHA-CHLORDENE	FISH	2.3	8	2	25.00	0.002	J	0.10	UX	0.06	0.05	MG/KG
ALPHA-CHLORDENE	FISH	2.5	5	0	0.00	0.010	UX	0.01	UX	0.01	0.00	MG/KG
ALPHA-CHLORDENE	FISH	3.1	7	1	14.29	0.010	UJ	0.02	J	0.01	0.01	MG/KG
ALPHA-CHLORDENE	FISH	3.2	8	1	12.50	0.006	J	0.01	UX	0.01	0.00	MG/KG
ALPHA-CHLORDENE	FISH	3.3	10	0	0.00	0.002	UX	0.01	UX	0.01	0.00	MG/KG
ALPHA-CHLORDENE	FISH	3.4	9	0	0.00	0.010	UX	0.01	UX	0.01	0.00	MG/KG
ALPHA-CHLORDENE	FISH	4.2	8	2	25.00	0.001	J	0.01	UJ	0.01	0.00	MG/KG
ALPHA-CHLORDENE	FISH	4.5	10	6	60.00	0.001	J	0.20	UX	0.03	0.06	MG/KG
ALPHA-CHLORDENE	FISH	5.2	9	8	88.89	0.000	NJ	0.01	UX	0.00	0.00	MG/KG
ALPHA-CHLORDENE	FISH	5.3	8	0	0.00	0.010	UX	0.01	UX	0.01	0.00	MG/KG
ALPHA-CHLORDENE	FISH	10.1	8	7	87.50	0.000	NJ	0.01	UX	0.00	0.00	MG/KG
ALPHA-CHLORDENE	FISH	13.1	4	0	0.00	0.010	UJ	0.01	UX	0.01	0.00	MG/KG
ALPHA-CHLORDENE	FISH	15.1	4	1	25.00	0.002	J	0.20	UX	0.09	0.08	MG/KG
AROCLOR-1254	FISH	1.1	8	5	62.50	0.010	NJ	0.38	NJ	0.07	0.13	MG/KG
AROCLOR-1254	FISH	1.5	8	8	100.00	0.010	NJ	0.14	NJ	0.07	0.04	MG/KG
AROCLOR-1254	FISH	2.3	8	7	87.50	0.010	U	0.77	NJ	0.22	0.24	MG/KG
AROCLOR-1254	FISH	2.5	2	2	100.00	0.090	J	0.19	J	0.14	0.07	MG/KG
AROCLOR-1254	FISH	3.1	7	7	100.00	0.020	NJ	0.14	NJ	0.08	0.04	MG/KG
AROCLOR-1254	FISH	3.2	8	8	100.00	0.080	NJ	0.33	NJ	0.22	0.10	MG/KG
AROCLOR-1254	FISH	3.3	7	7	100.00	0.060	NJ	0.37	NJ	0.13	0.11	MG/KG
AROCLOR-1254	FISH	3.4	9	9	100.00	0.020	NJ	0.19	NJ	0.09	0.07	MG/KG
AROCLOR-1254	FISH	4.2	8	5	62.50	0.010	NJ	0.27	J	0.09	0.10	MG/KG

TABLE D.2
SUMMARY STATISTICS FOR FISH TISSUE DATA
DETECTED COMPOUNDS SUMMARIZED BY SUBREACH
SORTED BY TYPE OF ANALYSIS, ANALYSIS, REACH & SUBREACH

TYPE OF ANALYSIS=ORGANICS
(CONTINUED)

ANALYSIS	SAMPLE MATRIX	REACH SEGMENT	NO. OF OBS.	NO. DETECTED	% DETECTED	MIN VALUE	MIN QUAL.	MAX VALUE	MAX QUAL.	AVG. VALUE	STD. DEV.	SAMPLE UNITS
AROCLOR-1254	FISH	4.5	10	10	100.00	0.030	NJ	0.24	NJ	0.12	0.09	MG/KG
AROCLOR-1254	FISH	5.2	9	6	66.67	0.010	U	0.18	NJ	0.07	0.06	MG/KG
AROCLOR-1254	FISH	5.3	8	8	100.00	0.010	J	0.32	J	0.15	0.11	MG/KG
AROCLOR-1254	FISH	10.1	8	0	0.00	0.010	U	0.05	U	0.02	0.02	MG/KG
AROCLOR-1254	FISH	13.1	2	2	100.00	0.040	J	0.19	J	0.11	0.11	MG/KG
AROCLOR-1254	FISH	15.1	4	4	100.00	0.080	NJ	0.20	NJ	0.13	0.05	MG/KG
AROCLOR-1260	FISH	1.1	8	8	100.00	0.050	NJ	2.55	NJ	0.74	0.95	MG/KG
AROCLOR-1260	FISH	1.5	8	8	100.00	0.100	NJ	0.41	NJ	0.21	0.10	MG/KG
AROCLOR-1260	FISH	2.3	8	8	100.00	0.320	NJ	2.29	NJ	0.99	0.70	MG/KG
AROCLOR-1260	FISH	2.5	6	6	100.00	0.230	J	1.42	J	0.68	0.51	MG/KG
AROCLOR-1260	FISH	3.1	8	8	100.00	0.030	NJ	0.93	NJ	0.33	0.28	MG/KG
AROCLOR-1260	FISH	3.2	8	8	100.00	0.280	NJ	3.00	NJ	0.94	0.87	MG/KG
AROCLOR-1260	FISH	3.3	10	10	100.00	0.150	NJ	1.54	NJ	0.56	0.42	MG/KG
AROCLOR-1260	FISH	3.4	10	10	100.00	0.210	NJ	0.55	NJ	0.36	0.12	MG/KG
AROCLOR-1260	FISH	4.2	8	7	87.50	0.010	UX	2.10	NJ	0.70	0.71	MG/KG
AROCLOR-1260	FISH	4.5	10	10	100.00	0.140	NJ	3.60	NJ	0.88	1.03	MG/KG
AROCLOR-1260	FISH	5.2	9	9	100.00	0.030	NJ	0.45	NJ	0.26	0.15	MG/KG
AROCLOR-1260	FISH	5.3	10	10	100.00	0.190	J	1.24	J	0.67	0.34	MG/KG
AROCLOR-1260	FISH	10.1	8	7	87.50	0.010	NJ	0.08	NJ	0.03	0.03	MG/KG
AROCLOR-1260	FISH	13.1	4	4	100.00	0.190	J	0.39	J	0.30	0.08	MG/KG
AROCLOR-1260	FISH	15.1	4	4	100.00	0.100	NJ	0.65	NJ	0.39	0.25	MG/KG
BIS(2-ETHYLHEXYL)PHTHALATE	FISH	1.5	6	0	0.00	0.680	UX	0.87	UX	0.75	0.08	MG/KG
BIS(2-ETHYLHEXYL)PHTHALATE	FISH	2.3	8	0	0.00	0.700	UX	1.90	UX	1.18	0.45	MG/KG
BIS(2-ETHYLHEXYL)PHTHALATE	FISH	3.1	7	0	0.00	0.350	UX	0.39	UX	0.37	0.01	MG/KG
BIS(2-ETHYLHEXYL)PHTHALATE	FISH	3.2	8	0	0.00	0.360	UJ	0.39	UJ	0.37	0.01	MG/KG
BIS(2-ETHYLHEXYL)PHTHALATE	FISH	3.3	9	0	0.00	0.360	UX	0.41	UJ	0.38	0.02	MG/KG
BIS(2-ETHYLHEXYL)PHTHALATE	FISH	3.4	9	1	11.11	0.047	J	0.41	UX	0.29	0.13	MG/KG
BIS(2-ETHYLHEXYL)PHTHALATE	FISH	4.2	1	0	0.00	0.660	UX	0.66	UX	0.66	.	MG/KG
BIS(2-ETHYLHEXYL)PHTHALATE	FISH	4.5	5	0	0.00	0.670	UX	0.72	UX	0.69	0.02	MG/KG
BIS(2-ETHYLHEXYL)PHTHALATE	FISH	15.1	3	0	0.00	0.670	UJ	0.71	UX	0.69	0.02	MG/KG
CHLORDENE	FISH	1.1	8	0	0.00	0.010	UX	0.10	UX	0.04	0.05	MG/KG
CHLORDENE	FISH	1.5	8	0	0.00	0.010	UJ	0.20	UJ	0.13	0.08	MG/KG
CHLORDENE	FISH	2.3	8	0	0.00	0.010	UX	0.10	UX	0.09	0.03	MG/KG
CHLORDENE	FISH	2.5	6	0	0.00	0.010	UX	0.01	UX	0.01	0.00	MG/KG
CHLORDENE	FISH	3.1	7	2	28.57	0.010	UJ	0.01	J	0.01	0.00	MG/KG
CHLORDENE	FISH	3.2	8	0	0.00	0.010	UJ	0.01	UX	0.01	0.00	MG/KG
CHLORDENE	FISH	3.3	10	0	0.00	0.010	UX	0.01	UX	0.01	0.00	MG/KG
CHLORDENE	FISH	3.4	9	0	0.00	0.010	UX	0.01	UX	0.01	0.00	MG/KG
CHLORDENE	FISH	4.2	8	0	0.00	0.010	UJ	0.01	UJ	0.01	0.00	MG/KG
CHLORDENE	FISH	4.5	10	0	0.00	0.010	UX	0.20	UX	0.04	0.06	MG/KG
CHLORDENE	FISH	5.2	9	5	55.56	0.000	NJ	0.10	UX	0.01	0.03	MG/KG
CHLORDENE	FISH	5.3	9	0	0.00	0.010	UX	0.01	UX	0.01	0.00	MG/KG
CHLORDENE	FISH	10.1	8	1	12.50	0.002	NJ	0.01	UX	0.01	0.00	MG/KG
CHLORDENE	FISH	13.1	4	0	0.00	0.010	UJ	0.01	UX	0.01	0.00	MG/KG
CHLORDENE	FISH	15.1	4	0	0.00	0.050	UX	0.20	UX	0.14	0.08	MG/KG
DI-N-OCTYLPHTHALATE	FISH	1.5	6	0	0.00	0.680	UX	0.87	UX	0.75	0.08	MG/KG

TABLE D.2
SUMMARY STATISTICS FOR FISH TISSUE DATA
DETECTED COMPOUNDS SUMMARIZED BY SUBREACH
SORTED BY TYPE OF ANALYSIS, ANALYSIS, REACH & SUBREACH

TYPE OF ANALYSIS=ORGANICS
(CONTINUED)

ANALYSIS	SAMPLE MATRIX	REACH SEGMENT	NO. OF OBS.	NO. DETECTED	% DETECTED	MIN VALUE	MIN QUAL.	MAX VALUE	MAX QUAL.	AVG. VALUE	STD. DEV.	SAMPLE UNITS
DI-N-OCTYLPHTHALATE	FISH	2.3	8	0	0.00	0.082	UX	1.90	UX	1.10	0.58	MG/KG
DI-N-OCTYLPHTHALATE	FISH	3.1	7	0	0.00	0.350	UX	0.39	UX	0.37	0.01	MG/KG
DI-N-OCTYLPHTHALATE	FISH	3.2	8	1	12.50	0.024	J	0.39	UJ	0.33	0.12	MG/KG
DI-N-OCTYLPHTHALATE	FISH	3.3	9	0	0.00	0.360	UJ	0.41	UJ	0.38	0.02	MG/KG
DI-N-OCTYLPHTHALATE	FISH	3.4	9	0	0.00	0.190	UX	0.41	UJ	0.32	0.10	MG/KG
DI-N-OCTYLPHTHALATE	FISH	4.2	1	0	0.00	0.660	UX	0.66	UX	0.66	.	MG/KG
DI-N-OCTYLPHTHALATE	FISH	4.5	5	0	0.00	0.670	UX	0.72	UX	0.69	0.02	MG/KG
DI-N-OCTYLPHTHALATE	FISH	15.1	3	0	0.00	0.670	UJ	0.71	UX	0.69	0.02	MG/KG
GAMMA-CHLORDANE	FISH	1.1	7	3	42.86	0.002	U	0.04	U	0.01	0.01	MG/KG
GAMMA-CHLORDANE	FISH	1.5	8	0	0.00	0.003	U	0.01	U	0.00	0.00	MG/KG
GAMMA-CHLORDANE	FISH	2.3	8	6	75.00	0.002	U	0.02	J	0.01	0.00	MG/KG
GAMMA-CHLORDANE	FISH	2.5	3	2	66.67	0.001	J	0.01	UX	0.00	0.00	MG/KG
GAMMA-CHLORDANE	FISH	3.1	7	7	100.00	0.016	J	0.05	J	0.03	0.01	MG/KG
GAMMA-CHLORDANE	FISH	3.2	8	8	100.00	0.016	J	0.07	J	0.04	0.02	MG/KG
GAMMA-CHLORDANE	FISH	3.3	10	10	100.00	0.008	J	0.02	J	0.02	0.01	MG/KG
GAMMA-CHLORDANE	FISH	3.4	9	9	100.00	0.001	J	0.03	J	0.02	0.01	MG/KG
GAMMA-CHLORDANE	FISH	4.2	8	8	100.00	0.002	J	0.02	J	0.01	0.01	MG/KG
GAMMA-CHLORDANE	FISH	4.5	10	10	100.00	0.001	J	0.03	J	0.01	0.01	MG/KG
GAMMA-CHLORDANE	FISH	5.2	9	9	100.00	0.000	NJ	0.01	J	0.00	0.00	MG/KG
GAMMA-CHLORDANE	FISH	5.3	9	8	88.89	0.002	J	0.08	J	0.02	0.02	MG/KG
GAMMA-CHLORDANE	FISH	10.1	8	8	100.00	0.000	J	0.00	J	0.00	0.00	MG/KG
GAMMA-CHLORDANE	FISH	13.1	2	2	100.00	0.003	J	0.01	J	0.00	0.00	MG/KG
GAMMA-CHLORDANE	FISH	15.1	4	4	100.00	0.002	J	0.01	J	0.00	0.00	MG/KG
GAMMA-CHLORDENE	FISH	1.1	7	6	85.71	0.000	J	0.01	UX	0.00	0.00	MG/KG
GAMMA-CHLORDENE	FISH	1.5	8	2	25.00	0.001	J	0.20	J	0.13	0.09	MG/KG
GAMMA-CHLORDENE	FISH	2.3	8	2	25.00	0.008	NJ	0.10	UX	0.08	0.04	MG/KG
GAMMA-CHLORDENE	FISH	2.5	6	0	0.00	0.010	UX	0.01	UX	0.01	0.00	MG/KG
GAMMA-CHLORDENE	FISH	3.1	7	6	85.71	0.003	J	0.03	J	0.02	0.01	MG/KG
GAMMA-CHLORDENE	FISH	3.2	8	8	100.00	0.007	X	0.04	J	0.02	0.01	MG/KG
GAMMA-CHLORDENE	FISH	3.3	10	3	30.00	0.003	J	0.01	UJ	0.01	0.00	MG/KG
GAMMA-CHLORDENE	FISH	3.4	9	7	77.78	0.003	J	0.01	UX	0.01	0.00	MG/KG
GAMMA-CHLORDENE	FISH	4.2	8	2	25.00	0.003	J	0.01	UJ	0.01	0.00	MG/KG
GAMMA-CHLORDENE	FISH	4.5	9	7	77.78	0.002	J	0.02	J	0.01	0.00	MG/KG
GAMMA-CHLORDENE	FISH	5.2	9	8	88.89	0.000	NJ	0.01	UX	0.00	0.00	MG/KG
GAMMA-CHLORDENE	FISH	5.3	9	1	11.11	0.000	J	0.01	UX	0.01	0.00	MG/KG
GAMMA-CHLORDENE	FISH	10.1	8	7	87.50	0.000	NJ	0.01	UX	0.00	0.00	MG/KG
GAMMA-CHLORDENE	FISH	13.1	3	0	0.00	0.010	UJ	0.01	UX	0.01	0.00	MG/KG
GAMMA-CHLORDENE	FISH	15.1	4	2	50.00	0.003	J	0.10	UX	0.04	0.05	MG/KG
OXYCHLORDANE	FISH	1.1	7	7	100.00	0.001	J	0.03	J	0.01	0.01	MG/KG
OXYCHLORDANE	FISH	1.5	8	2	25.00	0.000	U	0.20	UJ	0.05	0.09	MG/KG
OXYCHLORDANE	FISH	2.3	8	6	75.00	0.002	J	0.10	UX	0.03	0.04	MG/KG
OXYCHLORDANE	FISH	2.5	3	0	0.00	0.010	UX	0.01	UX	0.01	0.00	MG/KG
OXYCHLORDANE	FISH	3.1	7	5	71.43	0.003	J	0.01	J	0.01	0.00	MG/KG
OXYCHLORDANE	FISH	3.2	8	8	100.00	0.001	J	0.07	J	0.01	0.02	MG/KG
OXYCHLORDANE	FISH	3.3	10	4	40.00	0.001	J	0.01	UX	0.01	0.00	MG/KG
OXYCHLORDANE	FISH	3.4	9	7	77.78	0.001	J	0.01	UX	0.00	0.00	MG/KG

TABLE D.2
SUMMARY STATISTICS FOR FISH TISSUE DATA
DETECTED COMPOUNDS SUMMARIZED BY SUBREACH
SORTED BY TYPE OF ANALYSIS, ANALYSIS, REACH & SUBREACH

TYPE OF ANALYSIS=ORGANICS
(CONTINUED)

ANALYSIS	SAMPLE MATRIX	REACH SEGMENT	NO. OF OBS.	NO. DETECTED	% DETECTED	MIN VALUE	MIN QUAL.	MAX VALUE	MAX QUAL.	AVG. VALUE	STD. DEV.	SAMPLE UNITS
OXYCHLORDANE	FISH	4.2	8	7	87.50	0.008	J	0.09	J	0.03	0.03	MG/KG
OXYCHLORDANE	FISH	4.5	10	3	30.00	0.000	J	0.01	J	0.01	0.00	MG/KG
OXYCHLORDANE	FISH	5.2	9	3	33.33	0.000	NJ	0.10	UX	0.02	0.03	MG/KG
OXYCHLORDANE	FISH	5.3	9	3	33.33	0.001	J	0.01	UX	0.01	0.00	MG/KG
OXYCHLORDANE	FISH	10.1	8	7	87.50	0.000	NJ	0.01	UX	0.00	0.00	MG/KG
OXYCHLORDANE	FISH	13.1	2	2	100.00	0.051	J	0.06	J	0.06	0.01	MG/KG
OXYCHLORDANE	FISH	15.1	4	1	25.00	0.004	J	0.20	UX	0.11	0.10	MG/KG
4,4'-DDD	FISH	1.1	7	5	71.43	0.000	J	0.10	UX	0.02	0.04	MG/KG
4,4'-DDD	FISH	1.5	8	0	0.00	0.003	U	0.20	UJ	0.12	0.10	MG/KG
4,4'-DDD	FISH	2.3	8	0	0.00	0.010	UX	0.10	UX	0.09	0.03	MG/KG
4,4'-DDD	FISH	2.5	6	0	0.00	0.010	UX	0.01	UX	0.01	0.00	MG/KG
4,4'-DDD	FISH	3.1	7	0	0.00	0.015	UJ	0.02	UJ	0.02	0.00	MG/KG
4,4'-DDD	FISH	3.2	8	2	25.00	0.000	J	0.02	UJ	0.01	0.01	MG/KG
4,4'-DDD	FISH	3.3	10	0	0.00	0.016	UX	0.02	UX	0.02	0.00	MG/KG
4,4'-DDD	FISH	3.4	9	0	0.00	0.016	UX	0.02	UX	0.02	0.00	MG/KG
4,4'-DDD	FISH	4.2	8	0	0.00	0.010	UJ	0.01	UJ	0.01	0.00	MG/KG
4,4'-DDD	FISH	4.5	10	4	40.00	0.003	J	0.20	UX	0.03	0.06	MG/KG
4,4'-DDD	FISH	5.2	9	9	100.00	0.000	NJ	0.01	J	0.00	0.00	MG/KG
4,4'-DDD	FISH	5.3	8	3	37.50	0.002	J	0.02	J	0.01	0.01	MG/KG
4,4'-DDD	FISH	10.1	8	7	87.50	0.000	NJ	0.01	UX	0.00	0.00	MG/KG
4,4'-DDD	FISH	13.1	4	0	0.00	0.010	UJ	0.01	UX	0.01	0.00	MG/KG
4,4'-DDD	FISH	15.1	4	1	25.00	0.005	J	0.20	UX	0.13	0.09	MG/KG
4,4'-DDE	FISH	1.1	8	6	75.00	0.001	J	0.03	J	0.01	0.01	MG/KG
4,4'-DDE	FISH	1.5	8	2	25.00	0.010	UJ	0.20	UJ	0.13	0.08	MG/KG
4,4'-DDE	FISH	2.3	8	4	50.00	0.005	J	0.10	UX	0.05	0.05	MG/KG
4,4'-DDE	FISH	2.5	5	2	40.00	0.002	J	0.01	UX	0.01	0.00	MG/KG
4,4'-DDE	FISH	3.1	7	7	100.00	0.005	J	0.04	J	0.01	0.01	MG/KG
4,4'-DDE	FISH	3.2	8	8	100.00	0.000	J	0.02	J	0.01	0.01	MG/KG
4,4'-DDE	FISH	3.3	10	10	100.00	0.000	J	0.00	J	0.00	0.00	MG/KG
4,4'-DDE	FISH	3.4	9	9	100.00	0.000	J	0.00	J	0.00	0.00	MG/KG
4,4'-DDE	FISH	4.2	8	6	75.00	0.004	J	0.02	J	0.01	0.00	MG/KG
4,4'-DDE	FISH	4.5	10	6	60.00	0.010	UX	0.20	UX	0.04	0.06	MG/KG
4,4'-DDE	FISH	5.2	9	3	33.33	0.010	J	0.02	J	0.01	0.00	MG/KG
4,4'-DDE	FISH	5.3	9	6	66.67	0.005	J	0.03	J	0.01	0.01	MG/KG
4,4'-DDE	FISH	10.1	8	2	25.00	0.002	J	0.01	UX	0.01	0.00	MG/KG
4,4'-DDE	FISH	13.1	2	2	100.00	0.002	J	0.01	J	0.00	0.00	MG/KG
4,4'-DDE	FISH	15.1	4	0	0.00	0.050	UX	0.20	UX	0.14	0.08	MG/KG
4,4'-DDT	FISH	1.1	8	0	0.00	0.010	UX	0.10	UX	0.04	0.05	MG/KG
4,4'-DDT	FISH	1.5	8	0	0.00	0.010	UJ	0.20	UJ	0.13	0.08	MG/KG
4,4'-DDT	FISH	2.3	8	0	0.00	0.010	UX	0.10	UX	0.09	0.03	MG/KG
4,4'-DDT	FISH	2.5	5	2	40.00	0.000	J	0.01	UX	0.01	0.01	MG/KG
4,4'-DDT	FISH	3.1	7	0	0.00	0.015	UJ	0.02	UJ	0.02	0.00	MG/KG
4,4'-DDT	FISH	3.2	8	0	0.00	0.016	UX	0.02	UJ	0.02	0.00	MG/KG
4,4'-DDT	FISH	3.3	10	0	0.00	0.016	UX	0.02	UX	0.02	0.00	MG/KG
4,4'-DDT	FISH	3.4	9	0	0.00	0.010	UX	0.02	UX	0.02	0.00	MG/KG
4,4'-DDT	FISH	4.2	8	1	12.50	0.002	J	0.01	UJ	0.01	0.00	MG/KG

TABLE D.2
SUMMARY STATISTICS FOR FISH TISSUE DATA
DETECTED COMPOUNDS SUMMARIZED BY SUBREACH
SORTED BY TYPE OF ANALYSIS, ANALYSIS, REACH & SUBREACH

TYPE OF ANALYSIS=ORGANICS (CONTINUED)

ANALYSIS	SAMPLE MATRIX	REACH SEGMENT	NO. OF OBS.	NO. DETECTED	% DETECTED	MIN VALUE	MIN QUAL.	MAX VALUE	MAX QUAL.	AVG. VALUE	STD. DEV.	SAMPLE UNITS
4,4'-DDT	FISH	4.5	10	0	0.00	0.010	UX	0.20	UX	0.04	0.06	MG/KG
4,4'-DDT	FISH	5.2	9	0	0.00	0.010	UX	0.01	UX	0.01	0.00	MG/KG
4,4'-DDT	FISH	5.3	9	5	55.56	0.000	J	0.01	UX	0.00	0.00	MG/KG
4,4'-DDT	FISH	10.1	8	0	0.00	0.010	UX	0.01	UX	0.01	0.00	MG/KG
4,4'-DDT	FISH	13.1	3	0	0.00	0.010	UJ	0.01	UX	0.01	0.00	MG/KG
4,4'-DDT	FISH	15.1	4	0	0.00	0.050	UX	0.20	UX	0.14	0.08	MG/KG

TYPE OF ANALYSIS=RAD

ANALYSIS	SAMPLE MATRIX	REACH SEGMENT	NO. OF OBS.	NO. DETECTED	% DETECTED	MIN VALUE	MIN QUAL.	MAX VALUE	MAX QUAL.	AVG. VALUE	STD. DEV.	SAMPLE UNITS
CO-60	FISH	1.1	15	1	6.67	0.031	UJ	0.16	UJ	0.09	0.05	PCI/G (WET)
CO-60	FISH	1.5	13	0	0.00	0.029	UJ	0.19	UJ	0.10	0.05	PCI/G (WET)
CO-60	FISH	2.3	21	0	0.00	0.042	U	0.70	UJ	0.31	0.23	PCI/G (WET)
CO-60	FISH	2.5	6	0	0.00	0.076	UJ	0.43	UJ	0.25	0.17	PCI/G (WET)
CO-60	FISH	3.1	12	0	0.00	0.055	U	0.35	UJ	0.13	0.08	PCI/G (WET)
CO-60	FISH	3.2	14	0	0.00	0.032	UJ	0.18	UJ	0.09	0.04	PCI/G (WET)
CO-60	FISH	3.3	18	1	5.56	0.092	UJ	0.18	UJ	0.13	0.03	PCI/G (WET)
CO-60	FISH	3.4	10	0	0.00	0.068	UJ	0.38	UJ	0.18	0.10	PCI/G (WET)
CO-60	FISH	4.2	19	0	0.00	0.031	U	1.21	UJ	0.28	0.31	PCI/G (WET)
CO-60	FISH	4.5	19	0	0.00	0.008	UJ	0.24	UJ	0.13	0.05	PCI/G (WET)
CO-60	FISH	5.2	13	0	0.00	0.040	U	0.24	UJ	0.12	0.05	PCI/G (WET)
CO-60	FISH	5.3	15	0	0.00	0.029	UJ	0.19	UJ	0.10	0.05	PCI/G (WET)
CO-60	FISH	10.1	16	1	6.25	0.005	UJ	0.14	UJ	0.05	0.05	PCI/G (WET)
CO-60	FISH	13.1	6	1	16.67	0.051	UJ	0.14	UJ	0.08	0.04	PCI/G (WET)
CO-60	FISH	15.1	14	0	0.00	0.009	UJ	0.17	UJ	0.07	0.06	PCI/G (WET)
CS-137	FISH	1.1	15	7	46.67	0.010	J	0.15	UJ	0.06	0.04	PCI/G (WET)
CS-137	FISH	1.5	13	7	53.85	0.009	V/V	0.12	UJ	0.06	0.04	PCI/G (WET)
CS-137	FISH	2.3	21	18	85.71	0.095	J	2.31	V/V	0.49	0.52	PCI/G (WET)
CS-137	FISH	2.5	6	5	83.33	0.072	J	0.32	UJ	0.19	0.10	PCI/G (WET)
CS-137	FISH	3.1	12	5	41.67	0.036	V/V	0.29	UJ	0.10	0.07	PCI/G (WET)
CS-137	FISH	3.2	14	8	57.14	0.021	V/V	0.14	UJ	0.09	0.03	PCI/G (WET)
CS-137	FISH	3.3	18	10	55.56	0.005	V/V	0.17	V/V	0.08	0.04	PCI/G (WET)
CS-137	FISH	3.4	10	3	30.00	0.055	V/V	0.34	UJ	0.17	0.09	PCI/G (WET)
CS-137	FISH	4.2	20	14	70.00	0.035	V/V	1.03	UJ	0.20	0.25	PCI/G (WET)
CS-137	FISH	4.5	20	14	70.00	0.043	J	0.25	UJ	0.13	0.06	PCI/G (WET)
CS-137	FISH	5.2	13	10	76.92	0.020	V/V	0.16	UJ	0.09	0.05	PCI/G (WET)
CS-137	FISH	5.3	15	9	60.00	0.014	J	0.14	UJ	0.07	0.05	PCI/G (WET)
CS-137	FISH	10.1	17	9	52.94	0.013	J	0.17	UJ	0.07	0.06	PCI/G (WET)
CS-137	FISH	13.1	6	3	50.00	0.034	J	0.15	UJ	0.08	0.04	PCI/G (WET)
CS-137	FISH	15.1	14	5	35.71	0.018	J	0.16	UJ	0.08	0.05	PCI/G (WET)
SR-90	FISH	1.1	8	8	100.00	-0.100	J	0.10	J	0.01	0.10	PCI/G (BONE)
SR-90	FISH	2.5	6	6	100.00	0.200	V/V	0.70	V/V	0.45	0.19	PCI/G (BONE)
SR-90	FISH	3.1	8	8	100.00	-0.300	J	0.20	V/V	0.08	0.17	PCI/G (BONE)

TABLE D.2
SUMMARY STATISTICS FOR FISH TISSUE DATA
DETECTED COMPOUNDS SUMMARIZED BY SUBREACH
SORTED BY TYPE OF ANALYSIS, ANALYSIS, REACH & SUBREACH

TYPE OF ANALYSIS=RAD
(CONTINUED)

ANALYSIS	SAMPLE MATRIX	REACH SEGMENT	NO. OF OBS.	NO. DETECTED	% DETECTED	MIN VALUE	MIN QUAL.	MAX VALUE	MAX QUAL.	AVG. VALUE	STD. DEV.	SAMPLE UNITS
SR-90	FISH	3.3	10	10	100.00	0.000	J	0.80	J	0.39	0.23	PCI/G (BONE)
SR-90	FISH	3.4	10	10	100.00	0.000	J	0.50	J	0.16	0.18	PCI/G (BONE)
SR-90	FISH	4.5	10	10	100.00	0.000	J	0.40	J	0.15	0.15	PCI/G (BONE)
SR-90	FISH	5.2	9	9	100.00	-0.100	J	1.00	J	0.24	0.30	PCI/G (BONE)
SR-90	FISH	5.3	10	10	100.00	0.000	J	0.60	J	0.17	0.17	PCI/G (BONE)
SR-90	FISH	10.1	8	8	100.00	-0.100	J	0.30	J	0.11	0.12	PCI/G (BONE)
SR-90	FISH	13.1	4	4	100.00	0.000	J	0.30	J	0.15	0.13	PCI/G (BONE)
SR-90	FISH	15.1	4	4	100.00	0.100	J	0.20	J	0.15	0.08	PCI/G (BONE)

Appendix E

HUMAN HEALTH RISK METHODS

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E.1 HUMAN HEALTH SCREENING RISK ASSESSMENTS

Conservative and nonconservative screening risk analyses were performed for selected media and primary and secondary exposure pathways. Primary pathways are those most realistic and likely to be encountered. Secondary pathways are less likely scenarios or potential and/or future pathways of exposure. A listing of risk assessment scenarios, usage, and exposure factors used for the human health screening is given in Table E.2. Tables E.3 through E.5 give toxicity reference doses and cancer factors for those contaminants considered in the risk analyses. Screening results are presented in Tables E.6 through E.18.

Media and Primary Exposure Pathways

1. Fish:
   - ingestion by adult and child.

2. Surface Sediment:
   - external exposure to sediments for adult,
   - ingestion of sediments for adult and child, and
   - inhalation of sediments for adult.

3. Water:
   - ingestion by adult and child.

Media and Secondary Exposure Pathway

Buried Sediment (dredging of deep sediments):
- external exposure to dredged sediments for adult;
- ingestion of dredged sediments for adult;
- inhalation of dredged sediments for adult; and
- ingestion of milk, meat, and vegetables produced on dredged sediments for adult.

The results of the analyses for the selected analytes (see Table A.1) provided a comprehensive view of the extent of contamination in the selected media. Actuality, only 10% of the determinations exceeded their method detection limits. This is a common occurrence for regulatory-driven environmental sampling and analysis activities. For the screening risk analyses, a distinction was made between *detected contaminants*, contaminants with at least one detected value in a given reach, and *nondetected contaminants*, contaminants with no detected values in a reach. Separate analyses and interpretations of these results were done for detected and the nondetected contaminants.

The following sections describe the specific data manipulations performed for each of the selected media.

E.2 FISH

Except for PCBs data were combined for all fish species within a reach. Only catfish results were used for PCBs because catfish values are typically much greater than bass and are useful for the conservative screening. Only detected chlordane isomer values were summed. The average detection limit was used when all chlordane isomers were nondetects.

Given the potential for means of distributions with numerous non-detect values (censored data) to be positively biased, the upper 95% confidence limit of the arithmetic mean and the geometric mean were calculated using a maximum likelihood estimator (SAS PROC LIFEREG). The UCL was compared with the actual maximum value, and whichever is smaller was used in the conservative risk calculation as detected contaminants. The geometric mean was used for nonconservative calculations. Only a nonconservative calculation using the minimum detection limit was done for nondetected contaminants.

E.3 SEDIMENT

E.3.1 Surface Sediments

All grabs are summarized for each reach.

Surface sediment samples in a reach were used on the screening analysis. The upper 95% confidence limit of the arithmetic mean and the geometric mean were calculated using a maximum likelihood estimator (SAS PROC LIFEREG). The UCL was compared with the actual maximum value and which ever is smaller was used in the conservative risk calculations: for detected contaminants the geometric mean will be used for nonconservative calculations.

Only a nonconservative calculation using the minimum detection limit was done for the nondetected contaminants.

E.3.2 Cores

A mass-weighted average concentration was calculated to a depth of 1 m. For cores shorter than 1 m, the mass-weighted average of what was collected was calculated and was assumed to represent the concentration in the top 1 m of sediment. When there was more than one core per reach, the mass-weighted average for each core was calculated and the upper 95% confidence limit of the average of the core averages, or the maximum core average, (whichever is smaller) was used as the reach value for conservative screening. The arithmetic mean of the core averages was used for nonconservative screening. Only a nonconservative calculation using the minimum detection limit of the core averages was done for the nondetected contaminants.

E.4 WATER

The description of the water data used in the screening analyses requires some additional explanation. CR-ERP sampling consisted of a single grab sample collected at the same times (late 1989 and early 1990) and sites as the initial sediment and fish samples. To better represent the water quality of the CR/WBR system, additional data were obtained from ORR compliance and environmental monitoring programs. Table E.1 lists the sources of these data for each reach. The sampling locations relative to DOE facilities are shown in Fig. E.1. The source monitoring data are from samples collected at permitted outfalls to determine regulatory compliance with NPDES and DOE Order 5400.1. These samples were collected and analyzed at varying frequencies for the analytes specified in each outfall permit. Environmental monitoring samples were generally collected quarterly from locations upstream and downstream from DOE facilities. The quality of the analytical data is good, but not as well documented as the CR-ERP. Standard EPA sampling and analytical

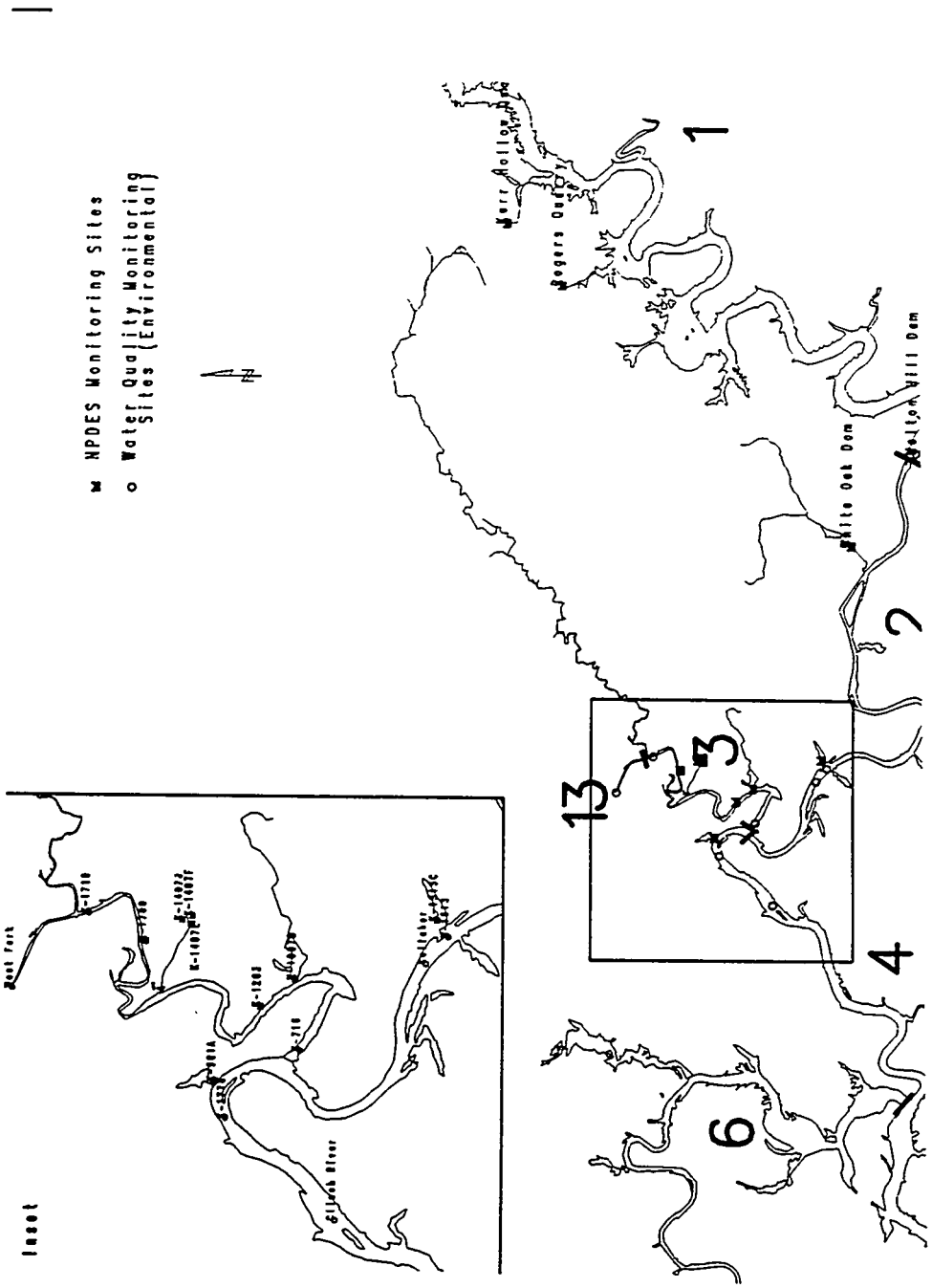

Fig. E.1. Location of NPDES monitoring sites in Clinch River/Watts Bar System.

Table E.1. Receiving reaches for Oak Ridge Reservation source monitoring and surface water environmental monitoring stations. Source monitoring data are collected in support of NPDES permits and DOE Order 5400.1. (Data from these locations for years 1990, 1991, and part of 1992, were used in the human health and ecological risk screening analyses).

Reach	Location	Source Type
1	Kerr Hollow Quarry	Source Monitoring
1	Rogers Quarry	Source Monitoring
1	Melton Hill Dam	Environmental Monitoring
2	White Oak Dam	Source Monitoring
2	K-1513	Environmental Monitoring
2	K-1515C	Source Monitoring
2	Gallaher Bridge	Environmental Monitoring
3	K-1710	Environmental Monitoring
3	K-1700	Source Monitoring
3	K-1407E	Source Monitoring
3	K-1407F	Source Monitoring
3	K-1407J	Source Monitoring
3	K-1203	Source Monitoring
3	K-1007B	Source Monitoring
3	K-716	Environmental Monitoring
4	K-901A	Source Monitoring
4	K-1770	Environmental Monitoring
4	Clinch River (Brashar Island)	Environmental Monitoring
4	Kingston	Environmental Monitoring
13	West Fork Poplar Creek	Environmental Monitoring

methods were used, but the results were not validated against the EPA functional guidelines for CERCLA as was done for CR-ERP. These data were integrated with CR-ERP results and all of the data used in the human health risk screening analyses.

Combining data from various organizations, collected and analyzed for different purposes, makes interpretation of the summarized data more difficult. For example, the CR-ERP gamma spectroscopy results which were less than detection limits were reported as a minimum detectable activity along with a data qualifier for the value. Similar source monitoring gamma results were reported as background corrected values and associated counting uncertainty. Therefore, negative and very small values were common, and distinguishing non-detected values was not possible. These results were used as is and included as detected contaminants in the screening analyses. Resulting risk summary tables, therefore, list numerous radionuclides with very low risk values and, more importantly, indicate that these radionuclides were detected in all samples (See ratio of detected to total analyses in Tables E.8 thru E.12.).

Results of analyses performed on raw/unfiltered water samples (e.g., total aluminum) were used when available. The data for the water pathways included samples collected by both the CR-ERP and by the ORR compliance and monitoring organizations.

The values used for the risk screening analyses for a given contaminant in a reach were calculated by first averaging all results by location and then determining the upper 95% confidence limit of the arithmetic mean of the location averages. The UCL or the maximum location average (whichever is smaller) was used as the value for conservative screening for each reach. The arithmetic mean of the location averages was used for nonconservative screening.

Table E.2. Usage and exposure factors for conservative and nonconservative screening

Risk	Route	Media	Estimate	Age	Body weight (kg)	Exposure duration (yr)	Exposure frequency	Averaging time (yr)	Ingestion Rate	Intake Rate	Units
Cancer	Exposure	Sed.	C	A		30	0.2282				
Cancer	Exposure	Sed.	NC	A		30	0.0114				
Cancer	Ingestion	Fish	C	A	70	30	0.1370	70	2.30E-01	1.35E-02	kg/d
Cancer	Ingestion	Fish	NC	A	70	30	0.0329	70	2.30E-01	3.24E-03	kg/d
Cancer	Ingestion	Meat	C	A	70	30	1.0000	70	2.00E-01	8.57E-02	kg/d
Cancer	Ingestion	Milk	C	A	70	30	1.0000	70	5.00E-01	2.14E-01	L/d
Cancer	Ingestion	Sed.	C	A	70	30	1.0000	70	1.00E-04	4.29E-05	kg/d
Cancer	Ingestion	Sed.	NC	A	70	30	1.0000	70	1.00E-05	4.29E-06	kg/d
Cancer	Ingestion	Veg.	C	A	70	30	1.0000	70	2.00E-01	8.57E-02	kg/d
Cancer	Ingestion	Water	C	A	70	30	1.0000	70	2.00E+00	8.57E-01	L/d
Cancer	Ingestion	Water	NC	A	70	30	1.0000	70	2.00E-01	8.57E-02	L/d
Cancer	Inhalation	Sed.	C	A	70	30	1.0000	70	2.30E+01	9.86E+00	m3/d
Toxic	Ingestion	Fish	C	A	70	1	0.2740	1	2.30E-01	6.30E-02	kg/d
				C	20	1	0.2740	1	1.15E-01	3.15E-02	kg/d
Toxic	Ingestion	Fish	NC	A	70	1	0.0274	1	2.30E-01	6.30E-03	kg/d
Toxic	Ingestion	Meat	C	A	70	1	1.0000	1	2.00E-01	2.00E-01	kg/d
				C	20	1	1.0000	1	1.00E-01	1.00E-01	kg/d
Toxic	Ingestion	Milk	C	A	70	1	1.0000	1	5.00E-01	5.00E-01	L/d
				C	10	1	1.0000	1	1.00E+00	1.00E+00	L/d
Toxic	Ingestion	Sed.	C	A	70	1	1.0000	1	1.00E-04	1.00E-04	kg/d
				C	15	1	1.0000	1	2.00E-04	2.00E-04	kg/d

Table E.2 (continued)

Risk	Route	Media	Estimate	Age	Body weight (kg)	Exposure duration (yr)	Exposure frequency	Averaging time (yr)	Ingestion Rate	Intake Rate	Units
Toxic	Ingestion	Sed.	NC	A	70	1	1.0000	1	1.00E-05	1.00E-05	kg/d
Toxic	Ingestion	Veg.	C	A	70	1	1.0000	1	2.00E-01	2.00E-01	kg/d
				C	20	1	1.0000	1	1.00E-01	1.00E-01	kg/d
Toxic	Ingestion	Water	C	A	70	1	1.0000	1	2.00E+00	2.00E+00	L/d
				C	15	1	1.0000	1	1.00E+00	1.00E+00	L/d
Toxic	Ingestion	Water	NC	A	70	1	1.0000	1	2.00E-01	2.00E-01	L/d
Toxic	Inhalation	Sed.	C	A	70	1	1.0000	1	2.30E+01	2.30E+01	m3/d

Table E.3. Reference doses and slope (cancer potency) factors for inorganic compounds

CAS No.	Compound	Oral reference dose (mg/kg/d)	Inhalation reference concentration (mg/m^3)	Oral slope factor $(mg/kg/d)^{-1}$	Inhalation slope factor $(mg/kg/d)^{-1}$
7429-90-5	Aluminum				
7440-36-0	Antimony	4.00E-04[a]			
7440-38-2	Arsenic	3.00E-04[a]		1.75E+00[a]	5.00E+01[b]
7440-39-3	Barium	7.00E-02[a]	5.00E-04[b]		
7440-41-7	Beryllium	5.00E-03[a]		4.30E+00[a]	8.40E+00[b]
7440-42-8	Boron	9.00E-02[a]	2.00E-02[b]		
7440-43-9	Cadmium	5.00E-04[a]			6.10E+00[b]
18540-29-9	Chromium	5.00E-03[a]			4.10E+01[b]
7440-50-8	Copper	3.70E-02[c]			
57-12-5	Cyanide	2.00E-02[a]			
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese	1.00E-01[a]	4.00E-04[a]		
7439-97-6	Mercury	3.00E-04[b]	3.00E-04[b]		
7439-98-7	Molybdenum	5.00E-03[b]			
7440-02-0	Nickel	2.00E-02[a]			8.40E-01[a]
7782-49-2	Selenium	5.00E-03[a]			
7440-22-4	Silver	5.00E-03[a]			
7440-24-6	Strontium	8.80E-01[b]			
7440-28-0	Thallium	7.00E-05[c]			
7440-31-5	Tin	6.00E-01[c]			
7440-61-1	Uranium	3.00E-03[a]			
7440-62-2	Vanadium	7.00E-03[b]			
7440-66-6	Zinc	2.00E-01[b]			

[a]USEPA 1992. Health Effects Assessment Summary Tables FY-1992. OHEA ECAO-CIN-821. EPA Office of Research and Development and Office of Emergency and Remedial Response, Washington, D.C.

[b]ORNL 1992. Toxicity Values from the U.S. Environmental Protection Agency Integrated Risk Information System and Health Effects Assessment Summary Table. Health and Safety Research Division, Oak Ridge, TN.

[c]Estimated value

Table E.4. Reference doses and slope (cancer potency) factors for organic compounds

CAS No.	Compound	Oral reference dose (mg/kg/d)	Inhalation reference concentration (mg/m^3)	Oral slope factor $(mg/kg/d)^{-1}$	Inhalation slope factor $(mg/kg/d)^{-1}$
71-55-6	1,1,1-Trichloroethane	9.00E-02[b]	1.00E+00[b]		
79-34-5	1,1,2,2-Tetrachloroethane			2.00E-01[a]	2.00E-01[b]
79-00-5	1,1,2-Trichloroethane	4.00E-03[a]		5.70E-02[a]	5.70E-02[b]
75-34-3	1,1-Dichloroethane	1.00E-01[b]	5.00E-01[b]		
75-35-4	1,1-Dichloroethylene	9.00E-03[a]		6.00E-01[a]	1.20E+00[b]
120-82-1	1,2,4-Trichlorobenzene	1.00E-02[b]	9.00E-03[b]		
95-50-1	1,2-Dichlorobenzene	9.00E-02[b]	2.00E-01[b]		
107-06-2	1,2-Dichloroethane			9.10E-02[a]	9.10E-02[b]
156-59-2	1,2-Dichloroethene (total)	1.00E-02[b]			
78-87-5	1,2-Dichloropropane		4.00E-03[a]	6.80E-02[b]	
541-73-1	1,3-Dichlorobenzene				
106-46-7	1,4-Dichlorobenzene		7.00E-01[b]	2.40E-02[b]	
95-95-4	2,4,5-Trichlorophenol	1.00E-01[a]			
88-06-2	2,4,6-Trichlorophenol			1.10E-02[a]	1.00E-02[b]
120-83-2	2,4-Dichlorophenol	3.00E-03[a]			
105-67-9	2,4-Dimethylphenol	2.00E-02[a]			
51-28-5	2,4-Dinitrophenol	2.00E-03[a]			
121-14-2	2,4-Dinitrotoluene			6.80E-01[b]	
606-20-2	2,6-Dinitrotoluene			6.80E-01[b]	
91-58-7	2-Chloronaphthalene	8.00E-02[a]			
95-57-8	2-Chlorophenol	5.00E-03[a]			
591-78-6	2-Hexanone				
91-57-6	2-Methylnaphthalene				
95-48-7	2-Methylphenol	5.00E-02[a]			
88-74-4	2-Nitroaniline				
88-75-5	2-Nitrophenol				
91-94-1	3,3'-Dichlorobenzidine			4.50E-01[a]	
99-09-2	3-Nitroaniline				
72-54-8	4,4'-DDD			2.40E-01[a]	
72-55-9	4,4'-DDE			3.40E-01[a]	
50-29-3	4,4'-DDT	5.00E-04[a]		3.40E-01[a]	3.40E-01[b]
534-52-1	4,6-Dinitro-2-methylphenol	1.00E-04[c]			
101-55-3	4-Bromophenyl-phenylether				

Table E.4 (continued)

CAS No.	Compound	Oral reference dose (mg/kg/d)	Inhalation reference concentration (mg/m^3)	Oral slope factor $(mg/kg/d)^{-1}$	Inhalation slope factor $(mg/kg/d)^{-1}$
59-50-7	4-Chloro-3-methylphenol				
106-47-8	4-Chloroaniline	4.00E-03[a]		3.50E-02[c]	
7005-72-3	4-Chlorophenyl-phenylether				
108-10-1	4-Methyl-2-pentanone	5.00E-02[b]	8.00E-02[b]		
106-44-5	4-Methylphenol	5.00E-02[b]			
100-01-6	4-Nitroaniline				
100-02-7	4-Nitrophenol				
83-32-9	Acenaphthene	6.00E-02[a]		1.15E+01[c]	
208-96-8	Acenaphthylene			1.15E+01[c]	
67-64-1	Acetone	1.00E-01[a]			
309-00-2	Aldrin	3.00E-05[b]		1.70E+01[a]	1.70E+01[b]
319-84-6	Alpha-BHC			6.30E+00[a]	6.30E+00[b]
120-12-7	Anthracene	3.00E-01[a]		7.30E+00[c]	
11097-69-1	Aroclor-1254			7.70E+00[c]	
11096-82-5	Aroclor-1260			7.70E+00[c]	
71-43-2	Benzene			2.90E-02[a]	2.90E-02[b]
92-87-5	Benzidine	3.00E-03[a]		2.30E+02[a]	2.30E+02[a]
56-55-3	Benzo(a)anthracene			7.30E-01[c]	
50-32-8	Benzo(a)pyrene			7.30E+00[a]	6.10E+00[b]
205-99-2	Benzo(b)fluoranthene			7.30E-01[c]	
191-24-2	Benzo(g,h,i)perylene			7.30E+00[c]	
207-08-9	Benzo(k)fluoranthene			7.30E-01[c]	
65-85-0	Benzoic acid	4.00E+00[a]			
100-51-6	Benzyl alcohol	3.00E-01[b]			
319-85-7	Beta-BHC			1.80E+00[a]	1.80E+00[b]
111-91-1	Bis(2-chloroethoxy)methane				
111-44-4	Bis(2-chloroethyl)ether			1.10E+00[a]	1.10E+00[b]
108-60-1	Bis(2-chloroisopropyl)ether	4.00E-02[a]		7.00E-02[b]	3.50E-02[b]
117-81-7	Bis(2-ethylhexyl)phthalate	2.00E-02[a]		1.40E-02[a]	
75-25-2	Bromoform	2.00E-02[a]		7.90E-03[a]	3.90E-03[b]
85-68-7	Butylbenzylphthalate	2.00E-01[a]			
75-15-0	Carbon disulfide	1.00E-01[a]	1.00E-02[b]		
56-23-5	Carbon tetrachloride	7.00E-04[a]		1.30E-01[a]	5.30E-02[b]

Table E.4 (continued)

CAS No.	Compound	Oral reference dose (mg/kg/d)	Inhalation reference concentration (mg/m^3)	Oral slope factor $(mg/kg/d)^{-1}$	Inhalation slope factor $(mg/kg/d)^{-1}$
108-90-7	Chlorobenzene	2.00E-02[a]	2.00E-02[b]		
57-74-9	Chlordane	6.00E-05[a]		1.30E+00[a]	1.30E+00[b]
124-48-1	Chlorodibromomethane	2.00E-02[a]		8.40E-02[a]	
75-00-3	Chloroethane		1.00E+01[a]		
67-66-3	Chloroform	1.00E-02[a]		6.10E-03[a]	8.10E-02[b]
74-87-3	Chloromethane			1.30E-02[b]	6.30E-03[b]
218-01-9	Chrysene			7.30E-02[c]	
10061-01-5	Cis-1,3-Dichloropropene	3.00E-04[c]		1.80E-01[c]	1.30E-01[c]
319-86-8	Delta-BHC				
84-74-2	Di-n-butylphthalate	1.00E-01[b]			
117-84-0	Di-n-octylphthalate	2.00E-02[b]			
53-70-3	Dibenz(a,h)anthracene			1.15E+01[c]	
132-64-9	Dibenzofuran				
75-27-4	Dichlorobromomethane	2.00E-02[a]		1.30E-01[a]	
60-57-1	Dieldrin	5.00E-05[a]		1.60E+01[a]	1.60E+01[b]
84-66-2	Diethylphthalate	8.00E-01[a]			
131-11-3	Dimethylphthalate	1.00E+00[b]			
959-98-8	Endosulfan I	5.00E-05[c]			
33213-65-9	Endosulfan II	5.00E-05[c]			
1031-07-8	Endosulfan sulfate				
72-20-8	Endrin	3.00E-04[a]			
100-41-4	Ethylbenzene	1.00E-01[a]	1.00E+00[a]		
206-44-0	Fluoranthene	4.00E-02[a]		7.30E+00[c]	
86-73-7	Fluorene	4.00E-02[a]		1.15E+01[c]	
58-89-9	Gamma-BHC (Lindane)	3.00E-04[a]		1.30E+00[b]	
76-44-8	Heptachlor	5.00E-04[a]		4.50E+00[a]	4.50E+00[b]
1024-57-3	Heptachlor epoxide	1.30E-05[a]		9.10E+00[a]	9.10E+00[b]
118-74-1	Hexachlorobenzene	8.00E-04[a]		1.60E+00[a]	1.60E+00[b]
87-68-3	Hexachlorobutadiene	2.00E-03[a]		7.80E-02[a]	7.80E-02[b]
77-47-4	Hexachlorocyclopentadiene	7.00E-03[a]	7.00E-05[b]		
67-72-1	Hexachloroethane	1.00E-03[a]		1.40E-02[a]	1.40E-02[b]
193-39-5	Indeno(1,2,3-cd)pyrene			7.30E-01[c]	
78-59-1	Isophorone	2.00E-01[a]		4.10E-03[a]	

Table E.4 (continued)

CAS No.	Compound	Oral reference dose (mg/kg/d)	Inhalation reference concentration (mg/m^3)	Oral slope factor $(mg/kg/d)^{-1}$	Inhalation slope factor $(mg/kg/d)^{-1}$
72-43-5	Methoxychlor	5.00E-03[a]			
74-83-9	Methyl bromide	1.40E-03[a]	5.00E-03[a]		
75-09-2	Methylene chloride	6.00E-02[a]	3.00E+00[b]	7.50E-03[a]	
621-64-7	N-Nitroso-di-n-propylamine			7.00E+00[a]	
62-75-9	N-Nitrosodimethylamine			5.10E+01[a]	5.10E+01[b]
86-30-6	N-Nitrosodiphenylamine			4.90E-03[a]	
91-20-3	Naphthalene	4.00E-02[b]			
98-95-3	Nitrobenzene	5.00E-04[a]	2.00E-03[b]		
87-86-5	Pentachlorophenol	3.00E-02[a]		1.20E-01[a]	
85-01-8	Phenanthrene			7.30E+00[c]	
108-95-2	Phenol	6.00E-01[a]			
129-00-0	Pyrene	3.00E-02[a]		7.30E+00[c]	
100-42-5	Styrene	2.00E-01[a]		3.00E-02[c]	2.00E-03[c]
127-18-4	Tetrachloroethylene	1.00E-02[a]		5.10E-02[c]	
108-88-3	Toluene	2.00E-01[a]	4.00E-01[b]		
8001-35-2	Toxaphene			1.10E+00[a]	1.10E+00[b]
156-60-5	Trans-1,2-dichloroethene	2.00E-02[a]			
10061-02-6	Trans-1,3-dichloropropene	3.00E-04[c]		1.80E-01[c]	1.30E-01[c]
79-01-6	Trichloroethylene			1.10E-02[c]	1.70E-02[c]
75-69-4	Trichlorofluoromethane	3.00E-01[a]	7.00E-01[b]		
108-05-4	Vinyl acetate	1.00E+00[b]	2.00E-01[a]		
75-01-4	Vinyl chloride			1.90E+00[b]	3.00E-01[b]
1330-20-7	Xylene	2.00E+00[a]			

[a]USEPA 1992. Health Effects Assessment Summary Tables FY-1992. OHEA ECAO-CIN-821. EPA Office of Research and Development and Office of Emergency and Remedial Response, Washington, D.C.

[b]ORNL 1992. Toxicity Values from the U.S. Environmental Protection Agency Integrated Risk Information System and Health Effects Assessment Summary Table. Health and Safety Research Division, Oak Ridge, TN.

[c]Estimated value

Table E.5. Slope (cancer potency) factors for radionuclides[a]

CAS No.	Radionuclide	External exposure slope factor (kg/Bq)	Oral slope factor (1/Bq)	Inhalation slope factor (1/Bq)
14596-10-2	Am-241	1.30E-10	6.50E-09	8.60E-07
13981-15-2	Cm-244	8.10E-13	4.30E-09	5.90E-07
10198-40-0	Co-60	2.30E-07	4.10E-10	4.10E-09
10045-97-3	Cs-137	5.40E-08	7.60E-10	5.10E-10
10028-17-8	H-3		1.50E-12	2.10E-12
13994-20-2	Np-237	1.20E-08	5.90E-09	7.80E-07
14119-24-5	Os-191	2.30E-09	1.80E-11	9.70E-11
15100-28-4	Pa-234	1.60E-07	1.80E-11	1.50E-11
13981-16-3	Pu-238	7.60E-13	5.90E-09	1.10E-06
15117-48-3	Pu-239	4.60E-13	6.20E-09	1.00E-06
10098-97-2	Sr-90		9.70E-10	1.70E-09
14133-76-7	Tc-99	1.60E-13	3.50E-11	2.20E-10
14274-82-9	Th-228	1.50E-07	1.50E-09	2.10E-06
15065-10-8	Th-234	9.50E-11	1.10E-10	8.60E-10
13966-29-5	U-234	8.10E-13	4.30E-10	7.00E-07
15117-96-1	U-235	6.50E-09	4.30E-10	6.80E-07
13982-70-2	U-236	6.50E-13	4.10E-10	6.80E-07
7440-61-1	U-238	9.70E-10	7.60E-10	1.40E-06

[a]USEPA 1992. Health Effects Assessment Summary Tables FY-1992. OHEA ECAO-CIN-821. EPA Office of Research and Development and Office of Emergency and Remedial Response, Washington, D.C.

Table E.6 Summary of carcinogens in the secondary pathways identified as low priority for further investigation

Contaminant Type	Contaminant	Reach 1	2	3	4	5	10
Organics							
	4,4'-DDD	G V	N	N	N	N	N
	4,4'-DDT	G H V	N	N	N	N	N
	Aroclor-1254	N			G	N	N
	Benzo(a)anthracene	G	G	G	N	N	N
	Benzo(a)pyrene	N	H	H	N	N	N
	Benzo(b)fluoranthene	N	G	G V	N	N	N
	Benzo(k)fluoranthene	G V	N	G V	N	N	N
	Bis(2-ethylhexyl)phthalate	N	G M L V	G M L V	G M L V	G M L V	G M L V
	Chrysene	G M L V	G M L V	G M L V	N	N	G
	Indeno(1,2,3-cd)pyrene	N	G V	N	N	N	N
	Toxaphene	N	H	N	N	N	N
Inorganics							
	Arsenic	H M L	H L	L	H M L	H M L	H M L
	Beryllium	H L	H L	H L	H L	H L	H L
	Cadmium	H	H	H	H	H	H

Table E.6 (continued)

Contaminant Type	Contaminant	Reach 1	2	3	4	5	10
Inorganics (cont.)							
	Chromium		H				
	Nickel	H	H	H	H	H	H
Radionuclides							
	Am-241	S	X G H M L V	X G H M L V	X G H M L V	X G H M L V	X G H M L V
	Cm-243,244	S	X G H M L V	X G H M L V	X G H M L V	X G H M L V	X G H M L V
	Co-60	G H M L V	G H M L V	G H M L V	G H M L V	G H M L V	N N N N N
	Cs-137	G H	G H	G H	H	G H	G H
	Pu-238	S	X G H M L V	X G H M L V	X G H M L V	X G H M L V	X G H M L V
	Pu-239,240	S	X G H M L V	X G H M L V	X G H M L V	X G H M L V	X G H M L V

Table E.6 (continued)

Contaminant Type	Contaminant	Reach 1	2	3	4	5	10
	Sr-90	S	G H M	G H M L	G H M	G H M	G H M L
	U-234	S	X G H M L V	X G H L V	X G H M L V	X G H M L V	X G H M L V
	U-235	S	X G H M L V	X G H M L V	X G H M L V	X G H M L V	X G H M L V
	U-238	S	X G H M L V	G H L V	X G H M L V	X G H M L V	X G H M L V

X	Carcinogens having conservative screening indices < 10^{-6} for direct external exposure to radionuclides in dredged sediment.
G	Carcinogens having conservative screening indices < 10^{-6} for direct ingestion of dredged sediment.
H	Carcinogens having conservative screening indices < 10^{-6} for inhalation of air contaminated by dredged sediment.
M	Carcinogens having conservative screening indices < 10^{-6} for ingestion of meat.
L	Carcinogens having conservative screening indices < 10^{-6} for ingestion of milk.
V	Carcinogens having conservative screening indices < 10^{-6} for ingestion of vegetables grown in dredged sediment.
N	Nondetects - contaminant concentrations were below detection limits.
S	No data available.

Table E.7 Summary of noncarcinogens in the secondary pathways identified as low priority for further investigation

Contaminant Type	Contaminant	Reach 1	2	3	4	5	10
Organics							
	4,4'-DDT	G M L V	N	N	N	N	N
	Anthracene	N	N	G M L V	N	N	G M L V
	Bis(2-ethylhexyl)phthalate	N	G M L V	G M L V	G M L V	G M L V	G M L V
	Di-n-butylphthalate	N	G M L V	G M L V	N	N	N
	Diethylphthalate	N	G M L V	N	N	N	N
	Dimethylphthalate	N	N	G M L V	N	N	N
	Fluoranthene	G M L V	G M L V	G M L V	G M L V	N	G M L V
	Naphthalene	N	G M L V	G M L V	N	N	N
	Pyrene	G M L V	G M L V	G M L V	G M L V	N	G M L V

Table E.7 (continued)

Contaminant Type	Contaminant	Reach 1	2	3	4	5	10
Inorganics							
	Antimony	N	S	G M L V	G M L V	G M L V	G M L V
	Arsenic	G M L	G M L	M L	G M L	G M L V	G M L V
	Beryllium	G M L V	G M L V	G M L V	G M L V	G M L V	G M L V
	Cadmium	G M	G M	G M	G	G	G M
	Chromium	G L	G L V	G	G L	G	G L
	Copper	G	L G V	G	G		G V
	Mercury	G H L	G H L	G H L	G H	G H	G H L M
	Nickel	G M L	G M L	G M L	G M L	G M L	G M L
	Selenium	G L V	G L V	G	G V	N	N
	Silver	G M L V	G M L V	G M V	G M	G M V	
	Thallium	N	N	G	N	N	N

Table E.7 (continued)

Contaminant Type	Contaminant	Reach 1	2	3	4	5	10
	Uranium	S	G M L V	G L V	G M L V	M L V	G M L V
	Zinc	G	G	G	G	G	G

X	Noncarcinogens having conservative screening indices < 0.1 for direct external exposure to radionuclides in dredged sediment.
G	Noncarcinogens having conservative screening indices < 0.1 for direct ingestion of dredged sediment.
H	Noncarcinogens having conservative screening indices < 0.1 for inhalation of air contaminated by dredged sediment.
M	Noncarcinogens having conservative screening indices < 0.1 for ingestion of meat.
L	Noncarcinogens having conservative screening indices < 0.1 for ingestion of milk.
V	Noncarcinogens having conservative screening indices < 0.1 for ingestion of vegetables grown in dredged sediment.
N	Nondetects - contaminant concentrations were below detection limits.
S	No data available.

Table E.8 Results of adult nonconservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
					Bq/kg	1/Bq	Bq/life	
1	Fish Ingestion	Radionuclides	Cs-137	14/28	9.30E-01 (G M)	7.6E-10	7.7E+01	5.9E-08
			Co-60	1/28	2.09E-01 (G M)	4.1E-10	1.7E+01	7.1E-09
			Sr-90	8/8	3.70E-02 (G M)	9.7E-10	3.1E+00	3.0E-09
			TOTAL					6.9E-08
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Inorganics	Arsenic	17/28	6.16E-02 (G M)	1.8E+00	2.9E-06	5.0E-06
			Beryllium	4/25	1.47E-03 (G M)	4.3E+00	6.8E-08	2.9E-07
			TOTAL					5.3E-06
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Aroclor-1260	16/16	2.46E-01 (G M)	7.7E+00	1.1E-05	8.8E-05
			Aroclor-1254	13/16	3.33E-02 (G M)	7.7E+00	1.5E-06	1.2E-05
			Chlordane	11/16	1.65E-02 (G M)	1.3E+00	7.6E-07	9.9E-07
			4,4'-DDE	8/16	5.30E-03 (G M)	3.4E-01	2.5E-07	8.3E-08
			4,4'-DDD	5/15	8.49E-04 (G M)	2.4E-01	3.9E-08	9.4E-09
			TOTAL					1.0E-04
1	Fish Ingestion							1.1E-04
					Bq/kg	1/Bq	Bq/yr	
	Sed. Exposure	Radionuclides	Cs-137	4/4	8.49E+00 (G M)	5.4E-08	1.8E+00	1.0E-07
			Co-60	4/4	2.34E+00 (G M)	2.3E-07	1.9E-01	4.3E-08
			TOTAL					1.4E-07
1	Sed. Exposure							1.4E-07
					Bq/kg	1/Bq	Bq/life	

Table E.8 Results of adult nonconservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
1	Sed. Ingestion	Radionuclides	Cs-137	4/4	8.49E+00 (G M)	7.6E-10	9.3E-01	7.1E-10
			Co-60	4/4	2.34E+00 (G M)	4.1E-10	2.6E-01	1.0E-10
			TOTAL					8.1E-10
1	Sed. Ingestion							8.1E-10
					Bq/L	1/Bq	Bq/life	
	Water Ingestion	Radionuclides	Sr-90	4/4	2.64E-02 (G M)	9.7E-10	5.8E+01	5.6E-08
			U-234	1/1	1.50E-02 (G M)	4.3E-10	3.3E+01	1.4E-08
			Pu-239	1/1	1.00E-03 (G M)	6.2E-09	2.2E+00	1.4E-08
			Cs-137	1/4	7.12E-03 (G M)	7.6E-10	1.6E+01	1.2E-08
			U-238	1/1	6.00E-03 (G M)	7.6E-10	1.3E+01	1.0E-08
			Co-60	1/4	9.57E-03 (G M)	4.1E-10	2.1E+01	8.6E-09
			U-235	1/1	3.00E-03 (G M)	4.3E-10	6.6E+00	2.8E-09
			TOTAL					1.2E-07
					mg/L	1/(mg/kg/d)	mg/kg/d	
		Inorganics	Beryllium	1/4	2.68E-03 (G M)	4.3E+00	3.3E-06	1.4E-05
			Arsenic	1/5	5.04E-03 (G M)	1.8E+00	6.2E-06	1.1E-05
			TOTAL					2.5E-05
1	Water Ingestion							2.5E-05
1								1.3E-04
					Bq/kg	1/Bq	Bq/life	
2	Fish Ingestion	Radionuclides	Cs-137	23/27	9.13E+00 (G M)	7.6E-10	7.6E+02	5.7E-07
			Sr-90	6/6	1.53E-01 (G M)	9.7E-10	1.3E+01	1.2E-08

Table E.8 Results of adult nonconservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
			TOTAL					5.9E-07
					mg/kg	1/(mg/kg/d)	mg/kg/d	
2	Fish Ingestion	Inorganics	Arsenic	5/13	3.80E-02 (G M)	1.8E+00	1.8E-06	3.1E-06
			TOTAL					3.1E-06
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Aroclor-1260	14/14	6.69E-01 (G M)	7.7E+00	3.1E-05	2.4E-04
			Aroclor-1254	9/10	1.21E-01 (G M)	7.7E+00	5.6E-06	4.3E-05
			Chlordane	9/14	1.14E-02 (G M)	1.3E+00	5.3E-07	6.9E-07
			Aldrin	2/14	1.28E-04 (G M)	1.7E+01	6.0E-09	1.0E-07
			4,4'-DDE	6/13	5.29E-03 (G M)	3.4E-01	2.5E-07	8.3E-08
			4,4'-DDT	2/13	4.67E-04 (G M)	3.4E-01	2.2E-08	7.4E-09
			TOTAL					2.8E-04
2	Fish Ingestion							2.9E-04
					Bq/kg	1/Bq	Bq/yr	
	Sed. Exposure	Radionuclides	Cs-137	46/46	6.64E+01 (G M)	5.4E-08	1.4E+01	7.8E-07
			Co-60	44/46	3.21E+00 (G M)	2.3E-07	2.5E-01	5.8E-08
			TOTAL					8.4E-07
2	Sed. Exposure							8.4E-07
					Bq/kg	1/Bq	Bq/life	
	Sed. Ingestion	Radionuclides	Cs-137	46/46	6.64E+01 (G M)	7.6E-10	7.3E+00	5.5E-09
			Co-60	44/46	3.21E+00 (G M)	4.1E-10	3.5E-01	1.4E-10
			TOTAL					5.7E-09

Table E.8 Results of adult nonconservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
2	Sed. Ingestion							5.7E-09
					Bq/L	1/Bq	Bq/life	
2	Water Ingestion	Radionuclides	H-3	2/2	5.79E+02 (G M)	1.5E-12	1.3E+06	1.9E-06
			Np-237	1/1	1.18E-01 (G M)	5.9E-09	2.6E+02	1.5E-06
			Sr-90	4/4	6.20E-01 (G M)	9.7E-10	1.4E+03	1.3E-06
			Th-228	1/1	3.55E-01 (G M)	1.5E-09	7.8E+02	1.2E-06
			U-234	1/1	1.90E-01 (G M)	4.3E-10	4.2E+02	1.8E-07
			Os-191	1/1	3.30E+00 (G M)	1.8E-11	7.2E+03	1.3E-07
			Th-234	1/1	3.97E-01 (G M)	1.1E-10	8.7E+02	9.6E-08
			Tc-99	1/1	1.04E+00 (G M)	3.5E-11	2.3E+03	8.0E-08
			U-238	1/1	3.40E-02 (G M)	7.6E-10	7.4E+01	5.7E-08
			U-235	2/2	5.76E-02 (G M)	4.3E-10	1.3E+02	5.4E-08
			Cs-137	4/5	2.36E-02 (G M)	7.6E-10	5.2E+01	3.9E-08
			Co-60	2/4	1.49E-02 (G M)	4.1E-10	3.3E+01	1.3E-08
			Pa-234	1/1	1.51E-01 (G M)	1.8E-11	3.3E+02	6.0E-09
			Pu-238	3/3	1.75E-05 (G M)	5.9E-09	3.8E-02	2.3E-10
			TOTAL					6.6E-06
					mg/L	1/(mg/kg/d)	mg/kg/d	
		Organics	Tetrachloroethylene	1/3	4.92E-03 (G M)	5.1E-02	6.0E-06	3.1E-07
			1,2-Dichloropropane	1/3	3.65E-03 (G M)	6.8E-02	4.5E-06	3.0E-07
			Chloroform	1/2	4.47E-03 (G M)	6.1E-03	5.5E-06	3.3E-08
			Methylene chloride	2/3	2.79E-03 (G M)	7.5E-03	3.4E-06	2.6E-08
			TOTAL					6.7E-07
2	Water Ingestion							7.2E-06
2								2.9E-04

Table E.8 Results of adult nonconservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
					Bq/kg	1/Bq	Bq/life	
3	Fish Ingestion	Radionuclides	Cs-137	26/54	1.78E+00 (G M)	7.6E-10	1.5E+02	1.1E-07
			Sr-90	28/28	8.97E-02 (G M)	9.7E-10	7.4E+00	7.2E-09
			Co-60	1/54	1.42E-01 (G M)	4.1E-10	1.2E+01	4.8E-09
			TOTAL					1.2E-07
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Inorganics	Arsenic	19/35	5.31E-02 (G M)	1.8E+00	2.5E-06	4.3E-06
			Beryllium	7/35	9.22E-04 (G M)	4.3E+00	4.3E-08	1.8E-07
			TOTAL					4.5E-06
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Aroclor-1260	36/36	3.91E-01 (G M)	7.7E+00	1.8E-05	1.4E-04
			Aroclor-1254	31/31	9.90E-02 (G M)	7.7E+00	4.6E-06	3.5E-05
			Chlordane	34/34	3.99E-02 (G M)	1.3E+00	1.8E-06	2.4E-06
			Bis(2-ethylhexyl)phthalate	1/33	4.71E-02 (G M)	1.4E-02	2.2E-06	3.1E-08
			4,4'-DDE	34/34	1.04E-03 (G M)	3.4E-01	4.8E-08	1.6E-08
			4,4'-DDD	2/34	3.00E-04 (G M)	2.4E-01	1.4E-08	3.3E-09
			TOTAL					1.8E-04
3	Fish Ingestion							1.8E-04
					Bq/kg	1/Bq	Bq/yr	
	Sed. Exposure	Radionuclides	Cs-137	3/3	2.55E+01 (G M)	5.4E-08	5.5E+00	3.0E-07
			Co-60	3/3	1.76E+00 (G M)	2.3E-07	1.4E-01	3.2E-08
			TOTAL					3.3E-07
3	Sed. Exposure							3.3E-07

Table E.8 Results of adult nonconservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
					Bq/kg	1/Bq	Bq/life	
3	Sed. Ingestion	Radionuclides	Cs-137	3/3	2.55E+01 (G M)	7.6E-10	2.8E+00	2.1E-09
			Co-60	3/3	1.76E+00 (G M)	4.1E-10	1.9E-01	7.9E-11
			TOTAL					2.2E-09
3	Sed. Ingestion							2.2E-09
					Bq/L	1/Bq	Bq/life	
	Water Ingestion	Radionuclides	Th-228	3/3	4.91E+01 (G M)	1.5E-09	1.1E+05	1.6E-04
			Th-234	7/7	5.87E+00 (G M)	1.1E-10	1.3E+04	1.4E-06
			Np-237	7/7	4.84E-02 (G M)	5.9E-09	1.1E+02	6.3E-07
			Pu-238	7/7	2.42E-02 (G M)	5.9E-09	5.3E+01	3.1E-07
			Pa-234	7/7	7.61E+00 (G M)	1.8E-11	1.7E+04	3.0E-07
			U-234	6/6	2.59E-01 (G M)	4.3E-10	5.7E+02	2.4E-07
			Tc-99	8/8	3.04E+00 (G M)	3.5E-11	6.7E+03	2.3E-07
			U-238	6/6	1.38E-01 (G M)	7.6E-10	3.0E+02	2.3E-07
			Pu-239	7/7	4.36E-03 (G M)	6.2E-09	9.5E+00	5.9E-08
			Cs-137	8/11	2.07E-02 (G M)	7.6E-10	4.5E+01	3.4E-08
			Sr-90	4/4	7.40E-03 (G M)	9.7E-10	1.6E+01	1.6E-08
			U-235	7/7	1.42E-02 (G M)	4.3E-10	3.1E+01	1.3E-08
			U-236	6/6	3.00E-03 (G M)	4.1E-10	6.6E+00	2.7E-09
			TOTAL					1.6E-04
					mg/L	1/(mg/kg/d)	mg/kg/d	
		Inorganics	Arsenic	3/10	3.47E-03 (G M)	1.8E+00	4.2E-06	7.4E-06
			Beryllium	2/10	1.37E-03 (G M)	4.3E+00	1.7E-06	7.2E-06
			TOTAL					1.5E-05
					mg/L	1/(mg/kg/d)	mg/kg/d	
		Organics	Pyrene	1/8	1.00E-02 (G M)	7.3E+00	1.2E-05	9.0E-05
			Fluoranthene	1/8	1.00E-02 (G M)	7.3E+00	1.2E-05	9.0E-05
			Anthracene	1/8	1.00E-02 (G M)	7.3E+00	1.2E-05	9.0E-05

Table E.8 Results of adult nonconservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
3	Water Ingestion	Organics	Phenanthrene	1/8	1.00E-02 (G M)	7.3E+00	1.2E-05	9.0E-05
			N-Nitroso-di-n-propylamine	1/8	1.00E-02 (G M)	7.0E+00	1.2E-05	8.6E-05
			Vinyl chloride	2/5	9.25E-03 (G M)	1.9E+00	1.1E-05	2.2E-05
			Aroclor-1254	2/3	1.00E-03 (G M)	7.7E+00	1.2E-06	9.4E-06
			Benzo(a)anthracene	1/8	1.00E-02 (G M)	7.3E-01	1.2E-05	9.0E-06
			1,1-Dichloroethylene	2/5	4.91E-03 (G M)	6.0E-01	6.0E-06	3.6E-06
			Trans-1,3-dichloropropene	1/5	5.00E-03 (G M)	1.8E-01	6.1E-06	1.1E-06
			Chrysene	1/8	1.00E-02 (G M)	7.3E-02	1.2E-05	9.0E-07
			Dichlorobromomethane	2/5	4.86E-03 (G M)	1.3E-01	6.0E-06	7.7E-07
			1,2-Dichloroethane	1/5	5.08E-03 (G M)	9.1E-02	6.2E-06	5.7E-07
			Chlorodibromomethane	1/5	5.00E-03 (G M)	8.4E-02	6.1E-06	5.1E-07
			1,4-Dichlorobenzene	1/9	8.98E-03 (G M)	2.4E-02	1.1E-05	2.6E-07
			Tetrachloroethylene	3/5	3.87E-03 (G M)	5.1E-02	4.7E-06	2.4E-07
			Benzene	2/5	4.98E-03 (G M)	2.9E-02	6.1E-06	1.8E-07
			Bis(2-ethylhexyl)phthalate	2/8	1.01E-02 (G M)	1.4E-02	1.2E-05	1.7E-07
			Trichloroethylene	3/5	5.23E-03 (G M)	1.1E-02	6.4E-06	7.0E-08
			Bromoform	1/5	5.01E-03 (G M)	7.9E-03	6.1E-06	4.8E-08
			Methylene chloride	3/5	4.84E-03 (G M)	7.5E-03	5.9E-06	4.4E-08
			Chloroform	3/5	3.46E-03 (G M)	6.1E-03	4.2E-06	2.6E-08
			TOTAL					4.9E-04
3	Water Ingestion							6.7E-04
3								8.5E-04
					Bq/kg	1/Bq	Bq/life	
4	Fish Ingestion	Radionuclides	Cs-137	28/40	3.32E+00 (G M)	7.6E-10	2.8E+02	2.1E-07
			Sr-90	10/10	8.47E-02 (G M)	9.7E-10	7.0E+00	6.8E-09
			TOTAL					2.2E-07
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Inorganics	Arsenic	25/27	8.79E-02 (G M)	1.8E+00	4.1E-06	7.1E-06

Table E.8 Results of adult nonconservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
			TOTAL					7.1E-06
					mg/kg	1/(mg/kg/d)	mg/kg/d	
4	Fish Ingestion	Organics	Aroclor-1260	17/18	4.33E-01 (G M)	7.7E+00	2.0E-05	1.5E-04
			Aroclor-1254	15/18	5.44E-02 (G M)	7.7E+00	2.5E-06	1.9E-05
			Chlordane	18/18	2.84E-02 (G M)	1.3E+00	1.3E-06	1.7E-06
			Aldrin	2/14	8.49E-04 (G M)	1.7E+01	3.9E-08	6.7E-07
			4,4'-DDE	12/18	1.11E-02 (G M)	3.4E-01	5.1E-07	1.7E-07
			4,4'-DDD	4/18	3.67E-03 (G M)	2.4E-01	1.7E-07	4.1E-08
			4,4'-DDT	1/18	1.58E-03 (G M)	3.4E-01	7.3E-08	2.5E-08
			TOTAL					1.8E-04
4	Fish Ingestion							1.8E-04
					Bq/kg	1/Bq	Bq/yr	
	Sed. Exposure	Radionuclides	Cs-137	93/93	6.57E+01 (G M)	5.4E-08	1.4E+01	7.7E-07
			Co-60	93/95	4.08E+00 (G M)	2.3E-07	3.2E-01	7.4E-08
			TOTAL					8.5E-07
4	Sed. Exposure							8.5E-07
					Bq/kg	1/Bq	Bq/life	
	Sed. Ingestion	Radionuclides	Cs-137	93/93	6.57E+01 (G M)	7.6E-10	7.2E+00	5.5E-09
			Co-60	93/95	4.08E+00 (G M)	4.1E-10	4.5E-01	1.8E-10
			TOTAL					5.7E-09
4	Sed. Ingestion							5.7E-09

Table E.8 Results of adult nonconservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
					Bq/L	1/Bq	Bq/life	
4	Water Ingestion	Radionuclides	Pu-239	4/4	6.50E-02 (G M)	6.2E-09	1.4E+02	8.8E-07
			Pu-238	4/4	4.69E-02 (G M)	5.9E-09	1.0E+02	6.1E-07
			Th-228	1/1	5.18E-02 (G M)	1.5E-09	1.1E+02	1.7E-07
			Th-234	3/3	4.84E-01 (G M)	1.1E-10	1.1E+03	1.2E-07
			Tc-99	3/3	1.09E+00 (G M)	3.5E-11	2.4E+03	8.4E-08
			U-234	1/1	8.24E-02 (G M)	4.3E-10	1.8E+02	7.8E-08
			U-238	1/1	4.41E-02 (G M)	7.6E-10	9.7E+01	7.3E-08
			H-3	1/1	1.68E+01 (G M)	1.5E-12	3.7E+04	5.5E-08
			Sr-90	2/2	1.19E-02 (G M)	9.7E-10	2.6E+01	2.5E-08
			Cs-137	5/6	1.20E-02 (G M)	7.6E-10	2.6E+01	2.0E-08
			Pa-234	3/3	4.33E-01 (G M)	1.8E-11	9.5E+02	1.7E-08
			Co-60	1/3	7.14E-03 (G M)	4.1E-10	1.6E+01	6.4E-09
			U-235	1/1	2.04E-03 (G M)	4.3E-10	4.5E+00	1.9E-09
			U-236	1/1	8.50E-04 (G M)	4.1E-10	1.9E+00	7.6E-10
			TOTAL					2.1E-06
4	Water Ingestion							2.1E-06
4								1.9E-04
					Bq/kg	1/Bq	Bq/life	
5	Fish Ingestion	Radionuclides	Cs-137	19/28	1.55E+00 (G M)	7.6E-10	1.3E+02	9.8E-08
			Sr-90	19/19	7.37E-02 (G M)	9.7E-10	6.1E+00	5.9E-09
			TOTAL					1.0E-07
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Inorganics	Arsenic	23/25	7.46E-02 (G M)	1.8E+00	3.5E-06	6.0E-06
			Beryllium	2/25	1.61E-05 (G M)	4.3E+00	7.4E-10	3.2E-09
			TOTAL					6.1E-06

Table E.8 Results of adult nonconservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
					mg/kg	1/(mg/kg/d)	mg/kg/d	
5	Fish Ingestion	Organics	Aroclor-1260	19/19	3.48E-01 (G M)	7.7E+00	1.6E-05	1.2E-04
			Aroclor-1254	14/17	5.83E-02 (G M)	7.7E+00	2.7E-06	2.1E-05
			Chlordane	18/18	1.06E-02 (G M)	1.3E+00	4.9E-07	6.4E-07
			Aldrin	2/18	4.64E-04 (G M)	1.7E+01	2.2E-08	3.7E-07
			4,4'-DDE	9/18	8.03E-03 (G M)	3.4E-01	3.7E-07	1.3E-07
			4,4'-DDD	12/17	1.55E-03 (G M)	2.4E-01	7.2E-08	1.7E-08
			4,4'-DDT	5/18	7.03E-04 (G M)	3.4E-01	3.3E-08	1.1E-08
			TOTAL					1.5E-04
5	Fish Ingestion							1.5E-04
					Bq/kg	1/Bq	Bq/yr	
	Sed. Exposure	Radionuclides	Cs-137	274/277	1.02E+01 (G M)	5.4E-08	2.2E+00	1.2E-07
			Co-60	116/277	5.35E-01 (G M)	2.3E-07	4.2E-02	9.7E-09
			TOTAL					1.3E-07
5	Sed. Exposure							1.3E-07
					Bq/kg	1/Bq	Bq/life	
	Sed. Ingestion	Radionuclides	Cs-137	274/277	1.02E+01 (G M)	7.6E-10	1.1E+00	8.5E-10
			Co-60	116/277	5.35E-01 (G M)	4.1E-10	5.9E-02	2.4E-11
			TOTAL					8.7E-10
5	Sed. Ingestion							8.7E-10
					Bq/L	1/Bq	Bq/life	
	Water Ingestion	Radionuclides	Sr-90	3/3	2.59E-02 (G M)	9.7E-10	5.7E+01	5.5E-08

Table E.8 Results of adult nonconservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
5	Water Ingestion	Radionuclides	Cs-137	1/3	2.83E-03 (G M)	7.6E-10	6.2E+00	4.7E-09
			TOTAL					6.0E-08
5	Water Ingestion							6.0E-08
5								1.5E-04
					Bq/kg	1/Bq	Bq/life	
10	Fish Ingestion	Radionuclides	Cs-137	9/17	9.34E-01 (G M)	7.6E-10	7.7E+01	5.9E-08
			Sr-90	8/8	5.60E-02 (G M)	9.7E-10	4.6E+00	4.5E-09
			Co-60	1/16	7.60E-02 (G M)	4.1E-10	6.3E+00	2.6E-09
			TOTAL					6.6E-08
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Inorganics	Arsenic	14/15	7.14E-02 (G M)	1.8E+00	3.3E-06	5.8E-06
			Beryllium	1/10	9.70E-06 (G M)	4.3E+00	4.5E-10	1.9E-09
			TOTAL					5.8E-06
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Aroclor-1260	7/8	2.20E-02 (G M)	7.7E+00	1.0E-06	7.8E-06
			Chlordane	8/8	8.32E-03 (G M)	1.3E+00	3.9E-07	5.0E-07
			4,4'-DDE	2/8	2.56E-03 (G M)	3.4E-01	1.2E-07	4.0E-08
			4,4'-DDD	7/8	6.87E-04 (G M)	2.4E-01	3.2E-08	7.6E-09
			TOTAL					8.4E-06
10	Fish Ingestion							1.4E-05
					mg/L	1/(mg/kg/d)	mg/kg/d	

Table E.8 Results of adult nonconservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
10	Water Ingestion	Organics	Bis(2-ethylhexyl)phthalate	1/1	7.50E-03 (G M)	1.4E-02	9.2E-06	1.3E-07
			TOTAL					1.3E-07
10	Water Ingestion							1.3E-07
10								1.4E-05
					Bq/kg	1/Bq	Bq/life	
13	Fish Ingestion	Radionuclides	Cs-137	3/6	1.91E+00 (G M)	7.6E-10	1.6E+02	1.2E-07
			Co-60	1/6	1.82E+00 (G M)	4.1E-10	1.5E+02	6.2E-08
			Sr-90	4/4	6.72E-02 (G M)	9.7E-10	5.6E+00	5.4E-09
			TOTAL					1.9E-07
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Inorganics	Arsenic	4/10	4.51E-02 (G M)	1.8E+00	2.1E-06	3.7E-06
			TOTAL					3.7E-06
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Aroclor-1260	4/4	2.88E-01 (G M)	7.7E+00	1.3E-05	1.0E-04
			Aroclor-1254	2/2	8.72E-02 (G M)	7.7E+00	4.0E-06	3.1E-05
			Chlordane	2/4	1.37E-02 (G M)	1.3E+00	6.3E-07	8.2E-07
			Aldrin	2/3	9.60E-04 (G M)	1.7E+01	4.4E-08	7.6E-07
			4,4'-DDE	2/2	3.87E-03 (G M)	3.4E-01	1.8E-07	6.1E-08
			TOTAL					1.4E-04
13	Fish Ingestion							1.4E-04
					Bq/L	1/Bq	Bq/life	

Table E.8 Results of adult nonconservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
13	Water Ingestion	Radionuclides	Th-228	1/1	4.44E-02 (G M)	1.5E-09	9.7E+01	1.5E-07
			Tc-99	1/1	1.49E+00 (G M)	3.5E-11	3.3E+03	1.1E-07
			Th-234	1/1	6.17E-02 (G M)	1.1E-10	1.4E+02	1.5E-08
			Cs-137	1/2	7.03E-03 (G M)	7.6E-10	1.5E+01	1.2E-08
			Pa-234	1/1	1.76E-01 (G M)	1.8E-11	3.8E+02	6.9E-09
			TOTAL					2.9E-07
13	Water Ingestion							2.9E-07
13								1.4E-04
					Bq/kg	1/Bq	Bq/yr	
18	Sed. Exposure	Radionuclides	Cs-137	22/23	3.66E+00 (G M)	5.4E-08	7.9E-01	4.3E-08
			Co-60	1/23	8.94E-03 (G M)	2.3E-07	7.1E-04	1.6E-10
			TOTAL					4.3E-08
18	Sed. Exposure							4.3E-08
					Bq/kg	1/Bq	Bq/life	
	Sed. Ingestion	Radionuclides	Cs-137	22/23	3.66E+00 (G M)	7.6E-10	4.0E-01	3.0E-10
			Co-60	1/23	8.94E-03 (G M)	4.1E-10	9.8E-04	4.0E-13
			TOTAL					3.0E-10
18	Sed. Ingestion							3.0E-10

Table E.8 Results of adult nonconservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
18								4.3E-08

Table E.9 Results of adult nonconservative screening for noncarcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
					mg/kg	1/(mg/kg/d)	mg/kg/d	
1	Fish Ingestion	Inorganics	Arsenic	17/28	6.16E-02 (G M)	3.0E-04	5.5E-06	1.8E-02
			Mercury	28/28	5.37E-02 (G M)	3.0E-04	4.8E-06	1.6E-02
			Selenium	26/28	7.48E-01 (G M)	5.0E-03	6.7E-05	1.3E-02
			Zinc	28/28	6.59E+00 (G M)	2.0E-01	5.9E-04	3.0E-03
			Beryllium	4/25	1.47E-03 (G M)	5.0E-03	1.3E-07	2.6E-05
			TOTAL					5.1E-02
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Chlordane	11/16	1.65E-02 (G M)	6.0E-05	1.5E-06	2.5E-02
			TOTAL					2.5E-02
1	Fish Ingestion							7.6E-02
					mg/L	1/(mg/kg/d)	mg/kg/d	
	Water Ingestion	Inorganics	Arsenic	1/5	5.04E-03 (G M)	3.0E-04	1.4E-05	4.8E-02
			Antimony	1/4	4.32E-03 (G M)	4.0E-04	1.2E-05	3.1E-02
			Chromium	3/6	7.86E-03 (G M)	5.0E-03	2.2E-05	4.5E-03
			Manganese	1/1	1.44E-01 (G M)	1.0E-01	4.1E-04	4.1E-03
			Cadmium	1/5	7.11E-04 (G M)	5.0E-04	2.0E-06	4.1E-03
			Mercury	2/5	2.39E-04 (G M)	3.0E-04	6.8E-07	2.3E-03
			Nickel	3/6	1.59E-02 (G M)	2.0E-02	4.5E-05	2.3E-03
			Beryllium	1/4	2.68E-03 (G M)	5.0E-03	7.6E-06	1.5E-03
			Barium	1/1	3.30E-02 (G M)	7.0E-02	9.4E-05	1.3E-03
			Selenium	3/6	2.33E-03 (G M)	5.0E-03	6.7E-06	1.3E-03
			Vanadium	1/1	2.48E-03 (G M)	7.0E-03	7.1E-06	1.0E-03
			Copper	2/6	5.13E-03 (G M)	3.7E-02	1.5E-05	4.0E-04
			Strontium	1/1	8.73E-02 (G M)	8.8E-01	2.5E-04	2.8E-04
			Zinc	3/6	7.81E-03 (G M)	2.0E-01	2.2E-05	1.1E-04
			TOTAL					1.0E-01

Table E.9 Results of adult nonconservative screening for noncarcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
1	Water Ingestion							1.0E-01
1								1.8E-01
					mg/kg	1/(mg/kg/d)	mg/kg/d	
2	Fish Ingestion	Inorganics	Mercury	13/13	6.38E-02 (G M)	3.0E-04	5.7E-06	1.9E-02
			Selenium	11/13	7.26E-01 (G M)	5.0E-03	6.5E-05	1.3E-02
			Arsenic	5/13	3.80E-02 (G M)	3.0E-04	3.4E-06	1.1E-02
			Zinc	13/13	5.74E+00 (G M)	2.0E-01	5.2E-04	2.6E-03
			TOTAL					4.6E-02
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Chlordane	9/14	1.14E-02 (G M)	6.0E-05	1.0E-06	1.7E-02
			Aldrin	2/14	1.28E-04 (G M)	3.0E-05	1.2E-08	3.9E-04
			4,4'-DDT	2/13	4.67E-04 (G M)	5.0E-04	4.2E-08	8.4E-05
			TOTAL					1.8E-02
2	Fish Ingestion							6.4E-02
					mg/L	1/(mg/kg/d)	mg/kg/d	
	Water Ingestion	Inorganics	Cyanide	1/1	1.06E-01 (G M)	2.0E-02	3.0E-04	1.5E-02
			Nickel	1/3	2.00E-02 (G M)	2.0E-02	5.7E-05	2.9E-03
			Selenium	1/4	2.37E-03 (G M)	5.0E-03	6.8E-06	1.4E-03
			Barium	2/2	3.04E-02 (G M)	7.0E-02	8.7E-05	1.2E-03
			Manganese	1/1	3.51E-02 (G M)	1.0E-01	1.0E-04	1.0E-03
			Uranium	2/2	7.49E-04 (G M)	3.0E-03	2.1E-06	7.1E-04
			Copper	2/3	5.09E-03 (G M)	3.7E-02	1.5E-05	3.9E-04
			Strontium	1/1	8.90E-02 (G M)	8.8E-01	2.5E-04	2.9E-04
			Zinc	2/3	1.30E-02 (G M)	2.0E-01	3.7E-05	1.9E-04

Table E.9 Results of adult nonconservative screening for noncarcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
			TOTAL					2.3E-02
					mg/L	1/(mg/kg/d)	mg/kg/d	
2	Water Ingestion	Organics	Tetrachloroethylene	1/3	4.92E-03 (G M)	1.0E-02	1.4E-05	1.4E-03
			Chloroform	1/2	4.47E-03 (G M)	1.0E-02	1.3E-05	1.3E-03
			Acetone	1/1	9.45E-03 (G M)	1.0E-01	2.7E-05	2.7E-04
			Carbon disulfide	1/1	4.69E-03 (G M)	1.0E-01	1.3E-05	1.3E-04
			Methylene chloride	2/3	2.79E-03 (G M)	6.0E-02	8.0E-06	1.3E-04
			Toluene	1/3	4.86E-03 (G M)	2.0E-01	1.4E-05	6.9E-05
			Phenol	1/2	1.11E-02 (G M)	6.0E-01	3.2E-05	5.3E-05
			Xylene	1/1	4.75E-03 (G M)	2.0E+00	1.4E-05	6.8E-06
			TOTAL					3.3E-03
2	Water Ingestion							2.6E-02
2								9.0E-02
					mg/kg	1/(mg/kg/d)	mg/kg/d	
3	Fish Ingestion	Inorganics	Mercury	35/35	4.23E-01 (G M)	3.0E-04	3.8E-05	1.3E-01
			Arsenic	19/35	5.31E-02 (G M)	3.0E-04	4.8E-06	1.6E-02
			Selenium	2/35	2.31E-01 (G M)	5.0E-03	2.1E-05	4.2E-03
			Zinc	35/35	5.76E+00 (G M)	2.0E-01	5.2E-04	2.6E-03
			Beryllium	7/35	9.22E-04 (G M)	5.0E-03	8.3E-08	1.7E-05
			TOTAL					1.5E-01
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Chlordane	34/34	3.99E-02 (G M)	6.0E-05	3.6E-06	6.0E-02
			Bis(2-ethylhexyl)phthalate	1/33	4.71E-02 (G M)	2.0E-02	4.2E-06	2.1E-04
			Di-n-octylphthalate	1/33	2.40E-02 (G M)	2.0E-02	2.2E-06	1.1E-04
			TOTAL					6.0E-02

Table E.9 Results of adult nonconservative screening for noncarcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
3	Fish Ingestion							2.1E-01
					mg/L	1/(mg/kg/d)	mg/kg/d	
3	Water Ingestion	Inorganics	Arsenic	3/10	3.47E-03 (G M)	3.0E-04	9.9E-06	3.3E-02
			Cyanide	3/3	9.77E-02 (G M)	2.0E-02	2.8E-04	1.4E-02
			Uranium	8/8	7.18E-03 (G M)	3.0E-03	2.1E-05	6.8E-03
			Molybdenum	1/4	1.08E-02 (G M)	5.0E-03	3.1E-05	6.2E-03
			Chromium	7/12	1.05E-02 (G M)	5.0E-03	3.0E-05	6.0E-03
			Nickel	5/10	3.76E-02 (G M)	2.0E-02	1.1E-04	5.4E-03
			Cadmium	3/11	9.16E-04 (G M)	5.0E-04	2.6E-06	5.2E-03
			Manganese	6/6	1.27E-01 (G M)	1.0E-01	3.6E-04	3.6E-03
			Barium	3/4	6.46E-02 (G M)	7.0E-02	1.8E-04	2.6E-03
			Mercury	5/10	2.67E-04 (G M)	3.0E-04	7.6E-07	2.5E-03
			Silver	4/11	4.27E-03 (G M)	5.0E-03	1.2E-05	2.4E-03
			Selenium	2/11	3.34E-03 (G M)	5.0E-03	9.6E-06	1.9E-03
			Boron	4/4	2.56E-02 (G M)	9.0E-02	7.3E-05	8.1E-04
			Beryllium	2/10	1.37E-03 (G M)	5.0E-03	3.9E-06	7.8E-04
			Copper	6/10	6.10E-03 (G M)	3.7E-02	1.7E-05	4.7E-04
			Zinc	7/11	1.47E-02 (G M)	2.0E-01	4.2E-05	2.1E-04
			Tin	1/3	1.14E-02 (G M)	6.0E-01	3.3E-05	5.4E-05
			TOTAL					9.2E-02
					mg/L	1/(mg/kg/d)	mg/kg/d	
		Organics	Trans-1,3-dichloropropene	1/5	5.00E-03 (G M)	3.0E-04	1.4E-05	4.8E-02
			2,4-Dichlorophenol	1/8	1.00E-02 (G M)	3.0E-03	2.9E-05	9.5E-03
			1,1-Dichloroethylene	2/5	4.91E-03 (G M)	9.0E-03	1.4E-05	1.6E-03
			Bis(2-ethylhexyl)phthalate	2/8	1.01E-02 (G M)	2.0E-02	2.9E-05	1.4E-03
			Tetrachloroethylene	3/5	3.87E-03 (G M)	1.0E-02	1.1E-05	1.1E-03
			Chloroform	3/5	3.46E-03 (G M)	1.0E-02	9.9E-06	9.9E-04
			Pyrene	1/8	1.00E-02 (G M)	3.0E-02	2.9E-05	9.6E-04
			Trans-1,2-dichloroethylene	3/5	5.14E-03 (G M)	2.0E-02	1.5E-05	7.3E-04
			Fluoranthene	1/8	1.00E-02 (G M)	4.0E-02	2.9E-05	7.2E-04
			Bromoform	1/5	5.01E-03 (G M)	2.0E-02	1.4E-05	7.2E-04
			Chlorobenzene	1/5	5.00E-03 (G M)	2.0E-02	1.4E-05	7.1E-04

Table E.9 Results of adult nonconservative screening for noncarcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
3	Water Ingestion	Organics	Chlorodibromomethane	1/5	5.00E-03 (G M)	2.0E-02	1.4E-05	7.1E-04
			Dichlorobromomethane	2/5	4.86E-03 (G M)	2.0E-02	1.4E-05	6.9E-04
			Di-n-butylphthalate	1/8	9.96E-03 (G M)	1.0E-01	2.8E-05	2.8E-04
			Methylene chloride	3/5	4.84E-03 (G M)	6.0E-02	1.4E-05	2.3E-04
			Butylbenzylphthalate	1/8	1.00E-02 (G M)	2.0E-01	2.9E-05	1.4E-04
			Ethylbenzene	1/5	5.00E-03 (G M)	1.0E-01	1.4E-05	1.4E-04
			1,1-Dichloroethane	2/5	4.87E-03 (G M)	1.0E-01	1.4E-05	1.4E-04
			1,1,1-Trichloroethane	2/5	4.29E-03 (G M)	9.0E-02	1.2E-05	1.4E-04
			Anthracene	1/8	1.00E-02 (G M)	3.0E-01	2.9E-05	9.5E-05
			Toluene	2/5	4.95E-03 (G M)	2.0E-01	1.4E-05	7.1E-05
			Phenol	4/8	1.10E-02 (G M)	6.0E-01	3.2E-05	5.3E-05
			Diethylphthalate	1/8	1.00E-02 (G M)	8.0E-01	2.9E-05	3.6E-05
			Dimethylphthalate	1/8	1.00E-02 (G M)	1.0E+00	2.9E-05	2.9E-05
			TOTAL					6.9E-02
3	Water Ingestion							1.6E-01
3								3.7E-01
					mg/kg	1/(mg/kg/d)	mg/kg/d	
4	Fish Ingestion	Inorganics	Mercury	27/27	1.85E-01 (G M)	3.0E-04	1.7E-05	5.6E-02
			Arsenic	25/27	8.79E-02 (G M)	3.0E-04	7.9E-06	2.6E-02
			Selenium	14/27	5.57E-01 (G M)	5.0E-03	5.0E-05	1.0E-02
			Zinc	27/27	5.75E+00 (G M)	2.0E-01	5.2E-04	2.6E-03
			TOTAL					9.5E-02
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Chlordane	18/18	2.84E-02 (G M)	6.0E-05	2.6E-06	4.3E-02
			Aldrin	2/14	8.49E-04 (G M)	3.0E-05	7.6E-08	2.5E-03
			4,4'-DDT	1/18	1.58E-03 (G M)	5.0E-04	1.4E-07	2.8E-04
			TOTAL					4.5E-02

Table E.9 Results of adult nonconservative screening for noncarcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
4	Fish Ingestion							1.4E-01
					mg/L	1/(mg/kg/d)	mg/kg/d	
4	Water Ingestion	Inorganics	Cyanide	1/2	9.17E-02 (G M)	2.0E-02	2.6E-04	1.3E-02
			Chromium	3/5	1.08E-02 (G M)	5.0E-03	3.1E-05	6.1E-03
			Nickel	2/4	1.62E-02 (G M)	2.0E-02	4.6E-05	2.3E-03
			Mercury	1/5	2.00E-04 (G M)	3.0E-04	5.7E-07	1.9E-03
			Manganese	2/2	5.12E-02 (G M)	1.0E-01	1.5E-04	1.5E-03
			Barium	1/1	3.30E-02 (G M)	7.0E-02	9.4E-05	1.3E-03
			Boron	1/1	2.30E-02 (G M)	9.0E-02	6.6E-05	7.3E-04
			Uranium	4/4	7.48E-04 (G M)	3.0E-03	2.1E-06	7.1E-04
			Copper	2/4	4.44E-03 (G M)	3.7E-02	1.3E-05	3.4E-04
			Zinc	2/4	5.71E-03 (G M)	2.0E-01	1.6E-05	8.2E-05
			TOTAL					2.8E-02
					mg/L	1/(mg/kg/d)	mg/kg/d	
		Organics	Phenol	1/4	1.07E-02 (G M)	6.0E-01	3.0E-05	5.1E-05
			TOTAL					5.1E-05
4	Water Ingestion							2.8E-02
4								1.7E-01
					mg/kg	1/(mg/kg/d)	mg/kg/d	
5	Fish Ingestion	Inorganics	Arsenic	23/25	7.46E-02 (G M)	3.0E-04	6.7E-06	2.2E-02
			Mercury	25/25	6.60E-02 (G M)	3.0E-04	5.9E-06	2.0E-02
			Zinc	24/24	6.98E+00 (G M)	2.0E-01	6.3E-04	3.1E-03
			Copper	6/25	4.65E-02 (G M)	3.7E-02	4.2E-06	1.1E-04
			Beryllium	2/25	1.61E-05 (G M)	5.0E-03	1.4E-09	2.9E-07

Table E.8 Results of adult nonconservative screening for noncarcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
			TOTAL					4.5E-02
					mg/kg	1/(mg/kg/d)	mg/kg/d	
5	Fish Ingestion	Organics	Chlordane	18/18	1.06E-02 (G M)	6.0E-05	9.6E-07	1.6E-02
			Aldrin	2/18	4.64E-04 (G M)	3.0E-05	4.2E-08	1.4E-03
			4,4'-DDT	5/18	7.03E-04 (G M)	5.0E-04	6.3E-08	1.3E-04
			TOTAL					1.7E-02
5	Fish Ingestion							6.3E-02
5								6.3E-02
					mg/kg	1/(mg/kg/d)	mg/kg/d	
10	Fish Ingestion	Inorganics	Mercury	15/15	1.90E-01 (G M)	3.0E-04	1.7E-05	5.7E-02
			Arsenic	14/15	7.14E-02 (G M)	3.0E-04	6.4E-06	2.1E-02
			Selenium	8/15	5.22E-01 (G M)	5.0E-03	4.7E-05	9.4E-03
			Zinc	15/15	5.22E+00 (G M)	2.0E-01	4.7E-04	2.4E-03
			Beryllium	1/10	9.70E-06 (G M)	5.0E-03	8.7E-10	1.7E-07
			TOTAL					9.0E-02
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Chlordane	8/8	8.32E-03 (G M)	6.0E-05	7.5E-07	1.2E-02
			TOTAL					1.2E-02
10	Fish Ingestion							1.0E-01
					mg/L	1/(mg/kg/d)	mg/kg/d	
	Water Ingestion	Organics	Bis(2-ethylhexyl)phthalate	1/1	7.50E-03 (G M)	2.0E-02	2.1E-05	1.1E-03

Table E.9 Results of adult nonconservative screening for noncarcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
			TOTAL					1.1E-03
10	Water Ingestion							1.1E-03
10								1.0E-01
					mg/kg	1/(mg/kg/d)	mg/kg/d	
13	Fish Ingestion	Inorganics	Mercury	10/10	1.06E-01 (G M)	3.0E-04	9.5E-06	3.2E-02
			Arsenic	4/10	4.51E-02 (G M)	3.0E-04	4.1E-06	1.4E-02
			Zinc	10/10	6.31E+00 (G M)	2.0E-01	5.7E-04	2.8E-03
			TOTAL					4.8E-02
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Chlordane	2/4	1.37E-02 (G M)	6.0E-05	1.2E-06	2.1E-02
			Aldrin	2/3	9.60E-04 (G M)	3.0E-05	8.6E-08	2.9E-03
			TOTAL					2.3E-02
13	Fish Ingestion							7.1E-02
					mg/L	1/(mg/kg/d)	mg/kg/d	
	Water Ingestion	Inorganics	Cyanide	1/1	8.79E-02 (G M)	2.0E-02	2.5E-04	1.3E-02
			Chromium	1/2	1.04E-02 (G M)	5.0E-03	3.0E-05	5.9E-03
			Manganese	1/1	1.54E-01 (G M)	1.0E-01	4.4E-04	4.4E-03
			Nickel	1/2	1.44E-02 (G M)	2.0E-02	4.1E-05	2.1E-03
			Zinc	1/2	1.04E-02 (G M)	2.0E-01	3.0E-05	1.5E-04
			TOTAL					2.5E-02

Table E.9 Results of adult nonconservative screening for noncarcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
13	Water Ingestion							2.5E-02
13								9.7E-02

Table E.10 Results of adult conservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
					Bq/kg	1/Bq	Bq/life	
1	Fish Ingestion	Radionuclides	Cs-137	14/28	1.54E+00 (UCL)	7.6E-10	5.3E+02	4.0E-07
			Co-60	1/28	2.38E+00 (UCL)	4.1E-10	8.2E+02	3.4E-07
			Sr-90	8/8	3.70E-02 (Max)	9.7E-10	1.3E+01	1.2E-08
			TOTAL					7.5E-07
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Inorganics	Arsenic	17/28	9.82E-02 (UCL)	1.8E+00	1.9E-05	3.3E-05
			Beryllium	4/25	3.26E-03 (UCL)	4.3E+00	6.3E-07	2.7E-06
			TOTAL					3.6E-05
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Aroclor-1260	16/16	8.97E-01 (UCL)	7.7E+00	1.7E-04	1.3E-03
			Aroclor-1254	13/16	1.99E-01 (UCL)	7.7E+00	3.8E-05	3.0E-04
			Chlordane	11/16	1.09E-01 (UCL)	1.3E+00	2.1E-05	2.7E-05
			4,4'-DDE	8/16	6.43E-02 (UCL)	3.4E-01	1.2E-05	4.2E-06
			4,4'-DDD	5/15	5.90E-03 (UCL)	2.4E-01	1.1E-06	2.7E-07
			TOTAL					1.7E-03
1	Fish Ingestion							1.7E-03
					Bq/kg	1/Bq	Bq/yr	
	Sed. Exposure	Radionuclides	Cs-137	4/4	1.48E+01 (Max)	5.4E-08	6.4E+01	3.5E-06
			Co-60	4/4	8.91E+00 (Max)	2.3E-07	1.4E+01	3.2E-06
			TOTAL					6.7E-06
1	Sed. Exposure							6.7E-06
					Bq/kg	1/Bq	Bq/life	

Table E.10 Results of adult conservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
1	Sed. Ingestion	Radionuclides	Cs-137	4/4	1.48E+01 (Max)	7.6E-10	1.6E+01	1.2E-08
			Co-60	4/4	8.91E+00 (Max)	4.1E-10	9.8E+00	4.0E-09
			TOTAL					1.6E-08
1	Sed. Ingestion							1.6E-08
					Bq/kg	1/Bq	Bq/life	
	Sed. Inhalation	Radionuclides	Co-60	4/4	8.91E+00 (Max)	4.1E-09	6.2E-03	2.6E-11
			Cs-137	4/4	1.48E+01 (Max)	5.1E-10	2.8E-02	1.4E-11
			TOTAL					4.0E-11
1	Sed. Inhalation							4.0E-11
					Bq/L	1/Bq	Bq/life	
	Water Ingestion	Radionuclides	Cs-137	1/4	1.49E-01 (Max)	7.6E-10	3.3E+03	2.5E-06
			Co-60	1/4	1.90E-01 (Max)	4.1E-10	4.2E+03	1.7E-06
			Sr-90	4/4	8.00E-02 (Max)	9.7E-10	1.8E+03	1.7E-06
			U-234	1/1	1.50E-02 (Max)	4.3E-10	3.3E+02	1.4E-07
			Pu-239	1/1	1.00E-03 (Max)	6.2E-09	2.2E+01	1.4E-07
			U-238	1/1	6.00E-03 (Max)	7.6E-10	1.3E+02	1.0E-07
			U-235	1/1	3.00E-03 (Max)	4.3E-10	6.6E+01	2.8E-08
			TOTAL					6.3E-06
					mg/L	1/(mg/kg/d)	mg/kg/d	
		Inorganics	Arsenic	1/5	4.28E-02 (UCL)	1.8E+00	5.2E-04	9.2E-04
			Beryllium	1/4	3.90E-03 (Max)	4.3E+00	4.8E-05	2.1E-04
			TOTAL					1.1E-03

Table E.10 Results of adult conservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
1	Water Ingestion							1.1E-03
1								2.8E-03
					Bq/kg	1/Bq	Bq/life	
2	Fish Ingestion	Radionuclides	Cs-137	23/27	2.19E+01 (UCL)	7.6E-10	7.6E+03	5.8E-06
			Sr-90	6/6	2.59E-01 (Max)	9.7E-10	8.9E+01	8.7E-08
			TOTAL					5.8E-06
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Inorganics	Arsenic	5/13	9.80E-02 (UCL)	1.8E+00	1.9E-05	3.3E-05
			TOTAL					3.3E-05
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Aroclor-1260	14/14	1.41E+00 (UCL)	7.7E+00	2.7E-04	2.1E-03
			Aroclor-1254	9/10	7.53E-01 (UCL)	7.7E+00	1.5E-04	1.1E-03
			Chlordane	9/14	8.16E-02 (UCL)	1.3E+00	1.6E-05	2.0E-05
			4,4'-DDE	6/13	1.83E-02 (UCL)	3.4E-01	3.5E-06	1.2E-06
			Aldrin	2/14	1.65E-04 (UCL)	1.7E+01	3.2E-08	5.4E-07
			4,4'-DDT	2/13	8.59E-04 (UCL)	3.4E-01	1.7E-07	5.6E-08
			TOTAL					3.2E-03
2	Fish Ingestion							3.3E-03
					Bq/kg	1/Bq	Bq/yr	
	Sed. Exposure	Radionuclides	Cs-137	46/46	1.27E+02 (UCL)	5.4E-08	5.5E+02	3.0E-05
			Co-60	44/46	5.22E+00 (UCL)	2.3E-07	8.3E+00	1.9E-06

Table E.10 Results of adult conservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
			TOTAL					3.2E-05
2	Sed. Exposure							3.2E-05
					Bq/kg	1/Bq	Bq/life	
2	Sed. Ingestion	Radionuclides	Cs-137	46/46	1.27E+02 (UCL)	7.6E-10	1.4E+02	1.1E-07
			Co-60	44/46	5.22E+00 (UCL)	4.1E-10	5.7E+00	2.3E-09
			TOTAL					1.1E-07
2	Sed. Ingestion							1.1E-07
					Bq/kg	1/Bq	Bq/life	
	Sed. Inhalation	Radionuclides	Cs-137	46/46	1.27E+02 (UCL)	5.1E-10	2.4E-01	1.2E-10
			Co-60	44/46	5.22E+00 (UCL)	4.1E-09	3.7E-03	1.5E-11
			TOTAL					1.4E-10
2	Sed. Inhalation							1.4E-10
					Bq/L	1/Bq	Bq/life	
	Water Ingestion	Radionuclides	H-3	2/2	6.80E+03 (Max)	1.5E-12	1.5E+08	2.2E-04
			Sr-90	4/4	8.42E+00 (Max)	9.7E-10	1.8E+05	1.8E-04
			Cs-137	4/5	2.14E+00 (UCL)	7.6E-10	4.7E+04	3.6E-05
			Np-237	1/1	1.18E-01 (Max)	5.9E-09	2.6E+03	1.5E-05
			Th-228	1/1	3.55E-01 (Max)	1.5E-09	7.8E+03	1.2E-05
			Co-60	2/4	2.77E-01 (Max)	4.1E-10	6.1E+03	2.5E-06
			U-234	1/1	1.90E-01 (Max)	4.3E-10	4.2E+03	1.8E-06
			Os-191	1/1	3.30E+00 (Max)	1.8E-11	7.2E+04	1.3E-06
			Th-234	1/1	3.97E-01 (Max)	1.1E-10	8.7E+03	9.6E-07
			Tc-99	1/1	1.04E+00 (Max)	3.5E-11	2.3E+04	8.0E-07

Table E.10 Results of adult conservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
2	Water Ingestion	Radionuclides	U-235	2/2	6.40E-02 (Max)	4.3E-10	1.4E+03	6.0E-07
			U-238	1/1	3.40E-02 (Max)	7.6E-10	7.4E+02	5.7E-07
			Pa-234	1/1	1.51E-01 (Max)	1.8E-11	3.3E+03	6.0E-08
			Pu-238	3/3	1.75E-05 (Max)	5.9E-09	3.8E-01	2.3E-09
			TOTAL					4.7E-04
					mg/L	1/(mg/kg/d)	mg/kg/d	
		Organics	1,2-Dichloropropane	1/3	5.00E-03 (Max)	6.8E-02	6.1E-05	4.2E-06
			Tetrachloroethylene	1/3	5.00E-03 (Max)	5.1E-02	6.1E-05	3.1E-06
			Methylene chloride	2/3	5.00E-03 (Max)	7.5E-03	6.1E-05	4.6E-07
			Chloroform	1/2	5.00E-03 (Max)	6.1E-03	6.1E-05	3.7E-07
			TOTAL					8.1E-06
2	Water Ingestion							4.8E-04
2								3.8E-03
					Bq/kg	1/Bq	Bq/life	
3	Fish Ingestion	Radionuclides	Cs-137	26/54	2.98E+00 (UCL)	7.6E-10	1.0E+03	7.8E-07
			Co-60	1/54	2.88E+00 (UCL)	4.1E-10	9.9E+02	4.1E-07
			Sr-90	28/28	1.51E-01 (UCL)	9.7E-10	5.2E+01	5.1E-08
			TOTAL					1.2E-06
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Inorganics	Arsenic	19/35	7.50E-02 (UCL)	1.8E+00	1.4E-05	2.5E-05
			Beryllium	7/35	5.45E-03 (UCL)	4.3E+00	1.1E-06	4.5E-06
			TOTAL					3.0E-05
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Aroclor-1260	36/36	7.71E-01 (UCL)	7.7E+00	1.5E-04	1.1E-03

Table E.10 Results of adult conservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
3	Fish Ingestion	Organics	Aroclor-1254	31/31	1.86E-01 (UCL)	7.7E+00	3.6E-05	2.8E-04
			Chlordane	34/34	7.45E-02 (UCL)	1.3E+00	1.4E-05	1.9E-05
			Bis(2-ethylhexyl)phthalate	1/33	4.10E-01 (Max)	1.4E-02	7.9E-05	1.1E-06
			4,4'-DDD	2/34	1.71E-02 (Max)	2.4E-01	3.3E-06	7.9E-07
			4,4'-DDE	34/34	9.10E-03 (UCL)	3.4E-01	1.8E-06	6.0E-07
			TOTAL					1.4E-03
3	Fish Ingestion							1.5E-03
					Bq/kg	1/Bq	Bq/yr	
	Sed. Exposure	Radionuclides	Cs-137	3/3	8.24E+01 (Max)	5.4E-08	3.6E+02	1.9E-05
			Co-60	3/3	5.00E+00 (Max)	2.3E-07	7.9E+00	1.8E-06
			TOTAL					2.1E-05
3	Sed. Exposure							2.1E-05
					Bq/kg	1/Bq	Bq/life	
	Sed. Ingestion	Radionuclides	Cs-137	3/3	8.24E+01 (Max)	7.6E-10	9.0E+01	6.9E-08
			Co-60	3/3	5.00E+00 (Max)	4.1E-10	5.5E+00	2.2E-09
			TOTAL					7.1E-08
3	Sed. Ingestion							7.1E-08
					Bq/kg	1/Bq	Bq/life	
	Sed. Inhalation	Radionuclides	Cs-137	3/3	8.24E+01 (Max)	5.1E-10	1.6E-01	8.1E-11
			Co-60	3/3	5.00E+00 (Max)	4.1E-09	3.5E-03	1.4E-11
			TOTAL					9.5E-11

Table E.10 Results of adult conservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
3	Sed. Inhalation							9.5E-11
					Bq/L	1/Bq	Bq/life	
3	Water Ingestion	Radionuclides	Th-228	3/3	5.99E+01 (Max)	1.5E-09	1.3E+06	2.0E-03
			U-234	6/6	9.38E+00 (UCL)	4.3E-10	2.1E+05	8.8E-05
			U-238	6/6	5.04E+00 (UCL)	7.6E-10	1.1E+05	8.4E-05
			Pa-234	7/7	1.27E+02 (UCL)	1.8E-11	2.8E+06	5.0E-05
			Th-234	7/7	1.74E+01 (UCL)	1.1E-10	3.8E+05	4.2E-05
			Np-237	7/7	1.90E-01 (UCL)	5.9E-09	4.2E+03	2.5E-05
			Tc-99	8/8	1.02E+01 (UCL)	3.5E-11	2.2E+05	7.8E-06
			Pu-238	7/7	3.84E-02 (UCL)	5.9E-09	8.4E+02	5.0E-06
			Pu-239	7/7	1.90E-02 (UCL)	6.2E-09	4.2E+02	2.6E-06
			Cs-137	8/11	1.41E-01 (UCL)	7.6E-10	3.1E+03	2.4E-06
			U-235	7/7	2.08E-01 (UCL)	4.3E-10	4.6E+03	2.0E-06
			U-236	6/6	9.70E-02 (UCL)	4.1E-10	2.1E+03	8.7E-07
			Sr-90	4/4	7.40E-03 (Max)	9.7E-10	1.6E+02	1.6E-07
			TOTAL					2.3E-03
					mg/L	1/(mg/kg/d)	mg/kg/d	
		Inorganics	Arsenic	3/10	1.14E-02 (UCL)	1.8E+00	1.4E-04	2.4E-04
			Beryllium	2/10	3.20E-03 (UCL)	4.3E+00	3.9E-05	1.7E-04
			TOTAL					4.1E-04
					mg/L	1/(mg/kg/d)	mg/kg/d	
		Organics	Pyrene	1/8	1.01E-02 (UCL)	7.3E+00	1.2E-04	9.0E-04
			Fluoranthene	1/8	1.01E-02 (UCL)	7.3E+00	1.2E-04	9.0E-04
			Anthracene	1/8	1.01E-02 (UCL)	7.3E+00	1.2E-04	9.0E-04
			Phenanthrene	1/8	1.01E-02 (UCL)	7.3E+00	1.2E-04	9.0E-04
			N-Nitroso-di-n-propylamine	1/8	1.01E-02 (UCL)	7.0E+00	1.2E-04	8.6E-04
			Vinyl chloride	2/5	1.00E-02 (Max)	1.9E+00	1.2E-04	2.3E-04
			Aroclor-1254	2/3	1.04E-03 (Max)	7.7E+00	1.3E-05	9.8E-05
			Benzo(a)anthracene	1/8	1.01E-02 (UCL)	7.3E-01	1.2E-04	9.0E-05
			1,1-Dichloroethylene	2/5	5.01E-03 (Max)	6.0E-01	6.1E-05	3.7E-05

Table E.10 Results of adult conservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
3	Water Ingestion	Organics	Trans-1,3-dichloropropene	1/5	5.01E-03 (UCL)	1.8E-01	6.1E-05	1.1E-05
			Chrysene	1/8	1.01E-02 (UCL)	7.3E-02	1.2E-04	9.0E-06
			Dichlorobromomethane	2/5	5.00E-03 (Max)	1.3E-01	6.1E-05	8.0E-06
			1,2-Dichloroethane	1/5	5.31E-03 (UCL)	9.1E-02	6.5E-05	5.9E-06
			Chlorodibromomethane	1/5	5.00E-03 (Max)	8.4E-02	6.1E-05	5.1E-06
			Trichloroethylene	3/5	3.20E-02 (UCL)	1.1E-02	3.9E-04	4.3E-06
			Tetrachloroethylene	3/5	5.03E-03 (UCL)	5.1E-02	6.2E-05	3.1E-06
			1,4-Dichlorobenzene	1/9	1.00E-02 (Max)	2.4E-02	1.2E-04	2.9E-06
			Benzene	2/5	5.00E-03 (Max)	2.9E-02	6.1E-05	1.8E-06
			Bis(2-ethylhexyl)phthalate	2/8	1.03E-02 (UCL)	1.4E-02	1.3E-04	1.8E-06
			Methylene chloride	3/5	5.53E-03 (UCL)	7.5E-03	6.8E-05	5.1E-07
			Bromoform	1/5	5.03E-03 (UCL)	7.9E-03	6.2E-05	4.9E-07
			Chloroform	3/5	5.10E-03 (UCL)	6.1E-03	6.2E-05	3.8E-07
			TOTAL					5.0E-03
3	Water Ingestion							7.7E-03
3								9.2E-03
					Bq/kg	1/Bq	Bq/life	
4	Fish Ingestion	Radionuclides	Cs-137	28/40	4.69E+00 (UCL)	7.6E-10	1.6E+03	1.2E-06
			Sr-90	10/10	1.34E-01 (UCL)	9.7E-10	4.6E+01	4.5E-08
			TOTAL					1.3E-06
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Inorganics	Arsenic	25/27	1.07E-01 (UCL)	1.8E+00	2.1E-05	3.6E-05
			TOTAL					3.6E-05
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Aroclor-1260	17/18	2.79E+00 (UCL)	7.7E+00	5.4E-04	4.1E-03
			Aroclor-1254	15/18	2.70E-01 (Max)	7.7E+00	5.2E-05	4.0E-04

Table E.10 Results of adult conservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
4	Fish Ingestion	Organics	Chlordane	18/18	9.72E-02 (UCL)	1.3E+00	1.9E-05	2.4E-05
			4,4'-DDT	1/18	2.00E-01 (Max)	3.4E-01	3.9E-05	1.3E-05
			Aldrin	2/14	1.33E-03 (UCL)	1.7E+01	2.6E-07	4.4E-06
			4,4'-DDE	12/18	2.44E-02 (UCL)	3.4E-01	4.7E-06	1.6E-06
			4,4'-DDD	4/18	9.04E-03 (UCL)	2.4E-01	1.7E-06	4.2E-07
			TOTAL					4.6E-03
4	Fish Ingestion							4.6E-03
					Bq/kg	1/Bq	Bq/yr	
	Sed. Exposure	Radionuclides	Cs-137	93/93	1.33E+02 (UCL)	5.4E-08	5.8E+02	3.1E-05
			Co-60	93/95	6.43E+00 (UCL)	2.3E-07	1.0E+01	2.3E-06
			TOTAL					3.3E-05
4	Sed. Exposure							3.3E-05
					Bq/kg	1/Bq	Bq/life	
	Sed. Ingestion	Radionuclides	Cs-137	93/93	1.33E+02 (UCL)	7.6E-10	1.5E+02	1.1E-07
			Co-60	93/95	6.43E+00 (UCL)	4.1E-10	7.0E+00	2.9E-09
			TOTAL					1.1E-07
4	Sed. Ingestion							1.1E-07
					Bq/kg	1/Bq	Bq/life	
	Sed. Inhalation	Radionuclides	Cs-137	93/93	1.33E+02 (UCL)	5.1E-10	2.5E-01	1.3E-10
			Co-60	93/95	6.43E+00 (UCL)	4.1E-09	4.5E-03	1.8E-11
			TOTAL					1.5E-10

Table E.10 Results of adult conservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
4	Sed. Inhalation							1.5E-10
					Bq/L	1/Bq	Bq/life	
4	Water Ingestion	Radionuclides	Pa-234	3/3	7.17E+01 (Max)	1.8E-11	1.6E+06	2.8E-05
			Pu-239	4/4	6.50E-02 (Max)	6.2E-09	1.4E+03	8.8E-06
			Pu-238	4/4	4.69E-02 (Max)	5.9E-09	1.0E+03	6.1E-06
			Th-228	1/1	5.18E-02 (Max)	1.5E-09	1.1E+03	1.7E-06
			Th-234	3/3	6.91E-01 (Max)	1.1E-10	1.5E+04	1.7E-06
			Cs-137	5/6	7.18E-02 (UCL)	7.6E-10	1.6E+03	1.2E-06
			Tc-99	3/3	1.09E+00 (Max)	3.5E-11	2.4E+04	8.4E-07
			U-234	1/1	8.24E-02 (Max)	4.3E-10	1.8E+03	7.8E-07
			U-238	1/1	4.41E-02 (Max)	7.6E-10	9.7E+02	7.3E-07
			H-3	1/1	1.68E+01 (Max)	1.5E-12	3.7E+05	5.5E-07
			Sr-90	2/2	1.19E-02 (Max)	9.7E-10	2.6E+02	2.5E-07
			Co-60	1/3	1.98E-02 (Max)	4.1E-10	4.3E+02	1.8E-07
			U-235	1/1	2.04E-03 (Max)	4.3E-10	4.5E+01	1.9E-08
			U-236	1/1	8.50E-04 (Max)	4.1E-10	1.9E+01	7.6E-09
			TOTAL					5.1E-05
4	Water Ingestion							5.1E-05
4								4.7E-03
					Bq/kg	1/Bq	Bq/life	
5	Fish Ingestion	Radionuclides	Cs-137	19/28	2.64E+00 (UCL)	7.6E-10	9.1E+02	6.9E-07
			Sr-90	19/19	1.23E-01 (UCL)	9.7E-10	4.2E+01	4.1E-08
			TOTAL					7.3E-07
					mg/kg	1/(mg/kg/d)	mg/kg/d	

Table E.10 Results of adult conservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
5	Fish Ingestion	Inorganics	Arsenic	23/25	9.23E-02 (UCL)	1.8E+00	1.8E-05	3.1E-05
			Beryllium	2/25	2.70E-02 (Max)	4.3E+00	5.2E-06	2.2E-05
			TOTAL					5.4E-05
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Aroclor-1260	19/19	8.90E-01 (UCL)	7.7E+00	1.7E-04	1.3E-03
			Aroclor-1254	14/17	3.20E-01 (Max)	7.7E+00	6.2E-05	4.8E-04
			Aldrin	2/18	5.45E-03 (UCL)	1.7E+01	1.1E-06	1.8E-05
			Chlordane	18/18	4.55E-02 (UCL)	1.3E+00	8.8E-06	1.1E-05
			4,4'-DDE	9/18	1.32E-02 (UCL)	3.4E-01	2.6E-06	8.7E-07
			4,4'-DDD	12/17	5.83E-03 (UCL)	2.4E-01	1.1E-06	2.7E-07
			4,4'-DDT	5/18	1.29E-03 (UCL)	3.4E-01	2.5E-07	8.5E-08
			TOTAL					1.8E-03
5	Fish Ingestion							1.9E-03
					Bq/kg	1/Bq	Bq/yr	
	Sed. Exposure	Radionuclides	Cs-137	274/277	2.70E+01 (UCL)	5.4E-08	1.2E+02	6.3E-06
			Co-60	116/277	1.46E+00 (UCL)	2.3E-07	2.3E+00	5.3E-07
			TOTAL					6.9E-06
5	Sed. Exposure							6.9E-06
					Bq/kg	1/Bq	Bq/life	
	Sed. Ingestion	Radionuclides	Cs-137	274/277	2.70E+01 (UCL)	7.6E-10	3.0E+01	2.2E-08
			Co-60	116/277	1.46E+00 (UCL)	4.1E-10	1.6E+00	6.6E-10
			TOTAL					2.3E-08

Table E.10 Results of adult conservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
5	Sed. Ingestion							2.3E-08
					Bq/kg	1/Bq	Bq/life	
5	Sed. Inhalation	Radionuclides	Cs-137	274/277	2.70E+01 (UCL)	5.1E-10	5.2E-02	2.6E-11
			Co-60	116/277	1.46E+00 (UCL)	4.1E-09	1.0E-03	4.2E-12
			TOTAL					3.1E-11
5	Sed. Inhalation							3.1E-11
					Bq/L	1/Bq	Bq/life	
	Water Ingestion	Radionuclides	Sr-90	3/3	2.59E-02 (Max)	9.7E-10	5.7E+02	5.5E-07
			Cs-137	1/3	3.27E-03 (Max)	7.6E-10	7.2E+01	5.4E-08
			TOTAL					6.0E-07
5	Water Ingestion							6.0E-07
5								1.9E-03
					Bq/kg	1/Bq	Bq/life	
10	Fish Ingestion	Radionuclides	Cs-137	9/17	1.58E+00 (UCL)	7.6E-10	5.4E+02	4.1E-07
			Co-60	1/16	8.02E-01 (UCL)	4.1E-10	2.8E+02	1.1E-07
			Sr-90	8/8	9.38E-02 (UCL)	9.7E-10	3.2E+01	3.1E-08
			TOTAL					5.6E-07
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Inorganics	Arsenic	14/15	9.68E-02 (UCL)	1.8E+00	1.9E-05	3.3E-05

Table E.10 Results of adult conservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
10	Fish Ingestion	Inorganics	Beryllium	1/10	3.70E-02 (Max)	4.3E+00	7.1E-06	3.1E-05
			TOTAL					6.3E-05
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Aroclor-1260	7/8	7.31E-02 (UCL)	7.7E+00	1.4E-05	1.1E-04
			Chlordane	8/8	1.57E-02 (UCL)	1.3E+00	3.0E-06	3.9E-06
			4,4'-DDE	2/8	2.95E-03 (UCL)	3.4E-01	5.7E-07	1.9E-07
			4,4'-DDD	7/8	1.22E-03 (UCL)	2.4E-01	2.4E-07	5.6E-08
			TOTAL					1.1E-04
10	Fish Ingestion							1.8E-04
					mg/L	1/(mg/kg/d)	mg/kg/d	
	Water Ingestion	Organics	Bis(2-ethylhexyl)phthalate	1/1	7.50E-03 (Max)	1.4E-02	9.2E-05	1.3E-06
			TOTAL					1.3E-06
10	Water Ingestion							1.3E-06
10								1.8E-04
					Bq/kg	1/Bq	Bq/life	
13	Fish Ingestion	Radionuclides	Cs-137	3/6	3.45E+00 (UCL)	7.6E-10	1.2E+03	9.0E-07
			Co-60	1/6	2.68E+00 (UCL)	4.1E-10	9.2E+02	3.8E-07
			Sr-90	4/4	1.11E-01 (Max)	9.7E-10	3.8E+01	3.7E-08
			TOTAL					1.3E-06
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Inorganics	Arsenic	4/10	5.90E-02 (UCL)	1.8E+00	1.1E-05	2.0E-05

Table E.10 Results of adult conservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
			TOTAL					2.0E-05
					mg/kg	1/(mg/kg/d)	mg/kg/d	
13	Fish Ingestion	Organics	Aroclor-1260	4/4	3.90E-01 (Max)	7.7E+00	7.5E-05	5.8E-04
			Aroclor-1254	2/2	1.90E-01 (Max)	7.7E+00	3.7E-05	2.8E-04
			Chlordane	2/4	7.29E-02 (Max)	1.3E+00	1.4E-05	1.8E-05
			Aldrin	2/3	1.30E-03 (UCL)	1.7E+01	2.5E-07	4.3E-06
			4,4'-DDE	2/2	6.82E-03 (Max)	3.4E-01	1.3E-06	4.5E-07
			TOTAL					8.8E-04
13	Fish Ingestion							9.1E-04
					Bq/L	1/Bq	Bq/life	
	Water Ingestion	Radionuclides	Th-228	1/1	4.44E-02 (Max)	1.5E-09	9.7E+02	1.5E-06
			Tc-99	1/1	1.49E+00 (Max)	3.5E-11	3.3E+04	1.1E-06
			Cs-137	1/2	1.24E-02 (Max)	7.6E-10	2.7E+02	2.1E-07
			Th-234	1/1	6.17E-02 (Max)	1.1E-10	1.4E+03	1.5E-07
			Pa-234	1/1	1.76E-01 (Max)	1.8E-11	3.8E+03	6.9E-08
			TOTAL					3.0E-06
13	Water Ingestion							3.0E-06
13								9.1E-04
					Bq/kg	1/Bq	Bq/yr	
18	Sed. Exposure	Radionuclides	Cs-137	22/23	8.66E+00 (UCL)	5.4E-08	3.8E+01	2.0E-06
			Co-60	1/23	1.39E+00 (Max)	2.3E-07	2.2E+00	5.1E-07
			TOTAL					2.5E-06

Table E.10 Results of adult conservative screening for carcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
18	Sed. Exposure							2.5E-06
					Bq/kg	1/Bq	Bq/life	
18	Sed. Ingestion	Radionuclides	Cs-137	22/23	8.66E+00 (UCL)	7.6E-10	9.5E+00	7.2E-09
			Co-60	1/23	1.39E+00 (Max)	4.1E-10	1.5E+00	6.3E-10
			TOTAL					7.8E-09
18	Sed. Ingestion							7.8E-09
					Bq/kg	1/Bq	Bq/life	
	Sed. Inhalation	Radionuclides	Cs-137	22/23	8.66E+00 (UCL)	5.1E-10	1.7E-02	8.5E-12
			Co-60	1/23	1.39E+00 (Max)	4.1E-09	9.8E-04	4.0E-12
			TOTAL					1.2E-11
18	Sed. Inhalation							1.2E-11
18								2.5E-06

Table E.11 Results of adult conservative screening for noncarcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
					mg/kg	1/(mg/kg/d)	mg/kg/d	
1	Fish Ingestion	Inorganics	Arsenic	17/28	9.82E-02 (UCL)	3.0E-04	8.8E-05	2.9E-01
			Mercury	28/28	8.19E-02 (UCL)	3.0E-04	7.4E-05	2.5E-01
			Selenium	28/28	8.34E-01 (UCL)	5.0E-03	7.5E-04	1.5E-01
			Zinc	28/28	7.55E+00 (UCL)	2.0E-01	6.8E-03	3.4E-02
			Beryllium	4/25	3.26E-03 (UCL)	5.0E-03	2.9E-06	5.9E-04
			TOTAL					7.3E-01
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Chlordane	11/16	1.09E-01 (UCL)	6.0E-05	9.9E-05	1.6E+00
			TOTAL					1.6E+00
1	Fish Ingestion							2.4E+00
					mg/L	1/(mg/kg/d)	mg/kg/d	
	Water Ingestion	Inorganics	Arsenic	1/5	4.28E-02 (UCL)	3.0E-04	1.2E-03	4.1E+00
			Antimony	1/4	5.09E-02 (Max)	4.0E-04	1.5E-03	3.6E+00
			Cadmium	1/5	4.95E-03 (UCL)	5.0E-04	1.4E-04	2.8E-01
			Selenium	3/6	1.84E-02 (UCL)	5.0E-03	5.3E-04	1.1E-01
			Chromium	3/6	9.80E-03 (Max)	5.0E-03	2.8E-04	5.6E-02
			Nickel	3/6	3.02E-02 (UCL)	2.0E-02	8.6E-04	4.3E-02
			Manganese	1/1	1.44E-01 (Max)	1.0E-01	4.1E-03	4.1E-02
			Mercury	2/5	3.50E-04 (UCL)	3.0E-04	1.0E-05	3.3E-02
			Beryllium	1/4	3.90E-03 (Max)	5.0E-03	1.1E-04	2.2E-02
			Barium	1/1	3.30E-02 (Max)	7.0E-02	9.4E-04	1.3E-02
			Vanadium	1/1	2.48E-03 (Max)	7.0E-03	7.1E-05	1.0E-02
			Copper	2/6	7.44E-03 (UCL)	3.7E-02	2.1E-04	5.7E-03
			Strontium	1/1	8.73E-02 (Max)	8.8E-01	2.5E-03	2.8E-03
			Zinc	3/6	1.40E-02 (UCL)	2.0E-01	4.0E-04	2.0E-03
			TOTAL					8.3E+00

Table E.11 Results of adult conservative screening for noncarcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
1	Water Ingestion							8.3E+00
1								1.1E+01
					mg/kg	1/(mg/kg/d)	mg/kg/d	
2	Fish Ingestion	Inorganics	Mercury	13/13	1.35E-01 (UCL)	3.0E-04	1.2E-04	4.1E-01
			Arsenic	5/13	9.80E-02 (UCL)	3.0E-04	8.8E-05	2.9E-01
			Selenium	11/13	8.51E-01 (UCL)	5.0E-03	7.7E-04	1.5E-01
			Zinc	13/13	6.57E+00 (UCL)	2.0E-01	5.9E-03	3.0E-02
			TOTAL					8.8E-01
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Chlordane	9/14	8.16E-02 (UCL)	6.0E-05	7.3E-05	1.2E+00
			Aldrin	2/14	1.65E-04 (UCL)	3.0E-05	1.5E-07	5.0E-03
			4,4'-DDT	2/13	8.59E-04 (UCL)	5.0E-04	7.7E-07	1.5E-03
			TOTAL					1.2E+00
2	Fish Ingestion							2.1E+00
					mg/L	1/(mg/kg/d)	mg/kg/d	
	Water Ingestion	Inorganics	Cyanide	1/1	1.06E-01 (Max)	2.0E-02	3.0E-03	1.5E-01
			Selenium	1/4	6.72E-03 (Max)	5.0E-03	1.9E-04	3.8E-02
			Nickel	1/3	2.21E-02 (Max)	2.0E-02	6.3E-04	3.2E-02
			Barium	2/2	3.30E-02 (Max)	7.0E-02	9.4E-04	1.3E-02
			Manganese	1/1	3.51E-02 (Max)	1.0E-01	1.0E-03	1.0E-02
			Uranium	2/2	8.42E-04 (Max)	3.0E-03	2.4E-05	8.0E-03
			Zinc	2/3	5.20E-02 (Max)	2.0E-01	1.5E-03	7.4E-03
			Copper	2/3	6.50E-03 (Max)	3.7E-02	1.9E-04	5.0E-03
			Strontium	1/1	8.90E-02 (Max)	8.8E-01	2.5E-03	2.9E-03

Table E.11 Results of adult conservative screening for noncarcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
			TOTAL					2.7E-01
					mg/L	1/(mg/kg/d)	mg/kg/d	
2	Water Ingestion	Organics	Tetrachloroethylene	1/3	5.00E-03 (Max)	1.0E-02	1.4E-04	1.4E-02
			Chloroform	1/2	5.00E-03 (Max)	1.0E-02	1.4E-04	1.4E-02
			Acetone	1/1	9.45E-03 (Max)	1.0E-01	2.7E-04	2.7E-03
			Methylene chloride	2/3	5.00E-03 (Max)	6.0E-02	1.4E-04	2.4E-03
			Carbon disulfide	1/1	4.69E-03 (Max)	1.0E-01	1.3E-04	1.3E-03
			Toluene	1/3	5.00E-03 (Max)	2.0E-01	1.4E-04	7.1E-04
			Phenol	1/2	1.23E-02 (Max)	6.0E-01	3.5E-04	5.8E-04
			Xylene	1/1	4.75E-03 (Max)	2.0E+00	1.4E-04	6.8E-05
			TOTAL					3.6E-02
2	Water Ingestion							3.0E-01
2								2.4E+00
					mg/kg	1/(mg/kg/d)	mg/kg/d	
3	Fish Ingestion	Inorganics	Mercury	35/35	6.16E-01 (UCL)	3.0E-04	5.5E-04	1.8E+00
			Arsenic	19/35	7.50E-02 (UCL)	3.0E-04	6.8E-05	2.3E-01
			Selenium	2/35	5.77E-01 (UCL)	5.0E-03	5.2E-04	1.0E-01
			Zinc	35/35	6.55E+00 (UCL)	2.0E-01	5.9E-03	2.9E-02
			Beryllium	7/35	5.45E-03 (UCL)	5.0E-03	4.9E-06	9.8E-04
			TOTAL					2.2E+00
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Chlordane	34/34	7.45E-02 (UCL)	6.0E-05	6.7E-05	1.1E+00
			Bis(2-ethylhexyl)phthalate	1/33	4.10E-01 (Max)	2.0E-02	3.7E-04	1.8E-02
			Di-n-octylphthalate	1/33	4.10E-01 (Max)	2.0E-02	3.7E-04	1.8E-02
			TOTAL					1.2E+00

Table E.11 Results of adult conservative screening for noncarcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
3	Fish Ingestion							3.4E+00
					mg/L	1/(mg/kg/d)	mg/kg/d	
3	Water Ingestion	Inorganics	Uranium	8/8	2.91E-01 (UCL)	3.0E-03	8.3E-03	2.8E+00
			Arsenic	3/10	1.14E-02 (UCL)	3.0E-04	3.3E-04	1.1E+00
			Nickel	5/10	1.29E-01 (UCL)	2.0E-02	3.7E-03	1.8E-01
			Cyanide	3/3	1.01E-01 (Max)	2.0E-02	2.9E-03	1.4E-01
			Cadmium	3/11	2.13E-03 (UCL)	5.0E-04	6.1E-05	1.2E-01
			Molybdenum	1/4	1.38E-02 (Max)	5.0E-03	3.9E-04	7.9E-02
			Boron	4/4	2.31E-01 (Max)	9.0E-02	6.6E-03	7.3E-02
			Chromium	7/12	1.13E-02 (UCL)	5.0E-03	3.2E-04	6.5E-02
			Manganese	6/6	2.19E-01 (UCL)	1.0E-01	6.2E-03	6.2E-02
			Selenium	2/11	1.08E-02 (UCL)	5.0E-03	3.1E-04	6.2E-02
			Silver	4/11	9.38E-03 (UCL)	5.0E-03	2.7E-04	5.3E-02
			Barium	3/4	1.18E-01 (Max)	7.0E-02	3.4E-03	4.8E-02
			Mercury	5/10	5.03E-04 (UCL)	3.0E-04	1.4E-05	4.8E-02
			Beryllium	2/10	3.20E-03 (UCL)	5.0E-03	9.1E-05	1.8E-02
			Copper	6/10	1.54E-02 (UCL)	3.7E-02	4.4E-04	1.2E-02
			Zinc	7/11	2.98E-02 (UCL)	2.0E-01	8.5E-04	4.2E-03
			Tin	1/3	1.48E-02 (Max)	6.0E-01	4.2E-04	7.0E-04
			TOTAL					4.8E+00
					mg/L	1/(mg/kg/d)	mg/kg/d	
		Organics	Trans-1,3-dichloropropene	1/5	5.01E-03 (UCL)	3.0E-04	1.4E-04	4.8E-01
			2,4-Dichlorophenol	1/8	1.01E-02 (UCL)	3.0E-03	2.9E-04	9.6E-02
			Trans-1,2-dichloroethylene	3/5	2.23E-02 (UCL)	2.0E-02	6.4E-04	3.2E-02
			1,1-Dichloroethylene	2/5	5.01E-03 (Max)	9.0E-03	1.4E-04	1.6E-02
			Bis(2-ethylhexyl)phthalate	2/8	1.03E-02 (UCL)	2.0E-02	2.9E-04	1.5E-02
			Chloroform	3/5	5.10E-03 (UCL)	1.0E-02	1.5E-04	1.5E-02
			Tetrachloroethylene	3/5	5.03E-03 (UCL)	1.0E-02	1.4E-04	1.4E-02
			Pyrene	1/8	1.01E-02 (UCL)	3.0E-02	2.9E-04	9.6E-03
			Fluoranthene	1/8	1.01E-02 (UCL)	4.0E-02	2.9E-04	7.2E-03
			Bromoform	1/5	5.03E-03 (UCL)	2.0E-02	1.4E-04	7.2E-03
			Dichlorobromomethane	2/5	5.00E-03 (Max)	2.0E-02	1.4E-04	7.1E-03

Table E.11 Results of adult conservative screening for noncarcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
3	Water Ingestion	Organics	Chlorobenzene	1/5	5.00E-03 (Max)	2.0E-02	1.4E-04	7.1E-03
			Chlorodibromomethane	1/5	5.00E-03 (Max)	2.0E-02	1.4E-04	7.1E-03
			Di-n-butylphthalate	1/8	1.00E-02 (Max)	1.0E-01	2.9E-04	2.9E-03
			Methylene chloride	3/5	5.53E-03 (UCL)	6.0E-02	1.6E-04	2.6E-03
			1,1,1-Trichloroethane	2/5	5.02E-03 (Max)	9.0E-02	1.4E-04	1.6E-03
			Butylbenzylphthalate	1/8	1.00E-02 (UCL)	2.0E-01	2.9E-04	1.4E-03
			1,1-Dichloroethane	2/5	5.00E-03 (Max)	1.0E-01	1.4E-04	1.4E-03
			Ethylbenzene	1/5	5.00E-03 (Max)	1.0E-01	1.4E-04	1.4E-03
			Anthracene	1/8	1.01E-02 (UCL)	3.0E-01	2.9E-04	9.6E-04
			Toluene	2/5	5.00E-03 (Max)	2.0E-01	1.4E-04	7.1E-04
			Phenol	4/8	1.24E-02 (UCL)	6.0E-01	3.5E-04	5.9E-04
			Diethylphthalate	1/8	1.01E-02 (UCL)	8.0E-01	2.9E-04	3.6E-04
			Dimethylphthalate	1/8	1.01E-02 (UCL)	1.0E+00	2.9E-04	2.9E-04
			TOTAL					7.2E-01
3	Water Ingestion							5.6E+00
3								8.9E+00
					mg/kg	1/(mg/kg/d)	mg/kg/d	
4	Fish Ingestion	Inorganics	Mercury	27/27	3.91E-01 (UCL)	3.0E-04	3.5E-04	1.2E+00
			Arsenic	25/27	1.07E-01 (UCL)	3.0E-04	9.7E-05	3.2E-01
			Selenium	14/27	6.86E-01 (UCL)	5.0E-03	6.2E-04	1.2E-01
			Zinc	27/27	6.55E+00 (UCL)	2.0E-01	5.9E-03	2.9E-02
			TOTAL					1.6E+00
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Chlordane	18/18	9.72E-02 (UCL)	6.0E-05	8.7E-05	1.5E+00
			4,4'-DDT	1/18	2.00E-01 (Max)	5.0E-04	1.8E-04	3.6E-01
			Aldrin	2/14	1.33E-03 (UCL)	3.0E-05	1.2E-06	4.0E-02
			TOTAL					1.9E+00

Table E.11 Results of adult conservative screening for noncarcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
4	Fish Ingestion							3.5E+00
					mg/L	1/(mg/kg/d)	mg/kg/d	
4	Water Ingestion	Inorganics	Cyanide	1/2	9.59E-02 (Max)	2.0E-02	2.7E-03	1.4E-01
			Chromium	3/5	1.62E-02 (Max)	5.0E-03	4.6E-04	9.3E-02
			Uranium	4/4	3.58E-03 (UCL)	3.0E-03	1.0E-04	3.4E-02
			Nickel	2/4	1.90E-02 (Max)	2.0E-02	5.4E-04	2.7E-02
			Mercury	1/5	2.01E-04 (UCL)	3.0E-04	5.8E-06	1.9E-02
			Manganese	2/2	6.17E-02 (Max)	1.0E-01	1.8E-03	1.8E-02
			Barium	1/1	3.30E-02 (Max)	7.0E-02	9.4E-04	1.3E-02
			Boron	1/1	2.30E-02 (Max)	9.0E-02	6.6E-04	7.3E-03
			Copper	2/4	4.53E-03 (Max)	3.7E-02	1.3E-04	3.5E-03
			Zinc	2/4	8.12E-03 (Max)	2.0E-01	2.3E-04	1.2E-03
			TOTAL					3.5E-01
					mg/L	1/(mg/kg/d)	mg/kg/d	
		Organics	Phenol	1/4	1.29E-02 (Max)	6.0E-01	3.7E-04	6.1E-04
			TOTAL					6.1E-04
4	Water Ingestion							3.5E-01
4								3.9E+00
					mg/kg	1/(mg/kg/d)	mg/kg/d	
5	Fish Ingestion	Inorganics	Copper	6/25	1.70E+02 (Max)	3.7E-02	1.5E-01	4.1E+00
			Mercury	25/25	1.08E-01 (UCL)	3.0E-04	9.7E-05	3.2E-01
			Arsenic	23/25	9.23E-02 (UCL)	3.0E-04	8.3E-05	2.8E-01
			Zinc	24/24	1.09E+01 (UCL)	2.0E-01	9.8E-03	4.9E-02
			Beryllium	2/25	2.70E-02 (Max)	5.0E-03	2.4E-05	4.9E-03

Table E.11 Results of adult conservative screening for noncarcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
			TOTAL					4.8E+00
					mg/kg	1/(mg/kg/d)	mg/kg/d	
5	Fish Ingestion	Organics	Chlordane	18/18	4.55E-02 (UCL)	6.0E-05	4.1E-05	6.8E-01
			Aldrin	2/18	5.45E-03 (UCL)	3.0E-05	4.9E-06	1.6E-01
			4,4'-DDT	5/18	1.29E-03 (UCL)	5.0E-04	1.2E-06	2.3E-03
			TOTAL					8.5E-01
5	Fish Ingestion							5.6E+00
5								5.6E+00
					mg/kg	1/(mg/kg/d)	mg/kg/d	
10	Fish Ingestion	Inorganics	Mercury	15/15	2.80E-01 (UCL)	3.0E-04	2.5E-04	8.4E-01
			Arsenic	14/15	9.68E-02 (UCL)	3.0E-04	8.7E-05	2.9E-01
			Selenium	8/15	5.82E-01 (UCL)	5.0E-03	5.2E-04	1.0E-01
			Zinc	15/15	5.97E+00 (UCL)	2.0E-01	5.4E-03	2.7E-02
			Beryllium	1/10	3.70E-02 (Max)	5.0E-03	3.3E-05	6.7E-03
			TOTAL					1.3E+00
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Chlordane	8/8	1.57E-02 (UCL)	6.0E-05	1.4E-05	2.4E-01
			TOTAL					2.4E-01
10	Fish Ingestion							1.5E+00
					mg/L	1/(mg/kg/d)	mg/kg/d	
	Water Ingestion	Organics	Bis(2-ethylhexyl)phthalate	1/1	7.50E-03 (Max)	2.0E-02	2.1E-04	1.1E-02

Table E.11 Results of adult conservative screening for noncarcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
			TOTAL					1.1E-02
10	Water Ingestion							1.1E-02
10								1.5E+00
					mg/kg	1/(mg/kg/d)	mg/kg/d	
13	Fish Ingestion	Inorganics	Mercury	10/10	3.67E-01 (UCL)	3.0E-04	3.3E-04	1.1E+00
			Arsenic	4/10	5.90E-02 (UCL)	3.0E-04	5.3E-05	1.8E-01
			Zinc	10/10	6.98E+00 (UCL)	2.0E-01	6.3E-03	3.1E-02
			TOTAL					1.3E+00
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Chlordane	2/4	7.29E-02 (Max)	6.0E-05	6.6E-05	1.1E+00
			Aldrin	2/3	1.30E-03 (UCL)	3.0E-05	1.2E-06	3.9E-02
			TOTAL					1.1E+00
13	Fish Ingestion							2.4E+00
					mg/L	1/(mg/kg/d)	mg/kg/d	
	Water Ingestion	Inorganics	Cyanide	1/1	8.79E-02 (Max)	2.0E-02	2.5E-03	1.3E-01
			Chromium	1/2	1.10E-02 (Max)	5.0E-03	3.1E-04	6.3E-02
			Manganese	1/1	1.54E-01 (Max)	1.0E-01	4.4E-03	4.4E-02
			Nickel	1/2	1.90E-02 (Max)	2.0E-02	5.4E-04	2.7E-02
			Zinc	1/2	1.80E-02 (Max)	2.0E-01	5.1E-04	2.6E-03
			TOTAL					2.6E-01

Table E.11 Results of adult conservative screening for noncarcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
13	Water Ingestion							2.6E-01
13								2.7E+00

Table E.12 Results of child conservative screening for noncarcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
					mg/kg	1/(mg/kg/d)	mg/kg/d	
1	Fish Ingestion	Inorganics	Arsenic	17/28	9.82E-02 (UCL)	3.0E-04	1.5E-04	5.2E-01
			Mercury	28/28	8.19E-02 (UCL)	3.0E-04	1.3E-04	4.3E-01
			Selenium	26/28	8.34E-01 (UCL)	5.0E-03	1.3E-03	2.6E-01
			Zinc	28/28	7.55E+00 (UCL)	2.0E-01	1.2E-02	5.9E-02
			Beryllium	4/25	3.26E-03 (UCL)	5.0E-03	5.1E-06	1.0E-03
			TOTAL					1.3E+00
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Chlordane	11/16	1.09E-01 (UCL)	6.0E-05	1.7E-04	2.9E+00
			TOTAL					2.9E+00
1	Fish Ingestion							4.1E+00
					mg/L	1/(mg/kg/d)	mg/kg/d	
	Water Ingestion	Inorganics	Arsenic	1/5	4.28E-02 (UCL)	3.0E-04	2.9E-03	9.5E+00
			Antimony	1/4	5.09E-02 (Max)	4.0E-04	3.4E-03	8.5E+00
			Cadmium	1/5	4.95E-03 (UCL)	5.0E-04	3.3E-04	6.6E-01
			Selenium	3/6	1.84E-02 (UCL)	5.0E-03	1.2E-03	2.5E-01
			Chromium	3/6	9.80E-03 (Max)	5.0E-03	6.5E-04	1.3E-01
			Nickel	3/6	3.02E-02 (UCL)	2.0E-02	2.0E-03	1.0E-01
			Manganese	1/1	1.44E-01 (Max)	1.0E-01	9.6E-03	9.6E-02
			Mercury	2/5	3.50E-04 (UCL)	3.0E-04	2.3E-05	7.8E-02
			Beryllium	1/4	3.90E-03 (Max)	5.0E-03	2.6E-04	5.2E-02
			Barium	1/1	3.30E-02 (Max)	7.0E-02	2.2E-03	3.1E-02
			Vanadium	1/1	2.48E-03 (Max)	7.0E-03	1.7E-04	2.4E-02
			Copper	2/6	7.44E-03 (UCL)	3.7E-02	5.0E-04	1.3E-02
			Strontium	1/1	8.73E-02 (Max)	8.8E-01	5.8E-03	6.6E-03
			Zinc	3/6	1.40E-02 (UCL)	2.0E-01	9.3E-04	4.7E-03
			TOTAL					1.9E+01

Table E.12 Results of child conservative screening for noncarcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
1	Water Ingestion							1.9E+01
1								2.4E+01
					mg/kg	1/(mg/kg/d)	mg/kg/d	
2	Fish Ingestion	Inorganics	Mercury	13/13	1.35E-01 (UCL)	3.0E-04	2.1E-04	7.1E-01
			Arsenic	5/13	9.80E-02 (UCL)	3.0E-04	1.5E-04	5.1E-01
			Selenium	11/13	8.51E-01 (UCL)	5.0E-03	1.3E-03	2.7E-01
			Zinc	13/13	6.57E+00 (UCL)	2.0E-01	1.0E-02	5.2E-02
			TOTAL					1.5E+00
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Chlordane	9/14	8.16E-02 (UCL)	6.0E-05	1.3E-04	2.1E+00
			Aldrin	2/14	1.65E-04 (UCL)	3.0E-05	2.6E-07	8.7E-03
			4,4'-DDT	2/13	8.59E-04 (UCL)	5.0E-04	1.4E-06	2.7E-03
			TOTAL					2.2E+00
2	Fish Ingestion							3.7E+00
					mg/L	1/(mg/kg/d)	mg/kg/d	
	Water Ingestion	Inorganics	Cyanide	1/1	1.08E-01 (Max)	2.0E-02	7.0E-03	3.5E-01
			Selenium	1/4	6.72E-03 (Max)	5.0E-03	4.5E-04	9.0E-02
			Nickel	1/3	2.21E-02 (Max)	2.0E-02	1.5E-03	7.4E-02
			Barium	2/2	3.30E-02 (Max)	7.0E-02	2.2E-03	3.1E-02
			Manganese	1/1	3.51E-02 (Max)	1.0E-01	2.3E-03	2.3E-02
			Uranium	2/2	8.42E-04 (Max)	3.0E-03	5.6E-05	1.9E-02
			Zinc	2/3	5.20E-02 (Max)	2.0E-01	3.5E-03	1.7E-02
			Copper	2/3	6.50E-03 (Max)	3.7E-02	4.3E-04	1.2E-02
			Strontium	1/1	8.90E-02 (Max)	8.8E-01	5.9E-03	6.7E-03

Table E.12 Results of child conservative screening for noncarcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
			TOTAL					6.2E-01
					mg/L	1/(mg/kg/d)	mg/kg/d	
2	Water Ingestion	Organics	Tetrachloroethylene	1/3	5.00E-03 (Max)	1.0E-02	3.3E-04	3.3E-02
			Chloroform	1/2	5.00E-03 (Max)	1.0E-02	3.3E-04	3.3E-02
			Acetone	1/1	9.45E-03 (Max)	1.0E-01	6.3E-04	6.3E-03
			Methylene chloride	2/3	5.00E-03 (Max)	6.0E-02	3.3E-04	5.6E-03
			Carbon disulfide	1/1	4.69E-03 (Max)	1.0E-01	3.1E-04	3.1E-03
			Toluene	1/3	5.00E-03 (Max)	2.0E-01	3.3E-04	1.7E-03
			Phenol	1/2	1.23E-02 (Max)	6.0E-01	8.2E-04	1.4E-03
			Xylene	1/1	4.75E-03 (Max)	2.0E+00	3.2E-04	1.6E-04
			TOTAL					8.5E-02
2	Water Ingestion							7.1E-01
2								4.4E+00
					mg/kg	1/(mg/kg/d)	mg/kg/d	
3	Fish Ingestion	Inorganics	Mercury	35/35	6.16E-01 (UCL)	3.0E-04	9.7E-04	3.2E+00
			Arsenic	19/35	7.50E-02 (UCL)	3.0E-04	1.2E-04	3.9E-01
			Selenium	2/35	5.77E-01 (UCL)	5.0E-03	9.1E-04	1.8E-01
			Zinc	35/35	6.55E+00 (UCL)	2.0E-01	1.0E-02	5.2E-02
			Beryllium	7/35	5.45E-03 (UCL)	5.0E-03	8.6E-06	1.7E-03
			TOTAL					3.9E+00
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Chlordane	34/34	7.45E-02 (UCL)	6.0E-05	1.2E-04	2.0E+00
			Bis(2-ethylhexyl)phthalate	1/33	4.10E-01 (Max)	2.0E-02	6.5E-04	3.2E-02
			Di-n-octylphthalate	1/33	4.10E-01 (Max)	2.0E-02	6.5E-04	3.2E-02
			TOTAL					2.0E+00

Table E.12 Results of child conservative screening for noncarcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
3	Fish Ingestion							5.9E+00
					mg/L	1/(mg/kg/d)	mg/kg/d	
3	Water Ingestion	Inorganics	Uranium	8/8	2.91E-01 (UCL)	3.0E-03	1.9E-02	6.5E+00
			Arsenic	3/10	1.14E-02 (UCL)	3.0E-04	7.6E-04	2.5E+00
			Nickel	5/10	1.29E-01 (UCL)	2.0E-02	8.6E-03	4.3E-01
			Cyanide	3/3	1.01E-01 (Max)	2.0E-02	6.8E-03	3.4E-01
			Cadmium	3/11	2.13E-03 (UCL)	5.0E-04	1.4E-04	2.8E-01
			Molybdenum	1/4	1.38E-02 (Max)	5.0E-03	9.2E-04	1.8E-01
			Boron	4/4	2.31E-01 (Max)	9.0E-02	1.5E-02	1.7E-01
			Chromium	7/12	1.13E-02 (UCL)	5.0E-03	7.5E-04	1.5E-01
			Manganese	6/6	2.19E-01 (UCL)	1.0E-01	1.5E-02	1.5E-01
			Selenium	2/11	1.08E-02 (UCL)	5.0E-03	7.2E-04	1.4E-01
			Silver	4/11	9.36E-03 (UCL)	5.0E-03	6.2E-04	1.2E-01
			Barium	3/4	1.18E-01 (Max)	7.0E-02	7.9E-03	1.1E-01
			Mercury	5/10	5.03E-04 (UCL)	3.0E-04	3.4E-05	1.1E-01
			Beryllium	2/10	3.20E-03 (UCL)	5.0E-03	2.1E-04	4.3E-02
			Copper	6/10	1.54E-02 (UCL)	3.7E-02	1.0E-03	2.8E-02
			Zinc	7/11	2.96E-02 (UCL)	2.0E-01	2.0E-03	9.9E-03
			Tin	1/3	1.48E-02 (Max)	6.0E-01	9.9E-04	1.6E-03
			TOTAL					1.1E+01
					mg/L	1/(mg/kg/d)	mg/kg/d	
		Organics	Trans-1,3-dichloropropene	1/5	5.01E-03 (UCL)	3.0E-04	3.3E-04	1.1E+00
			2,4-Dichlorophenol	1/8	1.01E-02 (UCL)	3.0E-03	6.7E-04	2.2E-01
			Trans-1,2-dichloroethylene	3/5	2.23E-02 (UCL)	2.0E-02	1.5E-03	7.4E-02
			1,1-Dichloroethylene	2/5	5.01E-03 (Max)	9.0E-03	3.3E-04	3.7E-02
			Bis(2-ethylhexyl)phthalate	2/8	1.03E-02 (UCL)	2.0E-02	6.9E-04	3.4E-02
			Chloroform	3/5	5.10E-03 (UCL)	1.0E-02	3.4E-04	3.4E-02
			Tetrachloroethylene	3/5	5.03E-03 (UCL)	1.0E-02	3.4E-04	3.4E-02
			Pyrene	1/8	1.01E-02 (UCL)	3.0E-02	6.7E-04	2.2E-02
			Fluoranthene	1/8	1.01E-02 (UCL)	4.0E-02	6.7E-04	1.7E-02
			Bromoform	1/5	5.03E-03 (UCL)	2.0E-02	3.4E-04	1.7E-02
			Dichlorobromomethane	2/5	5.00E-03 (Max)	2.0E-02	3.3E-04	1.7E-02

Table E.12 Results of child conservative screening for noncarcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
3	Water Ingestion	Organics	Chlorobenzene	1/5	5.00E-03 (Max)	2.0E-02	3.3E-04	1.7E-02
			Chlorodibromomethane	1/5	5.00E-03 (Max)	2.0E-02	3.3E-04	1.7E-02
			Di-n-butylphthalate	1/8	1.00E-02 (Max)	1.0E-01	6.7E-04	6.7E-03
			Methylene chloride	3/5	5.53E-03 (UCL)	6.0E-02	3.7E-04	6.1E-03
			1,1,1-Trichloroethane	2/5	5.02E-03 (Max)	9.0E-02	3.3E-04	3.7E-03
			Butylbenzylphthalate	1/8	1.00E-02 (UCL)	2.0E-01	6.7E-04	3.3E-03
			1,1-Dichloroethane	2/5	5.00E-03 (Max)	1.0E-01	3.3E-04	3.3E-03
			Ethylbenzene	1/5	5.00E-03 (Max)	1.0E-01	3.3E-04	3.3E-03
			Anthracene	1/8	1.01E-02 (UCL)	3.0E-01	6.7E-04	2.2E-03
			Toluene	2/5	5.00E-03 (Max)	2.0E-01	3.3E-04	1.7E-03
			Phenol	4/8	1.24E-02 (UCL)	6.0E-01	8.2E-04	1.4E-03
			Diethylphthalate	1/8	1.01E-02 (UCL)	8.0E-01	6.7E-04	8.4E-04
			Dimethylphthalate	1/8	1.01E-02 (UCL)	1.0E+00	6.7E-04	6.7E-04
			TOTAL					1.7E+00
3	Water Ingestion							1.3E+01
3								1.9E+01
					mg/kg	1/(mg/kg/d)	mg/kg/d	
4	Fish Ingestion	Inorganics	Mercury	27/27	3.91E-01 (UCL)	3.0E-04	6.2E-04	2.1E+00
			Arsenic	25/27	1.07E-01 (UCL)	3.0E-04	1.7E-04	5.6E-01
			Selenium	14/27	6.86E-01 (UCL)	5.0E-03	1.1E-03	2.2E-01
			Zinc	27/27	6.55E+00 (UCL)	2.0E-01	1.0E-02	5.2E-02
			TOTAL					2.9E+00
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Chlordane	18/18	9.72E-02 (UCL)	6.0E-05	1.5E-04	2.6E+00
			4,4'-DDT	1/18	2.00E-01 (Max)	5.0E-04	3.2E-04	6.3E-01
			Aldrin	2/14	1.33E-03 (UCL)	3.0E-05	2.1E-06	7.0E-02
			TOTAL					3.3E+00

Table E.12 Results of child conservative screening for noncarcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
4	Fish Ingestion							6.1E+00
					mg/L	1/(mg/kg/d)	mg/kg/d	
4	Water Ingestion	Inorganics	Cyanide	1/2	9.59E-02 (Max)	2.0E-02	6.4E-03	3.2E-01
			Chromium	3/5	1.62E-02 (Max)	5.0E-03	1.1E-03	2.2E-01
			Uranium	4/4	3.58E-03 (UCL)	3.0E-03	2.4E-04	8.0E-02
			Nickel	2/4	1.90E-02 (Max)	2.0E-02	1.3E-03	6.3E-02
			Mercury	1/5	2.01E-04 (UCL)	3.0E-04	1.3E-05	4.5E-02
			Manganese	2/2	6.17E-02 (Max)	1.0E-01	4.1E-03	4.1E-02
			Barium	1/1	3.30E-02 (Max)	7.0E-02	2.2E-03	3.1E-02
			Boron	1/1	2.30E-02 (Max)	9.0E-02	1.5E-03	1.7E-02
			Copper	2/4	4.53E-03 (Max)	3.7E-02	3.0E-04	8.2E-03
			Zinc	2/4	8.12E-03 (Max)	2.0E-01	5.4E-04	2.7E-03
			TOTAL					8.2E-01
					mg/L	1/(mg/kg/d)	mg/kg/d	
		Organics	Phenol	1/4	1.29E-02 (Max)	6.0E-01	8.6E-04	1.4E-03
			TOTAL					1.4E-03
4	Water Ingestion							8.3E-01
4								7.0E+00
					mg/kg	1/(mg/kg/d)	mg/kg/d	
5	Fish Ingestion	Inorganics	Copper	6/25	1.70E+02 (Max)	3.7E-02	2.7E-01	7.2E+00
			Mercury	25/25	1.08E-01 (UCL)	3.0E-04	1.7E-04	5.7E-01
			Arsenic	23/25	9.23E-02 (UCL)	3.0E-04	1.5E-04	4.8E-01
			Zinc	24/24	1.09E+01 (UCL)	2.0E-01	1.7E-02	8.6E-02
			Beryllium	2/25	2.70E-02 (Max)	5.0E-03	4.3E-05	8.5E-03

Table E.12 Results of child conservative screening for noncarcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
			TOTAL					8.4E+00
					mg/kg	1/(mg/kg/d)	mg/kg/d	
5	Fish Ingestion	Organics	Chlordane	18/18	4.55E-02 (UCL)	6.0E-05	7.2E-05	1.2E+00
			Aldrin	2/18	5.45E-03 (UCL)	3.0E-05	8.6E-06	2.9E-01
			4,4'-DDT	5/18	1.29E-03 (UCL)	5.0E-04	2.0E-06	4.1E-03
			TOTAL					1.5E+00
5	Fish Ingestion							9.9E+00
5								9.9E+00
					mg/kg	1/(mg/kg/d)	mg/kg/d	
10	Fish Ingestion	Inorganics	Mercury	15/15	2.80E-01 (UCL)	3.0E-04	4.4E-04	1.5E+00
			Arsenic	14/15	9.68E-02 (UCL)	3.0E-04	1.5E-04	5.1E-01
			Selenium	8/15	5.82E-01 (UCL)	5.0E-03	9.2E-04	1.8E-01
			Zinc	15/15	5.97E+00 (UCL)	2.0E-01	9.4E-03	4.7E-02
			Beryllium	1/10	3.70E-02 (Max)	5.0E-03	5.8E-05	1.2E-02
			TOTAL					2.2E+00
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Chlordane	8/8	1.57E-02 (UCL)	6.0E-05	2.5E-05	4.1E-01
			TOTAL					4.1E-01
10	Fish Ingestion							2.6E+00
					mg/L	1/(mg/kg/d)	mg/kg/d	
	Water Ingestion	Organics	Bis(2-ethylhexyl)phthalate	1/1	7.50E-03 (Max)	2.0E-02	5.0E-04	2.5E-02

Table E.12 Results of child conservative screening for noncarcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
			TOTAL					2.5E-02
10	Water Ingestion							2.5E-02
10								2.7E+00
					mg/kg	1/(mg/kg/d)	mg/kg/d	
13	Fish Ingestion	Inorganics	Mercury	10/10	3.67E-01 (UCL)	3.0E-04	5.8E-04	1.9E+00
			Arsenic	4/10	5.90E-02 (UCL)	3.0E-04	9.3E-05	3.1E-01
			Zinc	10/10	6.98E+00 (UCL)	2.0E-01	1.1E-02	5.5E-02
			TOTAL					2.3E+00
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Chlordane	2/4	7.29E-02 (Max)	6.0E-05	1.1E-04	1.9E+00
			Aldrin	2/3	1.30E-03 (UCL)	3.0E-05	2.1E-06	6.8E-02
			TOTAL					2.0E+00
13	Fish Ingestion							4.3E+00
					mg/L	1/(mg/kg/d)	mg/kg/d	
	Water Ingestion	Inorganics	Cyanide	1/1	8.79E-02 (Max)	2.0E-02	5.9E-03	2.9E-01
			Chromium	1/2	1.10E-02 (Max)	5.0E-03	7.3E-04	1.5E-01
			Manganese	1/1	1.54E-01 (Max)	1.0E-01	1.0E-02	1.0E-01
			Nickel	1/2	1.90E-02 (Max)	2.0E-02	1.3E-03	6.3E-02
			Zinc	1/2	1.80E-02 (Max)	2.0E-01	1.2E-03	6.0E-03
			TOTAL					6.1E-01

Table E.12 Results of child conservative screening for noncarcinogens in fish, surface sediment, and water where at least one measurement in a reach was above detection limits.

Reach	Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
13	Water Ingestion							6.1E-01
13								4.9E+00

Table E.13 Results of adult conservative screening for carcinogens in dredged sediments where at least one measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Sediment ingestion	Sediment inhalation	Sediment exposure	Milk ingestion	Meat ingestion	Vegetable ingestion	Multiple pathway total
1	Inorganics	Arsenic	1.2E-05	7.9E-07		1.4E-08	2.1E-07	2.1E-05	3.3E-05
		Beryllium	2.1E-08	9.9E-09		1.8E-08	1.3E-05	1.5E-05	3.0E-05
		Chromium		1.2E-06					1.2E-06
		Nickel		2.9E-08					2.9E-08
		Cadmium		6.2E-09					6.2E-09
		TOTAL	1.4E-05	2.0E-08		3.2E-08	1.4E-05	3.6E-05	6.5E-05
	Organics	Pyrene	3.7E-08			1.5E-05	1.4E-05	9.3E-05	1.3E-04
		Fluoranthene	3.7E-08			1.6E-05	1.5E-05	9.1E-05	1.3E-04
		Benzo(k)fluoranthene	3.6E-07			6.0E-05	5.7E-05	6.9E-07	1.2E-04
		Benzo(a)anthracene	3.6E-07			5.0E-06	4.7E-06	3.4E-06	1.4E-05
		4,4'-DDT	8.1E-08	1.9E-10		5.1E-06	4.9E-06	2.8E-07	1.0E-05
		4,4'-DDD	5.7E-08			1.7E-06	1.7E-06	3.2E-07	3.8E-06
		Chrysene	3.6E-08			8.8E-07	8.4E-07	2.3E-07	2.0E-06
		TOTAL	8.3E-06	1.9E-10		1.0E-04	9.9E-05	1.9E-04	4.0E-04
	Radionuclides	Cs-137	3.2E-08	3.8E-11	9.0E-06	1.8E-06	2.0E-06	1.2E-06	1.4E-05
		Co-60	5.2E-09	3.3E-11	4.2E-06	8.5E-08	3.8E-07	7.3E-08	4.8E-06
		TOTAL	3.7E-08	7.1E-11	1.3E-05	1.9E-06	2.4E-06	1.3E-06	1.9E-05
1			2.2E-05	2.0E-08	1.3E-05	1.1E-04	1.1E-04	2.3E-04	4.8E-04
2	Inorganics	Beryllium	2.1E-08	9.7E-09		1.7E-08	1.3E-05	1.5E-05	3.0E-05
		Arsenic	6.5E-08	4.4E-07		7.9E-09	1.2E-07	1.2E-05	1.9E-05
		Chromium		9.7E-07					9.7E-07
		Nickel		1.9E-08					1.9E-08
		Cadmium		4.2E-09					4.2E-09
		TOTAL	8.6E-08	1.4E-06		2.5E-08	1.3E-05	2.6E-05	4.9E-05
	Organics	Aroclor-1260	1.7E-05			5.6E-03	5.3E-03	2.2E-05	1.1E-02
		Aroclor-1254	1.7E-05			5.3E-04	5.1E-04	9.5E-05	1.1E-03
		Toxaphene	2.4E-06	5.8E-09		1.4E-06	1.3E-06	5.1E-04	5.1E-04
		Benzo(a)pyrene	2.2E-06	4.5E-09		7.1E-05	6.7E-05	1.2E-05	1.5E-04
		Phenanthrene	2.2E-06			5.7E-06	5.4E-06	8.3E-05	9.6E-05
		Pyrene	1.9E-06			7.9E-06	7.5E-06	4.9E-05	6.6E-05
		Fluoranthene	1.9E-06			8.0E-06	7.6E-06	4.7E-05	6.4E-05
		Indeno(1,2,3-cd)pyrene	2.2E-07			2.2E-05	2.1E-05	6.0E-07	4.3E-05

Table E.13 Results of adult conservative screening for carcinogens in dredged sediments where at least one measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Sediment ingestion	Sediment inhalation	Sediment exposure	Milk ingestion	Meat ingestion	Vegetable ingestion	Multiple pathway total
2	Organics	Benzo(b)fluoranthene	2.2E-07			8.4E-06	8.0E-06	1.1E-06	1.8E-05
		Benzo(a)anthracene	2.2E-07			3.1E-06	3.0E-06	2.2E-06	8.5E-06
		Chrysene	2.2E-08			5.5E-07	5.2E-07	1.4E-07	1.2E-06
		Bis(2-ethylhexyl)phthalate	5.1E-09			2.1E-08	2.0E-08	1.3E-07	1.7E-07
		TOTAL	4.6E-05	1.0E-08		6.3E-03	5.9E-03	8.2E-04	1.3E-02
	Radionuclides	Cs-137	8.6E-07	1.0E-09	2.4E-04	4.9E-05	5.5E-05	3.3E-05	3.8E-04
		Sr-90	1.4E-08	4.3E-11		2.9E-06	8.6E-07	5.3E-06	9.1E-06
		Co-60	5.8E-09	3.7E-11	4.7E-06	9.5E-08	4.3E-07	8.1E-08	5.3E-06
		U-238	3.8E-08	1.7E-07	2.6E-07	7.9E-08	3.9E-07	1.3E-07	1.1E-06
		U-234	2.4E-08	9.2E-08	2.4E-10	4.9E-08	2.5E-07	8.3E-08	4.9E-07
		Am-241	4.9E-08	1.5E-08	5.2E-09	5.9E-11	8.8E-10	8.6E-08	1.6E-07
		U-235	1.1E-09	4.1E-09	8.8E-08	2.3E-09	1.1E-08	3.8E-09	1.1E-07
		Pu-239,240	4.6E-08	1.8E-08	1.8E-11	1.3E-11	3.9E-10	4.2E-08	1.1E-07
		Pu-238	7.1E-09	2.8E-09	4.4E-12	1.8E-12	5.4E-11	5.8E-09	1.6E-08
		Cm-243,244	2.7E-09	5.4E-10	1.7E-12	2.0E-12	3.0E-11	2.9E-09	6.2E-09
		TOTAL	1.0E-08	3.0E-07	2.5E-04	5.2E-05	5.7E-05	3.9E-05	4.0E-04
2			5.5E-05	1.8E-06	2.5E-04	6.3E-03	6.0E-03	8.8E-04	1.3E-02
3	Inorganics	Arsenic	1.5E-04	1.0E-05		1.8E-07	2.7E-06	2.7E-04	4.3E-04
		Beryllium	4.1E-06	1.9E-08		3.4E-08	2.6E-05	2.9E-05	5.9E-05
		Chromium		1.8E-06					1.8E-06
		Nickel		2.9E-08					2.9E-08
		Cadmium		1.2E-08					1.2E-08
		TOTAL	1.5E-04	1.2E-05		2.2E-07	2.8E-05	3.0E-04	4.9E-04
	Organics	Aroclor-1254	1.0E-05			3.3E-04	3.1E-04	5.8E-05	7.0E-04
		Benzo(a)pyrene	2.1E-06	4.2E-09		6.7E-05	6.3E-05	1.1E-05	1.4E-04
		Anthracene	2.1E-06			4.6E-06	4.4E-06	9.4E-05	1.0E-04
		Phenanthrene	1.9E-06			4.9E-06	4.6E-06	7.1E-05	8.3E-05
		Benzo(k)fluoranthene	2.1E-07			3.6E-05	3.4E-05	4.0E-07	7.0E-05
		Fluoranthene	1.9E-06			8.1E-06	7.6E-06	4.7E-05	6.5E-05
		Pyrene	1.9E-06			7.6E-06	7.2E-06	4.7E-05	6.4E-05
		Benzo(b)fluoranthene	2.0E-07			7.6E-06	7.2E-06	9.9E-07	1.6E-05
		Benzo(a)anthracene	2.1E-07			2.9E-06	2.8E-06	2.0E-06	8.0E-06
		Chrysene	2.1E-08			5.2E-07	4.9E-07	1.4E-07	1.2E-06

Table E.13 Results of adult conservative screening for carcinogens in dredged sediments where at least one measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Sediment ingestion	Sediment inhalation	Sediment exposure	Milk ingestion	Meat ingestion	Vegetable ingestion	Multiple pathway total
3	Organics	Bis(2-ethylhexyl)phthalate	8.4E-09			3.5E-08	3.3E-08	2.1E-07	2.9E-07
		TOTAL	2.1E-05	4.2E-09		4.6E-04	4.4E-04	3.3E-04	1.3E-03
	Radionuclides	Cs-137	2.5E-07	2.9E-10	6.9E-05	1.4E-05	1.6E-05	9.4E-06	1.1E-04
		U-238	1.6E-07	7.0E-07	1.1E-06	3.3E-07	1.7E-06	5.6E-07	4.5E-06
		U-234	1.0E-07	3.9E-07	1.0E-09	2.1E-07	1.0E-06	3.5E-07	2.1E-06
		Sr-90	3.0E-09	9.0E-12		6.0E-07	1.8E-07	1.1E-06	1.9E-06
		Co-60	1.5E-09	9.8E-12	1.2E-06	2.5E-08	1.1E-07	2.1E-08	1.4E-06
		U-235	3.3E-09	1.3E-08	2.7E-07	7.0E-09	3.5E-08	1.2E-08	3.4E-07
		Am-241	2.8E-08	8.6E-09	3.0E-09	3.3E-11	5.0E-10	4.9E-08	8.9E-08
		Pu-239,240	3.9E-09	1.5E-09	1.5E-12	1.1E-12	3.3E-11	3.5E-09	8.9E-09
		Pu-238	3.5E-09	1.4E-09	2.2E-12	8.9E-13	2.7E-11	2.9E-09	7.8E-09
		Cm-243,244	2.2E-09	4.3E-10	1.3E-12	1.6E-12	2.4E-11	2.3E-09	5.0E-09
		TOTAL	5.5E-07	1.1E-06	7.2E-05	1.5E-05	1.9E-05	1.1E-05	1.2E-04
3			1.8E-04	1.3E-05	7.2E-05	4.8E-04	4.9E-04	6.4E-04	1.9E-03
4	Inorganics	Beryllium	3.1E-06	1.4E-08		2.6E-08	1.9E-05	2.1E-05	4.4E-05
		Arsenic	1.2E-05	8.0E-07		1.4E-08	2.1E-07	2.1E-05	3.4E-05
		Chromium		1.6E-06					1.6E-06
		Nickel		3.6E-08					3.6E-08
		Cadmium		1.3E-08					1.3E-08
		TOTAL	1.5E-05	2.4E-06		4.0E-08	1.9E-05	4.2E-05	7.9E-05
	Organics	N-Nitroso-di-n-propylamine	1.5E-05			1.2E-06	1.2E-06	4.2E-02	4.2E-02
		Phenanthrene	1.6E-05			4.2E-05	4.0E-05	6.2E-04	7.1E-04
		Pyrene	1.6E-05			6.6E-05	6.3E-05	4.1E-04	5.5E-04
		Fluoranthene	1.6E-05			6.8E-05	6.5E-05	4.0E-04	5.5E-04
		Aroclor-1254	8.3E-07			2.6E-05	2.5E-05	4.6E-06	5.6E-05
		Bis(2-ethylhexyl)phthalate	1.7E-08			7.0E-08	6.6E-08	4.2E-07	5.7E-07
		TOTAL	6.5E-05			2.0E-04	1.9E-04	4.4E-02	4.4E-02
	Radionuclides	Cs-137	1.4E-06	1.6E-09	3.9E-04	7.9E-05	8.9E-05	5.3E-05	6.2E-04
		Sr-90	1.6E-08	4.8E-11		3.2E-06	9.6E-07	5.9E-06	1.0E-05
		Co-60	9.7E-09	6.2E-11	7.9E-06	1.6E-07	7.1E-07	1.4E-07	8.9E-06
		U-238	5.8E-08	2.5E-07	4.0E-07	1.2E-07	6.0E-07	2.0E-07	1.6E-06
		U-234	3.9E-08	1.5E-07	3.9E-10	8.0E-08	4.0E-07	1.4E-07	8.1E-07

Table E.13 Results of adult conservative screening for carcinogens in dredged sediments where at least one measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Sediment ingestion	Sediment inhalation	Sediment exposure	Milk ingestion	Meat ingestion	Vegetable ingestion	Multiple pathway total
4	Radionuclides	U-235	2.1E-09	8.0E-09	1.7E-07	4.4E-09	2.2E-08	7.4E-09	2.2E-07
		Am-241	5.2E-08	1.6E-08	5.5E-09	6.2E-11	9.4E-10	9.1E-08	1.7E-07
		Pu-239,240	6.4E-08	2.5E-08	2.6E-11	1.8E-11	5.5E-10	5.9E-08	1.5E-07
		Pu-238	5.3E-09	2.1E-09	3.3E-12	1.3E-12	4.0E-11	4.3E-09	1.2E-08
		Cm-243,244	3.9E-09	7.7E-10	2.4E-12	2.9E-12	4.3E-11	4.2E-09	8.9E-09
		TOTAL	1.6E-06	4.6E-07	4.0E-04	8.3E-05	9.2E-05	6.0E-05	6.4E-04
4			8.1E-05	2.9E-06	4.0E-04	2.9E-04	3.0E-04	4.4E-02	4.5E-02
5	Inorganics	Beryllium	3.8E-08	1.8E-08		3.1E-08	2.3E-05	2.6E-05	5.3E-05
		Arsenic	9.7E-06	6.6E-07		1.2E-08	1.8E-07	1.7E-05	2.8E-05
		Chromium		2.1E-06					2.1E-06
		Cadmium		3.8E-08					3.8E-08
		Nickel		3.4E-08					3.4E-08
		TOTAL	1.4E-05	2.9E-06		4.3E-08	2.4E-05	4.4E-05	8.4E-05
	Organics	Bis(2-ethylhexyl)phthalate	2.0E-08			8.2E-08	7.8E-08	4.9E-07	6.7E-07
		TOTAL	2.0E-08			8.2E-08	7.8E-08	4.9E-07	6.7E-07
	Radionuclides	Cs-137	3.7E-07	4.3E-10	1.0E-04	2.1E-05	2.3E-05	1.4E-05	1.6E-04
		Co-60	4.6E-09	2.9E-11	3.7E-06	7.4E-08	3.4E-07	6.3E-08	4.2E-06
		Sr-90	5.6E-09	1.7E-11		1.1E-06	3.4E-07	2.1E-06	3.6E-06
		U-238	5.2E-08	2.3E-07	3.6E-07	1.1E-07	5.4E-07	1.8E-07	1.5E-06
		U-234	3.3E-08	1.3E-07	3.4E-10	6.9E-08	3.5E-07	1.2E-07	7.0E-07
		U-235	1.6E-09	5.9E-09	1.3E-07	3.2E-09	1.6E-08	5.5E-09	1.6E-07
		Am-241	2.7E-08	8.2E-09	2.8E-09	3.2E-11	4.8E-10	4.7E-08	8.5E-08
		Pu-239,240	2.4E-08	9.3E-09	9.7E-12	6.9E-12	2.1E-10	2.2E-08	5.6E-08
		Pu-238	7.5E-09	3.0E-09	4.6E-12	1.9E-12	5.7E-11	6.1E-09	1.7E-08
		Cm-243,244	3.1E-09	6.2E-10	1.9E-12	2.3E-12	3.5E-11	3.4E-09	7.2E-09
		TOTAL	5.3E-07	3.9E-07	1.1E-04	2.2E-05	2.5E-05	1.7E-05	1.7E-04
5			1.4E-05	3.2E-06	1.1E-04	2.2E-05	4.9E-05	6.1E-05	2.6E-04
10	Inorganics	Beryllium	3.4E-08	1.6E-08		2.8E-08	2.1E-05	2.4E-05	4.9E-05
		Arsenic	5.5E-06	3.8E-07		6.7E-09	1.0E-07	9.8E-06	1.6E-05

Table E.13 Results of adult conservative screening for carcinogens in dredged sediments where at least one measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Sediment ingestion	Sediment inhalation	Sediment exposure	Milk ingestion	Meat ingestion	Vegetable ingestion	Multiple pathway total
10	Inorganics	Chromium		1.3E-06					1.3E-06
		Nickel		2.6E-08					2.6E-08
		Cadmium		5.0E-09					5.0E-09
		TOTAL	8.9E-06	1.8E-06		3.5E-08	2.1E-05	3.4E-05	6.6E-05
	Organics	Anthracene	1.9E-05			4.2E-05	4.0E-05	8.5E-04	9.5E-04
		Phenanthrene	1.9E-05			5.0E-05	4.7E-05	7.2E-04	8.4E-04
		Pyrene	1.9E-05			7.8E-05	7.4E-05	4.8E-04	6.5E-04
		Fluoranthene	1.9E-05			8.0E-05	7.6E-05	4.7E-04	6.4E-04
		Chrysene	1.9E-07			4.6E-06	4.4E-06	1.2E-06	1.0E-05
		Bis(2-ethylhexyl)phthalate	2.9E-08			1.2E-07	1.1E-07	7.1E-07	9.8E-07
		TOTAL	7.6E-05			2.5E-04	2.4E-04	2.5E-03	3.1E-03
	Radionuclides	Cs-137	2.7E-08	3.2E-11	7.7E-06	1.6E-06	1.8E-06	1.0E-06	1.2E-05
		Sr-90	4.6E-09	1.4E-11		9.3E-07	2.8E-07	1.7E-06	2.9E-06
		U-238	4.1E-08	1.8E-07	2.8E-07	8.5E-08	4.2E-07	1.4E-07	1.1E-06
		U-234	2.1E-08	8.1E-08	2.1E-10	4.3E-08	2.2E-07	7.3E-08	4.4E-07
		U-235	1.0E-09	3.9E-09	8.5E-08	2.2E-09	1.1E-08	3.6E-09	1.1E-07
		Am-241	1.4E-08	4.4E-09	1.5E-09	1.7E-11	2.6E-10	2.5E-08	4.5E-08
		Pu-239,240	7.3E-09	2.8E-09	2.9E-12	2.1E-12	6.2E-11	6.7E-09	1.7E-08
		Cm-243,244	2.4E-09	4.7E-10	1.5E-12	1.7E-12	2.6E-11	2.5E-09	5.4E-09
		Pu-238	2.4E-09	9.5E-10	1.5E-12	6.1E-13	1.8E-11	2.0E-09	5.3E-09
		TOTAL	1.2E-07	2.7E-07	8.1E-06	2.6E-06	2.7E-06	3.0E-06	1.7E-05
10			8.5E-05	2.0E-06	8.1E-06	2.6E-04	2.7E-04	2.6E-03	3.2E-03

Table E.14 Results of adult conservative screening for noncarcinogens in dredged sediments where at least one measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Sediment ingestion	Sediment inhalation	Milk ingestion	Meat ingestion	Vegetable ingestion	Multiple pathway total
1	Inorganics	Zinc	8.7E-04		7.2E-01	2.2E+00	6.9E-01	3.6E+00
		Cadmium	2.0E-03		3.3E-01	5.0E-02	2.0E+00	2.4E+00
		Mercury	5.9E-04	4.9E-06	2.4E-02	1.5E-01	3.5E-01	5.2E-01
		Chromium	5.6E-03		7.1E-02	3.2E-01	1.1E-01	5.1E-01
		Copper	1.1E-03		1.5E-01	2.3E-01	1.1E-01	4.9E-01
		Selenium	2.0E-04		8.6E-02	2.6E-01	4.0E-02	3.8E-01
		Nickel	1.7E-03		3.2E-02	1.9E-02	1.7E-01	2.2E-01
		Arsenic	5.2E-02		7.2E-05	1.1E-03	1.1E-01	1.6E-01
		Silver	9.4E-05		7.8E-02	1.2E-02	3.7E-02	1.3E-01
		Beryllium	2.3E-04		2.2E-06	1.7E-03	1.9E-03	3.8E-03
		TOTAL	6.4E-02	4.9E-06	1.5E+00	3.2E+00	3.6E+00	8.4E+00
	Organics	4,4'-DDT	1.1E-03		8.1E-02	7.7E-02	4.5E-03	1.6E-01
		Pyrene	3.9E-05		1.9E-04	1.8E-04	1.1E-03	1.5E-03
		Fluoranthene	3.0E-05		1.4E-04	1.4E-04	8.4E-04	1.2E-03
		TOTAL	1.2E-03		8.2E-02	7.8E-02	6.5E-03	1.7E-01
1			6.5E-02	4.9E-06	1.6E+00	3.3E+00	3.6E+00	8.5E+00
2	Inorganics	Zinc	5.1E-04		4.2E-01	1.3E+00	4.0E-01	2.1E+00
		Cadmium	1.4E-03		2.2E-01	3.4E-02	1.3E+00	1.6E+00
		Mercury	1.2E-03	9.6E-06	4.8E-02	2.9E-01	6.9E-01	1.0E+00
		Chromium	4.6E-03		5.9E-02	2.7E-01	9.3E-02	4.2E-01
		Copper	5.6E-04		7.5E-02	1.1E-01	5.6E-02	2.4E-01
		Selenium	9.7E-05		4.2E-02	1.2E-01	1.9E-02	1.9E-01
		Nickel	1.1E-03		2.1E-02	1.3E-02	1.1E-01	1.5E-01
		Arsenic	2.9E-02		4.1E-05	6.1E-04	5.9E-02	8.9E-02
		Silver	3.9E-05		3.2E-02	4.8E-03	1.5E-02	5.2E-02
		Uranium	2.1E-03		4.9E-03	2.5E-02	8.3E-03	4.0E-02
		Beryllium	2.3E-04		2.2E-06	1.6E-03	1.8E-03	3.7E-03
		TOTAL	4.1E-02	9.6E-06	9.3E-01	2.1E+00	2.8E+00	5.9E+00
	Organics	Naphthalene	1.8E-05		1.6E-05	1.5E-05	2.9E-03	2.9E-03
		Bis(2-ethylhexyl)phthalate	4.2E-05		2.0E-04	1.9E-04	1.2E-03	1.7E-03
		Pyrene	2.0E-05		9.7E-05	9.2E-05	6.0E-04	8.1E-04
		Diethylphthalate	8.9E-07		2.5E-07	2.4E-07	6.4E-04	6.5E-04
		Fluoranthene	1.5E-05		7.4E-05	7.0E-05	4.3E-04	5.9E-04

Table E.14 Results of adult conservative screening for noncarcinogens in dredged sediments where at least one measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Sediment ingestion	Sediment inhalation	Milk ingestion	Meat ingestion	Vegetable ingestion	Multiple pathway total
2	Organics	Di-n-butylphthalate	7.0E-06		3.4E-05	3.2E-05	2.0E-04	2.7E-04
		TOTAL	1.0E-04		4.2E-04	4.0E-04	6.0E-03	6.9E-03
2			4.1E-02	9.6E-06	9.3E-01	2.1E+00	2.8E+00	5.9E+00
3	Inorganics	Thallium	3.0E-02		4.6E+00	9.2E+00	1.2E+01	2.6E+01
		Cadmium	3.8E-03		6.3E-01	9.5E-02	3.8E+00	4.5E+00
		Mercury	2.3E-03	1.9E-05	9.6E-02	5.7E-01	1.4E+00	2.1E+00
		Arsenic	6.7E-01		9.4E-04	1.4E-02	1.4E+00	2.0E+00
		Selenium	8.9E-04		3.8E-01	1.1E+00	1.8E-01	1.7E+00
		Zinc	4.0E-04		3.3E-01	9.9E-01	3.2E-01	1.6E+00
		Chromium	8.5E-03		1.1E-01	4.9E-01	1.7E-01	7.7E-01
		Copper	1.3E-03		1.8E-01	2.7E-01	1.3E-01	5.8E-01
		Silver	2.2E-04		1.8E-01	2.7E-02	8.7E-02	3.0E-01
		Nickel	1.7E-03		3.3E-02	2.0E-02	1.7E-01	2.2E-01
		Uranium	8.7E-03		2.1E-02	1.0E-01	3.5E-02	1.7E-01
		Antimony	1.1E-03		8.1E-04	2.4E-03	2.3E-02	2.7E-02
		Beryllium	4.5E-04		4.3E-06	3.2E-03	3.6E-03	7.3E-03
		TOTAL	7.3E-01	1.9E-05	6.5E+00	1.3E+01	2.0E+01	4.0E+01
	Organics	Bis(2-ethylhexyl)phthalate	7.0E-05		3.4E-04	3.2E-04	2.0E-03	2.7E-03
		Naphthalene	1.6E-05		1.5E-05	1.4E-05	2.6E-03	2.7E-03
		Dimethylphthalate	6.9E-07		1.3E-07	1.3E-07	7.9E-04	7.9E-04
		Pyrene	2.0E-05		9.4E-05	8.9E-05	5.8E-04	7.8E-04
		Fluoranthene	1.5E-05		7.4E-05	7.0E-05	4.3E-04	5.9E-04
		Di-n-butylphthalate	6.6E-06		3.2E-05	3.1E-05	1.9E-04	2.6E-04
		Anthracene	2.2E-06		5.7E-06	5.4E-06	1.1E-04	1.3E-04
		TOTAL	1.3E-04		5.6E-04	5.3E-04	6.7E-03	8.0E-03
3			7.3E-01	1.9E-05	6.5E+00	1.3E+01	2.0E+01	4.0E+01
4	Inorganics	Mercury	7.6E-02	6.3E-04	3.1E+00	1.9E+01	4.5E+01	6.7E+01
		Cadmium	4.0E-03		6.7E-01	1.0E-01	4.0E+00	4.8E+00
		Zinc	8.9E-04		7.3E-01	2.2E+00	7.1E-01	3.6E+00
		Silver	5.1E-04		4.3E-01	6.4E-02	2.0E-01	6.9E-01

Table E.14 Results of adult conservative screening for noncarcinogens in dredged sediments where at least one measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Sediment ingestion	Sediment inhalation	Milk ingestion	Meat ingestion	Vegetable ingestion	Multiple pathway total
4	Inorganics	Chromium	7.6E-03		9.7E-02	4.4E-01	1.5E-01	6.9E-01
		Selenium	3.5E-04		1.5E-01	4.5E-01	7.0E-02	6.7E-01
		Copper	1.3E-03		1.8E-01	2.7E-01	1.3E-01	5.9E-01
		Nickel	2.1E-03		4.0E-02	2.4E-02	2.1E-01	2.7E-01
		Arsenic	5.2E-02		7.3E-05	1.1E-03	1.1E-01	1.6E-01
		Uranium	3.2E-03		7.6E-03	3.8E-02	1.3E-02	6.1E-02
		Antimony	1.5E-03		1.1E-03	3.2E-03	2.9E-02	3.5E-02
		Beryllium	3.3E-04		3.2E-06	2.4E-03	2.7E-03	5.4E-03
		TOTAL	1.5E-01	6.3E-04	5.4E+00	2.2E+01	5.1E+01	7.9E+01
	Organics	Pyrene	1.7E-04		8.1E-04	7.7E-04	5.0E-03	6.8E-03
		Bis(2-ethylhexyl)phthalate	1.4E-04		6.7E-04	6.3E-04	4.0E-03	5.4E-03
		Fluoranthene	1.3E-04		6.3E-04	6.0E-04	3.7E-03	5.0E-03
		TOTAL	4.4E-04		2.1E-03	2.0E-03	1.3E-02	1.7E-02
4			1.5E-01	6.3E-04	5.4E+00	2.2E+01	5.1E+01	7.9E+01
5	Inorganics	Cadmium	1.2E-02		2.0E+00	3.0E-01	1.2E+01	1.4E+01
		Mercury	1.4E-02	1.2E-04	5.8E-01	3.5E+00	8.4E+00	1.3E+01
		Zinc	1.9E-03		1.6E+00	4.7E+00	1.5E+00	7.8E+00
		Chromium	1.0E-02		1.3E-01	5.8E-01	2.0E-01	9.2E-01
		Copper	1.5E-03		2.0E-01	3.0E-01	1.5E-01	6.5E-01
		Nickel	2.0E-03		3.8E-02	2.3E-02	2.0E-01	2.6E-01
		Silver	1.8E-04		1.5E-01	2.2E-02	7.0E-02	2.4E-01
		Arsenic	4.3E-02		6.1E-05	9.1E-04	8.9E-02	1.3E-01
		Uranium	2.8E-03		6.8E-03	3.4E-02	1.1E-02	5.5E-02
		Antimony	1.7E-03		1.2E-03	3.7E-03	3.4E-02	4.1E-02
		Beryllium	4.1E-04		3.9E-06	2.9E-03	3.3E-03	6.6E-03
		TOTAL	9.0E-02	1.2E-04	4.7E+00	9.5E+00	2.3E+01	3.7E+01
	Organics	Bis(2-ethylhexyl)phthalate	1.6E-04		7.9E-04	7.5E-04	4.7E-03	6.4E-03
		TOTAL	1.6E-04		7.9E-04	7.5E-04	4.7E-03	6.4E-03
5			9.0E-02	1.2E-04	4.7E+00	9.5E+00	2.3E+01	3.7E+01

Table E.14 Results of adult conservative screening for noncarcinogens in dredged sediments where at least one measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Sediment ingestion	Sediment inhalation	Milk ingestion	Meat ingestion	Vegetable ingestion	Multiple pathway total
10	Inorganics	Zinc	6.3E-04		5.2E-01	1.6E+00	5.0E-01	2.6E+00
		Cadmium	1.6E-03		2.6E-01	3.9E-02	1.6E+00	1.9E+00
		Chromium	6.3E-03		8.1E-02	3.6E-01	1.3E-01	5.8E-01
		Mercury	3.9E-04	3.2E-06	1.6E-02	9.6E-02	2.3E-01	3.4E-01
		Copper	7.7E-04		1.0E-01	1.5E-01	7.7E-02	3.4E-01
		Nickel	1.5E-03		2.9E-02	1.7E-02	1.5E-01	2.0E-01
		Arsenic	2.4E-02		3.4E-05	5.2E-04	5.0E-02	7.5E-02
		Uranium	2.1E-03		5.1E-03	2.6E-02	8.7E-03	4.2E-02
		Antimony	1.5E-03		1.1E-03	3.2E-03	3.0E-02	3.5E-02
		Beryllium	3.7E-04		3.5E-06	2.7E-03	3.0E-03	6.0E-03
		TOTAL	4.0E-02	3.2E-06	1.0E+00	2.3E+00	2.8E+00	6.1E+00
	Organics	Bis(2-ethylhexyl)phthalate	2.4E-04		1.1E-03	1.1E-03	6.9E-03	9.3E-03
		Pyrene	2.0E-04		9.5E-04	9.0E-04	5.9E-03	7.9E-03
		Fluoranthene	1.5E-04		7.4E-04	7.0E-04	4.3E-03	5.9E-03
		Anthracene	2.0E-05		5.2E-05	4.9E-05	1.0E-03	1.2E-03
		TOTAL	6.1E-04		2.9E-03	2.7E-03	1.8E-02	2.4E-02
10			4.0E-02	3.2E-06	1.0E+00	2.3E+00	2.8E+00	6.1E+00

Table E.15 Results of adult nonconservative screening for carcinogens in fish and water where no measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Fish samples	Fish concentration	Fish ingest. carcinogen screening index	Water samples	Water concentration	Water ingest. carcinogen screening index
				mg/kg			mg/L	
1	Organics	1,4-Dichlorobenzene	6	6.80E-01 (Min)	7.6E-07	3	1.00E-02 (Min)	2.9E-07
		2,4,6-Trichlorophenol	6	6.80E-01 (Min)	3.5E-07	3	1.00E-02 (Min)	1.3E-07
		2,4-Dinitrotoluene	6	6.80E-01 (Min)	2.1E-05	3	1.00E-02 (Min)	8.3E-06
		2,6-Dinitrotoluene	6	6.80E-01 (Min)	2.1E-05	3	1.00E-02 (Min)	8.3E-06
		3,3'-Dichlorobenzidine	6	1.40E+00 (Min)	2.9E-05	3	2.00E-02 (Min)	1.1E-05
		4,4'-DDD				2	1.00E-04 (Min)	2.9E-08
		4,4'-DDE				2	1.00E-04 (Min)	4.2E-08
		4,4'-DDT	16	1.00E-02 (Min)	1.6E-07	2	1.00E-04 (Min)	4.2E-08
		4-Chloroaniline	6	6.80E-01 (Min)	1.1E-06	3	1.00E-02 (Min)	4.3E-07
		Acenaphthene	6	6.80E-01 (Min)	3.6E-04	3	1.00E-02 (Min)	1.4E-04
		Acenaphthylene	6	6.80E-01 (Min)	3.6E-04	3	1.00E-02 (Min)	1.4E-04
		Aldrin	16	1.00E-02 (Min)	7.9E-08	2	5.00E-05 (Min)	1.0E-06
		Alpha-BHC				2	5.00E-05 (Min)	3.9E-07
		Anthracene	6	6.80E-01 (Min)	2.3E-04	3	1.00E-02 (Min)	8.9E-05
		Aroclor-1254				2	1.00E-03 (Min)	9.4E-06
		Aroclor-1260				2	1.00E-03 (Min)	9.4E-06
		Benzo(a)anthracene	6	6.80E-01 (Min)	2.3E-05	3	1.00E-02 (Min)	8.9E-06
		Benzo(a)pyrene	6	6.80E-01 (Min)	2.3E-04	3	1.00E-02 (Min)	8.9E-05
		Benzo(b)fluoranthene	6	6.80E-01 (Min)	2.3E-05	3	1.00E-02 (Min)	8.9E-06
		Benzo(g,h,i)perylene	6	6.80E-01 (Min)	2.3E-04	3	1.00E-02 (Min)	8.9E-05
		Benzo(k)fluoranthene	6	6.80E-01 (Min)	2.3E-05	3	1.00E-02 (Min)	8.9E-06
		Beta-BHC				2	5.00E-05 (Min)	1.1E-07
		Bis(2-chloroethyl)ether	6	6.80E-01 (Min)	3.5E-05	3	1.00E-02 (Min)	1.3E-05
		Bis(2-chloroisopropyl)ether	6	6.80E-01 (Min)	2.2E-06	3	1.00E-02 (Min)	8.6E-07
		Bis(2-ethylhexyl)phthalate	6	6.80E-01 (Min)	4.4E-07	3	1.00E-02 (Min)	1.7E-07
		Chlordane				4	5.00E-04 (Min)	8.0E-07
		Chrysene	6	6.80E-01 (Min)	2.3E-06	3	1.00E-02 (Min)	8.9E-07
		Dibenz(a,h)anthracene	6	6.80E-01 (Min)	3.6E-04	3	1.00E-02 (Min)	1.4E-04
		Dieldrin				2	1.00E-04 (Min)	2.0E-06
		Fluoranthene	6	6.80E-01 (Min)	2.3E-04	3	1.00E-02 (Min)	8.9E-05
		Fluorene	6	6.80E-01 (Min)	3.6E-04	3	1.00E-02 (Min)	1.4E-04
		Gamma-BHC (Lindane)				2	5.00E-05 (Min)	8.0E-08
		Heptachlor				2	5.00E-05 (Min)	2.8E-07
		Heptachlor epoxide				2	5.00E-05 (Min)	5.6E-07
		Hexachlorobenzene	6	6.80E-01 (Min)	5.0E-05	3	1.00E-02 (Min)	2.0E-05
		Hexachlorobutadiene	6	6.80E-01 (Min)	2.5E-06	3	1.00E-02 (Min)	9.6E-07

Table E.15 Results of adult nonconservative screening for carcinogens in fish and water where no measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Fish samples	Fish concentration	Fish ingest. carcinogen screening index	Water samples	Water concentration	Water ingest. carcinogen screening index
1	Organics	Hexachloroethane	6	6.80E-01 (Min)	4.4E-07	3	1.00E-02 (Min)	1.7E-07
		Indeno(1,2,3-cd)pyrene	6	6.80E-01 (Min)	2.3E-05	3	1.00E-02 (Min)	8.9E-06
		Isophorone	6	6.80E-01 (Min)	1.3E-07	3	1.00E-02 (Min)	5.0E-08
		N-Nitroso-di-n-propylamine	6	6.80E-01 (Min)	2.2E-04	3	1.00E-02 (Min)	8.6E-05
		N-Nitrosodiphenylamine	6	6.80E-01 (Min)	1.5E-07	3	1.00E-02 (Min)	6.0E-08
		Pentachlorophenol	6	3.40E+00 (Min)	1.9E-05	3	5.00E-02 (Min)	7.3E-06
		Phenanthrene	6	6.80E-01 (Min)	2.3E-04	3	1.00E-02 (Min)	8.9E-05
		Pyrene	6	6.80E-01 (Min)	2.3E-04	3	1.00E-02 (Min)	8.9E-05
		Toxaphene				2	1.00E-03 (Min)	1.3E-06
				mg/kg			mg/L	
2	Inorganics	Arsenic				3	1.30E-03 (Min)	2.8E-06
		Beryllium	13	3.00E-03 (Min)	6.0E-07	4	2.00E-04 (Min)	1.1E-06
				mg/kg			mg/L	
	Organics	1,1,2,2-Tetrachloroethane				3	4.84E-03 (Min)	1.2E-06
		1,1,2-Trichloroethane				3	4.84E-03 (Min)	3.4E-07
		1,1-Dichloroethylene				3	4.84E-03 (Min)	3.6E-06
		1,2-Dichloroethane				3	4.84E-03 (Min)	5.4E-07
		1,4-Dichlorobenzene	8	7.00E-01 (Min)	7.8E-07	3	9.50E-03 (Min)	2.8E-07
		2,4,6-Trichlorophenol	8	7.00E-01 (Min)	3.6E-07	2	1.00E-02 (Min)	1.3E-07
		2,4-Dinitrotoluene	8	7.00E-01 (Min)	2.2E-05	3	1.00E-02 (Min)	8.3E-06
		2,6-Dinitrotoluene	8	7.00E-01 (Min)	2.2E-05	3	1.00E-02 (Min)	8.3E-06
		3,3'-Dichlorobenzidine	8	1.40E+00 (Min)	2.9E-05	3	2.00E-02 (Min)	1.1E-05
		4,4'-DDD	14	1.00E-02 (Min)	1.1E-07	2	1.00E-04 (Min)	2.9E-08
		4,4'-DDE				2	1.00E-04 (Min)	4.2E-08
		4,4'-DDT				2	1.00E-04 (Min)	4.2E-08
		4-Chloroaniline	2	7.00E-01 (Min)	1.1E-06	2	1.00E-02 (Min)	4.3E-07
		Acenaphthene	8	7.00E-01 (Min)	3.7E-04	3	1.00E-02 (Min)	1.4E-04
		Acenaphthylene	8	7.00E-01 (Min)	3.7E-04	3	1.00E-02 (Min)	1.4E-04
		Aldrin				2	5.00E-05 (Min)	1.0E-06
		Alpha-BHC				2	5.00E-05 (Min)	3.9E-07
		Anthracene	8	7.00E-01 (Min)	2.4E-04	3	1.00E-02 (Min)	8.9E-05
		Aroclor-1254				2	1.00E-03 (Min)	9.4E-06
		Aroclor-1260				2	1.00E-03 (Min)	9.4E-06

Table E.15 Results of adult nonconservative screening for carcinogens in fish and water where no measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Fish samples	Fish concentration	Fish ingest. carcinogen screening index	Water samples	Water concentration	Water ingest. carcinogen screening index
2	Organics	Benzene				3	4.84E-03 (Min)	1.7E-07
		Benzidine				1	2.00E-02 (Min)	5.6E-03
		Benzo(a)anthracene	8	7.00E-01 (Min)	2.4E-05	3	1.00E-02 (Min)	8.9E-06
		Benzo(a)pyrene	8	7.00E-01 (Min)	2.4E-04	3	1.00E-02 (Min)	8.9E-05
		Benzo(b)fluoranthene	8	7.00E-01 (Min)	2.4E-05	3	1.00E-02 (Min)	8.9E-06
		Benzo(g,h,i)perylene	8	7.00E-01 (Min)	2.4E-04	3	1.00E-02 (Min)	8.9E-05
		Benzo(k)fluoranthene	8	7.00E-01 (Min)	2.4E-05	3	1.00E-02 (Min)	8.9E-06
		Beta-BHC				2	5.00E-05 (Min)	1.1E-07
		Bis(2-chloroethyl)ether	8	7.00E-01 (Min)	3.6E-05	3	1.00E-02 (Min)	1.3E-05
		Bis(2-chloroisopropyl)ether	8	7.00E-01 (Min)	2.3E-06	3	1.00E-02 (Min)	8.6E-07
		Bis(2-ethylhexyl)phthalate	8	7.00E-01 (Min)	4.5E-07	3	1.00E-02 (Min)	1.7E-07
		Bromoform				3	4.84E-03 (Min)	4.7E-08
		Carbon tetrachloride				3	4.84E-03 (Min)	7.7E-07
		Chlordane				4	5.00E-04 (Min)	8.0E-07
		Chlorodibromomethane				3	4.84E-03 (Min)	5.0E-07
		Chloromethane				3	9.69E-03 (Min)	1.5E-07
		Chrysene	8	7.00E-01 (Min)	2.4E-06	3	1.00E-02 (Min)	8.9E-07
		Cis-1,3-Dichloropropene				3	4.84E-03 (Min)	1.1E-06
		Dibenz(a,h)anthracene	8	7.00E-01 (Min)	3.7E-04	3	1.00E-02 (Min)	1.4E-04
		Dichlorobromomethane				3	4.84E-03 (Min)	7.7E-07
		Dieldrin				2	1.00E-04 (Min)	2.0E-06
		Fluoranthene	8	7.00E-01 (Min)	2.4E-04	3	1.00E-02 (Min)	8.9E-05
		Fluorene	8	7.00E-01 (Min)	3.7E-04	3	1.00E-02 (Min)	1.4E-04
		Gamma-BHC (Lindane)				2	5.00E-05 (Min)	8.0E-08
		Heptachlor				2	5.00E-05 (Min)	2.8E-07
		Heptachlor epoxide				2	5.00E-05 (Min)	5.6E-07
		Hexachlorobenzene	8	7.00E-01 (Min)	5.2E-05	3	1.00E-02 (Min)	2.0E-05
		Hexachlorobutadiene	8	7.00E-01 (Min)	2.5E-06	3	1.00E-02 (Min)	9.6E-07
		Hexachloroethane	8	7.00E-01 (Min)	4.5E-07	3	1.00E-02 (Min)	1.7E-07
		Indeno(1,2,3-cd)pyrene	8	7.00E-01 (Min)	2.4E-05	3	1.00E-02 (Min)	8.9E-06
		Isophorone	8	7.00E-01 (Min)	1.3E-07	3	1.00E-02 (Min)	5.0E-08
		N-Nitroso-di-n-propylamine	8	7.00E-01 (Min)	2.3E-04	3	1.00E-02 (Min)	8.6E-05
		N-Nitrosodimethylamine				1	1.00E-02 (Min)	6.2E-04
		N-Nitrosodiphenylamine	8	7.00E-01 (Min)	1.6E-07	3	1.00E-02 (Min)	6.0E-08
		Pentachlorophenol	8	3.50E+00 (Min)	1.9E-05	2	5.00E-02 (Min)	7.3E-06
		Phenanthrene	8	7.00E-01 (Min)	2.4E-04	3	1.00E-02 (Min)	8.9E-05
		Pyrene	8	7.00E-01 (Min)	2.4E-04	3	1.00E-02 (Min)	8.9E-05
		Styrene				1	4.84E-03 (Min)	1.8E-07

Table E.15 Results of adult nonconservative screening for carcinogens in fish and water where no measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Fish samples	Fish concentration	Fish ingest. carcinogen screening index	Water samples	Water concentration	Water ingest. carcinogen screening index
2	Organics	Toxaphene				2	1.00E-03 (Min)	1.3E-06
		Trans-1,3-dichloropropene				3	4.84E-03 (Min)	1.1E-06
		Trichloroethylene				2	5.00E-03 (Min)	6.7E-08
		Vinyl chloride				3	9.69E-03 (Min)	2.3E-05
				Bq/kg			Bq/L	
	Radionuclides	Co-60	27	1.56E+00 (Min)	5.3E-08			
				mg/kg			mg/L	
3	Organics	1,1,2,2-Tetrachloroethane				5	5.00E-03 (Min)	1.2E-06
		1,1,2-Trichloroethane				5	5.00E-03 (Min)	3.5E-07
		1,2-Dichloropropane				5	5.00E-03 (Min)	4.2E-07
		1,4-Dichlorobenzene	34	1.90E-01 (Min)	2.1E-07			
		2,4,6-Trichlorophenol	34	1.90E-01 (Min)	9.7E-08	8	1.00E-02 (Min)	1.3E-07
		2,4-Dinitrotoluene	34	1.90E-01 (Min)	6.0E-06	8	1.00E-02 (Min)	8.3E-06
		2,6-Dinitrotoluene	34	1.90E-01 (Min)	6.0E-06	8	1.00E-02 (Min)	8.3E-06
		3,3'-Dichlorobenzidine	34	3.70E-01 (Min)	7.7E-06	8	2.00E-02 (Min)	1.1E-05
		4,4'-DDD				1	1.00E-04 (Min)	2.9E-08
		4,4'-DDE				1	1.00E-04 (Min)	4.2E-08
		4,4'-DDT	34	1.00E-02 (Min)	1.6E-07	1	1.00E-04 (Min)	4.2E-08
		4-Chloroaniline	34	1.90E-01 (Min)	3.1E-07	5	1.00E-02 (Min)	4.3E-07
		Acenaphthene	34	1.90E-01 (Min)	1.0E-04	8	1.00E-02 (Min)	1.4E-04
		Acenaphthylene	34	1.90E-01 (Min)	1.0E-04	8	1.00E-02 (Min)	1.4E-04
		Aldrin	34	7.72E-03 (Min)	6.1E-06	1	5.00E-05 (Min)	1.0E-06
		Alpha-BHC				1	5.00E-05 (Min)	3.9E-07
		Anthracene	34	1.90E-01 (Min)	6.4E-05			
		Aroclor-1260				3	1.00E-03 (Min)	9.4E-06
		Benzidine				4	1.00E-02 (Min)	2.8E-03
		Benzo(a)anthracene	34	1.90E-01 (Min)	6.4E-06			
		Benzo(a)pyrene	33	1.90E-01 (Min)	6.4E-05	8	1.00E-02 (Min)	8.9E-05
		Benzo(b)fluoranthene	33	1.90E-01 (Min)	6.4E-06	8	1.00E-02 (Min)	8.9E-06
		Benzo(g,h,i)perylene	32	1.90E-01 (Min)	6.4E-05	8	1.00E-02 (Min)	8.9E-05
		Benzo(k)fluoranthene	33	1.90E-01 (Min)	6.4E-06	8	1.00E-02 (Min)	8.9E-06
		Beta-BHC				1	5.00E-05 (Min)	1.1E-07
		Bis(2-chloroethyl)ether	34	1.90E-01 (Min)	9.7E-06	8	1.00E-02 (Min)	1.3E-05

Table E.15 Results of adult nonconservative screening for carcinogens in fish and water where no measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Fish samples	Fish concentration	Fish ingest. carcinogen screening index	Water samples	Water concentration	Water ingest. carcinogen screening index
3	Organics	Bis(2-chloroisopropyl)ether	34	1.90E-01 (Min)	6.2E-07	8	1.00E-02 (Min)	8.6E-07
		Carbon tetrachloride				5	5.00E-03 (Min)	8.0E-07
		Chlordane				2	5.00E-04 (Min)	8.0E-07
		Chloromethane				5	1.00E-02 (Min)	1.6E-07
		Chrysene	34	1.90E-01 (Min)	6.4E-07			
		Cis-1,3-Dichloropropene				5	5.00E-03 (Min)	1.1E-06
		Dibenz(a,h)anthracene	33	1.90E-01 (Min)	1.0E-04	8	1.00E-02 (Min)	1.4E-04
		Dieldrin				1	1.00E-04 (Min)	2.0E-06
		Fluoranthene	34	1.90E-01 (Min)	6.4E-05			
		Fluorene	34	1.90E-01 (Min)	1.0E-04	8	1.00E-02 (Min)	1.4E-04
		Gamma-BHC (Lindane)				1	5.00E-05 (Min)	8.0E-08
		Heptachlor				1	5.00E-05 (Min)	2.8E-07
		Heptachlor epoxide				1	5.00E-05 (Min)	5.6E-07
		Hexachlorobenzene	34	1.90E-01 (Min)	1.4E-05	8	1.00E-02 (Min)	2.0E-05
		Hexachlorobutadiene	34	1.90E-01 (Min)	6.9E-07	8	1.00E-02 (Min)	9.6E-07
		Hexachloroethane	34	1.90E-01 (Min)	1.2E-07	8	1.00E-02 (Min)	1.7E-07
		Indeno(1,2,3-cd)pyrene	33	1.90E-01 (Min)	6.4E-06	8	1.00E-02 (Min)	8.9E-06
		Isophorone	34	1.90E-01 (Min)	3.6E-08	8	1.00E-02 (Min)	5.0E-08
		N-Nitroso-di-n-propylamine	34	1.90E-01 (Min)	6.2E-05			
		N-Nitrosodimethylamine				4	1.00E-02 (Min)	6.2E-04
		N-Nitrosodiphenylamine	34	1.90E-01 (Min)	4.3E-08	8	1.00E-02 (Min)	6.0E-08
		Pentachlorophenol	34	9.30E-01 (Min)	5.2E-06	8	5.00E-02 (Min)	7.3E-06
		Phenanthrene	34	1.90E-01 (Min)	6.4E-05			
		Pyrene	34	1.90E-01 (Min)	6.4E-05			
		Styrene				1	5.00E-03 (Min)	1.8E-07
		Toxaphene				1	1.00E-03 (Min)	1.3E-06
				Bq/kg			Bq/L	
	Radionuclides	Co-60				3	2.19E-03 (Min)	2.0E-09
				mg/kg			mg/L	
4	Inorganics	Arsenic				5	1.30E-03 (Min)	2.8E-06
		Beryllium	27	3.00E-03 (Min)	6.0E-07	3	3.00E-04 (Min)	1.6E-06

Table E.15 Results of adult nonconservative screening for carcinogens in fish and water where no measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Fish samples	Fish concentration	Fish ingest. carcinogen screening index	Water samples	Water concentration	Water ingest. carcinogen screening index
				mg/kg			mg/L	
4	Organics	1,1,2,2-Tetrachloroethane				2	5.00E-03 (Min)	1.2E-06
		1,1,2-Trichloroethane				2	5.00E-03 (Min)	3.5E-07
		1,1-Dichloroethylene				2	5.00E-03 (Min)	3.7E-06
		1,2-Dichloroethane				2	5.00E-03 (Min)	5.6E-07
		1,2-Dichloropropane				2	5.00E-03 (Min)	4.2E-07
		1,4-Dichlorobenzene	6	6.60E-01 (Min)	7.3E-07	4	9.50E-03 (Min)	2.8E-07
		2,4,6-Trichlorophenol	13	6.60E-01 (Min)	3.4E-07	4	1.00E-02 (Min)	1.3E-07
		2,4-Dinitrotoluene	6	6.60E-01 (Min)	2.1E-05	4	1.00E-02 (Min)	8.3E-06
		2,6-Dinitrotoluene	6	6.60E-01 (Min)	2.1E-05	4	1.00E-02 (Min)	8.3E-06
		3,3'-Dichlorobenzidine	6	1.30E+00 (Min)	2.7E-05	4	2.00E-02 (Min)	1.1E-05
		4,4'-DDD				3	1.00E-04 (Min)	2.9E-08
		4,4'-DDE				3	1.00E-04 (Min)	4.2E-08
		4,4'-DDT				3	1.00E-04 (Min)	4.2E-08
		4-Chloroaniline	6	6.60E-01 (Min)	1.1E-06	2	1.00E-02 (Min)	4.3E-07
		Acenaphthene	6	6.60E-01 (Min)	3.5E-04	4	1.00E-02 (Min)	1.4E-04
		Acenaphthylene	6	6.60E-01 (Min)	3.5E-04	4	1.00E-02 (Min)	1.4E-04
		Aldrin				3	5.00E-05 (Min)	1.0E-06
		Alpha-BHC				3	5.00E-05 (Min)	3.9E-07
		Anthracene	6	6.60E-01 (Min)	2.2E-04	4	1.00E-02 (Min)	8.9E-05
		Aroclor-1254				4	1.00E-03 (Min)	9.4E-06
		Aroclor-1260				4	1.00E-03 (Min)	9.4E-06
		Benzene				2	5.00E-03 (Min)	1.8E-07
		Benzidine				2	1.00E-02 (Min)	2.8E-03
		Benzo(a)anthracene	6	6.60E-01 (Min)	2.2E-05	4	1.00E-02 (Min)	8.9E-06
		Benzo(a)pyrene	6	6.60E-01 (Min)	2.2E-04	4	1.00E-02 (Min)	8.9E-05
		Benzo(b)fluoranthene	6	6.60E-01 (Min)	2.2E-05	4	1.00E-02 (Min)	8.9E-06
		Benzo(g,h,i)perylene	6	6.60E-01 (Min)	2.2E-04	4	1.00E-02 (Min)	8.9E-05
		Benzo(k)fluoranthene	6	6.60E-01 (Min)	2.2E-05	4	1.00E-02 (Min)	8.9E-06
		Beta-BHC				3	5.00E-05 (Min)	1.1E-07
		Bis(2-chloroethyl)ether	7	6.60E-01 (Min)	3.4E-05	4	1.00E-02 (Min)	1.3E-05
		Bis(2-chloroisopropyl)ether	6	6.60E-01 (Min)	2.1E-06	4	1.00E-02 (Min)	8.6E-07
		Bis(2-ethylhexyl)phthalate	6	6.60E-01 (Min)	4.3E-07	4	1.00E-02 (Min)	1.7E-07
		Bromoform				2	5.00E-03 (Min)	4.8E-08
		Carbon tetrachloride				2	5.00E-03 (Min)	8.0E-07
		Chlordane				6	5.00E-04 (Min)	8.0E-07
		Chlorodibromomethane				2	5.00E-03 (Min)	5.1E-07

Table E.15 Results of adult nonconservative screening for carcinogens in fish and water where no measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Fish samples	Fish concentration	Fish ingest. carcinogen screening index	Water samples	Water concentration	Water ingest. carcinogen screening index
4	Organics	Chloroform				2	5.00E-03 (Min)	3.7E-08
		Chloromethane				2	1.00E-02 (Min)	1.6E-07
		Chrysene	6	6.60E-01 (Min)	2.2E-06	4	1.00E-02 (Min)	8.9E-07
		Cis-1,3-Dichloropropene				2	5.00E-03 (Min)	1.1E-06
		Dibenz(a,h)anthracene	6	6.60E-01 (Min)	3.5E-04	4	1.00E-02 (Min)	1.4E-04
		Dichlorobromomethane				2	5.00E-03 (Min)	8.0E-07
		Dieldrin				3	1.00E-04 (Min)	2.0E-06
		Fluoranthene	7	6.60E-01 (Min)	2.2E-04	4	1.00E-02 (Min)	8.9E-05
		Fluorene	6	6.60E-01 (Min)	3.5E-04	4	1.00E-02 (Min)	1.4E-04
		Gamma-BHC (Lindane)				3	5.00E-05 (Min)	8.0E-08
		Heptachlor				3	5.00E-05 (Min)	2.8E-07
		Heptachlor epoxide				3	5.00E-05 (Min)	5.6E-07
		Hexachlorobenzene	6	6.60E-01 (Min)	4.9E-05	4	1.00E-02 (Min)	2.0E-05
		Hexachlorobutadiene	6	6.60E-01 (Min)	2.4E-06	4	1.00E-02 (Min)	9.6E-07
		Hexachloroethane	6	6.60E-01 (Min)	4.3E-07	4	1.00E-02 (Min)	1.7E-07
		Indeno(1,2,3-cd)pyrene	6	6.60E-01 (Min)	2.2E-05	4	1.00E-02 (Min)	8.9E-06
		Isophorone	6	6.60E-01 (Min)	1.3E-07	4	1.00E-02 (Min)	5.0E-08
		Methylene chloride				2	5.00E-03 (Min)	4.6E-08
		N-Nitroso-di-n-propylamine	6	6.60E-01 (Min)	2.1E-04	4	1.00E-02 (Min)	8.6E-05
		N-Nitrosodimethylamine				2	1.00E-02 (Min)	6.2E-04
		N-Nitrosodiphenylamine	6	6.60E-01 (Min)	1.5E-07	4	1.00E-02 (Min)	6.0E-08
		Pentachlorophenol	13	3.30E+00 (Min)	1.8E-05	4	5.00E-02 (Min)	7.3E-06
		Phenanthrene	6	6.60E-01 (Min)	2.2E-04	4	1.00E-02 (Min)	8.9E-05
		Pyrene	6	6.60E-01 (Min)	2.2E-04	4	1.00E-02 (Min)	8.9E-05
		Tetrachloroethylene				2	5.00E-03 (Min)	3.1E-07
		Toxaphene				3	1.00E-03 (Min)	1.3E-06
		Trans-1,3-dichloropropene				2	5.00E-03 (Min)	1.1E-06
		Trichloroethylene				2	5.00E-03 (Min)	6.7E-08
		Vinyl chloride				2	1.00E-02 (Min)	2.3E-05
				Bq/kg			Bq/L	
	Radionuclides	Co-60	38	2.33E-01 (Min)	7.9E-09			
				mg/kg			mg/L	
5	Inorganics	Arsenic				4	1.30E-03 (Min)	2.8E-06

Table E.15 Results of adult nonconservative screening for carcinogens in fish and water where no measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Fish samples	Fish concentration	Fish ingest. carcinogen screening index	Water samples	Water concentration	Water ingest. carcinogen screening index
5	Inorganics	Beryllium				4	3.90E-03 (Min)	2.1E-05
				mg/kg			mg/L	
	Organics	1,4-Dichlorobenzene				4	1.00E-02 (Min)	2.9E-07
		2,4,6-Trichlorophenol	9	6.60E-01 (Min)	3.4E-07	4	1.00E-02 (Min)	1.3E-07
		2,4-Dinitrotoluene				4	1.00E-02 (Min)	8.3E-06
		2,6-Dinitrotoluene				4	1.00E-02 (Min)	8.3E-06
		3,3'-Dichlorobenzidine				4	2.00E-02 (Min)	1.1E-05
		4,4'-DDD				3	1.00E-04 (Min)	2.9E-08
		4,4'-DDE				3	1.00E-04 (Min)	4.2E-08
		4,4'-DDT				3	1.00E-04 (Min)	4.2E-08
		4-Chloroaniline				4	1.00E-02 (Min)	4.3E-07
		Acenaphthene				4	1.00E-02 (Min)	1.4E-04
		Acenaphthylene				4	1.00E-02 (Min)	1.4E-04
		Aldrin				3	5.00E-05 (Min)	1.0E-06
		Alpha-BHC				3	5.00E-05 (Min)	3.9E-07
		Anthracene				4	1.00E-02 (Min)	8.9E-05
		Aroclor-1254				3	1.00E-03 (Min)	9.4E-06
		Aroclor-1260				3	1.00E-03 (Min)	9.4E-06
		Benzo(a)anthracene				4	1.00E-02 (Min)	8.9E-06
		Benzo(a)pyrene				4	1.00E-02 (Min)	8.9E-05
		Benzo(b)fluoranthene				4	1.00E-02 (Min)	8.9E-06
		Benzo(g,h,i)perylene				4	1.00E-02 (Min)	8.9E-05
		Benzo(k)fluoranthene				4	1.00E-02 (Min)	8.9E-06
		Beta-BHC				3	5.00E-05 (Min)	1.1E-07
		Bis(2-chloroethyl)ether				4	1.00E-02 (Min)	1.3E-05
		Bis(2-chloroisopropyl)ether				4	1.00E-02 (Min)	8.6E-07
		Bis(2-ethylhexyl)phthalate				4	3.00E-03 (Min)	5.1E-08
		Chlordane				6	5.00E-04 (Min)	8.0E-07
		Chrysene				4	1.00E-02 (Min)	8.9E-07
		Dibenz(a,h)anthracene				4	1.00E-02 (Min)	1.4E-04
		Dieldrin				3	1.00E-04 (Min)	2.0E-06
		Fluoranthene				4	1.00E-02 (Min)	8.9E-05
		Fluorene				4	1.00E-02 (Min)	1.4E-04
		Gamma-BHC (Lindane)				3	5.00E-05 (Min)	8.0E-08
		Heptachlor				3	5.00E-05 (Min)	2.8E-07
		Heptachlor epoxide				3	5.00E-05 (Min)	5.6E-07

Table E.15 Results of adult nonconservative screening for carcinogens in fish and water where no measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Fish samples	Fish concentration	Fish ingest. carcinogen screening index	Water samples	Water concentration	Water ingest. carcinogen screening index
5	Organics	Hexachlorobenzene				4	1.00E-02 (Min)	2.0E-05
		Hexachlorobutadiene				4	1.00E-02 (Min)	9.6E-07
		Hexachloroethane				4	1.00E-02 (Min)	1.7E-07
		Indeno(1,2,3-cd)pyrene				4	1.00E-02 (Min)	8.9E-06
		Isophorone				4	1.00E-02 (Min)	5.0E-08
		N-Nitroso-di-n-propylamine				4	1.00E-02 (Min)	8.6E-05
		N-Nitrosodiphenylamine				4	1.00E-02 (Min)	6.0E-08
		Pentachlorophenol	9	3.30E+00 (Min)	1.8E-05	4	5.00E-02 (Min)	7.3E-06
		Phenanthrene				4	1.00E-02 (Min)	8.9E-05
		Pyrene				4	1.00E-02 (Min)	8.9E-05
		Toxaphene				3	1.00E-03 (Min)	1.3E-06
				Bq/kg			Bq/L	
	Radionuclides	Co-60	28	1.09E+00 (Min)	3.7E-08	3	3.18E-03 (Min)	2.9E-09
				mg/kg			mg/L	
10	Inorganics	Arsenic				1	1.30E-03 (Min)	2.8E-06
		Beryllium				1	3.90E-03 (Min)	2.1E-05
				mg/kg			mg/L	
	Organics	1,4-Dichlorobenzene				1	1.00E-02 (Min)	2.9E-07
		2,4-Dinitrotoluene				1	1.00E-02 (Min)	8.3E-06
		2,6-Dinitrotoluene				1	1.00E-02 (Min)	8.3E-06
		3,3'-Dichlorobenzidine				1	2.00E-02 (Min)	1.1E-05
		4,4'-DDD				1	1.00E-04 (Min)	2.9E-08
		4,4'-DDE				1	1.00E-04 (Min)	4.2E-08
		4,4'-DDT	8	1.00E-02 (Min)	1.6E-07	1	1.00E-04 (Min)	4.2E-08
		4-Chloroaniline				1	1.00E-02 (Min)	4.3E-07
		Acenaphthene				1	1.00E-02 (Min)	1.4E-04
		Acenaphthylene				1	1.00E-02 (Min)	1.4E-04
		Aldrin	8	1.00E-02 (Min)	7.9E-06	1	5.00E-05 (Min)	1.0E-06
		Alpha-BHC				1	5.00E-05 (Min)	3.9E-07
		Anthracene				1	1.00E-02 (Min)	8.9E-05
		Aroclor-1254	8	1.00E-02 (Min)	3.6E-06	1	1.00E-03 (Min)	9.4E-06

Table E.15 Results of adult nonconservative screening for carcinogens in fish and water where no measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Fish samples	Fish concentration	Fish ingest. carcinogen screening index	Water samples	Water concentration	Water ingest. carcinogen screening index
10	Organics	Aroclor-1260				1	1.00E-03 (Min)	9.4E-06
		Benzo(a)anthracene				1	1.00E-02 (Min)	8.9E-06
		Benzo(a)pyrene				1	1.00E-02 (Min)	8.9E-05
		Benzo(b)fluoranthene				1	1.00E-02 (Min)	8.9E-06
		Benzo(g,h,i)perylene				1	1.00E-02 (Min)	8.9E-05
		Benzo(k)fluoranthene				1	1.00E-02 (Min)	8.9E-06
		Beta-BHC				1	5.00E-05 (Min)	1.1E-07
		Bis(2-chloroethyl)ether				1	1.00E-02 (Min)	1.3E-05
		Bis(2-chloroisopropyl)ether				1	1.00E-02 (Min)	8.6E-07
		Chlordane				2	5.00E-04 (Min)	8.0E-07
		Chrysene				1	1.00E-02 (Min)	8.9E-07
		Dibenz(a,h)anthracene				1	1.00E-02 (Min)	1.4E-04
		Dieldrin				1	1.00E-04 (Min)	2.0E-06
		Fluoranthene				1	1.00E-02 (Min)	8.9E-05
		Fluorene				1	1.00E-02 (Min)	1.4E-04
		Gamma-BHC (Lindane)				1	5.00E-05 (Min)	8.0E-08
		Heptachlor				1	5.00E-05 (Min)	2.8E-07
		Heptachlor epoxide				1	5.00E-05 (Min)	5.6E-07
		Hexachlorobenzene				1	1.00E-02 (Min)	2.0E-05
		Hexachlorobutadiene				1	1.00E-02 (Min)	9.6E-07
		Hexachloroethane				1	1.00E-02 (Min)	1.7E-07
		Indeno(1,2,3-cd)pyrene				1	1.00E-02 (Min)	8.9E-06
		Isophorone				1	1.00E-02 (Min)	5.0E-08
		N-Nitroso-di-n-propylamine				1	1.00E-02 (Min)	8.6E-05
		N-Nitrosodiphenylamine				1	1.00E-02 (Min)	6.0E-08
		Pentachlorophenol				1	5.00E-02 (Min)	7.3E-06
		Phenanthrene				1	1.00E-02 (Min)	8.9E-05
		Pyrene				1	1.00E-02 (Min)	8.9E-05
		Toxaphene				1	1.00E-03 (Min)	1.3E-06
				Bq/kg			Bq/L	
	Radionuclides	Cs-137				1	2.37E-03 (Min)	3.9E-09
		Co-60				1	2.80E-03 (Min)	2.5E-09
				mg/kg			mg/L	

Table E.15 Results of adult nonconservative screening for carcinogens in fish and water where no measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Fish samples	Fish concentration	Fish ingest. carcinogen screening index	Water samples	Water concentration	Water ingest. carcinogen screening index
13	Inorganics	Arsenic				2	1.30E-03 (Min)	2.8E-06
		Beryllium	3	3.00E-03 (Min)	6.0E-07	1	3.90E-03 (Min)	2.1E-05
				mg/kg			mg/L	
	Organics	1,1,2,2-Tetrachloroethane				1	5.00E-03 (Min)	1.2E-06
		1,1,2-Trichloroethane				1	5.00E-03 (Min)	3.5E-07
		1,1-Dichloroethylene				1	5.00E-03 (Min)	3.7E-06
		1,2-Dichloroethane				1	5.00E-03 (Min)	5.6E-07
		1,2-Dichloropropane				1	5.00E-03 (Min)	4.2E-07
		1,4-Dichlorobenzene				2	1.00E-02 (Min)	2.9E-07
		2,4,6-Trichlorophenol	2	6.90E-01 (Min)	3.5E-07	2	1.00E-02 (Min)	1.3E-07
		2,4-Dinitrotoluene				2	1.00E-02 (Min)	8.3E-06
		2,6-Dinitrotoluene				2	1.00E-02 (Min)	8.3E-06
		3,3'-Dichlorobenzidine				2	2.00E-02 (Min)	1.1E-05
		4,4'-DDD	4	1.00E-02 (Min)	1.1E-07			
		4,4'-DDT	3	1.00E-02 (Min)	1.6E-07			
		4-Chloroaniline				1	1.00E-02 (Min)	4.3E-07
		Acenaphthene				2	1.00E-02 (Min)	1.4E-04
		Acenaphthylene				2	1.00E-02 (Min)	1.4E-04
		Anthracene				2	1.00E-02 (Min)	8.9E-05
		Benzene				1	5.00E-03 (Min)	1.8E-07
		Benzidine				1	1.00E-02 (Min)	2.8E-03
		Benzo(a)anthracene				2	1.00E-02 (Min)	8.9E-06
		Benzo(a)pyrene				2	1.00E-02 (Min)	8.9E-05
		Benzo(b)fluoranthene				2	1.00E-02 (Min)	8.9E-06
		Benzo(g,h,i)perylene				2	1.00E-02 (Min)	8.9E-05
		Benzo(k)fluoranthene				2	1.00E-02 (Min)	8.9E-06
		Bis(2-chloroethyl)ether				2	1.00E-02 (Min)	1.3E-05
		Bis(2-chloroisopropyl)ether				2	1.00E-02 (Min)	8.6E-07
		Bis(2-ethylhexyl)phthalate				2	1.00E-02 (Min)	1.7E-07
		Bromoform				1	5.00E-03 (Min)	4.8E-08
		Carbon tetrachloride				1	5.00E-03 (Min)	8.0E-07
		Chlorodibromomethane				1	5.00E-03 (Min)	5.1E-07
		Chloroform				1	5.00E-03 (Min)	3.7E-08
		Chloromethane				1	1.00E-02 (Min)	1.6E-07
		Chrysene				2	1.00E-02 (Min)	8.9E-07
		Cis-1,3-Dichloropropene				1	5.00E-03 (Min)	1.1E-06

Table E.15 Results of adult nonconservative screening for carcinogens in fish and water where no measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Fish samples	Fish concentration	Fish ingest. carcinogen screening index	Water samples	Water concentration	Water ingest. carcinogen screening index
13	Organics	Dibenz(a,h)anthracene				2	1.00E-02 (Min)	1.4E-04
		Dichlorobromomethane				1	5.00E-03 (Min)	8.0E-07
		Fluoranthene				2	1.00E-02 (Min)	8.9E-05
		Fluorene				2	1.00E-02 (Min)	1.4E-04
		Hexachlorobenzene				2	1.00E-02 (Min)	2.0E-05
		Hexachlorobutadiene				2	1.00E-02 (Min)	9.6E-07
		Hexachloroethane				2	1.00E-02 (Min)	1.7E-07
		Indeno(1,2,3-cd)pyrene				2	1.00E-02 (Min)	8.9E-06
		Isophorone				2	1.00E-02 (Min)	5.0E-08
		Methylene chloride				1	5.00E-03 (Min)	4.6E-08
		N-Nitroso-di-n-propylamine				2	1.00E-02 (Min)	8.6E-05
		N-Nitrosodimethylamine				1	1.00E-02 (Min)	6.2E-04
		N-Nitrosodiphenylamine				2	1.00E-02 (Min)	6.0E-08
		Pentachlorophenol	2	3.40E+00 (Min)	1.9E-05	2	5.00E-02 (Min)	7.3E-06
		Phenanthrene				2	1.00E-02 (Min)	8.9E-05
		Pyrene				2	1.00E-02 (Min)	8.9E-05
		Tetrachloroethylene				1	5.00E-03 (Min)	3.1E-07
		Trans-1,3-dichloropropene				1	5.00E-03 (Min)	1.1E-06
		Trichloroethylene				1	5.00E-03 (Min)	6.7E-08
		Vinyl chloride				1	1.00E-02 (Min)	2.3E-05
				Bq/kg			Bq/L	
	Radionuclides	Co-60				1	8.37E-03 (Min)	7.5E-09

Table E.16 Results of adult nonconservative screening for noncarcinogens in fish and water where no measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Fish samples	Fish concentration	Fish ingest. carcinogen screening index	Water samples	Water concentration	Water ingest. carcinogen screening index
				mg/kg			mg/L	
1	Inorganics	Antimony	28	2.80E-01 (Min)	6.3E-02			
		Boron				1	8.00E-02 (Min)	2.5E-03
		Cadmium	28	1.10E-01 (Min)	2.0E-02			
		Chromium	28	2.80E-01 (Min)	5.0E-03			
		Copper	28	2.80E-01 (Min)	6.8E-04			
		Molybdenum				1	4.00E-02 (Min)	2.3E-02
		Nickel	28	2.80E-01 (Min)	1.3E-03			
		Silver	28	1.10E-01 (Min)	2.0E-03	4	7.40E-04 (Min)	4.2E-04
		Thallium	28	2.00E-02 (Min)	2.6E-02	3	2.70E-03 (Min)	1.1E-01
		Tin				1	5.00E-02 (Min)	2.4E-04
				mg/kg			mg/L	
	Organics	1,2,4-Trichlorobenzene	6	6.80E-01 (Min)	6.1E-03	3	1.00E-02 (Min)	2.9E-03
		1,2-Dichlorobenzene	6	6.80E-01 (Min)	6.8E-04	3	1.00E-02 (Min)	3.2E-04
		2,4,5-Trichlorophenol	6	3.40E+00 (Min)	3.1E-03	3	5.00E-02 (Min)	1.4E-03
		2,4-Dichlorophenol	6	6.80E-01 (Min)	2.0E-02	3	1.00E-02 (Min)	9.5E-03
		2,4-Dimethylphenol	6	6.80E-01 (Min)	3.1E-03	3	1.00E-02 (Min)	1.4E-03
		2,4-Dinitrophenol	6	3.40E+00 (Min)	1.5E-01	3	5.00E-02 (Min)	7.1E-02
		2-Chloronaphthalene	6	6.80E-01 (Min)	7.7E-04	3	1.00E-02 (Min)	3.6E-04
		2-Chlorophenol	6	6.80E-01 (Min)	1.2E-02	3	1.00E-02 (Min)	5.7E-03
		2-Methylphenol	6	6.80E-01 (Min)	1.2E-03	3	1.00E-02 (Min)	5.7E-04
		4,4'-DDT	16	1.00E-02 (Min)	1.8E-03	2	1.00E-04 (Min)	5.7E-04
		4,6-Dinitro-2-methylphenol	6	3.40E+00 (Min)	3.1E+00	3	5.00E-02 (Min)	1.4E+00
		4-Chloroaniline	6	6.80E-01 (Min)	1.5E-02	3	1.00E-02 (Min)	7.1E-03
		4-Methylphenol	6	6.80E-01 (Min)	1.2E-03	3	1.00E-02 (Min)	5.7E-04
		Acenaphthene	6	6.80E-01 (Min)	1.0E-03	3	1.00E-02 (Min)	4.8E-04
		Aldrin	16	1.00E-02 (Min)	3.0E-02	2	5.00E-05 (Min)	4.8E-03
		Anthracene	6	6.80E-01 (Min)	2.0E-04	3	1.00E-02 (Min)	9.5E-05
		Benzoic acid	6	3.40E+00 (Min)	7.7E-05	3	5.00E-02 (Min)	3.6E-05
		Benzyl alcohol	6	6.80E-01 (Min)	2.0E-04	3	1.00E-02 (Min)	9.5E-05
		Bis(2-chloroisopropyl)ether	6	6.80E-01 (Min)	1.5E-03	3	1.00E-02 (Min)	7.1E-04
		Bis(2-ethylhexyl)phthalate	6	6.80E-01 (Min)	3.1E-03	3	1.00E-02 (Min)	1.4E-03
		Butylbenzylphthalate	6	6.80E-01 (Min)	3.1E-04	3	1.00E-02 (Min)	1.4E-04
		Chlordane				4	5.00E-04 (Min)	2.4E-02
		Di-n-butylphthalate	6	6.80E-01 (Min)	6.1E-04	3	1.00E-02 (Min)	2.9E-04

Table E.16 Results of adult nonconservative screening for noncarcinogens in fish and water where no measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Fish samples	Fish concentration	Fish ingest. carcinogen screening index	Water samples	Water concentration	Water ingest. carcinogen screening index
1	Organics	Di-n-octylphthalate	6	6.80E-01 (Min)	3.1E-03	3	1.00E-02 (Min)	1.4E-03
		Dieldrin				2	1.00E-04 (Min)	5.7E-03
		Diethylphthalate	6	6.80E-01 (Min)	7.7E-05	3	1.00E-02 (Min)	3.6E-05
		Dimethylphthalate	6	6.80E-01 (Min)	6.1E-05	3	1.00E-02 (Min)	2.9E-05
		Endosulfan I				2	5.00E-05 (Min)	2.9E-03
		Endosulfan II				2	1.00E-04 (Min)	5.7E-03
		Endrin				2	1.00E-04 (Min)	9.5E-04
		Fluoranthene	6	6.80E-01 (Min)	1.5E-03	3	1.00E-02 (Min)	7.1E-04
		Fluorene	6	6.80E-01 (Min)	1.5E-03	3	1.00E-02 (Min)	7.1E-04
		Gamma-BHC (Lindane)				2	5.00E-05 (Min)	4.8E-04
		Heptachlor				2	5.00E-05 (Min)	2.9E-04
		Heptachlor epoxide				2	5.00E-05 (Min)	1.1E-02
		Hexachlorobenzene	6	6.80E-01 (Min)	7.7E-02	3	1.00E-02 (Min)	3.6E-02
		Hexachlorobutadiene	6	6.80E-01 (Min)	3.1E-02	3	1.00E-02 (Min)	1.4E-02
		Hexachlorocyclopentadiene	6	6.80E-01 (Min)	8.7E-03	3	1.00E-02 (Min)	4.1E-03
		Hexachloroethane	6	6.80E-01 (Min)	6.1E-02	3	1.00E-02 (Min)	2.9E-02
		Isophorone	6	6.80E-01 (Min)	3.1E-04	3	1.00E-02 (Min)	1.4E-04
		Methoxychlor				2	5.00E-04 (Min)	2.9E-04
		Naphthalene	6	6.80E-01 (Min)	1.5E-03	3	1.00E-02 (Min)	7.1E-04
		Nitrobenzene	6	6.80E-01 (Min)	1.2E-01	3	1.00E-02 (Min)	5.7E-02
		Pentachlorophenol	6	3.40E+00 (Min)	1.0E-02	3	5.00E-02 (Min)	4.8E-03
		Phenol	6	6.80E-01 (Min)	1.0E-04	3	1.00E-02 (Min)	4.8E-05
		Pyrene	6	6.80E-01 (Min)	2.0E-03	3	1.00E-02 (Min)	9.5E-04
				mg/kg			mg/L	
2	Inorganics	Antimony	13	4.60E-01 (Min)	1.0E-01	4	1.90E-03 (Min)	1.4E-02
		Arsenic				3	1.30E-03 (Min)	1.2E-02
		Beryllium	13	3.00E-03 (Min)	5.4E-05	4	2.00E-04 (Min)	1.1E-04
		Boron				2	4.00E-03 (Min)	1.3E-04
		Cadmium	13	1.80E-01 (Min)	3.2E-02	3	2.10E-04 (Min)	1.2E-03
		Chromium	13	4.60E-01 (Min)	8.3E-03	3	9.80E-03 (Min)	5.6E-03
		Copper	13	4.60E-01 (Min)	1.1E-03			
		Mercury				3	2.00E-04 (Min)	1.9E-03
		Molybdenum				2	1.00E-02 (Min)	5.7E-03
		Nickel	13	4.60E-01 (Min)	2.1E-03			
		Silver	13	1.80E-01 (Min)	3.2E-03	3	7.40E-04 (Min)	4.2E-04

Table E.16 Results of adult nonconservative screening for noncarcinogens in fish and water where no measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Fish samples	Fish concentration	Fish ingest. carcinogen screening index	Water samples	Water concentration	Water ingest. carcinogen screening index
2	Inorganics	Thallium	13	2.00E-02 (Min)	2.6E-02	3	2.70E-03 (Min)	1.1E-01
		Tin				2	1.00E-02 (Min)	4.8E-05
		Vanadium				1	2.00E-03 (Min)	8.2E-04
				mg/kg			mg/L	
	Organics	1,1,1-Trichloroethane				3	4.84E-03 (Min)	1.5E-04
		1,1,2-Trichloroethane				3	4.84E-03 (Min)	3.5E-03
		1,1-Dichloroethane				3	4.84E-03 (Min)	1.4E-04
		1,1-Dichloroethylene				3	4.84E-03 (Min)	1.5E-03
		1,2,4-Trichlorobenzene	8	7.00E-01 (Min)	6.3E-03	3	1.00E-02 (Min)	2.9E-03
		1,2-Dichlorobenzene	8	7.00E-01 (Min)	7.0E-04	3	9.50E-03 (Min)	3.0E-04
		1,2-Dichloroethylene (total)				1	4.84E-03 (Min)	1.4E-03
		2,4,5-Trichlorophenol	8	3.50E+00 (Min)	3.2E-03	1	5.00E-02 (Min)	1.4E-03
		2,4-Dichlorophenol	8	7.00E-01 (Min)	2.1E-02	2	1.00E-02 (Min)	9.5E-03
		2,4-Dimethylphenol	8	7.00E-01 (Min)	3.2E-03	2	1.00E-02 (Min)	1.4E-03
		2,4-Dinitrophenol	8	3.50E+00 (Min)	1.6E-01	1	5.00E-02 (Min)	7.1E-02
		2-Chloronaphthalene	8	7.00E-01 (Min)	7.9E-04	3	1.00E-02 (Min)	3.6E-04
		2-Chlorophenol	8	7.00E-01 (Min)	1.3E-02	2	1.00E-02 (Min)	5.7E-03
		2-Methylphenol	8	7.00E-01 (Min)	1.3E-03	1	1.00E-02 (Min)	5.7E-04
		4,4'-DDT				2	1.00E-04 (Min)	5.7E-04
		4,6-Dinitro-2-methylphenol	8	3.50E+00 (Min)	3.2E+00	2	5.00E-02 (Min)	1.4E+00
		4-Chloroaniline	2	7.00E-01 (Min)	1.6E-02	2	1.00E-02 (Min)	7.1E-03
		4-Methyl-2-pentanone				1	9.69E-03 (Min)	5.5E-04
		4-Methylphenol	8	7.00E-01 (Min)	1.3E-03	1	1.00E-02 (Min)	5.7E-04
		Acenaphthene	8	7.00E-01 (Min)	1.1E-03	3	1.00E-02 (Min)	4.8E-04
		Aldrin				2	5.00E-05 (Min)	4.8E-03
		Anthracene	8	7.00E-01 (Min)	2.1E-04	3	1.00E-02 (Min)	9.5E-05
		Benzidine				1	2.00E-02 (Min)	1.9E-02
		Benzoic acid	8	3.50E+00 (Min)	7.9E-05	2	5.00E-02 (Min)	3.6E-05
		Benzyl alcohol	8	7.00E-01 (Min)	2.1E-04	2	1.00E-02 (Min)	9.5E-05
		Bis(2-chloroisopropyl)ether	8	7.00E-01 (Min)	1.6E-03	3	1.00E-02 (Min)	7.1E-04
		Bis(2-ethylhexyl)phthalate	8	7.00E-01 (Min)	3.2E-03	3	1.00E-02 (Min)	1.4E-03
		Bromoform				3	4.84E-03 (Min)	6.9E-04
		Butylbenzylphthalate	8	7.00E-01 (Min)	3.2E-04	3	1.00E-02 (Min)	1.4E-04
		Carbon tetrachloride				3	4.84E-03 (Min)	2.0E-02
		Chlordane				4	5.00E-04 (Min)	2.4E-02
		Chlorobenzene				3	4.84E-03 (Min)	6.9E-04

Table E.18 Results of adult nonconservative screening for noncarcinogens in fish and water where no measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Fish samples	Fish concentration	Fish ingest. carcinogen screening index	Water samples	Water concentration	Water ingest. carcinogen screening index
2	Organics	Chlorodibromomethane				3	4.84E-03 (Min)	6.9E-04
		Cis-1,3-Dichloropropene				3	4.84E-03 (Min)	4.6E-02
		Di-n-butylphthalate	8	7.00E-01 (Min)	6.3E-04	3	1.00E-02 (Min)	2.9E-04
		Di-n-octylphthalate	8	8.20E-02 (Min)	3.7E-04	3	1.00E-02 (Min)	1.4E-03
		Dichlorobromomethane				3	4.84E-03 (Min)	6.9E-04
		Dieldrin				2	1.00E-04 (Min)	5.7E-03
		Diethylphthalate	8	8.00E-02 (Min)	9.0E-06	3	1.00E-02 (Min)	3.6E-05
		Dimethylphthalate	8	7.00E-01 (Min)	6.3E-05	3	1.00E-02 (Min)	2.9E-05
		Endosulfan I				2	5.00E-05 (Min)	2.9E-03
		Endosulfan II				2	1.00E-04 (Min)	5.7E-03
		Endrin				2	1.00E-04 (Min)	9.5E-04
		Ethylbenzene				3	4.84E-03 (Min)	1.4E-04
		Fluoranthene	8	7.00E-01 (Min)	1.6E-03	3	1.00E-02 (Min)	7.1E-04
		Fluorene	8	7.00E-01 (Min)	1.6E-03	3	1.00E-02 (Min)	7.1E-04
		Gamma-BHC (Lindane)				2	5.00E-05 (Min)	4.8E-04
		Heptachlor				2	5.00E-05 (Min)	2.9E-04
		Heptachlor epoxide				2	5.00E-05 (Min)	1.1E-02
		Hexachlorobenzene	8	7.00E-01 (Min)	7.9E-02	3	1.00E-02 (Min)	3.6E-02
		Hexachlorobutadiene	8	7.00E-01 (Min)	3.2E-02	3	1.00E-02 (Min)	1.4E-02
		Hexachlorocyclopentadiene	8	7.00E-01 (Min)	9.0E-03	3	1.00E-02 (Min)	4.1E-03
		Hexachloroethane	8	7.00E-01 (Min)	6.3E-02	3	1.00E-02 (Min)	2.9E-02
		Isophorone	8	7.00E-01 (Min)	3.2E-04	3	1.00E-02 (Min)	1.4E-04
		Methoxychlor				2	5.00E-04 (Min)	2.9E-04
		Methyl bromide				3	9.69E-03 (Min)	2.0E-02
		Naphthalene	8	7.00E-01 (Min)	1.6E-03	3	1.00E-02 (Min)	7.1E-04
		Nitrobenzene	8	7.00E-01 (Min)	1.3E-01	3	1.00E-02 (Min)	5.7E-02
		Pentachlorophenol	8	3.50E+00 (Min)	1.1E-02	2	5.00E-02 (Min)	4.8E-03
		Phenol	8	7.00E-01 (Min)	1.1E-04			
		Pyrene	8	7.00E-01 (Min)	2.1E-03	3	1.00E-02 (Min)	9.5E-04
		Styrene				1	4.84E-03 (Min)	6.9E-05
		Trans-1,2-dichloroethylene				2	5.00E-03 (Min)	7.1E-04
		Trans-1,3-dichloropropene				3	4.84E-03 (Min)	4.6E-02
		Trichlorofluoromethane				1	5.00E-03 (Min)	4.8E-05
		Vinyl acetate				1	9.69E-03 (Min)	2.8E-05
				mg/kg			mg/L	

Table E.16 Results of adult nonconservative screening for noncarcinogens in fish and water where no measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Fish samples	Fish concentration	Fish ingest. carcinogen screening index	Water samples	Water concentration	Water ingest. carcinogen screening index
3	Inorganics	Antimony	35	3.00E-01 (Min)	6.8E-02	9	1.90E-03 (Min)	1.4E-02
		Cadmium	35	1.20E-01 (Min)	2.2E-02			
		Chromium	35	3.00E-01 (Min)	5.4E-03			
		Copper	35	3.00E-01 (Min)	7.3E-04			
		Nickel	35	3.00E-01 (Min)	1.4E-03			
		Silver	35	1.20E-01 (Min)	2.2E-03			
		Thallium	35	2.00E-02 (Min)	2.6E-02	8	2.70E-03 (Min)	1.1E-01
		Vanadium				1	5.00E-01 (Min)	2.0E-01
				mg/kg			mg/L	
	Organics	1,1,2-Trichloroethane				5	5.00E-03 (Min)	3.6E-03
		1,2,4-Trichlorobenzene	34	1.90E-01 (Min)	1.7E-03	8	1.00E-02 (Min)	2.9E-03
		1,2-Dichlorobenzene	34	1.90E-01 (Min)	1.9E-04	9	4.86E-03 (Min)	1.5E-04
		1,2-Dichloroethylene (total)				1	5.00E-03 (Min)	1.4E-03
		2,4,5-Trichlorophenol	34	9.30E-01 (Min)	8.4E-04	5	5.00E-02 (Min)	1.4E-03
		2,4-Dichlorophenol	34	1.90E-01 (Min)	5.7E-03			
		2,4-Dimethylphenol	34	1.90E-01 (Min)	8.6E-04	8	1.00E-02 (Min)	1.4E-03
		2,4-Dinitrophenol	34	9.30E-01 (Min)	4.2E-02	4	5.00E-02 (Min)	7.1E-02
		2-Chloronaphthalene	34	1.90E-01 (Min)	2.1E-04	8	1.00E-02 (Min)	3.6E-04
		2-Chlorophenol	34	1.90E-01 (Min)	3.4E-03	8	1.00E-02 (Min)	5.7E-03
		2-Methylphenol	34	1.90E-01 (Min)	3.4E-04	5	1.00E-02 (Min)	5.7E-04
		4,4'-DDT	34	1.00E-02 (Min)	1.8E-03	1	1.00E-04 (Min)	5.7E-04
		4,6-Dinitro-2-methylphenol	34	9.30E-01 (Min)	8.4E-01	8	5.00E-02 (Min)	1.4E+00
		4-Chloroaniline	34	1.90E-01 (Min)	4.3E-03	5	1.00E-02 (Min)	7.1E-03
		4-Methyl-2-pentanone				1	1.00E-02 (Min)	5.7E-04
		4-Methylphenol	34	1.90E-01 (Min)	3.4E-04	5	1.00E-02 (Min)	5.7E-04
		Acenaphthene	34	1.90E-01 (Min)	2.9E-04	8	1.00E-02 (Min)	4.8E-04
		Acetone				1	1.00E-02 (Min)	2.9E-04
		Aldrin	34	7.72E-03 (Min)	2.3E-02	1	5.00E-05 (Min)	4.8E-03
		Anthracene	34	1.90E-01 (Min)	5.7E-05			
		Benzidine				4	1.00E-02 (Min)	9.5E-03
		Benzoic acid	34	9.30E-01 (Min)	2.1E-05	5	5.00E-02 (Min)	3.6E-05
		Benzyl alcohol	34	1.90E-01 (Min)	5.7E-05	5	1.00E-02 (Min)	9.5E-05
		Bis(2-chloroisopropyl)ether	34	1.90E-01 (Min)	4.3E-04	8	1.00E-02 (Min)	7.1E-04
		Butylbenzylphthalate	34	1.90E-01 (Min)	8.6E-05			
		Carbon tetrachloride				5	5.00E-03 (Min)	2.0E-02
		Chlordane				2	5.00E-04 (Min)	2.4E-02

Table E.16 Results of adult nonconservative screening for noncarcinogens in fish and water where no measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Fish samples	Fish concentration	Fish ingest. carcinogen screening index	Water samples	Water concentration	Water ingest. carcinogen screening index
3	Organics	Cis-1,3-Dichloropropene				5	5.00E-03 (Min)	4.8E-02
		Di-n-butylphthalate	34	1.90E-01 (Min)	1.7E-04			
		Di-n-octylphthalate				8	1.00E-02 (Min)	1.4E-03
		Dieldrin				1	1.00E-04 (Min)	5.7E-03
		Diethylphthalate	34	1.90E-01 (Min)	2.1E-05			
		Dimethylphthalate	34	1.90E-01 (Min)	1.7E-05			
		Endosulfan I				1	5.00E-05 (Min)	2.9E-03
		Endosulfan II				1	1.00E-04 (Min)	5.7E-03
		Endrin				1	1.00E-04 (Min)	9.5E-04
		Fluoranthene	34	1.90E-01 (Min)	4.3E-04			
		Fluorene	34	1.90E-01 (Min)	4.3E-04	8	1.00E-02 (Min)	7.1E-04
		Gamma-BHC (Lindane)				1	5.00E-05 (Min)	4.8E-04
		Heptachlor				1	5.00E-05 (Min)	2.9E-04
		Heptachlor epoxide				1	5.00E-05 (Min)	1.1E-02
		Hexachlorobenzene	34	1.90E-01 (Min)	2.1E-02	8	1.00E-02 (Min)	3.6E-02
		Hexachlorobutadiene	34	1.90E-01 (Min)	8.6E-03	8	1.00E-02 (Min)	1.4E-02
		Hexachlorocyclopentadiene	34	1.90E-01 (Min)	2.4E-03	8	1.00E-02 (Min)	4.1E-03
		Hexachloroethane	34	1.90E-01 (Min)	1.7E-02	8	1.00E-02 (Min)	2.9E-02
		Isophorone	34	1.90E-01 (Min)	8.6E-05	8	1.00E-02 (Min)	1.4E-04
		Methoxychlor				1	5.00E-04 (Min)	2.9E-04
		Methyl bromide				5	9.99E-03 (Min)	2.0E-02
		Naphthalene	34	1.90E-01 (Min)	4.3E-04	8	1.00E-02 (Min)	7.1E-04
		Nitrobenzene	34	1.90E-01 (Min)	3.4E-02	8	1.00E-02 (Min)	5.7E-02
		Pentachlorophenol	34	9.30E-01 (Min)	2.8E-03	8	5.00E-02 (Min)	4.8E-03
		Phenol	34	1.90E-01 (Min)	2.9E-05			
		Pyrene	34	1.90E-01 (Min)	5.7E-04			
		Styrene				1	5.00E-03 (Min)	7.1E-05
		Trichlorofluoromethane				4	5.00E-03 (Min)	4.8E-05
		Vinyl acetate				1	1.00E-02 (Min)	2.9E-05
		Xylene				1	5.00E-03 (Min)	7.1E-06
				mg/kg			mg/L	
4	Inorganics	Antimony	27	4.80E-01 (Min)	1.1E-01	4	1.90E-03 (Min)	1.4E-02
		Arsenic				5	1.30E-03 (Min)	1.2E-02
		Beryllium	27	3.00E-03 (Min)	5.4E-05	3	3.00E-04 (Min)	1.7E-04
		Cadmium	27	1.90E-01 (Min)	3.4E-02	5	2.10E-04 (Min)	1.2E-03

Table E.18 Results of adult nonconservative screening for noncarcinogens in fish and water where no measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Fish samples	Fish concentration	Fish ingest. carcinogen screening index	Water samples	Water concentration	Water ingest. carcinogen screening index
4	Inorganics	Chromium	27	4.80E-01 (Min)	8.6E-03			
		Copper	27	4.80E-01 (Min)	1.2E-03			
		Molybdenum				1	1.00E-02 (Min)	5.7E-03
		Nickel	27	4.80E-01 (Min)	2.2E-03			
		Selenium				4	9.70E-04 (Min)	5.5E-04
		Silver	27	1.90E-01 (Min)	3.4E-03	4	7.40E-04 (Min)	4.2E-04
		Thallium	27	2.00E-02 (Min)	2.6E-02	4	2.70E-03 (Min)	1.1E-01
		Tin				1	1.00E-02 (Min)	4.8E-05
				mg/kg			mg/L	
	Organics	1,1,1-Trichloroethane				2	5.00E-03 (Min)	1.6E-04
		1,1,2-Trichloroethane				2	5.00E-03 (Min)	3.6E-03
		1,1-Dichloroethane				2	5.00E-03 (Min)	1.4E-04
		1,1-Dichloroethylene				2	5.00E-03 (Min)	1.6E-03
		1,2,4-Trichlorobenzene	6	6.60E-01 (Min)	5.9E-03	4	1.00E-02 (Min)	2.9E-03
		1,2-Dichlorobenzene	6	6.60E-01 (Min)	6.6E-04	4	9.50E-03 (Min)	3.0E-04
		2,4,5-Trichlorophenol	13	3.30E+00 (Min)	3.0E-03	2	5.00E-02 (Min)	1.4E-03
		2,4-Dichlorophenol	14	6.60E-01 (Min)	2.0E-02	4	1.00E-02 (Min)	9.5E-03
		2,4-Dimethylphenol	14	6.60E-01 (Min)	3.0E-03	4	1.00E-02 (Min)	1.4E-03
		2,4-Dinitrophenol	13	3.30E+00 (Min)	1.5E-01	2	5.00E-02 (Min)	7.1E-02
		2-Chloronaphthalene	6	6.60E-01 (Min)	7.4E-04	4	1.00E-02 (Min)	3.6E-04
		2-Chlorophenol	14	6.60E-01 (Min)	1.2E-02	4	1.00E-02 (Min)	5.7E-03
		2-Methylphenol	13	6.60E-01 (Min)	1.2E-03	2	1.00E-02 (Min)	5.7E-04
		4,4'-DDT				3	1.00E-04 (Min)	5.7E-04
		4,6-Dinitro-2-methylphenol	13	3.30E+00 (Min)	3.0E+00	4	5.00E-02 (Min)	1.4E+00
		4-Chloroaniline	6	6.60E-01 (Min)	1.5E-02	2	1.00E-02 (Min)	7.1E-03
		4-Methylphenol	14	6.60E-01 (Min)	1.2E-03	2	1.00E-02 (Min)	5.7E-04
		Acenaphthene	6	6.60E-01 (Min)	9.9E-04	4	1.00E-02 (Min)	4.8E-04
		Aldrin				3	5.00E-05 (Min)	4.8E-03
		Anthracene	6	6.60E-01 (Min)	2.0E-04	4	1.00E-02 (Min)	9.5E-05
		Benzidine				2	1.00E-02 (Min)	9.5E-03
		Benzoic acid	2	3.30E+00 (Min)	7.4E-05	2	5.00E-02 (Min)	3.6E-05
		Benzyl alcohol	6	6.60E-01 (Min)	2.0E-04	2	1.00E-02 (Min)	9.5E-05
		Bis(2-chloroisopropyl)ether	6	6.60E-01 (Min)	1.5E-03	4	1.00E-02 (Min)	7.1E-04
		Bis(2-ethylhexyl)phthalate	6	6.60E-01 (Min)	3.0E-03	4	1.00E-02 (Min)	1.4E-03
		Bromoform				2	5.00E-03 (Min)	7.1E-04
		Butylbenzylphthalate	6	6.60E-01 (Min)	3.0E-04	4	1.00E-02 (Min)	1.4E-04

Table E.16 Results of adult nonconservative screening for noncarcinogens in fish and water where no measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Fish samples	Fish concentration	Fish ingest. carcinogen screening index	Water samples	Water concentration	Water ingest. carcinogen screening index
4	Organics	Carbon tetrachloride				2	5.00E-03 (Min)	2.0E-02
		Chlordane				6	5.00E-04 (Min)	2.4E-02
		Chlorobenzene				2	5.00E-03 (Min)	7.1E-04
		Chlorodibromomethane				2	5.00E-03 (Min)	7.1E-04
		Chloroform				2	5.00E-03 (Min)	1.4E-03
		Cis-1,3-Dichloropropene				2	5.00E-03 (Min)	4.8E-02
		Di-n-butylphthalate	6	6.60E-01 (Min)	5.9E-04	4	1.00E-02 (Min)	2.9E-04
		Di-n-octylphthalate	6	6.60E-01 (Min)	3.0E-03	4	1.00E-02 (Min)	1.4E-03
		Dichlorobromomethane				2	5.00E-03 (Min)	7.1E-04
		Dieldrin				3	1.00E-04 (Min)	5.7E-03
		Diethylphthalate	6	6.60E-01 (Min)	7.4E-05	4	1.00E-02 (Min)	3.6E-05
		Dimethylphthalate	6	6.60E-01 (Min)	5.9E-05	4	1.00E-02 (Min)	2.9E-05
		Endosulfan I				3	5.00E-05 (Min)	2.9E-03
		Endosulfan II				3	1.00E-04 (Min)	5.7E-03
		Endrin				3	1.00E-04 (Min)	9.5E-04
		Ethylbenzene				2	5.00E-03 (Min)	1.4E-04
		Fluoranthene	7	6.60E-01 (Min)	1.5E-03	4	1.00E-02 (Min)	7.1E-04
		Fluorene	6	6.60E-01 (Min)	1.5E-03	4	1.00E-02 (Min)	7.1E-04
		Gamma-BHC (Lindane)				3	5.00E-05 (Min)	4.8E-04
		Heptachlor				3	5.00E-05 (Min)	2.9E-04
		Heptachlor epoxide				3	5.00E-05 (Min)	1.1E-02
		Hexachlorobenzene	6	6.60E-01 (Min)	7.4E-02	4	1.00E-02 (Min)	3.6E-02
		Hexachlorobutadiene	6	6.60E-01 (Min)	3.0E-02	4	1.00E-02 (Min)	1.4E-02
		Hexachlorocyclopentadiene	6	6.60E-01 (Min)	8.5E-03	4	1.00E-02 (Min)	4.1E-03
		Hexachloroethane	6	6.60E-01 (Min)	5.9E-02	4	1.00E-02 (Min)	2.9E-02
		Isophorone	6	6.60E-01 (Min)	3.0E-04	4	1.00E-02 (Min)	1.4E-04
		Methoxychlor				3	5.00E-04 (Min)	2.9E-04
		Methyl bromide				2	1.00E-02 (Min)	2.0E-02
		Methylene chloride				2	5.00E-03 (Min)	2.4E-04
		Naphthalene	6	6.60E-01 (Min)	1.5E-03	4	1.00E-02 (Min)	7.1E-04
		Nitrobenzene	6	6.60E-01 (Min)	1.2E-01	4	1.00E-02 (Min)	5.7E-02
		Pentachlorophenol	13	3.30E+00 (Min)	9.9E-03	4	5.00E-02 (Min)	4.8E-03
		Phenol	13	6.60E-01 (Min)	9.9E-05			
		Pyrene	6	6.60E-01 (Min)	2.0E-03	4	1.00E-02 (Min)	9.5E-04
		Tetrachloroethylene				2	5.00E-03 (Min)	1.4E-03
		Toluene				2	5.00E-03 (Min)	7.1E-05
		Trans-1,2-dichloroethylene				2	5.00E-03 (Min)	7.1E-04
		Trans-1,3-dichloropropene				2	5.00E-03 (Min)	4.8E-02

Table E.16 Results of adult nonconservative screening for noncarcinogens in fish and water where no measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Fish samples	Fish concentration	Fish ingest. carcinogen screening index	Water samples	Water concentration	Water ingest. carcinogen screening index
4	Organics	Trichlorofluoromethane				1	5.00E-03 (Min)	4.8E-05
				mg/kg			mg/L	
5	Inorganics	Antimony	25	4.60E-01 (Min)	1.0E-01	4	1.90E-03 (Min)	1.4E-02
		Arsenic				4	1.30E-03 (Min)	1.2E-02
		Beryllium				4	3.90E-03 (Min)	2.2E-03
		Cadmium	25	1.80E-01 (Min)	3.4E-02	4	2.10E-04 (Min)	1.2E-03
		Chromium	25	4.60E-01 (Min)	8.3E-03	4	9.80E-03 (Min)	5.6E-03
		Copper				4	4.40E-03 (Min)	3.4E-04
		Mercury				4	2.00E-04 (Min)	1.9E-03
		Nickel	5	4.60E-01 (Min)	2.1E-03	4	1.90E-02 (Min)	2.7E-03
		Selenium	25	4.60E-01 (Min)	8.3E-03	4	9.70E-04 (Min)	5.5E-04
		Silver	25	1.80E-01 (Min)	3.4E-03	4	7.40E-04 (Min)	4.2E-04
		Thallium	16	2.00E-02 (Min)	2.6E-02	4	2.70E-03 (Min)	1.1E-01
		Zinc				4	3.40E-03 (Min)	4.9E-05
				mg/kg			mg/L	
	Organics	1,2,4-Trichlorobenzene				4	1.00E-02 (Min)	2.9E-03
		1,2-Dichlorobenzene				4	1.00E-02 (Min)	3.2E-04
		2,4,5-Trichlorophenol	9	3.30E+00 (Min)	3.0E-03	4	5.00E-02 (Min)	1.4E-03
		2,4-Dichlorophenol	9	6.60E-01 (Min)	2.0E-02	4	1.00E-02 (Min)	9.5E-03
		2,4-Dimethylphenol	9	6.60E-01 (Min)	3.0E-03	4	1.00E-02 (Min)	1.4E-03
		2,4-Dinitrophenol	9	3.30E+00 (Min)	1.5E-01	4	5.00E-02 (Min)	7.1E-02
		2-Chloronaphthalene				4	1.00E-02 (Min)	3.6E-04
		2-Chlorophenol	9	6.60E-01 (Min)	1.2E-02	4	1.00E-02 (Min)	5.7E-03
		2-Methylphenol	9	6.60E-01 (Min)	1.2E-03	4	1.00E-02 (Min)	5.7E-04
		4,4'-DDT				3	1.00E-04 (Min)	5.7E-04
		4,6-Dinitro-2-methylphenol	8	3.30E+00 (Min)	3.0E+00	4	5.00E-02 (Min)	1.4E+00
		4-Chloroaniline				4	1.00E-02 (Min)	7.1E-03
		4-Methylphenol	9	6.60E-01 (Min)	1.2E-03	4	1.00E-02 (Min)	5.7E-04
		Acenaphthene				4	1.00E-02 (Min)	4.8E-04
		Aldrin				3	5.00E-05 (Min)	4.8E-03
		Anthracene				4	1.00E-02 (Min)	9.5E-05
		Benzoic acid				4	5.00E-02 (Min)	3.6E-05
		Benzyl alcohol				4	1.00E-02 (Min)	9.5E-05

Table E.16 Results of adult nonconservative screening for noncarcinogens in fish and water where no measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Fish samples	Fish concentration	Fish ingest. carcinogen screening index	Water samples	Water concentration	Water ingest. carcinogen screening index
5	Organics	Bis(2-chloroisopropyl)ether				4	1.00E-02 (Min)	7.1E-04
		Bis(2-ethylhexyl)phthalate				4	3.00E-03 (Min)	4.3E-04
		Butylbenzylphthalate				4	1.00E-02 (Min)	1.4E-04
		Chlordane				6	5.00E-04 (Min)	2.4E-02
		Di-n-butylphthalate				4	1.00E-02 (Min)	2.9E-04
		Di-n-octylphthalate				4	1.00E-02 (Min)	1.4E-03
		Dieldrin				3	1.00E-04 (Min)	5.7E-03
		Diethylphthalate				4	1.00E-02 (Min)	3.6E-05
		Dimethylphthalate				4	1.00E-02 (Min)	2.9E-05
		Endosulfan I				3	5.00E-05 (Min)	2.9E-03
		Endosulfan II				3	1.00E-04 (Min)	5.7E-03
		Endrin				3	1.00E-04 (Min)	9.5E-04
		Fluoranthene				4	1.00E-02 (Min)	7.1E-04
		Fluorene				4	1.00E-02 (Min)	7.1E-04
		Gamma-BHC (Lindane)				3	5.00E-05 (Min)	4.8E-04
		Heptachlor				3	5.00E-05 (Min)	2.9E-04
		Heptachlor epoxide				3	5.00E-05 (Min)	1.1E-02
		Hexachlorobenzene				4	1.00E-02 (Min)	3.6E-02
		Hexachlorobutadiene				4	1.00E-02 (Min)	1.4E-02
		Hexachlorocyclopentadiene				4	1.00E-02 (Min)	4.1E-03
		Hexachloroethane				4	1.00E-02 (Min)	2.9E-02
		Isophorone				4	1.00E-02 (Min)	1.4E-04
		Methoxychlor				3	5.00E-04 (Min)	2.9E-04
		Naphthalene	1	5.70E-02 (Min)	1.3E-04	4	1.00E-02 (Min)	7.1E-04
		Nitrobenzene				4	1.00E-02 (Min)	5.7E-02
		Pentachlorophenol	9	3.30E+00 (Min)	9.9E-03	4	5.00E-02 (Min)	4.8E-03
		Phenol	9	6.60E-01 (Min)	9.9E-05	4	1.00E-02 (Min)	4.8E-05
		Pyrene				4	1.00E-02 (Min)	9.5E-04
				mg/kg			mg/L	
10	Inorganics	Antimony	15	3.50E-01 (Min)	7.9E-02	1	1.90E-03 (Min)	1.4E-02
		Arsenic				1	1.30E-03 (Min)	1.2E-02
		Beryllium				1	3.90E-03 (Min)	2.2E-03
		Cadmium	15	1.40E-01 (Min)	2.5E-02	1	2.10E-04 (Min)	1.2E-03
		Chromium	15	3.50E-01 (Min)	6.3E-03	1	9.80E-03 (Min)	5.6E-03
		Copper	15	3.50E-01 (Min)	8.5E-04	1	4.40E-03 (Min)	3.4E-04

Table E.16 Results of adult nonconservative screening for noncarcinogens in fish and water where no measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Fish samples	Fish concentration	Fish ingest. carcinogen screening index	Water samples	Water concentration	Water ingest. carcinogen screening index
				mg/kg			mg/L	
10	Inorganics	Mercury				1	2.00E-04 (Min)	1.9E-03
		Nickel	15	3.50E-01 (Min)	1.6E-03	1	1.90E-02 (Min)	2.7E-03
		Selenium				1	9.70E-04 (Min)	5.5E-04
		Silver	15	1.40E-01 (Min)	2.5E-03	1	7.40E-04 (Min)	4.2E-04
		Thallium	15	2.00E-02 (Min)	2.6E-02	1	2.70E-03 (Min)	1.1E-01
		Zinc				1	1.05E-02 (Min)	1.5E-04
	Organics	1,2,4-Trichlorobenzene				1	1.00E-02 (Min)	2.9E-03
		1,2-Dichlorobenzene				1	1.00E-02 (Min)	3.2E-04
		2,4-Dichlorophenol				1	1.00E-02 (Min)	9.5E-03
		2,4-Dimethylphenol				1	1.00E-02 (Min)	1.4E-03
		2,4-Dinitrophenol				1	5.00E-02 (Min)	7.1E-02
		2-Chloronaphthalene				1	1.00E-02 (Min)	3.6E-04
		2-Chlorophenol				1	1.00E-02 (Min)	5.7E-03
		2-Methylphenol				1	1.00E-02 (Min)	5.7E-04
		4,4'-DDT	8	1.00E-02 (Min)	1.8E-03	1	1.00E-04 (Min)	5.7E-04
		4,6-Dinitro-2-methylphenol				1	5.00E-02 (Min)	1.4E+00
		4-Chloroaniline				1	1.00E-02 (Min)	7.1E-03
		4-Methylphenol				1	1.00E-02 (Min)	5.7E-04
		Acenaphthene				1	1.00E-02 (Min)	4.8E-04
		Aldrin	8	1.00E-02 (Min)	3.0E-02	1	5.00E-05 (Min)	4.8E-03
		Anthracene				1	1.00E-02 (Min)	9.5E-05
		Benzoic acid				1	5.00E-02 (Min)	3.6E-05
		Benzyl alcohol				1	1.00E-02 (Min)	9.5E-05
		Bis(2-chloroisopropyl)ether				1	1.00E-02 (Min)	7.1E-04
		Butylbenzylphthalate				1	1.00E-02 (Min)	1.4E-04
		Chlordane				2	5.00E-04 (Min)	2.4E-02
		Di-n-butylphthalate				1	1.00E-02 (Min)	2.9E-04
		Di-n-octylphthalate				1	1.00E-02 (Min)	1.4E-03
		Dieldrin				1	1.00E-04 (Min)	5.7E-03
		Diethylphthalate				1	1.00E-02 (Min)	3.6E-05
		Dimethylphthalate				1	1.00E-02 (Min)	2.9E-05
		Endosulfan I				1	5.00E-05 (Min)	2.9E-03
		Endosulfan II				1	1.00E-04 (Min)	5.7E-03
		Endrin				1	1.00E-04 (Min)	9.5E-04
		Fluoranthene				1	1.00E-02 (Min)	7.1E-04

Table E.18 Results of adult nonconservative screening for noncarcinogens in fish and water where no measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Fish samples	Fish concentration	Fish ingest. carcinogen screening index	Water samples	Water concentration	Water ingest. carcinogen screening index
10	Organics	Fluorene				1	1.00E-02 (Min)	7.1E-04
		Gamma-BHC (Lindane)				1	5.00E-05 (Min)	4.8E-04
		Heptachlor				1	5.00E-05 (Min)	2.9E-04
		Heptachlor epoxide				1	5.00E-05 (Min)	1.1E-02
		Hexachlorobenzene				1	1.00E-02 (Min)	3.6E-02
		Hexachlorobutadiene				1	1.00E-02 (Min)	1.4E-02
		Hexachlorocyclopentadiene				1	1.00E-02 (Min)	4.1E-03
		Hexachloroethane				1	1.00E-02 (Min)	2.9E-02
		Isophorone				1	1.00E-02 (Min)	1.4E-04
		Methoxychlor				1	5.00E-04 (Min)	2.9E-04
		Naphthalene				1	1.00E-02 (Min)	7.1E-04
		Nitrobenzene				1	1.00E-02 (Min)	5.7E-02
		Pentachlorophenol				1	5.00E-02 (Min)	4.8E-03
		Phenol				1	1.00E-02 (Min)	4.8E-05
		Pyrene				1	1.00E-02 (Min)	9.5E-04
				mg/kg			mg/L	
13	Inorganics	Antimony	10	4.60E-01 (Min)	1.0E-01	1	1.90E-03 (Min)	1.4E-02
		Arsenic				2	1.30E-03 (Min)	1.2E-02
		Beryllium	3	3.00E-03 (Min)	5.4E-05	1	3.90E-03 (Min)	2.2E-03
		Cadmium	10	1.80E-01 (Min)	3.2E-02	2	2.10E-04 (Min)	1.2E-03
		Chromium	10	4.50E-01 (Min)	8.1E-03			
		Copper	10	4.50E-01 (Min)	1.1E-03	2	4.00E-03 (Min)	3.1E-04
		Mercury				2	2.00E-04 (Min)	1.9E-03
		Nickel	10	4.50E-01 (Min)	2.0E-03			
		Selenium	10	4.50E-01 (Min)	8.1E-03	1	9.70E-04 (Min)	5.5E-04
		Silver	10	1.80E-01 (Min)	3.2E-03	1	7.40E-04 (Min)	4.2E-04
		Thallium	10	2.00E-02 (Min)	2.6E-02	1	2.70E-03 (Min)	1.1E-01
		Uranium				1	6.67E-04 (Min)	6.3E-04
				mg/kg			mg/L	
	Organics	1,1,1-Trichloroethane				1	5.00E-03 (Min)	1.6E-04
		1,1,2-Trichloroethane				1	5.00E-03 (Min)	3.6E-03
		1,1-Dichloroethane				1	5.00E-03 (Min)	1.4E-04
		1,1-Dichloroethylene				1	5.00E-03 (Min)	1.6E-03

Table E.18 Results of adult nonconservative screening for noncarcinogens in fish and water where no measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Fish samples	Fish concentration	Fish ingest. carcinogen screening index	Water samples	Water concentration	Water ingest. carcinogen screening index
13	Organics	1,2,4-Trichlorobenzene				2	1.00E-02 (Min)	2.9E-03
		1,2-Dichlorobenzene				2	1.00E-02 (Min)	3.2E-04
		2,4,5-Trichlorophenol	2	3.40E+00 (Min)	3.1E-03	1	5.00E-02 (Min)	1.4E-03
		2,4-Dichlorophenol	2	6.90E-01 (Min)	2.1E-02	2	1.00E-02 (Min)	9.5E-03
		2,4-Dimethylphenol	2	6.90E-01 (Min)	3.1E-03	2	1.00E-02 (Min)	1.4E-03
		2,4-Dinitrophenol	2	3.40E+00 (Min)	1.5E-01	1	5.00E-02 (Min)	7.1E-02
		2-Chloronaphthalene				2	1.00E-02 (Min)	3.6E-04
		2-Chlorophenol	2	6.90E-01 (Min)	1.2E-02	2	1.00E-02 (Min)	5.7E-03
		2-Methylphenol	2	6.90E-01 (Min)	1.2E-03	1	1.00E-02 (Min)	5.7E-04
		4,4'-DDT	3	1.00E-02 (Min)	1.8E-03			
		4,6-Dinitro-2-methylphenol	2	3.40E+00 (Min)	3.1E+00	2	5.00E-02 (Min)	1.4E+00
		4-Chloroaniline				1	1.00E-02 (Min)	7.1E-03
		4-Methylphenol	2	6.90E-01 (Min)	1.2E-03	1	1.00E-02 (Min)	5.7E-04
		Acenaphthene				2	1.00E-02 (Min)	4.8E-04
		Anthracene				2	1.00E-02 (Min)	9.5E-05
		Benzidine				1	1.00E-02 (Min)	9.5E-03
		Benzoic acid				1	5.00E-02 (Min)	3.6E-05
		Benzyl alcohol				1	1.00E-02 (Min)	9.5E-05
		Bis(2-chloroisopropyl)ether				2	1.00E-02 (Min)	7.1E-04
		Bis(2-ethylhexyl)phthalate				2	1.00E-02 (Min)	1.4E-03
		Bromoform				1	5.00E-03 (Min)	7.1E-04
		Butylbenzylphthalate				2	1.00E-02 (Min)	1.4E-04
		Carbon tetrachloride				1	5.00E-03 (Min)	2.0E-02
		Chlorobenzene				1	5.00E-03 (Min)	7.1E-04
		Chlorodibromomethane				1	5.00E-03 (Min)	7.1E-04
		Chloroform				1	5.00E-03 (Min)	1.4E-03
		Cis-1,3-Dichloropropene				1	5.00E-03 (Min)	4.8E-02
		Di-n-butylphthalate				2	1.00E-02 (Min)	2.9E-04
		Di-n-octylphthalate				2	1.00E-02 (Min)	1.4E-03
		Dichlorobromomethane				1	5.00E-03 (Min)	7.1E-04
		Diethylphthalate				2	1.00E-02 (Min)	3.6E-05
		Dimethylphthalate				2	1.00E-02 (Min)	2.9E-05
		Ethylbenzene				1	5.00E-03 (Min)	1.4E-04
		Fluoranthene				2	1.00E-02 (Min)	7.1E-04
		Fluorene				2	1.00E-02 (Min)	7.1E-04
		Hexachlorobenzene				2	1.00E-02 (Min)	3.6E-02
		Hexachlorobutadiene				2	1.00E-02 (Min)	1.4E-02
		Hexachlorocyclopentadiene				2	1.00E-02 (Min)	4.1E-03

Table E.16 Results of adult nonconservative screening for noncarcinogens in fish and water where no measurement in a reach was above detection limits.

Reach	Contaminant type	Contaminant	Fish samples	Fish concentration	Fish ingest. carcinogen screening index	Water samples	Water concentration	Water ingest. carcinogen screening index
13	Organics	Hexachloroethane				2	1.00E-02 (Min)	2.9E-02
		Isophorone				2	1.00E-02 (Min)	1.4E-04
		Methyl bromide				1	1.00E-02 (Min)	2.0E-02
		Methylene chloride				1	5.00E-03 (Min)	2.4E-04
		Naphthalene				2	1.00E-02 (Min)	7.1E-04
		Nitrobenzene				2	1.00E-02 (Min)	5.7E-02
		Pentachlorophenol	2	3.40E+00 (Min)	1.0E-02	2	5.00E-02 (Min)	4.8E-03
		Phenol	2	6.90E-01 (Min)	1.0E-04	2	1.00E-02 (Min)	4.8E-05
		Pyrene				2	1.00E-02 (Min)	9.5E-04
		Tetrachloroethylene				1	5.00E-03 (Min)	1.4E-03
		Toluene				1	5.00E-03 (Min)	7.1E-05
		Trans-1,2-dichloroethylene				1	5.00E-03 (Min)	7.1E-04
		Trans-1,3-dichloropropene				1	5.00E-03 (Min)	4.8E-02

Table E.17 Results of adult nonconservative screening for carcinogens in dredged sediment where no measurements in a reach were above detection limits.

Reach	Media	Contaminant type	Contaminant	Total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
					mg/kg	1/(mg/kg/d)	mg/kg/d	
1	Sed. Ingestion	Organics	Aroclor-1260	23	1.20E+00 (Min)	7.7E+00	7.3E-08	5.6E-07
			Aroclor-1254	23	1.20E+00 (Min)	7.7E+00	7.3E-08	5.6E-07
			Dibenz(a,h)anthracene	25	5.16E-01 (Min)	1.2E+01	3.2E-08	3.6E-07
			Acenaphthene	25	5.16E-01 (Min)	1.2E+01	3.2E-08	3.6E-07
			Fluorene	25	5.16E-01 (Min)	1.2E+01	3.2E-08	3.6E-07
			Acenaphthylene	25	5.16E-01 (Min)	1.2E+01	3.2E-08	3.6E-07
			Benzo(a)pyrene	25	5.16E-01 (Min)	7.3E+00	3.2E-08	2.3E-07
			Phenanthrene	25	5.16E-01 (Min)	7.3E+00	3.2E-08	2.3E-07
			Anthracene	25	5.16E-01 (Min)	7.3E+00	3.2E-08	2.3E-07
			Benzo(g,h,i)perylene	25	5.16E-01 (Min)	7.3E+00	3.2E-08	2.3E-07
			N-Nitroso-di-n-propylamine	25	5.16E-01 (Min)	7.0E+00	3.2E-08	2.2E-07
			Dieldrin	23	1.20E-01 (Min)	1.6E+01	7.3E-09	1.2E-07
			Toxaphene	23	1.20E+00 (Min)	1.1E+00	7.3E-08	8.1E-08
			Aldrin	23	5.98E-02 (Min)	1.7E+01	3.7E-09	6.2E-08
			Hexachlorobenzene	25	5.16E-01 (Min)	1.6E+00	3.2E-08	5.1E-08
			Chlordane	23	5.98E-01 (Min)	1.3E+00	3.7E-08	4.8E-08
			Bis(2-chloroethyl)ether	25	5.16E-01 (Min)	1.1E+00	3.2E-08	3.5E-08
			Heptachlor epoxide	23	5.98E-02 (Min)	9.1E+00	3.7E-09	3.3E-08
			3,3'-Dichlorobenzidine	25	1.04E+00 (Min)	4.5E-01	6.3E-08	2.9E-08
			Indeno(1,2,3-cd)pyrene	25	5.16E-01 (Min)	7.3E-01	3.2E-08	2.3E-08
			Benzo(b)fluoranthene	25	5.16E-01 (Min)	7.3E-01	3.2E-08	2.3E-08
			Alpha-BHC	23	5.98E-02 (Min)	6.3E+00	3.7E-09	2.3E-08
			2,4-Dinitrotoluene	25	5.16E-01 (Min)	6.8E-01	3.2E-08	2.1E-08
			2,6-Dinitrotoluene	25	5.16E-01 (Min)	6.8E-01	3.2E-08	2.1E-08
			Pentachlorophenol	25	2.49E+00 (Min)	1.2E-01	1.5E-07	1.8E-08
			Heptachlor	23	5.98E-02 (Min)	4.5E+00	3.7E-09	1.6E-08
			Beta-BHC	23	5.98E-02 (Min)	1.8E+00	3.7E-09	6.6E-09
			Gamma-BHC (Lindane)	23	5.98E-02 (Min)	1.3E+00	3.7E-09	4.8E-09
			4,4'-DDE	23	1.20E-01 (Min)	3.4E-01	7.3E-09	2.5E-09
			Hexachlorobutadiene	25	5.16E-01 (Min)	7.8E-02	3.2E-08	2.5E-09
			Bis(2-chloroisopropyl)ether	25	5.16E-01 (Min)	7.0E-02	3.2E-08	2.2E-09
			4-Chloroaniline	25	5.16E-01 (Min)	3.5E-02	3.2E-08	1.1E-09
			1,4-Dichlorobenzene	25	5.16E-01 (Min)	2.4E-02	3.2E-08	7.6E-10
			Bis(2-ethylhexyl)phthalate	25	7.48E-01 (Min)	1.4E-02	4.6E-08	6.4E-10
			Hexachloroethane	25	5.16E-01 (Min)	1.4E-02	3.2E-08	4.4E-10
			2,4,6-Trichlorophenol	25	5.16E-01 (Min)	1.1E-02	3.2E-08	3.5E-10
			N-Nitrosodiphenylamine	25	5.16E-01 (Min)	4.9E-03	3.2E-08	1.5E-10

Table E.17 Results of adult nonconservative screening for carcinogens in dredged sediment where no measurements in a reach were above detection limits.

Reach	Media	Contaminant type	Contaminant	Total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
1	Sed. Ingestion	Organics	Isophorone	25	5.16E-01 (Min)	4.1E-03	3.2E-08	1.3E-10
					mg/kg	1/(mg/kg/d)	mg/kg/d	
2	Sed. Ingestion	Organics	Dibenz(a,h)anthracene	40	5.00E-01 (Min)	1.2E+01	3.1E-08	3.5E-07
			Acenaphthene	40	5.00E-01 (Min)	1.2E+01	3.1E-08	3.5E-07
			Fluorene	40	5.00E-01 (Min)	1.2E+01	3.1E-08	3.5E-07
			Acenaphthylene	40	5.00E-01 (Min)	1.2E+01	3.1E-08	3.5E-07
			Anthracene	40	5.00E-01 (Min)	7.3E+00	3.1E-08	2.2E-07
			Benzo(g,h,i)perylene	40	5.00E-01 (Min)	7.3E+00	3.1E-08	2.2E-07
			N-Nitroso-di-n-propylamine	40	5.00E-01 (Min)	7.0E+00	3.1E-08	2.1E-07
			Dieldrin	41	1.90E-01 (Min)	1.6E+01	1.2E-08	1.9E-07
			Aldrin	41	9.42E-02 (Min)	1.7E+01	5.8E-09	9.8E-08
			Chlordane	41	9.39E-01 (Min)	1.3E+00	5.7E-08	7.5E-08
			Heptachlor epoxide	41	9.42E-02 (Min)	9.1E+00	5.8E-09	5.2E-08
			Hexachlorobenzene	40	5.00E-01 (Min)	1.6E+00	3.1E-08	4.9E-08
			Alpha-BHC	41	9.42E-02 (Min)	6.3E+00	5.8E-09	3.6E-08
			Bis(2-chloroethyl)ether	40	5.00E-01 (Min)	1.1E+00	3.1E-08	3.4E-08
			3,3'-Dichlorobenzidine	40	9.97E-01 (Min)	4.5E-01	6.1E-08	2.7E-08
			Heptachlor	41	9.42E-02 (Min)	4.5E+00	5.8E-09	2.6E-08
			Benzo(k)fluoranthene	40	5.00E-01 (Min)	7.3E-01	3.1E-08	2.2E-08
			2,4-Dinitrotoluene	40	5.00E-01 (Min)	6.8E-01	3.1E-08	2.1E-08
			2,6-Dinitrotoluene	40	5.00E-01 (Min)	6.8E-01	3.1E-08	2.1E-08
			Pentachlorophenol	40	2.43E+00 (Min)	1.2E-01	1.5E-07	1.8E-08
			Beta-BHC	41	9.42E-02 (Min)	1.8E+00	5.8E-09	1.0E-08
			Gamma-BHC (Lindane)	41	9.42E-02 (Min)	1.3E+00	5.8E-09	7.5E-09
			4,4'-DDT	41	1.90E-01 (Min)	3.4E-01	1.2E-08	3.9E-09
			4,4'-DDE	41	1.90E-01 (Min)	3.4E-01	1.2E-08	3.9E-09
			4,4'-DDD	41	1.90E-01 (Min)	2.4E-01	1.2E-08	2.8E-09
			Hexachlorobutadiene	40	5.00E-01 (Min)	7.8E-02	3.1E-08	2.4E-09
			Bis(2-chloroisopropyl)ether	40	5.00E-01 (Min)	7.0E-02	3.1E-08	2.1E-09
			4-Chloroaniline	40	5.00E-01 (Min)	3.5E-02	3.1E-08	1.1E-09
			1,4-Dichlorobenzene	40	5.00E-01 (Min)	2.4E-02	3.1E-08	7.3E-10
			Hexachloroethane	40	5.00E-01 (Min)	1.4E-02	3.1E-08	4.3E-10
			2,4,6-Trichlorophenol	40	5.00E-01 (Min)	1.1E-02	3.1E-08	3.4E-10
			N-Nitrosodiphenylamine	40	5.00E-01 (Min)	4.9E-03	3.1E-08	1.5E-10
			Isophorone	40	5.00E-01 (Min)	4.1E-03	3.1E-08	1.3E-10

Table E.17 Results of adult nonconservative screening for carcinogens in dredged sediment where no measurements in a reach were above detection limits.

Reach	Media	Contaminant type	Contaminant	Total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
					mg/kg	1/(mg/kg/d)	mg/kg/d	
3	Sed. Ingestion	Organics	Aroclor-1260	49	9.38E-01 (Min)	7.7E+00	5.7E-08	4.4E-07
			Dibenz(a,h)anthracene	50	4.17E-01 (Min)	1.2E+01	2.6E-08	2.9E-07
			Acenaphthene	50	4.17E-01 (Min)	1.2E+01	2.6E-08	2.9E-07
			Fluorene	50	4.17E-01 (Min)	1.2E+01	2.6E-08	2.9E-07
			Acenaphthylene	50	4.17E-01 (Min)	1.2E+01	2.6E-08	2.9E-07
			Benzo(g,h,i)perylene	50	4.17E-01 (Min)	7.3E+00	2.6E-08	1.9E-07
			N-Nitroso-di-n-propylamine	50	4.17E-01 (Min)	7.0E+00	2.6E-08	1.8E-07
			Dieldrin	49	9.38E-02 (Min)	1.6E+01	5.7E-09	9.2E-08
			Toxaphene	49	9.38E-01 (Min)	1.1E+00	5.7E-08	6.3E-08
			Aldrin	49	4.62E-02 (Min)	1.7E+01	2.8E-09	4.8E-08
			Hexachlorobenzene	50	4.17E-01 (Min)	1.6E+00	2.6E-08	4.1E-08
			Chlordane	49	4.62E-01 (Min)	1.3E+00	2.8E-08	3.7E-08
			Bis(2-chloroethyl)ether	50	4.17E-01 (Min)	1.1E+00	2.6E-08	2.8E-08
			Heptachlor epoxide	49	4.62E-02 (Min)	9.1E+00	2.8E-09	2.6E-08
			3,3'-Dichlorobenzidine	50	8.34E-01 (Min)	4.5E-01	5.1E-08	2.3E-08
			Indeno(1,2,3-cd)pyrene	50	4.17E-01 (Min)	7.3E-01	2.6E-08	1.9E-08
			Alpha-BHC	49	4.62E-02 (Min)	6.3E+00	2.8E-09	1.8E-08
			2,4-Dinitrotoluene	50	4.17E-01 (Min)	6.8E-01	2.6E-08	1.7E-08
			2,6-Dinitrotoluene	50	4.17E-01 (Min)	6.8E-01	2.6E-08	1.7E-08
			Pentachlorophenol	50	2.02E+00 (Min)	1.2E-01	1.2E-07	1.5E-08
			Heptachlor	49	4.62E-02 (Min)	4.5E+00	2.8E-09	1.3E-08
			Beta-BHC	49	4.62E-02 (Min)	1.8E+00	2.8E-09	5.1E-09
			Gamma-BHC (Lindane)	49	4.62E-02 (Min)	1.3E+00	2.8E-09	3.7E-09
			Hexachlorobutadiene	50	4.17E-01 (Min)	7.8E-02	2.6E-08	2.0E-09
			4,4'-DDT	49	9.38E-02 (Min)	3.4E-01	5.7E-09	2.0E-09
			4,4'-DDE	49	9.38E-02 (Min)	3.4E-01	5.7E-09	2.0E-09
			Bis(2-chloroisopropyl)ether	50	4.17E-01 (Min)	7.0E-02	2.6E-08	1.8E-09
			4,4'-DDD	49	9.38E-02 (Min)	2.4E-01	5.7E-09	1.4E-09
			4-Chloroaniline	50	4.17E-01 (Min)	3.5E-02	2.6E-08	8.9E-10
			1,4-Dichlorobenzene	50	4.17E-01 (Min)	2.4E-02	2.6E-08	6.1E-10
			Hexachloroethane	50	4.17E-01 (Min)	1.4E-02	2.6E-08	3.6E-10
			2,4,6-Trichlorophenol	50	4.17E-01 (Min)	1.1E-02	2.6E-08	2.8E-10
			N-Nitrosodiphenylamine	50	4.17E-01 (Min)	4.9E-03	2.6E-08	1.3E-10
			Isophorone	50	4.17E-01 (Min)	4.1E-03	2.6E-08	1.0E-10

Table E.17 Results of adult nonconservative screening for carcinogens in dredged sediment where no measurements in a reach were above detection limits.

Reach	Media	Contaminant type	Contaminant	Total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
					mg/kg	1/(mg/kg/d)	mg/kg/d	
4	Sed. Ingestion	Organics	Aroclor-1260	45	1.91E+00 (Min)	7.7E+00	1.2E-07	9.0E-07
			Dibenz(a,h)anthracene	47	4.97E-01 (Min)	1.2E+01	3.0E-08	3.5E-07
			Acenaphthene	47	4.97E-01 (Min)	1.2E+01	3.0E-08	3.5E-07
			Fluorene	47	4.97E-01 (Min)	1.2E+01	3.0E-08	3.5E-07
			Acenaphthylene	47	4.97E-01 (Min)	1.2E+01	3.0E-08	3.5E-07
			Benzo(a)pyrene	47	4.97E-01 (Min)	7.3E+00	3.0E-08	2.2E-07
			Anthracene	47	4.97E-01 (Min)	7.3E+00	3.0E-08	2.2E-07
			Benzo(g,h,i)perylene	47	4.97E-01 (Min)	7.3E+00	3.0E-08	2.2E-07
			Dieldrin	45	1.91E-01 (Min)	1.6E+01	1.2E-08	1.9E-07
			Toxaphene	44	1.91E+00 (Min)	1.1E+00	1.2E-07	1.3E-07
			Aldrin	44	9.54E-02 (Min)	1.7E+01	5.8E-09	9.9E-08
			Chlordane	44	9.54E-01 (Min)	1.3E+00	5.8E-08	7.6E-08
			Heptachlor epoxide	44	9.54E-02 (Min)	9.1E+00	5.8E-09	5.3E-08
			Hexachlorobenzene	47	4.97E-01 (Min)	1.6E+00	3.0E-08	4.9E-08
			Alpha-BHC	44	9.54E-02 (Min)	6.3E+00	5.8E-09	3.7E-08
			Bis(2-chloroethyl)ether	47	4.97E-01 (Min)	1.1E+00	3.0E-08	3.3E-08
			3,3'-Dichlorobenzidine	47	9.90E-01 (Min)	4.5E-01	6.1E-08	2.7E-08
			Heptachlor	44	9.54E-02 (Min)	4.5E+00	5.8E-09	2.6E-08
			Benzo(a)anthracene	47	4.97E-01 (Min)	7.3E-01	3.0E-08	2.2E-08
			Indeno(1,2,3-cd)pyrene	47	4.97E-01 (Min)	7.3E-01	3.0E-08	2.2E-08
			Benzo(b)fluoranthene	47	4.97E-01 (Min)	7.3E-01	3.0E-08	2.2E-08
			Benzo(k)fluoranthene	47	4.97E-01 (Min)	7.3E-01	3.0E-08	2.2E-08
			2,4-Dinitrotoluene	47	4.97E-01 (Min)	6.8E-01	3.0E-08	2.1E-08
			2,6-Dinitrotoluene	47	4.97E-01 (Min)	6.8E-01	3.0E-08	2.1E-08
			Pentachlorophenol	47	2.40E+00 (Min)	1.2E-01	1.5E-07	1.8E-08
			Beta-BHC	44	9.54E-02 (Min)	1.8E+00	5.8E-09	1.1E-08
			Gamma-BHC (Lindane)	44	9.54E-02 (Min)	1.3E+00	5.8E-09	7.6E-09
			4,4'-DDT	45	1.91E-01 (Min)	3.4E-01	1.2E-08	4.0E-09
			4,4'-DDE	45	1.91E-01 (Min)	3.4E-01	1.2E-08	4.0E-09
			4,4'-DDD	45	1.91E-01 (Min)	2.4E-01	1.2E-08	2.8E-09
			Hexachlorobutadiene	47	4.97E-01 (Min)	7.8E-02	3.0E-08	2.4E-09
			Chrysene	47	4.97E-01 (Min)	7.3E-02	3.0E-08	2.2E-09
			Bis(2-chloroisopropyl)ether	47	4.97E-01 (Min)	7.0E-02	3.0E-08	2.1E-09
			4-Chloroaniline	47	4.97E-01 (Min)	3.5E-02	3.0E-08	1.1E-09

Table E.17 Results of adult nonconservative screening for carcinogens in dredged sediment where no measurements in a reach were above detection limits.

Reach	Media	Contaminant type	Contaminant	Total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
4	Sed. Ingestion	Organics	1,4-Dichlorobenzene	47	4.97E-01 (Min)	2.4E-02	3.0E-08	7.3E-10
			Hexachloroethane	47	4.97E-01 (Min)	1.4E-02	3.0E-08	4.3E-10
			2,4,6-Trichlorophenol	47	4.97E-01 (Min)	1.1E-02	3.0E-08	3.3E-10
			N-Nitrosodiphenylamine	47	4.97E-01 (Min)	4.9E-03	3.0E-08	1.5E-10
			Isophorone	47	4.97E-01 (Min)	4.1E-03	3.0E-08	1.2E-10
					mg/kg	1/(mg/kg/d)	mg/kg/d	
5	Sed. Ingestion	Organics	Aroclor-1260	62	7.12E+00 (Min)	7.7E+00	4.4E-07	3.4E-06
			Aroclor-1254	62	7.12E+00 (Min)	7.7E+00	4.4E-07	3.4E-06
			Dieldrin	62	7.12E-01 (Min)	1.6E+01	4.4E-08	7.0E-07
			Dibenz(a,h)anthracene	62	7.25E-01 (Min)	1.2E+01	4.4E-08	5.1E-07
			Acenaphthene	62	7.25E-01 (Min)	1.2E+01	4.4E-08	5.1E-07
			Fluorene	62	7.25E-01 (Min)	1.2E+01	4.4E-08	5.1E-07
			Acenaphthylene	62	7.25E-01 (Min)	1.2E+01	4.4E-08	5.1E-07
			Toxaphene	62	7.12E+00 (Min)	1.1E+00	4.4E-07	4.8E-07
			Aldrin	42	3.55E-01 (Min)	1.7E+01	2.2E-08	3.7E-07
			Benzo(a)pyrene	62	7.25E-01 (Min)	7.3E+00	4.4E-08	3.2E-07
			Phenanthrene	62	7.25E-01 (Min)	7.3E+00	4.4E-08	3.2E-07
			Anthracene	62	7.25E-01 (Min)	7.3E+00	4.4E-08	3.2E-07
			Pyrene	62	7.25E-01 (Min)	7.3E+00	4.4E-08	3.2E-07
			Benzo(g,h,i)perylene	62	7.25E-01 (Min)	7.3E+00	4.4E-08	3.2E-07
			Fluoranthene	62	7.25E-01 (Min)	7.3E+00	4.4E-08	3.2E-07
			N-Nitroso-di-n-propylamine	62	7.25E-01 (Min)	7.0E+00	4.4E-08	3.1E-07
			Chlordane	42	3.55E+00 (Min)	1.3E+00	2.2E-07	2.8E-07
			Heptachlor epoxide	42	3.55E-01 (Min)	9.1E+00	2.2E-08	2.0E-07
			Alpha-BHC	42	3.55E-01 (Min)	6.3E+00	2.2E-08	1.4E-07
			Heptachlor	42	3.55E-01 (Min)	4.5E+00	2.2E-08	9.8E-08
			Hexachlorobenzene	62	7.25E-01 (Min)	1.6E+00	4.4E-08	7.1E-08
			Bis(2-chloroethyl)ether	62	7.25E-01 (Min)	1.1E+00	4.4E-08	4.9E-08
			3,3'-Dichlorobenzidine	62	1.44E+00 (Min)	4.5E-01	8.8E-08	4.0E-08
			Beta-BHC	42	3.55E-01 (Min)	1.8E+00	2.2E-08	3.9E-08
			Benzo(a)anthracene	62	7.25E-01 (Min)	7.3E-01	4.4E-08	3.2E-08
			Indeno(1,2,3-cd)pyrene	62	7.25E-01 (Min)	7.3E-01	4.4E-08	3.2E-08
			Benzo(b)fluoranthene	62	7.25E-01 (Min)	7.3E-01	4.4E-08	3.2E-08
			Benzo(k)fluoranthene	62	7.25E-01 (Min)	7.3E-01	4.4E-08	3.2E-08
			2,4-Dinitrotoluene	62	7.25E-01 (Min)	6.8E-01	4.4E-08	3.0E-08

Table E.17 Results of adult nonconservative screening for carcinogens in dredged sediment where no measurements in a reach were above detection limits.

Reach	Media	Contaminant type	Contaminant	Total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
5	Sed. Ingestion	Organics	2,6-Dinitrotoluene	62	7.25E-01 (Min)	6.8E-01	4.4E-08	3.0E-08
			Gamma-BHC (Lindane)	42	3.55E-01 (Min)	1.3E+00	2.2E-08	2.8E-08
			Pentachlorophenol	62	3.54E+00 (Min)	1.2E-01	2.2E-07	2.6E-08
			4,4'-DDT	62	7.12E-01 (Min)	3.4E-01	4.4E-08	1.5E-08
			4,4'-DDE	62	7.12E-01 (Min)	3.4E-01	4.4E-08	1.5E-08
			4,4'-DDD	62	7.12E-01 (Min)	2.4E-01	4.4E-08	1.0E-08
			Hexachlorobutadiene	62	7.25E-01 (Min)	7.8E-02	4.4E-08	3.5E-09
			Chrysene	62	7.25E-01 (Min)	7.3E-02	4.4E-08	3.2E-09
			Bis(2-chloroisopropyl)ether	62	7.25E-01 (Min)	7.0E-02	4.4E-08	3.1E-09
			4-Chloroaniline	62	7.25E-01 (Min)	3.5E-02	4.4E-08	1.6E-09
			1,4-Dichlorobenzene	62	7.25E-01 (Min)	2.4E-02	4.4E-08	1.1E-09
			Hexachloroethane	62	7.25E-01 (Min)	1.4E-02	4.4E-08	6.2E-10
			2,4,6-Trichlorophenol	62	7.25E-01 (Min)	1.1E-02	4.4E-08	4.9E-10
			N-Nitrosodiphenylamine	62	7.25E-01 (Min)	4.9E-03	4.4E-08	2.2E-10
			Isophorone	62	7.25E-01 (Min)	4.1E-03	4.4E-08	1.8E-10
					Bq/kg	1/Bq	Bq/yr	
10	Sed. Exposure	Radionuclides	Co-60	21	6.35E+00 (Min)	2.3E-07	5.0E-01	1.2E-07
					Bq/kg	1/Bq	Bq/life	
	Sed. Ingestion	Radionuclides	Co-60	21	6.35E+00 (Min)	4.1E-10	7.0E-01	2.9E-10
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Aroclor-1260	22	1.68E+01 (Min)	7.7E+00	1.0E-06	7.9E-06
			Aroclor-1254	22	1.68E+01 (Min)	7.7E+00	1.0E-06	7.9E-06
			Dibenz(a,h)anthracene	22	4.43E+00 (Min)	1.2E+01	2.7E-07	3.1E-06
			Acenaphthene	22	4.43E+00 (Min)	1.2E+01	2.7E-07	3.1E-06
			Fluorene	22	4.43E+00 (Min)	1.2E+01	2.7E-07	3.1E-06
			Acenaphthylene	22	4.43E+00 (Min)	1.2E+01	2.7E-07	3.1E-06
			Benzo(a)pyrene	22	4.43E+00 (Min)	7.3E+00	2.7E-07	2.0E-06
			Benzo(g,h,i)perylene	22	4.43E+00 (Min)	7.3E+00	2.7E-07	2.0E-06
			N-Nitroso-di-n-propylamine	22	4.43E+00 (Min)	7.0E+00	2.7E-07	1.9E-06
			Dieldrin	22	1.68E+00 (Min)	1.6E+01	1.0E-07	1.6E-06

Table E.17 Results of adult nonconservative screening for carcinogens in dredged sediment where no measurements in a reach were above detection limits.

Reach	Media	Contaminant type	Contaminant	Total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
10	Sed. Ingestion	Organics	Toxaphene	11	1.55E+01 (Min)	1.1E+00	9.5E-07	1.0E-06
			Aldrin	11	7.72E-01 (Min)	1.7E+01	4.7E-08	8.0E-07
			Chlordane	11	7.72E+00 (Min)	1.3E+00	4.7E-07	6.1E-07
			Hexachlorobenzene	22	4.43E+00 (Min)	1.6E+00	2.7E-07	4.3E-07
			Heptachlor epoxide	11	7.72E-01 (Min)	9.1E+00	4.7E-08	4.3E-07
			Bis(2-chloroethyl)ether	22	4.43E+00 (Min)	1.1E+00	2.7E-07	3.0E-07
			Alpha-BHC	11	7.72E-01 (Min)	6.3E+00	4.7E-08	3.0E-07
			3,3'-Dichlorobenzidine	22	8.91E+00 (Min)	4.5E-01	5.5E-07	2.5E-07
			Heptachlor	11	7.72E-01 (Min)	4.5E+00	4.7E-08	2.1E-07
			Benzo(a)anthracene	22	4.43E+00 (Min)	7.3E-01	2.7E-07	2.0E-07
			Indeno(1,2,3-cd)pyrene	22	4.43E+00 (Min)	7.3E-01	2.7E-07	2.0E-07
			Benzo(b)fluoranthene	22	4.43E+00 (Min)	7.3E-01	2.7E-07	2.0E-07
			Benzo(k)fluoranthene	22	4.43E+00 (Min)	7.3E-01	2.7E-07	2.0E-07
			2,4-Dinitrotoluene	22	4.43E+00 (Min)	6.8E-01	2.7E-07	1.8E-07
			2,6-Dinitrotoluene	22	4.43E+00 (Min)	6.8E-01	2.7E-07	1.8E-07
			Pentachlorophenol	22	2.16E+01 (Min)	1.2E-01	1.3E-06	1.6E-07
			Beta-BHC	11	7.72E-01 (Min)	1.8E+00	4.7E-08	8.5E-08
			Gamma-BHC (Lindane)	11	7.72E-01 (Min)	1.3E+00	4.7E-08	6.1E-08
			4,4'-DDT	22	1.68E+00 (Min)	3.4E-01	1.0E-07	3.5E-08
			4,4'-DDE	22	1.68E+00 (Min)	3.4E-01	1.0E-07	3.5E-08
			4,4'-DDD	22	1.68E+00 (Min)	2.4E-01	1.0E-07	2.5E-08
			Hexachlorobutadiene	22	4.43E+00 (Min)	7.8E-02	2.7E-07	2.1E-08
			Bis(2-chloroisopropyl)ether	22	4.43E+00 (Min)	7.0E-02	2.7E-07	1.9E-08
			4-Chloroaniline	22	4.43E+00 (Min)	3.5E-02	2.7E-07	9.5E-09
			1,4-Dichlorobenzene	22	4.43E+00 (Min)	2.4E-02	2.7E-07	6.5E-09
			Hexachloroethane	22	4.43E+00 (Min)	1.4E-02	2.7E-07	3.8E-09
			2,4,6-Trichlorophenol	22	4.43E+00 (Min)	1.1E-02	2.7E-07	3.0E-09
			N-Nitrosodiphenylamine	22	4.43E+00 (Min)	4.9E-03	2.7E-07	1.3E-09
			Isophorone	22	4.43E+00 (Min)	4.1E-03	2.7E-07	1.1E-09

Table E.18. Results of adult nonconservative screening for noncarcinogens in dredged sediment where no measurements in a reach were above detection limits

Reach	Media	Contaminant type	Contaminant	Total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
					mg/kg	1/(mg/kg/d)	mg/kg/d	
1	Sed. Ingestion	Inorganics	Thallium	21	3.17E-01 (Min)	7.0E-05	4.5E-08	6.5E-04
			Antimony	14	4.50E-01 (Min)	4.0E-04	6.4E-08	1.6E-04
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	4,6-Dinitro-2-methylphenol	25	2.49E+00 (Min)	1.0E-04	3.6E-07	3.6E-03
			Chlordane	23	5.98E-01 (Min)	6.0E-05	8.5E-08	1.4E-03
			Heptachlor epoxide	23	5.98E-02 (Min)	1.3E-05	8.5E-09	6.6E-04
			Dieldrin	23	1.20E-01 (Min)	5.0E-05	1.7E-08	3.4E-04
			Endosulfan II	23	1.20E-01 (Min)	5.0E-05	1.7E-08	3.4E-04
			Aldrin	23	5.98E-02 (Min)	3.0E-05	8.5E-09	2.8E-04
			2,4-Dinitrophenol	25	2.49E+00 (Min)	2.0E-03	3.6E-07	1.8E-04
			Endosulfan I	23	5.98E-02 (Min)	5.0E-05	8.5E-09	1.7E-04
			Nitrobenzene	25	5.16E-01 (Min)	5.0E-04	7.4E-08	1.5E-04
			Hexachlorobenzene	25	5.16E-01 (Min)	8.0E-04	7.4E-08	9.2E-05
			Hexachloroethane	25	5.16E-01 (Min)	1.0E-03	7.4E-08	7.4E-05
			Endrin	23	1.20E-01 (Min)	3.0E-04	1.7E-08	5.7E-05
			Hexachlorobutadiene	25	5.16E-01 (Min)	2.0E-03	7.4E-08	3.7E-05
			Gamma-BHC (Lindane)	23	5.98E-02 (Min)	3.0E-04	8.5E-09	2.8E-05
			2,4-Dichlorophenol	25	5.16E-01 (Min)	3.0E-03	7.4E-08	2.5E-05
			4-Chloroaniline	25	5.16E-01 (Min)	4.0E-03	7.4E-08	1.8E-05
			Heptachlor	23	5.98E-02 (Min)	5.0E-04	8.5E-09	1.7E-05
			Methoxychlor	23	5.98E-01 (Min)	5.0E-03	8.5E-08	1.7E-05
			2-Chlorophenol	25	5.16E-01 (Min)	5.0E-03	7.4E-08	1.5E-05
			Pentachlorophenol	25	2.49E+00 (Min)	3.0E-02	3.6E-07	1.2E-05
			Hexachlorocyclopentadiene	25	5.16E-01 (Min)	7.0E-03	7.4E-08	1.1E-05
			1,2,4-Trichlorobenzene	25	5.16E-01 (Min)	1.0E-02	7.4E-08	7.4E-06
			Bis(2-ethylhexyl)phthalate	25	7.48E-01 (Min)	2.0E-02	1.1E-07	5.3E-06
			2,4-Dimethylphenol	25	5.16E-01 (Min)	2.0E-02	7.4E-08	3.7E-06
			Di-n-octylphthalate	25	5.16E-01 (Min)	2.0E-02	7.4E-08	3.7E-06
			2,4,5-Trichlorophenol	25	2.49E+00 (Min)	1.0E-01	3.6E-07	3.6E-06
			Fluorene	25	5.16E-01 (Min)	4.0E-02	7.4E-08	1.8E-06
			Naphthalene	25	5.16E-01 (Min)	4.0E-02	7.4E-08	1.8E-06
			Bis(2-chloroisopropyl)ether	25	5.16E-01 (Min)	4.0E-02	7.4E-08	1.8E-06
			2-Methylphenol	25	5.16E-01 (Min)	5.0E-02	7.4E-08	1.5E-06
			4-Methylphenol	25	5.16E-01 (Min)	5.0E-02	7.4E-08	1.5E-06
			Acenaphthene	25	5.16E-01 (Min)	6.0E-02	7.4E-08	1.2E-06

Table E.18 (continued)

Reach	Media	Contaminant type	Contaminant	Total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
1	Sed. Ingestion	Organics	2-Chloronaphthalene	25	5.16E-01 (Min)	8.0E-02	7.4E-08	9.2E-07
			1,2-Dichlorobenzene	25	5.16E-01 (Min)	9.0E-02	7.4E-08	8.2E-07
			Di-n-butylphthalate	25	5.16E-01 (Min)	1.0E-01	7.4E-08	7.4E-07
			Isophorone	25	5.16E-01 (Min)	2.0E-01	7.4E-08	3.7E-07
			Butylbenzylphthalate	25	5.16E-01 (Min)	2.0E-01	7.4E-08	3.7E-07
			Benzyl alcohol	25	5.16E-01 (Min)	3.0E-01	7.4E-08	2.5E-07
			Anthracene	25	5.16E-01 (Min)	3.0E-01	7.4E-08	2.5E-07
			Phenol	25	5.16E-01 (Min)	6.0E-01	7.4E-08	1.2E-07
			Diethylphthalate	25	5.16E-01 (Min)	8.0E-01	7.4E-08	9.2E-08
			Benzoic acid	25	2.49E+00 (Min)	4.0E+00	3.6E-07	8.9E-08
			Dimethylphthalate	25	5.16E-01 (Min)	1.0E+00	7.4E-08	7.4E-08
					mg/kg	1/(mg/kg/d)	mg/kg/d	
2	Sed. Ingestion	Inorganics	Thallium	40	3.02E-01 (Min)	7.0E-05	4.3E-08	6.2E-04
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	4,6-Dinitro-2-methylphenol	40	2.43E+00 (Min)	1.0E-04	3.5E-07	3.5E-03
			Chlordane	41	9.39E-01 (Min)	6.0E-05	1.3E-07	2.2E-03
			Heptachlor epoxide	41	9.42E-02 (Min)	1.3E-05	1.3E-08	1.0E-03
			Dieldrin	41	1.90E-01 (Min)	5.0E-05	2.7E-08	5.4E-04
			Endosulfan II	41	1.90E-01 (Min)	5.0E-05	2.7E-08	5.4E-04
			Aldrin	41	9.42E-02 (Min)	3.0E-05	1.3E-08	4.5E-04
			Endosulfan I	41	9.42E-02 (Min)	5.0E-05	1.3E-08	2.7E-04
			2,4-Dinitrophenol	40	2.43E+00 (Min)	2.0E-03	3.5E-07	1.7E-04
			Nitrobenzene	40	5.00E-01 (Min)	5.0E-04	7.1E-08	1.4E-04
			Endrin	41	1.90E-01 (Min)	3.0E-04	2.7E-08	9.0E-05
			Hexachlorobenzene	40	5.00E-01 (Min)	8.0E-04	7.1E-08	8.9E-05
			Hexachloroethane	40	5.00E-01 (Min)	1.0E-03	7.1E-08	7.1E-05
			4,4'-DDT	41	1.90E-01 (Min)	5.0E-04	2.7E-08	5.4E-05
			Gamma-BHC (Lindane)	41	9.42E-02 (Min)	3.0E-04	1.3E-08	4.5E-05
			Hexachlorobutadiene	40	5.00E-01 (Min)	2.0E-03	7.1E-08	3.6E-05
			Heptachlor	41	9.42E-02 (Min)	5.0E-04	1.3E-08	2.7E-05
			Methoxychlor	41	9.39E-01 (Min)	5.0E-03	1.3E-07	2.7E-05
			2,4-Dichlorophenol	40	5.00E-01 (Min)	3.0E-03	7.1E-08	2.4E-05
			4-Chloroaniline	40	5.00E-01 (Min)	4.0E-03	7.1E-08	1.8E-05

Table E.18 (continued)

Reach	Media	Contaminant type	Contaminant	Total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
2	Sed. Ingestion	Organics	2-Chlorophenol	40	5.00E-01 (Min)	5.0E-03	7.1E-08	1.4E-05
			Pentachlorophenol	40	2.43E+00 (Min)	3.0E-02	3.5E-07	1.2E-05
			Hexachlorocyclopentadiene	40	5.00E-01 (Min)	7.0E-03	7.1E-08	1.0E-05
			1,2,4-Trichlorobenzene	40	5.00E-01 (Min)	1.0E-02	7.1E-08	7.1E-06
			2,4-Dimethylphenol	40	5.00E-01 (Min)	2.0E-02	7.1E-08	3.6E-06
			Di-n-octylphthalate	40	5.00E-01 (Min)	2.0E-02	7.1E-08	3.6E-06
			2,4,5-Trichlorophenol	40	2.43E+00 (Min)	1.0E-01	3.5E-07	3.5E-06
			Fluorene	40	5.00E-01 (Min)	4.0E-02	7.1E-08	1.8E-06
			Bis(2-chloroisopropyl)ether	40	5.00E-01 (Min)	4.0E-02	7.1E-08	1.8E-06
			2-Methylphenol	40	5.00E-01 (Min)	5.0E-02	7.1E-08	1.4E-06
			4-Methylphenol	40	5.00E-01 (Min)	5.0E-02	7.1E-08	1.4E-06
			Acenaphthene	40	5.00E-01 (Min)	6.0E-02	7.1E-08	1.2E-06
			2-Chloronaphthalene	40	5.00E-01 (Min)	8.0E-02	7.1E-08	8.9E-07
			1,2-Dichlorobenzene	40	5.00E-01 (Min)	9.0E-02	7.1E-08	7.9E-07
			Isophorone	40	5.00E-01 (Min)	2.0E-01	7.1E-08	3.6E-07
			Butylbenzylphthalate	40	4.89E-01 (Min)	2.0E-01	7.0E-08	3.5E-07
			Benzyl alcohol	40	5.00E-01 (Min)	3.0E-01	7.1E-08	2.4E-07
			Anthracene	40	5.00E-01 (Min)	3.0E-01	7.1E-08	2.4E-07
			Phenol	40	5.00E-01 (Min)	6.0E-01	7.1E-08	1.2E-07
			Benzoic acid	40	2.43E+00 (Min)	4.0E+00	3.5E-07	8.7E-08
			Dimethylphthalate	40	5.00E-01 (Min)	1.0E+00	7.1E-08	7.1E-08
					mg/kg	1/(mg/kg/d)	mg/kg/d	
3	Sed. Ingestion	Organics	4,6-Dinitro-2-methylphenol	50	2.02E+00 (Min)	1.0E-04	2.9E-07	2.9E-03
			Chlordane	49	4.62E-01 (Min)	6.0E-05	6.6E-08	1.1E-03
			Heptachlor epoxide	49	4.62E-02 (Min)	1.3E-05	6.6E-09	5.1E-04
			Dieldrin	49	9.38E-02 (Min)	5.0E-05	1.3E-08	2.7E-04
			Endosulfan II	49	9.38E-02 (Min)	5.0E-05	1.3E-08	2.7E-04
			Aldrin	49	4.62E-02 (Min)	3.0E-05	6.6E-09	2.2E-04
			2,4-Dinitrophenol	50	2.02E+00 (Min)	2.0E-03	2.9E-07	1.4E-04
			Endosulfan I	49	4.62E-02 (Min)	5.0E-05	6.6E-09	1.3E-04
			Nitrobenzene	50	4.17E-01 (Min)	5.0E-04	6.0E-08	1.2E-04
			Hexachlorobenzene	50	4.17E-01 (Min)	8.0E-04	6.0E-08	7.4E-05
			Hexachloroethane	50	4.17E-01 (Min)	1.0E-03	6.0E-08	6.0E-05
			Endrin	49	9.38E-02 (Min)	3.0E-04	1.3E-08	4.5E-05
			Hexachlorobutadiene	50	4.17E-01 (Min)	2.0E-03	6.0E-08	3.0E-05

Table E.18 (continued)

Reach	Media	Contaminant type	Contaminant	Total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index	
3	Sed. Ingestion	Organics	4,4'-DDT	49	9.38E-02 (Min)	5.0E-04	1.3E-08	2.7E-05	
			Gamma-BHC (Lindane)	49	4.62E-02 (Min)	3.0E-04	6.6E-09	2.2E-05	
			2,4-Dichlorophenol	50	4.17E-01 (Min)	3.0E-03	6.0E-08	2.0E-05	
			4-Chloroaniline	50	4.17E-01 (Min)	4.0E-03	6.0E-08	1.5E-05	
			Heptachlor	49	4.62E-02 (Min)	5.0E-04	6.6E-09	1.3E-05	
			Methoxychlor	49	4.62E-01 (Min)	5.0E-03	6.6E-08	1.3E-05	
			2-Chlorophenol	50	4.17E-01 (Min)	5.0E-03	6.0E-08	1.2E-05	
			Pentachlorophenol	50	2.02E+00 (Min)	3.0E-02	2.9E-07	9.6E-06	
			Hexachlorocyclopentadiene	50	4.17E-01 (Min)	7.0E-03	6.0E-08	8.5E-06	
			1,2,4-Trichlorobenzene	50	4.17E-01 (Min)	1.0E-02	6.0E-08	6.0E-06	
			2,4-Dimethylphenol	50	4.17E-01 (Min)	2.0E-02	6.0E-08	3.0E-06	
			Di-n-octylphthalate	50	4.17E-01 (Min)	2.0E-02	6.0E-08	3.0E-06	
			2,4,5-Trichlorophenol	50	2.02E+00 (Min)	1.0E-01	2.9E-07	2.9E-06	
			Fluorene	50	4.17E-01 (Min)	4.0E-02	6.0E-08	1.5E-06	
			Bis(2-chloroisopropyl)ether	50	4.17E-01 (Min)	4.0E-02	6.0E-08	1.5E-06	
			2-Methylphenol	50	4.17E-01 (Min)	5.0E-02	6.0E-08	1.2E-06	
			4-Methylphenol	50	4.17E-01 (Min)	5.0E-02	6.0E-08	1.2E-06	
			Acenaphthene	50	4.17E-01 (Min)	6.0E-02	6.0E-08	9.9E-07	
			2-Chloronaphthalene	50	4.17E-01 (Min)	8.0E-02	6.0E-08	7.4E-07	
			1,2-Dichlorobenzene	50	4.17E-01 (Min)	9.0E-02	6.0E-08	6.6E-07	
			Isophorone	50	4.17E-01 (Min)	2.0E-01	6.0E-08	3.0E-07	
			Butylbenzylphthalate	50	4.17E-01 (Min)	2.0E-01	6.0E-08	3.0E-07	
			Benzyl alcohol	50	4.17E-01 (Min)	3.0E-01	6.0E-08	2.0E-07	
			Phenol	50	4.17E-01 (Min)	6.0E-01	6.0E-08	9.9E-08	
			Diethylphthalate	50	4.28E-01 (Min)	8.0E-01	6.1E-08	7.6E-08	
			Benzoic acid	50	2.02E+00 (Min)	4.0E+00	2.9E-07	7.2E-08	
					mg/kg	1/(mg/kg/d)	mg/kg/d		
4	Sed. Ingestion	Inorganics	Thallium	40	3.12E-01 (Min)	7.0E-05	4.5E-08	6.4E-04	
					mg/kg	1/(mg/kg/d)	mg/kg/d		
			Organics 4,6-Dinitro-2-methylphenol		47	2.40E+00 (Min)	1.0E-04	3.4E-07	3.4E-03
			Chlordane	44	9.54E-01 (Min)	6.0E-05	1.4E-07	2.3E-03	
			Heptachlor epoxide	44	9.54E-02 (Min)	1.3E-05	1.4E-08	1.0E-03	
			Dieldrin	45	1.91E-01 (Min)	5.0E-05	2.7E-08	5.4E-04	

Table E.18 (continued)

Reach	Media	Contaminant type	Contaminant	Total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
4	Sed. Ingestion	Organics	Endosulfan II	45	1.91E-01 (Min)	5.0E-05	2.7E-08	5.4E-04
			Aldrin	44	9.54E-02 (Min)	3.0E-05	1.4E-08	4.5E-04
			Endosulfan I	44	9.54E-02 (Min)	5.0E-05	1.4E-08	2.7E-04
			2,4-Dinitrophenol	44	2.41E+00 (Min)	2.0E-03	3.4E-07	1.7E-04
			Nitrobenzene	47	4.97E-01 (Min)	5.0E-04	7.1E-08	1.4E-04
			Endrin	45	1.91E-01 (Min)	3.0E-04	2.7E-08	9.1E-05
			Hexachlorobenzene	47	4.97E-01 (Min)	8.0E-04	7.1E-08	8.9E-05
			Hexachloroethane	47	4.97E-01 (Min)	1.0E-03	7.1E-08	7.1E-05
			4,4'-DDT	45	1.91E-01 (Min)	5.0E-04	2.7E-08	5.4E-05
			Gamma-BHC (Lindane)	44	9.54E-02 (Min)	3.0E-04	1.4E-08	4.5E-05
			Hexachlorobutadiene	47	4.97E-01 (Min)	2.0E-03	7.1E-08	3.5E-05
			Methoxychlor	45	9.54E-01 (Min)	5.0E-03	1.4E-07	2.7E-05
			Heptachlor	44	9.54E-02 (Min)	5.0E-04	1.4E-08	2.7E-05
			2,4-Dichlorophenol	47	4.97E-01 (Min)	3.0E-03	7.1E-08	2.4E-05
			4-Chloroaniline	47	4.97E-01 (Min)	4.0E-03	7.1E-08	1.8E-05
			2-Chlorophenol	47	4.97E-01 (Min)	5.0E-03	7.1E-08	1.4E-05
			Pentachlorophenol	47	2.40E+00 (Min)	3.0E-02	3.4E-07	1.1E-05
			Hexachlorocyclopentadiene	47	4.97E-01 (Min)	7.0E-03	7.1E-08	1.0E-05
			1,2,4-Trichlorobenzene	47	4.97E-01 (Min)	1.0E-02	7.1E-08	7.1E-06
			2,4-Dimethylphenol	47	4.97E-01 (Min)	2.0E-02	7.1E-08	3.5E-06
			Di-n-octylphthalate	47	4.97E-01 (Min)	2.0E-02	7.1E-08	3.5E-06
			2,4,5-Trichlorophenol	47	2.40E+00 (Min)	1.0E-01	3.4E-07	3.4E-06
			Fluorene	47	4.97E-01 (Min)	4.0E-02	7.1E-08	1.8E-06
			Naphthalene	47	4.97E-01 (Min)	4.0E-02	7.1E-08	1.8E-06
			Bis(2-chloroisopropyl)ether	47	4.97E-01 (Min)	4.0E-02	7.1E-08	1.8E-06
			2-Methylphenol	47	4.97E-01 (Min)	5.0E-02	7.1E-08	1.4E-06
			4-Methylphenol	47	4.97E-01 (Min)	5.0E-02	7.1E-08	1.4E-06
			Acenaphthene	47	4.97E-01 (Min)	6.0E-02	7.1E-08	1.2E-06
			2-Chloronaphthalene	47	4.97E-01 (Min)	8.0E-02	7.1E-08	8.9E-07
			1,2-Dichlorobenzene	47	4.97E-01 (Min)	9.0E-02	7.1E-08	7.9E-07
			Di-n-butylphthalate	47	4.97E-01 (Min)	1.0E-01	7.1E-08	7.1E-07
			Isophorone	47	4.97E-01 (Min)	2.0E-01	7.1E-08	3.5E-07
			Butylbenzylphthalate	47	4.97E-01 (Min)	2.0E-01	7.1E-08	3.5E-07
			Benzyl alcohol	47	4.97E-01 (Min)	3.0E-01	7.1E-08	2.4E-07
			Anthracene	47	4.97E-01 (Min)	3.0E-01	7.1E-08	2.4E-07
			Phenol	47	4.97E-01 (Min)	6.0E-01	7.1E-08	1.2E-07
			Diethylphthalate	47	4.97E-01 (Min)	8.0E-01	7.1E-08	8.9E-08
			Benzoic acid	47	2.40E+00 (Min)	4.0E+00	3.4E-07	8.6E-08
			Dimethylphthalate	47	4.97E-01 (Min)	1.0E+00	7.1E-08	7.1E-08

Table E.18 (continued)

Reach	Media	Contaminant type	Contaminant	Total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
5	Sed. Ingestion	Inorganics	Thallium	68	3.99E-01 (Min)	7.0E-05	5.7E-08	8.1E-04
			Selenium	40	4.01E-01 (Min)	5.0E-03	5.7E-08	1.1E-05
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	Chlordane	42	3.55E+00 (Min)	6.0E-05	5.1E-07	8.4E-03
			4,6-Dinitro-2-methylphenol	62	3.54E+00 (Min)	1.0E-04	5.1E-07	5.1E-03
			Heptachlor epoxide	42	3.55E-01 (Min)	1.3E-05	5.1E-08	3.9E-03
			Dieldrin	62	7.12E-01 (Min)	5.0E-05	1.0E-07	2.0E-03
			Endosulfan II	62	7.12E-01 (Min)	5.0E-05	1.0E-07	2.0E-03
			Aldrin	42	3.55E-01 (Min)	3.0E-05	5.1E-08	1.7E-03
			Endosulfan I	42	3.55E-01 (Min)	5.0E-05	5.1E-08	1.0E-03
			Endrin	62	7.12E-01 (Min)	3.0E-04	1.0E-07	3.4E-04
			2,4-Dinitrophenol	51	3.54E+00 (Min)	2.0E-03	5.1E-07	2.5E-04
			Nitrobenzene	62	7.25E-01 (Min)	5.0E-04	1.0E-07	2.1E-04
			4,4'-DDT	62	7.12E-01 (Min)	5.0E-04	1.0E-07	2.0E-04
			Gamma-BHC (Lindane)	42	3.55E-01 (Min)	3.0E-04	5.1E-08	1.7E-04
			Hexachlorobenzene	62	7.25E-01 (Min)	8.0E-04	1.0E-07	1.3E-04
			Hexachloroethane	62	7.25E-01 (Min)	1.0E-03	1.0E-07	1.0E-04
			Methoxychlor	62	3.55E+00 (Min)	5.0E-03	5.1E-07	1.0E-04
			Heptachlor	42	3.55E-01 (Min)	5.0E-04	5.1E-08	1.0E-04
			Hexachlorobutadiene	62	7.25E-01 (Min)	2.0E-03	1.0E-07	5.2E-05
			2,4-Dichlorophenol	62	7.25E-01 (Min)	3.0E-03	1.0E-07	3.5E-05
			4-Chloroaniline	62	7.25E-01 (Min)	4.0E-03	1.0E-07	2.6E-05
			2-Chlorophenol	62	7.25E-01 (Min)	5.0E-03	1.0E-07	2.1E-05
			Pentachlorophenol	62	3.54E+00 (Min)	3.0E-02	5.1E-07	1.7E-05
			Hexachlorocyclopentadiene	62	7.25E-01 (Min)	7.0E-03	1.0E-07	1.5E-05
			1,2,4-Trichlorobenzene	62	7.25E-01 (Min)	1.0E-02	1.0E-07	1.0E-05
			2,4-Dimethylphenol	62	7.25E-01 (Min)	2.0E-02	1.0E-07	5.2E-06
			Di-n-octylphthalate	62	7.25E-01 (Min)	2.0E-02	1.0E-07	5.2E-06
			2,4,5-Trichlorophenol	62	3.54E+00 (Min)	1.0E-01	5.1E-07	5.1E-06
			Pyrene	62	7.25E-01 (Min)	3.0E-02	1.0E-07	3.5E-06
			Fluorene	62	7.25E-01 (Min)	4.0E-02	1.0E-07	2.6E-06
			Naphthalene	62	7.25E-01 (Min)	4.0E-02	1.0E-07	2.6E-06

Table E.18 (continued)

Reach	Media	Contaminant type	Contaminant	Total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
5	Sed. Ingestion	Organics	Bis(2-chloroisopropyl)ether	62	7.25E-01 (Min)	4.0E-02	1.0E-07	2.6E-06
			Fluoranthene	62	7.25E-01 (Min)	4.0E-02	1.0E-07	2.6E-06
			2-Methylphenol	54	7.25E-01 (Min)	5.0E-02	1.0E-07	2.1E-06
			4-Methylphenol	62	7.25E-01 (Min)	5.0E-02	1.0E-07	2.1E-06
			Acenaphthene	62	7.25E-01 (Min)	6.0E-02	1.0E-07	1.7E-06
			2-Chloronaphthalene	62	7.25E-01 (Min)	8.0E-02	1.0E-07	1.3E-06
			1,2-Dichlorobenzene	62	7.25E-01 (Min)	9.0E-02	1.0E-07	1.2E-06
			Di-n-butylphthalate	62	7.25E-01 (Min)	1.0E-01	1.0E-07	1.0E-06
			Isophorone	62	7.25E-01 (Min)	2.0E-01	1.0E-07	5.2E-07
			Butylbenzylphthalate	62	7.25E-01 (Min)	2.0E-01	1.0E-07	5.2E-07
			Benzyl alcohol	54	7.25E-01 (Min)	3.0E-01	1.0E-07	3.5E-07
			Anthracene	62	7.25E-01 (Min)	3.0E-01	1.0E-07	3.5E-07
			Phenol	62	7.25E-01 (Min)	6.0E-01	1.0E-07	1.7E-07
			Diethylphthalate	62	7.25E-01 (Min)	8.0E-01	1.0E-07	1.3E-07
			Benzoic acid	62	3.54E+00 (Min)	4.0E+00	5.1E-07	1.3E-07
			Dimethylphthalate	62	7.25E-01 (Min)	1.0E+00	1.0E-07	1.0E-07
					mg/kg	1/(mg/kg/d)	mg/kg/d	
10	Sed. Ingestion	Inorganics	Thallium	23	4.37E-01 (Min)	7.0E-05	6.2E-08	8.9E-04
			Selenium	17	4.51E-01 (Min)	5.0E-03	6.4E-08	1.3E-05
					mg/kg	1/(mg/kg/d)	mg/kg/d	
		Organics	4,6-Dinitro-2-methylphenol	22	2.16E+01 (Min)	1.0E-04	3.1E-06	3.1E-02
			Chlordane	11	7.72E+00 (Min)	6.0E-05	1.1E-06	1.8E-02
			Heptachlor epoxide	11	7.72E-01 (Min)	1.3E-05	1.1E-07	8.5E-03
			Dieldrin	22	1.68E+00 (Min)	5.0E-05	2.4E-07	4.8E-03
			Endosulfan II	22	1.68E+00 (Min)	5.0E-05	2.4E-07	4.8E-03
			Aldrin	11	7.72E-01 (Min)	3.0E-05	1.1E-07	3.7E-03
			Endosulfan I	11	7.72E-01 (Min)	5.0E-05	1.1E-07	2.2E-03
			2,4-Dinitrophenol	22	2.16E+01 (Min)	2.0E-03	3.1E-06	1.5E-03
			Nitrobenzene	22	4.43E+00 (Min)	5.0E-04	6.3E-07	1.3E-03
			Endrin	22	1.68E+00 (Min)	3.0E-04	2.4E-07	8.0E-04
			Hexachlorobenzene	22	4.43E+00 (Min)	8.0E-04	6.3E-07	7.9E-04
			Hexachloroethane	22	4.43E+00 (Min)	1.0E-03	6.3E-07	6.3E-04
			4,4'-DDT	22	1.68E+00 (Min)	5.0E-04	2.4E-07	4.8E-04

Table E.18 (continued)

Reach	Media	Contaminant type	Contaminant	Total samples	Concentration (type)	Reference dose	Intake rate	Noncarcinogen screening index
10	Sed. Ingestion	Organics	Gamma-BHC (Lindane)	11	7.72E-01 (Min)	3.0E-04	1.1E-07	3.7E-04
			Hexachlorobutadiene	22	4.43E+00 (Min)	2.0E-03	6.3E-07	3.2E-04
			Methoxychlor	22	8.32E+00 (Min)	5.0E-03	1.2E-06	2.4E-04
			Heptachlor	11	7.72E-01 (Min)	5.0E-04	1.1E-07	2.2E-04
			2,4-Dichlorophenol	22	4.43E+00 (Min)	3.0E-03	6.3E-07	2.1E-04
			4-Chloroaniline	22	4.43E+00 (Min)	4.0E-03	6.3E-07	1.6E-04
			2-Chlorophenol	22	4.43E+00 (Min)	5.0E-03	6.3E-07	1.3E-04
			Pentachlorophenol	22	2.16E+01 (Min)	3.0E-02	3.1E-06	1.0E-04
			Hexachlorocyclopentadiene	22	4.43E+00 (Min)	7.0E-03	6.3E-07	9.0E-05
			1,2,4-Trichlorobenzene	22	4.43E+00 (Min)	1.0E-02	6.3E-07	6.3E-05
			2,4-Dimethylphenol	22	4.43E+00 (Min)	2.0E-02	6.3E-07	3.2E-05
			Di-n-octylphthalate	22	4.43E+00 (Min)	2.0E-02	6.3E-07	3.2E-05
			2,4,5-Trichlorophenol	22	2.16E+01 (Min)	1.0E-01	3.1E-06	3.1E-05
			Fluorene	22	4.43E+00 (Min)	4.0E-02	6.3E-07	1.6E-05
			Naphthalene	22	4.43E+00 (Min)	4.0E-02	6.3E-07	1.6E-05
			Bis(2-chloroisopropyl)ether	22	4.43E+00 (Min)	4.0E-02	6.3E-07	1.6E-05
			2-Methylphenol	22	4.43E+00 (Min)	5.0E-02	6.3E-07	1.3E-05
			4-Methylphenol	22	4.43E+00 (Min)	5.0E-02	6.3E-07	1.3E-05
			Acenaphthene	22	4.43E+00 (Min)	6.0E-02	6.3E-07	1.1E-05
			2-Chloronaphthalene	22	4.43E+00 (Min)	8.0E-02	6.3E-07	7.9E-06
			1,2-Dichlorobenzene	22	4.43E+00 (Min)	9.0E-02	6.3E-07	7.0E-06
			Di-n-butylphthalate	22	4.43E+00 (Min)	1.0E-01	6.3E-07	6.3E-06
			Isophorone	22	4.43E+00 (Min)	2.0E-01	6.3E-07	3.2E-06
			Butylbenzylphthalate	22	4.43E+00 (Min)	2.0E-01	6.3E-07	3.2E-06
			Benzyl alcohol	22	4.43E+00 (Min)	3.0E-01	6.3E-07	2.1E-06
			Phenol	22	4.43E+00 (Min)	6.0E-01	6.3E-07	1.1E-06
			Diethylphthalate	22	4.43E+00 (Min)	8.0E-01	6.3E-07	7.9E-07
			Benzoic acid	22	2.16E+01 (Min)	4.0E+00	3.1E-06	7.7E-07
			Dimethylphthalate	22	4.43E+00 (Min)	1.0E+00	6.3E-07	6.3E-07

Table E.19. Analytes without reference doses and slope (cancer potency) factors

Type	Analyte	CAS No.
Inorganics	Aluminum	7429-90-5
	Iron	7439-89-6
	Lead	7439-92-1
	Magnesium	7439-95-4
Organics	1,3-Dichlorobenzene	541-73-1
	2-Hexanone	591-78-6
	2-Methylnaphthalene	91-57-6
	2-Nitroaniline	88-74-4
	2-Nitrophenol	88-75-5
	3-Nitroaniline	99-09-2
	4-Bromophenyl-phenylether	101-55-3
	4-Chloro-3-methylphenol	59-50-7
	4-Chlorophenyl-phenylether	7005-72-3
	4-Nitroaniline	100-01-6
	4-Nitrophenol	100-02-7
	Bis(2-chloroethoxy)methane	111-91-1
	Chloroethane	75-00-3
	Delta-BHC	319-86-8
	Dibenzofuran	132-64-9
	Endosulfan sulfate	1031-07-8
	Endrin ketone	53494-70-5
Radionuclides	Cm-245	15621-76-8
	Cm-248	15758-33-5

Appendix F

ECOLOGICAL RISK METHODS

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F.1 DATA SUMMARIZATION FOR ECOLOGICAL RISK ASSESSMENT

The presentation of results of the analyses for the selected analytes (Table A.1) provides a comprehensive view of the extent of contamination in the three media. However, for the risk assessment, these data must be summarized as typical and extreme exposure concentrations. For detected chemicals, mean concentrations and the upper 95% confidence limits of the mean concentrations were considered. The mean concentrations are assumed to represent typical chronic exposures. Upper 95% confidence limits may represent local extreme chronic concentrations or acute exposures. For undetected chemicals, minimum detection limits and the upper 95% confidence limits of the mean of the detection limits were the concentrations considered.

Only 10% of the determinations were above their respective method detection limit. This is a common observation for regulatory driven environmental sampling and analysis activities. It follows that 90% of the analyte determinations were not detected above their respective analytical method detection limits in CRRI samples. For the screening risk analyses, a distinction was made between *detected contaminants*, contaminants with at least one detected value in a given reach, and *nondetected contaminants*, contaminants with no detected values in a reach. Separate analyses and interpretations of these results were required.

The following sections describe the specific data manipulations performed for each of the selected media results.

F.2 FISH

F.2.1 Subsetting

Data were combined for all fish species within a reach for all chemicals except for PCBs. Only catfish results were used for PCBs. Only detected chlordane isomer values were summed. Only regular samples—no field duplicates—were used.

F.2.2 Summary Statistics

F.2.2.1 Detected contaminants

Given the potential for means of distributions with numerous non-detect values (censored data) to be positively biased, the upper 95% confidence limit of the arithmetic mean and the geometric mean were estimated using maximum likelihood estimator calculations (SAS PROC LIFEREG). The upper 95% confidence limit was compared with the actual maximum value and the lower value was used in the risk characterization. Detection limits were used as is.

F.2.2.2 Non-detected contaminants

The upper 95% confidence limit of the arithmetic mean was calculated and compared to the maximum analyte detection limit. The smaller of the two values, along with the minimum detection limit were used for the exposure assessment.

F.3 SEDIMENT CORES

F.3.1 Subsetting

Only analytical data for core segments from depths $\leq$ 6 cm were used.

F.3.2 Summary Statistics

F.3.2.1 Detected contaminants

The arithmetic mean concentration was calculated to a depth of 6 cm. When there was more than one core per reach, the average for each core was calculated and then the upper 95% confidence limit of the mean of the core averages, or the maximum core average, (whichever was smaller) was used as the value for the reach. The arithmetic mean of the core averages was used as the estimate of chronic exposure.

F.3.2.2 Non-detected contaminants

The upper 95% confidence limit of the arithmetic mean was calculated and compared to the maximum analyte detection limit. The smaller of the two values, along with the minimum detection limit was used for the exposure assessment.

F.4 WATER

F.4.1 Subsetting

F.4.1.1 Dissolved constituents

Dissolved metal concentrations and total organic concentrations from CRRI samples were used for one set of exposure assessments. Organic analyses were performed on unfiltered CRRI samples.

F.4.1.2 Total concentrations

Because dissolved concentrations were available for only the limited CRRI samples, total metal concentrations from unfiltered CRRI samples and all contaminant results from unfiltered ORR NPDES and environmental monitoring samples (Table E.1 and Fig. E.1) were included, but exposures were analyzed and discussed separately.

F.4.2 Summary Statistics

F.4.2.1 Detected contaminants

The values for the screening assessment for a given contaminant in a reach were calculated by first averaging all results at a location and then determining the upper 95% confidence limit of the mean of the location averages. Either the upper 95% confidence limit or the maximum location average, whichever was smaller, was used as the value for the reach.

F.4.2.2 Nondetected contaminants

The upper 95% confidence limit of the arithmetic mean was calculated and compared to the maximum analyte detection limit. The smaller of the two values, along with the minimum detection limit was used for the exposure assessment.

Table F.1. Mean and upper confidence limit (UCL) concentration of chemicals detected in the dissolved phase of CRRI water samples (ug/L), toxicological benchmarks (ug/L), and quotients for aquatic life

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Geo. mean[a] water conc.	UCL[b] water conc.	Mean quotient	UCL quotient	Benchmark	Flag	Benchmark type
CADMIUM	1	3	1	0.27	0.39	20.769	30.00	0.01		SS EC20
	1	3	1	0.27	0.39	1.800	2.60	0.15		LCV DAPHNIDS
	1	3	1	0.27	0.39	0.360	0.52	0.75		LTV EC20 DAPHNID
	1	3	1	0.27	0.39	0.245	0.35	1.10		NAWQ ACTUAL
	1	3	1	0.27	0.39	0.159	0.23	1.70		LCV FISH
	1	3	1	0.27	0.39	0.150	0.22	1.80		LTV EC20 FISH
	1	3	1	0.27	0.39	0.063	0.09	4.30		EC20 POPULATION
	4	3	1	0.24	0.31	18.718	23.85	0.01		SS EC20
	4	3	1	0.24	0.31	1.622	2.07	0.15		LCV DAPHNIDS
	4	3	1	0.24	0.31	0.324	0.41	0.75		LTV EC20 DAPHNID
	4	3	1	0.24	0.31	0.221	0.28	1.10		NAWQ ACTUAL
	4	3	1	0.24	0.31	0.143	0.18	1.70		LCV FISH
	4	3	1	0.24	0.31	0.135	0.17	1.80		LTV EC20 FISH
	4	3	1	0.24	0.31	0.057	0.07	4.30		EC20 POPULATION
IRON	2	2	1	29.80	54.00	1.862	3.37	16.00		LTV EC20 DAPHNID
	2	2	1	29.80	54.00	0.189	0.34	158.00		LCV DAPHNIDS
	2	2	1	29.80	54.00	0.030	0.05	1000.00		NAWQ ACTUAL
	5	3	1	18.33	29.00	1.146	1.81	16.00		LTV EC20 DAPHNID
	5	3	1	18.33	29.00	0.116	0.18	158.00		LCV DAPHNIDS
	5	3	1	18.33	29.00	0.018	0.03	1000.00		NAWQ ACTUAL
LEAD	1	3	1	1.80	2.40	5.143	6.86	0.35		SS EC20
	1	3	1	1.80	2.40	0.562	0.75	3.20		NAWQ ACTUAL
	1	3	1	1.80	2.40	0.147	0.20	12.26		LCV DAPHNIDS
	1	3	1	1.80	2.40	0.095	0.13	18.88		LCV FISH
	1	3	1	1.80	2.40	0.082	0.11	22.00		LTV EC20 FISH
	1	3	1	1.80	2.40	0.025	0.03	71.00		EC20 POPULATION
	4	3	1	0.97	1.50	2.762	4.29	0.35		SS EC20
	4	3	1	0.97	1.50	0.302	0.47	3.20		NAWQ ACTUAL
	4	3	1	0.97	1.50	0.079	0.12	12.26		LCV DAPHNIDS
	4	3	1	0.97	1.50	0.051	0.08	18.88		LCV FISH
	4	3	1	0.97	1.50	0.044	0.07	22.00		LTV EC20 FISH
	4	3	1	0.97	1.50	0.014	0.02	71.00		EC20 POPULATION
	13	1	1	0.60	0.60	1.714	1.71	0.35		SS EC20
	13	1	1	0.60	0.60	0.187	0.19	3.20		NAWQ ACTUAL
	13	1	1	0.60	0.60	0.049	0.05	12.26		LCV DAPHNIDS
	13	1	1	0.60	0.60	0.032	0.03	18.88		LCV FISH
	13	1	1	0.60	0.60	0.027	0.03	22.00		LTV EC20 FISH
	13	1	1	0.60	0.60	0.008	0.01	71.00		EC20 POPULATION

Table F.1 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Geo. mean[a] water conc.	UCL[b] water conc.	Mean quotient	UCL quotient	Benchmark	Flag	Benchmark type
MERCURY	3	4	1	0.28	0.52	936.667	1746.67	0.00		NAWQ ADVISORY
	3	4	1	0.28	0.52	9.367	17.47	0.03	<	LTV EC20 FISH
	3	4	1	0.28	0.52	7.025	13.10	0.04	<	LCV DAPHNIDS
	3	4	1	0.28	0.52	1.004	1.87	0.28		EC20 POPULATION
	3	4	1	0.28	0.52	0.540	1.01	0.52		LCV FISH
	3	4	1	0.28	0.52	0.323	0.60	0.87		LTV EC20 DAPHNID
SILVER	3	4	1	3.80	13.00	31.708	108.33	0.12		LCV FISH
	3	4	1	3.80	13.00	27.179	92.86	0.14		SS EC20
	3	4	1	3.80	13.00	19.025	65.00	0.20		LTV EC20 FISH
	3	4	1	3.80	13.00	15.220	52.00	0.25		NAWQ ADVISORY
	3	4	1	3.80	13.00	11.891	40.63	0.32		EC20 POPULATION
	3	4	1	3.80	13.00	6.795	23.21	0.56	<	LTV EC20 DAPHNID
	3	4	1	3.80	13.00	1.463	5.00	2.60		LCV DAPHNIDS
SODIUM	1	3	3	4910.00	5260.00	0.058	0.06	85049.00	*	LCV DAPHNIDS
	2	2	2	5000.00	5220.00	0.059	0.06	85049.00	*	LCV DAPHNIDS
	3	4	4	3440.00	4150.00	0.040	0.05	85049.00	*	LCV DAPHNIDS
	4	2	2	4335.00	4910.00	0.051	0.06	85049.00	*	LCV DAPHNIDS
	5	4	4	4715.00	5140.00	0.055	0.06	85049.00	*	LCV DAPHNIDS
	10	2	2	5000.00	5060.00	0.059	0.06	85049.00	*	LCV DAPHNIDS
	13	1	1	2640.00	2640.00	0.031	0.03	85049.00	*	LCV DAPHNIDS
ZINC	10	2	1	14.45	21.00	0.688	1.00	21.00		SS EC20
	10	2	1	14.45	21.00	0.397	0.58	36.41		LCV FISH
	10	2	1	14.45	21.00	0.309	0.45	46.73		LCV DAPHNIDS
	10	2	1	14.45	21.00	0.307	0.45	47.00		LTV EC20 FISH
	10	2	1	14.45	21.00	0.181	0.26	80.00		EC20 POPULATION
	10	2	1	14.45	21.00	0.131	0.19	110.00		NAWQ ACTUAL

[a]In cases of mixed detects and nondetects, statistics are calculated using all values, "as is." The mean concentration is the geometric mean.
[b]UCL concentration was compared with the maximum value, and the smaller has been used as the "UCL Concentration."

Table F.2. Limits of detection of chemicals not detected in the dissolved phase of the CRRI water samples (ug/L), toxicological benchmarks (ug/L), and quotients for aquatic life

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
ANTIMONY	1	3	0	1.90	1.900	0.106	0.106	18.00	NAWQ ADVISORY
	1	3	0	1.90	1.900	0.024	0.024	79.00	EC20 POPULATION
	1	3	0	1.90	1.900	0.001	0.001	1600.00	LCV FISH
	1	3	0	1.90	1.900	0.001	0.001	1900.00	LTV EC20 DAPHNID
	1	3	0	1.90	1.900	0.001	0.001	2310.00	LTV EC20 FISH
	1	3	0	1.90	1.900	0.000	0.000	5400.00	LCV DAPHNIDS
	2	2	0	1.90	1.900	0.106	0.106	18.00	NAWQ ADVISORY
	2	2	0	1.90	1.900	0.024	0.024	79.00	EC20 POPULATION
	2	2	0	1.90	1.900	0.001	0.001	1600.00	LCV FISH
	2	2	0	1.90	1.900	0.001	0.001	1900.00	LTV EC20 DAPHNID
	2	2	0	1.90	1.900	0.001	0.001	2310.00	LTV EC20 FISH
	2	2	0	1.90	1.900	0.000	0.000	5400.00	LCV DAPHNIDS
	3	4	0	1.90	1.900	0.106	0.106	18.00	NAWQ ADVISORY
	3	4	0	1.90	1.900	0.024	0.024	79.00	EC20 POPULATION
	3	4	0	1.90	1.900	0.001	0.001	1600.00	LCV FISH
	3	4	0	1.90	1.900	0.001	0.001	1900.00	LTV EC20 DAPHNID
	3	4	0	1.90	1.900	0.001	0.001	2310.00	LTV EC20 FISH
	3	4	0	1.90	1.900	0.000	0.000	5400.00	LCV DAPHNIDS
	4	3	0	1.90	1.900	0.106	0.106	18.00	NAWQ ADVISORY
	4	3	0	1.90	1.900	0.024	0.024	79.00	EC20 POPULATION
	4	3	0	1.90	1.900	0.001	0.001	1600.00	LCV FISH
	4	3	0	1.90	1.900	0.001	0.001	1900.00	LTV EC20 DAPHNID
	4	3	0	1.90	1.900	0.001	0.001	2310.00	LTV EC20 FISH
	4	3	0	1.90	1.900	0.000	0.000	5400.00	LCV DAPHNIDS
	5	4	0	1.90	1.900	0.106	0.106	18.00	NAWQ ADVISORY
	5	4	0	1.90	1.900	0.024	0.024	79.00	EC20 POPULATION
	5	4	0	1.90	1.900	0.001	0.001	1600.00	LCV FISH
	5	4	0	1.90	1.900	0.001	0.001	1900.00	LTV EC20 DAPHNID
	5	4	0	1.90	1.900	0.001	0.001	2310.00	LTV EC20 FISH
	5	4	0	1.90	1.900	0.000	0.000	5400.00	LCV DAPHNIDS
	10	2	0	1.90	1.900	0.106	0.106	18.00	NAWQ ADVISORY
	10	2	0	1.90	1.900	0.024	0.024	79.00	EC20 POPULATION
	10	2	0	1.90	1.900	0.001	0.001	1600.00	LCV FISH
	10	2	0	1.90	1.900	0.001	0.001	1900.00	LTV EC20 DAPHNID
	10	2	0	1.90	1.900	0.001	0.001	2310.00	LTV EC20 FISH
	10	2	0	1.90	1.900	0.000	0.000	5400.00	LCV DAPHNIDS
	13	1	0	1.90	1.900	0.106	0.106	18.00	NAWQ ADVISORY
	13	1	0	1.90	1.900	0.024	0.024	79.00	EC20 POPULATION
	13	1	0	1.90	1.900	0.001	0.001	1600.00	LCV FISH
	13	1	0	1.90	1.900	0.001	0.001	1900.00	LTV EC20 DAPHNID
	13	1	0	1.90	1.900	0.001	0.001	2310.00	LTV EC20 FISH

Table F.2 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
ARSENIC	13	1	0	1.90	1.900	0.000	0.000	5400.00	LCV DAPHNIDS
	1	3	0	1.30	1.300	0.024	0.024	55.00	SS EC20
	1	3	0	1.30	1.300	0.007	0.007	190.00	NAWQ ACTUAL
	1	3	0	1.30	1.300	0.002	0.002	633.00	LTV EC20 DAPHNID
	1	3	0	1.30	1.300	0.001	0.001	914.10	LCV DAPHNIDS
	1	3	0	1.30	1.300	0.001	0.001	1995.00	EC20 POPULATION
	1	3	0	1.30	1.300	0.001	0.001	2130.00	LTV EC20 FISH
	1	3	0	1.30	1.300	0.000	0.000	2962.00	LCV FISH
	2	2	0	1.30	1.300	0.024	0.024	55.00	SS EC20
	2	2	0	1.30	1.300	0.007	0.007	190.00	NAWQ ACTUAL
	2	2	0	1.30	1.300	0.002	0.002	633.00	LTV EC20 DAPHNID
	2	2	0	1.30	1.300	0.001	0.001	914.10	LCV DAPHNIDS
	2	2	0	1.30	1.300	0.001	0.001	1995.00	EC20 POPULATION
	2	2	0	1.30	1.300	0.001	0.001	2130.00	LTV EC20 FISH
	2	2	0	1.30	1.300	0.000	0.000	2962.00	LCV FISH
	3	4	0	1.30	1.300	0.024	0.024	55.00	SS EC20
	3	4	0	1.30	1.300	0.007	0.007	190.00	NAWQ ACTUAL
	3	4	0	1.30	1.300	0.002	0.002	633.00	LTV EC20 DAPHNID
	3	4	0	1.30	1.300	0.001	0.001	914.10	LCV DAPHNIDS
	3	4	0	1.30	1.300	0.001	0.001	1995.00	EC20 POPULATION
	3	4	0	1.30	1.300	0.001	0.001	2130.00	LTV EC20 FISH
	3	4	0	1.30	1.300	0.000	0.000	2962.00	LCV FISH
	4	3	0	1.30	1.300	0.024	0.024	55.00	SS EC20
	4	3	0	1.30	1.300	0.007	0.007	190.00	NAWQ ACTUAL
	4	3	0	1.30	1.300	0.002	0.002	633.00	LTV EC20 DAPHNID
	4	3	0	1.30	1.300	0.001	0.001	914.10	LCV DAPHNIDS
	4	3	0	1.30	1.300	0.001	0.001	1995.00	EC20 POPULATION
	4	3	0	1.30	1.300	0.001	0.001	2130.00	LTV EC20 FISH
	4	3	0	1.30	1.300	0.000	0.000	2962.00	LCV FISH
	5	4	0	1.30	1.300	0.024	0.024	55.00	SS EC20
	5	4	0	1.30	1.300	0.007	0.007	190.00	NAWQ ACTUAL
	5	4	0	1.30	1.300	0.002	0.002	633.00	LTV EC20 DAPHNID
	5	4	0	1.30	1.300	0.001	0.001	914.10	LCV DAPHNIDS
	5	4	0	1.30	1.300	0.001	0.001	1995.00	EC20 POPULATION
	5	4	0	1.30	1.300	0.001	0.001	2130.00	LTV EC20 FISH
	5	4	0	1.30	1.300	0.000	0.000	2962.00	LCV FISH
	10	2	0	1.30	1.300	0.024	0.024	55.00	SS EC20
	10	2	0	1.30	1.300	0.007	0.007	190.00	NAWQ ACTUAL
	10	2	0	1.30	1.300	0.002	0.002	633.00	LTV EC20 DAPHNID
	10	2	0	1.30	1.300	0.001	0.001	914.10	LCV DAPHNIDS
	10	2	0	1.30	1.300	0.001	0.001	1995.00	EC20 POPULATION
	10	2	0	1.30	1.300	0.001	0.001	2130.00	LTV EC20 FISH
	10	2	0	1.30	1.300	0.000	0.000	2962.00	LCV FISH

Table F.2 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
ARSENIC (continued)	13	1	0	1.30	1.300	0.024	0.024	55.00	SS EC20
	13	1	0	1.30	1.300	0.007	0.007	190.00	NAWQ ACTUAL
	13	1	0	1.30	1.300	0.002	0.002	633.00	LTV EC20 DAPHNID
	13	1	0	1.30	1.300	0.001	0.001	914.10	LCV DAPHNIDS
	13	1	0	1.30	1.300	0.001	0.001	1995.00	EC20 POPULATION
	13	1	0	1.30	1.300	0.001	0.001	2130.00	LTV EC20 FISH
	13	1	0	1.30	1.300	0.000	0.000	2962.00	LCV FISH
BERYLLIUM	1	3	0	3.90	3.900	6.393	6.393	0.61	NAWQ ADVISORY
	1	3	0	3.90	3.900	1.026	1.026	3.80	LTV EC20 DAPHNID
	1	3	0	3.90	3.900	0.736	0.736	5.30	LCV DAPHNIDS
	1	3	0	3.90	3.900	0.186	0.186	21.00	EC20 POPULATION
	1	3	0	3.90	3.900	0.068	0.068	57.00	LCV FISH
	1	3	0	3.90	3.900	0.026	0.026	148.00	LTV EC20 FISH
	2	2	0	3.90	3.900	6.393	6.393	0.61	NAWQ ADVISORY
	2	2	0	3.90	3.900	1.026	1.026	3.80	LTV EC20 DAPHNID
	2	2	0	3.90	3.900	0.736	0.736	5.30	LCV DAPHNIDS
	2	2	0	3.90	3.900	0.186	0.186	21.00	EC20 POPULATION
	2	2	0	3.90	3.900	0.068	0.068	57.00	LCV FISH
	2	2	0	3.90	3.900	0.026	0.026	148.00	LTV EC20 FISH
	3	4	0	3.90	3.900	6.393	6.393	0.61	NAWQ ADVISORY
	3	4	0	3.90	3.900	1.026	1.026	3.80	LTV EC20 DAPHNID
	3	4	0	3.90	3.900	0.736	0.736	5.30	LCV DAPHNIDS
	3	4	0	3.90	3.900	0.186	0.186	21.00	EC20 POPULATION
	3	4	0	3.90	3.900	0.068	0.068	57.00	LCV FISH
	3	4	0	3.90	3.900	0.026	0.026	148.00	LTV EC20 FISH
	4	2	0	3.90	3.900	6.393	6.393	0.61	NAWQ ADVISORY
	4	2	0	3.90	3.900	1.026	1.026	3.80	LTV EC20 DAPHNID
	4	2	0	3.90	3.900	0.736	0.736	5.30	LCV DAPHNIDS
	4	2	0	3.90	3.900	0.186	0.186	21.00	EC20 POPULATION
	4	2	0	3.90	3.900	0.068	0.068	57.00	LCV FISH
	4	2	0	3.90	3.900	0.026	0.026	148.00	LTV EC20 FISH
	5	4	0	3.90	3.900	6.393	6.393	0.61	NAWQ ADVISORY
	5	4	0	3.90	3.900	1.026	1.026	3.80	LTV EC20 DAPHNID
	5	4	0	3.90	3.900	0.736	0.736	5.30	LCV DAPHNIDS
	5	4	0	3.90	3.900	0.186	0.186	21.00	EC20 POPULATION
	5	4	0	3.90	3.900	0.068	0.068	57.00	LCV FISH
	5	4	0	3.90	3.900	0.026	0.026	148.00	LTV EC20 FISH
	10	2	0	3.90	3.900	6.393	6.393	0.61	NAWQ ADVISORY
	10	2	0	3.90	3.900	1.026	1.026	3.80	LTV EC20 DAPHNID
	10	2	0	3.90	3.900	0.736	0.736	5.30	LCV DAPHNIDS
	10	2	0	3.90	3.900	0.186	0.186	21.00	EC20 POPULATION
	10	2	0	3.90	3.900	0.068	0.068	57.00	LCV FISH

Table F.2 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
BERYLLIUM (continued)	10	2	0	3.90	3.900	0.026	0.026	148.00	LTV EC20 FISH
	13	1	0	3.90	3.900	6.393	6.393	0.61	NAWQ ADVISORY
	13	1	0	3.90	3.900	1.026	1.026	3.80	LTV EC20 DAPHNID
	13	1	0	3.90	3.900	0.736	0.736	5.30	LCV DAPHNIDS
	13	1	0	3.90	3.900	0.186	0.186	21.00	EC20 POPULATION
	13	1	0	3.90	3.900	0.068	0.068	57.00	LCV FISH
	13	1	0	3.90	3.900	0.026	0.026	148.00	LTV EC20 FISH
CADMIUM	2	2	0	0.21	0.210	16.154	16.154	0.01	SS EC20
	2	2	0	0.21	0.210	1.400	1.400	0.15	LCV DAPHNIDS
	2	2	0	0.21	0.210	0.280	0.280	0.75	LTV EC20 DAPHNID
	2	2	0	0.21	0.210	0.191	0.191	1.10	NAWQ ACTUAL
	2	2	0	0.21	0.210	0.124	0.124	1.70	LCV FISH
	2	2	0	0.21	0.210	0.117	0.117	1.80	LTV EC20 FISH
	2	2	0	0.21	0.210	0.049	0.049	4.30	EC20 POPULATION
	3	4	0	0.21	0.210	16.154	16.154	0.01	SS EC20
	3	4	0	0.21	0.210	1.400	1.400	0.15	LCV DAPHNIDS
	3	4	0	0.21	0.210	0.280	0.280	0.75	LTV EC20 DAPHNID
	3	4	0	0.21	0.210	0.191	0.191	1.10	NAWQ ACTUAL
	3	4	0	0.21	0.210	0.124	0.124	1.70	LCV FISH
	3	4	0	0.21	0.210	0.117	0.117	1.80	LTV EC20 FISH
	3	4	0	0.21	0.210	0.049	0.049	4.30	EC20 POPULATION
	5	4	0	0.21	0.210	16.154	16.154	0.01	SS EC20
	5	4	0	0.21	0.210	1.400	1.400	0.15	LCV DAPHNIDS
	5	4	0	0.21	0.210	0.280	0.280	0.75	LTV EC20 DAPHNID
	5	4	0	0.21	0.210	0.191	0.191	1.10	NAWQ ACTUAL
	5	4	0	0.21	0.210	0.124	0.124	1.70	LCV FISH
	5	4	0	0.21	0.210	0.117	0.117	1.80	LTV EC20 FISH
	5	4	0	0.21	0.210	0.049	0.049	4.30	EC20 POPULATION
	10	2	0	0.21	0.210	16.154	16.154	0.01	SS EC20
	10	2	0	0.21	0.210	1.400	1.400	0.15	LCV DAPHNIDS
	10	2	0	0.21	0.210	0.280	0.280	0.75	LTV EC20 DAPHNID
	10	2	0	0.21	0.210	0.191	0.191	1.10	NAWQ ACTUAL
	10	2	0	0.21	0.210	0.124	0.124	1.70	LCV FISH
	10	2	0	0.21	0.210	0.117	0.117	1.80	LTV EC20 FISH
	10	2	0	0.21	0.210	0.049	0.049	4.30	EC20 POPULATION
	13	1	0	0.21	0.210	16.154	16.154	0.01	SS EC20
	13	1	0	0.21	0.210	1.400	1.400	0.15	LCV DAPHNIDS
	13	1	0	0.21	0.210	0.280	0.280	0.75	LTV EC20 DAPHNID
	13	1	0	0.21	0.210	0.191	0.191	1.10	NAWQ ACTUAL
	13	1	0	0.21	0.210	0.124	0.124	1.70	LCV FISH
	13	1	0	0.21	0.210	0.117	0.117	1.80	LTV EC20 FISH
	13	1	0	0.21	0.210	0.049	0.049	4.30	EC20 POPULATION

Table F.2 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
CHROMIUM	1	3	0	9.80	9.800	36.842	36.842	0.27	SS EC20
	1	3	0	9.80	9.800	19.600	19.600	0.50	LTV EC20 DAPHNID
	1	3	0	9.80	9.800	1.598	1.598	6.13	LCV DAPHNIDS
	1	3	0	9.80	9.800	0.891	0.891	11.00	NAWQ ACTUAL
	1	3	0	9.80	9.800	0.192	0.192	51.00	LTV EC20 FISH
	1	3	0	9.80	9.800	0.134	0.134	73.18	LCV FISH
	1	3	0	9.80	9.800	0.031	0.031	316.00	EC20 POPULATION
	2	2	0	9.80	9.800	36.842	36.842	0.27	SS EC20
	2	2	0	9.80	9.800	19.600	19.600	0.50	LTV EC20 DAPHNID
	2	2	0	9.80	9.800	1.598	1.598	6.13	LCV DAPHNIDS
	2	2	0	9.80	9.800	0.891	0.891	11.00	NAWQ ACTUAL
	2	2	0	9.80	9.800	0.192	0.192	51.00	LTV EC20 FISH
	2	2	0	9.80	9.800	0.134	0.134	73.18	LCV FISH
	2	2	0	9.80	9.800	0.031	0.031	316.00	EC20 POPULATION
	3	4	0	9.80	9.800	36.842	36.842	0.27	SS EC20
	3	4	0	9.80	9.800	19.600	19.600	0.50	LTV EC20 DAPHNID
	3	4	0	9.80	9.800	1.598	1.598	6.13	LCV DAPHNIDS
	3	4	0	9.80	9.800	0.891	0.891	11.00	NAWQ ACTUAL
	3	4	0	9.80	9.800	0.192	0.192	51.00	LTV EC20 FISH
	3	4	0	9.80	9.800	0.134	0.134	73.18	LCV FISH
	3	4	0	9.80	9.800	0.031	0.031	316.00	EC20 POPULATION
	4	2	0	9.80	9.800	36.842	36.842	0.27	SS EC20
	4	2	0	9.80	9.800	19.600	19.600	0.50	LTV EC20 DAPHNID
	4	2	0	9.80	9.800	1.598	1.598	6.13	LCV DAPHNIDS
	4	2	0	9.80	9.800	0.891	0.891	11.00	NAWQ ACTUAL
	4	2	0	9.80	9.800	0.192	0.192	51.00	LTV EC20 FISH
	4	2	0	9.80	9.800	0.134	0.134	73.18	LCV FISH
	4	2	0	9.80	9.800	0.031	0.031	316.00	EC20 POPULATION
	5	4	0	9.80	9.800	36.842	36.842	0.27	SS EC20
	5	4	0	9.80	9.800	19.600	19.600	0.50	LTV EC20 DAPHNID
	5	4	0	9.80	9.800	1.598	1.598	6.13	LCV DAPHNIDS
	5	4	0	9.80	9.800	0.891	0.891	11.00	NAWQ ACTUAL
	5	4	0	9.80	9.800	0.192	0.192	51.00	LTV EC20 FISH
	5	4	0	9.80	9.800	0.134	0.134	73.18	LCV FISH
	5	4	0	9.80	9.800	0.031	0.031	316.00	EC20 POPULATION
	10	2	0	9.80	9.800	36.842	36.842	0.27	SS EC20
	10	2	0	9.80	9.800	19.600	19.600	0.50	LTV EC20 DAPHNID
	10	2	0	9.80	9.800	1.598	1.598	6.13	LCV DAPHNIDS
	10	2	0	9.80	9.800	0.891	0.891	11.00	NAWQ ACTUAL
	10	2	0	9.80	9.800	0.192	0.192	51.00	LTV EC20 FISH
	10	2	0	9.80	9.800	0.134	0.134	73.18	LCV FISH
	10	2	0	9.80	9.800	0.031	0.031	316.00	EC20 POPULATION

Table F.2 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
CHROMIUM (continued)	13	1	0	9.80	9.800	36.842	36.842	0.27	SS EC20
	13	1	0	9.80	9.800	19.600	19.600	0.50	LTV EC20 DAPHNID
	13	1	0	9.80	9.800	1.598	1.598	6.13	LCV DAPHNIDS
	13	1	0	9.80	9.800	0.891	0.891	11.00	NAWQ ACTUAL
	13	1	0	9.80	9.800	0.192	0.192	51.00	LTV EC20 FISH
	13	1	0	9.80	9.800	0.134	0.134	73.18	LCV FISH
	13	1	0	9.80	9.800	0.031	0.031	316.00	EC20 POPULATION
COPPER	1	3	0	4.40	4.400	21.463	21.463	0.20	LTV EC20 DAPHNID
	1	3	0	4.40	4.400	19.130	19.130	0.23	LCV DAPHNIDS
	1	3	0	4.40	4.400	16.923	16.923	0.26	SS EC20
	1	3	0	4.40	4.400	1.136	1.136	3.87	LCV FISH
	1	3	0	4.40	4.400	0.880	0.880	5.00	LTV EC20 FISH
	1	3	0	4.40	4.400	0.512	0.512	8.60	EC20 POPULATION
	1	3	0	4.40	4.400	0.367	0.367	12.00	NAWQ ACTUAL
	2	2	0	4.40	4.400	21.463	21.463	0.20	LTV EC20 DAPHNID
	2	2	0	4.40	4.400	19.130	19.130	0.23	LCV DAPHNIDS
	2	2	0	4.40	4.400	16.923	16.923	0.26	SS EC20
	2	2	0	4.40	4.400	1.136	1.136	3.87	LCV FISH
	2	2	0	4.40	4.400	0.880	0.880	5.00	LTV EC20 FISH
	2	2	0	4.40	4.400	0.512	0.512	8.60	EC20 POPULATION
	2	2	0	4.40	4.400	0.367	0.367	12.00	NAWQ ACTUAL
	3	4	0	4.40	4.400	21.463	21.463	0.20	LTV EC20 DAPHNID
	3	4	0	4.40	4.400	19.130	19.130	0.23	LCV DAPHNIDS
	3	4	0	4.40	4.400	16.923	16.923	0.26	SS EC20
	3	4	0	4.40	4.400	1.136	1.136	3.87	LCV FISH
	3	4	0	4.40	4.400	0.880	0.880	5.00	LTV EC20 FISH
	3	4	0	4.40	4.400	0.512	0.512	8.60	EC20 POPULATION
	3	4	0	4.40	4.400	0.367	0.367	12.00	NAWQ ACTUAL
	4	2	0	4.40	4.400	21.463	21.463	0.20	LTV EC20 DAPHNID
	4	2	0	4.40	4.400	19.130	19.130	0.23	LCV DAPHNIDS
	4	2	0	4.40	4.400	16.923	16.923	0.26	SS EC20
	4	2	0	4.40	4.400	1.136	1.136	3.87	LCV FISH
	4	2	0	4.40	4.400	0.880	0.880	5.00	LTV EC20 FISH
	4	2	0	4.40	4.400	0.512	0.512	8.60	EC20 POPULATION
	4	2	0	4.40	4.400	0.367	0.367	12.00	NAWQ ACTUAL
	5	4	0	4.40	4.400	21.463	21.463	0.20	LTV EC20 DAPHNID
	5	4	0	4.40	4.400	19.130	19.130	0.23	LCV DAPHNIDS
	5	4	0	4.40	4.400	16.923	16.923	0.26	SS EC20
	5	4	0	4.40	4.400	1.136	1.136	3.87	LCV FISH
	5	4	0	4.40	4.400	0.880	0.880	5.00	LTV EC20 FISH
	5	4	0	4.40	4.400	0.512	0.512	8.60	EC20 POPULATION
	5	4	0	4.40	4.400	0.367	0.367	12.00	NAWQ ACTUAL

Table F.2 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
COPPER (continued)	10	2	0	4.40	4.400	21.463	21.463	0.20	LTV EC20 DAPHNID
	10	2	0	4.40	4.400	19.130	19.130	0.23	LCV DAPHNIDS
	10	2	0	4.40	4.400	16.923	16.923	0.26	SS EC20
	10	2	0	4.40	4.400	1.136	1.136	3.87	LCV FISH
	10	2	0	4.40	4.400	0.880	0.880	5.00	LTV EC20 FISH
	10	2	0	4.40	4.400	0.512	0.512	8.60	EC20 POPULATION
	10	2	0	4.40	4.400	0.367	0.367	12.00	NAWQ ACTUAL
	13	1	0	4.40	4.400	21.463	21.463	0.20	LTV EC20 DAPHNID
	13	1	0	4.40	4.400	19.130	19.130	0.23	LCV DAPHNIDS
	13	1	0	4.40	4.400	16.923	16.923	0.26	SS EC20
	13	1	0	4.40	4.400	1.136	1.136	3.87	LCV FISH
	13	1	0	4.40	4.400	0.880	0.880	5.00	LTV EC20 FISH
	13	1	0	4.40	4.400	0.512	0.512	8.60	EC20 POPULATION
	13	1	0	4.40	4.400	0.367	0.367	12.00	NAWQ ACTUAL
IRON	1	2	0	9.00	495.570	0.562	30.973	16.00	LTV EC20 DAPHNID
	1	2	0	9.00	495.570	0.057	3.137	158.00	LCV DAPHNIDS
	1	2	0	9.00	495.570	0.009	0.496	1000.00	NAWQ ACTUAL
	3	4	0	6.70	10.176	0.419	0.636	16.00	LTV EC20 DAPHNID
	3	4	0	6.70	10.176	0.042	0.064	158.00	LCV DAPHNIDS
	3	4	0	6.70	10.176	0.007	0.010	1000.00	NAWQ ACTUAL
	4	2	0	5.60	30.271	0.350	1.892	16.00	LTV EC20 DAPHNID
	4	2	0	5.60	30.271	0.035	0.192	158.00	LCV DAPHNIDS
	4	2	0	5.60	30.271	0.006	0.030	1000.00	NAWQ ACTUAL
	10	2	0	5.60	5.600	0.350	0.350	16.00	LTV EC20 DAPHNID
	10	2	0	5.60	5.600	0.035	0.035	158.00	LCV DAPHNIDS
	10	2	0	5.60	5.600	0.006	0.006	1000.00	NAWQ ACTUAL
LEAD	2	2	0	2.00	5.427	5.714	15.504	0.35	SS EC20
	2	2	0	2.00	5.427	0.625	1.696	3.20	NAWQ ACTUAL
	2	2	0	2.00	5.427	0.163	0.443	12.26	LCV DAPHNIDS
	2	2	0	2.00	5.427	0.106	0.287	18.88	LCV FISH
	2	2	0	2.00	5.427	0.091	0.247	22.00	LTV EC20 FISH
	2	2	0	2.00	5.427	0.028	0.076	71.00	EC20 POPULATION
	3	4	0	0.36	2.460	1.029	7.030	0.35	SS EC20
	3	4	0	0.36	2.460	0.112	0.769	3.20	NAWQ ACTUAL
	3	4	0	0.36	2.460	0.029	0.201	12.26	LCV DAPHNIDS
	3	4	0	0.36	2.460	0.019	0.130	18.88	LCV FISH
	3	4	0	0.36	2.460	0.016	0.112	22.00	LTV EC20 FISH
	3	4	0	0.36	2.460	0.005	0.035	71.00	EC20 POPULATION
	5	4	0	0.36	2.509	1.029	7.168	0.35	SS EC20
	5	4	0	0.36	2.509	0.112	0.784	3.20	NAWQ ACTUAL
	5	4	0	0.36	2.509	0.029	0.205	12.26	LCV DAPHNIDS

Table F.2 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
LEAD (continued)	5	4	0	0.36	2.509	0.019	0.133	18.88	LCV FISH
	5	4	0	0.36	2.509	0.016	0.114	22.00	LTV EC20 FISH
	5	4	0	0.36	2.509	0.005	0.035	71.00	EC20 POPULATION
	10	2	0	0.50	1.871	1.429	5.345	0.35	SS EC20
	10	2	0	0.50	1.871	0.156	0.585	3.20	NAWQ ACTUAL
	10	2	0	0.50	1.871	0.041	0.153	12.26	LCV DAPHNIDS
	10	2	0	0.50	1.871	0.026	0.099	18.88	LCV FISH
	10	2	0	0.50	1.871	0.023	0.085	22.00	LTV EC20 FISH
	10	2	0	0.50	1.871	0.007	0.026	71.00	EC20 POPULATION
MERCURY	1	3	0	0.20	0.200	666.667	666.667	0.00	NAWQ ADVISORY
	1	3	0	0.20	0.200	6.667	6.667	0.03	LTV EC20 FISH
	1	3	0	0.20	0.200	5.000	5.000	0.04	LCV DAPHNIDS
	1	3	0	0.20	0.200	0.714	0.714	0.28	EC20 POPULATION
	1	3	0	0.20	0.200	0.385	0.385	0.52	LCV FISH
	1	3	0	0.20	0.200	0.230	0.230	0.87	LTV EC20 DAPHNID
	2	2	0	0.20	0.200	666.667	666.667	0.00	NAWQ ADVISORY
	2	2	0	0.20	0.200	6.667	6.667	0.03	LTV EC20 FISH
	2	2	0	0.20	0.200	5.000	5.000	0.04	LCV DAPHNIDS
	2	2	0	0.20	0.200	0.714	0.714	0.28	EC20 POPULATION
	2	2	0	0.20	0.200	0.385	0.385	0.52	LCV FISH
	2	2	0	0.20	0.200	0.230	0.230	0.87	LTV EC20 DAPHNID
	4	3	0	0.20	0.200	666.667	666.667	0.00	NAWQ ADVISORY
	4	3	0	0.20	0.200	6.667	6.667	0.03	LTV EC20 FISH
	4	3	0	0.20	0.200	5.000	5.000	0.04	LCV DAPHNIDS
	4	3	0	0.20	0.200	0.714	0.714	0.28	EC20 POPULATION
	4	3	0	0.20	0.200	0.385	0.385	0.52	LCV FISH
	4	3	0	0.20	0.200	0.230	0.230	0.87	LTV EC20 DAPHNID
	5	4	0	0.20	0.200	666.667	666.667	0.00	NAWQ ADVISORY
	5	4	0	0.20	0.200	6.667	6.667	0.03	LTV EC20 FISH
	5	4	0	0.20	0.200	5.000	5.000	0.04	LCV DAPHNIDS
	5	4	0	0.20	0.200	0.714	0.714	0.28	EC20 POPULATION
	5	4	0	0.20	0.200	0.385	0.385	0.52	LCV FISH
	5	4	0	0.20	0.200	0.230	0.230	0.87	LTV EC20 DAPHNID
	10	2	0	0.20	0.200	666.667	666.667	0.00	NAWQ ADVISORY
	10	2	0	0.20	0.200	6.667	6.667	0.03	LTV EC20 FISH
	10	2	0	0.20	0.200	5.000	5.000	0.04	LCV DAPHNIDS
	10	2	0	0.20	0.200	0.714	0.714	0.28	EC20 POPULATION
	10	2	0	0.20	0.200	0.385	0.385	0.52	LCV FISH
	10	2	0	0.20	0.200	0.230	0.230	0.87	LTV EC20 DAPHNID
	13	1	0	0.20	0.200	666.667	666.667	0.00	NAWQ ADVISORY
	13	1	0	0.20	0.200	6.667	6.667	0.03	LTV EC20 FISH
	13	1	0	0.20	0.200	5.000	5.000	0.04	LCV DAPHNIDS

Table F.2 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
MERCURY (continued)	13	1	0	0.20	0.200	0.714	0.714	0.28	EC20 POPULATION
	13	1	0	0.20	0.200	0.385	0.385	0.52	LCV FISH
	13	1	0	0.20	0.200	0.230	0.230	0.87	LTV EC20 DAPHNID
NICKEL	1	3	0	19.00	19.000	3.800	3.800	5.00	LCV DAPHNIDS
	1	3	0	19.00	19.000	1.727	1.727	11.00	SS EC20
	1	3	0	19.00	19.000	0.543	0.543	35.00	LCV FISH
	1	3	0	19.00	19.000	0.422	0.422	45.00	LTV EC20 DAPHNID
	1	3	0	19.00	19.000	0.306	0.306	62.00	LTV EC20 FISH
	1	3	0	19.00	19.000	0.119	0.119	160.00	NAWQ ACTUAL
	1	3	0	19.00	19.000	0.088	0.088	215.00	EC20 POPULATION
	2	2	0	19.00	19.000	3.800	3.800	5.00	LCV DAPHNIDS
	2	2	0	19.00	19.000	1.727	1.727	11.00	SS EC20
	2	2	0	19.00	19.000	0.543	0.543	35.00	LCV FISH
	2	2	0	19.00	19.000	0.422	0.422	45.00	LTV EC20 DAPHNID
	2	2	0	19.00	19.000	0.306	0.306	62.00	LTV EC20 FISH
	2	2	0	19.00	19.000	0.119	0.119	160.00	NAWQ ACTUAL
	2	2	0	19.00	19.000	0.088	0.088	215.00	EC20 POPULATION
	3	4	0	19.00	19.000	3.800	3.800	5.00	LCV DAPHNIDS
	3	4	0	19.00	19.000	1.727	1.727	11.00	SS EC20
	3	4	0	19.00	19.000	0.543	0.543	35.00	LCV FISH
	3	4	0	19.00	19.000	0.422	0.422	45.00	LTV EC20 DAPHNID
	3	4	0	19.00	19.000	0.306	0.306	62.00	LTV EC20 FISH
	3	4	0	19.00	19.000	0.119	0.119	160.00	NAWQ ACTUAL
	3	4	0	19.00	19.000	0.088	0.088	215.00	EC20 POPULATION
	4	2	0	19.00	19.000	3.800	3.800	5.00	LCV DAPHNIDS
	4	2	0	19.00	19.000	1.727	1.727	11.00	SS EC20
	4	2	0	19.00	19.000	0.543	0.543	35.00	LCV FISH
	4	2	0	19.00	19.000	0.422	0.422	45.00	LTV EC20 DAPHNID
	4	2	0	19.00	19.000	0.306	0.306	62.00	LTV EC20 FISH
	4	2	0	19.00	19.000	0.119	0.119	160.00	NAWQ ACTUAL
	4	2	0	19.00	19.000	0.088	0.088	215.00	EC20 POPULATION
	5	4	0	19.00	19.000	3.800	3.800	5.00	LCV DAPHNIDS
	5	4	0	19.00	19.000	1.727	1.727	11.00	SS EC20
	5	4	0	19.00	19.000	0.543	0.543	35.00	LCV FISH
	5	4	0	19.00	19.000	0.422	0.422	45.00	LTV EC20 DAPHNID
	5	4	0	19.00	19.000	0.306	0.306	62.00	LTV EC20 FISH
	5	4	0	19.00	19.000	0.119	0.119	160.00	NAWQ ACTUAL
	5	4	0	19.00	19.000	0.088	0.088	215.00	EC20 POPULATION
	10	2	0	19.00	19.000	3.800	3.800	5.00	LCV DAPHNIDS
	10	2	0	19.00	19.000	1.727	1.727	11.00	SS EC20
	10	2	0	19.00	19.000	0.543	0.543	35.00	LCV FISH
	10	2	0	19.00	19.000	0.422	0.422	45.00	LTV EC20 DAPHNID

Table F.2 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
NICKEL (continued)	10	2	0	19.00	19.000	0.306	0.306	62.00	LTV EC20 FISH
	10	2	0	19.00	19.000	0.119	0.119	160.00	NAWQ ACTUAL
	10	2	0	19.00	19.000	0.088	0.088	215.00	EC20 POPULATION
	13	1	0	19.00	19.000	3.800	3.800	5.00	LCV DAPHNIDS
	13	1	0	19.00	19.000	1.727	1.727	11.00	SS EC20
	13	1	0	19.00	19.000	0.543	0.543	35.00	LCV FISH
	13	1	0	19.00	19.000	0.422	0.422	45.00	LTV EC20 DAPHNID
	13	1	0	19.00	19.000	0.306	0.306	62.00	LTV EC20 FISH
	13	1	0	19.00	19.000	0.119	0.119	160.00	NAWQ ACTUAL
	13	1	0	19.00	19.000	0.088	0.088	215.00	EC20 POPULATION
SELENIUM	1	3	0	0.97	0.970	0.373	0.373	2.60	SS EC20
	1	3	0	0.97	0.970	0.039	0.039	25.00	LTV EC20 DAPHNID
	1	3	0	0.97	0.970	0.028	0.028	35.00	NAWQ ACTUAL
	1	3	0	0.97	0.970	0.024	0.024	40.00	LTV EC20 FISH
	1	3	0	0.97	0.970	0.011	0.011	88.32	LCV FISH
	1	3	0	0.97	0.970	0.011	0.011	91.65	LCV DAPHNIDS
	2	2	0	0.97	0.970	0.373	0.373	2.60	SS EC20
	2	2	0	0.97	0.970	0.039	0.039	25.00	LTV EC20 DAPHNID
	2	2	0	0.97	0.970	0.028	0.028	35.00	NAWQ ACTUAL
	2	2	0	0.97	0.970	0.024	0.024	40.00	LTV EC20 FISH
	2	2	0	0.97	0.970	0.011	0.011	88.32	LCV FISH
	2	2	0	0.97	0.970	0.011	0.011	91.65	LCV DAPHNIDS
	3	4	0	0.97	0.970	0.373	0.373	2.60	SS EC20
	3	4	0	0.97	0.970	0.039	0.039	25.00	LTV EC20 DAPHNID
	3	4	0	0.97	0.970	0.028	0.028	35.00	NAWQ ACTUAL
	3	4	0	0.97	0.970	0.024	0.024	40.00	LTV EC20 FISH
	3	4	0	0.97	0.970	0.011	0.011	88.32	LCV FISH
	3	4	0	0.97	0.970	0.011	0.011	91.65	LCV DAPHNIDS
	4	3	0	0.97	0.970	0.373	0.373	2.60	SS EC20
	4	3	0	0.97	0.970	0.039	0.039	25.00	LTV EC20 DAPHNID
	4	3	0	0.97	0.970	0.028	0.028	35.00	NAWQ ACTUAL
	4	3	0	0.97	0.970	0.024	0.024	40.00	LTV EC20 FISH
	4	3	0	0.97	0.970	0.011	0.011	88.32	LCV FISH
	4	3	0	0.97	0.970	0.011	0.011	91.65	LCV DAPHNIDS
	5	4	0	0.97	0.970	0.373	0.373	2.60	SS EC20
	5	4	0	0.97	0.970	0.039	0.039	25.00	LTV EC20 DAPHNID
	5	4	0	0.97	0.970	0.028	0.028	35.00	NAWQ ACTUAL
	5	4	0	0.97	0.970	0.024	0.024	40.00	LTV EC20 FISH
	5	4	0	0.97	0.970	0.011	0.011	88.32	LCV FISH
	5	4	0	0.97	0.970	0.011	0.011	91.65	LCV DAPHNIDS
	10	2	0	0.97	0.970	0.373	0.373	2.60	SS EC20
	10	2	0	0.97	0.970	0.039	0.039	25.00	LTV EC20 DAPHNID

Table F.2 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
SELENIUM (continued)	10	2	0	0.97	0.970	0.028	0.028	35.00	NAWQ ACTUAL
	10	2	0	0.97	0.970	0.024	0.024	40.00	LTV EC20 FISH
	10	2	0	0.97	0.970	0.011	0.011	88.32	LCV FISH
	10	2	0	0.97	0.970	0.011	0.011	91.65	LCV DAPHNIDS
	13	1	0	0.97	0.970	0.373	0.373	2.60	SS EC20
	13	1	0	0.97	0.970	0.039	0.039	25.00	LTV EC20 DAPHNID
	13	1	0	0.97	0.970	0.028	0.028	35.00	NAWQ ACTUAL
	13	1	0	0.97	0.970	0.024	0.024	40.00	LTV EC20 FISH
	13	1	0	0.97	0.970	0.011	0.011	88.32	LCV FISH
	13	1	0	0.97	0.970	0.011	0.011	91.65	LCV DAPHNIDS
SILVER	1	3	0	0.74	0.740	6.167	6.167	0.12	LCV FISH
	1	3	0	0.74	0.740	5.286	5.286	0.14	SS EC20
	1	3	0	0.74	0.740	3.700	3.700	0.20	LTV EC20 FISH
	1	3	0	0.74	0.740	2.960	2.960	0.25	NAWQ ADVISORY
	1	3	0	0.74	0.740	2.313	2.313	0.32	EC20 POPULATION
	1	3	0	0.74	0.740	1.321	1.321	0.56	LTV EC20 DAPHNID
	1	3	0	0.74	0.740	0.285	0.285	2.60	LCV DAPHNIDS
	2	2	0	0.74	0.740	6.167	6.167	0.12	LCV FISH
	2	2	0	0.74	0.740	5.286	5.286	0.14	SS EC20
	2	2	0	0.74	0.740	3.700	3.700	0.20	LTV EC20 FISH
	2	2	0	0.74	0.740	2.960	2.960	0.25	NAWQ ADVISORY
	2	2	0	0.74	0.740	2.313	2.313	0.32	EC20 POPULATION
	2	2	0	0.74	0.740	1.321	1.321	0.56	LTV EC20 DAPHNID
	2	2	0	0.74	0.740	0.285	0.285	2.60	LCV DAPHNIDS
	4	3	0	0.74	0.740	6.167	6.167	0.12	LCV FISH
	4	3	0	0.74	0.740	5.286	5.286	0.14	SS EC20
	4	3	0	0.74	0.740	3.700	3.700	0.20	LTV EC20 FISH
	4	3	0	0.74	0.740	2.960	2.960	0.25	NAWQ ADVISORY
	4	3	0	0.74	0.740	2.313	2.313	0.32	EC20 POPULATION
	4	3	0	0.74	0.740	1.321	1.321	0.56	LTV EC20 DAPHNID
	4	3	0	0.74	0.740	0.285	0.285	2.60	LCV DAPHNIDS
	5	4	0	0.74	0.740	6.167	6.167	0.12	LCV FISH
	5	4	0	0.74	0.740	5.286	5.286	0.14	SS EC20
	5	4	0	0.74	0.740	3.700	3.700	0.20	LTV EC20 FISH
	5	4	0	0.74	0.740	2.960	2.960	0.25	NAWQ ADVISORY
	5	4	0	0.74	0.740	2.313	2.313	0.32	EC20 POPULATION
	5	4	0	0.74	0.740	1.321	1.321	0.56	LTV EC20 DAPHNID
	5	4	0	0.74	0.740	0.285	0.285	2.60	LCV DAPHNIDS
	10	2	0	0.74	0.740	6.167	6.167	0.12	LCV FISH
	10	2	0	0.74	0.740	5.286	5.286	0.14	SS EC20
	10	2	0	0.74	0.740	3.700	3.700	0.20	LTV EC20 FISH
	10	2	0	0.74	0.740	2.960	2.960	0.25	NAWQ ADVISORY

Table F.2 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
SILVER (continued)	10	2	0	0.74	0.740	2.313	2.313	0.32	EC20 POPULATION
	10	2	0	0.74	0.740	1.321	1.321	0.56	LTV EC20 DAPHNID
	10	2	0	0.74	0.740	0.285	0.285	2.60	LCV DAPHNIDS
	13	1	0	0.74	0.740	6.167	6.167	0.12	LCV FISH
	13	1	0	0.74	0.740	5.286	5.286	0.14	SS EC20
	13	1	0	0.74	0.740	3.700	3.700	0.20	LTV EC20 FISH
	13	1	0	0.74	0.740	2.960	2.960	0.25	NAWQ ADVISORY
	13	1	0	0.74	0.740	2.313	2.313	0.32	EC20 POPULATION
	13	1	0	0.74	0.740	1.321	1.321	0.56	LTV EC20 DAPHNID
	13	1	0	0.74	0.740	0.285	0.285	2.60	LCV DAPHNIDS
THALLIUM	1	3	0	2.70	2.700	1.080	1.080	2.50	NAWQ ADVISORY
	1	3	0	2.70	2.700	0.047	0.047	57.00	LCV FISH
	1	3	0	2.70	2.700	0.042	0.042	64.00	LTV EC20 DAPHNID
	1	3	0	2.70	2.700	0.040	0.040	67.00	EC20 POPULATION
	1	3	0	2.70	2.700	0.033	0.033	81.00	LTV EC20 FISH
	1	3	0	2.70	2.700	0.020	0.020	135.00	LCV DAPHNIDS
	2	2	0	2.70	2.700	1.080	1.080	2.50	NAWQ ADVISORY
	2	2	0	2.70	2.700	0.047	0.047	57.00	LCV FISH
	2	2	0	2.70	2.700	0.042	0.042	64.00	LTV EC20 DAPHNID
	2	2	0	2.70	2.700	0.040	0.040	67.00	EC20 POPULATION
	2	2	0	2.70	2.700	0.033	0.033	81.00	LTV EC20 FISH
	2	2	0	2.70	2.700	0.020	0.020	135.00	LCV DAPHNIDS
	3	3	0	2.70	2.700	1.080	1.080	2.50	NAWQ ADVISORY
	3	3	0	2.70	2.700	0.047	0.047	57.00	LCV FISH
	3	3	0	2.70	2.700	0.042	0.042	64.00	LTV EC20 DAPHNID
	3	3	0	2.70	2.700	0.040	0.040	67.00	EC20 POPULATION
	3	3	0	2.70	2.700	0.033	0.033	81.00	LTV EC20 FISH
	3	3	0	2.70	2.700	0.020	0.020	135.00	LCV DAPHNIDS
	4	3	0	2.70	2.700	1.080	1.080	2.50	NAWQ ADVISORY
	4	3	0	2.70	2.700	0.047	0.047	57.00	LCV FISH
	4	3	0	2.70	2.700	0.042	0.042	64.00	LTV EC20 DAPHNID
	4	3	0	2.70	2.700	0.040	0.040	67.00	EC20 POPULATION
	4	3	0	2.70	2.700	0.033	0.033	81.00	LTV EC20 FISH
	4	3	0	2.70	2.700	0.020	0.020	135.00	LCV DAPHNIDS
	5	4	0	2.70	2.700	1.080	1.080	2.50	NAWQ ADVISORY
	5	4	0	2.70	2.700	0.047	0.047	57.00	LCV FISH
	5	4	0	2.70	2.700	0.042	0.042	64.00	LTV EC20 DAPHNID
	5	4	0	2.70	2.700	0.040	0.040	67.00	EC20 POPULATION
	5	4	0	2.70	2.700	0.033	0.033	81.00	LTV EC20 FISH
	5	4	0	2.70	2.700	0.020	0.020	135.00	LCV DAPHNIDS
	10	2	0	2.70	2.700	1.080	1.080	2.50	NAWQ ADVISORY
	10	2	0	2.70	2.700	0.047	0.047	57.00	LCV FISH

Table F.2 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
THALLIUM (continued)	10	2	0	2.70	2.700	0.042	0.042	64.00	LTV EC20 DAPHNID
	10	2	0	2.70	2.700	0.040	0.040	67.00	EC20 POPULATION
	10	2	0	2.70	2.700	0.033	0.033	81.00	LTV EC20 FISH
	10	2	0	2.70	2.700	0.020	0.020	135.00	LCV DAPHNIDS
	13	1	0	2.70	2.700	1.080	1.080	2.50	NAWQ ADVISORY
	13	1	0	2.70	2.700	0.047	0.047	57.00	LCV FISH
	13	1	0	2.70	2.700	0.042	0.042	64.00	LTV EC20 DAPHNID
	13	1	0	2.70	2.700	0.040	0.040	67.00	EC20 POPULATION
	13	1	0	2.70	2.700	0.033	0.033	81.00	LTV EC20 FISH
	13	1	0	2.70	2.700	0.020	0.020	135.00	LCV DAPHNIDS
ZINC	1	3	0	3.40	22.431	0.162	1.068	21.00	SS EC20
	1	3	0	3.40	22.431	0.093	0.616	36.41	LCV FISH
	1	3	0	3.40	22.431	0.073	0.480	46.73	LCV DAPHNIDS
	1	3	0	3.40	22.431	0.072	0.477	47.00	LTV EC20 FISH
	1	3	0	3.40	22.431	0.042	0.280	80.00	EC20 POPULATION
	1	3	0	3.40	22.431	0.031	0.204	110.00	NAWQ ACTUAL
	2	2	0	3.40	62.337	0.162	2.968	21.00	SS EC20
	2	2	0	3.40	62.337	0.093	1.712	36.41	LCV FISH
	2	2	0	3.40	62.337	0.073	1.334	46.73	LCV DAPHNIDS
	2	2	0	3.40	62.337	0.072	1.326	47.00	LTV EC20 FISH
	2	2	0	3.40	62.337	0.042	0.779	80.00	EC20 POPULATION
	2	2	0	3.40	62.337	0.031	0.567	110.00	NAWQ ACTUAL
	3	4	0	3.40	17.145	0.162	0.816	21.00	SS EC20
	3	4	0	3.40	17.145	0.093	0.471	36.41	LCV FISH
	3	4	0	3.40	17.145	0.073	0.367	46.73	LCV DAPHNIDS
	3	4	0	3.40	17.145	0.072	0.365	47.00	LTV EC20 FISH
	3	4	0	3.40	17.145	0.042	0.214	80.00	EC20 POPULATION
	3	4	0	3.40	17.145	0.031	0.156	110.00	NAWQ ACTUAL
	4	2	0	3.40	3.400	0.162	0.162	21.00	SS EC20
	4	2	0	3.40	3.400	0.093	0.093	36.41	LCV FISH
	4	2	0	3.40	3.400	0.073	0.073	46.73	LCV DAPHNIDS
	4	2	0	3.40	3.400	0.072	0.072	47.00	LTV EC20 FISH
	4	2	0	3.40	3.400	0.042	0.042	80.00	EC20 POPULATION
	4	2	0	3.40	3.400	0.031	0.031	110.00	NAWQ ACTUAL
	5	4	0	3.40	17.003	0.162	0.810	21.00	SS EC20
	5	4	0	3.40	17.003	0.093	0.467	36.41	LCV FISH
	5	4	0	3.40	17.003	0.073	0.364	46.73	LCV DAPHNIDS
	5	4	0	3.40	17.003	0.072	0.362	47.00	LTV EC20 FISH
	5	4	0	3.40	17.003	0.042	0.213	80.00	EC20 POPULATION
	5	4	0	3.40	17.003	0.031	0.155	110.00	NAWQ ACTUAL
	13	1	0	13.00	13.000	0.619	0.619	21.00	SS EC20
	13	1	0	13.00	13.000	0.357	0.357	36.41	LCV FISH

Table F.2 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
ZINC (continued)	13	1	0	13.00	13.000	0.278	0.278	46.73	LCV DAPHNIDS
	13	1	0	13.00	13.000	0.277	0.277	47.00	LTV EC20 FISH
	13	1	0	13.00	13.000	0.163	0.163	80.00	EC20 POPULATION
	13	1	0	13.00	13.000	0.118	0.118	110.00	NAWQ ACTUAL

[a]The maximum detection limit was used in cases where the UCL was missing (i.e., where N = 1).

Table F.3. Mean and upper confidence limit (UCL) concentrations of chemicals detected in NPDES water samples (ug/L), toxicological benchmarks (ug/L), and quotients for aquatic life

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Mean[a] water concentration	UCL[b] water concentration	Mean quotient	UCL quotient	Benchmark	Flag	Benchmark type
1,1,1-TRICHLOROETHANE	3	704	200	4.47	5.02	3.19	3.59	1.40		NAWQ ADVISORY
	3	704	200	4.47	5.02	0.02	0.02	251.00		EC20 POPULATION
	3	704	200	4.47	5.02	0.00	0.00	1300.00		LTV EC20 DAPHNID
	3	704	200	4.47	5.02	0.00	0.00	1770.00		LCV DAPHNIDS
	3	704	200	4.47	5.02	0.00	0.00	2457.00	*	LTV EC20 FISH
	3	704	200	4.47	5.02	0.00	0.00	3493.00	*	LCV FISH
1,1-DICHLOROETHANE	3	705	41	4.87	5.00	9.55	9.80	0.51		NAWQ ADVISORY
	3	705	41	4.87	5.00	0.00	0.00	1585.00		EC20 POPULATION
	3	705	41	4.87	5.00	0.00	0.00	8219.00	*	LTV EC20 FISH
	3	705	41	4.87	5.00	0.00	0.00	14680.00	*	LCV FISH
1,2-DICHLOROETHANE	3	705	3	5.08	5.25	0.04	0.04	144.00		NAWQ ADVISORY
	3	705	3	5.08	5.25	0.00	0.00	1259.00		EC20 POPULATION
	3	705	3	5.08	5.25	0.00	0.00	11000.00	<	LTV EC20 DAPHNID
	3	705	3	5.08	5.25	0.00	0.00	15200.00		LCV DAPHNIDS
	3	705	3	5.08	5.25	0.00	0.00	29000.00		LTV EC20 FISH
	3	705	3	5.08	5.25	0.00	0.00	41364.00		LCV FISH
ACETONE	2	64	8	9.45	9.45	0.01	0.01	770.00		NAWQ ADVISORY
	2	64	8	9.45	9.45	0.00	0.00	23714.00		EC20 POPULATION
	2	64	8	9.45	9.45	0.00	0.00	161867.00	*	LTV EC20 FISH
	2	64	8	9.45	9.45	0.00	0.00	507640.00	*	LCV FISH
	2	64	8	9.45	9.45	0.00	0.00	3114182.00	*	LCV DAPHNIDS
ALUMINUM	1	64	52	618.34	618.34	8.24	8.24	75.00		SS EC20
	1	64	52	618.34	618.34	7.11	7.11	87.00		NAWQ ACTUAL
	1	64	52	618.34	618.34	1.15	1.15	540.00		LTV EC20 DAPHNID
	1	64	52	618.34	618.34	0.33	0.33	1900.00		LCV DAPHNIDS
	1	64	52	618.34	618.34	0.13	0.13	4700.00		LTV EC20 FISH
	1	64	52	618.34	618.34	0.11	0.11	5800.00		LCV FISH
	2	186	186	343.50	487.01	4.58	6.49	75.00		SS EC20
	2	186	186	343.50	487.01	3.95	5.60	87.00		NAWQ ACTUAL
	2	186	186	343.50	487.01	0.64	0.90	540.00		LTV EC20 DAPHNID
	2	186	186	343.50	487.01	0.18	0.26	1900.00		LCV DAPHNIDS
	2	186	186	343.50	487.01	0.07	0.10	4700.00		LTV EC20 FISH
	2	186	186	343.50	487.01	0.06	0.08	5800.00		LCV FISH
	3	497	318	1774.17	3807.40	23.66	50.77	75.00		SS EC20
	3	497	318	1774.17	3807.40	20.39	43.76	87.00		NAWQ ACTUAL
	3	497	318	1774.17	3807.40	3.29	7.05	540.00		LTV EC20 DAPHNID
	3	497	318	1774.17	3807.40	0.93	2.00	1900.00		LCV DAPHNIDS
	3	497	318	1774.17	3807.40	0.38	0.81	4700.00		LTV EC20 FISH
	3	497	318	1774.17	3807.40	0.31	0.66	5800.00		LCV FISH

Table F.3 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Mean[a] water concentration	UCL[b] water concentration	Mean quotient	UCL quotient	Benchmark	Flag	Benchmark type
ALUMINUM (continued)	4	1	1	540.00	540.00	7.20	7.20	75.00		SS EC20
	4	1	1	540.00	540.00	6.21	6.21	87.00		NAWQ ACTUAL
	4	1	1	540.00	540.00	1.00	1.00	540.00		LTV EC20 DAPHNID
	4	1	1	540.00	540.00	0.28	0.28	1900.00		LCV DAPHNIDS
	4	1	1	540.00	540.00	0.11	0.11	4700.00		LTV EC20 FISH
	4	1	1	540.00	540.00	0.09	0.09	5800.00		LCV FISH
ANTHRACENE	3	179	1	10.04	10.13	1004347.83	1012927.74	0.00		NAWQ ADVISORY
	3	179	1	10.04	10.13	111.59	112.55	0.09	*	LCV FISH
	3	179	1	10.04	10.13	28.70	28.94	0.35	*	LTV EC20 FISH
	3	179	1	10.04	10.13	4.78	4.82	2.10	<	LCV DAPHNIDS
	3	179	1	10.04	10.13	1.22	1.24	8.20	>	LTV EC20 DAPHNID
	1	64	2	50.87	50.87	2.83	2.83	18.00		NAWQ ADVISORY
	1	64	2	50.87	50.87	0.64	0.64	79.00		EC20 POPULATION
	1	64	2	50.87	50.87	0.03	0.03	1600.00		LCV FISH
	1	64	2	50.87	50.87	0.03	0.03	1900.00		LTV EC20 DAPHNID
	1	64	2	50.87	50.87	0.02	0.02	2310.00		LTV EC20 FISH
	1	64	2	50.87	50.87	0.01	0.01	5400.00		LCV DAPHNIDS
	3	210	5	1.01	1.04	50.45	51.91	0.02		NAWQ ADVISORY
	3	210	5	1.01	1.04	1.94	2.00	0.52		LTV EC20 FISH
	3	210	5	1.01	1.04	1.60	1.65	0.63		EC20 POPULATION
	3	210	5	1.01	1.04	1.01	1.04	1.00		LCV FISH
	3	210	5	1.01	1.04	0.84	0.87	1.20		LTV EC20 DAPHNID
	3	210	5	1.01	1.04	0.48	0.49	2.10		LCV DAPHNIDS
	1	219	56	39.09	45.71	0.71	0.83	55.00		SS EC20
	1	219	56	39.09	45.71	0.21	0.24	190.00		NAWQ ACTUAL
	1	219	56	39.09	45.71	0.06	0.07	633.00		LTV EC20 DAPHNID
	1	219	56	39.09	45.71	0.04	0.05	914.10		LCV DAPHNIDS
	1	219	56	39.09	45.71	0.02	0.02	1995.00		EC20 POPULATION
	1	219	56	39.09	45.71	0.02	0.02	2130.00		LTV EC20 FISH
	1	219	56	39.09	45.71	0.01	0.02	2962.00		LCV FISH
	3	412	26	8.78	16.14	0.16	0.29	55.00		SS EC20
	3	412	26	8.78	16.14	0.05	0.08	190.00		NAWQ ACTUAL
	3	412	26	8.78	16.14	0.01	0.03	633.00		LTV EC20 DAPHNID
	3	412	26	8.78	16.14	0.01	0.02	914.10		LCV DAPHNIDS
	3	412	26	8.78	16.14	0.00	0.01	1995.00		EC20 POPULATION
	3	412	26	8.78	16.14	0.00	0.01	2130.00		LTV EC20 FISH
	3	412	26	8.78	16.14	0.00	0.01	2962.00		LCV FISH

Table F.3 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Mean[a] water concentration	UCL[b] water concentration	Mean quotient	UCL quotient	Benchmark	Flag	Benchmark type
BARIUM	1	64	60	32.97	32.97	0.30	0.30	109.00		NAWQ ADVISORY
	1	64	60	32.97	32.97	0.00	0.00	20336.00	*	LCV DAPHNIDS
	2	2	2	30.50	33.00	0.28	0.30	109.00		NAWQ ADVISORY
	2	2	2	30.50	33.00	0.00	0.00	20336.00	*	LCV DAPHNIDS
	3	192	9	80.00	114.41	0.73	1.05	109.00		NAWQ ADVISORY
	3	192	9	80.00	114.41	0.00	0.01	20336.00	*	LCV DAPHNIDS
	4	1	1	33.00	33.00	0.30	0.30	109.00		NAWQ ADVISORY
	4	1	1	33.00	33.00	0.00	0.00	20336.00	*	LCV DAPHNIDS
BENZENE	3	705	9	4.98	5.00	1.56	1.56	3.20		NAWQ ADVISORY
	3	705	9	4.98	5.00	0.24	0.24	21.00		LTV EC20 FISH
	3	705	9	4.98	5.00	0.02	0.02	229.00		EC20 POPULATION
	3	705	9	4.98	5.00	0.02	0.02	299.00	*	LCV FISH
	3	705	9	4.98	5.00	0.00	0.00	98000.00	>	LCV DAPHNIDS
BENZO(A)ANTHRACENE	3	179	1	10.05	10.15	3722.11	3758.42	0.00		NAWQ ADVISORY
	3	179	1	10.05	10.15	15.46	15.61	0.65	*	LCV DAPHNIDS
BERYLLIUM	1	64	4	0.87	0.87	1.42	1.42	0.61		NAWQ ADVISORY
	1	64	4	0.87	0.87	0.23	0.23	3.80		LTV EC20 DAPHNID
	1	64	4	0.87	0.87	0.16	0.16	5.30		LCV DAPHNIDS
	1	64	4	0.87	0.87	0.04	0.04	21.00		EC20 POPULATION
	1	64	4	0.87	0.87	0.02	0.02	57.00	*	LCV FISH
	1	64	4	0.87	0.87	0.01	0.01	148.00	*	LTV EC20 FISH
	3	398	13	0.79	1.10	1.30	1.81	0.61		NAWQ ADVISORY
	3	398	13	0.79	1.10	0.21	0.29	3.80		LTV EC20 DAPHNID
	3	398	13	0.79	1.10	0.15	0.21	5.30		LCV DAPHNIDS
	3	398	13	0.79	1.10	0.04	0.05	21.00		EC20 POPULATION
	3	398	13	0.79	1.10	0.01	0.02	57.00	*	LCV FISH
	3	398	13	0.79	1.10	0.01	0.01	148.00	*	LTV EC20 FISH
BIS(2-ETHYLHEXYL)PHTHALATE	3	179	28	10.19	10.56	1018.86	1055.79	0.01		NAWQ ADVISORY
	3	179	28	10.19	10.56	3.40	3.52	3.00	<	LCV DAPHNIDS
	3	179	28	10.19	10.56	3.40	3.52	3.00	<	LTV EC20 DAPHNID
	3	179	28	10.19	10.56	1.21	1.26	8.40		LCV FISH
	3	179	28	10.19	10.56	0.20	0.21	50.00		EC20 POPULATION
	3	179	28	10.19	10.56	0.19	0.20	54.00	>	LTV EC20 FISH
BORON	3	192	191	69.67	176.38	9.95	25.20	7.00		LTV EC20 DAPHNID
	4	1	1	23.00	23.00	3.29	3.29	7.00		LTV EC20 DAPHNID

Table F.3 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Mean[a] water concentration	UCL[b] water concentration	Mean quotient	UCL quotient	Benchmark	Flag	Benchmark type
CADMIUM	1	173	52	4.51	5.35	347.27	411.76	0.01		SS EC20
	1	173	52	4.51	5.35	30.10	35.69	0.15		LCV DAPHNIDS
	1	173	52	4.51	5.35	6.02	7.14	0.75		LTV EC20 DAPHNID
	1	173	52	4.51	5.35	4.10	4.87	1.10		NAWQ ACTUAL
	1	173	52	4.51	5.35	2.66	3.15	1.70		LCV FISH
	1	173	52	4.51	5.35	2.51	2.97	1.80		LTV EC20 FISH
	1	173	52	4.51	5.35	1.05	1.24	4.30		EC20 POPULATION
	3	615	17	2.15	2.43	165.35	187.09	0.01		SS EC20
	3	615	17	2.15	2.43	14.33	16.21	0.15		LCV DAPHNIDS
	3	615	17	2.15	2.43	2.87	3.24	0.75		LTV EC20 DAPHNID
	3	615	17	2.15	2.43	1.95	2.21	1.10		NAWQ ACTUAL
	3	615	17	2.15	2.43	1.26	1.43	1.70		LCV FISH
	3	615	17	2.15	2.43	1.19	1.35	1.80		LTV EC20 FISH
	3	615	17	2.15	2.43	0.50	0.57	4.30		EC20 POPULATION
CARBON DISULFIDE	2	32	2	4.69	4.69	5.15	5.15	0.91		NAWQ ADVISORY
	2	32	2	4.69	4.69	0.02	0.02	244.00	*	LCV DAPHNIDS
	2	32	2	4.69	4.69	0.00	0.00	1000.00		EC20 POPULATION
	2	32	2	4.69	4.69	0.00	0.00	5719.00	*	LTV EC20 FISH
	2	32	2	4.69	4.69	0.00	0.00	9538.00	*	LCV FISH
CHLOROBENZENE	3	705	1	5.00	5.00	0.43	0.43	11.60		NAWQ ADVISORY
	3	705	1	5.00	5.00	0.03	0.03	165.00		EC20 POPULATION
	3	705	1	5.00	5.00	0.00	0.00	1002.00	*	LTV EC20 FISH
	3	705	1	5.00	5.00	0.00	0.00	1203.00	*	LCV FISH
	3	705	1	5.00	5.00	0.00	0.00	15042.00	*	LCV DAPHNIDS
CHLOROFORM	2	9	1	4.50	5.00	0.32	0.36	14.00		NAWQ ADVISORY
	2	9	1	4.50	5.00	0.01	0.01	562.00		EC20 POPULATION
	2	9	1	4.50	5.00	0.00	0.00	3578.00	*	LCV FISH
	2	9	1	4.50	5.00	0.00	0.00	4483.00	*	LCV DAPHNIDS
	2	9	1	4.50	5.00	0.00	0.00	8400.00		LTV EC20 FISH
	3	705	601	4.25	5.26	0.30	0.38	14.00		NAWQ ADVISORY
	3	705	601	4.25	5.26	0.01	0.01	562.00		EC20 POPULATION
	3	705	601	4.25	5.26	0.00	0.00	3578.00	*	LCV FISH
	3	705	601	4.25	5.26	0.00	0.00	4483.00	*	LCV DAPHNIDS
	3	705	601	4.25	5.26	0.00	0.00	8400.00		LTV EC20 FISH

Table F.3 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Mean[a] water concentration	UCL[b] water concentration	Mean quotient	UCL quotient	Benchmark	Flag	Benchmark type
CHROMIUM	1	211	96	6.32	6.96	23.77	26.16	0.27		SS EC20
	1	211	96	6.32	6.96	12.65	13.92	0.50		LTV EC20 DAPHNID
	1	211	96	6.32	6.96	1.03	1.13	6.13		LCV DAPHNIDS
	1	211	96	6.32	6.96	0.57	0.63	11.00		NAWQ ACTUAL
	1	211	96	6.32	6.96	0.12	0.14	51.00		LTV EC20 FISH
	1	211	96	6.32	6.96	0.09	0.10	73.18		LCV FISH
	1	211	96	6.32	6.96	0.02	0.02	316.00		EC20 POPULATION
	3	883	89	10.92	11.86	41.05	44.60	0.27		SS EC20
	3	883	89	10.92	11.86	21.84	23.72	0.50		LTV EC20 DAPHNID
	3	883	89	10.92	11.86	1.78	1.93	6.13		LCV DAPHNIDS
	3	883	89	10.92	11.86	0.99	1.08	11.00		NAWQ ACTUAL
	3	883	89	10.92	11.86	0.21	0.23	51.00		LTV EC20 FISH
	3	883	89	10.92	11.86	0.15	0.16	73.18		LCV FISH
	3	883	89	10.92	11.86	0.03	0.04	316.00		EC20 POPULATION
	4	184	39	13.54	16.20	50.90	60.90	0.27		SS EC20
	4	184	39	13.54	16.20	27.08	32.40	0.50		LTV EC20 DAPHNID
	4	184	39	13.54	16.20	2.21	2.64	6.13		LCV DAPHNIDS
	4	184	39	13.54	16.20	1.23	1.47	11.00		NAWQ ACTUAL
	4	184	39	13.54	16.20	0.27	0.32	51.00		LTV EC20 FISH
	4	184	39	13.54	16.20	0.19	0.22	73.18		LCV FISH
	4	184	39	13.54	16.20	0.04	0.05	316.00		EC20 POPULATION
	13	8	1	11.00	11.00	41.35	41.35	0.27		SS EC20
	13	8	1	11.00	11.00	22.00	22.00	0.50		LTV EC20 DAPHNID
	13	8	1	11.00	11.00	1.79	1.79	6.13		LCV DAPHNIDS
	13	8	1	11.00	11.00	1.00	1.00	11.00		NAWQ ACTUAL
	13	8	1	11.00	11.00	0.22	0.22	51.00		LTV EC20 FISH
	13	8	1	11.00	11.00	0.15	0.15	73.18		LCV FISH
	13	8	1	11.00	11.00	0.03	0.03	316.00		EC20 POPULATION
COPPER	1	211	66	6.31	9.34	30.79	45.56	0.20		LTV EC20 DAPHNID
	1	211	66	6.31	9.34	27.44	40.61	0.23		LCV DAPHNIDS
	1	211	66	6.31	9.34	24.27	35.92	0.26		SS EC20
	1	211	66	6.31	9.34	1.63	2.41	3.87		LCV FISH
	1	211	66	6.31	9.34	1.26	1.87	5.00		LTV EC20 FISH
	1	211	66	6.31	9.34	0.73	1.09	8.60		EC20 POPULATION
	1	211	66	6.31	9.34	0.53	0.78	12.00		NAWQ ACTUAL
	2	24	3	5.29	5.29	25.79	25.79	0.20		LTV EC20 DAPHNID
	2	24	3	5.29	5.29	22.99	22.99	0.23		LCV DAPHNIDS
	2	24	3	5.29	5.29	20.34	20.34	0.26		SS EC20
	2	24	3	5.29	5.29	1.37	1.37	3.87		LCV FISH
	2	24	3	5.29	5.29	1.06	1.06	5.00		LTV EC20 FISH
	2	24	3	5.29	5.29	0.61	0.61	8.60		EC20 POPULATION
	2	24	3	5.29	5.29	0.44	0.44	12.00		NAWQ ACTUAL

Table F.3 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Mean[a] water concentration	UCL[b] water concentration	Mean quotient	UCL quotient	Benchmark	Flag	Benchmark type
COPPER (continued)	3	412	332	13.56	19.90	66.15	97.07	0.20		LTV EC20 DAPHNID
	3	412	332	13.56	19.90	58.96	86.52	0.23		LCV DAPHNIDS
	3	412	332	13.56	19.90	52.16	76.54	0.26		SS EC20
	3	412	332	13.56	19.90	3.50	5.14	3.87		LCV FISH
	3	412	332	13.56	19.90	2.71	3.98	5.00		LTV EC20 FISH
	3	412	332	13.56	19.90	1.58	2.31	8.60		EC20 POPULATION
	3	412	332	13.56	19.90	1.13	1.66	12.00		NAWQ ACTUAL
	4	32	5	4.47	4.52	21.83	22.07	0.20		LTV EC20 DAPHNID
	4	32	5	4.47	4.52	19.46	19.67	0.23		LCV DAPHNIDS
	4	32	5	4.47	4.52	17.21	17.40	0.26		SS EC20
	4	32	5	4.47	4.52	1.16	1.17	3.87		LCV FISH
	4	32	5	4.47	4.52	0.89	0.90	5.00		LTV EC20 FISH
	4	32	5	4.47	4.52	0.52	0.53	8.60		EC20 POPULATION
	4	32	5	4.47	4.52	0.37	0.38	12.00		NAWQ ACTUAL
CYANIDE	2	24	1	105.67	105.67	90.31	90.31	1.17		SS EC20
	2	24	1	105.67	105.67	20.32	20.32	5.20		NAWQ ACTUAL
	2	24	1	105.67	105.67	19.94	19.94	5.30		LTV EC20 FISH
	2	24	1	105.67	105.67	13.55	13.55	7.80		LCV FISH
	2	24	1	105.67	105.67	9.61	9.61	11.00		EC20 POPULATION
	3	191	16	97.77	101.29	83.56	86.57	1.17		SS EC20
	3	191	16	97.77	101.29	18.80	19.48	5.20		NAWQ ACTUAL
	3	191	16	97.77	101.29	18.45	19.11	5.30		LTV EC20 FISH
	3	191	16	97.77	101.29	12.53	12.99	7.80		LCV FISH
	3	191	16	97.77	101.29	8.89	9.21	11.00		EC20 POPULATION
	4	32	1	91.83	95.92	78.49	81.98	1.17		SS EC20
	4	32	1	91.83	95.92	17.66	18.45	5.20		NAWQ ACTUAL
	4	32	1	91.83	95.92	17.33	18.10	5.30		LTV EC20 FISH
	4	32	1	91.83	95.92	11.77	12.30	7.80		LCV FISH
	4	32	1	91.83	95.92	8.35	8.72	11.00		EC20 POPULATION
	13	8	1	87.87	87.87	75.11	75.11	1.17		SS EC20
	13	8	1	87.87	87.87	16.90	16.90	5.20		NAWQ ACTUAL
	13	8	1	87.87	87.87	16.58	16.58	5.30		LTV EC20 FISH
	13	8	1	87.87	87.87	11.27	11.27	7.80		LCV FISH
	13	8	1	87.87	87.87	7.99	7.99	11.00		EC20 POPULATION
DI-N-BUTYLPHTHALATE	3	179	11	9.93	10.00	2.26	2.27	4.40		NAWQ ADVISORY
	3	179	11	9.93	10.00	0.04	0.04	251.00		EC20 POPULATION
	3	179	11	9.93	10.00	0.04	0.04	270.00		LTV EC20 FISH
	3	179	11	9.93	10.00	0.02	0.02	500.00		LTV EC20 DAPHNID
	3	179	11	9.93	10.00	0.01	0.01	717.00		LCV FISH
	3	179	11	9.93	10.00	0.01	0.01	717.00		LCV DAPHNIDS

Table F.3 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Mean[a] water concentration	UCL[b] water concentration	Mean quotient	UCL quotient	Benchmark	Flag	Benchmark type
DIETHYLPHTHALATE	3	179	1	10.05	10.14	0.37	0.38	27.00		NAWQ ADVISORY
	3	179	1	10.05	10.14	0.01	0.01	1000.00		EC20 POPULATION
FLUORANTHENE	3	179	2	10.05	10.13	5.91	5.96	1.70		NAWQ ADVISORY
	3	179	2	10.05	10.13	0.31	0.32	32.00		EC20 POPULATION
	3	179	2	10.05	10.13	0.00	0.00	65795.00	*	LCV DAPHNIDS
IRON	1	211	140	265.29	621.36	16.58	38.84	16.00		LTV EC20 DAPHNID
	1	211	140	265.29	621.36	1.68	3.93	158.00		LCV DAPHNIDS
	1	211	140	265.29	621.36	0.27	0.62	1000.00		NAWQ ACTUAL
	2	1	1	220.00	220.00	13.75	13.75	16.00		LTV EC20 DAPHNID
	2	1	1	220.00	220.00	1.39	1.39	158.00		LCV DAPHNIDS
	2	1	1	220.00	220.00	0.22	0.22	1000.00		NAWQ ACTUAL
	3	363	352	1962.63	3835.87	122.66	239.74	16.00		LTV EC20 DAPHNID
	3	363	352	1962.63	3835.87	12.42	24.28	158.00		LCV DAPHNIDS
	3	363	352	1962.63	3835.87	1.96	3.84	1000.00		NAWQ ACTUAL
	4	1	1	660.00	660.00	41.25	41.25	16.00		LTV EC20 DAPHNID
	4	1	1	660.00	660.00	4.18	4.18	158.00		LCV DAPHNIDS
	4	1	1	660.00	660.00	0.66	0.66	1000.00		NAWQ ACTUAL
LEAD	1	215	16	29.89	46.44	85.41	132.69	0.35		SS EC20
	1	215	16	29.89	46.44	9.34	14.51	3.20		NAWQ ACTUAL
	1	215	16	29.89	46.44	2.44	3.79	12.26		LCV DAPHNIDS
	1	215	16	29.89	46.44	1.58	2.46	18.88		LCV FISH
	1	215	16	29.89	46.44	1.36	2.11	22.00		LTV EC20 FISH
	1	215	16	29.89	46.44	0.42	0.65	71.00		EC20 POPULATION
	2	24	1	4.19	4.19	11.98	11.98	0.35		SS EC20
	2	24	1	4.19	4.19	1.31	1.31	3.20		NAWQ ACTUAL
	2	24	1	4.19	4.19	0.34	0.34	12.26		LCV DAPHNIDS
	2	24	1	4.19	4.19	0.22	0.22	18.88		LCV FISH
	2	24	1	4.19	4.19	0.19	0.19	22.00		LTV EC20 FISH
	2	24	1	4.19	4.19	0.06	0.06	71.00		EC20 POPULATION
	3	715	121	7.92	14.18	22.63	40.53	0.35		SS EC20
	3	715	121	7.92	14.18	2.48	4.43	3.20		NAWQ ACTUAL
	3	715	121	7.92	14.18	0.65	1.16	12.26		LCV DAPHNIDS
	3	715	121	7.92	14.18	0.42	0.75	18.88		LCV FISH
	3	715	121	7.92	14.18	0.36	0.64	22.00		LTV EC20 FISH
	3	715	121	7.92	14.18	0.11	0.20	71.00		EC20 POPULATION

Table F.3 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Mean[a] water concentration	UCL[b] water concentration	Mean quotient	UCL quotient	Benchmark	Flag	Benchmark type
MANGANESE	1	114	110	144.21	144.21	13.11	13.11	11.00		NAWQ ADVISORY
	1	114	110	144.21	144.21	1.29	1.29	112.00		EC20 POPULATION
	1	114	110	144.21	144.21	0.13	0.13	1100.00	<	LCV DAPHNIDS
	1	114	110	144.21	144.21	0.13	0.13	1100.00	<	LTV EC20 DAPHNID
	1	114	110	144.21	144.21	0.11	0.11	1270.00		LTV EC20 FISH
	1	114	110	144.21	144.21	0.08	0.08	1770.00		LCV FISH
	2	24	24	35.12	35.12	3.19	3.19	11.00		NAWQ ADVISORY
	2	24	24	35.12	35.12	0.31	0.31	112.00		EC20 POPULATION
	2	24	24	35.12	35.12	0.03	0.03	1100.00	<	LCV DAPHNIDS
	2	24	24	35.12	35.12	0.03	0.03	1100.00	<	LTV EC20 DAPHNID
	2	24	24	35.12	35.12	0.03	0.03	1270.00		LTV EC20 FISH
	2	24	24	35.12	35.12	0.02	0.02	1770.00		LCV FISH
	3	410	366	145.41	201.44	13.22	18.31	11.00		NAWQ ADVISORY
	3	410	366	145.41	201.44	1.30	1.80	112.00		EC20 POPULATION
	3	410	366	145.41	201.44	0.13	0.18	1100.00	<	LCV DAPHNIDS
	3	410	366	145.41	201.44	0.13	0.18	1100.00	<	LTV EC20 DAPHNID
	3	410	366	145.41	201.44	0.11	0.16	1270.00		LTV EC20 FISH
	3	410	366	145.41	201.44	0.08	0.11	1770.00		LCV FISH
	4	32	32	52.12	61.70	4.74	5.61	11.00		NAWQ ADVISORY
	4	32	32	52.12	61.70	0.47	0.55	112.00		EC20 POPULATION
	4	32	32	52.12	61.70	0.05	0.06	1100.00	<	LCV DAPHNIDS
	4	32	32	52.12	61.70	0.05	0.06	1100.00	<	LTV EC20 DAPHNID
	4	32	32	52.12	61.70	0.04	0.05	1270.00		LTV EC20 FISH
	4	32	32	52.12	61.70	0.03	0.03	1770.00		LCV FISH
	13	8	8	154.29	154.29	14.03	14.03	11.00		NAWQ ADVISORY
	13	8	8	154.29	154.29	1.38	1.38	112.00		EC20 POPULATION
	13	8	8	154.29	154.29	0.14	0.14	1100.00	<	LCV DAPHNIDS
	13	8	8	154.29	154.29	0.14	0.14	1100.00	<	LTV EC20 DAPHNID
	13	8	8	154.29	154.29	0.12	0.12	1270.00		LTV EC20 FISH
	13	8	8	154.29	154.29	0.09	0.09	1770.00		LCV FISH

Table F.3 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Mean[a] water concentration	UCL[b] water concentration	Mean quotient	UCL quotient	Benchmark	Flag	Benchmark type
MERCURY	1	147	75	0.32	0.39	1065.08	1301.59	0.00		NAWQ ADVISORY
	1	147	75	0.32	0.39	10.65	13.02	0.03	<	LTV EC20 FISH
	1	147	75	0.32	0.39	7.99	9.76	0.04	<	LCV DAPHNIDS
	1	147	75	0.32	0.39	1.14	1.39	0.28		EC20 POPULATION
	1	147	75	0.32	0.39	0.61	0.75	0.52		LCV FISH
	1	147	75	0.32	0.39	0.37	0.45	0.87		LTV EC20 DAPHNID
	3	444	50	0.40	0.65	1326.54	2175.57	0.00		NAWQ ADVISORY
	3	444	50	0.40	0.65	13.27	21.76	0.03	<	LTV EC20 FISH
	3	444	50	0.40	0.65	9.95	16.32	0.04	<	LCV DAPHNIDS
	3	444	50	0.40	0.65	1.42	2.33	0.28		EC20 POPULATION
	3	444	50	0.40	0.65	0.77	1.26	0.52		LCV FISH
	3	444	50	0.40	0.65	0.46	0.75	0.87		LTV EC20 DAPHNID
	4	32	1	0.20	0.20	669.44	672.22	0.00		NAWQ ADVISORY
	4	32	1	0.20	0.20	6.69	6.72	0.03	<	LTV EC20 FISH
	4	32	1	0.20	0.20	5.02	5.04	0.04	<	LCV DAPHNIDS
	4	32	1	0.20	0.20	0.72	0.72	0.28		EC20 POPULATION
	4	32	1	0.20	0.20	0.39	0.39	0.52		LCV FISH
	4	32	1	0.20	0.20	0.23	0.23	0.87		LTV EC20 DAPHNID
METHYLENE CHLORIDE	2	41	9	3.67	5.00	0.02	0.02	220.00		NAWQ ADVISORY
	2	41	9	3.67	5.00	0.01	0.01	410.00		LTV EC20 FISH
	2	41	9	3.67	5.00	0.00	0.00	1259.00		EC20 POPULATION
	2	41	9	3.67	5.00	0.00	0.00	42667.00	*	LCV DAPHNIDS
	2	41	9	3.67	5.00	0.00	0.00	108000.00		LCV FISH
	3	705	70	5.04	5.41	0.02	0.02	220.00		NAWQ ADVISORY
	3	705	70	5.04	5.41	0.01	0.01	410.00		LTV EC20 FISH
	3	705	70	5.04	5.41	0.00	0.00	1259.00		EC20 POPULATION
	3	705	70	5.04	5.41	0.00	0.00	42667.00	*	LCV DAPHNIDS
	3	705	70	5.04	5.41	0.00	0.00	108000.00		LCV FISH
MOLYBDENUM	3	192	31	10.95	12.83	0.37	0.43	30.00		NAWQ ADVISORY
	3	192	31	10.95	12.83	0.03	0.04	360.00		LTV EC20 DAPHNID
	3	192	31	10.95	12.83	0.01	0.01	880.00		LCV DAPHNIDS

Table F.3 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Mean[a] water concentration	UCL[b] water concentration	Mean quotient	UCL quotient	Benchmark	Flag	Benchmark type
NICKEL	1	211	95	18.03	38.01	3.61	7.60	5.00	<	LCV DAPHNIDS
	1	211	95	18.03	38.01	1.64	3.46	11.00		SS EC20
	1	211	95	18.03	38.01	0.52	1.09	35.00	<	LCV FISH
	1	211	95	18.03	38.01	0.40	0.84	45.00		LTV EC20 DAPHNID
	1	211	95	18.03	38.01	0.29	0.61	62.00		LTV EC20 FISH
	1	211	95	18.03	38.01	0.11	0.24	160.00		NAWQ ACTUAL
	1	211	95	18.03	38.01	0.08	0.18	215.00		EC20 POPULATION
	2	24	2	22.08	22.08	4.42	4.42	5.00	<	LCV DAPHNIDS
	2	24	2	22.08	22.08	2.01	2.01	11.00		SS EC20
	2	24	2	22.08	22.08	0.63	0.63	35.00	<	LCV FISH
	2	24	2	22.08	22.08	0.49	0.49	45.00		LTV EC20 DAPHNID
	2	24	2	22.08	22.08	0.36	0.36	62.00		LTV EC20 FISH
	2	24	2	22.08	22.08	0.14	0.14	160.00		NAWQ ACTUAL
	2	24	2	22.08	22.08	0.10	0.10	215.00		EC20 POPULATION
	3	412	88	95.90	181.14	19.18	36.23	5.00	<	LCV DAPHNIDS
	3	412	88	95.90	181.14	8.72	16.47	11.00		SS EC20
	3	412	88	95.90	181.14	2.74	5.18	35.00	<	LCV FISH
	3	412	88	95.90	181.14	2.13	4.03	45.00		LTV EC20 DAPHNID
	3	412	88	95.90	181.14	1.55	2.92	62.00		LTV EC20 FISH
	3	412	88	95.90	181.14	0.60	1.13	160.00		NAWQ ACTUAL
	3	412	88	95.90	181.14	0.45	0.84	215.00		EC20 POPULATION
	4	32	3	14.04	16.71	2.81	3.34	5.00	<	LCV DAPHNIDS
	4	32	3	14.04	16.71	1.28	1.52	11.00		SS EC20
	4	32	3	14.04	16.71	0.40	0.48	35.00	<	LCV FISH
	4	32	3	14.04	16.71	0.31	0.37	45.00		LTV EC20 DAPHNID
	4	32	3	14.04	16.71	0.23	0.27	62.00		LTV EC20 FISH
	4	32	3	14.04	16.71	0.09	0.10	160.00		NAWQ ACTUAL
	4	32	3	14.04	16.71	0.07	0.08	215.00		EC20 POPULATION
	13	8	2	10.87	10.87	2.17	2.17	5.00	<	LCV DAPHNIDS
	13	8	2	10.87	10.87	0.99	0.99	11.00		SS EC20
	13	8	2	10.87	10.87	0.31	0.31	35.00	<	LCV FISH
	13	8	2	10.87	10.87	0.24	0.24	45.00		LTV EC20 DAPHNID
	13	8	2	10.87	10.87	0.18	0.18	62.00		LTV EC20 FISH
	13	8	2	10.87	10.87	0.07	0.07	160.00		NAWQ ACTUAL
	13	8	2	10.87	10.87	0.05	0.05	215.00		EC20 POPULATION
PHENANTHRENE	3	179	1	10.04	10.12	23.35	23.55	0.43		NAWQ ADVISORY
	3	179	1	10.04	10.12	0.09	0.09	110.00		LTV EC20 DAPHNID
	3	179	1	10.04	10.12	0.05	0.05	200.00		LCV DAPHNIDS

Table F.3 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Mean[a] water concentration	UCL[b] water concentration	Mean quotient	UCL quotient	Benchmark	Flag	Benchmark type
PHENOL	2	8	1	12.25	12.25	0.58	0.58	21.00		NAWQ ADVISORY
	2	8	1	12.25	12.25	0.05	0.05	230.00	<	LTV EC20 FISH
	2	8	1	12.25	12.25	0.01	0.01	1369.00		LCV FISH
	2	8	1	12.25	12.25	0.01	0.01	2005.00	*	LCV DAPHNIDS
	2	8	1	12.25	12.25	0.00	0.00	4467.00		EC20 POPULATION
	3	179	20	12.23	13.50	0.58	0.64	21.00		NAWQ ADVISORY
	3	179	20	12.23	13.50	0.05	0.06	230.00	<	LTV EC20 FISH
	3	179	20	12.23	13.50	0.01	0.01	1369.00		LCV FISH
	3	179	20	12.23	13.50	0.01	0.01	2005.00	*	LCV DAPHNIDS
	3	179	20	12.23	13.50	0.00	0.00	4467.00		EC20 POPULATION
	4	10	2	11.44	12.87	0.54	0.61	21.00		NAWQ ADVISORY
	4	10	2	11.44	12.87	0.05	0.06	230.00	<	LTV EC20 FISH
	4	10	2	11.44	12.87	0.01	0.01	1369.00		LCV FISH
	4	10	2	11.44	12.87	0.01	0.01	2005.00	*	LCV DAPHNIDS
	4	10	2	11.44	12.87	0.00	0.00	4467.00		EC20 POPULATION
SELENIUM	1	260	106	11.60	29.50	4.46	11.35	2.60		SS EC20
	1	260	106	11.60	29.50	0.46	1.18	25.00		LTV EC20 DAPHNID
	1	260	106	11.60	29.50	0.33	0.84	35.00		NAWQ ACTUAL
	1	260	106	11.60	29.50	0.29	0.74	40.00		LTV EC20 FISH
	1	260	106	11.60	29.50	0.13	0.33	88.32		LCV FISH
	1	260	106	11.60	29.50	0.13	0.32	91.65		LCV DAPHNIDS
	2	26	2	5.86	6.72	2.25	2.58	2.60		SS EC20
	2	26	2	5.86	6.72	0.23	0.27	25.00		LTV EC20 DAPHNID
	2	26	2	5.86	6.72	0.17	0.19	35.00		NAWQ ACTUAL
	2	26	2	5.86	6.72	0.15	0.17	40.00		LTV EC20 FISH
	2	26	2	5.86	6.72	0.07	0.08	88.32		LCV FISH
	2	26	2	5.86	6.72	0.06	0.07	91.65		LCV DAPHNIDS
	3	571	2	8.55	14.76	3.29	5.68	2.60		SS EC20
	3	571	2	8.55	14.76	0.34	0.59	25.00		LTV EC20 DAPHNID
	3	571	2	8.55	14.76	0.24	0.42	35.00		NAWQ ACTUAL
	3	571	2	8.55	14.76	0.21	0.37	40.00		LTV EC20 FISH
	3	571	2	8.55	14.76	0.10	0.17	88.32		LCV FISH
	3	571	2	8.55	14.76	0.09	0.16	91.65		LCV DAPHNIDS
SILVER	3	570	6	9.17	10.88	76.41	90.70	0.12		LCV FISH
	3	570	6	9.17	10.88	65.50	77.75	0.14		SS EC20
	3	570	6	9.17	10.88	45.85	54.42	0.20		LTV EC20 FISH
	3	570	6	9.17	10.88	36.68	43.54	0.25		NAWQ ADVISORY
	3	570	6	9.17	10.88	28.66	34.01	0.32		EC20 POPULATION
	3	570	6	9.17	10.88	16.37	19.44	0.56	<	LTV EC20 DAPHNID
	3	570	6	9.17	10.88	3.53	4.19	2.60		LCV DAPHNIDS

Table F3 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Mean[a] water concentration	UCL[b] water concentration	Mean quotient	UCL quotient	Benchmark	Flag	Benchmark type
SODIUM	1	106	8	2836.41	4996.87	0.03	0.06	85049.00	*	LCV DAPHNIDS
	2	25	25	9143.96	14000.00	0.11	0.16	85049.00	*	LCV DAPHNIDS
	3	49	49	8215.83	13000.00	0.10	0.15	85049.00	*	LCV DAPHNIDS
	4	32	32	4317.29	4454.58	0.05	0.05	85049.00	*	LCV DAPHNIDS
	13	8	8	4265.00	4265.00	0.05	0.05	85049.00	*	LCV DAPHNIDS
TOLUENE	2	41	2	4.86	5.00	0.47	0.48	10.40		NAWQ ADVISORY
	2	41	2	4.86	5.00	0.19	0.19	26.00	<	LTV EC20 FISH
	2	41	2	4.86	5.00	0.02	0.02	200.00		EC20 POPULATION
	2	41	2	4.86	5.00	0.00	0.00	1269.00	*	LCV FISH
	2	41	2	4.86	5.00	0.00	0.00	25229.00	*	LCV DAPHNIDS
	3	705	26	4.95	5.00	0.48	0.48	10.40		NAWQ ADVISORY
	3	705	26	4.95	5.00	0.19	0.19	26.00	<	LTV EC20 FISH
	3	705	26	4.95	5.00	0.02	0.02	200.00		EC20 POPULATION
	3	705	26	4.95	5.00	0.00	0.00	1269.00	*	LCV FISH
	3	705	26	4.95	5.00	0.00	0.00	25229.00	*	LCV DAPHNIDS
URANIUM	2	46	11	0.75	0.84	107.73	120.23	0.01		NAWQ ADVISORY
	2	46	11	0.75	0.84	0.03	0.03	27.00		EC20 POPULATION
	2	46	11	0.75	0.84	0.01	0.01	142.00	*	LCV FISH
	2	46	11	0.75	0.84	0.00	0.00	455.00	*	LTV EC20 FISH
	3	72	65	1.94	2.53	277.78	361.11	0.01		NAWQ ADVISORY
	3	72	65	1.94	2.53	0.07	0.09	27.00		EC20 POPULATION
	3	72	65	1.94	2.53	0.01	0.02	142.00	*	LCV FISH
	3	72	65	1.94	2.53	0.00	0.01	455.00	*	LTV EC20 FISH
	4	58	22	0.51	0.67	72.77	95.24	0.01		NAWQ ADVISORY
	4	58	22	0.51	0.67	0.02	0.02	27.00		EC20 POPULATION
	4	58	22	0.51	0.67	0.00	0.00	142.00	*	LCV FISH
	4	58	22	0.51	0.67	0.00	0.00	455.00	*	LTV EC20 FISH
VANADIUM	1	64	12	2.47	2.47	0.82	0.82	3.00		NAWQ ADVISORY
	1	64	12	2.47	2.47	0.08	0.08	32.00		EC20 POPULATION
	1	64	12	2.47	2.47	0.06	0.06	41.00		LTV EC20 FISH
	1	64	12	2.47	2.47	0.03	0.03	80.00		LCV FISH
	1	64	12	2.47	2.47	0.01	0.01	430.00		LTV EC20 DAPHNID
	1	64	12	2.47	2.47	0.00	0.00	940.00	>	LCV DAPHNIDS
VINYL CHLORIDE	3	704	144	9.34	10.00	9.84	10.53	0.95		NAWQ ADVISORY
	3	704	144	9.34	10.00	0.00	0.00	14520.00	*	LTV EC20 FISH
	3	704	144	9.34	10.00	0.00	0.00	28879.00	*	LCV FISH
XYLENE	2	32	1	4.75	4.75	3.25	3.25	1.46		NAWQ ADVISORY
	2	32	1	4.75	4.75	0.00	0.00	2680.00		LTV EC20 FISH
	2	32	1	4.75	4.75	0.00	0.00	62308.00	*	LCV FISH

Table F.3 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Mean[a] water concentration	UCL[b] water concentration	Mean quotient	UCL quotient	Benchmark	Flag	Benchmark type
ZINC	1	211	119	11.47	16.80	0.55	0.80	21.00		SS EC20
	1	211	119	11.47	16.80	0.31	0.46	36.41		LCV FISH
	1	211	119	11.47	16.80	0.25	0.36	46.73		LCV DAPHNIDS
	1	211	119	11.47	16.80	0.24	0.36	47.00		LTV EC20 FISH
	1	211	119	11.47	16.80	0.14	0.21	80.00		EC20 POPULATION
	1	211	119	11.47	16.80	0.10	0.15	110.00		NAWQ ACTUAL
	2	24	15	10.61	10.61	0.51	0.51	21.00		SS EC20
	2	24	15	10.61	10.61	0.29	0.29	36.41		LCV FISH
	2	24	15	10.61	10.61	0.23	0.23	46.73		LCV DAPHNIDS
	2	24	15	10.61	10.61	0.23	0.23	47.00		LTV EC20 FISH
	2	24	15	10.61	10.61	0.13	0.13	80.00		EC20 POPULATION
	2	24	15	10.61	10.61	0.10	0.10	110.00		NAWQ ACTUAL
	3	707	235	27.62	35.23	1.32	1.68	21.00		SS EC20
	3	707	235	27.62	35.23	0.76	0.97	36.41		LCV FISH
	3	707	235	27.62	35.23	0.59	0.75	46.73		LCV DAPHNIDS
	3	707	235	27.62	35.23	0.59	0.75	47.00		LTV EC20 FISH
	3	707	235	27.62	35.23	0.35	0.44	80.00		EC20 POPULATION
	3	707	235	27.62	35.23	0.25	0.32	110.00		NAWQ ACTUAL
	4	32	20	7.32	8.12	0.35	0.39	21.00		SS EC20
	4	32	20	7.32	8.12	0.20	0.22	36.41		LCV FISH
	4	32	20	7.32	8.12	0.16	0.17	46.73		LCV DAPHNIDS
	4	32	20	7.32	8.12	0.16	0.17	47.00		LTV EC20 FISH
	4	32	20	7.32	8.12	0.09	0.10	80.00		EC20 POPULATION
	4	32	20	7.32	8.12	0.07	0.07	110.00		NAWQ ACTUAL
	13	8	5	6.01	6.01	0.29	0.29	21.00		SS EC20
	13	8	5	6.01	6.01	0.17	0.17	36.41		LCV FISH
	13	8	5	6.01	6.01	0.13	0.13	46.73		LCV DAPHNIDS
	13	8	5	6.01	6.01	0.13	0.13	47.00		LTV EC20 FISH
	13	8	5	6.01	6.01	0.08	0.08	80.00		EC20 POPULATION
	13	8	5	6.01	6.01	0.05	0.05	110.00		NAWQ ACTUAL
ZIRCONIUM	1	106	28	11.98	20.00	56.23	93.90	0.21		NAWQ ADVISORY
	1	106	28	11.98	20.00	0.05	0.08	251.00		EC20 POPULATION
	1	106	28	11.98	20.00	0.02	0.04	548.00	*	LCV FISH
	1	106	28	11.98	20.00	0.00	0.01	2396.00	*	LTV EC20 FISH

[a]In cases of mixed detects and nondetects, statistics are calculated using all values, "as is." The mean concentration is the geometric mean.
[b]UCL concentration was compared with the maximum value, and the smaller has been used as the "UCL concentration."

Table F.4. Limits of detection of chemicals not detected in NPDES water samples (ug/L), toxicological benchmarks (ug/L), and quotients for aquatic life

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL* detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
1,1,1-TRICHLOROETHANE	2	41	0	4.844	5.053	3.46	3.61	1.40	NAWQ ADVISORY
	2	41	0	4.844	5.053	0.02	0.02	251.00	EC20 POPULATION
	2	41	0	4.844	5.053	0.00	0.00	1300.00	LTV EC20 DAPHNID
	2	41	0	4.844	5.053	0.00	0.00	1770.00	LCV DAPHNIDS
	2	41	0	4.844	5.053	0.00	0.00	2457.00	LTV EC20 FISH
	2	41	0	4.844	5.053	0.00	0.00	3493.00	LCV FISH
	4	10	0	5.000	5.000	3.57	3.57	1.40	NAWQ ADVISORY
	4	10	0	5.000	5.000	0.02	0.02	251.00	EC20 POPULATION
	4	10	0	5.000	5.000	0.00	0.00	1300.00	LTV EC20 DAPHNID
	4	10	0	5.000	5.000	0.00	0.00	1770.00	LCV DAPHNIDS
	4	10	0	5.000	5.000	0.00	0.00	2457.00	LTV EC20 FISH
	4	10	0	5.000	5.000	0.00	0.00	3493.00	LCV FISH
	13	2	0	5.000	5.000	3.57	3.57	1.40	NAWQ ADVISORY
	13	2	0	5.000	5.000	0.02	0.02	251.00	EC20 POPULATION
	13	2	0	5.000	5.000	0.00	0.00	1300.00	LTV EC20 DAPHNID
	13	2	0	5.000	5.000	0.00	0.00	1770.00	LCV DAPHNIDS
	13	2	0	5.000	5.000	0.00	0.00	2457.00	LTV EC20 FISH
	13	2	0	5.000	5.000	0.00	0.00	3493.00	LCV FISH
1,1,2,2-TETRACHLOROETHANE	2	41	0	4.844	5.053	0.16	0.16	31.00	NAWQ ADVISORY
	2	41	0	4.844	5.053	0.01	0.01	420.00	LTV EC20 DAPHNID
	2	41	0	4.844	5.053	0.00	0.00	1400.00	LTV EC20 FISH
	2	41	0	4.844	5.053	0.00	0.00	1585.00	EC20 POPULATION
	2	41	0	4.844	5.053	0.00	0.00	2400.00	LCV FISH
	2	41	0	4.844	5.053	0.00	0.00	9900.00	LCV DAPHNIDS
	3	705	0	5.000	5.000	0.16	0.16	31.00	NAWQ ADVISORY
	3	705	0	5.000	5.000	0.01	0.01	420.00	LTV EC20 DAPHNID
	3	705	0	5.000	5.000	0.00	0.00	1400.00	LTV EC20 FISH
	3	705	0	5.000	5.000	0.00	0.00	1585.00	EC20 POPULATION
	3	705	0	5.000	5.000	0.00	0.00	2400.00	LCV FISH
	3	705	0	5.000	5.000	0.00	0.00	9900.00	LCV DAPHNIDS
	4	10	0	5.000	5.000	0.16	0.16	31.00	NAWQ ADVISORY
	4	10	0	5.000	5.000	0.01	0.01	420.00	LTV EC20 DAPHNID
	4	10	0	5.000	5.000	0.00	0.00	1400.00	LTV EC20 FISH
	4	10	0	5.000	5.000	0.00	0.00	1585.00	EC20 POPULATION
	4	10	0	5.000	5.000	0.00	0.00	2400.00	LCV FISH
	4	10	0	5.000	5.000	0.00	0.00	9900.00	LCV DAPHNIDS
	13	2	0	5.000	5.000	0.16	0.16	31.00	NAWQ ADVISORY
	13	2	0	5.000	5.000	0.01	0.01	420.00	LTV EC20 DAPHNID
	13	2	0	5.000	5.000	0.00	0.00	1400.00	LTV EC20 FISH
	13	2	0	5.000	5.000	0.00	0.00	1585.00	EC20 POPULATION
	13	2	0	5.000	5.000	0.00	0.00	2400.00	LCV FISH
	13	2	0	5.000	5.000	0.00	0.00	9900.00	LCV DAPHNIDS

Table F.4 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
1,1,2-TRICHLOROETHANE	2	41	0	4.844	5.053	0.05	0.05	92.00	NAWQ ADVISORY
	2	41	0	4.844	5.053	0.00	0.00	9400.00	LCV FISH
	2	41	0	4.844	5.053	0.00	0.00	13000.00	LTV EC20 DAPHNID
	2	41	0	4.844	5.053	0.00	0.00	14800.00	LTV EC20 FISH
	2	41	0	4.844	5.053	0.00	0.00	15849.00	EC20 POPULATION
	2	41	0	4.844	5.053	0.00	0.00	18400.00	LCV DAPHNIDS
	3	705	0	5.000	5.000	0.05	0.05	92.00	NAWQ ADVISORY
	3	705	0	5.000	5.000	0.00	0.00	9400.00	LCV FISH
	3	705	0	5.000	5.000	0.00	0.00	13000.00	LTV EC20 DAPHNID
	3	705	0	5.000	5.000	0.00	0.00	14800.00	LTV EC20 FISH
	3	705	0	5.000	5.000	0.00	0.00	15849.00	EC20 POPULATION
	3	705	0	5.000	5.000	0.00	0.00	18400.00	LCV DAPHNIDS
	4	10	0	5.000	5.000	0.05	0.05	92.00	NAWQ ADVISORY
	4	10	0	5.000	5.000	0.00	0.00	9400.00	LCV FISH
	4	10	0	5.000	5.000	0.00	0.00	13000.00	LTV EC20 DAPHNID
	4	10	0	5.000	5.000	0.00	0.00	14800.00	LTV EC20 FISH
	4	10	0	5.000	5.000	0.00	0.00	15849.00	EC20 POPULATION
	4	10	0	5.000	5.000	0.00	0.00	18400.00	LCV DAPHNIDS
	13	2	0	5.000	5.000	0.05	0.05	92.00	NAWQ ADVISORY
	13	2	0	5.000	5.000	0.00	0.00	9400.00	LCV FISH
	13	2	0	5.000	5.000	0.00	0.00	13000.00	LTV EC20 DAPHNID
	13	2	0	5.000	5.000	0.00	0.00	14800.00	LTV EC20 FISH
	13	2	0	5.000	5.000	0.00	0.00	15849.00	EC20 POPULATION
	13	2	0	5.000	5.000	0.00	0.00	18400.00	LCV DAPHNIDS
1,1-DICHLOROETHANE	2	41	0	4.844	5.053	9.50	9.91	0.51	NAWQ ADVISORY
	2	41	0	4.844	5.053	0.00	0.00	1585.00	EC20 POPULATION
	2	41	0	4.844	5.053	0.00	0.00	8219.00	LTV EC20 FISH
	2	41	0	4.844	5.053	0.00	0.00	14680.00	LCV FISH
	4	10	0	5.000	5.000	9.80	9.80	0.51	NAWQ ADVISORY
	4	10	0	5.000	5.000	0.00	0.00	1585.00	EC20 POPULATION
	4	10	0	5.000	5.000	0.00	0.00	8219.00	LTV EC20 FISH
	4	10	0	5.000	5.000	0.00	0.00	14680.00	LCV FISH
	13	2	0	5.000	5.000	9.80	9.80	0.51	NAWQ ADVISORY
	13	2	0	5.000	5.000	0.00	0.00	1585.00	EC20 POPULATION
	13	2	0	5.000	5.000	0.00	0.00	8219.00	LTV EC20 FISH
	13	2	0	5.000	5.000	0.00	0.00	14680.00	LCV FISH

Table F.4 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
1,2-DICHLOROETHANE	2	41	0	4.844	5.053	0.03	0.04	144.00	NAWQ ADVISORY
	2	41	0	4.844	5.053	0.00	0.00	1259.00	EC20 POPULATION
	2	41	0	4.844	5.053	0.00	0.00	11000.00	LTV EC20 DAPHNID
	2	41	0	4.844	5.053	0.00	0.00	15200.00	LCV DAPHNIDS
	2	41	0	4.844	5.053	0.00	0.00	29000.00	LTV EC20 FISH
	2	41	0	4.844	5.053	0.00	0.00	41364.00	LCV FISH
	4	10	0	5.000	5.000	0.03	0.03	144.00	NAWQ ADVISORY
	4	10	0	5.000	5.000	0.00	0.00	1259.00	EC20 POPULATION
	4	10	0	5.000	5.000	0.00	0.00	11000.00	LTV EC20 DAPHNID
	4	10	0	5.000	5.000	0.00	0.00	15200.00	LCV DAPHNIDS
	4	10	0	5.000	5.000	0.00	0.00	29000.00	LTV EC20 FISH
	4	10	0	5.000	5.000	0.00	0.00	41364.00	LCV FISH
	13	2	0	5.000	5.000	0.03	0.03	144.00	NAWQ ADVISORY
	13	2	0	5.000	5.000	0.00	0.00	1259.00	EC20 POPULATION
	13	2	0	5.000	5.000	0.00	0.00	11000.00	LTV EC20 DAPHNID
	13	2	0	5.000	5.000	0.00	0.00	15200.00	LCV DAPHNIDS
	13	2	0	5.000	5.000	0.00	0.00	29000.00	LTV EC20 FISH
	13	2	0	5.000	5.000	0.00	0.00	41364.00	LCV FISH
2-HEXANONE	2	32	0	9.687	9.687	8.81	8.81	1.10	NAWQ ADVISORY
	2	32	0	9.687	9.687	0.01	0.01	1259.00	EC20 POPULATION
	2	32	0	9.687	9.687	0.00	0.00	16155.00	LTV EC20 FISH
	2	32	0	9.687	9.687	0.00	0.00	32783.00	LCV FISH
	3	2	0	10.000	10.000	9.09	9.09	1.10	NAWQ ADVISORY
	3	2	0	10.000	10.000	0.01	0.01	1259.00	EC20 POPULATION
	3	2	0	10.000	10.000	0.00	0.00	16155.00	LTV EC20 FISH
	3	2	0	10.000	10.000	0.00	0.00	32783.00	LCV FISH
2-METHYLPHENOL	3	1	0	10.000	10.000	1.30	1.30	7.70	NAWQ ADVISORY
	3	1	0	10.000	10.000	0.14	0.14	74.00	EC20 POPULATION
	3	1	0	10.000	10.000	0.02	0.02	470.00	LTV EC20 FISH
	3	1	0	10.000	10.000	0.02	0.02	489.00	LCV FISH
	3	1	0	10.000	10.000	0.01	0.01	1316.00	LCV DAPHNIDS
2-NITROPHENOL	2	8	0	10.000	10.000	0.07	0.07	150.00	NAWQ ACTUAL
	3	179	0	10.000	10.148	0.07	0.07	150.00	NAWQ ACTUAL
	4	10	0	10.000	10.000	0.07	0.07	150.00	NAWQ ACTUAL
	13	2	0	10.000	10.000	0.07	0.07	150.00	NAWQ ACTUAL
4,4'-DDD	3	1	0	0.100	0.100	238.10	238.10	0.00	NAWQ ADVISORY
	3	1	0	0.100	0.100	0.16	0.16	0.61	EC20 POPULATION
	3	1	0	0.100	0.100	0.06	0.06	1.69	LCV FISH
	3	1	0	0.100	0.100	0.03	0.03	3.99	LTV EC20 FISH

Table F.4 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL* detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
4,4'-DDE	3	1	0	0.100	0.100	12.50	12.50	0.01	SS EC20
	3	1	0	0.100	0.100	6.25	6.25	0.02	LCV DAPHNIDS
	3	1	0	0.100	0.100	5.00	5.00	0.02	NAWQ ADVISORY
	3	1	0	0.100	0.100	0.29	0.29	0.35	LTV EC20 FISH
	3	1	0	0.100	0.100	0.14	0.14	0.73	LCV FISH
4,4'-DDT	3	1	0	0.100	0.100	12.50	12.50	0.01	SS EC20
	3	1	0	0.100	0.100	6.25	6.25	0.02	LCV DAPHNIDS
	3	1	0	0.100	0.100	5.00	5.00	0.02	NAWQ ADVISORY
	3	1	0	0.100	0.100	0.29	0.29	0.35	LTV EC20 FISH
	3	1	0	0.100	0.100	0.14	0.14	0.73	LCV FISH
4-METHYL-2-PENTANONE	2	32	0	9.687	9.687	4.21	4.21	2.30	NAWQ ADVISORY
	2	32	0	9.687	9.687	0.01	0.01	1585.00	EC20 POPULATION
	2	32	0	9.687	9.687	0.00	0.00	77400.00	LCV FISH
	3	2	0	10.000	10.000	4.35	4.35	2.30	NAWQ ADVISORY
	3	2	0	10.000	10.000	0.01	0.01	1585.00	EC20 POPULATION
	3	2	0	10.000	10.000	0.00	0.00	77400.00	LCV FISH
ACENAPHTHENE	2	8	0	10.000	10.000	4.55	4.55	2.20	NAWQ ADVISORY
	2	8	0	10.000	10.000	0.05	0.05	197.00	LTV EC20 FISH
	2	8	0	10.000	10.000	0.02	0.02	413.00	LCV FISH
	2	8	0	10.000	10.000	0.00	0.00	6646.00	LCV DAPHNIDS
	3	179	0	10.000	10.148	4.55	4.61	2.20	NAWQ ADVISORY
	3	179	0	10.000	10.148	0.05	0.05	197.00	LTV EC20 FISH
	3	179	0	10.000	10.148	0.02	0.02	413.00	LCV FISH
	3	179	0	10.000	10.148	0.00	0.00	6646.00	LCV DAPHNIDS
	4	10	0	10.000	10.000	4.55	4.55	2.20	NAWQ ADVISORY
	4	10	0	10.000	10.000	0.05	0.05	197.00	LTV EC20 FISH
	4	10	0	10.000	10.000	0.02	0.02	413.00	LCV FISH
	4	10	0	10.000	10.000	0.00	0.00	6646.00	LCV DAPHNIDS
	13	2	0	10.000	10.000	4.55	4.55	2.20	NAWQ ADVISORY
	13	2	0	10.000	10.000	0.05	0.05	197.00	LTV EC20 FISH
	13	2	0	10.000	10.000	0.02	0.02	413.00	LCV FISH
	13	2	0	10.000	10.000	0.00	0.00	6646.00	LCV DAPHNIDS
ACETONE	3	4	0	10.000	10.000	0.01	0.01	770.00	NAWQ ADVISORY
	3	4	0	10.000	10.000	0.00	0.00	23714.00	EC20 POPULATION
	3	4	0	10.000	10.000	0.00	0.00	161867.00	LTV EC20 FISH
	3	4	0	10.000	10.000	0.00	0.00	507640.00	LCV FISH
	3	4	0	10.000	10.000	0.00	0.00	3114182.00	LCV DAPHNIDS
ALDRIN	3	1	0	0.050	0.050	0.67	0.67	0.08	NAWQ ADVISORY

Table F.4 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
ANTHRACENE	2	8	0	10.000	10.000	1000000.00	1000000.00	0.00	NAWQ ADVISORY
	2	8	0	10.000	10.000	111.11	111.11	0.09	LCV FISH
	2	8	0	10.000	10.000	28.57	28.57	0.35	LTV EC20 FISH
	2	8	0	10.000	10.000	4.76	4.76	2.10	LCV DAPHNIDS
	2	8	0	10.000	10.000	1.22	1.22	8.20	LTV EC20 DAPHNID
	4	10	0	10.000	10.000	1000000.00	1000000.00	0.00	NAWQ ADVISORY
	4	10	0	10.000	10.000	111.11	111.11	0.09	LCV FISH
	4	10	0	10.000	10.000	28.57	28.57	0.35	LTV EC20 FISH
	4	10	0	10.000	10.000	4.76	4.76	2.10	LCV DAPHNIDS
	4	10	0	10.000	10.000	1.22	1.22	8.20	LTV EC20 DAPHNID
	13	2	0	10.000	10.000	1000000.00	1000000.00	0.00	NAWQ ADVISORY
	13	2	0	10.000	10.000	111.11	111.11	0.09	LCV FISH
	13	2	0	10.000	10.000	28.57	28.57	0.35	LTV EC20 FISH
	13	2	0	10.000	10.000	4.76	4.76	2.10	LCV DAPHNIDS
	13	2	0	10.000	10.000	1.22	1.22	8.20	LTV EC20 DAPHNID
ANTIMONY	2	2	0	50.000	50.000	2.78	2.78	18.00	NAWQ ADVISORY
	2	2	0	50.000	50.000	0.63	0.63	79.00	EC20 POPULATION
	2	2	0	50.000	50.000	0.03	0.03	1600.00	LCV FISH
	2	2	0	50.000	50.000	0.03	0.03	1900.00	LTV EC20 DAPHNID
	2	2	0	50.000	50.000	0.02	0.02	2310.00	LTV EC20 FISH
	2	2	0	50.000	50.000	0.01	0.01	5400.00	LCV DAPHNIDS
	3	194	0	50.000	57.077	2.78	3.17	18.00	NAWQ ADVISORY
	3	194	0	50.000	57.077	0.63	0.72	79.00	EC20 POPULATION
	3	194	0	50.000	57.077	0.03	0.04	1600.00	LCV FISH
	3	194	0	50.000	57.077	0.03	0.03	1900.00	LTV EC20 DAPHNID
	3	194	0	50.000	57.077	0.02	0.02	2310.00	LTV EC20 FISH
	3	194	0	50.000	57.077	0.01	0.01	5400.00	LCV DAPHNIDS
	4	1	0	50.000	50.000	2.78	2.78	18.00	NAWQ ADVISORY
	4	1	0	50.000	50.000	0.63	0.63	79.00	EC20 POPULATION
	4	1	0	50.000	50.000	0.03	0.03	1600.00	LCV FISH
	4	1	0	50.000	50.000	0.03	0.03	1900.00	LTV EC20 DAPHNID
	4	1	0	50.000	50.000	0.02	0.02	2310.00	LTV EC20 FISH
	4	1	0	50.000	50.000	0.01	0.01	5400.00	LCV DAPHNIDS
AROCLOR-1221	3	210	0	0.500	0.501	172.41	172.91	0.00	NAWQ ADVISORY
	3	210	0	0.500	0.501	0.05	0.05	10.00	EC20 POPULATION
	3	210	0	0.500	0.501	0.01	0.01	60.00	LCV FISH
	3	210	0	0.500	0.501	0.01	0.01	80.00	LTV EC20 FISH
	4	1	0	0.500	0.500	172.41	172.41	0.00	NAWQ ADVISORY
	4	1	0	0.500	0.500	0.05	0.05	10.00	EC20 POPULATION
	4	1	0	0.500	0.500	0.01	0.01	60.00	LCV FISH
	4	1	0	0.500	0.500	0.01	0.01	80.00	LTV EC20 FISH

Table F.4 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
AROCLOR-1232	3	210	0	0.500	0.501	86.21	86.46	0.01	NAWQ ADVISORY
	3	210	0	0.500	0.501	0.03	0.03	16.00	EC20 POPULATION
	3	210	0	0.500	0.501	0.00	0.00	124.00	LCV FISH
	3	210	0	0.500	0.501	0.00	0.00	148.00	LTV EC20 FISH
	4	1	0	0.500	0.500	86.21	86.21	0.01	NAWQ ADVISORY
	4	1	0	0.500	0.500	0.03	0.03	16.00	EC20 POPULATION
	4	1	0	0.500	0.500	0.00	0.00	124.00	LCV FISH
	4	1	0	0.500	0.500	0.00	0.00	148.00	LTV EC20 FISH
AROCLOR-1242	3	210	0	0.500	0.501	50.00	50.14	0.01	NAWQ ADVISORY
	3	210	0	0.500	0.501	0.32	0.32	1.58	EC20 POPULATION
	3	210	0	0.500	0.501	0.17	0.17	2.90	LTV EC20 FISH
	3	210	0	0.500	0.501	0.06	0.06	9.00	LCV FISH
	4	1	0	0.500	0.500	50.00	50.00	0.01	NAWQ ADVISORY
	4	1	0	0.500	0.500	0.32	0.32	1.58	EC20 POPULATION
	4	1	0	0.500	0.500	0.17	0.17	2.90	LTV EC20 FISH
	4	1	0	0.500	0.500	0.06	0.06	9.00	LCV FISH
AROCLOR-1248	3	210	0	0.500	0.501	2500.00	2507.23	0.00	NAWQ ADVISORY
	3	210	0	0.500	0.501	2.50	2.51	0.20	LCV FISH
	3	210	0	0.500	0.501	1.25	1.25	0.40	LTV EC20 FISH
	3	210	0	0.500	0.501	0.40	0.40	1.26	EC20 POPULATION
	3	210	0	0.500	0.501	0.20	0.20	2.50	LTV EC20 DAPHNID
	3	210	0	0.500	0.501	0.12	0.12	4.30	LCV DAPHNIDS
	4	1	0	0.500	0.500	2500.00	2500.00	0.00	NAWQ ADVISORY
	4	1	0	0.500	0.500	2.50	2.50	0.20	LCV FISH
	4	1	0	0.500	0.500	1.25	1.25	0.40	LTV EC20 FISH
	4	1	0	0.500	0.500	0.40	0.40	1.26	EC20 POPULATION
	4	1	0	0.500	0.500	0.20	0.20	2.50	LTV EC20 DAPHNID
	4	1	0	0.500	0.500	0.12	0.12	4.30	LCV DAPHNIDS
AROCLOR-1254	4	1	0	1.000	1.000	50.00	50.00	0.02	NAWQ ADVISORY
	4	1	0	1.000	1.000	1.92	1.92	0.52	LTV EC20 FISH
	4	1	0	1.000	1.000	1.59	1.59	0.63	EC20 POPULATION
	4	1	0	1.000	1.000	1.00	1.00	1.00	LCV FISH
	4	1	0	1.000	1.000	0.83	0.83	1.20	LTV EC20 DAPHNID
	4	1	0	1.000	1.000	0.48	0.48	2.10	LCV DAPHNIDS

Table F.4 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
AROCLOR-1260	3	210	0	1.000	1.003	9.09	9.12	0.11	NAWQ ADVISORY
	3	210	0	1.000	1.003	0.48	0.48	2.10	LTV EC20 FISH
	3	210	0	1.000	1.003	0.43	0.44	2.30	LCV FISH
	3	210	0	1.000	1.003	0.00	0.00	316.00	EC20 POPULATION
	4	1	0	1.000	1.000	9.09	9.09	0.11	NAWQ ADVISORY
	4	1	0	1.000	1.000	0.48	0.48	2.10	LTV EC20 FISH
	4	1	0	1.000	1.000	0.43	0.43	2.30	LCV FISH
	4	1	0	1.000	1.000	0.00	0.00	316.00	EC20 POPULATION
ARSENIC	2	24	0	5.000	5.000	0.09	0.09	55.00	SS EC20
	2	24	0	5.000	5.000	0.03	0.03	190.00	NAWQ ACTUAL
	2	24	0	5.000	5.000	0.01	0.01	633.00	LTV EC20 DAPHNID
	2	24	0	5.000	5.000	0.01	0.01	914.10	LCV DAPHNIDS
	2	24	0	5.000	5.000	0.00	0.00	1995.00	EC20 POPULATION
	2	24	0	5.000	5.000	0.00	0.00	2130.00	LTV EC20 FISH
	2	24	0	5.000	5.000	0.00	0.00	2962.00	LCV FISH
	4	32	0	5.000	5.000	0.09	0.09	55.00	SS EC20
	4	32	0	5.000	5.000	0.03	0.03	190.00	NAWQ ACTUAL
	4	32	0	5.000	5.000	0.01	0.01	633.00	LTV EC20 DAPHNID
	4	32	0	5.000	5.000	0.01	0.01	914.10	LCV DAPHNIDS
	4	32	0	5.000	5.000	0.00	0.00	1995.00	EC20 POPULATION
	4	32	0	5.000	5.000	0.00	0.00	2130.00	LTV EC20 FISH
	4	32	0	5.000	5.000	0.00	0.00	2962.00	LCV FISH
	13	8	0	5.000	5.000	0.09	0.09	55.00	SS EC20
	13	8	0	5.000	5.000	0.03	0.03	190.00	NAWQ ACTUAL
	13	8	0	5.000	5.000	0.01	0.01	633.00	LTV EC20 DAPHNID
	13	8	0	5.000	5.000	0.01	0.01	914.10	LCV DAPHNIDS
	13	8	0	5.000	5.000	0.00	0.00	1995.00	EC20 POPULATION
	13	8	0	5.000	5.000	0.00	0.00	2130.00	LTV EC20 FISH
	13	8	0	5.000	5.000	0.00	0.00	2962.00	LCV FISH
BENZENE	2	41	0	4.844	5.053	1.51	1.58	3.20	NAWQ ADVISORY
	2	41	0	4.844	5.053	0.23	0.24	21.00	LTV EC20 FISH
	2	41	0	4.844	5.053	0.02	0.02	229.00	EC20 POPULATION
	2	41	0	4.844	5.053	0.02	0.02	299.00	LCV FISH
	2	41	0	4.844	5.053	0.00	0.00	98000.00	LCV DAPHNIDS
	4	10	0	5.000	5.000	1.56	1.56	3.20	NAWQ ADVISORY
	4	10	0	5.000	5.000	0.24	0.24	21.00	LTV EC20 FISH
	4	10	0	5.000	5.000	0.02	0.02	229.00	EC20 POPULATION
	4	10	0	5.000	5.000	0.02	0.02	299.00	LCV FISH
	4	10	0	5.000	5.000	0.00	0.00	98000.00	LCV DAPHNIDS

Table F.4 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
BENZENE (continued)	13	2	0	5.000	5.000	1.56	1.56	3.20	NAWQ ADVISORY
	13	2	0	5.000	5.000	0.24	0.24	21.00	LTV EC20 FISH
	13	2	0	5.000	5.000	0.02	0.02	229.00	EC20 POPULATION
	13	2	0	5.000	5.000	0.02	0.02	299.00	LCV FISH
	13	2	0	5.000	5.000	0.00	0.00	98000.00	LCV DAPHNIDS
BENZO(A)ANTHRACENE	2	8	0	10.000	10.000	3703.70	3703.70	0.00	NAWQ ADVISORY
	2	8	0	10.000	10.000	15.38	15.38	0.65	LCV DAPHNIDS
	4	10	0	10.000	10.000	3703.70	3703.70	0.00	NAWQ ADVISORY
	4	10	0	10.000	10.000	15.38	15.38	0.65	LCV DAPHNIDS
	13	2	0	10.000	10.000	3703.70	3703.70	0.00	NAWQ ADVISORY
	13	2	0	10.000	10.000	15.38	15.38	0.65	LCV DAPHNIDS
BENZO(A)PYRENE	2	8	0	10.000	10.000	7692.31	7692.31	0.00	NAWQ ADVISORY
	2	8	0	10.000	10.000	33.33	33.33	0.30	LCV DAPHNIDS
	2	8	0	10.000	10.000	3.34	3.34	2.99	LTV EC20 FISH
	3	179	0	10.000	10.148	7692.31	7805.96	0.00	NAWQ ADVISORY
	3	179	0	10.000	10.148	33.33	33.83	0.30	LCV DAPHNIDS
	3	179	0	10.000	10.148	3.34	3.39	2.99	LTV EC20 FISH
	4	10	0	10.000	10.000	7692.31	7692.31	0.00	NAWQ ADVISORY
	4	10	0	10.000	10.000	33.33	33.33	0.30	LCV DAPHNIDS
	4	10	0	10.000	10.000	3.34	3.34	2.99	LTV EC20 FISH
	13	2	0	10.000	10.000	7692.31	7692.31	0.00	NAWQ ADVISORY
	13	2	0	10.000	10.000	33.33	33.33	0.30	LCV DAPHNIDS
	13	2	0	10.000	10.000	3.34	3.34	2.99	LTV EC20 FISH
BENZOIC ACID	3	1	0	50.000	50.000	111.11	111.11	0.45	NAWQ ADVISORY
	3	1	0	50.000	50.000	0.04	0.04	1259.00	EC20 POPULATION
	3	1	0	50.000	50.000	0.01	0.01	7409.00	LTV EC20 FISH
	3	1	0	50.000	50.000	0.00	0.00	12976.00	LCV FISH
BENZYL ALCOHOL	3	1	0	10.000	10.000	68.03	68.03	0.15	NAWQ ADVISORY
	3	1	0	10.000	10.000	0.03	0.03	375.00	EC20 POPULATION
	3	1	0	10.000	10.000	0.02	0.02	550.00	LTV EC20 FISH
	3	1	0	10.000	10.000	0.02	0.02	589.00	LCV FISH

Table F.4 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
BERYLLIUM	2	2	0	0.200	0.885	0.33	1.45	0.61	NAWQ ADVISORY
	2	2	0	0.200	0.885	0.05	0.23	3.80	LTV EC20 DAPHNID
	2	2	0	0.200	0.885	0.04	0.17	5.30	LCV DAPHNIDS
	2	2	0	0.200	0.885	0.01	0.04	21.00	EC20 POPULATION
	2	2	0	0.200	0.885	0.00	0.02	57.00	LCV FISH
	2	2	0	0.200	0.885	0.00	0.01	148.00	LTV EC20 FISH
	4	1	0	0.300	0.300	0.49	0.49	0.61	NAWQ ADVISORY
	4	1	0	0.300	0.300	0.08	0.08	3.80	LTV EC20 DAPHNID
	4	1	0	0.300	0.300	0.06	0.06	5.30	LCV DAPHNIDS
	4	1	0	0.300	0.300	0.01	0.01	21.00	EC20 POPULATION
	4	1	0	0.300	0.300	0.01	0.01	57.00	LCV FISH
	4	1	0	0.300	0.300	0.00	0.00	148.00	LTV EC20 FISH
BIS(2-ETHYLHEXYL)PHTHALATE	2	8	0	10.000	10.000	1000.00	1000.00	0.01	NAWQ ADVISORY
	2	8	0	10.000	10.000	3.33	3.33	3.00	LCV DAPHNIDS
	2	8	0	10.000	10.000	3.33	3.33	3.00	LTV EC20 DAPHNID
	2	8	0	10.000	10.000	1.19	1.19	8.40	LCV FISH
	2	8	0	10.000	10.000	0.20	0.20	50.00	EC20 POPULATION
	2	8	0	10.000	10.000	0.19	0.19	54.00	LTV EC20 FISH
	4	10	0	10.000	10.000	1000.00	1000.00	0.01	NAWQ ADVISORY
	4	10	0	10.000	10.000	3.33	3.33	3.00	LCV DAPHNIDS
	4	10	0	10.000	10.000	3.33	3.33	3.00	LTV EC20 DAPHNID
	4	10	0	10.000	10.000	1.19	1.19	8.40	LCV FISH
	4	10	0	10.000	10.000	0.20	0.20	50.00	EC20 POPULATION
	4	10	0	10.000	10.000	0.19	0.19	54.00	LTV EC20 FISH
	13	2	0	10.000	10.000	1000.00	1000.00	0.01	NAWQ ADVISORY
	13	2	0	10.000	10.000	3.33	3.33	3.00	LCV DAPHNIDS
	13	2	0	10.000	10.000	3.33	3.33	3.00	LTV EC20 DAPHNID
	13	2	0	10.000	10.000	1.19	1.19	8.40	LCV FISH
	13	2	0	10.000	10.000	0.20	0.20	50.00	EC20 POPULATION
	13	2	0	10.000	10.000	0.19	0.19	54.00	LTV EC20 FISH
BORON	1	64	0	80.000	80.000	11.43	11.43	7.00	LTV EC20 DAPHNID
	2	2	0	4.000	524.836	0.57	74.98	7.00	LTV EC20 DAPHNID

Table F.4 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
CADMIUM	2	24	0	2.083	2.083	160.26	160.26	0.01	SS EC20
	2	24	0	2.083	2.083	13.89	13.89	0.15	LCV DAPHNIDS
	2	24	0	2.083	2.083	2.78	2.78	0.75	LTV EC20 DAPHNID
	2	24	0	2.083	2.083	1.89	1.89	1.10	NAWQ ACTUAL
	2	24	0	2.083	2.083	1.23	1.23	1.70	LCV FISH
	2	24	0	2.083	2.083	1.16	1.16	1.80	LTV EC20 FISH
	2	24	0	2.083	2.083	0.48	0.48	4.30	EC20 POPULATION
	4	32	0	2.000	2.000	153.85	153.85	0.01	SS EC20
	4	32	0	2.000	2.000	13.33	13.33	0.15	LCV DAPHNIDS
	4	32	0	2.000	2.000	2.67	2.67	0.75	LTV EC20 DAPHNID
	4	32	0	2.000	2.000	1.82	1.82	1.10	NAWQ ACTUAL
	4	32	0	2.000	2.000	1.18	1.18	1.70	LCV FISH
	4	32	0	2.000	2.000	1.11	1.11	1.80	LTV EC20 FISH
	4	32	0	2.000	2.000	0.47	0.47	4.30	EC20 POPULATION
	13	8	0	2.000	2.000	153.85	153.85	0.01	SS EC20
	13	8	0	2.000	2.000	13.33	13.33	0.15	LCV DAPHNIDS
	13	8	0	2.000	2.000	2.67	2.67	0.75	LTV EC20 DAPHNID
	13	8	0	2.000	2.000	1.82	1.82	1.10	NAWQ ACTUAL
	13	8	0	2.000	2.000	1.18	1.18	1.70	LCV FISH
	13	8	0	2.000	2.000	1.11	1.11	1.80	LTV EC20 FISH
	13	8	0	2.000	2.000	0.47	0.47	4.30	EC20 POPULATION
CARBON TETRACHLORIDE	2	41	0	4.844	5.053	0.08	0.08	63.00	NAWQ ADVISORY
	2	41	0	4.844	5.053	0.07	0.08	65.00	LTV EC20 FISH
	2	41	0	4.844	5.053	0.02	0.02	224.00	EC20 POPULATION
	2	41	0	4.844	5.053	0.00	0.00	3400.00	LCV FISH
	2	41	0	4.844	5.053	0.00	0.00	5580.00	LCV DAPHNIDS
	3	705	0	5.000	5.000	0.08	0.08	63.00	NAWQ ADVISORY
	3	705	0	5.000	5.000	0.08	0.08	65.00	LTV EC20 FISH
	3	705	0	5.000	5.000	0.02	0.02	224.00	EC20 POPULATION
	3	705	0	5.000	5.000	0.00	0.00	3400.00	LCV FISH
	3	705	0	5.000	5.000	0.00	0.00	5580.00	LCV DAPHNIDS
	4	10	0	5.000	5.000	0.08	0.08	63.00	NAWQ ADVISORY
	4	10	0	5.000	5.000	0.08	0.08	65.00	LTV EC20 FISH
	4	10	0	5.000	5.000	0.02	0.02	224.00	EC20 POPULATION
	4	10	0	5.000	5.000	0.00	0.00	3400.00	LCV FISH
	4	10	0	5.000	5.000	0.00	0.00	5580.00	LCV DAPHNIDS
	13	2	0	5.000	5.000	0.08	0.08	63.00	NAWQ ADVISORY
	13	2	0	5.000	5.000	0.08	0.08	65.00	LTV EC20 FISH
	13	2	0	5.000	5.000	0.02	0.02	224.00	EC20 POPULATION
	13	2	0	5.000	5.000	0.00	0.00	3400.00	LCV FISH
	13	2	0	5.000	5.000	0.00	0.00	5580.00	LCV DAPHNIDS

Table F.4 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
CHLORDANE	3	1	0	0.500	0.500	2.94	2.94	0.17	NAWQ ACTUAL
	3	1	0	0.500	0.500	2.00	2.00	0.25	LTV EC20 FISH
	3	1	0	0.500	0.500	1.00	1.00	0.50	SS EC20
	3	1	0	0.500	0.500	0.70	0.70	0.71	EC20 POPULATION
	3	1	0	0.500	0.500	0.31	0.31	1.60	LCV FISH
	3	1	0	0.500	0.500	0.04	0.04	12.10	LTV EC20 DAPHNID
	3	1	0	0.500	0.500	0.03	0.03	16.00	LCV DAPHNIDS
CHLOROBENZENE	2	41	0	4.844	5.053	0.42	0.44	11.60	NAWQ ADVISORY
	2	41	0	4.844	5.053	0.03	0.03	165.00	EC20 POPULATION
	2	41	0	4.844	5.053	0.00	0.01	1002.00	LTV EC20 FISH
	2	41	0	4.844	5.053	0.00	0.00	1203.00	LCV FISH
	2	41	0	4.844	5.053	0.00	0.00	15042.00	LCV DAPHNIDS
	4	10	0	5.000	5.000	0.43	0.43	11.60	NAWQ ADVISORY
	4	10	0	5.000	5.000	0.03	0.03	165.00	EC20 POPULATION
	4	10	0	5.000	5.000	0.00	0.00	1002.00	LTV EC20 FISH
	4	10	0	5.000	5.000	0.00	0.00	1203.00	LCV FISH
	4	10	0	5.000	5.000	0.00	0.00	15042.00	LCV DAPHNIDS
	13	2	0	5.000	5.000	0.43	0.43	11.60	NAWQ ADVISORY
	13	2	0	5.000	5.000	0.03	0.03	165.00	EC20 POPULATION
	13	2	0	5.000	5.000	0.00	0.00	1002.00	LTV EC20 FISH
	13	2	0	5.000	5.000	0.00	0.00	1203.00	LCV FISH
	13	2	0	5.000	5.000	0.00	0.00	15042.00	LCV DAPHNIDS
CHLOROFORM	4	10	0	5.000	5.000	0.36	0.36	14.00	NAWQ ADVISORY
	4	10	0	5.000	5.000	0.01	0.01	562.00	EC20 POPULATION
	4	10	0	5.000	5.000	0.00	0.00	3578.00	LCV FISH
	4	10	0	5.000	5.000	0.00	0.00	4483.00	LCV DAPHNIDS
	4	10	0	5.000	5.000	0.00	0.00	8400.00	LTV EC20 FISH
	13	2	0	5.000	5.000	0.36	0.36	14.00	NAWQ ADVISORY
	13	2	0	5.000	5.000	0.01	0.01	562.00	EC20 POPULATION
	13	2	0	5.000	5.000	0.00	0.00	3578.00	LCV FISH
	13	2	0	5.000	5.000	0.00	0.00	4483.00	LCV DAPHNIDS
	13	2	0	5.000	5.000	0.00	0.00	8400.00	LTV EC20 FISH
CHROMIUM	2	24	0	10.000	10.000	37.59	37.59	0.27	SS EC20
	2	24	0	10.000	10.000	20.00	20.00	0.50	LTV EC20 DAPHNID
	2	24	0	10.000	10.000	1.63	1.63	6.13	LCV DAPHNIDS
	2	24	0	10.000	10.000	0.91	0.91	11.00	NAWQ ACTUAL
	2	24	0	10.000	10.000	0.20	0.20	51.00	LTV EC20 FISH
	2	24	0	10.000	10.000	0.14	0.14	73.18	LCV FISH
	2	24	0	10.000	10.000	0.03	0.03	316.00	EC20 POPULATION

Table F.4 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
COBALT	1	64	0	4.000	4.000	13.79	13.79	0.29	NAWQ ADVISORY
	1	64	0	4.000	4.000	1.01	1.01	3.98	EC20 POPULATION
	1	64	0	4.000	4.000	0.91	0.91	4.40	LTV EC20 DAPHNID
	1	64	0	4.000	4.000	0.78	0.78	5.10	LCV DAPHNIDS
	1	64	0	4.000	4.000	0.01	0.01	290.00	LCV FISH
	1	64	0	4.000	4.000	0.00	0.00	810.00	LTV EC20 FISH
	2	2	0	4.000	10.853	13.79	37.42	0.29	NAWQ ADVISORY
	2	2	0	4.000	10.853	1.01	2.73	3.98	EC20 POPULATION
	2	2	0	4.000	10.853	0.91	2.47	4.40	LTV EC20 DAPHNID
	2	2	0	4.000	10.853	0.78	2.13	5.10	LCV DAPHNIDS
	2	2	0	4.000	10.853	0.01	0.04	290.00	LCV FISH
	2	2	0	4.000	10.853	0.00	0.01	810.00	LTV EC20 FISH
	3	192	0	5.000	115.367	17.24	397.82	0.29	NAWQ ADVISORY
	3	192	0	5.000	115.367	1.26	28.99	3.98	EC20 POPULATION
	3	192	0	5.000	115.367	1.14	26.22	4.40	LTV EC20 DAPHNID
	3	192	0	5.000	115.367	0.98	22.62	5.10	LCV DAPHNIDS
	3	192	0	5.000	115.367	0.02	0.40	290.00	LCV FISH
	3	192	0	5.000	115.367	0.01	0.14	810.00	LTV EC20 FISH
	4	1	0	5.000	5.000	17.24	17.24	0.29	NAWQ ADVISORY
	4	1	0	5.000	5.000	1.26	1.26	3.98	EC20 POPULATION
	4	1	0	5.000	5.000	1.14	1.14	4.40	LTV EC20 DAPHNID
	4	1	0	5.000	5.000	0.98	0.98	5.10	LCV DAPHNIDS
	4	1	0	5.000	5.000	0.02	0.02	290.00	LCV FISH
	4	1	0	5.000	5.000	0.01	0.01	810.00	LTV EC20 FISH
COPPER	13	8	0	4.000	4.000	19.51	19.51	0.20	LTV EC20 DAPHNID
	13	8	0	4.000	4.000	17.39	17.39	0.23	LCV DAPHNIDS
	13	8	0	4.000	4.000	15.38	15.38	0.26	SS EC20
	13	8	0	4.000	4.000	1.03	1.03	3.87	LCV FISH
	13	8	0	4.000	4.000	0.80	0.80	5.00	LTV EC20 FISH
	13	8	0	4.000	4.000	0.47	0.47	8.60	EC20 POPULATION
	13	8	0	4.000	4.000	0.33	0.33	12.00	NAWQ ACTUAL

Table F.4 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL* detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
DI-N-BUTYLPHTHALATE	2	8	0	10.000	10.000	2.27	2.27	4.40	NAWQ ADVISORY
	2	8	0	10.000	10.000	0.04	0.04	251.00	EC20 POPULATION
	2	8	0	10.000	10.000	0.04	0.04	270.00	LTV EC20 FISH
	2	8	0	10.000	10.000	0.02	0.02	500.00	LTV EC20 DAPHNID
	2	8	0	10.000	10.000	0.01	0.01	717.00	LCV FISH
	2	8	0	10.000	10.000	0.01	0.01	717.00	LCV DAPHNIDS
	4	10	0	10.000	10.000	2.27	2.27	4.40	NAWQ ADVISORY
	4	10	0	10.000	10.000	0.04	0.04	251.00	EC20 POPULATION
	4	10	0	10.000	10.000	0.04	0.04	270.00	LTV EC20 FISH
	4	10	0	10.000	10.000	0.02	0.02	500.00	LTV EC20 DAPHNID
	4	10	0	10.000	10.000	0.01	0.01	717.00	LCV FISH
	4	10	0	10.000	10.000	0.01	0.01	717.00	LCV DAPHNIDS
	13	2	0	10.000	10.000	2.27	2.27	4.40	NAWQ ADVISORY
	13	2	0	10.000	10.000	0.04	0.04	251.00	EC20 POPULATION
	13	2	0	10.000	10.000	0.04	0.04	270.00	LTV EC20 FISH
	13	2	0	10.000	10.000	0.02	0.02	500.00	LTV EC20 DAPHNID
	13	2	0	10.000	10.000	0.01	0.01	717.00	LCV FISH
	13	2	0	10.000	10.000	0.01	0.01	717.00	LCV DAPHNIDS
DI-N-OCTYLPHTHALATE	2	8	0	10.000	10.000	0.10	0.10	100.00	LTV EC20 FISH
	2	8	0	10.000	10.000	0.03	0.03	310.00	LTV EC20 DAPHNID
	2	8	0	10.000	10.000	0.02	0.02	570.00	LCV DAPHNIDS
	2	8	0	10.000	10.000	0.01	0.01	1995.00	EC20 POPULATION
	2	8	0	10.000	10.000	0.00	0.00	5700.00	LCV FISH
	3	179	0	10.000	10.148	0.10	0.10	100.00	LTV EC20 FISH
	3	179	0	10.000	10.148	0.03	0.03	310.00	LTV EC20 DAPHNID
	3	179	0	10.000	10.148	0.02	0.02	570.00	LCV DAPHNIDS
	3	179	0	10.000	10.148	0.01	0.01	1995.00	EC20 POPULATION
	3	179	0	10.000	10.148	0.00	0.00	5700.00	LCV FISH
	4	10	0	10.000	10.000	0.10	0.10	100.00	LTV EC20 FISH
	4	10	0	10.000	10.000	0.03	0.03	310.00	LTV EC20 DAPHNID
	4	10	0	10.000	10.000	0.02	0.02	570.00	LCV DAPHNIDS
	4	10	0	10.000	10.000	0.01	0.01	1995.00	EC20 POPULATION
	4	10	0	10.000	10.000	0.00	0.00	5700.00	LCV FISH
	13	2	0	10.000	10.000	0.10	0.10	100.00	LTV EC20 FISH
	13	2	0	10.000	10.000	0.03	0.03	310.00	LTV EC20 DAPHNID
	13	2	0	10.000	10.000	0.02	0.02	570.00	LCV DAPHNIDS
	13	2	0	10.000	10.000	0.01	0.01	1995.00	EC20 POPULATION
	13	2	0	10.000	10.000	0.00	0.00	5700.00	LCV FISH
DIBENZOFURAN	3	1	0	10.000	10.000	5.00	5.00	2.00	NAWQ ADVISORY
	3	1	0	10.000	10.000	0.01	0.01	1003.00	LCV DAPHNIDS

Table F.4 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
DIETHYLPHTHALATE	2	8	0	10.000	10.000	0.37	0.37	27.00	NAWQ ADVISORY
	2	8	0	10.000	10.000	0.01	0.01	1000.00	EC20 POPULATION
	4	10	0	10.000	10.000	0.37	0.37	27.00	NAWQ ADVISORY
	4	10	0	10.000	10.000	0.01	0.01	1000.00	EC20 POPULATION
	13	2	0	10.000	10.000	0.37	0.37	27.00	NAWQ ADVISORY
	13	2	0	10.000	10.000	0.01	0.01	1000.00	EC20 POPULATION
FLUORANTHENE	2	8	0	10.000	10.000	5.88	5.88	1.70	NAWQ ADVISORY
	2	8	0	10.000	10.000	0.31	0.31	32.00	EC20 POPULATION
	2	8	0	10.000	10.000	0.00	0.00	65795.00	LCV DAPHNIDS
	4	10	0	10.000	10.000	5.88	5.88	1.70	NAWQ ADVISORY
	4	10	0	10.000	10.000	0.31	0.31	32.00	EC20 POPULATION
	4	10	0	10.000	10.000	0.00	0.00	65795.00	LCV DAPHNIDS
	13	2	0	10.000	10.000	5.88	5.88	1.70	NAWQ ADVISORY
	13	2	0	10.000	10.000	0.31	0.31	32.00	EC20 POPULATION
	13	2	0	10.000	10.000	0.00	0.00	65795.00	LCV DAPHNIDS
GAMMA-BHC (LINDANE)	3	1	0	0.050	0.050	0.62	0.62	0.08	NAWQ ADVISORY
	3	1	0	0.050	0.050	0.45	0.45	0.11	SS EC20
	3	1	0	0.050	0.050	0.05	0.05	1.10	LTV EC20 FISH
	3	1	0	0.050	0.050	0.00	0.00	11.00	LTV EC20 DAPHNID
	3	1	0	0.050	0.050	0.00	0.00	14.50	LCV DAPHNIDS
	3	1	0	0.050	0.050	0.00	0.00	14.60	LCV FISH
HEPTACHLOR	3	1	0	0.050	0.050	12.50	12.50	0.00	SS EC20
	3	1	0	0.050	0.050	5.00	5.00	0.01	NAWQ ADVISORY
	3	1	0	0.050	0.050	0.50	0.50	0.10	EC20 POPULATION
	3	1	0	0.050	0.050	0.06	0.06	0.86	LTV EC20 FISH
	3	1	0	0.050	0.050	0.04	0.04	1.26	LCV FISH
	3	1	0	0.050	0.050	0.02	0.02	3.18	LCV DAPHNIDS
LEAD	4	32	0	4.000	4.000	11.43	11.43	0.35	SS EC20
	4	32	0	4.000	4.000	1.25	1.25	3.20	NAWQ ACTUAL
	4	32	0	4.000	4.000	0.33	0.33	12.26	LCV DAPHNIDS
	4	32	0	4.000	4.000	0.21	0.21	18.88	LCV FISH
	4	32	0	4.000	4.000	0.18	0.18	22.00	LTV EC20 FISH
	4	32	0	4.000	4.000	0.06	0.06	71.00	EC20 POPULATION
	13	8	0	4.000	4.000	11.43	11.43	0.35	SS EC20
	13	8	0	4.000	4.000	1.25	1.25	3.20	NAWQ ACTUAL
	13	8	0	4.000	4.000	0.33	0.33	12.26	LCV DAPHNIDS
	13	8	0	4.000	4.000	0.21	0.21	18.88	LCV FISH
	13	8	0	4.000	4.000	0.18	0.18	22.00	LTV EC20 FISH
	13	8	0	4.000	4.000	0.06	0.06	71.00	EC20 POPULATION

Table F.4 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
MERCURY	2	24	0	0.200	0.200	666.67	666.67	0.00	NAWQ ADVISORY
	2	24	0	0.200	0.200	6.67	6.67	0.03	LTV EC20 FISH
	2	24	0	0.200	0.200	5.00	5.00	0.04	LCV DAPHNIDS
	2	24	0	0.200	0.200	0.71	0.71	0.28	EC20 POPULATION
	2	24	0	0.200	0.200	0.38	0.38	0.52	LCV FISH
	2	24	0	0.200	0.200	0.23	0.23	0.87	LTV EC20 DAPHNID
	13	8	0	0.200	0.200	666.67	666.67	0.00	NAWQ ADVISORY
	13	8	0	0.200	0.200	6.67	6.67	0.03	LTV EC20 FISH
	13	8	0	0.200	0.200	5.00	5.00	0.04	LCV DAPHNIDS
	13	8	0	0.200	0.200	0.71	0.71	0.28	EC20 POPULATION
	13	8	0	0.200	0.200	0.38	0.38	0.52	LCV FISH
	13	8	0	0.200	0.200	0.23	0.23	0.87	LTV EC20 DAPHNID
METHYLENE CHLORIDE	4	10	0	5.000	5.000	0.02	0.02	220.00	NAWQ ADVISORY
	4	10	0	5.000	5.000	0.01	0.01	410.00	LTV EC20 FISH
	4	10	0	5.000	5.000	0.00	0.00	1259.00	EC20 POPULATION
	4	10	0	5.000	5.000	0.00	0.00	42667.00	LCV DAPHNIDS
	4	10	0	5.000	5.000	0.00	0.00	108000.00	LCV FISH
	13	2	0	5.000	5.000	0.02	0.02	220.00	NAWQ ADVISORY
	13	2	0	5.000	5.000	0.01	0.01	410.00	LTV EC20 FISH
	13	2	0	5.000	5.000	0.00	0.00	1259.00	EC20 POPULATION
	13	2	0	5.000	5.000	0.00	0.00	42667.00	LCV DAPHNIDS
	13	2	0	5.000	5.000	0.00	0.00	108000.00	LCV FISH
MOLYBDENUM	1	64	0	40.000	40.000	1.33	1.33	30.00	NAWQ ADVISORY
	1	64	0	40.000	40.000	0.11	0.11	360.00	LTV EC20 DAPHNID
	1	64	0	40.000	40.000	0.05	0.05	880.00	LCV DAPHNIDS
	2	2	0	10.000	215.593	0.33	7.19	30.00	NAWQ ADVISORY
	2	2	0	10.000	215.593	0.03	0.60	360.00	LTV EC20 DAPHNID
	2	2	0	10.000	215.593	0.01	0.24	880.00	LCV DAPHNIDS
	4	1	0	10.000	10.000	0.33	0.33	30.00	NAWQ ADVISORY
	4	1	0	10.000	10.000	0.03	0.03	360.00	LTV EC20 DAPHNID
	4	1	0	10.000	10.000	0.01	0.01	880.00	LCV DAPHNIDS
N-NITROSODIPHENYLAMINE	2	8	0	10.000	10.000	4.00	4.00	2.50	NAWQ ADVISORY
	2	8	0	10.000	10.000	0.25	0.25	40.00	EC20 POPULATION
	2	8	0	10.000	10.000	0.03	0.03	332.00	LCV FISH
	2	8	0	10.000	10.000	0.03	0.03	339.00	LTV EC20 FISH
	2	8	0	10.000	10.000	0.01	0.01	1042.00	LCV DAPHNIDS
	3	179	0	10.000	10.148	4.00	4.06	2.50	NAWQ ADVISORY
	3	179	0	10.000	10.148	0.25	0.25	40.00	EC20 POPULATION
	3	179	0	10.000	10.148	0.03	0.03	332.00	LCV FISH
	3	179	0	10.000	10.148	0.03	0.03	339.00	LTV EC20 FISH
	3	179	0	10.000	10.148	0.01	0.01	1042.00	LCV DAPHNIDS

Table F.4 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
N-NITROSODIPHENYLAMINE (continued)	4	10	0	10.000	10.000	4.00	4.00	2.50	NAWQ ADVISORY
	4	10	0	10.000	10.000	0.25	0.25	40.00	EC20 POPULATION
	4	10	0	10.000	10.000	0.03	0.03	332.00	LCV FISH
	4	10	0	10.000	10.000	0.03	0.03	339.00	LTV EC20 FISH
	4	10	0	10.000	10.000	0.01	0.01	1042.00	LCV DAPHNIDS
	13	2	0	10.000	10.000	4.00	4.00	2.50	NAWQ ADVISORY
	13	2	0	10.000	10.000	0.25	0.25	40.00	EC20 POPULATION
	13	2	0	10.000	10.000	0.03	0.03	332.00	LCV FISH
	13	2	0	10.000	10.000	0.03	0.03	339.00	LTV EC20 FISH
	13	2	0	10.000	10.000	0.01	0.01	1042.00	LCV DAPHNIDS
NAPHTHALENE	2	8	0	10.000	10.000	4.76	4.76	2.10	NAWQ ADVISORY
	2	8	0	10.000	10.000	0.02	0.02	450.00	LTV EC20 FISH
	2	8	0	10.000	10.000	0.02	0.02	600.00	LTV EC20 DAPHNID
	2	8	0	10.000	10.000	0.02	0.02	620.00	LCV FISH
	2	8	0	10.000	10.000	0.01	0.01	1000.00	EC20 POPULATION
	2	8	0	10.000	10.000	0.01	0.01	1163.00	LCV DAPHNIDS
	3	179	0	10.000	10.148	4.76	4.83	2.10	NAWQ ADVISORY
	3	179	0	10.000	10.148	0.02	0.02	450.00	LTV EC20 FISH
	3	179	0	10.000	10.148	0.02	0.02	600.00	LTV EC20 DAPHNID
	3	179	0	10.000	10.148	0.02	0.02	620.00	LCV FISH
	3	179	0	10.000	10.148	0.01	0.01	1000.00	EC20 POPULATION
	3	179	0	10.000	10.148	0.01	0.01	1163.00	LCV DAPHNIDS
	4	10	0	10.000	10.000	4.76	4.76	2.10	NAWQ ADVISORY
	4	10	0	10.000	10.000	0.02	0.02	450.00	LTV EC20 FISH
	4	10	0	10.000	10.000	0.02	0.02	600.00	LTV EC20 DAPHNID
	4	10	0	10.000	10.000	0.02	0.02	620.00	LCV FISH
	4	10	0	10.000	10.000	0.01	0.01	1000.00	EC20 POPULATION
	4	10	0	10.000	10.000	0.01	0.01	1163.00	LCV DAPHNIDS
	13	2	0	10.000	10.000	4.76	4.76	2.10	NAWQ ADVISORY
	13	2	0	10.000	10.000	0.02	0.02	450.00	LTV EC20 FISH
	13	2	0	10.000	10.000	0.02	0.02	600.00	LTV EC20 DAPHNID
	13	2	0	10.000	10.000	0.02	0.02	620.00	LCV FISH
	13	2	0	10.000	10.000	0.01	0.01	1000.00	EC20 POPULATION
	13	2	0	10.000	10.000	0.01	0.01	1163.00	LCV DAPHNIDS

Table F.4 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
PHENANTHRENE	2	8	0	10.000	10.000	23.26	23.26	0.43	NAWQ ADVISORY
	2	8	0	10.000	10.000	0.09	0.09	110.00	LTV EC20 DAPHNID
	2	8	0	10.000	10.000	0.05	0.05	200.00	LCV DAPHNIDS
	4	10	0	10.000	10.000	23.26	23.26	0.43	NAWQ ADVISORY
	4	10	0	10.000	10.000	0.09	0.09	110.00	LTV EC20 DAPHNID
	4	10	0	10.000	10.000	0.05	0.05	200.00	LCV DAPHNIDS
	13	2	0	10.000	10.000	23.26	23.26	0.43	NAWQ ADVISORY
	13	2	0	10.000	10.000	0.09	0.09	110.00	LTV EC20 DAPHNID
	13	2	0	10.000	10.000	0.05	0.05	200.00	LCV DAPHNIDS
PHENOL	13	2	0	10.000	10.000	0.48	0.48	21.00	NAWQ ADVISORY
	13	2	0	10.000	10.000	0.04	0.04	230.00	LTV EC20 FISH
	13	2	0	10.000	10.000	0.01	0.01	1369.00	LCV FISH
	13	2	0	10.000	10.000	0.00	0.00	2005.00	LCV DAPHNIDS
	13	2	0	10.000	10.000	0.00	0.00	4467.00	EC20 POPULATION
SELENIUM	4	1	0	5.000	5.000	1.92	1.92	2.60	SS EC20
	4	1	0	5.000	5.000	0.20	0.20	25.00	LTV EC20 DAPHNID
	4	1	0	5.000	5.000	0.14	0.14	35.00	NAWQ ACTUAL
	4	1	0	5.000	5.000	0.13	0.13	40.00	LTV EC20 FISH
	4	1	0	5.000	5.000	0.06	0.06	88.32	LCV FISH
	4	1	0	5.000	5.000	0.05	0.05	91.65	LCV DAPHNIDS
SILVER	1	68	0	5.441	5.441	45.34	45.34	0.12	LCV FISH
	1	68	0	5.441	5.441	38.87	38.87	0.14	SS EC20
	1	68	0	5.441	5.441	27.21	27.21	0.20	LTV EC20 FISH
	1	68	0	5.441	5.441	21.76	21.76	0.25	NAWQ ADVISORY
	1	68	0	5.441	5.441	17.00	17.00	0.32	EC20 POPULATION
	1	68	0	5.441	5.441	9.72	9.72	0.56	LTV EC20 DAPHNID
	1	68	0	5.441	5.441	2.09	2.09	2.60	LCV DAPHNIDS
	2	1	0	6.000	6.000	50.00	50.00	0.12	LCV FISH
	2	1	0	6.000	6.000	42.86	42.86	0.14	SS EC20
	2	1	0	6.000	6.000	30.00	30.00	0.20	LTV EC20 FISH
	2	1	0	6.000	6.000	24.00	24.00	0.25	NAWQ ADVISORY
	2	1	0	6.000	6.000	18.75	18.75	0.32	EC20 POPULATION
	2	1	0	6.000	6.000	10.71	10.71	0.56	LTV EC20 DAPHNID
	2	1	0	6.000	6.000	2.31	2.31	2.60	LCV DAPHNIDS
	4	1	0	6.000	6.000	50.00	50.00	0.12	LCV FISH
	4	1	0	6.000	6.000	42.86	42.86	0.14	SS EC20
	4	1	0	6.000	6.000	30.00	30.00	0.20	LTV EC20 FISH
	4	1	0	6.000	6.000	24.00	24.00	0.25	NAWQ ADVISORY
	4	1	0	6.000	6.000	18.75	18.75	0.32	EC20 POPULATION
	4	1	0	6.000	6.000	10.71	10.71	0.56	LTV EC20 DAPHNID
	4	1	0	6.000	6.000	2.31	2.31	2.60	LCV DAPHNIDS

Table F.4 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL* detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
THALLIUM	2	1	0	10.000	10.000	4.00	4.00	2.50	NAWQ ADVISORY
	2	1	0	10.000	10.000	0.18	0.18	57.00	LCV FISH
	2	1	0	10.000	10.000	0.16	0.16	64.00	LTV EC20 DAPHNID
	2	1	0	10.000	10.000	0.15	0.15	67.00	EC20 POPULATION
	2	1	0	10.000	10.000	0.12	0.12	81.00	LTV EC20 FISH
	2	1	0	10.000	10.000	0.07	0.07	135.00	LCV DAPHNIDS
	3	193	0	10.000	11.144	4.00	4.46	2.50	NAWQ ADVISORY
	3	193	0	10.000	11.144	0.18	0.20	57.00	LCV FISH
	3	193	0	10.000	11.144	0.16	0.17	64.00	LTV EC20 DAPHNID
	3	193	0	10.000	11.144	0.15	0.17	67.00	EC20 POPULATION
	3	193	0	10.000	11.144	0.12	0.14	81.00	LTV EC20 FISH
	3	193	0	10.000	11.144	0.07	0.08	135.00	LCV DAPHNIDS
	4	1	0	10.000	10.000	4.00	4.00	2.50	NAWQ ADVISORY
	4	1	0	10.000	10.000	0.18	0.18	57.00	LCV FISH
	4	1	0	10.000	10.000	0.16	0.16	64.00	LTV EC20 DAPHNID
	4	1	0	10.000	10.000	0.15	0.15	67.00	EC20 POPULATION
	4	1	0	10.000	10.000	0.12	0.12	81.00	LTV EC20 FISH
	4	1	0	10.000	10.000	0.07	0.07	135.00	LCV DAPHNIDS
TOLUENE	4	10	0	5.000	5.000	0.48	0.48	10.40	NAWQ ADVISORY
	4	10	0	5.000	5.000	0.19	0.19	26.00	LTV EC20 FISH
	4	10	0	5.000	5.000	0.02	0.02	200.00	EC20 POPULATION
	4	10	0	5.000	5.000	0.00	0.00	1269.00	LCV FISH
	4	10	0	5.000	5.000	0.00	0.00	25229.00	LCV DAPHNIDS
	13	2	0	5.000	5.000	0.48	0.48	10.40	NAWQ ADVISORY
	13	2	0	5.000	5.000	0.19	0.19	26.00	LTV EC20 FISH
	13	2	0	5.000	5.000	0.02	0.02	200.00	EC20 POPULATION
	13	2	0	5.000	5.000	0.00	0.00	1269.00	LCV FISH
	13	2	0	5.000	5.000	0.00	0.00	25229.00	LCV DAPHNIDS
URANIUM	13	12	0	0.667	0.667	95.24	95.24	0.01	NAWQ ADVISORY
	13	12	0	0.667	0.667	0.02	0.02	27.00	EC20 POPULATION
	13	12	0	0.667	0.667	0.00	0.00	142.00	LCV FISH
	13	12	0	0.667	0.667	0.00	0.00	455.00	LTV EC20 FISH

Table F.4 (continued)

Analyte	Reach	Number analyzed in reach (water)	Number detects in reach (water)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UDL quotient	Benchmark	Benchmark type
VANADIUM	2	1	0	2.000	2.000	0.67	0.67	3.00	NAWQ ADVISORY
	2	1	0	2.000	2.000	0.06	0.06	32.00	EC20 POPULATION
	2	1	0	2.000	2.000	0.05	0.05	41.00	LTV EC20 FISH
	2	1	0	2.000	2.000	0.02	0.02	80.00	LCV FISH
	2	1	0	2.000	2.000	0.00	0.00	430.00	LTV EC20 DAPHNID
	2	1	0	2.000	2.000	0.00	0.00	940.00	LCV DAPHNIDS
	3	1	0	500.000	500.000	166.67	166.67	3.00	NAWQ ADVISORY
	3	1	0	500.000	500.000	15.63	15.63	32.00	EC20 POPULATION
	3	1	0	500.000	500.000	12.20	12.20	41.00	LTV EC20 FISH
	3	1	0	500.000	500.000	6.25	6.25	80.00	LCV FISH
	3	1	0	500.000	500.000	1.16	1.16	430.00	LTV EC20 DAPHNID
	3	1	0	500.000	500.000	0.53	0.53	940.00	LCV DAPHNIDS
VINYL ACETATE	2	32	0	9.687	9.687	12.11	12.11	0.80	NAWQ ADVISORY
	2	32	0	9.687	9.687	0.09	0.09	108.00	EC20 POPULATION
	2	32	0	9.687	9.687	0.01	0.01	718.00	LTV EC20 FISH
	2	32	0	9.687	9.687	0.01	0.01	810.00	LCV FISH
	3	2	0	10.000	10.000	12.50	12.50	0.80	NAWQ ADVISORY
	3	2	0	10.000	10.000	0.09	0.09	108.00	EC20 POPULATION
	3	2	0	10.000	10.000	0.01	0.01	718.00	LTV EC20 FISH
	3	2	0	10.000	10.000	0.01	0.01	810.00	LCV FISH
VINYL CHLORIDE	2	41	0	9.687	10.106	10.20	10.64	0.95	NAWQ ADVISORY
	2	41	0	9.687	10.106	0.00	0.00	14520.00	LTV EC20 FISH
	2	41	0	9.687	10.106	0.00	0.00	28879.00	LCV FISH
	4	10	0	10.000	10.000	10.53	10.53	0.95	NAWQ ADVISORY
	4	10	0	10.000	10.000	0.00	0.00	14520.00	LTV EC20 FISH
	4	10	0	10.000	10.000	0.00	0.00	28879.00	LCV FISH
	13	2	0	10.000	10.000	10.53	10.53	0.95	NAWQ ADVISORY
	13	2	0	10.000	10.000	0.00	0.00	14520.00	LTV EC20 FISH
	13	2	0	10.000	10.000	0.00	0.00	28879.00	LCV FISH
XYLENE	3	2	0	5.000	5.000	3.42	3.42	1.46	NAWQ ADVISORY
	3	2	0	5.000	5.000	0.00	0.00	2680.00	LTV EC20 FISH
	3	2	0	5.000	5.000	0.00	0.00	62308.00	LCV FISH
ZIRCONIUM	2	1	0	20.000	20.000	93.90	93.90	0.21	NAWQ ADVISORY
	2	1	0	20.000	20.000	0.08	0.08	251.00	EC20 POPULATION
	2	1	0	20.000	20.000	0.04	0.04	548.00	LCV FISH
	2	1	0	20.000	20.000	0.01	0.01	2396.00	LTV EC20 FISH

[a]The maximum detection limit was used in cases where the UCL was missing (i.e., where N = 1).

Table F.5. Mean and upper confidence limit (UCL) concentrations of chemicals detected in fish (ug/L), bioconcentration factors, estimated exposure in water (ug/L), and quotients for exposure to that water concentration

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Mean fish[a] concentration	UCL fish[b] concentration	BCF	Mean estimated water conc.	UCL estimated water conc.	Mean quotient	UCL quotient	Benchmark	Flag	Benchmark type
4,4'-DDD	1	15	5	0.85	5.90	170000.00	0.0000	0.000	0.0119	0.08	0.00		NAWQ ADVISORY
	1	15	5	0.85	5.90	170000.00	0.0000	0.000	0.0000	0.00	0.61		EC20 POPULATION
	1	15	5	0.85	5.90	170000.00	0.0000	0.000	0.0000	0.00	1.69	*	LCV FISH
	1	15	5	0.85	5.90	170000.00	0.0000	0.000	0.0000	0.00	3.99	*	LTV EC20 FISH
	3	34	2	0.30	17.08	170000.00	0.0000	0.000	0.0042	0.24	0.00		NAWQ ADVISORY
	3	34	2	0.30	17.08	170000.00	0.0000	0.000	0.0000	0.00	0.61		EC20 POPULATION
	3	34	2	0.30	17.08	170000.00	0.0000	0.000	0.0000	0.00	1.69	*	LCV FISH
	3	34	2	0.30	17.08	170000.00	0.0000	0.000	0.0000	0.00	3.99	*	LTV EC20 FISH
	4	18	4	3.67	9.04	170000.00	0.0000	0.000	0.0514	0.13	0.00		NAWQ ADVISORY
	4	18	4	3.67	9.04	170000.00	0.0000	0.000	0.0000	0.00	0.61		EC20 POPULATION
	4	18	4	3.67	9.04	170000.00	0.0000	0.000	0.0000	0.00	1.69	*	LCV FISH
	4	18	4	3.67	9.04	170000.00	0.0000	0.000	0.0000	0.00	3.99	*	LTV EC20 FISH
	5	17	12	1.55	5.83	170000.00	0.0000	0.000	0.0218	0.08	0.00		NAWQ ADVISORY
	5	17	12	1.55	5.83	170000.00	0.0000	0.000	0.0000	0.00	0.61		EC20 POPULATION
	5	17	12	1.55	5.83	170000.00	0.0000	0.000	0.0000	0.00	1.69	*	LCV FISH
	5	17	12	1.55	5.83	170000.00	0.0000	0.000	0.0000	0.00	3.99	*	LTV EC20 FISH
	10	8	7	0.69	1.22	170000.00	0.0000	0.000	0.0096	0.02	0.00		NAWQ ADVISORY
	10	8	7	0.69	1.22	170000.00	0.0000	0.000	0.0000	0.00	0.61		EC20 POPULATION
	10	8	7	0.69	1.22	170000.00	0.0000	0.000	0.0000	0.00	1.69	*	LCV FISH
	10	8	7	0.69	1.22	170000.00	0.0000	0.000	0.0000	0.00	3.99	*	LTV EC20 FISH
	15	4	1	4.74	200.00	170000.00	0.0000	0.001	0.0664	2.80	0.00		NAWQ ADVISORY
	15	4	1	4.74	200.00	170000.00	0.0000	0.001	0.0000	0.00	0.61		EC20 POPULATION
	15	4	1	4.74	200.00	170000.00	0.0000	0.001	0.0000	0.00	1.69	*	LCV FISH
	15	4	1	4.74	200.00	170000.00	0.0000	0.001	0.0000	0.00	3.99	*	LTV EC20 FISH
4,4'-DDE	1	16	8	5.30	64.28	8000000.00	0.0000	0.000	0.0001	0.00	0.01		SS EC20
	1	16	8	5.30	64.28	8000000.00	0.0000	0.000	0.0000	0.00	0.02	*	LCV DAPHNIDS
	1	16	8	5.30	64.28	8000000.00	0.0000	0.000	0.0000	0.00	0.02		NAWQ ADVISORY
	1	16	8	5.30	64.28	8000000.00	0.0000	0.000	0.0000	0.00	0.35		LTV EC20 FISH
	1	16	8	5.30	64.28	8000000.00	0.0000	0.000	0.0000	0.00	0.73		LCV FISH
	2	13	6	5.29	18.27	8000000.00	0.0000	0.000	0.0001	0.00	0.01		SS EC20
	2	13	6	5.29	18.27	8000000.00	0.0000	0.000	0.0000	0.00	0.02	*	LCV DAPHNIDS
	2	13	6	5.29	18.27	8000000.00	0.0000	0.000	0.0000	0.00	0.02		NAWQ ADVISORY
	2	13	6	5.29	18.27	8000000.00	0.0000	0.000	0.0000	0.00	0.35		LTV EC20 FISH
	2	13	6	5.29	18.27	8000000.00	0.0000	0.000	0.0000	0.00	0.73		LCV FISH
	3	34	34	1.04	9.10	8000000.00	0.0000	0.000	0.0000	0.00	0.01		SS EC20
	3	34	34	1.04	9.10	8000000.00	0.0000	0.000	0.0000	0.00	0.02	*	LCV DAPHNIDS
	3	34	34	1.04	9.10	8000000.00	0.0000	0.000	0.0000	0.00	0.02		NAWQ ADVISORY
	3	34	34	1.04	9.10	8000000.00	0.0000	0.000	0.0000	0.00	0.35		LTV EC20 FISH
	3	34	34	1.04	9.10	8000000.00	0.0000	0.000	0.0000	0.00	0.73		LCV FISH

Table F.5 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Mean fish[a] concentration	UCL Fish[b] concentration	BCF	Mean estimated water conc.	UCL estimated water conc.	Mean quotient	UCL quotient	Benchmark	Flag	Benchmark type
4,4'-DDE (continued)	4	18	12	11.09	24.40	8000000.00	0.0000	0.000	0.0002	0.00	0.01		SS EC20
	4	18	12	11.09	24.40	8000000.00	0.0000	0.000	0.0001	0.00	0.02	*	LCV DAPHNIDS
	4	18	12	11.09	24.40	8000000.00	0.0000	0.000	0.0001	0.00	0.02		NAWQ ADVISORY
	4	18	12	11.09	24.40	8000000.00	0.0000	0.000	0.0000	0.00	0.35		LTV EC20 FISH
	4	18	12	11.09	24.40	8000000.00	0.0000	0.000	0.0000	0.00	0.73		LCV FISH
	5	18	9	8.03	13.23	8000000.00	0.0000	0.000	0.0001	0.00	0.01		SS EC20
	5	18	9	8.03	13.23	8000000.00	0.0000	0.000	0.0001	0.00	0.02	*	LCV DAPHNIDS
	5	18	9	8.03	13.23	8000000.00	0.0000	0.000	0.0001	0.00	0.02		NAWQ ADVISORY
	5	18	9	8.03	13.23	8000000.00	0.0000	0.000	0.0000	0.00	0.35		LTV EC20 FISH
	5	18	9	8.03	13.23	8000000.00	0.0000	0.000	0.0000	0.00	0.73		LCV FISH
	10	8	2	2.56	2.95	8000000.00	0.0000	0.000	0.0000	0.00	0.01		SS EC20
	10	8	2	2.56	2.95	8000000.00	0.0000	0.000	0.0000	0.00	0.02	*	LCV DAPHNIDS
	10	8	2	2.56	2.95	8000000.00	0.0000	0.000	0.0000	0.00	0.02		NAWQ ADVISORY
	10	8	2	2.56	2.95	8000000.00	0.0000	0.000	0.0000	0.00	0.35		LTV EC20 FISH
	10	8	2	2.56	2.95	8000000.00	0.0000	0.000	0.0000	0.00	0.73		LCV FISH
	13	2	2	3.87	6.82	8000000.00	0.0000	0.000	0.0001	0.00	0.01		SS EC20
	13	2	2	3.87	6.82	8000000.00	0.0000	0.000	0.0000	0.00	0.02	*	LCV DAPHNIDS
	13	2	2	3.87	6.82	8000000.00	0.0000	0.000	0.0000	0.00	0.02		NAWQ ADVISORY
	13	2	2	3.87	6.82	8000000.00	0.0000	0.000	0.0000	0.00	0.35		LTV EC20 FISH
	13	2	2	3.87	6.82	8000000.00	0.0000	0.000	0.0000	0.00	0.73		LCV FISH
4,4'-DDT	2	13	2	0.47	0.86	34000.00	0.0000	0.000	0.0017	0.00	0.01		SS EC20
	2	13	2	0.47	0.86	34000.00	0.0000	0.000	0.0009	0.00	0.02	*	LCV DAPHNIDS
	2	13	2	0.47	0.86	34000.00	0.0000	0.000	0.0007	0.00	0.02		NAWQ ADVISORY
	2	13	2	0.47	0.86	34000.00	0.0000	0.000	0.0000	0.00	0.35		LTV EC20 FISH
	2	13	2	0.47	0.86	34000.00	0.0000	0.000	0.0000	0.00	0.73		LCV FISH
	4	18	1	1.58	200.00	34000.00	0.0000	0.006	0.0058	0.74	0.01		SS EC20
	4	18	1	1.58	200.00	34000.00	0.0000	0.006	0.0029	0.37	0.02	*	LCV DAPHNIDS
	4	18	1	1.58	200.00	34000.00	0.0000	0.006	0.0023	0.29	0.02		NAWQ ADVISORY
	4	18	1	1.58	200.00	34000.00	0.0000	0.006	0.0001	0.02	0.35		LTV EC20 FISH
	4	18	1	1.58	200.00	34000.00	0.0000	0.006	0.0001	0.01	0.73		LCV FISH
	5	18	5	0.70	1.29	34000.00	0.0000	0.000	0.0026	0.00	0.01		SS EC20
	5	18	5	0.70	1.29	34000.00	0.0000	0.000	0.0013	0.00	0.02	*	LCV DAPHNIDS
	5	18	5	0.70	1.29	34000.00	0.0000	0.000	0.0010	0.00	0.02		NAWQ ADVISORY
	5	18	5	0.70	1.29	34000.00	0.0000	0.000	0.0001	0.00	0.35		LTV EC20 FISH
	5	18	5	0.70	1.29	34000.00	0.0000	0.000	0.0000	0.00	0.73		LCV FISH
ALDRIN	2	14	2	0.13	0.16	11000.00	0.0000	0.000	0.0002	0.00	0.08		NAWQ ADVISORY
	4	14	2	0.85	1.33	11000.00	0.0001	0.000	0.0010	0.00	0.08		NAWQ ADVISORY
	5	18	2	0.46	5.45	11000.00	0.0000	0.000	0.0006	0.01	0.08		NAWQ ADVISORY
	13	3	2	0.96	1.30	11000.00	0.0001	0.000	0.0012	0.00	0.08		NAWQ ADVISORY

Table F.5 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Mean fish[a] concentration	UCL Fish[b] concentration	BCF	Mean estimated water conc.	UCL estimated water conc.	Mean quotient	UCL quotient	Benchmark	Benchmark type
AROCLOR-1254	1	16	13	33.28	199.06	10000000.00	0.0000	0.000	0.0002	0.00	0.02	NAWQ ADVISORY
	1	16	13	33.28	199.06	10000000.00	0.0000	0.000	0.0000	0.00	0.52	LTV EC20 FISH
	1	16	13	33.28	199.06	10000000.00	0.0000	0.000	0.0000	0.00	0.63	EC20 POPULATION
	1	16	13	33.28	199.06	10000000.00	0.0000	0.000	0.0000	0.00	1.00	LCV FISH
	1	16	13	33.28	199.06	10000000.00	0.0000	0.000	0.0000	0.00	1.20	LTV EC20 DAPHNID
	1	16	13	33.28	199.06	10000000.00	0.0000	0.000	0.0000	0.00	2.10	LCV DAPHNIDS
	2	10	9	121.49	753.09	10000000.00	0.0000	0.000	0.0006	0.00	0.02	NAWQ ADVISORY
	2	10	9	121.49	753.09	10000000.00	0.0000	0.000	0.0000	0.00	0.52	LTV EC20 FISH
	2	10	9	121.49	753.09	10000000.00	0.0000	0.000	0.0000	0.00	0.63	EC20 POPULATION
	2	10	9	121.49	753.09	10000000.00	0.0000	0.000	0.0000	0.00	1.00	LCV FISH
	2	10	9	121.49	753.09	10000000.00	0.0000	0.000	0.0000	0.00	1.20	LTV EC20 DAPHNID
	2	10	9	121.49	753.09	10000000.00	0.0000	0.000	0.0000	0.00	2.10	LCV DAPHNIDS
	3	31	31	99.03	186.33	10000000.00	0.0000	0.000	0.0005	0.00	0.02	NAWQ ADVISORY
	3	31	31	99.03	186.33	10000000.00	0.0000	0.000	0.0000	0.00	0.52	LTV EC20 FISH
	3	31	31	99.03	186.33	10000000.00	0.0000	0.000	0.0000	0.00	0.63	EC20 POPULATION
	3	31	31	99.03	186.33	10000000.00	0.0000	0.000	0.0000	0.00	1.00	LCV FISH
	3	31	31	99.03	186.33	10000000.00	0.0000	0.000	0.0000	0.00	1.20	LTV EC20 DAPHNID
	3	31	31	99.03	186.33	10000000.00	0.0000	0.000	0.0000	0.00	2.10	LCV DAPHNIDS
	4	18	15	54.39	270.00	10000000.00	0.0000	0.000	0.0003	0.00	0.02	NAWQ ADVISORY
	4	18	15	54.39	270.00	10000000.00	0.0000	0.000	0.0000	0.00	0.52	LTV EC20 FISH
	4	18	15	54.39	270.00	10000000.00	0.0000	0.000	0.0000	0.00	0.63	EC20 POPULATION
	4	18	15	54.39	270.00	10000000.00	0.0000	0.000	0.0000	0.00	1.00	LCV FISH
	4	18	15	54.39	270.00	10000000.00	0.0000	0.000	0.0000	0.00	1.20	LTV EC20 DAPHNID
	4	18	15	54.39	270.00	10000000.00	0.0000	0.000	0.0000	0.00	2.10	LCV DAPHNIDS
	5	17	14	58.30	320.00	10000000.00	0.0000	0.000	0.0003	0.00	0.02	NAWQ ADVISORY
	5	17	14	58.30	320.00	10000000.00	0.0000	0.000	0.0000	0.00	0.52	LTV EC20 FISH
	5	17	14	58.30	320.00	10000000.00	0.0000	0.000	0.0000	0.00	0.63	EC20 POPULATION
	5	17	14	58.30	320.00	10000000.00	0.0000	0.000	0.0000	0.00	1.00	LCV FISH
	5	17	14	58.30	320.00	10000000.00	0.0000	0.000	0.0000	0.00	1.20	LTV EC20 DAPHNID
	5	17	14	58.30	320.00	10000000.00	0.0000	0.000	0.0000	0.00	2.10	LCV DAPHNIDS
	13	2	2	87.18	190.00	10000000.00	0.0000	0.000	0.0004	0.00	0.02	NAWQ ADVISORY
	13	2	2	87.18	190.00	10000000.00	0.0000	0.000	0.0000	0.00	0.52	LTV EC20 FISH
	13	2	2	87.18	190.00	10000000.00	0.0000	0.000	0.0000	0.00	0.63	EC20 POPULATION
	13	2	2	87.18	190.00	10000000.00	0.0000	0.000	0.0000	0.00	1.00	LCV FISH
	13	2	2	87.18	190.00	10000000.00	0.0000	0.000	0.0000	0.00	1.20	LTV EC20 DAPHNID
	13	2	2	87.18	190.00	10000000.00	0.0000	0.000	0.0000	0.00	2.10	LCV DAPHNIDS
	15	4	4	122.34	200.00	10000000.00	0.0000	0.000	0.0006	0.00	0.02	NAWQ ADVISORY
	15	4	4	122.34	200.00	10000000.00	0.0000	0.000	0.0000	0.00	0.52	LTV EC20 FISH
	15	4	4	122.34	200.00	10000000.00	0.0000	0.000	0.0000	0.00	0.63	EC20 POPULATION
	15	4	4	122.34	200.00	10000000.00	0.0000	0.000	0.0000	0.00	1.00	LCV FISH
	15	4	4	122.34	200.00	10000000.00	0.0000	0.000	0.0000	0.00	1.20	LTV EC20 DAPHNID
	15	4	4	122.34	200.00	10000000.00	0.0000	0.000	0.0000	0.00	2.10	LCV DAPHNIDS

Table F.5 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Mean fish[a] concentration	UCL fish[b] concentration	BCF	Mean estimated water conc.	UCL estimated water conc.	Mean quotient	UCL quotient	Benchmark	Benchmark type
AROCLOR-1260	1	16	16	245.86	896.56	10000000.00	0.0000	0.000	0.0002	0.00	0.11	NAWQ ADVISORY
	1	16	16	245.86	896.56	10000000.00	0.0000	0.000	0.0000	0.00	2.10	LTV EC20 FISH
	1	16	16	245.86	896.56	10000000.00	0.0000	0.000	0.0000	0.00	2.30	LCV FISH
	1	16	16	245.86	896.56	10000000.00	0.0000	0.000	0.0000	0.00	316.00	EC20 POPULATION
	2	14	14	668.53	1406.39	10000000.00	0.0001	0.000	0.0006	0.00	0.11	NAWQ ADVISORY
	2	14	14	668.53	1406.39	10000000.00	0.0001	0.000	0.0000	0.00	2.10	LTV EC20 FISH
	2	14	14	668.53	1406.39	10000000.00	0.0001	0.000	0.0000	0.00	2.30	LCV FISH
	2	14	14	668.53	1406.39	10000000.00	0.0001	0.000	0.0000	0.00	316.00	EC20 POPULATION
	3	36	36	390.85	770.54	10000000.00	0.0000	0.000	0.0004	0.00	0.11	NAWQ ADVISORY
	3	36	36	390.85	770.54	10000000.00	0.0000	0.000	0.0000	0.00	2.10	LTV EC20 FISH
	3	36	36	390.85	770.54	10000000.00	0.0000	0.000	0.0000	0.00	2.30	LCV FISH
	3	36	36	390.85	770.54	10000000.00	0.0000	0.000	0.0000	0.00	316.00	EC20 POPULATION
	4	18	17	433.14	2789.52	10000000.00	0.0000	0.000	0.0004	0.00	0.11	NAWQ ADVISORY
	4	18	17	433.14	2789.52	10000000.00	0.0000	0.000	0.0000	0.00	2.10	LTV EC20 FISH
	4	18	17	433.14	2789.52	10000000.00	0.0000	0.000	0.0000	0.00	2.30	LCV FISH
	4	18	17	433.14	2789.52	10000000.00	0.0000	0.000	0.0000	0.00	316.00	EC20 POPULATION
	5	19	19	347.76	889.60	10000000.00	0.0000	0.000	0.0003	0.00	0.11	NAWQ ADVISORY
	5	19	19	347.76	889.60	10000000.00	0.0000	0.000	0.0000	0.00	2.10	LTV EC20 FISH
	5	19	19	347.76	889.60	10000000.00	0.0000	0.000	0.0000	0.00	2.30	LCV FISH
	5	19	19	347.76	889.60	10000000.00	0.0000	0.000	0.0000	0.00	316.00	EC20 POPULATION
	10	8	7	21.98	73.10	10000000.00	0.0000	0.000	0.0000	0.00	0.11	NAWQ ADVISORY
	10	8	7	21.98	73.10	10000000.00	0.0000	0.000	0.0000	0.00	2.10	LTV EC20 FISH
	10	8	7	21.98	73.10	10000000.00	0.0000	0.000	0.0000	0.00	2.30	LCV FISH
	10	8	7	21.98	73.10	10000000.00	0.0000	0.000	0.0000	0.00	316.00	EC20 POPULATION
	13	4	4	288.12	390.00	10000000.00	0.0000	0.000	0.0003	0.00	0.11	NAWQ ADVISORY
	13	4	4	288.12	390.00	10000000.00	0.0000	0.000	0.0000	0.00	2.10	LTV EC20 FISH
	13	4	4	288.12	390.00	10000000.00	0.0000	0.000	0.0000	0.00	2.30	LCV FISH
	13	4	4	288.12	390.00	10000000.00	0.0000	0.000	0.0000	0.00	316.00	EC20 POPULATION
	15	4	4	310.50	650.00	10000000.00	0.0000	0.000	0.0003	0.00	0.11	NAWQ ADVISORY
	15	4	4	310.50	650.00	10000000.00	0.0000	0.000	0.0000	0.00	2.10	LTV EC20 FISH
	15	4	4	310.50	650.00	10000000.00	0.0000	0.000	0.0000	0.00	2.30	LCV FISH
	15	4	4	310.50	650.00	10000000.00	0.0000	0.000	0.0000	0.00	316.00	EC20 POPULATION
ARSENIC	1	28	17	61.63	98.23	2.44	25.2574	40.258	0.4592	0.73	55.00	SS EC20
	1	28	17	61.63	98.23	2.44	25.2574	40.258	0.1329	0.21	190.00	NAWQ ACTUAL
	1	28	17	61.63	98.23	2.44	25.2574	40.258	0.0399	0.06	633.00	LTV EC20 DAPHNID
	1	28	17	61.63	98.23	2.44	25.2574	40.258	0.0276	0.04	914.10	LCV DAPHNIDS
	1	28	17	61.63	98.23	2.44	25.2574	40.258	0.0127	0.02	1995.00	EC20 POPULATION
	1	28	17	61.63	98.23	2.44	25.2574	40.258	0.0119	0.02	2130.00	LTV EC20 FISH
	1	28	17	61.63	98.23	2.44	25.2574	40.258	0.0085	0.01	2962.00	LCV FISH
	2	13	5	37.96	98.02	2.44	15.5556	40.172	0.2828	0.73	55.00	SS EC20
	2	13	5	37.96	98.02	2.44	15.5556	40.172	0.0819	0.21	190.00	NAWQ ACTUAL

Table F.5 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Mean fish[a] concentration	UCL Fish[b] concentration	BCF	Mean estimated water conc.	UCL estimated water conc.	Mean quotient	UCL quotient	Benchmark	Benchmark type
ARSENIC (continued)	2	13	5	37.96	98.02	2.44	15.5556	40.172	0.0246	0.06	633.00	LTV EC20 DAPHNID
	2	13	5	37.96	98.02	2.44	15.5556	40.172	0.0170	0.04	914.10	LCV DAPHNIDS
	2	13	5	37.96	98.02	2.44	15.5556	40.172	0.0078	0.02	1995.00	EC20 POPULATION
	2	13	5	37.96	98.02	2.44	15.5556	40.172	0.0073	0.02	2130.00	LTV EC20 FISH
	2	13	5	37.96	98.02	2.44	15.5556	40.172	0.0053	0.01	2962.00	LCV FISH
	3	35	19	53.08	75.04	2.44	21.7539	30.756	0.3955	0.56	55.00	SS EC20
	3	35	19	53.08	75.04	2.44	21.7539	30.756	0.1145	0.16	190.00	NAWQ ACTUAL
	3	35	19	53.08	75.04	2.44	21.7539	30.756	0.0344	0.05	633.00	LTV EC20 DAPHNID
	3	35	19	53.08	75.04	2.44	21.7539	30.756	0.0238	0.03	914.10	LCV DAPHNIDS
	3	35	19	53.08	75.04	2.44	21.7539	30.756	0.0109	0.02	1995.00	EC20 POPULATION
	3	35	19	53.08	75.04	2.44	21.7539	30.756	0.0102	0.01	2130.00	LTV EC20 FISH
	3	35	19	53.08	75.04	2.44	21.7539	30.756	0.0073	0.01	2962.00	LCV FISH
	4	27	25	87.93	107.22	2.44	36.0373	43.943	0.6552	0.80	55.00	SS EC20
	4	27	25	87.93	107.22	2.44	36.0373	43.943	0.1897	0.23	190.00	NAWQ ACTUAL
	4	27	25	87.93	107.22	2.44	36.0373	43.943	0.0569	0.07	633.00	LTV EC20 DAPHNID
	4	27	25	87.93	107.22	2.44	36.0373	43.943	0.0394	0.05	914.10	LCV DAPHNIDS
	4	27	25	87.93	107.22	2.44	36.0373	43.943	0.0181	0.02	1995.00	EC20 POPULATION
	4	27	25	87.93	107.22	2.44	36.0373	43.943	0.0169	0.02	2130.00	LTV EC20 FISH
	4	27	25	87.93	107.22	2.44	36.0373	43.943	0.0122	0.01	2962.00	LCV FISH
	5	25	23	74.61	92.28	2.44	30.5769	37.819	0.5559	0.69	55.00	SS EC20
	5	25	23	74.61	92.28	2.44	30.5769	37.819	0.1609	0.20	190.00	NAWQ ACTUAL
	5	25	23	74.61	92.28	2.44	30.5769	37.819	0.0483	0.06	633.00	LTV EC20 DAPHNID
	5	25	23	74.61	92.28	2.44	30.5769	37.819	0.0335	0.04	914.10	LCV DAPHNIDS
	5	25	23	74.61	92.28	2.44	30.5769	37.819	0.0153	0.02	1995.00	EC20 POPULATION
	5	25	23	74.61	92.28	2.44	30.5769	37.819	0.0144	0.02	2130.00	LTV EC20 FISH
	5	25	23	74.61	92.28	2.44	30.5769	37.819	0.0103	0.01	2962.00	LCV FISH
	10	15	14	71.43	96.82	2.44	29.2742	39.680	0.5323	0.72	55.00	SS EC20
	10	15	14	71.43	96.82	2.44	29.2742	39.680	0.1541	0.21	190.00	NAWQ ACTUAL
	10	15	14	71.43	96.82	2.44	29.2742	39.680	0.0462	0.06	633.00	LTV EC20 DAPHNID
	10	15	14	71.43	96.82	2.44	29.2742	39.680	0.0320	0.04	914.10	LCV DAPHNIDS
	10	15	14	71.43	96.82	2.44	29.2742	39.680	0.0147	0.02	1995.00	EC20 POPULATION
	10	15	14	71.43	96.82	2.44	29.2742	39.680	0.0137	0.02	2130.00	LTV EC20 FISH
	10	15	14	71.43	96.82	2.44	29.2742	39.680	0.0099	0.01	2962.00	LCV FISH
	13	10	4	45.14	59.01	2.44	18.5001	24.185	0.3364	0.44	55.00	SS EC20
	13	10	4	45.14	59.01	2.44	18.5001	24.185	0.0974	0.13	190.00	NAWQ ACTUAL
	13	10	4	45.14	59.01	2.44	18.5001	24.185	0.0292	0.04	633.00	LTV EC20 DAPHNID
	13	10	4	45.14	59.01	2.44	18.5001	24.185	0.0202	0.03	914.10	LCV DAPHNIDS
	13	10	4	45.14	59.01	2.44	18.5001	24.185	0.0093	0.01	1995.00	EC20 POPULATION
	13	10	4	45.14	59.01	2.44	18.5001	24.185	0.0087	0.01	2130.00	LTV EC20 FISH
	13	10	4	45.14	59.01	2.44	18.5001	24.185	0.0062	0.01	2962.00	LCV FISH
	15	16	10	64.69	112.68	2.44	26.5123	46.181	0.4820	0.84	55.00	SS EC20
	15	16	10	64.69	112.68	2.44	26.5123	46.181	0.1395	0.24	190.00	NAWQ ACTUAL

Table F.5 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Mean fish[a] concentration	UCL Fish[b] concentration	BCF	Mean estimated water conc.	UCL estimated water conc.	Mean quotient	UCL quotient	Benchmark	Flag	Benchmark type
ARSENIC (continued)	15	16	10	64.69	112.68	2.44	26.5123	46.181	0.0419	0.07	633.00		LTV EC20 DAPHNID
	15	16	10	64.69	112.68	2.44	26.5123	46.181	0.0290	0.05	914.10		LCV DAPHNIDS
	15	16	10	64.69	112.68	2.44	26.5123	46.181	0.0133	0.02	1995.00		EC20 POPULATION
	15	16	10	64.69	112.68	2.44	26.5123	46.181	0.0124	0.02	2130.00		LTV EC20 FISH
	15	16	10	64.69	112.68	2.44	26.5123	46.181	0.0090	0.02	2962.00		LCV FISH
BERYLLIUM	1	25	4	1.47	3.26	2.00	0.7338	1.632	1.2029	2.67	0.61		NAWQ ADVISORY
	1	25	4	1.47	3.26	2.00	0.7338	1.632	0.1931	0.43	3.80		LTV EC20 DAPHNID
	1	25	4	1.47	3.26	2.00	0.7338	1.632	0.1384	0.31	5.30		LCV DAPHNIDS
	1	25	4	1.47	3.26	2.00	0.7338	1.632	0.0349	0.08	21.00		EC20 POPULATION
	1	25	4	1.47	3.26	2.00	0.7338	1.632	0.0129	0.03	57.00	*	LCV FISH
	1	25	4	1.47	3.26	2.00	0.7338	1.632	0.0050	0.01	148.00	*	LTV EC20 FISH
	3	35	7	0.92	5.45	2.00	0.4608	2.726	0.7554	4.47	0.61		NAWQ ADVISORY
	3	35	7	0.92	5.45	2.00	0.4608	2.726	0.1213	0.72	3.80		LTV EC20 DAPHNID
	3	35	7	0.92	5.45	2.00	0.4608	2.726	0.0869	0.51	5.30		LCV DAPHNIDS
	3	35	7	0.92	5.45	2.00	0.4608	2.726	0.0219	0.13	21.00		EC20 POPULATION
	3	35	7	0.92	5.45	2.00	0.4608	2.726	0.0081	0.05	57.00	*	LCV FISH
	3	35	7	0.92	5.45	2.00	0.4608	2.726	0.0031	0.02	148.00	*	LTV EC20 FISH
	5	25	2	0.02	27.00	2.00	0.0080	13.500	0.0132	22.13	0.61		NAWQ ADVISORY
	5	25	2	0.02	27.00	2.00	0.0080	13.500	0.0021	3.55	3.80		LTV EC20 DAPHNID
	5	25	2	0.02	27.00	2.00	0.0080	13.500	0.0015	2.55	5.30		LCV DAPHNIDS
	5	25	2	0.02	27.00	2.00	0.0080	13.500	0.0004	0.64	21.00		EC20 POPULATION
	5	25	2	0.02	27.00	2.00	0.0080	13.500	0.0001	0.24	57.00	*	LCV FISH
	5	25	2	0.02	27.00	2.00	0.0080	13.500	0.0001	0.09	148.00	*	LTV EC20 FISH
	10	10	1	0.01	37.00	2.00	0.0048	18.500	0.0079	30.33	0.61		NAWQ ADVISORY
	10	10	1	0.01	37.00	2.00	0.0048	18.500	0.0013	4.87	3.80		LTV EC20 DAPHNID
	10	10	1	0.01	37.00	2.00	0.0048	18.500	0.0009	3.49	5.30		LCV DAPHNIDS
	10	10	1	0.01	37.00	2.00	0.0048	18.500	0.0002	0.88	21.00		EC20 POPULATION
	10	10	1	0.01	37.00	2.00	0.0048	18.500	0.0001	0.32	57.00	*	LCV FISH
	10	10	1	0.01	37.00	2.00	0.0048	18.500	0.0000	0.13	148.00	*	LTV EC20 FISH
	15	16	5	1.32	19.00	2.00	0.6620	9.500	1.0853	15.57	0.61		NAWQ ADVISORY
	15	16	5	1.32	19.00	2.00	0.6620	9.500	0.1742	2.50	3.80		LTV EC20 DAPHNID
	15	16	5	1.32	19.00	2.00	0.6620	9.500	0.1249	1.79	5.30		LCV DAPHNIDS
	15	16	5	1.32	19.00	2.00	0.6620	9.500	0.0315	0.45	21.00		EC20 POPULATION
	15	16	5	1.32	19.00	2.00	0.6620	9.500	0.0116	0.17	57.00	*	LCV FISH
	15	16	5	1.32	19.00	2.00	0.6620	9.500	0.0045	0.06	148.00	*	LTV EC20 FISH

Table F.5 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Mean fish[a] concentration	UCL Fish[b] concentration	BCF	Mean estimated water conc.	UCL estimated water conc.	Mean quotient	UCL quotient	Benchmark	Flag	Benchmark type
BIS(2-ETHYLHEXYL)PHTHALATE	3	33	1	47.09	410.00	310.00	0.1519	1.323	15.1912	132.26	0.01		NAWQ ADVISORY
	3	33	1	47.09	410.00	310.00	0.1519	1.323	0.0506	0.44	3.00	<	LCV DAPHNIDS
	3	33	1	47.09	410.00	310.00	0.1519	1.323	0.0506	0.44	3.00	<	LTV EC20 DAPHNID
	3	33	1	47.09	410.00	310.00	0.1519	1.323	0.0181	0.16	8.40		LCV FISH
	3	33	1	47.09	410.00	310.00	0.1519	1.323	0.0030	0.03	50.00		EC20 POPULATION
	3	33	1	47.09	410.00	310.00	0.1519	1.323	0.0028	0.02	54.00	>	LTV EC20 FISH
CHLORDANE	1	16	11	16.47	109.45	4702.00	0.0035	0.023	0.0206	0.14	0.17		NAWQ ACTUAL
	1	16	11	16.47	109.45	4702.00	0.0035	0.023	0.0140	0.09	0.25	<	LTV EC20 FISH
	1	16	11	16.47	109.45	4702.00	0.0035	0.023	0.0070	0.05	0.50		SS EC20
	1	16	11	16.47	109.45	4702.00	0.0035	0.023	0.0049	0.03	0.71		EC20 POPULATION
	1	16	11	16.47	109.45	4702.00	0.0035	0.023	0.0022	0.01	1.60		LCV FISH
	1	16	11	16.47	109.45	4702.00	0.0035	0.023	0.0003	0.00	12.10		LTV EC20 DAPHNID
	1	16	11	16.47	109.45	4702.00	0.0035	0.023	0.0002	0.00	16.00		LCV DAPHNIDS
	2	14	9	11.44	81.60	4702.00	0.0024	0.017	0.0143	0.10	0.17		NAWQ ACTUAL
	2	14	9	11.44	81.60	4702.00	0.0024	0.017	0.0097	0.07	0.25	<	LTV EC20 FISH
	2	14	9	11.44	81.60	4702.00	0.0024	0.017	0.0049	0.03	0.50		SS EC20
	2	14	9	11.44	81.60	4702.00	0.0024	0.017	0.0034	0.02	0.71		EC20 POPULATION
	2	14	9	11.44	81.60	4702.00	0.0024	0.017	0.0015	0.01	1.60		LCV FISH
	2	14	9	11.44	81.60	4702.00	0.0024	0.017	0.0002	0.00	12.10		LTV EC20 DAPHNID
	2	14	9	11.44	81.60	4702.00	0.0024	0.017	0.0002	0.00	16.00		LCV DAPHNIDS
	3	34	34	39.89	74.47	4702.00	0.0085	0.016	0.0499	0.09	0.17		NAWQ ACTUAL
	3	34	34	39.89	74.47	4702.00	0.0085	0.016	0.0339	0.06	0.25	<	LTV EC20 FISH
	3	34	34	39.89	74.47	4702.00	0.0085	0.016	0.0170	0.03	0.50		SS EC20
	3	34	34	39.89	74.47	4702.00	0.0085	0.016	0.0119	0.02	0.71		EC20 POPULATION
	3	34	34	39.89	74.47	4702.00	0.0085	0.016	0.0053	0.01	1.60		LCV FISH
	3	34	34	39.89	74.47	4702.00	0.0085	0.016	0.0007	0.00	12.10		LTV EC20 DAPHNID
	3	34	34	39.89	74.47	4702.00	0.0085	0.016	0.0005	0.00	16.00		LCV DAPHNIDS
	4	18	18	28.38	97.19	4702.00	0.0060	0.021	0.0355	0.12	0.17		NAWQ ACTUAL
	4	18	18	28.38	97.19	4702.00	0.0060	0.021	0.0241	0.08	0.25	<	LTV EC20 FISH
	4	18	18	28.38	97.19	4702.00	0.0060	0.021	0.0121	0.04	0.50		SS EC20
	4	18	18	28.38	97.19	4702.00	0.0060	0.021	0.0085	0.03	0.71		EC20 POPULATION
	4	18	18	28.38	97.19	4702.00	0.0060	0.021	0.0038	0.01	1.60		LCV FISH
	4	18	18	28.38	97.19	4702.00	0.0060	0.021	0.0005	0.00	12.10		LTV EC20 DAPHNID
	4	18	18	28.38	97.19	4702.00	0.0060	0.021	0.0004	0.00	16.00		LCV DAPHNIDS
	5	18	18	10.62	45.49	4702.00	0.0023	0.010	0.0133	0.06	0.17		NAWQ ACTUAL
	5	18	18	10.62	45.49	4702.00	0.0023	0.010	0.0090	0.04	0.25	<	LTV EC20 FISH
	5	18	18	10.62	45.49	4702.00	0.0023	0.010	0.0045	0.02	0.50		SS EC20
	5	18	18	10.62	45.49	4702.00	0.0023	0.010	0.0032	0.01	0.71		EC20 POPULATION
	5	18	18	10.62	45.49	4702.00	0.0023	0.010	0.0014	0.01	1.60		LCV FISH
	5	18	18	10.62	45.49	4702.00	0.0023	0.010	0.0002	0.00	12.10		LTV EC20 DAPHNID
	5	18	18	10.62	45.49	4702.00	0.0023	0.010	0.0001	0.00	16.00		LCV DAPHNIDS

Table F.5 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Mean fish[a] concentration	UCL Fish[b] concentration	BCF	Mean estimated water conc.	UCL estimated water conc.	Mean quotient	UCL quotient	Benchmark	Flag	Benchmark type
CHLORDANE (continued)	10	8	8	8.32	15.71	4702.00	0.0018	0.003	0.0104	0.02	0.17		NAWQ ACTUAL
	10	8	8	8.32	15.71	4702.00	0.0018	0.003	0.0071	0.01	0.25	<	LTV EC20 FISH
	10	8	8	8.32	15.71	4702.00	0.0018	0.003	0.0035	0.01	0.50		SS EC20
	10	8	8	8.32	15.71	4702.00	0.0018	0.003	0.0025	0.00	0.71		EC20 POPULATION
	10	8	8	8.32	15.71	4702.00	0.0018	0.003	0.0011	0.00	1.60		LCV FISH
	10	8	8	8.32	15.71	4702.00	0.0018	0.003	0.0001	0.00	12.10		LTV EC20 DAPHNID
	10	8	8	8.32	15.71	4702.00	0.0018	0.003	0.0001	0.00	16.00		LCV DAPHNIDS
	13	4	2	13.69	72.89	4702.00	0.0029	0.016	0.0171	0.09	0.17		NAWQ ACTUAL
	13	4	2	13.69	72.89	4702.00	0.0029	0.016	0.0116	0.06	0.25	<	LTV EC20 FISH
	13	4	2	13.69	72.89	4702.00	0.0029	0.016	0.0058	0.03	0.50		SS EC20
	13	4	2	13.69	72.89	4702.00	0.0029	0.016	0.0041	0.02	0.71		EC20 POPULATION
	13	4	2	13.69	72.89	4702.00	0.0029	0.016	0.0018	0.01	1.60		LCV FISH
	13	4	2	13.69	72.89	4702.00	0.0029	0.016	0.0002	0.00	12.10		LTV EC20 DAPHNID
	13	4	2	13.69	72.89	4702.00	0.0029	0.016	0.0002	0.00	16.00		LCV DAPHNIDS
	15	4	4	12.25	22.08	4702.00	0.0026	0.005	0.0153	0.03	0.17		NAWQ ACTUAL
	15	4	4	12.25	22.08	4702.00	0.0026	0.005	0.0104	0.02	0.25	<	LTV EC20 FISH
	15	4	4	12.25	22.08	4702.00	0.0026	0.005	0.0052	0.01	0.50		SS EC20
	15	4	4	12.25	22.08	4702.00	0.0026	0.005	0.0037	0.01	0.71		EC20 POPULATION
	15	4	4	12.25	22.08	4702.00	0.0026	0.005	0.0016	0.00	1.60		LCV FISH
	15	4	4	12.25	22.08	4702.00	0.0026	0.005	0.0002	0.00	12.10		LTV EC20 DAPHNID
	15	4	4	12.25	22.08	4702.00	0.0026	0.005	0.0002	0.00	16.00		LCV DAPHNIDS
COPPER	5	25	6	46.48	170000.00	210.00	0.2213	809.524	1.0797	3948.90	0.20		LTV EC20 DAPHNID
	5	25	6	46.48	170000.00	210.00	0.2213	809.524	0.9623	3519.67	0.23		LCV DAPHNIDS
	5	25	6	46.48	170000.00	210.00	0.2213	809.524	0.8513	3113.55	0.26		SS EC20
	5	25	6	46.48	170000.00	210.00	0.2213	809.524	0.0571	209.02	3.87		LCV FISH
	5	25	6	46.48	170000.00	210.00	0.2213	809.524	0.0443	161.90	5.00		LTV EC20 FISH
	5	25	6	46.48	170000.00	210.00	0.2213	809.524	0.0257	94.13	8.60		EC20 POPULATION
	5	25	6	46.48	170000.00	210.00	0.2213	809.524	0.0184	67.46	12.00		NAWQ ACTUAL
DI-N-OCTYLPHTHALATE	3	33	1	24.05	410.00	9300.00	0.0026	0.044	0.0000	0.00	100.00	<	LTV EC20 FISH
	3	33	1	24.05	410.00	9300.00	0.0026	0.044	0.0000	0.00	310.00		LTV EC20 DAPHNID
	3	33	1	24.05	410.00	9300.00	0.0026	0.044	0.0000	0.00	570.00		LCV DAPHNIDS
	3	33	1	24.05	410.00	9300.00	0.0026	0.044	0.0000	0.00	1995.00		EC20 POPULATION
	3	33	1	24.05	410.00	9300.00	0.0026	0.044	0.0000	0.00	5700.00		LCV FISH

Table F.5 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Mean fish[a] concentration	UCL Fish[b] concentration	BCF	Mean estimated water conc.	UCL estimated water conc.	Mean quotient	UCL quotient	Benchmark	Flag	Benchmark type
MERCURY	1	28	28	53.67	81.95	63000.00	0.0009	0.001	2.8399	4.34	0.00		NAWQ ADVISORY
	1	28	28	53.67	81.95	63000.00	0.0009	0.001	0.0284	0.04	0.03	<	LTV EC20 FISH
	1	28	28	53.67	81.95	63000.00	0.0009	0.001	0.0213	0.03	0.04	<	LCV DAPHNIDS
	1	28	28	53.67	81.95	63000.00	0.0009	0.001	0.0030	0.00	0.28		EC20 POPULATION
	1	28	28	53.67	81.95	63000.00	0.0009	0.001	0.0016	0.00	0.52		LCV FISH
	1	28	28	53.67	81.95	63000.00	0.0009	0.001	0.0010	0.00	0.87		LTV EC20 DAPHNID
	2	13	13	63.84	134.97	63000.00	0.0010	0.002	3.3779	7.14	0.00		NAWQ ADVISORY
	2	13	13	63.84	134.97	63000.00	0.0010	0.002	0.0338	0.07	0.03	<	LTV EC20 FISH
	2	13	13	63.84	134.97	63000.00	0.0010	0.002	0.0253	0.05	0.04	<	LCV DAPHNIDS
	2	13	13	63.84	134.97	63000.00	0.0010	0.002	0.0036	0.01	0.28		EC20 POPULATION
	2	13	13	63.84	134.97	63000.00	0.0010	0.002	0.0019	0.00	0.52		LCV FISH
	2	13	13	63.84	134.97	63000.00	0.0010	0.002	0.0012	0.00	0.87		LTV EC20 DAPHNID
	3	35	35	422.59	615.51	63000.00	0.0067	0.010	22.3592	32.57	0.00		NAWQ ADVISORY
	3	35	35	422.59	615.51	63000.00	0.0067	0.010	0.2236	0.33	0.03	<	LTV EC20 FISH
	3	35	35	422.59	615.51	63000.00	0.0067	0.010	0.1677	0.24	0.04	<	LCV DAPHNIDS
	3	35	35	422.59	615.51	63000.00	0.0067	0.010	0.0240	0.03	0.28		EC20 POPULATION
	3	35	35	422.59	615.51	63000.00	0.0067	0.010	0.0129	0.02	0.52		LCV FISH
	3	35	35	422.59	615.51	63000.00	0.0067	0.010	0.0077	0.01	0.87		LTV EC20 DAPHNID
	4	27	27	185.34	390.65	63000.00	0.0029	0.006	9.8061	20.67	0.00		NAWQ ADVISORY
	4	27	27	185.34	390.65	63000.00	0.0029	0.006	0.0981	0.21	0.03	<	LTV EC20 FISH
	4	27	27	185.34	390.65	63000.00	0.0029	0.006	0.0735	0.16	0.04	<	LCV DAPHNIDS
	4	27	27	185.34	390.65	63000.00	0.0029	0.006	0.0105	0.02	0.28		EC20 POPULATION
	4	27	27	185.34	390.65	63000.00	0.0029	0.006	0.0057	0.01	0.52		LCV FISH
	4	27	27	185.34	390.65	63000.00	0.0029	0.006	0.0034	0.01	0.87		LTV EC20 DAPHNID
	5	25	25	65.98	107.91	63000.00	0.0010	0.002	3.4912	5.71	0.00		NAWQ ADVISORY
	5	25	25	65.98	107.91	63000.00	0.0010	0.002	0.0349	0.06	0.03	<	LTV EC20 FISH
	5	25	25	65.98	107.91	63000.00	0.0010	0.002	0.0262	0.04	0.04	<	LCV DAPHNIDS
	5	25	25	65.98	107.91	63000.00	0.0010	0.002	0.0037	0.01	0.28		EC20 POPULATION
	5	25	25	65.98	107.91	63000.00	0.0010	0.002	0.0020	0.00	0.52		LCV FISH
	5	25	25	65.98	107.91	63000.00	0.0010	0.002	0.0012	0.00	0.87		LTV EC20 DAPHNID
	10	15	15	190.08	279.96	63000.00	0.0030	0.004	10.0574	14.81	0.00		NAWQ ADVISORY
	10	15	15	190.08	279.96	63000.00	0.0030	0.004	0.1006	0.15	0.03	<	LTV EC20 FISH
	10	15	15	190.08	279.96	63000.00	0.0030	0.004	0.0754	0.11	0.04	<	LCV DAPHNIDS
	10	15	15	190.08	279.96	63000.00	0.0030	0.004	0.0108	0.02	0.28		EC20 POPULATION
	10	15	15	190.08	279.96	63000.00	0.0030	0.004	0.0058	0.01	0.52		LCV FISH
	10	15	15	190.08	279.96	63000.00	0.0030	0.004	0.0035	0.01	0.87		LTV EC20 DAPHNID
	13	10	10	105.51	367.42	63000.00	0.0017	0.006	5.5827	19.44	0.00		NAWQ ADVISORY
	13	10	10	105.51	367.42	63000.00	0.0017	0.006	0.0558	0.19	0.03	<	LTV EC20 FISH
	13	10	10	105.51	367.42	63000.00	0.0017	0.006	0.0419	0.15	0.04	<	LCV DAPHNIDS
	13	10	10	105.51	367.42	63000.00	0.0017	0.006	0.0060	0.02	0.28		EC20 POPULATION
	13	10	10	105.51	367.42	63000.00	0.0017	0.006	0.0032	0.01	0.52		LCV FISH
	13	10	10	105.51	367.42	63000.00	0.0017	0.006	0.0019	0.01	0.87		LTV EC20 DAPHNID

Table F.5 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Mean fish[a] concentration	UCL Fish[b] concentration	BCF	Mean estimated water conc.	UCL estimated water conc.	Mean quotient	UCL quotient	Benchmark	Flag	Benchmark type
MERCURY (continued)	15	16	16	132.09	218.29	63000.00	0.0021	0.003	6.9888	11.55	0.00		NAWQ ADVISORY
	15	16	16	132.09	218.29	63000.00	0.0021	0.003	0.0699	0.12	0.03	<	LTV EC20 FISH
	15	16	16	132.09	218.29	63000.00	0.0021	0.003	0.0524	0.09	0.04	<	LCV DAPHNIDS
	15	16	16	132.09	218.29	63000.00	0.0021	0.003	0.0075	0.01	0.28		EC20 POPULATION
	15	16	16	132.09	218.29	63000.00	0.0021	0.003	0.0040	0.01	0.52		LCV FISH
	15	16	16	132.09	218.29	63000.00	0.0021	0.003	0.0024	0.00	0.87		LTV EC20 DAPHNID
SELENIUM	1	28	26	748.33	834.48	8.00	93.5412	104.310	35.9774	40.12	2.60		SS EC20
	1	28	26	748.33	834.48	8.00	93.5412	104.310	3.7416	4.17	25.00		LTV EC20 DAPHNID
	1	28	26	748.33	834.48	8.00	93.5412	104.310	2.6726	2.98	35.00		NAWQ ACTUAL
	1	28	26	748.33	834.48	8.00	93.5412	104.310	2.3385	2.61	40.00		LTV EC20 FISH
	1	28	26	748.33	834.48	8.00	93.5412	104.310	1.0591	1.18	88.32		LCV FISH
	1	28	26	748.33	834.48	8.00	93.5412	104.310	1.0206	1.14	91.65		LCV DAPHNIDS
	2	13	11	726.04	850.69	8.00	90.7551	106.337	34.9058	40.90	2.60		SS EC20
	2	13	11	726.04	850.69	8.00	90.7551	106.337	3.6302	4.25	25.00		LTV EC20 DAPHNID
	2	13	11	726.04	850.69	8.00	90.7551	106.337	2.5930	3.04	35.00		NAWQ ACTUAL
	2	13	11	726.04	850.69	8.00	90.7551	106.337	2.2689	2.66	40.00		LTV EC20 FISH
	2	13	11	726.04	850.69	8.00	90.7551	106.337	1.0276	1.20	88.32		LCV FISH
	2	13	11	726.04	850.69	8.00	90.7551	106.337	0.9902	1.16	91.65		LCV DAPHNIDS
	3	35	2	231.39	576.88	8.00	28.9237	72.110	11.1245	27.73	2.60		SS EC20
	3	35	2	231.39	576.88	8.00	28.9237	72.110	1.1569	2.88	25.00		LTV EC20 DAPHNID
	3	35	2	231.39	576.88	8.00	28.9237	72.110	0.8264	2.06	35.00		NAWQ ACTUAL
	3	35	2	231.39	576.88	8.00	28.9237	72.110	0.7231	1.80	40.00		LTV EC20 FISH
	3	35	2	231.39	576.88	8.00	28.9237	72.110	0.3275	0.82	88.32		LCV FISH
	3	35	2	231.39	576.88	8.00	28.9237	72.110	0.3156	0.79	91.65		LCV DAPHNIDS
	4	27	14	556.53	686.35	8.00	69.5667	85.793	26.7564	33.00	2.60		SS EC20
	4	27	14	556.53	686.35	8.00	69.5667	85.793	2.7827	3.43	25.00		LTV EC20 DAPHNID
	4	27	14	556.53	686.35	8.00	69.5667	85.793	1.9876	2.45	35.00		NAWQ ACTUAL
	4	27	14	556.53	686.35	8.00	69.5667	85.793	1.7392	2.14	40.00		LTV EC20 FISH
	4	27	14	556.53	686.35	8.00	69.5667	85.793	0.7877	0.97	88.32		LCV FISH
	4	27	14	556.53	686.35	8.00	69.5667	85.793	0.7590	0.94	91.65		LCV DAPHNIDS
	10	15	8	521.86	582.48	8.00	65.2320	72.810	25.0892	28.00	2.60		SS EC20
	10	15	8	521.86	582.48	8.00	65.2320	72.810	2.6093	2.91	25.00		LTV EC20 DAPHNID
	10	15	8	521.86	582.48	8.00	65.2320	72.810	1.8638	2.08	35.00		NAWQ ACTUAL
	10	15	8	521.86	582.48	8.00	65.2320	72.810	1.6308	1.82	40.00		LTV EC20 FISH
	10	15	8	521.86	582.48	8.00	65.2320	72.810	0.7386	0.82	88.32		LCV FISH
	10	15	8	521.86	582.48	8.00	65.2320	72.810	0.7118	0.79	91.65		LCV DAPHNIDS

Table F.5 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Mean fish[a] concentration	UCL Fish[b] concentration	BCF	Mean estimated water conc.	UCL estimated water conc.	Mean quotient	UCL quotient	Benchmark	Flag	Benchmark type
SELENIUM (continued)	15	16	8	524.64	679.48	8.00	65.5796	84.935	25.2229	32.67	2.60		SS EC20
	15	16	8	524.64	679.48	8.00	65.5796	84.935	2.6232	3.40	25.00		LTV EC20 DAPHNID
	15	16	8	524.64	679.48	8.00	65.5796	84.935	1.8737	2.43	35.00		NAWQ ACTUAL
	15	16	8	524.64	679.48	8.00	65.5796	84.935	1.6395	2.12	40.00		LTV EC20 FISH
	15	16	8	524.64	679.48	8.00	65.5796	84.935	0.7425	0.96	88.32		LCV FISH
	15	16	8	524.64	679.48	8.00	65.5796	84.935	0.7155	0.93	91.65		LCV DAPHNIDS
ZINC	1	28	28	6589.72	7546.46	1000.00	6.5897	7.546	0.3138	0.36	21.00		SS EC20
	1	28	28	6589.72	7546.46	1000.00	6.5897	7.546	0.1810	0.21	36.41		LCV FISH
	1	28	28	6589.72	7546.46	1000.00	6.5897	7.546	0.1410	0.16	46.73		LCV DAPHNIDS
	1	28	28	6589.72	7546.46	1000.00	6.5897	7.546	0.1402	0.16	47.00		LTV EC20 FISH
	1	28	28	6589.72	7546.46	1000.00	6.5897	7.546	0.0824	0.09	80.00		EC20 POPULATION
	1	28	28	6589.72	7546.46	1000.00	6.5897	7.546	0.0599	0.07	110.00		NAWQ ACTUAL
	2	13	13	5741.98	6566.14	1000.00	5.7420	6.566	0.2734	0.31	21.00		SS EC20
	2	13	13	5741.98	6566.14	1000.00	5.7420	6.566	0.1577	0.18	36.41		LCV FISH
	2	13	13	5741.98	6566.14	1000.00	5.7420	6.566	0.1229	0.14	46.73		LCV DAPHNIDS
	2	13	13	5741.98	6566.14	1000.00	5.7420	6.566	0.1222	0.14	47.00		LTV EC20 FISH
	2	13	13	5741.98	6566.14	1000.00	5.7420	6.566	0.0718	0.08	80.00		EC20 POPULATION
	2	13	13	5741.98	6566.14	1000.00	5.7420	6.566	0.0522	0.06	110.00		NAWQ ACTUAL
	3	35	35	5763.90	6551.08	1000.00	5.7639	6.551	0.2745	0.31	21.00		SS EC20
	3	35	35	5763.90	6551.08	1000.00	5.7639	6.551	0.1583	0.18	36.41		LCV FISH
	3	35	35	5763.90	6551.08	1000.00	5.7639	6.551	0.1233	0.14	46.73		LCV DAPHNIDS
	3	35	35	5763.90	6551.08	1000.00	5.7639	6.551	0.1226	0.14	47.00		LTV EC20 FISH
	3	35	35	5763.90	6551.08	1000.00	5.7639	6.551	0.0720	0.08	80.00		EC20 POPULATION
	3	35	35	5763.90	6551.08	1000.00	5.7639	6.551	0.0524	0.06	110.00		NAWQ ACTUAL
	4	27	27	5746.66	6545.24	1000.00	5.7467	6.545	0.2737	0.31	21.00		SS EC20
	4	27	27	5746.66	6545.24	1000.00	5.7467	6.545	0.1578	0.18	36.41		LCV FISH
	4	27	27	5746.66	6545.24	1000.00	5.7467	6.545	0.1230	0.14	46.73		LCV DAPHNIDS
	4	27	27	5746.66	6545.24	1000.00	5.7467	6.545	0.1223	0.14	47.00		LTV EC20 FISH
	4	27	27	5746.66	6545.24	1000.00	5.7467	6.545	0.0718	0.08	80.00		EC20 POPULATION
	4	27	27	5746.66	6545.24	1000.00	5.7467	6.545	0.0522	0.06	110.00		NAWQ ACTUAL
	5	24	24	6977.21	10929.98	1000.00	6.9772	10.930	0.3322	0.52	21.00		SS EC20
	5	24	24	6977.21	10929.98	1000.00	6.9772	10.930	0.1916	0.30	36.41		LCV FISH
	5	24	24	6977.21	10929.98	1000.00	6.9772	10.930	0.1493	0.23	46.73		LCV DAPHNIDS
	5	24	24	6977.21	10929.98	1000.00	6.9772	10.930	0.1485	0.23	47.00		LTV EC20 FISH
	5	24	24	6977.21	10929.98	1000.00	6.9772	10.930	0.0872	0.14	80.00		EC20 POPULATION
	5	24	24	6977.21	10929.98	1000.00	6.9772	10.930	0.0634	0.10	110.00		NAWQ ACTUAL

Table F.5 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Mean fish[a] concentration	UCL Fish[b] concentration	BCF	Mean estimated water conc.	UCL estimated water conc.	Mean quotient	UCL quotient	Benchmark	Benchmark type
ZINC (continued)	10	15	15	5221.38	5966.77	1000.00	5.2214	5.967	0.2486	0.28	21.00	SS EC20
	10	15	15	5221.38	5966.77	1000.00	5.2214	5.967	0.1434	0.16	36.41	LCV FISH
	10	15	15	5221.38	5966.77	1000.00	5.2214	5.967	0.1117	0.13	46.73	LCV DAPHNIDS
	10	15	15	5221.38	5966.77	1000.00	5.2214	5.967	0.1111	0.13	47.00	LTV EC20 FISH
	10	15	15	5221.38	5966.77	1000.00	5.2214	5.967	0.0653	0.07	80.00	EC20 POPULATION
	10	15	15	5221.38	5966.77	1000.00	5.2214	5.967	0.0475	0.05	110.00	NAWQ ACTUAL
	13	10	10	6313.03	6976.61	1000.00	6.3130	6.977	0.3006	0.33	21.00	SS EC20
	13	10	10	6313.03	6976.61	1000.00	6.3130	6.977	0.1734	0.19	36.41	LCV FISH
	13	10	10	6313.03	6976.61	1000.00	6.3130	6.977	0.1351	0.15	46.73	LCV DAPHNIDS
	13	10	10	6313.03	6976.61	1000.00	6.3130	6.977	0.1343	0.15	47.00	LTV EC20 FISH
	13	10	10	6313.03	6976.61	1000.00	6.3130	6.977	0.0789	0.09	80.00	EC20 POPULATION
	13	10	10	6313.03	6976.61	1000.00	6.3130	6.977	0.0574	0.06	110.00	NAWQ ACTUAL
	15	16	16	5772.05	6898.93	1000.00	5.7720	6.899	0.2749	0.33	21.00	SS EC20
	15	16	16	5772.05	6898.93	1000.00	5.7720	6.899	0.1585	0.19	36.41	LCV FISH
	15	16	16	5772.05	6898.93	1000.00	5.7720	6.899	0.1235	0.15	46.73	LCV DAPHNIDS
	15	16	16	5772.05	6898.93	1000.00	5.7720	6.899	0.1228	0.15	47.00	LTV EC20 FISH
	15	16	16	5772.05	6898.93	1000.00	5.7720	6.899	0.0722	0.09	80.00	EC20 POPULATION
	15	16	16	5772.05	6898.93	1000.00	5.7720	6.899	0.0525	0.06	110.00	NAWQ ACTUAL

[a]In cases of mixed detects and nondetects, statistics are calculated using all values, "as is." The mean concentration is the geometric mean.

[b]UCL concentration was compared with the maximum value and the smaller has been used as the "UCL concentration."

Table F.6. Limits of detection of chemicals not detected in fish (ug/L), bioconcentration factors, estimated exposure in water (ug/L), and quotients for exposure to that water concentration

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	Maximum detection limit	BCF	Minimum exposure conc.	Maximum exposure conc.	Minimum detection limit quo.	Maximum detection limit quo.	Benchmark	Flag	Benchmark type
2,4-DINITROPHENOL	1	6	0	3400.00	4300.00	.	.	.	.	.	150.00		NAWQ ACTUAL
	2	8	0	3500.00	9300.00	.	.	.	.	.	150.00		NAWQ ACTUAL
	3	34	0	930.00	2100.00	.	.	.	.	.	150.00		NAWQ ACTUAL
	4	13	0	3300.00	4100.00	.	.	.	.	.	150.00		NAWQ ACTUAL
	5	9	0	3300.00	4200.00	.	.	.	.	.	150.00		NAWQ ACTUAL
	13	2	0	3400.00	3500.00	.	.	.	.	.	150.00		NAWQ ACTUAL
	15	4	0	3400.00	3800.00	.	.	.	.	.	150.00		NAWQ ACTUAL
2-METHYLPHENOL	1	6	0	680.00	870.00	.	.	.	.	.	7.70		NAWQ ADVISORY
	1	6	0	680.00	870.00	.	.	.	.	.	74.00		EC20 POPULATION
	1	6	0	680.00	870.00	.	.	.	.	.	470.00	*	LTV EC20 FISH
	1	6	0	680.00	870.00	.	.	.	.	.	489.00	*	LCV FISH
	1	6	0	680.00	870.00	.	.	.	.	.	1316.00	*	LCV DAPHNIDS
	2	8	0	700.00	1900.00	.	.	.	.	.	7.70		NAWQ ADVISORY
	2	8	0	700.00	1900.00	.	.	.	.	.	74.00		EC20 POPULATION
	2	8	0	700.00	1900.00	.	.	.	.	.	470.00	*	LTV EC20 FISH
	2	8	0	700.00	1900.00	.	.	.	.	.	489.00	*	LCV FISH
	2	8	0	700.00	1900.00	.	.	.	.	.	1316.00	*	LCV DAPHNIDS
	3	34	0	190.00	410.00	.	.	.	.	.	7.70		NAWQ ADVISORY
	3	34	0	190.00	410.00	.	.	.	.	.	74.00		EC20 POPULATION
	3	34	0	190.00	410.00	.	.	.	.	.	470.00	*	LTV EC20 FISH
	3	34	0	190.00	410.00	.	.	.	.	.	489.00	*	LCV FISH
	3	34	0	190.00	410.00	.	.	.	.	.	1316.00	*	LCV DAPHNIDS
	4	13	0	660.00	830.00	.	.	.	.	.	7.70		NAWQ ADVISORY
	4	13	0	660.00	830.00	.	.	.	.	.	74.00		EC20 POPULATION
	4	13	0	660.00	830.00	.	.	.	.	.	470.00	*	LTV EC20 FISH
	4	13	0	660.00	830.00	.	.	.	.	.	489.00	*	LCV FISH
	4	13	0	660.00	830.00	.	.	.	.	.	1316.00	*	LCV DAPHNIDS
	5	9	0	660.00	830.00	.	.	.	.	.	7.70		NAWQ ADVISORY
	5	9	0	660.00	830.00	.	.	.	.	.	74.00		EC20 POPULATION
	5	9	0	660.00	830.00	.	.	.	.	.	470.00	*	LTV EC20 FISH
	5	9	0	660.00	830.00	.	.	.	.	.	489.00	*	LCV FISH
	5	9	0	660.00	830.00	.	.	.	.	.	1316.00	*	LCV DAPHNIDS
	13	2	0	690.00	700.00	.	.	.	.	.	7.70		NAWQ ADVISORY
	13	2	0	690.00	700.00	.	.	.	.	.	74.00		EC20 POPULATION
	13	2	0	690.00	700.00	.	.	.	.	.	470.00	*	LTV EC20 FISH
	13	2	0	690.00	700.00	.	.	.	.	.	489.00	*	LCV FISH
	13	2	0	690.00	700.00	.	.	.	.	.	1316.00	*	LCV DAPHNIDS
	15	4	0	670.00	770.00	.	.	.	.	.	7.70		NAWQ ADVISORY
	15	4	0	670.00	770.00	.	.	.	.	.	74.00		EC20 POPULATION
	15	4	0	670.00	770.00	.	.	.	.	.	470.00	*	LTV EC20 FISH
	15	4	0	670.00	770.00	.	.	.	.	.	489.00	*	LCV FISH
	15	4	0	670.00	770.00	.	.	.	.	.	1316.00	*	LCV DAPHNIDS

Table F.6 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	Maximum detection limit	BCF	Minimum exposure conc.	Maximum exposure conc.	Minimum detection limit quo.	Maximum detection limit quo.	Benchmark	Flag	Benchmark type
2-NITROPHENOL	1	6	0	680.00	870.00	150	4.533	5.800	0.03	0.04	150.00		NAWQ ACTUAL
	2	8	0	700.00	1900.00	150	4.667	12.667	0.03	0.08	150.00		NAWQ ACTUAL
	3	34	0	190.00	410.00	150	1.267	2.733	0.01	0.02	150.00		NAWQ ACTUAL
	4	13	0	660.00	830.00	150	4.400	5.533	0.03	0.04	150.00		NAWQ ACTUAL
	5	9	0	660.00	830.00	150	4.400	5.533	0.03	0.04	150.00		NAWQ ACTUAL
	13	2	0	690.00	700.00	150	4.600	4.667	0.03	0.03	150.00		NAWQ ACTUAL
	15	4	0	670.00	770.00	150	4.467	5.133	0.03	0.03	150.00		NAWQ ACTUAL
4,4'-DDD	2	14	0	10.00	100.00	170000	0.000	0.001	0.14	1.40	0.00		NAWQ ADVISORY
	2	14	0	10.00	100.00	170000	0.000	0.001	0.00	0.00	0.61		EC20 POPULATION
	2	14	0	10.00	100.00	170000	0.000	0.001	0.00	0.00	1.69	*	LCV FISH
	2	14	0	10.00	100.00	170000	0.000	0.001	0.00	0.00	3.99	*	LTV EC20 FISH
	13	4	0	10.00	10.00	170000	0.000	0.000	0.14	0.14	0.00		NAWQ ADVISORY
	13	4	0	10.00	10.00	170000	0.000	0.000	0.00	0.00	0.61		EC20 POPULATION
	13	4	0	10.00	10.00	170000	0.000	0.000	0.00	0.00	1.69	*	LCV FISH
	13	4	0	10.00	10.00	170000	0.000	0.000	0.00	0.00	3.99	*	LTV EC20 FISH
4,4'-DDE	15	4	0	50.00	200.00	8000000	0.000	0.000	0.00	0.00	0.01		SS EC20
	15	4	0	50.00	200.00	8000000	0.000	0.000	0.00	0.00	0.02	*	LCV DAPHNIDS
	15	4	0	50.00	200.00	8000000	0.000	0.000	0.00	0.00	0.02		NAWQ ADVISORY
	15	4	0	50.00	200.00	8000000	0.000	0.000	0.00	0.00	0.35		LTV EC20 FISH
	15	4	0	50.00	200.00	8000000	0.000	0.000	0.00	0.00	0.73		LCV FISH
4,4'-DDT	1	16	0	10.00	200.00	34000	0.000	0.006	0.04	0.74	0.01		SS EC20
	1	16	0	10.00	200.00	34000	0.000	0.006	0.02	0.37	0.02	*	LCV DAPHNIDS
	1	16	0	10.00	200.00	34000	0.000	0.006	0.01	0.29	0.02		NAWQ ADVISORY
	1	16	0	10.00	200.00	34000	0.000	0.006	0.00	0.02	0.35		LTV EC20 FISH
	1	16	0	10.00	200.00	34000	0.000	0.006	0.00	0.01	0.73		LCV FISH
	3	34	0	10.00	17.08	34000	0.000	0.001	0.04	0.06	0.01		SS EC20
	3	34	0	10.00	17.08	34000	0.000	0.001	0.02	0.03	0.02	*	LCV DAPHNIDS
	3	34	0	10.00	17.08	34000	0.000	0.001	0.01	0.03	0.02		NAWQ ADVISORY
	3	34	0	10.00	17.08	34000	0.000	0.001	0.00	0.00	0.35		LTV EC20 FISH
	3	34	0	10.00	17.08	34000	0.000	0.001	0.00	0.00	0.73		LCV FISH
	10	8	0	10.00	10.00	34000	0.000	0.000	0.04	0.04	0.01		SS EC20
	10	8	0	10.00	10.00	34000	0.000	0.000	0.02	0.02	0.02	*	LCV DAPHNIDS
	10	8	0	10.00	10.00	34000	0.000	0.000	0.01	0.01	0.02		NAWQ ADVISORY
	10	8	0	10.00	10.00	34000	0.000	0.000	0.00	0.00	0.35		LTV EC20 FISH
	10	8	0	10.00	10.00	34000	0.000	0.000	0.00	0.00	0.73		LCV FISH
	13	3	0	10.00	10.00	34000	0.000	0.000	0.04	0.04	0.01		SS EC20
	13	3	0	10.00	10.00	34000	0.000	0.000	0.02	0.02	0.02	*	LCV DAPHNIDS
	13	3	0	10.00	10.00	34000	0.000	0.000	0.01	0.01	0.02		NAWQ ADVISORY
	13	3	0	10.00	10.00	34000	0.000	0.000	0.00	0.00	0.35		LTV EC20 FISH
	13	3	0	10.00	10.00	34000	0.000	0.000	0.00	0.00	0.73		LCV FISH
	15	4	0	50.00	200.00	34000	0.001	0.006	0.18	0.74	0.01		SS EC20
	15	4	0	50.00	200.00	34000	0.001	0.006	0.09	0.37	0.02	*	LCV DAPHNIDS
	15	4	0	50.00	200.00	34000	0.001	0.006	0.07	0.29	0.02		NAWQ ADVISORY
	15	4	0	50.00	200.00	34000	0.001	0.006	0.00	0.02	0.35		LTV EC20 FISH

Table F.6 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	Maximum detection limit	BCF	Minimum exposure conc.	Maximum exposure conc.	Minimum detection limit quo.	Maximum detection limit quo.	Benchmark	Flag	Benchmark type
4,4'-DDT (continued)	15	4	0	50.00	200.00	34000	0.001	0.006	0.00	0.01	0.73		LCV FISH
ACENAPHTHENE	1	6	0	680.00	870.00	390	1.744	2.231	0.79	1.01	2.20		NAWQ ADVISORY
	1	6	0	680.00	870.00	390	1.744	2.231	0.01	0.01	197.00	<	LTV EC20 FISH
	1	6	0	680.00	870.00	390	1.744	2.231	0.00	0.01	413.00		LCV FISH
	1	6	0	680.00	870.00	390	1.744	2.231	0.00	0.00	6646.00	*	LCV DAPHNIDS
	2	8	0	700.00	1900.00	390	1.795	4.872	0.82	2.21	2.20		NAWQ ADVISORY
	2	8	0	700.00	1900.00	390	1.795	4.872	0.01	0.02	197.00	<	LTV EC20 FISH
	2	8	0	700.00	1900.00	390	1.795	4.872	0.00	0.01	413.00		LCV FISH
	2	8	0	700.00	1900.00	390	1.795	4.872	0.00	0.00	6646.00	*	LCV DAPHNIDS
	3	34	0	190.00	410.00	390	0.487	1.051	0.22	0.48	2.20		NAWQ ADVISORY
	3	34	0	190.00	410.00	390	0.487	1.051	0.00	0.01	197.00	<	LTV EC20 FISH
	3	34	0	190.00	410.00	390	0.487	1.051	0.00	0.00	413.00		LCV FISH
	3	34	0	190.00	410.00	390	0.487	1.051	0.00	0.00	6646.00	*	LCV DAPHNIDS
	4	6	0	660.00	720.00	390	1.692	1.846	0.77	0.84	2.20		NAWQ ADVISORY
	4	6	0	660.00	720.00	390	1.692	1.846	0.01	0.01	197.00	<	LTV EC20 FISH
	4	6	0	660.00	720.00	390	1.692	1.846	0.00	0.00	413.00		LCV FISH
	4	6	0	660.00	720.00	390	1.692	1.846	0.00	0.00	6646.00	*	LCV DAPHNIDS
	15	3	0	670.00	710.00	390	1.718	1.821	0.78	0.83	2.20		NAWQ ADVISORY
	15	3	0	670.00	710.00	390	1.718	1.821	0.01	0.01	197.00	<	LTV EC20 FISH
	15	3	0	670.00	710.00	390	1.718	1.821	0.00	0.00	413.00		LCV FISH
	15	3	0	670.00	710.00	390	1.718	1.821	0.00	0.00	6646.00	*	LCV DAPHNIDS
ALDRIN	1	16	0	10.00	200.00	11000	0.001	0.018	0.01	0.24	0.08		NAWQ ADVISORY
	3	34	0	7.72	8.54	11000	0.001	0.001	0.01	0.01	0.08		NAWQ ADVISORY
	10	8	0	10.00	10.00	11000	0.001	0.001	0.01	0.01	0.08		NAWQ ADVISORY
	15	4	0	50.00	200.00	11000	0.005	0.018	0.06	0.24	0.08		NAWQ ADVISORY
ANTHRACENE	1	6	0	680.00	870.00	485	1.402	1.794	140206.19	179381.44	0.00		NAWQ ADVISORY
	1	6	0	680.00	870.00	485	1.402	1.794	15.58	19.93	0.09	*	LCV FISH
	1	6	0	680.00	870.00	485	1.402	1.794	4.01	5.13	0.35	*	LTV EC20 FISH
	1	6	0	680.00	870.00	485	1.402	1.794	0.67	0.85	2.10	<	LCV DAPHNIDS
	1	6	0	680.00	870.00	485	1.402	1.794	0.17	0.22	8.20	>	LTV EC20 DAPHNID
	2	8	0	700.00	1900.00	485	1.443	3.918	144329.90	391752.58	0.00		NAWQ ADVISORY
	2	8	0	700.00	1900.00	485	1.443	3.918	16.04	43.53	0.09	*	LCV FISH
	2	8	0	700.00	1900.00	485	1.443	3.918	4.12	11.19	0.35	*	LTV EC20 FISH
	2	8	0	700.00	1900.00	485	1.443	3.918	0.69	1.87	2.10	<	LCV DAPHNIDS
	2	8	0	700.00	1900.00	485	1.443	3.918	0.18	0.48	8.20	>	LTV EC20 DAPHNID
	3	34	0	190.00	410.00	485	0.392	0.845	39175.26	84536.08	0.00		NAWQ ADVISORY
	3	34	0	190.00	410.00	485	0.392	0.845	4.35	9.39	0.09	*	LCV FISH
	3	34	0	190.00	410.00	485	0.392	0.845	1.12	2.42	0.35	*	LTV EC20 FISH
	3	34	0	190.00	410.00	485	0.392	0.845	0.19	0.40	2.10	<	LCV DAPHNIDS
	3	34	0	190.00	410.00	485	0.392	0.845	0.05	0.10	8.20	>	LTV EC20 DAPHNID
	4	6	0	660.00	720.00	485	1.361	1.485	136082.47	148453.61	0.00		NAWQ ADVISORY
	4	6	0	660.00	720.00	485	1.361	1.485	15.12	16.49	0.09	*	LCV FISH
	4	6	0	660.00	720.00	485	1.361	1.485	3.89	4.24	0.35	*	LTV EC20 FISH
	4	6	0	660.00	720.00	485	1.361	1.485	0.65	0.71	2.10	<	LCV DAPHNIDS

Table F.6 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	Maximum detection limit	BCF	Minimum exposure conc.	Maximum exposure conc.	Minimum detection limit quo.	Maximum detection limit quo.	Benchmark	Flag	Benchmark type
ANTHRACENE (continued)	4	6	0	660.00	720.00	485	1.361	1.485	0.17	0.18	8.20	>	LTV EC20 DAPHNID
	15	3	0	670.00	710.00	485	1.381	1.464	138144.33	146391.75	0.00		NAWQ ADVISORY
	15	3	0	670.00	710.00	485	1.381	1.464	15.35	16.27	0.09	*	LCV FISH
	15	3	0	670.00	710.00	485	1.381	1.464	3.95	4.18	0.35	*	LTV EC20 FISH
	15	3	0	670.00	710.00	485	1.381	1.464	0.66	0.70	2.10	<	LCV DAPHNIDS
	15	3	0	670.00	710.00	485	1.381	1.464	0.17	0.18	8.20	>	LTV EC20 DAPHNID
ANTIMONY	1	28	0	280.00	580.00	1	280.000	580.000	15.56	32.22	18.00		NAWQ ADVISORY
	1	28	0	280.00	580.00	1	280.000	580.000	3.54	7.34	79.00		EC20 POPULATION
	1	28	0	280.00	580.00	1	280.000	580.000	0.17	0.36	1600.00		LCV FISH
	1	28	0	280.00	580.00	1	280.000	580.000	0.15	0.31	1900.00		LTV EC20 DAPHNID
	1	28	0	280.00	580.00	1	280.000	580.000	0.12	0.25	2310.00		LTV EC20 FISH
	1	28	0	280.00	580.00	1	280.000	580.000	0.05	0.11	5400.00		LCV DAPHNIDS
	2	13	0	460.00	600.00	1	460.000	600.000	25.56	33.33	18.00		NAWQ ADVISORY
	2	13	0	460.00	600.00	1	460.000	600.000	5.82	7.59	79.00		EC20 POPULATION
	2	13	0	460.00	600.00	1	460.000	600.000	0.29	0.38	1600.00		LCV FISH
	2	13	0	460.00	600.00	1	460.000	600.000	0.24	0.32	1900.00		LTV EC20 DAPHNID
	2	13	0	460.00	600.00	1	460.000	600.000	0.20	0.26	2310.00		LTV EC20 FISH
	2	13	0	460.00	600.00	1	460.000	600.000	0.09	0.11	5400.00		LCV DAPHNIDS
	3	35	0	300.00	590.00	1	300.000	590.000	16.67	32.78	18.00		NAWQ ADVISORY
	3	35	0	300.00	590.00	1	300.000	590.000	3.80	7.47	79.00		EC20 POPULATION
	3	35	0	300.00	590.00	1	300.000	590.000	0.19	0.37	1600.00		LCV FISH
	3	35	0	300.00	590.00	1	300.000	590.000	0.16	0.31	1900.00		LTV EC20 DAPHNID
	3	35	0	300.00	590.00	1	300.000	590.000	0.13	0.26	2310.00		LTV EC20 FISH
	3	35	0	300.00	590.00	1	300.000	590.000	0.06	0.11	5400.00		LCV DAPHNIDS
	4	27	0	480.00	610.00	1	480.000	610.000	26.67	33.89	18.00		NAWQ ADVISORY
	4	27	0	480.00	610.00	1	480.000	610.000	6.08	7.72	79.00		EC20 POPULATION
	4	27	0	480.00	610.00	1	480.000	610.000	0.30	0.38	1600.00		LCV FISH
	4	27	0	480.00	610.00	1	480.000	610.000	0.25	0.32	1900.00		LTV EC20 DAPHNID
	4	27	0	480.00	610.00	1	480.000	610.000	0.21	0.26	2310.00		LTV EC20 FISH
	4	27	0	480.00	610.00	1	480.000	610.000	0.09	0.11	5400.00		LCV DAPHNIDS
	5	25	0	460.00	630.00	1	460.000	630.000	25.56	35.00	18.00		NAWQ ADVISORY
	5	25	0	460.00	630.00	1	460.000	630.000	5.82	7.97	79.00		EC20 POPULATION
	5	25	0	460.00	630.00	1	460.000	630.000	0.29	0.39	1600.00		LCV FISH
	5	25	0	460.00	630.00	1	460.000	630.000	0.24	0.33	1900.00		LTV EC20 DAPHNID
	5	25	0	460.00	630.00	1	460.000	630.000	0.20	0.27	2310.00		LTV EC20 FISH
	5	25	0	460.00	630.00	1	460.000	630.000	0.09	0.12	5400.00		LCV DAPHNIDS
	10	15	0	350.00	610.00	1	350.000	610.000	19.44	33.89	18.00		NAWQ ADVISORY
	10	15	0	350.00	610.00	1	350.000	610.000	4.43	7.72	79.00		EC20 POPULATION
	10	15	0	350.00	610.00	1	350.000	610.000	0.22	0.38	1600.00		LCV FISH
	10	15	0	350.00	610.00	1	350.000	610.000	0.18	0.32	1900.00		LTV EC20 DAPHNID
	10	15	0	350.00	610.00	1	350.000	610.000	0.15	0.26	2310.00		LTV EC20 FISH
	10	15	0	350.00	610.00	1	350.000	610.000	0.06	0.11	5400.00		LCV DAPHNIDS
	13	10	0	460.00	570.00	1	460.000	570.000	25.56	31.67	18.00		NAWQ ADVISORY
	13	10	0	460.00	570.00	1	460.000	570.000	5.82	7.22	79.00		EC20 POPULATION
	13	10	0	460.00	570.00	1	460.000	570.000	0.29	0.36	1600.00		LCV FISH
	13	10	0	460.00	570.00	1	460.000	570.000	0.24	0.30	1900.00		LTV EC20 DAPHNID

Table F.6 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	Maximum detection limit	BCF	Minimum exposure conc.	Maximum exposure conc.	Minimum detection limit quo.	Maximum detection limit quo.	Benchmark	Flag	Benchmark type
ANTIMONY (continued)	13	10	0	460.00	570.00	1	460.000	570.000	0.20	0.25	2310.00		LTV EC20 FISH
	13	10	0	460.00	570.00	1	460.000	570.000	0.09	0.11	5400.00		LCV DAPHNIDS
	15	16	0	350.00	570.00	1	350.000	570.000	19.44	31.67	18.00		NAWQ ADVISORY
	15	16	0	350.00	570.00	1	350.000	570.000	4.43	7.22	79.00		EC20 POPULATION
	15	16	0	350.00	570.00	1	350.000	570.000	0.22	0.36	1600.00		LCV FISH
	15	16	0	350.00	570.00	1	350.000	570.000	0.18	0.30	1900.00		LTV EC20 DAPHNID
	15	16	0	350.00	570.00	1	350.000	570.000	0.15	0.25	2310.00		LTV EC20 FISH
	15	16	0	350.00	570.00	1	350.000	570.000	0.06	0.11	5400.00		LCV DAPHNIDS
AROCLOR-1254	10	8	0	10.00	50.00	10000000	0.000	0.000	0.00	0.00	0.02		NAWQ ADVISORY
	10	8	0	10.00	50.00	10000000	0.000	0.000	0.00	0.00	0.52		LTV EC20 FISH
	10	8	0	10.00	50.00	10000000	0.000	0.000	0.00	0.00	0.63		EC20 POPULATION
	10	8	0	10.00	50.00	10000000	0.000	0.000	0.00	0.00	1.00		LCV FISH
	10	8	0	10.00	50.00	10000000	0.000	0.000	0.00	0.00	1.20		LTV EC20 DAPHNID
	10	8	0	10.00	50.00	10000000	0.000	0.000	0.00	0.00	2.10		LCV DAPHNIDS
BENZO(A)ANTHRACENE	1	6	0	680.00	870.00	10109	0.067	0.086	24.91	31.87	0.00		NAWQ ADVISORY
	1	6	0	680.00	870.00	10109	0.067	0.086	0.10	0.13	0.65	*	LCV DAPHNIDS
	2	8	0	700.00	1900.00	10109	0.069	0.188	25.65	69.61	0.00		NAWQ ADVISORY
	2	8	0	700.00	1900.00	10109	0.069	0.188	0.11	0.29	0.65	*	LCV DAPHNIDS
	3	34	0	190.00	410.00	10109	0.019	0.041	6.96	15.02	0.00		NAWQ ADVISORY
	3	34	0	190.00	410.00	10109	0.019	0.041	0.03	0.06	0.65	*	LCV DAPHNIDS
	4	6	0	660.00	720.00	10109	0.065	0.071	24.18	26.38	0.00		NAWQ ADVISORY
	4	6	0	660.00	720.00	10109	0.065	0.071	0.10	0.11	0.65	*	LCV DAPHNIDS
	15	3	0	670.00	710.00	10109	0.066	0.070	24.55	26.01	0.00		NAWQ ADVISORY
	15	3	0	670.00	710.00	10109	0.066	0.070	0.10	0.11	0.65	*	LCV DAPHNIDS
BENZO(A)PYRENE	1	6	0	680.00	870.00	30	22.667	29.000	17435.90	22307.69	0.00		NAWQ ADVISORY
	1	6	0	680.00	870.00	30	22.667	29.000	75.56	96.67	0.30	*	LCV DAPHNIDS
	1	6	0	680.00	870.00	30	22.667	29.000	7.58	9.70	2.99	>	LTV EC20 FISH
	2	8	0	700.00	1900.00	30	23.333	63.333	17948.72	48717.95	0.00		NAWQ ADVISORY
	2	8	0	700.00	1900.00	30	23.333	63.333	77.78	211.11	0.30	*	LCV DAPHNIDS
	2	8	0	700.00	1900.00	30	23.333	63.333	7.80	21.18	2.99	>	LTV EC20 FISH
	3	33	0	190.00	410.00	30	6.333	13.667	4871.79	10512.82	0.00		NAWQ ADVISORY
	3	33	0	190.00	410.00	30	6.333	13.667	21.11	45.56	0.30	*	LCV DAPHNIDS
	3	33	0	190.00	410.00	30	6.333	13.667	2.12	4.57	2.99	>	LTV EC20 FISH
	4	6	0	660.00	720.00	30	22.000	24.000	16923.08	18461.54	0.00		NAWQ ADVISORY
	4	6	0	660.00	720.00	30	22.000	24.000	73.33	80.00	0.30	*	LCV DAPHNIDS
	4	6	0	660.00	720.00	30	22.000	24.000	7.36	8.03	2.99	>	LTV EC20 FISH
	15	3	0	670.00	710.00	30	22.333	23.667	17179.49	18205.13	0.00		NAWQ ADVISORY
	15	3	0	670.00	710.00	30	22.333	23.667	74.44	78.89	0.30	*	LCV DAPHNIDS
	15	3	0	670.00	710.00	30	22.333	23.667	7.47	7.92	2.99	>	LTV EC20 FISH

Table F.6 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	Maximum detection limit	BCF	Minimum exposure conc.	Maximum exposure conc.	Minimum detection limit quo.	Maximum detection limit quo.	Benchmark	Flag	Benchmark type
BENZOIC ACID	1	6	0	3400.00	4300.00	.	.	.	.	.	0.45		NAWQ ADVISORY
	1	6	0	3400.00	4300.00	.	.	.	.	.	1259.00		EC20 POPULATION
	1	6	0	3400.00	4300.00	.	.	.	.	.	7409.00	*	LTV EC20 FISH
	1	6	0	3400.00	4300.00	.	.	.	.	.	12976.00	*	LCV FISH
	2	8	0	3500.00	9300.00	.	.	.	.	.	0.45		NAWQ ADVISORY
	2	8	0	3500.00	9300.00	.	.	.	.	.	1259.00		EC20 POPULATION
	2	8	0	3500.00	9300.00	.	.	.	.	.	7409.00	*	LTV EC20 FISH
	2	8	0	3500.00	9300.00	.	.	.	.	.	12976.00	*	LCV FISH
	3	34	0	930.00	2100.00	.	.	.	.	.	0.45		NAWQ ADVISORY
	3	34	0	930.00	2100.00	.	.	.	.	.	1259.00		EC20 POPULATION
	3	34	0	930.00	2100.00	.	.	.	.	.	7409.00	*	LTV EC20 FISH
	3	34	0	930.00	2100.00	.	.	.	.	.	12976.00	*	LCV FISH
	4	2	0	3300.00	3600.00	.	.	.	.	.	0.45		NAWQ ADVISORY
	4	2	0	3300.00	3600.00	.	.	.	.	.	1259.00		EC20 POPULATION
	4	2	0	3300.00	3600.00	.	.	.	.	.	7409.00	*	LTV EC20 FISH
	4	2	0	3300.00	3600.00	.	.	.	.	.	12976.00	*	LCV FISH
BENZYL ALCOHOL	1	6	0	680.00	870.00	.	.	.	.	.	0.15		NAWQ ADVISORY
	1	6	0	680.00	870.00	.	.	.	.	.	375.00		EC20 POPULATION
	1	6	0	680.00	870.00	.	.	.	.	.	550.00	*	LTV EC20 FISH
	1	6	0	680.00	870.00	.	.	.	.	.	589.00	*	LCV FISH
	2	8	0	700.00	1900.00	.	.	.	.	.	0.15		NAWQ ADVISORY
	2	8	0	700.00	1900.00	.	.	.	.	.	375.00		EC20 POPULATION
	2	8	0	700.00	1900.00	.	.	.	.	.	550.00	*	LTV EC20 FISH
	2	8	0	700.00	1900.00	.	.	.	.	.	589.00	*	LCV FISH
	3	34	0	190.00	410.00	.	.	.	.	.	0.15		NAWQ ADVISORY
	3	34	0	190.00	410.00	.	.	.	.	.	375.00		EC20 POPULATION
	3	34	0	190.00	410.00	.	.	.	.	.	550.00	*	LTV EC20 FISH
	3	34	0	190.00	410.00	.	.	.	.	.	589.00	*	LCV FISH
	4	6	0	660.00	720.00	.	.	.	.	.	0.15		NAWQ ADVISORY
	4	6	0	660.00	720.00	.	.	.	.	.	375.00		EC20 POPULATION
	4	6	0	660.00	720.00	.	.	.	.	.	550.00	*	LTV EC20 FISH
	4	6	0	660.00	720.00	.	.	.	.	.	589.00	*	LCV FISH
	15	3	0	670.00	710.00	.	.	.	.	.	0.15		NAWQ ADVISORY
	15	3	0	670.00	710.00	.	.	.	.	.	375.00		EC20 POPULATION
	15	3	0	670.00	710.00	.	.	.	.	.	550.00	*	LTV EC20 FISH
	15	3	0	670.00	710.00	.	.	.	.	.	589.00	*	LCV FISH

Table F.6 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	Maximum detection limit	BCF	Minimum exposure conc.	Maximum exposure conc.	Minimum detection limit quo.	Maximum detection limit quo.	Benchmark	Flag	Benchmark type
BERYLLIUM	2	13	0	3.00	3.00	2	1.500	1.500	2.46	2.46	0.61		NAWQ ADVISORY
	2	13	0	3.00	3.00	2	1.500	1.500	0.39	0.39	3.80		LTV EC20 DAPHNID
	2	13	0	3.00	3.00	2	1.500	1.500	0.28	0.28	5.30		LCV DAPHNIDS
	2	13	0	3.00	3.00	2	1.500	1.500	0.07	0.07	21.00		EC20 POPULATION
	2	13	0	3.00	3.00	2	1.500	1.500	0.03	0.03	57.00	*	LCV FISH
	2	13	0	3.00	3.00	2	1.500	1.500	0.01	0.01	148.00	*	LTV EC20 FISH
	4	27	0	3.00	3.00	2	1.500	1.500	2.46	2.46	0.61		NAWQ ADVISORY
	4	27	0	3.00	3.00	2	1.500	1.500	0.39	0.39	3.80		LTV EC20 DAPHNID
	4	27	0	3.00	3.00	2	1.500	1.500	0.28	0.28	5.30		LCV DAPHNIDS
	4	27	0	3.00	3.00	2	1.500	1.500	0.07	0.07	21.00		EC20 POPULATION
	4	27	0	3.00	3.00	2	1.500	1.500	0.03	0.03	57.00	*	LCV FISH
	4	27	0	3.00	3.00	2	1.500	1.500	0.01	0.01	148.00	*	LTV EC20 FISH
	13	3	0	3.00	3.00	2	1.500	1.500	2.46	2.46	0.61		NAWQ ADVISORY
	13	3	0	3.00	3.00	2	1.500	1.500	0.39	0.39	3.80		LTV EC20 DAPHNID
	13	3	0	3.00	3.00	2	1.500	1.500	0.28	0.28	5.30		LCV DAPHNIDS
	13	3	0	3.00	3.00	2	1.500	1.500	0.07	0.07	21.00		EC20 POPULATION
	13	3	0	3.00	3.00	2	1.500	1.500	0.03	0.03	57.00	*	LCV FISH
	13	3	0	3.00	3.00	2	1.500	1.500	0.01	0.01	148.00	*	LTV EC20 FISH
BIS(2-ETHYLHEXYL)PHTHALATE	1	6	0	680.00	870.00	310	2.194	2.806	219.35	280.65	0.01		NAWQ ADVISORY
	1	6	0	680.00	870.00	310	2.194	2.806	0.73	0.94	3.00	<	LCV DAPHNIDS
	1	6	0	680.00	870.00	310	2.194	2.806	0.73	0.94	3.00	<	LTV EC20 DAPHNID
	1	6	0	680.00	870.00	310	2.194	2.806	0.26	0.33	8.40		LCV FISH
	1	6	0	680.00	870.00	310	2.194	2.806	0.04	0.06	50.00		EC20 POPULATION
	1	6	0	680.00	870.00	310	2.194	2.806	0.04	0.05	54.00	>	LTV EC20 FISH
	2	8	0	700.00	1900.00	310	2.258	6.129	225.81	612.90	0.01		NAWQ ADVISORY
	2	8	0	700.00	1900.00	310	2.258	6.129	0.75	2.04	3.00	<	LCV DAPHNIDS
	2	8	0	700.00	1900.00	310	2.258	6.129	0.75	2.04	3.00	<	LTV EC20 DAPHNID
	2	8	0	700.00	1900.00	310	2.258	6.129	0.27	0.73	8.40		LCV FISH
	2	8	0	700.00	1900.00	310	2.258	6.129	0.05	0.12	50.00		EC20 POPULATION
	2	8	0	700.00	1900.00	310	2.258	6.129	0.04	0.11	54.00	>	LTV EC20 FISH
	4	6	0	660.00	720.00	310	2.129	2.323	212.90	232.26	0.01		NAWQ ADVISORY
	4	6	0	660.00	720.00	310	2.129	2.323	0.71	0.77	3.00	<	LCV DAPHNIDS
	4	6	0	660.00	720.00	310	2.129	2.323	0.71	0.77	3.00	<	LTV EC20 DAPHNID
	4	6	0	660.00	720.00	310	2.129	2.323	0.25	0.28	8.40		LCV FISH
	4	6	0	660.00	720.00	310	2.129	2.323	0.04	0.05	50.00		EC20 POPULATION
	4	6	0	660.00	720.00	310	2.129	2.323	0.04	0.04	54.00	>	LTV EC20 FISH
	15	3	0	670.00	710.00	310	2.161	2.290	216.13	229.03	0.01		NAWQ ADVISORY
	15	3	0	670.00	710.00	310	2.161	2.290	0.72	0.76	3.00	<	LCV DAPHNIDS
	15	3	0	670.00	710.00	310	2.161	2.290	0.72	0.76	3.00	<	LTV EC20 DAPHNID
	15	3	0	670.00	710.00	310	2.161	2.290	0.26	0.27	8.40		LCV FISH
	15	3	0	670.00	710.00	310	2.161	2.290	0.04	0.05	50.00		EC20 POPULATION
	15	3	0	670.00	710.00	310	2.161	2.290	0.04	0.04	54.00	>	LTV EC20 FISH

Table F.6 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	Maximum detection limit	BCF	Minimum exposure conc.	Maximum exposure conc.	Minimum detection limit quo.	Maximum detection limit quo.	Benchmark	Flag	Benchmark type
CADMIUM	1	28	0	110.00	230.00	50	2.200	4.600	169.23	353.85	0.01		SS EC20
	1	28	0	110.00	230.00	50	2.200	4.600	14.67	30.67	0.15		LCV DAPHNIDS
	1	28	0	110.00	230.00	50	2.200	4.600	2.93	6.13	0.75		LTV EC20 DAPHNID
	1	28	0	110.00	230.00	50	2.200	4.600	2.00	4.18	1.10		NAWQ ACTUAL
	1	28	0	110.00	230.00	50	2.200	4.600	1.29	2.71	1.70		LCV FISH
	1	28	0	110.00	230.00	50	2.200	4.600	1.22	2.56	1.80		LTV EC20 FISH
	1	28	0	110.00	230.00	50	2.200	4.600	0.51	1.07	4.30		EC20 POPULATION
	2	13	0	180.00	240.00	50	3.600	4.800	276.92	369.23	0.01		SS EC20
	2	13	0	180.00	240.00	50	3.600	4.800	24.00	32.00	0.15		LCV DAPHNIDS
	2	13	0	180.00	240.00	50	3.600	4.800	4.80	6.40	0.75		LTV EC20 DAPHNID
	2	13	0	180.00	240.00	50	3.600	4.800	3.27	4.36	1.10		NAWQ ACTUAL
	2	13	0	180.00	240.00	50	3.600	4.800	2.12	2.82	1.70		LCV FISH
	2	13	0	180.00	240.00	50	3.600	4.800	2.00	2.67	1.80		LTV EC20 FISH
	2	13	0	180.00	240.00	50	3.600	4.800	0.84	1.12	4.30		EC20 POPULATION
	3	35	0	120.00	240.00	50	2.400	4.800	184.62	369.23	0.01		SS EC20
	3	35	0	120.00	240.00	50	2.400	4.800	16.00	32.00	0.15		LCV DAPHNIDS
	3	35	0	120.00	240.00	50	2.400	4.800	3.20	6.40	0.75		LTV EC20 DAPHNID
	3	35	0	120.00	240.00	50	2.400	4.800	2.18	4.36	1.10		NAWQ ACTUAL
	3	35	0	120.00	240.00	50	2.400	4.800	1.41	2.82	1.70		LCV FISH
	3	35	0	120.00	240.00	50	2.400	4.800	1.33	2.67	1.80		LTV EC20 FISH
	3	35	0	120.00	240.00	50	2.400	4.800	0.56	1.12	4.30		EC20 POPULATION
	4	27	0	190.00	240.00	50	3.800	4.800	292.31	369.23	0.01		SS EC20
	4	27	0	190.00	240.00	50	3.800	4.800	25.33	32.00	0.15		LCV DAPHNIDS
	4	27	0	190.00	240.00	50	3.800	4.800	5.07	6.40	0.75		LTV EC20 DAPHNID
	4	27	0	190.00	240.00	50	3.800	4.800	3.45	4.36	1.10		NAWQ ACTUAL
	4	27	0	190.00	240.00	50	3.800	4.800	2.24	2.82	1.70		LCV FISH
	4	27	0	190.00	240.00	50	3.800	4.800	2.11	2.67	1.80		LTV EC20 FISH
	4	27	0	190.00	240.00	50	3.800	4.800	0.88	1.12	4.30		EC20 POPULATION
	5	25	0	190.00	280.00	50	3.800	5.600	292.31	430.77	0.01		SS EC20
	5	25	0	190.00	280.00	50	3.800	5.600	25.33	37.33	0.15		LCV DAPHNIDS
	5	25	0	190.00	280.00	50	3.800	5.600	5.07	7.47	0.75		LTV EC20 DAPHNID
	5	25	0	190.00	280.00	50	3.800	5.600	3.45	5.09	1.10		NAWQ ACTUAL
	5	25	0	190.00	280.00	50	3.800	5.600	2.24	3.29	1.70		LCV FISH
	5	25	0	190.00	280.00	50	3.800	5.600	2.11	3.11	1.80		LTV EC20 FISH
	5	25	0	190.00	280.00	50	3.800	5.600	0.88	1.30	4.30		EC20 POPULATION
	10	15	0	140.00	250.00	50	2.800	5.000	215.38	384.62	0.01		SS EC20
	10	15	0	140.00	250.00	50	2.800	5.000	18.67	33.33	0.15		LCV DAPHNIDS
	10	15	0	140.00	250.00	50	2.800	5.000	3.73	6.67	0.75		LTV EC20 DAPHNID
	10	15	0	140.00	250.00	50	2.800	5.000	2.55	4.55	1.10		NAWQ ACTUAL
	10	15	0	140.00	250.00	50	2.800	5.000	1.65	2.94	1.70		LCV FISH
	10	15	0	140.00	250.00	50	2.800	5.000	1.56	2.78	1.80		LTV EC20 FISH
	10	15	0	140.00	250.00	50	2.800	5.000	0.65	1.16	4.30		EC20 POPULATION
	13	10	0	180.00	240.00	50	3.600	4.800	276.92	369.23	0.01		SS EC20
	13	10	0	180.00	240.00	50	3.600	4.800	24.00	32.00	0.15		LCV DAPHNIDS
	13	10	0	180.00	240.00	50	3.600	4.800	4.80	6.40	0.75		LTV EC20 DAPHNID
	13	10	0	180.00	240.00	50	3.600	4.800	3.27	4.36	1.10		NAWQ ACTUAL
	13	10	0	180.00	240.00	50	3.600	4.800	2.12	2.82	1.70		LCV FISH

Table F.6 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	Maximum detection limit	BCF	Minimum exposure conc.	Maximum exposure conc.	Minimum detection limit quo.	Maximum detection limit quo.	Benchmark	Flag	Benchmark type
CADMIUM (continued)	13	10	0	180.00	240.00	50	3.600	4.800	2.00	2.67	1.80		LTV EC20 FISH
	13	10	0	180.00	240.00	50	3.600	4.800	0.84	1.12	4.30		EC20 POPULATION
	15	16	0	140.00	230.00	50	2.800	4.600	215.38	353.85	0.01		SS EC20
	15	16	0	140.00	230.00	50	2.800	4.600	18.67	30.67	0.15		LCV DAPHNIDS
	15	16	0	140.00	230.00	50	2.800	4.600	3.73	6.13	0.75		LTV EC20 DAPHNID
	15	16	0	140.00	230.00	50	2.800	4.600	2.55	4.18	1.10		NAWQ ACTUAL
	15	16	0	140.00	230.00	50	2.800	4.600	1.65	2.71	1.70		LCV FISH
	15	16	0	140.00	230.00	50	2.800	4.600	1.56	2.56	1.80		LTV EC20 FISH
	15	16	0	140.00	230.00	50	2.800	4.600	0.65	1.07	4.30		EC20 POPULATION
CHROMIUM	1	28	0	280.00	580.00	200	1.400	2.900	5.26	10.90	0.27		SS EC20
	1	28	0	280.00	580.00	200	1.400	2.900	2.80	5.80	0.50		LTV EC20 DAPHNID
	1	28	0	280.00	580.00	200	1.400	2.900	0.23	0.47	6.13		LCV DAPHNIDS
	1	28	0	280.00	580.00	200	1.400	2.900	0.13	0.26	11.00		NAWQ ACTUAL
	1	28	0	280.00	580.00	200	1.400	2.900	0.03	0.06	51.00		LTV EC20 FISH
	1	28	0	280.00	580.00	200	1.400	2.900	0.02	0.04	73.18		LCV FISH
	1	28	0	280.00	580.00	200	1.400	2.900	0.00	0.01	316.00		EC20 POPULATION
	2	13	0	460.00	600.00	200	2.300	3.000	8.65	11.28	0.27		SS EC20
	2	13	0	460.00	600.00	200	2.300	3.000	4.60	6.00	0.50		LTV EC20 DAPHNID
	2	13	0	460.00	600.00	200	2.300	3.000	0.38	0.49	6.13		LCV DAPHNIDS
	2	13	0	460.00	600.00	200	2.300	3.000	0.21	0.27	11.00		NAWQ ACTUAL
	2	13	0	460.00	600.00	200	2.300	3.000	0.05	0.06	51.00		LTV EC20 FISH
	2	13	0	460.00	600.00	200	2.300	3.000	0.03	0.04	73.18		LCV FISH
	2	13	0	460.00	600.00	200	2.300	3.000	0.01	0.01	316.00		EC20 POPULATION
	3	35	0	300.00	590.00	200	1.500	2.950	5.64	11.09	0.27		SS EC20
	3	35	0	300.00	590.00	200	1.500	2.950	3.00	5.90	0.50		LTV EC20 DAPHNID
	3	35	0	300.00	590.00	200	1.500	2.950	0.24	0.48	6.13		LCV DAPHNIDS
	3	35	0	300.00	590.00	200	1.500	2.950	0.14	0.27	11.00		NAWQ ACTUAL
	3	35	0	300.00	590.00	200	1.500	2.950	0.03	0.06	51.00		LTV EC20 FISH
	3	35	0	300.00	590.00	200	1.500	2.950	0.02	0.04	73.18		LCV FISH
	3	35	0	300.00	590.00	200	1.500	2.950	0.00	0.01	316.00		EC20 POPULATION
	4	27	0	480.00	610.00	200	2.400	3.050	9.02	11.47	0.27		SS EC20
	4	27	0	480.00	610.00	200	2.400	3.050	4.80	6.10	0.50		LTV EC20 DAPHNID
	4	27	0	480.00	610.00	200	2.400	3.050	0.39	0.50	6.13		LCV DAPHNIDS
	4	27	0	480.00	610.00	200	2.400	3.050	0.22	0.28	11.00		NAWQ ACTUAL
	4	27	0	480.00	610.00	200	2.400	3.050	0.05	0.06	51.00		LTV EC20 FISH
	4	27	0	480.00	610.00	200	2.400	3.050	0.03	0.04	73.18		LCV FISH
	4	27	0	480.00	610.00	200	2.400	3.050	0.01	0.01	316.00		EC20 POPULATION
	5	25	0	460.00	630.00	200	2.300	3.150	8.65	11.84	0.27		SS EC20
	5	25	0	460.00	630.00	200	2.300	3.150	4.60	6.30	0.50		LTV EC20 DAPHNID
	5	25	0	460.00	630.00	200	2.300	3.150	0.38	0.51	6.13		LCV DAPHNIDS
	5	25	0	460.00	630.00	200	2.300	3.150	0.21	0.29	11.00		NAWQ ACTUAL
	5	25	0	460.00	630.00	200	2.300	3.150	0.05	0.06	51.00		LTV EC20 FISH
	5	25	0	460.00	630.00	200	2.300	3.150	0.03	0.04	73.18		LCV FISH
	5	25	0	460.00	630.00	200	2.300	3.150	0.01	0.01	316.00		EC20 POPULATION
	10	15	0	350.00	610.00	200	1.750	3.050	6.58	11.47	0.27		SS EC20
	10	15	0	350.00	610.00	200	1.750	3.050	3.50	6.10	0.50		LTV EC20 DAPHNID

Table F.6 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	Maximum detection limit	BCF	Minimum exposure conc.	Maximum exposure conc.	Minimum detection limit quo.	Maximum detection limit quo.	Benchmark	Flag	Benchmark type
CHROMIUM (continued)	10	15	0	350.00	610.00	200	1.750	3.050	0.29	0.50	6.13		LCV DAPHNIDS
	10	15	0	350.00	610.00	200	1.750	3.050	0.16	0.28	11.00		NAWQ ACTUAL
	10	15	0	350.00	610.00	200	1.750	3.050	0.03	0.06	51.00		LTV EC20 FISH
	10	15	0	350.00	610.00	200	1.750	3.050	0.02	0.04	73.18		LCV FISH
	10	15	0	350.00	610.00	200	1.750	3.050	0.01	0.01	316.00		EC20 POPULATION
	13	10	0	450.00	590.00	200	2.250	2.950	8.46	11.09	0.27		SS EC20
	13	10	0	450.00	590.00	200	2.250	2.950	4.50	5.90	0.50		LTV EC20 DAPHNID
	13	10	0	450.00	590.00	200	2.250	2.950	0.37	0.48	6.13		LCV DAPHNIDS
	13	10	0	450.00	590.00	200	2.250	2.950	0.20	0.27	11.00		NAWQ ACTUAL
	13	10	0	450.00	590.00	200	2.250	2.950	0.04	0.06	51.00		LTV EC20 FISH
	13	10	0	450.00	590.00	200	2.250	2.950	0.03	0.04	73.18		LCV FISH
	13	10	0	450.00	590.00	200	2.250	2.950	0.01	0.01	316.00		EC20 POPULATION
	15	16	0	350.00	570.00	200	1.750	2.850	6.58	10.71	0.27		SS EC20
	15	16	0	350.00	570.00	200	1.750	2.850	3.50	5.70	0.50		LTV EC20 DAPHNID
	15	16	0	350.00	570.00	200	1.750	2.850	0.29	0.46	6.13		LCV DAPHNIDS
	15	16	0	350.00	570.00	200	1.750	2.850	0.16	0.26	11.00		NAWQ ACTUAL
	15	16	0	350.00	570.00	200	1.750	2.850	0.03	0.06	51.00		LTV EC20 FISH
	15	16	0	350.00	570.00	200	1.750	2.850	0.02	0.04	73.18		LCV FISH
	15	16	0	350.00	570.00	200	1.750	2.850	0.01	0.01	316.00		EC20 POPULATION
COPPER	1	28	0	280.00	580.00	210	1.333	2.762	6.50	13.47	0.20		LTV EC20 DAPHNID
	1	28	0	280.00	580.00	210	1.333	2.762	5.80	12.01	0.23		LCV DAPHNIDS
	1	28	0	280.00	580.00	210	1.333	2.762	5.13	10.62	0.26		SS EC20
	1	28	0	280.00	580.00	210	1.333	2.762	0.34	0.71	3.87		LCV FISH
	1	28	0	280.00	580.00	210	1.333	2.762	0.27	0.55	5.00		LTV EC20 FISH
	1	28	0	280.00	580.00	210	1.333	2.762	0.16	0.32	8.60		EC20 POPULATION
	1	28	0	280.00	580.00	210	1.333	2.762	0.11	0.23	12.00		NAWQ ACTUAL
	2	13	0	460.00	600.00	210	2.190	2.857	10.69	13.94	0.20		LTV EC20 DAPHNID
	2	13	0	460.00	600.00	210	2.190	2.857	9.52	12.42	0.23		LCV DAPHNIDS
	2	13	0	460.00	600.00	210	2.190	2.857	8.42	10.99	0.26		SS EC20
	2	13	0	460.00	600.00	210	2.190	2.857	0.57	0.74	3.87		LCV FISH
	2	13	0	460.00	600.00	210	2.190	2.857	0.44	0.57	5.00		LTV EC20 FISH
	2	13	0	460.00	600.00	210	2.190	2.857	0.25	0.33	8.60		EC20 POPULATION
	2	13	0	460.00	600.00	210	2.190	2.857	0.18	0.24	12.00		NAWQ ACTUAL
	3	35	0	300.00	590.00	210	1.429	2.810	6.97	13.70	0.20		LTV EC20 DAPHNID
	3	35	0	300.00	590.00	210	1.429	2.810	6.21	12.22	0.23		LCV DAPHNIDS
	3	35	0	300.00	590.00	210	1.429	2.810	5.49	10.81	0.26		SS EC20
	3	35	0	300.00	590.00	210	1.429	2.810	0.37	0.73	3.87		LCV FISH
	3	35	0	300.00	590.00	210	1.429	2.810	0.29	0.56	5.00		LTV EC20 FISH
	3	35	0	300.00	590.00	210	1.429	2.810	0.17	0.33	8.60		EC20 POPULATION
	3	35	0	300.00	590.00	210	1.429	2.810	0.12	0.23	12.00		NAWQ ACTUAL
	4	27	0	480.00	610.00	210	2.286	2.905	11.15	14.17	0.20		LTV EC20 DAPHNID
	4	27	0	480.00	610.00	210	2.286	2.905	9.94	12.63	0.23		LCV DAPHNIDS
	4	27	0	480.00	610.00	210	2.286	2.905	8.79	11.17	0.26		SS EC20
	4	27	0	480.00	610.00	210	2.286	2.905	0.59	0.75	3.87		LCV FISH
	4	27	0	480.00	610.00	210	2.286	2.905	0.46	0.58	5.00		LTV EC20 FISH
	4	27	0	480.00	610.00	210	2.286	2.905	0.27	0.34	8.60		EC20 POPULATION

Table F.6 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	Maximum detection limit	BCF	Minimum exposure conc.	Maximum exposure conc.	Minimum detection limit quo.	Maximum detection limit quo.	Benchmark	Flag	Benchmark type
COPPER (continued)	4	27	0	480.00	610.00	210	2.286	2.905	0.19	0.24	12.00		NAWQ ACTUAL
	10	15	0	350.00	610.00	210	1.667	2.905	8.13	14.17	0.20		LTV EC20 DAPHNID
	10	15	0	350.00	610.00	210	1.667	2.905	7.25	12.63	0.23		LCV DAPHNIDS
	10	15	0	350.00	610.00	210	1.667	2.905	6.41	11.17	0.26		SS EC20
	10	15	0	350.00	610.00	210	1.667	2.905	0.43	0.75	3.87		LCV FISH
	10	15	0	350.00	610.00	210	1.667	2.905	0.33	0.58	5.00		LTV EC20 FISH
	10	15	0	350.00	610.00	210	1.667	2.905	0.19	0.34	8.60		EC20 POPULATION
	10	15	0	350.00	610.00	210	1.667	2.905	0.14	0.24	12.00		NAWQ ACTUAL
	13	10	0	450.00	590.00	210	2.143	2.810	10.45	13.70	0.20		LTV EC20 DAPHNID
	13	10	0	450.00	590.00	210	2.143	2.810	9.32	12.22	0.23		LCV DAPHNIDS
	13	10	0	450.00	590.00	210	2.143	2.810	8.24	10.81	0.26		SS EC20
	13	10	0	450.00	590.00	210	2.143	2.810	0.55	0.73	3.87		LCV FISH
	13	10	0	450.00	590.00	210	2.143	2.810	0.43	0.56	5.00		LTV EC20 FISH
	13	10	0	450.00	590.00	210	2.143	2.810	0.25	0.33	8.60		EC20 POPULATION
	13	10	0	450.00	590.00	210	2.143	2.810	0.18	0.23	12.00		NAWQ ACTUAL
	15	16	0	350.00	570.00	210	1.667	2.714	8.13	13.24	0.20		LTV EC20 DAPHNID
	15	16	0	350.00	570.00	210	1.667	2.714	7.25	11.80	0.23		LCV DAPHNIDS
	15	16	0	350.00	570.00	210	1.667	2.714	6.41	10.44	0.26		SS EC20
	15	16	0	350.00	570.00	210	1.667	2.714	0.43	0.70	3.87		LCV FISH
	15	16	0	350.00	570.00	210	1.667	2.714	0.33	0.54	5.00		LTV EC20 FISH
	15	16	0	350.00	570.00	210	1.667	2.714	0.19	0.32	8.60		EC20 POPULATION
	15	16	0	350.00	570.00	210	1.667	2.714	0.14	0.23	12.00		NAWQ ACTUAL
DI-N-BUTYLPHTHALATE	1	6	0	680.00	870.00	89	7.640	9.775	1.74	2.22	4.40		NAWQ ADVISORY
	1	6	0	680.00	870.00	89	7.640	9.775	0.03	0.04	251.00		EC20 POPULATION
	1	6	0	680.00	870.00	89	7.640	9.775	0.03	0.04	270.00		LTV EC20 FISH
	1	6	0	680.00	870.00	89	7.640	9.775	0.02	0.02	500.00		LTV EC20 DAPHNID
	1	6	0	680.00	870.00	89	7.640	9.775	0.01	0.01	717.00		LCV FISH
	1	6	0	680.00	870.00	89	7.640	9.775	0.01	0.01	717.00		LCV DAPHNIDS
	2	8	0	700.00	1900.00	89	7.865	21.348	1.79	4.85	4.40		NAWQ ADVISORY
	2	8	0	700.00	1900.00	89	7.865	21.348	0.03	0.09	251.00		EC20 POPULATION
	2	8	0	700.00	1900.00	89	7.865	21.348	0.03	0.08	270.00		LTV EC20 FISH
	2	8	0	700.00	1900.00	89	7.865	21.348	0.02	0.04	500.00		LTV EC20 DAPHNID
	2	8	0	700.00	1900.00	89	7.865	21.348	0.01	0.03	717.00		LCV FISH
	2	8	0	700.00	1900.00	89	7.865	21.348	0.01	0.03	717.00		LCV DAPHNIDS
	3	34	0	190.00	410.00	89	2.135	4.607	0.49	1.05	4.40		NAWQ ADVISORY
	3	34	0	190.00	410.00	89	2.135	4.607	0.01	0.02	251.00		EC20 POPULATION
	3	34	0	190.00	410.00	89	2.135	4.607	0.01	0.02	270.00		LTV EC20 FISH
	3	34	0	190.00	410.00	89	2.135	4.607	0.00	0.01	500.00		LTV EC20 DAPHNID
	3	34	0	190.00	410.00	89	2.135	4.607	0.00	0.01	717.00		LCV FISH
	3	34	0	190.00	410.00	89	2.135	4.607	0.00	0.01	717.00		LCV DAPHNIDS
	4	6	0	660.00	720.00	89	7.416	8.090	1.69	1.84	4.40		NAWQ ADVISORY
	4	6	0	660.00	720.00	89	7.416	8.090	0.03	0.03	251.00		EC20 POPULATION
	4	6	0	660.00	720.00	89	7.416	8.090	0.03	0.03	270.00		LTV EC20 FISH
	4	6	0	660.00	720.00	89	7.416	8.090	0.01	0.02	500.00		LTV EC20 DAPHNID
	4	6	0	660.00	720.00	89	7.416	8.090	0.01	0.01	717.00		LCV FISH
	4	6	0	660.00	720.00	89	7.416	8.090	0.01	0.01	717.00		LCV DAPHNIDS

Table F.6 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	Maximum detection limit	BCF	Minimum exposure conc.	Maximum exposure conc.	Minimum detection limit quo.	Maximum detection limit quo.	Benchmark	Flag	Benchmark type
DI-N-BUTYLPHTHALATE (continued)	15	3	0	670.00	710.00	89	7.528	7.978	1.71	1.81	4.40		NAWQ ADVISORY
	15	3	0	670.00	710.00	89	7.528	7.978	0.03	0.03	251.00		EC20 POPULATION
	15	3	0	670.00	710.00	89	7.528	7.978	0.03	0.03	270.00		LTV EC20 FISH
	15	3	0	670.00	710.00	89	7.528	7.978	0.02	0.02	500.00		LTV EC20 DAPHNID
	15	3	0	670.00	710.00	89	7.528	7.978	0.01	0.01	717.00		LCV FISH
	15	3	0	670.00	710.00	89	7.528	7.978	0.01	0.01	717.00		LCV DAPHNIDS
DI-N-OCTYLPHTHALATE	1	6	0	680.00	870.00	9300	0.073	0.094	0.00	0.00	100.00	<	LTV EC20 FISH
	1	6	0	680.00	870.00	9300	0.073	0.094	0.00	0.00	310.00		LTV EC20 DAPHNID
	1	6	0	680.00	870.00	9300	0.073	0.094	0.00	0.00	570.00		LCV DAPHNIDS
	1	6	0	680.00	870.00	9300	0.073	0.094	0.00	0.00	1995.00		EC20 POPULATION
	1	6	0	680.00	870.00	9300	0.073	0.094	0.00	0.00	5700.00		LCV FISH
	2	8	0	82.00	1900.00	9300	0.009	0.204	0.00	0.00	100.00	<	LTV EC20 FISH
	2	8	0	82.00	1900.00	9300	0.009	0.204	0.00	0.00	310.00		LTV EC20 DAPHNID
	2	8	0	82.00	1900.00	9300	0.009	0.204	0.00	0.00	570.00		LCV DAPHNIDS
	2	8	0	82.00	1900.00	9300	0.009	0.204	0.00	0.00	1995.00		EC20 POPULATION
	2	8	0	82.00	1900.00	9300	0.009	0.204	0.00	0.00	5700.00		LCV FISH
	4	6	0	660.00	720.00	9300	0.071	0.077	0.00	0.00	100.00	<	LTV EC20 FISH
	4	6	0	660.00	720.00	9300	0.071	0.077	0.00	0.00	310.00		LTV EC20 DAPHNID
	4	6	0	660.00	720.00	9300	0.071	0.077	0.00	0.00	570.00		LCV DAPHNIDS
	4	6	0	660.00	720.00	9300	0.071	0.077	0.00	0.00	1995.00		EC20 POPULATION
	4	6	0	660.00	720.00	9300	0.071	0.077	0.00	0.00	5700.00		LCV FISH
	15	3	0	670.00	710.00	9300	0.072	0.076	0.00	0.00	100.00	<	LTV EC20 FISH
	15	3	0	670.00	710.00	9300	0.072	0.076	0.00	0.00	310.00		LTV EC20 DAPHNID
	15	3	0	670.00	710.00	9300	0.072	0.076	0.00	0.00	570.00		LCV DAPHNIDS
	15	3	0	670.00	710.00	9300	0.072	0.076	0.00	0.00	1995.00		EC20 POPULATION
	15	3	0	670.00	710.00	9300	0.072	0.076	0.00	0.00	5700.00		LCV FISH
DIBENZOFURAN	1	6	0	680.00	870.00	.	.	.	.	.	2.00		NAWQ ADVISORY
	1	6	0	680.00	870.00	.	.	.	.	.	1003.00	*	LCV DAPHNIDS
	2	8	0	700.00	1900.00	.	.	.	.	.	2.00		NAWQ ADVISORY
	2	8	0	700.00	1900.00	.	.	.	.	.	1003.00	*	LCV DAPHNIDS
	3	34	0	190.00	410.00	.	.	.	.	.	2.00		NAWQ ADVISORY
	3	34	0	190.00	410.00	.	.	.	.	.	1003.00	*	LCV DAPHNIDS
	4	6	0	660.00	720.00	.	.	.	.	.	2.00		NAWQ ADVISORY
	4	6	0	660.00	720.00	.	.	.	.	.	1003.00	*	LCV DAPHNIDS
	15	3	0	670.00	710.00	.	.	.	.	.	2.00		NAWQ ADVISORY
	15	3	0	670.00	710.00	.	.	.	.	.	1003.00	*	LCV DAPHNIDS

Table F.6 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	Maximum detection limit	BCF	Minimum exposure conc.	Maximum exposure conc.	Minimum detection limit quo.	Maximum detection limit quo.	Benchmark	Flag	Benchmark type
DIETHYLPHTHALATE	1	6	0	680.00	870.00	120	5.667	7.250	0.21	0.27	27.00		NAWQ ADVISORY
	1	6	0	680.00	870.00	120	5.667	7.250	0.01	0.01	1000.00		EC20 POPULATION
	2	8	0	80.00	1900.00	120	0.667	15.833	0.02	0.59	27.00		NAWQ ADVISORY
	2	8	0	80.00	1900.00	120	0.667	15.833	0.00	0.02	1000.00		EC20 POPULATION
	3	34	0	190.00	410.00	120	1.583	3.417	0.06	0.13	27.00		NAWQ ADVISORY
	3	34	0	190.00	410.00	120	1.583	3.417	0.00	0.00	1000.00		EC20 POPULATION
	4	6	0	660.00	720.00	120	5.500	6.000	0.20	0.22	27.00		NAWQ ADVISORY
	4	6	0	660.00	720.00	120	5.500	6.000	0.01	0.01	1000.00		EC20 POPULATION
	15	3	0	670.00	710.00	120	5.583	5.917	0.21	0.22	27.00		NAWQ ADVISORY
	15	3	0	670.00	710.00	120	5.583	5.917	0.01	0.01	1000.00		EC20 POPULATION
FLUORANTHENE	1	6	0	680.00	870.00	379	1.794	2.296	1.06	1.35	1.70		NAWQ ADVISORY
	1	6	0	680.00	870.00	379	1.794	2.296	0.06	0.07	32.00		EC20 POPULATION
	1	6	0	680.00	870.00	379	1.794	2.296	0.00	0.00	65795.00	*	LCV DAPHNIDS
	2	8	0	700.00	1900.00	379	1.847	5.013	1.09	2.95	1.70		NAWQ ADVISORY
	2	8	0	700.00	1900.00	379	1.847	5.013	0.06	0.16	32.00		EC20 POPULATION
	2	8	0	700.00	1900.00	379	1.847	5.013	0.00	0.00	65795.00	*	LCV DAPHNIDS
	3	34	0	190.00	410.00	379	0.501	1.082	0.29	0.64	1.70		NAWQ ADVISORY
	3	34	0	190.00	410.00	379	0.501	1.082	0.02	0.03	32.00		EC20 POPULATION
	3	34	0	190.00	410.00	379	0.501	1.082	0.00	0.00	65795.00	*	LCV DAPHNIDS
	4	7	0	660.00	730.00	379	1.741	1.926	1.02	1.13	1.70		NAWQ ADVISORY
	4	7	0	660.00	730.00	379	1.741	1.926	0.05	0.06	32.00		EC20 POPULATION
	4	7	0	660.00	730.00	379	1.741	1.926	0.00	0.00	65795.00	*	LCV DAPHNIDS
	15	3	0	670.00	710.00	379	1.768	1.873	1.04	1.10	1.70		NAWQ ADVISORY
	15	3	0	670.00	710.00	379	1.768	1.873	0.06	0.06	32.00		EC20 POPULATION
	15	3	0	670.00	710.00	379	1.768	1.873	0.00	0.00	65795.00	*	LCV DAPHNIDS
LEAD	1	28	0	280.00	580.00	300	0.933	1.933	2.67	5.52	0.35		SS EC20
	1	28	0	280.00	580.00	300	0.933	1.933	0.29	0.60	3.20		NAWQ ACTUAL
	1	28	0	280.00	580.00	300	0.933	1.933	0.08	0.16	12.26		LCV DAPHNIDS
	1	28	0	280.00	580.00	300	0.933	1.933	0.05	0.10	18.88		LCV FISH
	1	28	0	280.00	580.00	300	0.933	1.933	0.04	0.09	22.00		LTV EC20 FISH
	1	28	0	280.00	580.00	300	0.933	1.933	0.01	0.03	71.00		EC20 POPULATION
	2	13	0	460.00	600.00	300	1.533	2.000	4.38	5.71	0.35		SS EC20
	2	13	0	460.00	600.00	300	1.533	2.000	0.48	0.63	3.20		NAWQ ACTUAL
	2	13	0	460.00	600.00	300	1.533	2.000	0.13	0.16	12.26		LCV DAPHNIDS
	2	13	0	460.00	600.00	300	1.533	2.000	0.08	0.11	18.88		LCV FISH
	2	13	0	460.00	600.00	300	1.533	2.000	0.07	0.09	22.00		LTV EC20 FISH
	2	13	0	460.00	600.00	300	1.533	2.000	0.02	0.03	71.00		EC20 POPULATION
	3	25	0	300.00	590.00	300	1.000	1.967	2.86	5.62	0.35		SS EC20
	3	25	0	300.00	590.00	300	1.000	1.967	0.31	0.61	3.20		NAWQ ACTUAL
	3	25	0	300.00	590.00	300	1.000	1.967	0.08	0.16	12.26		LCV DAPHNIDS
	3	25	0	300.00	590.00	300	1.000	1.967	0.05	0.10	18.88		LCV FISH
	3	25	0	300.00	590.00	300	1.000	1.967	0.05	0.09	22.00		LTV EC20 FISH
	3	25	0	300.00	590.00	300	1.000	1.967	0.01	0.03	71.00		EC20 POPULATION
	4	17	0	480.00	610.00	300	1.600	2.033	4.57	5.81	0.35		SS EC20
	4	17	0	480.00	610.00	300	1.600	2.033	0.50	0.64	3.20		NAWQ ACTUAL

Table F.6 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	Maximum detection limit	BCF	Minimum exposure conc.	Maximum exposure conc.	Minimum detection limit quo.	Maximum detection limit quo.	Benchmark	Flag	Benchmark type
LEAD (continued)	4	17	0	480.00	610.00	300	1.600	2.033	0.13	0.17	12.26		LCV DAPHNIDS
	4	17	0	480.00	610.00	300	1.600	2.033	0.08	0.11	18.88		LCV FISH
	4	17	0	480.00	610.00	300	1.600	2.033	0.07	0.09	22.00		LTV EC20 FISH
	4	17	0	480.00	610.00	300	1.600	2.033	0.02	0.03	71.00		EC20 POPULATION
	5	5	0	460.00	510.00	300	1.533	1.700	4.38	4.86	0.35		SS EC20
	5	5	0	460.00	510.00	300	1.533	1.700	0.48	0.53	3.20		NAWQ ACTUAL
	5	5	0	460.00	510.00	300	1.533	1.700	0.13	0.14	12.26		LCV DAPHNIDS
	5	5	0	460.00	510.00	300	1.533	1.700	0.08	0.09	18.88		LCV FISH
	5	5	0	460.00	510.00	300	1.533	1.700	0.07	0.08	22.00		LTV EC20 FISH
	5	5	0	460.00	510.00	300	1.533	1.700	0.02	0.02	71.00		EC20 POPULATION
	10	5	0	350.00	440.00	300	1.167	1.467	3.33	4.19	0.35		SS EC20
	10	5	0	350.00	440.00	300	1.167	1.467	0.36	0.46	3.20		NAWQ ACTUAL
	10	5	0	350.00	440.00	300	1.167	1.467	0.10	0.12	12.26		LCV DAPHNIDS
	10	5	0	350.00	440.00	300	1.167	1.467	0.06	0.08	18.88		LCV FISH
	10	5	0	350.00	440.00	300	1.167	1.467	0.05	0.07	22.00		LTV EC20 FISH
	10	5	0	350.00	440.00	300	1.167	1.467	0.02	0.02	71.00		EC20 POPULATION
	13	10	0	450.00	590.00	300	1.500	1.967	4.29	5.62	0.35		SS EC20
	13	10	0	450.00	590.00	300	1.500	1.967	0.47	0.61	3.20		NAWQ ACTUAL
	13	10	0	450.00	590.00	300	1.500	1.967	0.12	0.16	12.26		LCV DAPHNIDS
	13	10	0	450.00	590.00	300	1.500	1.967	0.08	0.10	18.88		LCV FISH
	13	10	0	450.00	590.00	300	1.500	1.967	0.07	0.09	22.00		LTV EC20 FISH
	13	10	0	450.00	590.00	300	1.500	1.967	0.02	0.03	71.00		EC20 POPULATION
	15	16	0	350.00	570.00	300	1.167	1.900	3.33	5.43	0.35		SS EC20
	15	16	0	350.00	570.00	300	1.167	1.900	0.36	0.59	3.20		NAWQ ACTUAL
	15	16	0	350.00	570.00	300	1.167	1.900	0.10	0.15	12.26		LCV DAPHNIDS
	15	16	0	350.00	570.00	300	1.167	1.900	0.06	0.10	18.88		LCV FISH
	15	16	0	350.00	570.00	300	1.167	1.900	0.05	0.09	22.00		LTV EC20 FISH
	15	16	0	350.00	570.00	300	1.167	1.900	0.02	0.03	71.00		EC20 POPULATION
N-NITROSODIPHENYLAMINE	1	6	0	680.00	870.00	91	7.473	9.560	2.99	3.82	2.50		NAWQ ADVISORY
	1	6	0	680.00	870.00	91	7.473	9.560	0.19	0.24	40.00		EC20 POPULATION
	1	6	0	680.00	870.00	91	7.473	9.560	0.02	0.03	332.00	*	LCV FISH
	1	6	0	680.00	870.00	91	7.473	9.560	0.02	0.03	339.00	*	LTV EC20 FISH
	1	6	0	680.00	870.00	91	7.473	9.560	0.01	0.01	1042.00	*	LCV DAPHNIDS
	2	8	0	700.00	1900.00	91	7.692	20.879	3.08	8.35	2.50		NAWQ ADVISORY
	2	8	0	700.00	1900.00	91	7.692	20.879	0.19	0.52	40.00		EC20 POPULATION
	2	8	0	700.00	1900.00	91	7.692	20.879	0.02	0.06	332.00	*	LCV FISH
	2	8	0	700.00	1900.00	91	7.692	20.879	0.02	0.06	339.00	*	LTV EC20 FISH
	2	8	0	700.00	1900.00	91	7.692	20.879	0.01	0.02	1042.00	*	LCV DAPHNIDS
	3	34	0	190.00	410.00	91	2.088	4.505	0.84	1.80	2.50		NAWQ ADVISORY
	3	34	0	190.00	410.00	91	2.088	4.505	0.05	0.11	40.00		EC20 POPULATION
	3	34	0	190.00	410.00	91	2.088	4.505	0.01	0.01	332.00	*	LCV FISH
	3	34	0	190.00	410.00	91	2.088	4.505	0.01	0.01	339.00	*	LTV EC20 FISH
	3	34	0	190.00	410.00	91	2.088	4.505	0.00	0.00	1042.00	*	LCV DAPHNIDS
	4	6	0	660.00	720.00	91	7.253	7.912	2.90	3.16	2.50		NAWQ ADVISORY
	4	6	0	660.00	720.00	91	7.253	7.912	0.18	0.20	40.00		EC20 POPULATION
	4	6	0	660.00	720.00	91	7.253	7.912	0.02	0.02	332.00	*	LCV FISH

Table F.6 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	Maximum detection limit	BCF	Minimum exposure conc.	Maximum exposure conc.	Minimum detection limit quo.	Maximum detection limit quo.	Benchmark	Flag	Benchmark type
N-NITROSODIPHENYLAMINE (continued)	4	6	0	660.00	720.00	91	7.253	7.912	0.02	0.02	339.00	*	LTV EC20 FISH
	4	6	0	660.00	720.00	91	7.253	7.912	0.01	0.01	1042.00	*	LCV DAPHNIDS
	15	3	0	670.00	710.00	91	7.363	7.802	2.95	3.12	2.50		NAWQ ADVISORY
	15	3	0	670.00	710.00	91	7.363	7.802	0.18	0.20	40.00		EC20 POPULATION
	15	3	0	670.00	710.00	91	7.363	7.802	0.02	0.02	332.00	*	LCV FISH
	15	3	0	670.00	710.00	91	7.363	7.802	0.02	0.02	339.00	*	LTV EC20 FISH
	15	3	0	670.00	710.00	91	7.363	7.802	0.01	0.01	1042.00	*	LCV DAPHNIDS
NAPHTHALENE	1	6	0	680.00	870.00	430	1.581	2.023	0.75	0.96	2.10		NAWQ ADVISORY
	1	6	0	680.00	870.00	430	1.581	2.023	0.00	0.00	450.00		LTV EC20 FISH
	1	6	0	680.00	870.00	430	1.581	2.023	0.00	0.00	600.00	>	LTV EC20 DAPHNID
	1	6	0	680.00	870.00	430	1.581	2.023	0.00	0.00	620.00		LCV FISH
	1	6	0	680.00	870.00	430	1.581	2.023	0.00	0.00	1000.00		EC20 POPULATION
	1	6	0	680.00	870.00	430	1.581	2.023	0.00	0.00	1163.00	*	LCV DAPHNIDS
	2	8	0	700.00	1900.00	430	1.628	4.419	0.78	2.10	2.10		NAWQ ADVISORY
	2	8	0	700.00	1900.00	430	1.628	4.419	0.00	0.01	450.00		LTV EC20 FISH
	2	8	0	700.00	1900.00	430	1.628	4.419	0.00	0.01	600.00	>	LTV EC20 DAPHNID
	2	8	0	700.00	1900.00	430	1.628	4.419	0.00	0.01	620.00		LCV FISH
	2	8	0	700.00	1900.00	430	1.628	4.419	0.00	0.00	1000.00		EC20 POPULATION
	2	8	0	700.00	1900.00	430	1.628	4.419	0.00	0.00	1163.00	*	LCV DAPHNIDS
	3	34	0	190.00	410.00	430	0.442	0.953	0.21	0.45	2.10		NAWQ ADVISORY
	3	34	0	190.00	410.00	430	0.442	0.953	0.00	0.00	450.00		LTV EC20 FISH
	3	34	0	190.00	410.00	430	0.442	0.953	0.00	0.00	600.00	>	LTV EC20 DAPHNID
	3	34	0	190.00	410.00	430	0.442	0.953	0.00	0.00	620.00		LCV FISH
	3	34	0	190.00	410.00	430	0.442	0.953	0.00	0.00	1000.00		EC20 POPULATION
	3	34	0	190.00	410.00	430	0.442	0.953	0.00	0.00	1163.00	*	LCV DAPHNIDS
	4	6	0	660.00	720.00	430	1.535	1.674	0.73	0.80	2.10		NAWQ ADVISORY
	4	6	0	660.00	720.00	430	1.535	1.674	0.00	0.00	450.00		LTV EC20 FISH
	4	6	0	660.00	720.00	430	1.535	1.674	0.00	0.00	600.00	>	LTV EC20 DAPHNID
	4	6	0	660.00	720.00	430	1.535	1.674	0.00	0.00	620.00		LCV FISH
	4	6	0	660.00	720.00	430	1.535	1.674	0.00	0.00	1000.00		EC20 POPULATION
	4	6	0	660.00	720.00	430	1.535	1.674	0.00	0.00	1163.00	*	LCV DAPHNIDS
	5	1	0	57.00	57.00	430	0.133	0.133	0.06	0.06	2.10		NAWQ ADVISORY
	5	1	0	57.00	57.00	430	0.133	0.133	0.00	0.00	450.00		LTV EC20 FISH
	5	1	0	57.00	57.00	430	0.133	0.133	0.00	0.00	600.00	>	LTV EC20 DAPHNID
	5	1	0	57.00	57.00	430	0.133	0.133	0.00	0.00	620.00		LCV FISH
	5	1	0	57.00	57.00	430	0.133	0.133	0.00	0.00	1000.00		EC20 POPULATION
	5	1	0	57.00	57.00	430	0.133	0.133	0.00	0.00	1163.00	*	LCV DAPHNIDS
	15	3	0	670.00	710.00	430	1.558	1.651	0.74	0.79	2.10		NAWQ ADVISORY
	15	3	0	670.00	710.00	430	1.558	1.651	0.00	0.00	450.00		LTV EC20 FISH
	15	3	0	670.00	710.00	430	1.558	1.651	0.00	0.00	600.00	>	LTV EC20 DAPHNID
	15	3	0	670.00	710.00	430	1.558	1.651	0.00	0.00	620.00		LCV FISH
	15	3	0	670.00	710.00	430	1.558	1.651	0.00	0.00	1000.00		EC20 POPULATION
	15	3	0	670.00	710.00	430	1.558	1.651	0.00	0.00	1163.00	*	LCV DAPHNIDS

Table F.6 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	Maximum detection limit	BCF	Minimum exposure conc.	Maximum exposure conc.	Minimum detection limit quo.	Maximum detection limit quo.	Benchmark	Flag	Benchmark type
NICKEL	1	28	0	280.00	1100.00	100	2.800	11.000	0.56	2.20	5.00	<	LCV DAPHNIDS
	1	28	0	280.00	1100.00	100	2.800	11.000	0.25	1.00	11.00		SS EC20
	1	28	0	280.00	1100.00	100	2.800	11.000	0.08	0.31	35.00	<	LCV FISH
	1	28	0	280.00	1100.00	100	2.800	11.000	0.06	0.24	45.00		LTV EC20 DAPHNID
	1	28	0	280.00	1100.00	100	2.800	11.000	0.05	0.18	62.00		LTV EC20 FISH
	1	28	0	280.00	1100.00	100	2.800	11.000	0.02	0.07	160.00		NAWQ ACTUAL
	1	28	0	280.00	1100.00	100	2.800	11.000	0.01	0.05	215.00		EC20 POPULATION
	2	13	0	460.00	600.00	100	4.600	6.000	0.92	1.20	5.00	<	LCV DAPHNIDS
	2	13	0	460.00	600.00	100	4.600	6.000	0.42	0.55	11.00		SS EC20
	2	13	0	460.00	600.00	100	4.600	6.000	0.13	0.17	35.00	<	LCV FISH
	2	13	0	460.00	600.00	100	4.600	6.000	0.10	0.13	45.00		LTV EC20 DAPHNID
	2	13	0	460.00	600.00	100	4.600	6.000	0.07	0.10	62.00		LTV EC20 FISH
	2	13	0	460.00	600.00	100	4.600	6.000	0.03	0.04	160.00		NAWQ ACTUAL
	2	13	0	460.00	600.00	100	4.600	6.000	0.02	0.03	215.00		EC20 POPULATION
	3	35	0	300.00	590.00	100	3.000	5.900	0.60	1.18	5.00	<	LCV DAPHNIDS
	3	35	0	300.00	590.00	100	3.000	5.900	0.27	0.54	11.00		SS EC20
	3	35	0	300.00	590.00	100	3.000	5.900	0.09	0.17	35.00	<	LCV FISH
	3	35	0	300.00	590.00	100	3.000	5.900	0.07	0.13	45.00		LTV EC20 DAPHNID
	3	35	0	300.00	590.00	100	3.000	5.900	0.05	0.10	62.00		LTV EC20 FISH
	3	35	0	300.00	590.00	100	3.000	5.900	0.02	0.04	160.00		NAWQ ACTUAL
	3	35	0	300.00	590.00	100	3.000	5.900	0.01	0.03	215.00		EC20 POPULATION
	4	27	0	480.00	610.00	100	4.800	6.100	0.96	1.22	5.00	<	LCV DAPHNIDS
	4	27	0	480.00	610.00	100	4.800	6.100	0.44	0.55	11.00		SS EC20
	4	27	0	480.00	610.00	100	4.800	6.100	0.14	0.17	35.00	<	LCV FISH
	4	27	0	480.00	610.00	100	4.800	6.100	0.11	0.14	45.00		LTV EC20 DAPHNID
	4	27	0	480.00	610.00	100	4.800	6.100	0.08	0.10	62.00		LTV EC20 FISH
	4	27	0	480.00	610.00	100	4.800	6.100	0.03	0.04	160.00		NAWQ ACTUAL
	4	27	0	480.00	610.00	100	4.800	6.100	0.02	0.03	215.00		EC20 POPULATION
	5	5	0	460.00	510.00	100	4.600	5.100	0.92	1.02	5.00	<	LCV DAPHNIDS
	5	5	0	460.00	510.00	100	4.600	5.100	0.42	0.46	11.00		SS EC20
	5	5	0	460.00	510.00	100	4.600	5.100	0.13	0.15	35.00	<	LCV FISH
	5	5	0	460.00	510.00	100	4.600	5.100	0.10	0.11	45.00		LTV EC20 DAPHNID
	5	5	0	460.00	510.00	100	4.600	5.100	0.07	0.08	62.00		LTV EC20 FISH
	5	5	0	460.00	510.00	100	4.600	5.100	0.03	0.03	160.00		NAWQ ACTUAL
	5	5	0	460.00	510.00	100	4.600	5.100	0.02	0.02	215.00		EC20 POPULATION
	10	15	0	350.00	610.00	100	3.500	6.100	0.70	1.22	5.00	<	LCV DAPHNIDS
	10	15	0	350.00	610.00	100	3.500	6.100	0.32	0.55	11.00		SS EC20
	10	15	0	350.00	610.00	100	3.500	6.100	0.10	0.17	35.00	<	LCV FISH
	10	15	0	350.00	610.00	100	3.500	6.100	0.08	0.14	45.00		LTV EC20 DAPHNID
	10	15	0	350.00	610.00	100	3.500	6.100	0.06	0.10	62.00		LTV EC20 FISH
	10	15	0	350.00	610.00	100	3.500	6.100	0.02	0.04	160.00		NAWQ ACTUAL
	10	15	0	350.00	610.00	100	3.500	6.100	0.02	0.03	215.00		EC20 POPULATION
	13	10	0	450.00	590.00	100	4.500	5.900	0.90	1.18	5.00	<	LCV DAPHNIDS
	13	10	0	450.00	590.00	100	4.500	5.900	0.41	0.54	11.00		SS EC20
	13	10	0	450.00	590.00	100	4.500	5.900	0.13	0.17	35.00	<	LCV FISH
	13	10	0	450.00	590.00	100	4.500	5.900	0.10	0.13	45.00		LTV EC20 DAPHNID
	13	10	0	450.00	590.00	100	4.500	5.900	0.07	0.10	62.00		LTV EC20 FISH

Table F.6 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	Maximum detection limit	BCF	Minimum exposure conc.	Maximum exposure conc.	Minimum detection limit quo.	Maximum detection limit quo.	Benchmark	Flag	Benchmark type
NICKEL (continued)	13	10	0	450.00	590.00	100	4.500	5.900	0.03	0.04	160.00		NAWQ ACTUAL
	13	10	0	450.00	590.00	100	4.500	5.900	0.02	0.03	215.00		EC20 POPULATION
	15	16	0	350.00	570.00	100	3.500	5.700	0.70	1.14	5.00	<	LCV DAPHNIDS
	15	16	0	350.00	570.00	100	3.500	5.700	0.32	0.52	11.00		SS EC20
	15	16	0	350.00	570.00	100	3.500	5.700	0.10	0.16	35.00	<	LCV FISH
	15	16	0	350.00	570.00	100	3.500	5.700	0.08	0.13	45.00		LTV EC20 DAPHNID
	15	16	0	350.00	570.00	100	3.500	5.700	0.06	0.09	62.00		LTV EC20 FISH
	15	16	0	350.00	570.00	100	3.500	5.700	0.02	0.04	160.00		NAWQ ACTUAL
	15	16	0	350.00	570.00	100	3.500	5.700	0.02	0.03	215.00		EC20 POPULATION
PHENANTHRENE	1	6	0	680.00	870.00	325	2.092	2.677	4.87	6.23	0.43		NAWQ ADVISORY
	1	6	0	680.00	870.00	325	2.092	2.677	0.02	0.02	110.00		LTV EC20 DAPHNID
	1	6	0	680.00	870.00	325	2.092	2.677	0.01	0.01	200.00		LCV DAPHNIDS
	2	8	0	700.00	1900.00	325	2.154	5.846	5.01	13.60	0.43		NAWQ ADVISORY
	2	8	0	700.00	1900.00	325	2.154	5.846	0.02	0.05	110.00		LTV EC20 DAPHNID
	2	8	0	700.00	1900.00	325	2.154	5.846	0.01	0.03	200.00		LCV DAPHNIDS
	3	34	0	190.00	410.00	325	0.585	1.262	1.36	2.93	0.43		NAWQ ADVISORY
	3	34	0	190.00	410.00	325	0.585	1.262	0.01	0.01	110.00		LTV EC20 DAPHNID
	3	34	0	190.00	410.00	325	0.585	1.262	0.00	0.01	200.00		LCV DAPHNIDS
	4	6	0	660.00	720.00	325	2.031	2.215	4.72	5.15	0.43		NAWQ ADVISORY
	4	6	0	660.00	720.00	325	2.031	2.215	0.02	0.02	110.00		LTV EC20 DAPHNID
	4	6	0	660.00	720.00	325	2.031	2.215	0.01	0.01	200.00		LCV DAPHNIDS
	15	3	0	670.00	710.00	325	2.062	2.185	4.79	5.08	0.43		NAWQ ADVISORY
	15	3	0	670.00	710.00	325	2.062	2.185	0.02	0.02	110.00		LTV EC20 DAPHNID
	15	3	0	670.00	710.00	325	2.062	2.185	0.01	0.01	200.00		LCV DAPHNIDS
PHENOL	1	6	0	680.00	870.00	780	0.872	1.115	0.04	0.05	21.00		NAWQ ADVISORY
	1	6	0	680.00	870.00	780	0.872	1.115	0.00	0.00	230.00	<	LTV EC20 FISH
	1	6	0	680.00	870.00	780	0.872	1.115	0.00	0.00	1369.00		LCV FISH
	1	6	0	680.00	870.00	780	0.872	1.115	0.00	0.00	2005.00	*	LCV DAPHNIDS
	1	6	0	680.00	870.00	780	0.872	1.115	0.00	0.00	4467.00		EC20 POPULATION
	2	8	0	700.00	1900.00	780	0.897	2.436	0.04	0.12	21.00		NAWQ ADVISORY
	2	8	0	700.00	1900.00	780	0.897	2.436	0.00	0.01	230.00	<	LTV EC20 FISH
	2	8	0	700.00	1900.00	780	0.897	2.436	0.00	0.00	1369.00		LCV FISH
	2	8	0	700.00	1900.00	780	0.897	2.436	0.00	0.00	2005.00	*	LCV DAPHNIDS
	2	8	0	700.00	1900.00	780	0.897	2.436	0.00	0.00	4467.00		EC20 POPULATION
	3	34	0	190.00	410.00	780	0.244	0.526	0.01	0.03	21.00		NAWQ ADVISORY
	3	34	0	190.00	410.00	780	0.244	0.526	0.00	0.00	230.00	<	LTV EC20 FISH
	3	34	0	190.00	410.00	780	0.244	0.526	0.00	0.00	1369.00		LCV FISH
	3	34	0	190.00	410.00	780	0.244	0.526	0.00	0.00	2005.00	*	LCV DAPHNIDS
	3	34	0	190.00	410.00	780	0.244	0.526	0.00	0.00	4467.00		EC20 POPULATION
	4	13	0	660.00	830.00	780	0.846	1.064	0.04	0.05	21.00		NAWQ ADVISORY
	4	13	0	660.00	830.00	780	0.846	1.064	0.00	0.00	230.00	<	LTV EC20 FISH
	4	13	0	660.00	830.00	780	0.846	1.064	0.00	0.00	1369.00		LCV FISH
	4	13	0	660.00	830.00	780	0.846	1.064	0.00	0.00	2005.00	*	LCV DAPHNIDS
	4	13	0	660.00	830.00	780	0.846	1.064	0.00	0.00	4467.00		EC20 POPULATION
	4	13	0	660.00	830.00	780	0.846	1.064	0.04	0.05	21.00		NAWQ ADVISORY
	5	9	0	660.00	830.00	780	0.846	1.064					

Table F.6 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	Maximum detection limit	BCF	Minimum exposure conc.	Maximum exposure conc.	Minimum detection limit quo.	Maximum detection limit quo.	Benchmark	Flag	Benchmark type
PHENOL (continued)	5	9	0	660.00	830.00	780	0.846	1.064	0.00	0.00	230.00	<	LTV EC20 FISH
	5	9	0	660.00	830.00	780	0.846	1.064	0.00	0.00	1369.00		LCV FISH
	5	9	0	660.00	830.00	780	0.846	1.064	0.00	0.00	2005.00	*	LCV DAPHNIDS
	5	9	0	660.00	830.00	780	0.846	1.064	0.00	0.00	4467.00		EC20 POPULATION
	13	2	0	690.00	700.00	780	0.885	0.897	0.04	0.04	21.00		NAWQ ADVISORY
	13	2	0	690.00	700.00	780	0.885	0.897	0.00	0.00	230.00	<	LTV EC20 FISH
	13	2	0	690.00	700.00	780	0.885	0.897	0.00	0.00	1369.00		LCV FISH
	13	2	0	690.00	700.00	780	0.885	0.897	0.00	0.00	2005.00	*	LCV DAPHNIDS
	13	2	0	690.00	700.00	780	0.885	0.897	0.00	0.00	4467.00		EC20 POPULATION
	15	4	0	670.00	770.00	780	0.859	0.987	0.04	0.05	21.00		NAWQ ADVISORY
	15	4	0	670.00	770.00	780	0.859	0.987	0.00	0.00	230.00	<	LTV EC20 FISH
	15	4	0	670.00	770.00	780	0.859	0.987	0.00	0.00	1369.00		LCV FISH
	15	4	0	670.00	770.00	780	0.859	0.987	0.00	0.00	2005.00	*	LCV DAPHNIDS
	15	4	0	670.00	770.00	780	0.859	0.987	0.00	0.00	4467.00		EC20 POPULATION
SELENIUM	5	25	0	460.00	630.00	8	57.500	78.750	22.12	30.29	2.60		SS EC20
	5	25	0	460.00	630.00	8	57.500	78.750	2.30	3.15	25.00		LTV EC20 DAPHNID
	5	25	0	460.00	630.00	8	57.500	78.750	1.64	2.25	35.00		NAWQ ACTUAL
	5	25	0	460.00	630.00	8	57.500	78.750	1.44	1.97	40.00		LTV EC20 FISH
	5	25	0	460.00	630.00	8	57.500	78.750	0.65	0.89	88.32		LCV FISH
	5	25	0	460.00	630.00	8	57.500	78.750	0.63	0.86	91.65		LCV DAPHNIDS
	13	10	0	450.00	590.00	8	56.250	73.750	21.63	28.37	2.60		SS EC20
	13	10	0	450.00	590.00	8	56.250	73.750	2.25	2.95	25.00		LTV EC20 DAPHNID
	13	10	0	450.00	590.00	8	56.250	73.750	1.61	2.11	35.00		NAWQ ACTUAL
	13	10	0	450.00	590.00	8	56.250	73.750	1.41	1.84	40.00		LTV EC20 FISH
	13	10	0	450.00	590.00	8	56.250	73.750	0.64	0.84	88.32		LCV FISH
	13	10	0	450.00	590.00	8	56.250	73.750	0.61	0.80	91.65		LCV DAPHNIDS
SILVER	1	28	0	110.00	230.00	2	55.000	115.000	458.33	958.33	0.12		LCV FISH
	1	28	0	110.00	230.00	2	55.000	115.000	392.86	821.43	0.14		SS EC20
	1	28	0	110.00	230.00	2	55.000	115.000	275.00	575.00	0.20		LTV EC20 FISH
	1	28	0	110.00	230.00	2	55.000	115.000	220.00	460.00	0.25		NAWQ ADVISORY
	1	28	0	110.00	230.00	2	55.000	115.000	171.87	359.37	0.32		EC20 POPULATION
	1	28	0	110.00	230.00	2	55.000	115.000	98.21	205.36	0.56	<	LTV EC20 DAPHNID
	1	28	0	110.00	230.00	2	55.000	115.000	21.15	44.23	2.60		LCV DAPHNIDS
	2	13	0	180.00	240.00	2	90.000	120.000	750.00	1000.00	0.12		LCV FISH
	2	13	0	180.00	240.00	2	90.000	120.000	642.86	857.14	0.14		SS EC20
	2	13	0	180.00	240.00	2	90.000	120.000	450.00	600.00	0.20		LTV EC20 FISH
	2	13	0	180.00	240.00	2	90.000	120.000	360.00	480.00	0.25		NAWQ ADVISORY
	2	13	0	180.00	240.00	2	90.000	120.000	281.25	375.00	0.32		EC20 POPULATION
	2	13	0	180.00	240.00	2	90.000	120.000	160.71	214.29	0.56	<	LTV EC20 DAPHNID
	2	13	0	180.00	240.00	2	90.000	120.000	34.62	46.15	2.60		LCV DAPHNIDS
	3	35	0	120.00	240.00	2	60.000	120.000	500.00	1000.00	0.12		LCV FISH
	3	35	0	120.00	240.00	2	60.000	120.000	428.57	857.14	0.14		SS EC20
	3	35	0	120.00	240.00	2	60.000	120.000	300.00	600.00	0.20		LTV EC20 FISH
	3	35	0	120.00	240.00	2	60.000	120.000	240.00	480.00	0.25		NAWQ ADVISORY
	3	35	0	120.00	240.00	2	60.000	120.000	187.50	375.00	0.32		EC20 POPULATION

Table F.6 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	Maximum detection limit	BCF	Minimum exposure conc.	Maximum exposure conc.	Minimum detection limit quo.	Maximum detection limit quo.	Benchmark	Flag	Benchmark type
SILVER (continued)	3	35	0	120.00	240.00	2	60.000	120.000	107.14	214.29	0.56	<	LTV EC20 DAPHNID
	3	35	0	120.00	240.00	2	60.000	120.000	23.08	46.15	2.60		LCV DAPHNIDS
	4	27	0	190.00	240.00	2	95.000	120.000	791.67	1000.00	0.12		LCV FISH
	4	27	0	190.00	240.00	2	95.000	120.000	678.57	857.14	0.14		SS EC20
	4	27	0	190.00	240.00	2	95.000	120.000	475.00	600.00	0.20		LTV EC20 FISH
	4	27	0	190.00	240.00	2	95.000	120.000	380.00	480.00	0.25		NAWQ ADVISORY
	4	27	0	190.00	240.00	2	95.000	120.000	296.87	375.00	0.32		EC20 POPULATION
	4	27	0	190.00	240.00	2	95.000	120.000	169.64	214.29	0.56	<	LTV EC20 DAPHNID
	4	27	0	190.00	240.00	2	95.000	120.000	36.54	46.15	2.60		LCV DAPHNIDS
	5	25	0	190.00	250.00	2	95.000	125.000	791.67	1041.67	0.12		LCV FISH
	5	25	0	190.00	250.00	2	95.000	125.000	678.57	892.86	0.14		SS EC20
	5	25	0	190.00	250.00	2	95.000	125.000	475.00	625.00	0.20		LTV EC20 FISH
	5	25	0	190.00	250.00	2	95.000	125.000	380.00	500.00	0.25		NAWQ ADVISORY
	5	25	0	190.00	250.00	2	95.000	125.000	296.87	390.62	0.32		EC20 POPULATION
	5	25	0	190.00	250.00	2	95.000	125.000	169.64	223.21	0.56	<	LTV EC20 DAPHNID
	5	25	0	190.00	250.00	2	95.000	125.000	36.54	48.08	2.60		LCV DAPHNIDS
	10	15	0	140.00	250.00	2	70.000	125.000	583.33	1041.67	0.12		LCV FISH
	10	15	0	140.00	250.00	2	70.000	125.000	500.00	892.86	0.14		SS EC20
	10	15	0	140.00	250.00	2	70.000	125.000	350.00	625.00	0.20		LTV EC20 FISH
	10	15	0	140.00	250.00	2	70.000	125.000	280.00	500.00	0.25		NAWQ ADVISORY
	10	15	0	140.00	250.00	2	70.000	125.000	218.75	390.62	0.32		EC20 POPULATION
	10	15	0	140.00	250.00	2	70.000	125.000	125.00	223.21	0.56	<	LTV EC20 DAPHNID
	10	15	0	140.00	250.00	2	70.000	125.000	26.92	48.08	2.60		LCV DAPHNIDS
	13	10	0	180.00	240.00	2	90.000	120.000	750.00	1000.00	0.12		LCV FISH
	13	10	0	180.00	240.00	2	90.000	120.000	642.86	857.14	0.14		SS EC20
	13	10	0	180.00	240.00	2	90.000	120.000	450.00	600.00	0.20		LTV EC20 FISH
	13	10	0	180.00	240.00	2	90.000	120.000	360.00	480.00	0.25		NAWQ ADVISORY
	13	10	0	180.00	240.00	2	90.000	120.000	281.25	375.00	0.32		EC20 POPULATION
	13	10	0	180.00	240.00	2	90.000	120.000	160.71	214.29	0.56	<	LTV EC20 DAPHNID
	13	10	0	180.00	240.00	2	90.000	120.000	34.62	46.15	2.60		LCV DAPHNIDS
	15	16	0	140.00	230.00	2	70.000	115.000	583.33	958.33	0.12		LCV FISH
	15	16	0	140.00	230.00	2	70.000	115.000	500.00	821.43	0.14		SS EC20
	15	16	0	140.00	230.00	2	70.000	115.000	350.00	575.00	0.20		LTV EC20 FISH
	15	16	0	140.00	230.00	2	70.000	115.000	280.00	460.00	0.25		NAWQ ADVISORY
	15	16	0	140.00	230.00	2	70.000	115.000	218.75	359.37	0.32		EC20 POPULATION
	15	16	0	140.00	230.00	2	70.000	115.000	125.00	205.36	0.56	<	LTV EC20 DAPHNID
	15	16	0	140.00	230.00	2	70.000	115.000	26.92	44.23	2.60		LCV DAPHNIDS
THALLIUM	1	28	0	20.00	20.00	.	.	.	.	.	2.50		NAWQ ADVISORY
	1	28	0	20.00	20.00	.	.	.	.	.	57.00		LCV FISH
	1	28	0	20.00	20.00	.	.	.	.	.	64.00		LTV EC20 DAPHNID
	1	28	0	20.00	20.00	.	.	.	.	.	67.00		EC20 POPULATION
	1	28	0	20.00	20.00	.	.	.	.	.	81.00		LTV EC20 FISH
	1	28	0	20.00	20.00	.	.	.	.	.	135.00		LCV DAPHNIDS
	2	13	0	20.00	20.00	.	.	.	.	.	2.50		NAWQ ADVISORY
	2	13	0	20.00	20.00	.	.	.	.	.	57.00		LCV FISH
	2	13	0	20.00	20.00	.	.	.	.	.	64.00		LTV EC20 DAPHNID

Table F.6 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	Maximum detection limit	BCF	Minimum exposure conc.	Maximum exposure conc.	Minimum detection limit quo.	Maximum detection limit quo.	Benchmark	Flag	Benchmark type
THALLIUM (continued)	2	13	0	20.00	20.00	.	.	.	.	.	67.00		EC20 POPULATION
	2	13	0	20.00	20.00	.	.	.	.	.	81.00		LTV EC20 FISH
	2	13	0	20.00	20.00	.	.	.	.	.	135.00		LCV DAPHNIDS
	3	35	0	20.00	20.00	.	.	.	.	.	2.50		NAWQ ADVISORY
	3	35	0	20.00	20.00	.	.	.	.	.	57.00		LCV FISH
	3	35	0	20.00	20.00	.	.	.	.	.	64.00		LTV EC20 DAPHNID
	3	35	0	20.00	20.00	.	.	.	.	.	67.00		EC20 POPULATION
	3	35	0	20.00	20.00	.	.	.	.	.	81.00		LTV EC20 FISH
	3	35	0	20.00	20.00	.	.	.	.	.	135.00		LCV DAPHNIDS
	4	27	0	20.00	20.00	.	.	.	.	.	2.50		NAWQ ADVISORY
	4	27	0	20.00	20.00	.	.	.	.	.	57.00		LCV FISH
	4	27	0	20.00	20.00	.	.	.	.	.	64.00		LTV EC20 DAPHNID
	4	27	0	20.00	20.00	.	.	.	.	.	67.00		EC20 POPULATION
	4	27	0	20.00	20.00	.	.	.	.	.	81.00		LTV EC20 FISH
	4	27	0	20.00	20.00	.	.	.	.	.	135.00		LCV DAPHNIDS
	5	16	0	20.00	20.00	.	.	.	.	.	2.50		NAWQ ADVISORY
	5	16	0	20.00	20.00	.	.	.	.	.	57.00		LCV FISH
	5	16	0	20.00	20.00	.	.	.	.	.	64.00		LTV EC20 DAPHNID
	5	16	0	20.00	20.00	.	.	.	.	.	67.00		EC20 POPULATION
	5	16	0	20.00	20.00	.	.	.	.	.	81.00		LTV EC20 FISH
	5	16	0	20.00	20.00	.	.	.	.	.	135.00		LCV DAPHNIDS
	10	15	0	20.00	20.00	.	.	.	.	.	2.50		NAWQ ADVISORY
	10	15	0	20.00	20.00	.	.	.	.	.	57.00		LCV FISH
	10	15	0	20.00	20.00	.	.	.	.	.	64.00		LTV EC20 DAPHNID
	10	15	0	20.00	20.00	.	.	.	.	.	67.00		EC20 POPULATION
	10	15	0	20.00	20.00	.	.	.	.	.	81.00		LTV EC20 FISH
	10	15	0	20.00	20.00	.	.	.	.	.	135.00		LCV DAPHNIDS
	10	15	0	20.00	20.00	.	.	.	.	.	2.50		NAWQ ADVISORY
	13	10	0	20.00	20.00	.	.	.	.	.	57.00		LCV FISH
	13	10	0	20.00	20.00	.	.	.	.	.	64.00		LTV EC20 DAPHNID
	13	10	0	20.00	20.00	.	.	.	.	.	67.00		EC20 POPULATION
	13	10	0	20.00	20.00	.	.	.	.	.	81.00		LTV EC20 FISH
	13	10	0	20.00	20.00	.	.	.	.	.	135.00		LCV DAPHNIDS
	15	16	0	20.00	20.00	.	.	.	.	.	2.50		NAWQ ADVISORY
	15	16	0	20.00	20.00	.	.	.	.	.	57.00		LCV FISH
	15	16	0	20.00	20.00	.	.	.	.	.	64.00		LTV EC20 DAPHNID
	15	16	0	20.00	20.00	.	.	.	.	.	67.00		EC20 POPULATION
	15	16	0	20.00	20.00	.	.	.	.	.	81.00		LTV EC20 FISH
	15	16	0	20.00	20.00	.	.	.	.	.	135.00		LCV DAPHNIDS

Table F.7. Concentrations of inorganic chemicals detected in sediment (ug/L), toxicological benchmarks (ug/L), and quotients for benthic aquatic life

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Mean[a] sediment conc.	UCL[b] sediment conc.	Mean quotient	UCL quotient	Benchmark	Benchmark type
ANTIMONY	5	5	2	676.00	1288.75	0.3380	0.6444	2000	ER-L CONCENTRATION
	5	5	2	676.00	1288.75	0.0270	0.0515	25000	ER-M CONCENTRATION
	5	5	2	676.00	1288.75	0.0270	0.0515	25000	OVERALL APPARENT EFFECTS THRESHOLD
	7	8	3	313.12	398.35	0.1566	0.1992	2000	ER-L CONCENTRATION
	7	8	3	313.12	398.35	0.0125	0.0159	25000	ER-M CONCENTRATION
	7	8	3	313.12	398.35	0.0125	0.0159	25000	OVERALL APPARENT EFFECTS THRESHOLD
ARSENIC	1	2	4	6925.00	33925.69	0.2098	1.0281	33000	ER-L CONCENTRATION
	1	2	4	6925.00	33925.69	0.0815	0.3991	85000	ER-M CONCENTRATION
	1	2	4	6925.00	33925.69	0.1385	0.6785	50000	OVERALL APPARENT EFFECTS THRESHOLD
	2	2	4	3475.00	6333.90	0.1053	0.1919	33000	ER-L CONCENTRATION
	2	2	4	3475.00	6333.90	0.0409	0.0745	85000	ER-M CONCENTRATION
	2	2	4	3475.00	6333.90	0.0695	0.1267	50000	OVERALL APPARENT EFFECTS THRESHOLD
	3	2	4	16675.00	179632.08	0.5053	5.4434	33000	ER-L CONCENTRATION
	3	2	4	16675.00	179632.08	0.1962	2.1133	85000	ER-M CONCENTRATION
	3	2	4	16675.00	179632.08	0.3335	3.5926	50000	OVERALL APPARENT EFFECTS THRESHOLD
	4	2	4	5850.00	38250.82	0.1773	1.1591	33000	ER-L CONCENTRATION
	4	2	4	5850.00	38250.82	0.0688	0.4500	85000	ER-M CONCENTRATION
	4	2	4	5850.00	38250.82	0.1170	0.7650	50000	OVERALL APPARENT EFFECTS THRESHOLD
	5	6	10	10233.33	12268.99	0.3101	0.3718	33000	ER-L CONCENTRATION
	5	6	10	10233.33	12268.99	0.1204	0.1443	85000	ER-M CONCENTRATION
	5	6	10	10233.33	12268.99	0.2047	0.2454	50000	OVERALL APPARENT EFFECTS THRESHOLD
	7	8	15	11056.25	14128.35	0.3350	0.4281	33000	ER-L CONCENTRATION
	7	8	15	11056.25	14128.35	0.1301	0.1662	85000	ER-M CONCENTRATION
	7	8	15	11056.25	14128.35	0.2211	0.2826	50000	OVERALL APPARENT EFFECTS THRESHOLD
	10	1	2	7400.00	7400.00	0.2242	0.2242	33000	ER-L CONCENTRATION
	10	1	2	7400.00	7400.00	0.0871	0.0871	85000	ER-M CONCENTRATION
	10	1	2	7400.00	7400.00	0.1480	0.1480	50000	OVERALL APPARENT EFFECTS THRESHOLD
CADMIUM	1	2	3	850.00	1485.31	0.1700	0.2971	5000	ER-L CONCENTRATION
	1	2	3	850.00	1485.31	0.0944	0.1650	9000	ER-M CONCENTRATION
	1	2	3	850.00	1485.31	0.1700	0.2971	5000	OVERALL APPARENT EFFECTS THRESHOLD
	2	2	2	375.00	1327.97	0.0750	0.2656	5000	ER-L CONCENTRATION
	2	2	2	375.00	1327.97	0.0417	0.1476	9000	ER-M CONCENTRATION
	2	2	2	375.00	1327.97	0.0750	0.2656	5000	OVERALL APPARENT EFFECTS THRESHOLD
	3	2	4	1075.00	3933.90	0.2150	0.7868	5000	ER-L CONCENTRATION
	3	2	4	1075.00	3933.90	0.1194	0.4371	9000	ER-M CONCENTRATION
	3	2	4	1075.00	3933.90	0.2150	0.7868	5000	OVERALL APPARENT EFFECTS THRESHOLD
	4	2	4	845.00	4720.39	0.1690	0.9441	5000	ER-L CONCENTRATION
	4	2	4	845.00	4720.39	0.0939	0.5245	9000	ER-M CONCENTRATION
	4	2	4	845.00	4720.39	0.1690	0.9441	5000	OVERALL APPARENT EFFECTS THRESHOLD

Table F.7 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Mean[a] sediment conc.	UCL[b] sediment conc.	Mean quotient	UCL quotient	Benchmark	Benchmark type
CADMIUM (continued)	5	6	9	2003.33	4906.72	0.4007	0.9813	5000	ER-L CONCENTRATION
	5	6	9	2003.33	4906.72	0.2226	0.5452	9000	ER-M CONCENTRATION
	5	6	9	2003.33	4906.72	0.4007	0.9813	5000	OVERALL APPARENT EFFECTS THRESHOLD
	7	8	1	562.50	770.43	0.1125	0.1541	5000	ER-L CONCENTRATION
	7	8	1	562.50	770.43	0.0625	0.0856	9000	ER-M CONCENTRATION
	7	8	1	562.50	770.43	0.1125	0.1541	5000	OVERALL APPARENT EFFECTS THRESHOLD
CHROMIUM	1	2	4	11375.00	51081.89	0.1422	0.6385	80000	ER-L CONCENTRATION
	1	2	4	11375.00	51081.89	0.0784	0.3523	145000	ER-M CONCENTRATION
	2	2	4	8500.00	46618.61	0.1062	0.5827	80000	ER-L CONCENTRATION
	2	2	4	8500.00	46618.61	0.0586	0.3215	145000	ER-M CONCENTRATION
	3	2	4	22750.00	70398.27	0.2844	0.8800	80000	ER-L CONCENTRATION
	3	2	4	22750.00	70398.27	0.1569	0.4855	145000	ER-M CONCENTRATION
	4	2	4	13650.00	35250.55	0.1706	0.4406	80000	ER-L CONCENTRATION
	4	2	4	13650.00	35250.55	0.0941	0.2431	145000	ER-M CONCENTRATION
	5	6	10	24266.67	31106.11	0.3033	0.3888	80000	ER-L CONCENTRATION
	5	6	10	24266.67	31106.11	0.1674	0.2145	145000	ER-M CONCENTRATION
	7	8	15	29775.00	41513.37	0.3722	0.5189	80000	ER-L CONCENTRATION
	7	8	15	29775.00	41513.37	0.2053	0.2863	145000	ER-M CONCENTRATION
	10	1	2	28100.00	28100.00	0.3512	0.3512	80000	ER-L CONCENTRATION
	10	1	2	28100.00	28100.00	0.1938	0.1938	145000	ER-M CONCENTRATION
COPPER	1	2	4	37050.00	82157.03	0.5293	1.1737	70000	ER-L CONCENTRATION
	1	2	4	37050.00	82157.03	0.0950	0.2107	390000	ER-M CONCENTRATION
	1	2	4	37050.00	82157.03	0.1235	0.2739	300000	OVERALL APPARENT EFFECTS THRESHOLD
	2	2	4	10500.00	23206.20	0.1500	0.3315	70000	ER-L CONCENTRATION
	2	2	4	10500.00	23206.20	0.0269	0.0595	390000	ER-M CONCENTRATION
	2	2	4	10500.00	23206.20	0.0350	0.0774	300000	OVERALL APPARENT EFFECTS THRESHOLD
	3	2	4	29000.00	105237.23	0.4143	1.5034	70000	ER-L CONCENTRATION
	3	2	4	29000.00	105237.23	0.0744	0.2698	390000	ER-M CONCENTRATION
	3	2	4	29000.00	105237.23	0.0967	0.3508	300000	OVERALL APPARENT EFFECTS THRESHOLD
	4	2	4	30450.00	181018.53	0.4350	2.5860	70000	ER-L CONCENTRATION
	4	2	4	30450.00	181018.53	0.0781	0.4642	390000	ER-M CONCENTRATION
	4	2	4	30450.00	181018.53	0.1015	0.6034	300000	OVERALL APPARENT EFFECTS THRESHOLD
	5	6	10	32050.00	44295.52	0.4579	0.6328	70000	ER-L CONCENTRATION
	5	6	10	32050.00	44295.52	0.0822	0.1136	390000	ER-M CONCENTRATION
	5	6	10	32050.00	44295.52	0.1068	0.1477	300000	OVERALL APPARENT EFFECTS THRESHOLD
	7	8	15	27643.75	37241.37	0.3949	0.5320	70000	ER-L CONCENTRATION
	7	8	15	27643.75	37241.37	0.0709	0.0955	390000	ER-M CONCENTRATION
	7	8	15	27643.75	37241.37	0.0921	0.1241	300000	OVERALL APPARENT EFFECTS THRESHOLD

Table F.7 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Mean[a] sediment conc.	UCL[b] sediment conc.	Mean quotient	UCL quotient	Benchmark	Benchmark type
COPPER (continued)	10	1	2	53500.00	53500.00	0.7643	0.7643	70000	ER-L CONCENTRATION
	10	1	2	53500.00	53500.00	0.1372	0.1372	390000	ER-M CONCENTRATION
	10	1	2	53500.00	53500.00	0.1783	0.1783	300000	OVERALL APPARENT EFFECTS THRESHOLD
LEAD	1	2	4	29375.00	93858.99	0.8393	2.6817	35000	ER-L CONCENTRATION
	1	2	4	29375.00	93858.99	0.2670	0.8533	110000	ER-M CONCENTRATION
	1	2	4	29375.00	93858.99	0.0979	0.3129	300000	OVERALL APPARENT EFFECTS THRESHOLD
	2	2	4	13500.00	65595.44	0.3857	1.8742	35000	ER-L CONCENTRATION
	2	2	4	13500.00	65595.44	0.1227	0.5963	110000	ER-M CONCENTRATION
	2	2	4	13500.00	65595.44	0.0450	0.2187	300000	OVERALL APPARENT EFFECTS THRESHOLD
	3	2	4	25975.00	35822.31	0.7421	1.0235	35000	ER-L CONCENTRATION
	3	2	4	25975.00	35822.31	0.2361	0.3257	110000	ER-M CONCENTRATION
	3	2	4	25975.00	35822.31	0.0866	0.1194	300000	OVERALL APPARENT EFFECTS THRESHOLD
	4	2	4	20300.00	200728.11	0.5800	5.7351	35000	ER-L CONCENTRATION
	4	2	4	20300.00	200728.11	0.1845	1.8248	110000	ER-M CONCENTRATION
	4	2	4	20300.00	200728.11	0.0677	0.6691	300000	OVERALL APPARENT EFFECTS THRESHOLD
	5	6	10	47500.00	64534.61	1.3571	1.8438	35000	ER-L CONCENTRATION
	5	6	10	47500.00	64534.61	0.4318	0.5867	110000	ER-M CONCENTRATION
	5	6	10	47500.00	64534.61	0.1583	0.2151	300000	OVERALL APPARENT EFFECTS THRESHOLD
	7	8	15	18668.75	22529.67	0.5334	0.6437	35000	ER-L CONCENTRATION
	7	8	15	18668.75	22529.67	0.1697	0.2048	110000	ER-M CONCENTRATION
	7	8	15	18668.75	22529.67	0.0622	0.0751	300000	OVERALL APPARENT EFFECTS THRESHOLD
	10	1	2	39250.00	39250.00	1.1214	1.1214	35000	ER-L CONCENTRATION
	10	1	2	39250.00	39250.00	0.3568	0.3568	110000	ER-M CONCENTRATION
	10	1	2	39250.00	39250.00	0.1308	0.1308	300000	OVERALL APPARENT EFFECTS THRESHOLD
MERCURY	1	2	4	102.50	769.58	0.6833	5.1305	150	ER-L CONCENTRATION
	1	2	4	102.50	769.58	0.0788	0.5920	1300	ER-M CONCENTRATION
	1	2	4	102.50	769.58	0.1025	0.7696	1000	OVERALL APPARENT EFFECTS THRESHOLD
	2	1	2	550.00	550.00	3.6667	3.6667	150	ER-L CONCENTRATION
	2	1	2	550.00	550.00	0.4231	0.4231	1300	ER-M CONCENTRATION
	2	1	2	550.00	550.00	0.5500	0.5500	1000	OVERALL APPARENT EFFECTS THRESHOLD
	3	1	2	3665.00	3665.00	24.4333	24.4333	150	ER-L CONCENTRATION
	3	1	2	3665.00	3665.00	2.8192	2.8192	1300	ER-M CONCENTRATION
	3	1	2	3665.00	3665.00	3.6650	3.6650	1000	OVERALL APPARENT EFFECTS THRESHOLD
	4	2	4	2025.00	4883.90	13.5000	32.5593	150	ER-L CONCENTRATION
	4	2	4	2025.00	4883.90	1.5577	3.7568	1300	ER-M CONCENTRATION
	4	2	4	2025.00	4883.90	2.0250	4.8839	1000	OVERALL APPARENT EFFECTS THRESHOLD
	5	5	8	440.00	867.04	2.9333	5.7803	150	ER-L CONCENTRATION
	5	5	8	440.00	867.04	0.3385	0.6670	1300	ER-M CONCENTRATION
	5	5	8	440.00	867.04	0.4400	0.8670	1000	OVERALL APPARENT EFFECTS THRESHOLD

Table F.7 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Mean[a] sediment conc.	UCL[b] sediment conc.	Mean quotient	UCL quotient	Benchmark	Benchmark type
MERCURY (continued)	10	1	2	80.00	80.00	0.5333	0.5333	150	ER-L CONCENTRATION
	10	1	2	80.00	80.00	0.0615	0.0615	1300	ER-M CONCENTRATION
	10	1	2	80.00	80.00	0.0800	0.0800	1000	OVERALL APPARENT EFFECTS THRESHOLD
NICKEL	1	2	4	14800.00	61812.96	0.4933	2.0604	30000	ER-L CONCENTRATION
	1	2	4	14800.00	61812.96	0.2960	1.2363	50000	ER-M CONCENTRATION
	2	2	4	7250.00	48545.17	0.2417	1.6182	30000	ER-L CONCENTRATION
	2	2	4	7250.00	48545.17	0.1450	0.9709	50000	ER-M CONCENTRATION
	3	2	4	36750.00	65338.96	1.2250	2.1780	30000	ER-L CONCENTRATION
	3	2	4	36750.00	65338.96	0.7350	1.3068	50000	ER-M CONCENTRATION
	4	2	4	15725.00	78938.37	0.5242	2.6313	30000	ER-L CONCENTRATION
	4	2	4	15725.00	78938.37	0.3145	1.5788	50000	ER-M CONCENTRATION
	5	6	10	21441.67	27853.92	0.7147	0.9285	30000	ER-L CONCENTRATION
	5	6	10	21441.67	27853.92	0.4288	0.5571	50000	ER-M CONCENTRATION
	7	8	15	25987.50	31632.11	0.8662	1.0544	30000	ER-L CONCENTRATION
	7	8	15	25987.50	31632.11	0.5197	0.6326	50000	ER-M CONCENTRATION
	10	1	2	24250.00	24250.00	0.8083	0.8083	30000	ER-L CONCENTRATION
	10	1	2	24250.00	24250.00	0.4850	0.4850	50000	ER-M CONCENTRATION
SILVER	1	2	4	300.00	1062.37	0.3000	1.0624	1000	ER-L CONCENTRATION
	1	2	4	300.00	1062.37	0.1364	0.4829	2200	ER-M CONCENTRATION
	1	2	4	300.00	1062.37	0.1765	0.6249	1700	OVERALL APPARENT EFFECTS THRESHOLD
	2	2	2	85.00	783.84	0.0850	0.7838	1000	ER-L CONCENTRATION
	2	2	2	85.00	783.84	0.0386	0.3563	2200	ER-M CONCENTRATION
	2	2	2	85.00	783.84	0.0500	0.4611	1700	OVERALL APPARENT EFFECTS THRESHOLD
	3	1	2	230.00	230.00	0.2300	0.2300	1000	ER-L CONCENTRATION
	3	1	2	230.00	230.00	0.1045	0.1045	2200	ER-M CONCENTRATION
	3	1	2	230.00	230.00	0.1353	0.1353	1700	OVERALL APPARENT EFFECTS THRESHOLD
	5	6	8	338.33	640.83	0.3383	0.6408	1000	ER-L CONCENTRATION
	5	6	8	338.33	640.83	0.1538	0.2913	2200	ER-M CONCENTRATION
	5	6	8	338.33	640.83	0.1990	0.3770	1700	OVERALL APPARENT EFFECTS THRESHOLD
	7	8	9	63.12	93.67	0.0631	0.0937	1000	ER-L CONCENTRATION
	7	8	9	63.12	93.67	0.0287	0.0426	2200	ER-M CONCENTRATION
	7	8	9	63.12	93.67	0.0371	0.0551	1700	OVERALL APPARENT EFFECTS THRESHOLD
ZINC	1	2	4	81675.00	341199.23	0.6806	2.8433	120000	ER-L CONCENTRATION
	1	2	4	81675.00	341199.23	0.3025	1.2637	270000	ER-M CONCENTRATION
	1	2	4	81675.00	341199.23	0.3141	1.3123	260000	OVERALL APPARENT EFFECTS THRESHOLD
	2	2	4	39925.00	81537.82	0.3327	0.6795	120000	ER-L CONCENTRATION
	2	2	4	39925.00	81537.82	0.1479	0.3020	270000	ER-M CONCENTRATION
	2	2	4	39925.00	81537.82	0.1536	0.3136	260000	OVERALL APPARENT EFFECTS THRESHOLD

Table F.7 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Mean[a] sediment conc.	UCL[b] sediment conc.	Mean quotient	UCL quotient	Benchmark	Benchmark type
ZINC (continued)	3	2	4	76550.00	178199.64	0.6379	1.4850	120000	ER-L CONCENTRATION
	3	2	4	76550.00	178199.64	0.2835	0.6600	270000	ER-M CONCENTRATION
	3	2	4	76550.00	178199.64	0.2944	0.6854	260000	OVERALL APPARENT EFFECTS THRESHOLD
	4	2	4	81425.00	482623.41	0.6785	4.0219	120000	ER-L CONCENTRATION
	4	2	4	81425.00	482623.41	0.3016	1.7875	270000	ER-M CONCENTRATION
	4	2	4	81425.00	482623.41	0.3132	1.8562	260000	OVERALL APPARENT EFFECTS THRESHOLD
	5	6	10	181116.67	248313.51	1.5093	2.0693	120000	ER-L CONCENTRATION
	5	6	10	181116.67	248313.51	0.6708	0.9197	270000	ER-M CONCENTRATION
	5	6	10	181116.67	248313.51	0.6966	0.9551	260000	OVERALL APPARENT EFFECTS THRESHOLD
	7	8	15	73600.00	89511.67	0.6133	0.7459	120000	ER-L CONCENTRATION
	7	8	15	73600.00	89511.67	0.2726	0.3315	270000	ER-M CONCENTRATION
	7	8	15	73600.00	89511.67	0.2831	0.3443	260000	OVERALL APPARENT EFFECTS THRESHOLD
	10	1	2	105500.00	105500.00	0.8792	0.8792	120000	ER-L CONCENTRATION
	10	1	2	105500.00	105500.00	0.3907	0.3907	270000	ER-M CONCENTRATION
	10	1	2	105500.00	105500.00	0.4058	0.4058	260000	OVERALL APPARENT EFFECTS THRESHOLD

[a]In cases of mixed detects and nondetects, statistics were calculated using all values, "as is."
[b]The maximum concentration was used when the UCL concentration was missing.

Table F.8. Detection limits for inorganic chemicals not detected in sediment (ug/L), toxicological benchmarks (ug/L), and quotients for benthic aquatic life

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Minimum detection limit	UCL[a] detection limit	MDL quotient	UCL quotient	Benchmark	Benchmark type
ANTIMONY	1	1	0	700	700.000	0.35000	0.35000	2000	ER-L CONCENTRATION
	1	1	0	700	700.000	0.02800	0.02800	25000	ER-M CONCENTRATION
	1	1	0	700	700.000	0.02800	0.02800	25000	OVERALL APPARENT EFFECTS THRESHOLD
	3	1	0	300	300.000	0.15000	0.15000	2000	ER-L CONCENTRATION
	3	1	0	300	300.000	0.01200	0.01200	25000	ER-M CONCENTRATION
	3	1	0	300	300.000	0.01200	0.01200	25000	OVERALL APPARENT EFFECTS THRESHOLD
	4	1	0	550	550.000	0.27500	0.27500	2000	ER-L CONCENTRATION
	4	1	0	550	550.000	0.02200	0.02200	25000	ER-M CONCENTRATION
	4	1	0	550	550.000	0.02200	0.02200	25000	OVERALL APPARENT EFFECTS THRESHOLD
	10	1	0	600	600.000	0.30000	0.30000	2000	ER-L CONCENTRATION
	10	1	0	600	600.000	0.02400	0.02400	25000	ER-M CONCENTRATION
	10	1	0	600	600.000	0.02400	0.02400	25000	OVERALL APPARENT EFFECTS THRESHOLD
CADMIUM	10	1	0	600	600.000	0.12000	0.12000	5000	ER-L CONCENTRATION
	10	1	0	600	600.000	0.06667	0.06667	9000	ER-M CONCENTRATION
	10	1	0	600	600.000	0.12000	0.12000	5000	OVERALL APPARENT EFFECTS THRESHOLD
MERCURY	7	8	0	50	237.283	0.33333	1.58189	150	ER-L CONCENTRATION
	7	8	0	50	237.283	0.03846	0.18253	1300	ER-M CONCENTRATION
	7	8	0	50	237.283	0.05000	0.23728	1000	OVERALL APPARENT EFFECTS THRESHOLD

[a]The maximum detection limit is used in cases where the UCL detection limit was missing.

Table F.9. Mean and upper confidence limit (UCL) concentrations of organic chemicals detected in sediment (ug/L), toxicological benchmarks (ug/L), and quotients for benthic aquatic life.

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Mean[a] sediment conc.	Mean pore water conc.	UCL sediment conc.	UCL pore water conc.	Mean quotient	UCL quotient	Benchmark	Benchmark type
2-METHYLNAPHTHALENE	3	2	2	.	323.50	.	3455.58	.	.	.	.	NAWQ ADVISORY
	3	2	2	.	323.50	.	3455.58	.	.	.	.	NAWQ ACTUAL
	3	2	2	.	323.50	.	3455.58	.	.	.	.	LCV FISH
	3	2	2	.	323.50	.	3455.58	.	.	.	.	LCV DAPHNIDS
	3	2	2	.	323.50	.	3455.58	.	.	.	.	LTV EC20 FISH
	3	2	2	.	323.50	.	3455.58	.	.	.	.	LTV EC20 DAPHNID
	3	2	2	.	323.50	.	3455.58	.	.	.	.	SS EC20
	3	2	2	.	323.50	.	3455.58	.	.	.	.	EC20 POPULATION
4,4'-DDD	1	2	1	6.02	527.50	0.0504	3418.16	0.3264	.	.	.	NAWQ ACTUAL
	1	2	1	6.02	527.50	0.0504	3418.16	0.3264	.	.	.	LCV DAPHNIDS
	1	2	1	6.02	527.50	0.0504	3418.16	0.3264	.	.	.	LTV EC20 DAPHNID
	1	2	1	6.02	527.50	0.0504	3418.16	0.3264	.	.	.	SS EC20
	1	2	1	6.02	527.50	0.0504	3418.16	0.3264	119.943	777.219	0.00	NAWQ ADVISORY
	1	2	1	6.02	527.50	0.0504	3418.16	0.3264	0.083	0.535	0.61	EC20 POPULATION
	1	2	1	6.02	527.50	0.0504	3418.16	0.3264	0.030	0.193	1.69	LCV FISH
	1	2	1	6.02	527.50	0.0504	3418.16	0.3264	0.013	0.082	3.99	LTV EC20 FISH
4,4'-DDT	1	2	1	5.69	527.50	0.1077	3418.16	0.6979	.	.	.	NAWQ ACTUAL
	1	2	1	5.69	527.50	0.1077	3418.16	0.6979	.	.	.	LTV EC20 DAPHNID
	1	2	1	5.69	527.50	0.1077	3418.16	0.6979	.	.	.	EC20 POPULATION
	1	2	1	5.69	527.50	0.1077	3418.16	0.6979	13.463	87.237	0.01	SS EC20
	1	2	1	5.69	527.50	0.1077	3418.16	0.6979	6.731	43.619	0.02	LCV DAPHNIDS
	1	2	1	5.69	527.50	0.1077	3418.16	0.6979	5.385	34.895	0.02	NAWQ ADVISORY
	1	2	1	5.69	527.50	0.1077	3418.16	0.6979	0.308	1.994	0.35	LTV EC20 FISH
	1	2	1	5.69	527.50	0.1077	3418.16	0.6979	0.148	0.956	0.73	LCV FISH
AROCLOR-1254	2	2	1	7.14	1487.50	0.0108	12001.88	0.0869	.	.	.	NAWQ ACTUAL
	2	2	1	7.14	1487.50	0.0108	12001.88	0.0869	.	.	.	SS EC20
	2	2	1	7.14	1487.50	0.0108	12001.88	0.0869	0.539	4.347	0.02	NAWQ ADVISORY
	2	2	1	7.14	1487.50	0.0108	12001.88	0.0869	0.021	0.167	0.52	LTV EC20 FISH
	2	2	1	7.14	1487.50	0.0108	12001.88	0.0869	0.017	0.138	0.63	EC20 POPULATION
	2	2	1	7.14	1487.50	0.0108	12001.88	0.0869	0.011	0.087	1.00	LCV FISH
	2	2	1	7.14	1487.50	0.0108	12001.88	0.0869	0.009	0.072	1.20	LTV EC20 DAPHNID
	2	2	1	7.14	1487.50	0.0108	12001.88	0.0869	0.005	0.041	2.10	LCV DAPHNIDS
	3	2	2	7.14	3551.00	0.0257	39115.67	0.2834	.	.	.	NAWQ ACTUAL
	3	2	2	7.14	3551.00	0.0257	39115.67	0.2834	.	.	.	SS EC20
	3	2	2	7.14	3551.00	0.0257	39115.67	0.2834	1.286	14.168	0.02	NAWQ ADVISORY
	3	2	2	7.14	3551.00	0.0257	39115.67	0.2834	0.049	0.545	0.52	LTV EC20 FISH
	3	2	2	7.14	3551.00	0.0257	39115.67	0.2834	0.041	0.450	0.63	EC20 POPULATION
	3	2	2	7.14	3551.00	0.0257	39115.67	0.2834	0.026	0.283	1.00	LCV FISH
	3	2	2	7.14	3551.00	0.0257	39115.67	0.2834	0.021	0.236	1.20	LTV EC20 DAPHNID
	3	2	2	7.14	3551.00	0.0257	39115.67	0.2834	0.012	0.135	2.10	LCV DAPHNIDS

Table F.9 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Mean* sediment conc.	Mean pore water conc.	UCL sediment conc.	UCL pore water conc.	Mean quotient	UCL quotient	Benchmark	Benchmark type
AROCLOR-1254 (continued)	4	2	2	7.14	2614.90	0.0189	19150.75	0.1387	.	.	.	NAWQ ACTUAL
	4	2	2	7.14	2614.90	0.0189	19150.75	0.1387	.	.	.	SS EC20
	4	2	2	7.14	2614.90	0.0189	19150.75	0.1387	0.947	6.937	0.02	NAWQ ADVISORY
	4	2	2	7.14	2614.90	0.0189	19150.75	0.1387	0.036	0.267	0.52	LTV EC20 FISH
	4	2	2	7.14	2614.90	0.0189	19150.75	0.1387	0.030	0.220	0.63	EC20 POPULATION
	4	2	2	7.14	2614.90	0.0189	19150.75	0.1387	0.019	0.139	1.00	LCV FISH
	4	2	2	7.14	2614.90	0.0189	19150.75	0.1387	0.016	0.116	1.20	LTV EC20 DAPHNID
	4	2	2	7.14	2614.90	0.0189	19150.75	0.1387	0.009	0.066	2.10	LCV DAPHNIDS
AROCLOR-1260	2	2	1	7.14	1487.50	0.0108	12001.88	0.0869	.	.	.	NAWQ ACTUAL
	2	2	1	7.14	1487.50	0.0108	12001.88	0.0869	.	.	.	LCV DAPHNIDS
	2	2	1	7.14	1487.50	0.0108	12001.88	0.0869	.	.	.	LTV EC20 DAPHNID
	2	2	1	7.14	1487.50	0.0108	12001.88	0.0869	.	.	.	SS EC20
	2	2	1	7.14	1487.50	0.0108	12001.88	0.0869	0.098	0.790	0.11	NAWQ ADVISORY
	2	2	1	7.14	1487.50	0.0108	12001.88	0.0869	0.005	0.041	2.10	LTV EC20 FISH
	2	2	1	7.14	1487.50	0.0108	12001.88	0.0869	0.005	0.038	2.30	LCV FISH
	2	2	1	7.14	1487.50	0.0108	12001.88	0.0869	0.000	0.000	316.00	EC20 POPULATION
BIS(2-ETHYLHEXYL)PHTHALATE	2	2	3	4.89	395.00	0.5089	2427.99	3.1279	.	.	.	NAWQ ACTUAL
	2	2	3	4.89	395.00	0.5089	2427.99	3.1279	.	.	.	SS EC20
	2	2	3	4.89	395.00	0.5089	2427.99	3.1279	50.886	312.786	0.01	NAWQ ADVISORY
	2	2	3	4.89	395.00	0.5089	2427.99	3.1279	0.170	1.043	3.00	LCV DAPHNIDS
	2	2	3	4.89	395.00	0.5089	2427.99	3.1279	0.170	1.043	3.00	LTV EC20 DAPHNID
	2	2	3	4.89	395.00	0.5089	2427.99	3.1279	0.061	0.372	8.40	LCV FISH
	2	2	3	4.89	395.00	0.5089	2427.99	3.1279	0.010	0.063	50.00	EC20 POPULATION
	2	2	3	4.89	395.00	0.5089	2427.99	3.1279	0.009	0.058	54.00	LTV EC20 FISH
	3	2	2	4.89	1167.50	1.5040	5646.44	7.2740	.	.	.	NAWQ ACTUAL
	3	2	2	4.89	1167.50	1.5040	5646.44	7.2740	.	.	.	SS EC20
	3	2	2	4.89	1167.50	1.5040	5646.44	7.2740	150.403	727.402	0.01	NAWQ ADVISORY
	3	2	2	4.89	1167.50	1.5040	5646.44	7.2740	0.501	2.425	3.00	LCV DAPHNIDS
	3	2	2	4.89	1167.50	1.5040	5646.44	7.2740	0.501	2.425	3.00	LTV EC20 DAPHNID
	3	2	2	4.89	1167.50	1.5040	5646.44	7.2740	0.179	0.866	8.40	LCV FISH
	3	2	2	4.89	1167.50	1.5040	5646.44	7.2740	0.030	0.145	50.00	EC20 POPULATION
	3	2	2	4.89	1167.50	1.5040	5646.44	7.2740	0.028	0.135	54.00	LTV EC20 FISH
	5	4	5	4.89	2580.00	3.3237	5221.43	6.7265	.	.	.	NAWQ ACTUAL
	5	4	5	4.89	2580.00	3.3237	5221.43	6.7265	.	.	.	SS EC20
	5	4	5	4.89	2580.00	3.3237	5221.43	6.7265	332.368	672.651	0.01	NAWQ ADVISORY
	5	4	5	4.89	2580.00	3.3237	5221.43	6.7265	1.108	2.242	3.00	LCV DAPHNIDS
	5	4	5	4.89	2580.00	3.3237	5221.43	6.7265	1.108	2.242	3.00	LTV EC20 DAPHNID
	5	4	5	4.89	2580.00	3.3237	5221.43	6.7265	0.396	0.801	8.40	LCV FISH
	5	4	5	4.89	2580.00	3.3237	5221.43	6.7265	0.066	0.135	50.00	EC20 POPULATION
	5	4	5	4.89	2580.00	3.3237	5221.43	6.7265	0.062	0.125	54.00	LTV EC20 FISH

Table F.9 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Mean[a] sediment conc.	Mean pore water conc.	UCL sediment conc.	UCL pore water conc.	Mean quotient	UCL quotient	Benchmark	Benchmark type
FLUORANTHENE	3	2	4	4.90	472.50	0.5948	4443.19	5.5936	.	.	.	NAWQ ACTUAL
	3	2	4	4.90	472.50	0.5948	4443.19	5.5936	.	.	.	LCV FISH
	3	2	4	4.90	472.50	0.5948	4443.19	5.5936	.	.	.	LTV EC20 FISH
	3	2	4	4.90	472.50	0.5948	4443.19	5.5936	.	.	.	LTV EC20 DAPHNID
	3	2	4	4.90	472.50	0.5948	4443.19	5.5936	.	.	.	SS EC20
	3	2	4	4.90	472.50	0.5948	4443.19	5.5936	0.350	3.290	1.70	NAWQ ADVISORY
	3	2	4	4.90	472.50	0.5948	4443.19	5.5936	0.019	0.175	32.00	EC20 POPULATION
	3	2	4	4.90	472.50	0.5948	4443.19	5.5936	0.000	0.000	65795.00	LCV DAPHNIDS
NAPHTHALENE	3	2	1	3.59	451.75	11.6118	1954.26	50.2322	.	.	.	NAWQ ACTUAL
	3	2	1	3.59	451.75	11.6118	1954.26	50.2322	.	.	.	SS EC20
	3	2	1	3.59	451.75	11.6118	1954.26	50.2322	5.529	23.920	2.10	NAWQ ADVISORY
	3	2	1	3.59	451.75	11.6118	1954.26	50.2322	0.026	0.112	450.00	LTV EC20 FISH
	3	2	1	3.59	451.75	11.6118	1954.26	50.2322	0.019	0.084	600.00	LTV EC20 DAPHNID
	3	2	1	3.59	451.75	11.6118	1954.26	50.2322	0.019	0.081	620.00	LCV FISH
	3	2	1	3.59	451.75	11.6118	1954.26	50.2322	0.012	0.050	1000.00	EC20 POPULATION
	3	2	1	3.59	451.75	11.6118	1954.26	50.2322	0.010	0.043	1163.00	LCV DAPHNIDS
PHENANTHRENE	3	2	4	4.57	305.00	0.8209	2782.71	7.4898	.	.	.	NAWQ ACTUAL
	3	2	4	4.57	305.00	0.8209	2782.71	7.4898	.	.	.	LCV FISH
	3	2	4	4.57	305.00	0.8209	2782.71	7.4898	.	.	.	LTV EC20 FISH
	3	2	4	4.57	305.00	0.8209	2782.71	7.4898	.	.	.	SS EC20
	3	2	4	4.57	305.00	0.8209	2782.71	7.4898	.	.	.	EC20 POPULATION
	3	2	4	4.57	305.00	0.8209	2782.71	7.4898	1.909	17.418	0.43	NAWQ ADVISORY
	3	2	4	4.57	305.00	0.8209	2782.71	7.4898	0.007	0.068	110.00	LTV EC20 DAPHNID
	3	2	4	4.57	305.00	0.8209	2782.71	7.4898	0.004	0.037	200.00	LCV DAPHNIDS
PYRENE	3	2	4	4.88	355.00	0.4680	2578.59	3.3992	.	.	.	NAWQ ADVISORY
	3	2	4	4.88	355.00	0.4680	2578.59	3.3992	.	.	.	NAWQ ACTUAL
	3	2	4	4.88	355.00	0.4680	2578.59	3.3992	.	.	.	LCV FISH
	3	2	4	4.88	355.00	0.4680	2578.59	3.3992	.	.	.	LCV DAPHNIDS
	3	2	4	4.88	355.00	0.4680	2578.59	3.3992	.	.	.	LTV EC20 FISH
	3	2	4	4.88	355.00	0.4680	2578.59	3.3992	.	.	.	LTV EC20 DAPHNID
	3	2	4	4.88	355.00	0.4680	2578.59	3.3992	.	.	.	SS EC20
	3	2	4	4.88	355.00	0.4680	2578.59	3.3992	.	.	.	EC20 POPULATION

[a]In cases of mixed detects and nondetects, statistics are calculated using all values, "as is."

Table F.10. Detection limits for organic chemicals not detected in sediment (ug/L), estimated pore water concentrations (ug/L), toxicological benchmarks (ug/L), and quotients for benthic aquatic life

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL* detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
2,4-DINITROPHENOL	1	2	0	1.54	3000	8652.09	33838.96	97592.63	.	.	.	NAWQ ADVISORY
	1	2	0	1.54	3000	8652.09	33838.96	97592.63	.	.	.	LCV FISH
	1	2	0	1.54	3000	8652.09	33838.96	97592.63	.	.	.	LCV DAPHNIDS
	1	2	0	1.54	3000	8652.09	33838.96	97592.63	.	.	.	LTV EC20 FISH
	1	2	0	1.54	3000	8652.09	33838.96	97592.63	.	.	.	LTV EC20 DAPHNID
	1	2	0	1.54	3000	8652.09	33838.96	97592.63	.	.	.	SS EC20
	1	2	0	1.54	3000	8652.09	33838.96	97592.63	.	.	.	EC20 POPULATION
	1	2	0	1.54	3000	8652.09	33838.96	97592.63	57.68	650.62	150.00	NAWQ ACTUAL
	2	2	0	1.54	2150	6200.67	2835.31	8177.12	.	.	.	NAWQ ADVISORY
	2	2	0	1.54	2150	6200.67	2835.31	8177.12	.	.	.	LCV FISH
	2	2	0	1.54	2150	6200.67	2835.31	8177.12	.	.	.	LCV DAPHNIDS
	2	2	0	1.54	2150	6200.67	2835.31	8177.12	.	.	.	LTV EC20 FISH
	2	2	0	1.54	2150	6200.67	2835.31	8177.12	.	.	.	LTV EC20 DAPHNID
	2	2	0	1.54	2150	6200.67	2835.31	8177.12	.	.	.	SS EC20
	2	2	0	1.54	2150	6200.67	2835.31	8177.12	.	.	.	EC20 POPULATION
	2	2	0	1.54	2150	6200.67	2835.31	8177.12	41.34	54.51	150.00	NAWQ ACTUAL
	3	2	0	1.54	2750	7931.09	2750.00	7931.09	.	.	.	NAWQ ADVISORY
	3	2	0	1.54	2750	7931.09	2750.00	7931.09	.	.	.	LCV FISH
	3	2	0	1.54	2750	7931.09	2750.00	7931.09	.	.	.	LCV DAPHNIDS
	3	2	0	1.54	2750	7931.09	2750.00	7931.09	.	.	.	LTV EC20 FISH
	3	2	0	1.54	2750	7931.09	2750.00	7931.09	.	.	.	LTV EC20 DAPHNID
	3	2	0	1.54	2750	7931.09	2750.00	7931.09	.	.	.	SS EC20
	3	2	0	1.54	2750	7931.09	2750.00	7931.09	.	.	.	EC20 POPULATION
	3	2	0	1.54	2750	7931.09	2750.00	7931.09	52.87	52.87	150.00	NAWQ ACTUAL
	4	2	0	1.54	2450	7065.88	187826.42	541697.31	.	.	.	NAWQ ADVISORY
	4	2	0	1.54	2450	7065.88	187826.42	541697.31	.	.	.	LCV FISH
	4	2	0	1.54	2450	7065.88	187826.42	541697.31	.	.	.	LCV DAPHNIDS
	4	2	0	1.54	2450	7065.88	187826.42	541697.31	.	.	.	LTV EC20 FISH
	4	2	0	1.54	2450	7065.88	187826.42	541697.31	.	.	.	LTV EC20 DAPHNID
	4	2	0	1.54	2450	7065.88	187826.42	541697.31	.	.	.	SS EC20
	4	2	0	1.54	2450	7065.88	187826.42	541697.31	.	.	.	EC20 POPULATION
	4	2	0	1.54	2450	7065.88	187826.42	541697.31	47.11	3611.32	150.00	NAWQ ACTUAL
	5	4	0	1.54	4150	11968.73	33158.52	95630.22	.	.	.	NAWQ ADVISORY
	5	4	0	1.54	4150	11968.73	33158.52	95630.22	.	.	.	LCV FISH
	5	4	0	1.54	4150	11968.73	33158.52	95630.22	.	.	.	LCV DAPHNIDS
	5	4	0	1.54	4150	11968.73	33158.52	95630.22	.	.	.	LTV EC20 FISH
	5	4	0	1.54	4150	11968.73	33158.52	95630.22	.	.	.	LTV EC20 DAPHNID
	5	4	0	1.54	4150	11968.73	33158.52	95630.22	.	.	.	SS EC20
	5	4	0	1.54	4150	11968.73	33158.52	95630.22	.	.	.	EC20 POPULATION
	5	4	0	1.54	4150	11968.73	33158.52	95630.22	79.79	637.53	150.00	NAWQ ACTUAL

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL* detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
2,4-DINITROPHENOL (continued)	10	1	0	1.54	31000	89404.98	31000.00	89404.98	.	.	.	NAWQ ADVISORY
	10	1	0	1.54	31000	89404.98	31000.00	89404.98	.	.	.	LCV FISH
	10	1	0	1.54	31000	89404.98	31000.00	89404.98	.	.	.	LCV DAPHNIDS
	10	1	0	1.54	31000	89404.98	31000.00	89404.98	.	.	.	LTV EC20 FISH
	10	1	0	1.54	31000	89404.98	31000.00	89404.98	.	.	.	LTV EC20 DAPHNID
	10	1	0	1.54	31000	89404.98	31000.00	89404.98	.	.	.	SS EC20
	10	1	0	1.54	31000	89404.98	31000.00	89404.98	.	.	.	EC20 POPULATION
	10	1	0	1.54	31000	89404.98	31000.00	89404.98	596.03	596.03	150.00	NAWQ ACTUAL
2-METHYLNAPHTHALENE	1	2	0	.	620	.	6993.39	.	.	.	.	NAWQ ADVISORY
	1	2	0	.	620	.	6993.39	.	.	.	.	NAWQ ACTUAL
	1	2	0	.	620	.	6993.39	.	.	.	.	LCV FISH
	1	2	0	.	620	.	6993.39	.	.	.	.	LCV DAPHNIDS
	1	2	0	.	620	.	6993.39	.	.	.	.	LTV EC20 FISH
	1	2	0	.	620	.	6993.39	.	.	.	.	LTV EC20 DAPHNID
	1	2	0	.	620	.	6993.39	.	.	.	.	SS EC20
	1	2	0	.	620	.	6993.39	.	.	.	.	EC20 POPULATION
	2	2	0	.	445	.	616.33	.	.	.	.	NAWQ ADVISORY
	2	2	0	.	445	.	616.33	.	.	.	.	NAWQ ACTUAL
	2	2	0	.	445	.	616.33	.	.	.	.	LCV FISH
	2	2	0	.	445	.	616.33	.	.	.	.	LCV DAPHNIDS
	2	2	0	.	445	.	616.33	.	.	.	.	LTV EC20 FISH
	2	2	0	.	445	.	616.33	.	.	.	.	LTV EC20 DAPHNID
	2	2	0	.	445	.	616.33	.	.	.	.	SS EC20
	2	2	0	.	445	.	616.33	.	.	.	.	EC20 POPULATION
	4	2	0	.	500	.	38534.72	.	.	.	.	NAWQ ADVISORY
	4	2	0	.	500	.	38534.72	.	.	.	.	NAWQ ACTUAL
	4	2	0	.	500	.	38534.72	.	.	.	.	LCV FISH
	4	2	0	.	500	.	38534.72	.	.	.	.	LCV DAPHNIDS
	4	2	0	.	500	.	38534.72	.	.	.	.	LTV EC20 FISH
	4	2	0	.	500	.	38534.72	.	.	.	.	LTV EC20 DAPHNID
	4	2	0	.	500	.	38534.72	.	.	.	.	SS EC20
	4	2	0	.	500	.	38534.72	.	.	.	.	EC20 POPULATION
	5	4	0	.	855	.	6848.50	.	.	.	.	NAWQ ADVISORY
	5	4	0	.	855	.	6848.50	.	.	.	.	NAWQ ACTUAL
	5	4	0	.	855	.	6848.50	.	.	.	.	LCV FISH
	5	4	0	.	855	.	6848.50	.	.	.	.	LCV DAPHNIDS
	5	4	0	.	855	.	6848.50	.	.	.	.	LTV EC20 FISH
	5	4	0	.	855	.	6848.50	.	.	.	.	LTV EC20 DAPHNID
	5	4	0	.	855	.	6848.50	.	.	.	.	SS EC20
	5	4	0	.	855	.	6848.50	.	.	.	.	EC20 POPULATION

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL[a] detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark type
2-METHYLNAPHTHALENE (continued)	10	1	0	.	6500	.	6500.00	.	.	.	NAWQ ADVISORY
	10	1	0	.	6500	.	6500.00	.	.	.	NAWQ ACTUAL
	10	1	0	.	6500	.	6500.00	.	.	.	LCV FISH
	10	1	0	.	6500	.	6500.00	.	.	.	LCV DAPHNIDS
	10	1	0	.	6500	.	6500.00	.	.	.	LTV EC20 FISH
	10	1	0	.	6500	.	6500.00	.	.	.	LTV EC20 DAPHNID
	10	1	0	.	6500	.	6500.00	.	.	.	SS EC20
	10	1	0	.	6500	.	6500.00	.	.	.	EC20 POPULATION
2-METHYLPHENOL	1	2	0	1.95	620	695.65	6993.39	7846.71	.	.	NAWQ ACTUAL
	1	2	0	1.95	620	695.65	6993.39	7846.71	.	.	LTV EC20 DAPHNID
	1	2	0	1.95	620	695.65	6993.39	7846.71	.	.	SS EC20
	1	2	0	1.95	620	695.65	6993.39	7846.71	90.34	1019.05	7.70 NAWQ ADVISORY
	1	2	0	1.95	620	695.65	6993.39	7846.71	9.40	106.04	74.00 EC20 POPULATION
	1	2	0	1.95	620	695.65	6993.39	7846.71	1.48	16.70	470.00 LTV EC20 FISH
	1	2	0	1.95	620	695.65	6993.39	7846.71	1.42	16.05	489.00 LCV FISH
	1	2	0	1.95	620	695.65	6993.39	7846.71	0.53	5.96	1316.00 LCV DAPHNIDS
	2	2	0	1.95	445	499.30	616.33	691.53	.	.	NAWQ ACTUAL
	2	2	0	1.95	445	499.30	616.33	691.53	.	.	LTV EC20 DAPHNID
	2	2	0	1.95	445	499.30	616.33	691.53	.	.	SS EC20
	2	2	0	1.95	445	499.30	616.33	691.53	64.84	89.81	7.70 NAWQ ADVISORY
	2	2	0	1.95	445	499.30	616.33	691.53	6.75	9.35	74.00 EC20 POPULATION
	2	2	0	1.95	445	499.30	616.33	691.53	1.06	1.47	470.00 LTV EC20 FISH
	2	2	0	1.95	445	499.30	616.33	691.53	1.02	1.41	489.00 LCV FISH
	2	2	0	1.95	445	499.30	616.33	691.53	0.38	0.53	1316.00 LCV DAPHNIDS
	3	2	0	1.95	565	633.94	599.27	672.39	.	.	NAWQ ACTUAL
	3	2	0	1.95	565	633.94	599.27	672.39	.	.	LTV EC20 DAPHNID
	3	2	0	1.95	565	633.94	599.27	672.39	.	.	SS EC20
	3	2	0	1.95	565	633.94	599.27	672.39	82.33	87.32	7.70 NAWQ ADVISORY
	3	2	0	1.95	565	633.94	599.27	672.39	8.57	9.09	74.00 EC20 POPULATION
	3	2	0	1.95	565	633.94	599.27	672.39	1.35	1.43	470.00 LTV EC20 FISH
	3	2	0	1.95	565	633.94	599.27	672.39	1.30	1.38	489.00 LCV FISH
	3	2	0	1.95	565	633.94	599.27	672.39	0.48	0.51	1316.00 LCV DAPHNIDS
	4	2	0	1.95	500	561.01	38534.72	43236.66	.	.	NAWQ ACTUAL
	4	2	0	1.95	500	561.01	38534.72	43236.66	.	.	LTV EC20 DAPHNID
	4	2	0	1.95	500	561.01	38534.72	43236.66	.	.	SS EC20
	4	2	0	1.95	500	561.01	38534.72	43236.66	72.86	5615.15	7.70 NAWQ ADVISORY
	4	2	0	1.95	500	561.01	38534.72	43236.66	7.58	584.28	74.00 EC20 POPULATION
	4	2	0	1.95	500	561.01	38534.72	43236.66	1.19	91.99	470.00 LTV EC20 FISH
	4	2	0	1.95	500	561.01	38534.72	43236.66	1.15	88.42	489.00 LCV FISH
	4	2	0	1.95	500	561.01	38534.72	43236.66	0.43	32.85	1316.00 LCV DAPHNIDS

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL[a] detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
2-METHYLPHENOL (continued)	5	3	0	1.95	1070	1200.56	10367.99	11633.07	.	.	.	NAWQ ACTUAL
	5	3	0	1.95	1070	1200.56	10367.99	11633.07	.	.	.	LTV EC20 DAPHNID
	5	3	0	1.95	1070	1200.56	10367.99	11633.07	.	.	.	SS EC20
	5	3	0	1.95	1070	1200.56	10367.99	11633.07	155.92	1510.79	7.70	NAWQ ADVISORY
	5	3	0	1.95	1070	1200.56	10367.99	11633.07	16.22	157.20	74.00	EC20 POPULATION
	5	3	0	1.95	1070	1200.56	10367.99	11633.07	2.55	24.75	470.00	LTV EC20 FISH
	5	3	0	1.95	1070	1200.56	10367.99	11633.07	2.46	23.79	489.00	LCV FISH
	5	3	0	1.95	1070	1200.56	10367.99	11633.07	0.91	8.84	1316.00	LCV DAPHNIDS
	10	1	0	1.95	6500	7293.12	6500.00	7293.12	.	.	.	NAWQ ACTUAL
	10	1	0	1.95	6500	7293.12	6500.00	7293.12	.	.	.	LTV EC20 DAPHNID
	10	1	0	1.95	6500	7293.12	6500.00	7293.12	.	.	.	SS EC20
	10	1	0	1.95	6500	7293.12	6500.00	7293.12	947.16	947.16	7.70	NAWQ ADVISORY
	10	1	0	1.95	6500	7293.12	6500.00	7293.12	98.56	98.56	74.00	EC20 POPULATION
	10	1	0	1.95	6500	7293.12	6500.00	7293.12	15.52	15.52	470.00	LTV EC20 FISH
	10	1	0	1.95	6500	7293.12	6500.00	7293.12	14.91	14.91	489.00	LCV FISH
	10	1	0	1.95	6500	7293.12	6500.00	7293.12	5.54	5.54	1316.00	LCV DAPHNIDS
2-NITROPHENOL	1	2	0	1.79	620	1005.52	6993.39	11341.94	.	.	.	NAWQ ADVISORY
	1	2	0	1.79	620	1005.52	6993.39	11341.94	.	.	.	LCV FISH
	1	2	0	1.79	620	1005.52	6993.39	11341.94	.	.	.	LCV DAPHNIDS
	1	2	0	1.79	620	1005.52	6993.39	11341.94	.	.	.	LTV EC20 FISH
	1	2	0	1.79	620	1005.52	6993.39	11341.94	.	.	.	LTV EC20 DAPHNID
	1	2	0	1.79	620	1005.52	6993.39	11341.94	.	.	.	SS EC20
	1	2	0	1.79	620	1005.52	6993.39	11341.94	.	.	.	EC20 POPULATION
	1	2	0	1.79	620	1005.52	6993.39	11341.94	6.70	75.61	150.00	NAWQ ACTUAL
	2	2	0	1.79	445	721.71	616.33	999.57	.	.	.	NAWQ ADVISORY
	2	2	0	1.79	445	721.71	616.33	999.57	.	.	.	LCV FISH
	2	2	0	1.79	445	721.71	616.33	999.57	.	.	.	LCV DAPHNIDS
	2	2	0	1.79	445	721.71	616.33	999.57	.	.	.	LTV EC20 FISH
	2	2	0	1.79	445	721.71	616.33	999.57	.	.	.	LTV EC20 DAPHNID
	2	2	0	1.79	445	721.71	616.33	999.57	.	.	.	SS EC20
	2	2	0	1.79	445	721.71	616.33	999.57	.	.	.	EC20 POPULATION
	2	2	0	1.79	445	721.71	616.33	999.57	4.81	6.66	150.00	NAWQ ACTUAL
	3	2	0	1.79	565	916.32	599.27	971.89	.	.	.	NAWQ ADVISORY
	3	2	0	1.79	565	916.32	599.27	971.89	.	.	.	LCV FISH
	3	2	0	1.79	565	916.32	599.27	971.89	.	.	.	LCV DAPHNIDS
	3	2	0	1.79	565	916.32	599.27	971.89	.	.	.	LTV EC20 FISH
	3	2	0	1.79	565	916.32	599.27	971.89	.	.	.	LTV EC20 DAPHNID
	3	2	0	1.79	565	916.32	599.27	971.89	.	.	.	SS EC20
	3	2	0	1.79	565	916.32	599.27	971.89	.	.	.	EC20 POPULATION
	3	2	0	1.79	565	916.32	599.27	971.89	6.11	6.48	150.00	NAWQ ACTUAL

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL[a] detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
2-NITROPHENOL (continued)	4	2	0	1.79	500	810.91	38534.72	62495.99	.	.	.	NAWQ ADVISORY
	4	2	0	1.79	500	810.91	38534.72	62495.99	.	.	.	LCV FISH
	4	2	0	1.79	500	810.91	38534.72	62495.99	.	.	.	LCV DAPHNIDS
	4	2	0	1.79	500	810.91	38534.72	62495.99	.	.	.	LTV EC20 FISH
	4	2	0	1.79	500	810.91	38534.72	62495.99	.	.	.	LTV EC20 DAPHNID
	4	2	0	1.79	500	810.91	38534.72	62495.99	.	.	.	SS EC20
	4	2	0	1.79	500	810.91	38534.72	62495.99	.	.	.	EC20 POPULATION
	4	2	0	1.79	500	810.91	38534.72	62495.99	5.41	416.64	150.00	NAWQ ACTUAL
	5	4	0	1.79	855	1386.65	6848.50	11106.97	.	.	.	NAWQ ADVISORY
	5	4	0	1.79	855	1386.65	6848.50	11106.97	.	.	.	LCV FISH
	5	4	0	1.79	855	1386.65	6848.50	11106.97	.	.	.	LCV DAPHNIDS
	5	4	0	1.79	855	1386.65	6848.50	11106.97	.	.	.	LTV EC20 FISH
	5	4	0	1.79	855	1386.65	6848.50	11106.97	.	.	.	LTV EC20 DAPHNID
	5	4	0	1.79	855	1386.65	6848.50	11106.97	.	.	.	SS EC20
	5	4	0	1.79	855	1386.65	6848.50	11106.97	.	.	.	EC20 POPULATION
	5	4	0	1.79	855	1386.65	6848.50	11106.97	9.24	74.05	150.00	NAWQ ACTUAL
	10	1	0	1.79	6500	10541.77	6500.00	10541.77	.	.	.	NAWQ ADVISORY
	10	1	0	1.79	6500	10541.77	6500.00	10541.77	.	.	.	LCV FISH
	10	1	0	1.79	6500	10541.77	6500.00	10541.77	.	.	.	LCV DAPHNIDS
	10	1	0	1.79	6500	10541.77	6500.00	10541.77	.	.	.	LTV EC20 FISH
	10	1	0	1.79	6500	10541.77	6500.00	10541.77	.	.	.	LTV EC20 DAPHNID
	10	1	0	1.79	6500	10541.77	6500.00	10541.77	.	.	.	SS EC20
	10	1	0	1.79	6500	10541.77	6500.00	10541.77	.	.	.	EC20 POPULATION
	10	1	0	1.79	6500	10541.77	6500.00	10541.77	70.28	70.28	150.00	NAWQ ACTUAL
4,4'-DDD	2	2	0	6.02	71	0.01	1170.92	0.11	.	.	.	NAWQ ACTUAL
	2	2	0	6.02	71	0.01	1170.92	0.11	.	.	.	LCV DAPHNIDS
	2	2	0	6.02	71	0.01	1170.92	0.11	.	.	.	LTV EC20 DAPHNID
	2	2	0	6.02	71	0.01	1170.92	0.11	.	.	.	SS EC20
	2	2	0	6.02	71	0.01	1170.92	0.11	16.14	266.24	0.00	NAWQ ADVISORY
	2	2	0	6.02	71	0.01	1170.92	0.11	0.01	0.18	0.61	EC20 POPULATION
	2	2	0	6.02	71	0.01	1170.92	0.11	0.00	0.07	1.69	LCV FISH
	2	2	0	6.02	71	0.01	1170.92	0.11	0.00	0.03	3.99	LTV EC20 FISH
	3	2	0	6.02	280	0.03	2712.85	0.26	.	.	.	NAWQ ACTUAL
	3	2	0	6.02	280	0.03	2712.85	0.26	.	.	.	LCV DAPHNIDS
	3	2	0	6.02	280	0.03	2712.85	0.26	.	.	.	LTV EC20 DAPHNID
	3	2	0	6.02	280	0.03	2712.85	0.26	.	.	.	SS EC20
	3	2	0	6.02	280	0.03	2712.85	0.26	63.67	616.85	0.00	NAWQ ADVISORY
	3	2	0	6.02	280	0.03	2712.85	0.26	0.04	0.42	0.61	EC20 POPULATION
	3	2	0	6.02	280	0.03	2712.85	0.26	0.02	0.15	1.69	LCV FISH
	3	2	0	6.02	280	0.03	2712.85	0.26	0.01	0.06	3.99	LTV EC20 FISH

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL[a] detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
4,4'-DDD (continued)	4	2	0	6.02	240	0.02	6750.45	0.64	.	.	.	NAWQ ACTUAL
	4	2	0	6.02	240	0.02	6750.45	0.64	.	.	.	LCV DAPHNIDS
	4	2	0	6.02	240	0.02	6750.45	0.64	.	.	.	LTV EC20 DAPHNID
	4	2	0	6.02	240	0.02	6750.45	0.64	.	.	.	SS EC20
	4	2	0	6.02	240	0.02	6750.45	0.64	54.57	1534.91	0.00	NAWQ ADVISORY
	4	2	0	6.02	240	0.02	6750.45	0.64	0.04	1.06	0.61	EC20 POPULATION
	4	2	0	6.02	240	0.02	6750.45	0.64	0.01	0.38	1.69	LCV FISH
	4	2	0	6.02	240	0.02	6750.45	0.64	0.01	0.16	3.99	LTV EC20 FISH
	5	4	0	6.02	258	0.02	1759.09	0.17	.	.	.	NAWQ ACTUAL
	5	4	0	6.02	258	0.02	1759.09	0.17	.	.	.	LCV DAPHNIDS
	5	4	0	6.02	258	0.02	1759.09	0.17	.	.	.	LTV EC20 DAPHNID
	5	4	0	6.02	258	0.02	1759.09	0.17	.	.	.	SS EC20
	5	4	0	6.02	258	0.02	1759.09	0.17	58.66	399.98	0.00	NAWQ ADVISORY
	5	4	0	6.02	258	0.02	1759.09	0.17	0.04	0.28	0.61	EC20 POPULATION
	5	4	0	6.02	258	0.02	1759.09	0.17	0.01	0.10	1.69	LCV FISH
	5	4	0	6.02	258	0.02	1759.09	0.17	0.01	0.04	3.99	LTV EC20 FISH
	10	1	0	6.02	1130	0.11	1130.00	0.11	.	.	.	NAWQ ACTUAL
	10	1	0	6.02	1130	0.11	1130.00	0.11	.	.	.	LCV DAPHNIDS
	10	1	0	6.02	1130	0.11	1130.00	0.11	.	.	.	LTV EC20 DAPHNID
	10	1	0	6.02	1130	0.11	1130.00	0.11	.	.	.	SS EC20
	10	1	0	6.02	1130	0.11	1130.00	0.11	256.94	256.94	0.00	NAWQ ADVISORY
	10	1	0	6.02	1130	0.11	1130.00	0.11	0.18	0.18	0.61	EC20 POPULATION
	10	1	0	6.02	1130	0.11	1130.00	0.11	0.06	0.06	1.69	LCV FISH
	10	1	0	6.02	1130	0.11	1130.00	0.11	0.03	0.03	3.99	LTV EC20 FISH
4,4'-DDE	1	2	0	5.83	300	0.04	3418.16	0.51	.	.	.	NAWQ ACTUAL
	1	2	0	5.83	300	0.04	3418.16	0.51	.	.	.	LTV EC20 DAPHNID
	1	2	0	5.83	300	0.04	3418.16	0.51	.	.	.	EC20 POPULATION
	1	2	0	5.83	300	0.04	3418.16	0.51	5.55	63.20	0.01	SS EC20
	1	2	0	5.83	300	0.04	3418.16	0.51	2.77	31.60	0.02	LCV DAPHNIDS
	1	2	0	5.83	300	0.04	3418.16	0.51	2.22	25.28	0.02	NAWQ ADVISORY
	1	2	0	5.83	300	0.04	3418.16	0.51	0.13	1.44	0.35	LTV EC20 FISH
	1	2	0	5.83	300	0.04	3418.16	0.51	0.06	0.69	0.73	LCV FISH
	2	2	0	5.83	71	0.01	1170.92	0.17	.	.	.	NAWQ ACTUAL
	2	2	0	5.83	71	0.01	1170.92	0.17	.	.	.	LTV EC20 DAPHNID
	2	2	0	5.83	71	0.01	1170.92	0.17	.	.	.	EC20 POPULATION
	2	2	0	5.83	71	0.01	1170.92	0.17	1.31	21.65	0.01	SS EC20
	2	2	0	5.83	71	0.01	1170.92	0.17	0.66	10.82	0.02	LCV DAPHNIDS
	2	2	0	5.83	71	0.01	1170.92	0.17	0.53	8.66	0.02	NAWQ ADVISORY
	2	2	0	5.83	71	0.01	1170.92	0.17	0.03	0.49	0.35	LTV EC20 FISH
	2	2	0	5.83	71	0.01	1170.92	0.17	0.01	0.24	0.73	LCV FISH

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL[a] detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
4,4'-DDE (continued)	3	2	0	5.83	280	0.04	2712.85	0.40	.	.	.	NAWQ ACTUAL
	3	2	0	5.83	280	0.04	2712.85	0.40	.	.	.	LTV EC20 DAPHNID
	3	2	0	5.83	280	0.04	2712.85	0.40	.	.	.	EC20 POPULATION
	3	2	0	5.83	280	0.04	2712.85	0.40	5.18	50.16	0.01	SS EC20
	3	2	0	5.83	280	0.04	2712.85	0.40	2.59	25.08	0.02	LCV DAPHNIDS
	3	2	0	5.83	280	0.04	2712.85	0.40	2.07	20.06	0.02	NAWQ ADVISORY
	3	2	0	5.83	280	0.04	2712.85	0.40	0.12	1.15	0.35	LTV EC20 FISH
	3	2	0	5.83	280	0.04	2712.85	0.40	0.06	0.55	0.73	LCV FISH
	4	2	0	5.83	240	0.04	6750.45	1.00	.	.	.	NAWQ ACTUAL
	4	2	0	5.83	240	0.04	6750.45	1.00	.	.	.	LTV EC20 DAPHNID
	4	2	0	5.83	240	0.04	6750.45	1.00	.	.	.	EC20 POPULATION
	4	2	0	5.83	240	0.04	6750.45	1.00	4.44	124.81	0.01	SS EC20
	4	2	0	5.83	240	0.04	6750.45	1.00	2.22	62.40	0.02	LCV DAPHNIDS
	4	2	0	5.83	240	0.04	6750.45	1.00	1.77	49.92	0.02	NAWQ ADVISORY
	4	2	0	5.83	240	0.04	6750.45	1.00	0.10	2.85	0.35	LTV EC20 FISH
	4	2	0	5.83	240	0.04	6750.45	1.00	0.05	1.37	0.73	LCV FISH
	5	4	0	5.83	258	0.04	1759.09	0.26	.	.	.	NAWQ ACTUAL
	5	4	0	5.83	258	0.04	1759.09	0.26	.	.	.	LTV EC20 DAPHNID
	5	4	0	5.83	258	0.04	1759.09	0.26	.	.	.	EC20 POPULATION
	5	4	0	5.83	258	0.04	1759.09	0.26	4.77	32.52	0.01	SS EC20
	5	4	0	5.83	258	0.04	1759.09	0.26	2.39	16.26	0.02	LCV DAPHNIDS
	5	4	0	5.83	258	0.04	1759.09	0.26	1.91	13.01	0.02	NAWQ ADVISORY
	5	4	0	5.83	258	0.04	1759.09	0.26	0.11	0.74	0.35	LTV EC20 FISH
	5	4	0	5.83	258	0.04	1759.09	0.26	0.05	0.36	0.73	LCV FISH
	10	1	0	5.83	1130	0.17	1130.00	0.17	.	.	.	NAWQ ACTUAL
	10	1	0	5.83	1130	0.17	1130.00	0.17	.	.	.	LTV EC20 DAPHNID
	10	1	0	5.83	1130	0.17	1130.00	0.17	.	.	.	EC20 POPULATION
	10	1	0	5.83	1130	0.17	1130.00	0.17	20.89	20.89	0.01	SS EC20
	10	1	0	5.83	1130	0.17	1130.00	0.17	10.45	10.45	0.02	LCV DAPHNIDS
	10	1	0	5.83	1130	0.17	1130.00	0.17	8.36	8.36	0.02	NAWQ ADVISORY
	10	1	0	5.83	1130	0.17	1130.00	0.17	0.48	0.48	0.35	LTV EC20 FISH
	10	1	0	5.83	1130	0.17	1130.00	0.17	0.23	0.23	0.73	LCV FISH
4,4'-DDT	2	2	0	5.69	71	0.01	1170.92	0.24	.	.	.	NAWQ ACTUAL
	2	2	0	5.69	71	0.01	1170.92	0.24	.	.	.	LTV EC20 DAPHNID
	2	2	0	5.69	71	0.01	1170.92	0.24	.	.	.	EC20 POPULATION
	2	2	0	5.69	71	0.01	1170.92	0.24	1.81	29.88	0.01	SS EC20
	2	2	0	5.69	71	0.01	1170.92	0.24	0.91	14.94	0.02	LCV DAPHNIDS
	2	2	0	5.69	71	0.01	1170.92	0.24	0.72	11.95	0.02	NAWQ ADVISORY
	2	2	0	5.69	71	0.01	1170.92	0.24	0.04	0.68	0.35	LTV EC20 FISH
	2	2	0	5.69	71	0.01	1170.92	0.24	0.02	0.33	0.73	LCV FISH

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL[a] detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
4,4'-DDT (continued)	3	2	0	5.69	280	0.06	2712.85	0.55	.	.	.	NAWQ ACTUAL
	3	2	0	5.69	280	0.06	2712.85	0.55	.	.	.	LTV EC20 DAPHNID
	3	2	0	5.69	280	0.06	2712.85	0.55	.	.	.	EC20 POPULATION
	3	2	0	5.69	280	0.06	2712.85	0.55	7.15	69.24	0.01	SS EC20
	3	2	0	5.69	280	0.06	2712.85	0.55	3.57	34.62	0.02	LCV DAPHNIDS
	3	2	0	5.69	280	0.06	2712.85	0.55	2.86	27.69	0.02	NAWQ ADVISORY
	3	2	0	5.69	280	0.06	2712.85	0.55	0.16	1.58	0.35	LTV EC20 FISH
	3	2	0	5.69	280	0.06	2712.85	0.55	0.08	0.76	0.73	LCV FISH
	4	2	0	5.69	240	0.05	6750.45	1.38	.	.	.	NAWQ ACTUAL
	4	2	0	5.69	240	0.05	6750.45	1.38	.	.	.	LTV EC20 DAPHNID
	4	2	0	5.69	240	0.05	6750.45	1.38	.	.	.	EC20 POPULATION
	4	2	0	5.69	240	0.05	6750.45	1.38	6.13	172.28	0.01	SS EC20
	4	2	0	5.69	240	0.05	6750.45	1.38	3.06	86.14	0.02	LCV DAPHNIDS
	4	2	0	5.69	240	0.05	6750.45	1.38	2.45	68.91	0.02	NAWQ ADVISORY
	4	2	0	5.69	240	0.05	6750.45	1.38	0.14	3.94	0.35	LTV EC20 FISH
	4	2	0	5.69	240	0.05	6750.45	1.38	0.07	1.89	0.73	LCV FISH
	5	4	0	5.69	258	0.05	1759.09	0.36	.	.	.	NAWQ ACTUAL
	5	4	0	5.69	258	0.05	1759.09	0.36	.	.	.	LTV EC20 DAPHNID
	5	4	0	5.69	258	0.05	1759.09	0.36	.	.	.	EC20 POPULATION
	5	4	0	5.69	258	0.05	1759.09	0.36	6.58	44.90	0.01	SS EC20
	5	4	0	5.69	258	0.05	1759.09	0.36	3.29	22.45	0.02	LCV DAPHNIDS
	5	4	0	5.69	258	0.05	1759.09	0.36	2.63	17.96	0.02	NAWQ ADVISORY
	5	4	0	5.69	258	0.05	1759.09	0.36	0.15	1.03	0.35	LTV EC20 FISH
	5	4	0	5.69	258	0.05	1759.09	0.36	0.07	0.49	0.73	LCV FISH
	10	1	0	5.69	1130	0.23	1130.00	0.23	.	.	.	NAWQ ACTUAL
	10	1	0	5.69	1130	0.23	1130.00	0.23	.	.	.	LTV EC20 DAPHNID
	10	1	0	5.69	1130	0.23	1130.00	0.23	.	.	.	EC20 POPULATION
	10	1	0	5.69	1130	0.23	1130.00	0.23	28.84	28.84	0.01	SS EC20
	10	1	0	5.69	1130	0.23	1130.00	0.23	14.42	14.42	0.02	LCV DAPHNIDS
	10	1	0	5.69	1130	0.23	1130.00	0.23	11.54	11.54	0.02	NAWQ ADVISORY
	10	1	0	5.69	1130	0.23	1130.00	0.23	0.66	0.66	0.35	LTV EC20 FISH
	10	1	0	5.69	1130	0.23	1130.00	0.23	0.32	0.32	0.73	LCV FISH
ACENAPHTHENE	1	2	0	3.92	620	7.45	6993.39	84.08	.	.	.	NAWQ ACTUAL
	1	2	0	3.92	620	7.45	6993.39	84.08	.	.	.	LTV EC20 DAPHNID
	1	2	0	3.92	620	7.45	6993.39	84.08	.	.	.	SS EC20
	1	2	0	3.92	620	7.45	6993.39	84.08	.	.	.	EC20 POPULATION
	1	2	0	3.92	620	7.45	6993.39	84.08	3.39	38.22	2.20	NAWQ ADVISORY
	1	2	0	3.92	620	7.45	6993.39	84.08	0.04	0.43	197.00	LTV EC20 FISH
	1	2	0	3.92	620	7.45	6993.39	84.08	0.02	0.20	413.00	LCV FISH
	1	2	0	3.92	620	7.45	6993.39	84.08	0.00	0.01	6646.00	LCV DAPHNIDS

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL* detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
ACENAPTHENE (continued)	2	2	0	3.92	445	5.35	616.33	7.41	.	.	.	NAWQ ACTUAL
	2	2	0	3.92	445	5.35	616.33	7.41	.	.	.	LTV EC20 DAPHNID
	2	2	0	3.92	445	5.35	616.33	7.41	.	.	.	SS EC20
	2	2	0	3.92	445	5.35	616.33	7.41	.	.	.	EC20 POPULATION
	2	2	0	3.92	445	5.35	616.33	7.41	2.43	3.37	2.20	NAWQ ADVISORY
	2	2	0	3.92	445	5.35	616.33	7.41	0.03	0.04	197.00	LTV EC20 FISH
	2	2	0	3.92	445	5.35	616.33	7.41	0.01	0.02	413.00	LCV FISH
	2	2	0	3.92	445	5.35	616.33	7.41	0.00	0.00	6646.00	LCV DAPHNIDS
	3	2	0	3.92	565	6.79	599.27	7.20	.	.	.	NAWQ ACTUAL
	3	2	0	3.92	565	6.79	599.27	7.20	.	.	.	LTV EC20 DAPHNID
	3	2	0	3.92	565	6.79	599.27	7.20	.	.	.	SS EC20
	3	2	0	3.92	565	6.79	599.27	7.20	.	.	.	EC20 POPULATION
	3	2	0	3.92	565	6.79	599.27	7.20	3.09	3.27	2.20	NAWQ ADVISORY
	3	2	0	3.92	565	6.79	599.27	7.20	0.03	0.04	197.00	LTV EC20 FISH
	3	2	0	3.92	565	6.79	599.27	7.20	0.02	0.02	413.00	LCV FISH
	3	2	0	3.92	565	6.79	599.27	7.20	0.00	0.00	6646.00	LCV DAPHNIDS
	4	2	0	3.92	500	6.01	38534.72	463.29	.	.	.	NAWQ ACTUAL
	4	2	0	3.92	500	6.01	38534.72	463.29	.	.	.	LTV EC20 DAPHNID
	4	2	0	3.92	500	6.01	38534.72	463.29	.	.	.	SS EC20
	4	2	0	3.92	500	6.01	38534.72	463.29	.	.	.	EC20 POPULATION
	4	2	0	3.92	500	6.01	38534.72	463.29	2.73	210.59	2.20	NAWQ ADVISORY
	4	2	0	3.92	500	6.01	38534.72	463.29	0.03	2.35	197.00	LTV EC20 FISH
	4	2	0	3.92	500	6.01	38534.72	463.29	0.01	1.12	413.00	LCV FISH
	4	2	0	3.92	500	6.01	38534.72	463.29	0.00	0.07	6646.00	LCV DAPHNIDS
	5	4	0	3.92	855	10.28	6848.50	82.34	.	.	.	NAWQ ACTUAL
	5	4	0	3.92	855	10.28	6848.50	82.34	.	.	.	LTV EC20 DAPHNID
	5	4	0	3.92	855	10.28	6848.50	82.34	.	.	.	SS EC20
	5	4	0	3.92	855	10.28	6848.50	82.34	.	.	.	EC20 POPULATION
	5	4	0	3.92	855	10.28	6848.50	82.34	4.67	37.43	2.20	NAWQ ADVISORY
	5	4	0	3.92	855	10.28	6848.50	82.34	0.05	0.42	197.00	LTV EC20 FISH
	5	4	0	3.92	855	10.28	6848.50	82.34	0.02	0.20	413.00	LCV FISH
	5	4	0	3.92	855	10.28	6848.50	82.34	0.00	0.01	6646.00	LCV DAPHNIDS
	10	1	0	3.92	6500	78.15	6500.00	78.15	.	.	.	NAWQ ACTUAL
	10	1	0	3.92	6500	78.15	6500.00	78.15	.	.	.	LTV EC20 DAPHNID
	10	1	0	3.92	6500	78.15	6500.00	78.15	.	.	.	SS EC20
	10	1	0	3.92	6500	78.15	6500.00	78.15	.	.	.	EC20 POPULATION
	10	1	0	3.92	6500	78.15	6500.00	78.15	35.52	35.52	2.20	NAWQ ADVISORY
	10	1	0	3.92	6500	78.15	6500.00	78.15	0.40	0.40	197.00	LTV EC20 FISH
	10	1	0	3.92	6500	78.15	6500.00	78.15	0.19	0.19	413.00	LCV FISH
	10	1	0	3.92	6500	78.15	6500.00	78.15	0.01	0.01	6646.00	LCV DAPHNIDS

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL* detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
ALDRIN	1	2	0	3.01	150	14.66	1726.21	168.69	195.45	2249.23	0.08	NAWQ ADVISORY
	1	2	0	3.01	150	14.66	1726.21	168.69	.	.	.	NAWQ ACTUAL
	1	2	0	3.01	150	14.66	1726.21	168.69	.	.	.	LCV FISH
	1	2	0	3.01	150	14.66	1726.21	168.69	.	.	.	LCV DAPHNIDS
	1	2	0	3.01	150	14.66	1726.21	168.69	.	.	.	LTV EC20 FISH
	1	2	0	3.01	150	14.66	1726.21	168.69	.	.	.	LTV EC20 DAPHNID
	1	2	0	3.01	150	14.66	1726.21	168.69	.	.	.	SS EC20
	1	2	0	3.01	150	14.66	1726.21	168.69	.	.	.	EC20 POPULATION
	2	2	0	3.01	35	3.42	590.10	57.67	45.60	768.89	0.08	NAWQ ADVISORY
	2	2	0	3.01	35	3.42	590.10	57.67	.	.	.	NAWQ ACTUAL
	2	2	0	3.01	35	3.42	590.10	57.67	.	.	.	LCV FISH
	2	2	0	3.01	35	3.42	590.10	57.67	.	.	.	LCV DAPHNIDS
	2	2	0	3.01	35	3.42	590.10	57.67	.	.	.	LTV EC20 FISH
	2	2	0	3.01	35	3.42	590.10	57.67	.	.	.	LTV EC20 DAPHNID
	2	2	0	3.01	35	3.42	590.10	57.67	.	.	.	SS EC20
	2	2	0	3.01	35	3.42	590.10	57.67	.	.	.	EC20 POPULATION
	3	2	0	3.01	135	13.19	1402.82	137.09	175.90	1827.86	0.08	NAWQ ADVISORY
	3	2	0	3.01	135	13.19	1402.82	137.09	.	.	.	NAWQ ACTUAL
	3	2	0	3.01	135	13.19	1402.82	137.09	.	.	.	LCV FISH
	3	2	0	3.01	135	13.19	1402.82	137.09	.	.	.	LCV DAPHNIDS
	3	2	0	3.01	135	13.19	1402.82	137.09	.	.	.	LTV EC20 FISH
	3	2	0	3.01	135	13.19	1402.82	137.09	.	.	.	LTV EC20 DAPHNID
	3	2	0	3.01	135	13.19	1402.82	137.09	.	.	.	SS EC20
	3	2	0	3.01	135	13.19	1402.82	137.09	.	.	.	EC20 POPULATION
	4	2	0	3.01	120	11.73	4780.11	467.13	156.36	6228.40	0.08	NAWQ ADVISORY
	4	2	0	3.01	120	11.73	4780.11	467.13	.	.	.	NAWQ ACTUAL
	4	2	0	3.01	120	11.73	4780.11	467.13	.	.	.	LCV FISH
	4	2	0	3.01	120	11.73	4780.11	467.13	.	.	.	LCV DAPHNIDS
	4	2	0	3.01	120	11.73	4780.11	467.13	.	.	.	LTV EC20 FISH
	4	2	0	3.01	120	11.73	4780.11	467.13	.	.	.	LTV EC20 DAPHNID
	4	2	0	3.01	120	11.73	4780.11	467.13	.	.	.	SS EC20
	4	2	0	3.01	120	11.73	4780.11	467.13	.	.	.	EC20 POPULATION
	5	2	0	3.01	129	12.61	1232.35	120.43	168.08	1605.73	0.08	NAWQ ADVISORY
	5	2	0	3.01	129	12.61	1232.35	120.43	.	.	.	NAWQ ACTUAL
	5	2	0	3.01	129	12.61	1232.35	120.43	.	.	.	LCV FISH
	5	2	0	3.01	129	12.61	1232.35	120.43	.	.	.	LCV DAPHNIDS
	5	2	0	3.01	129	12.61	1232.35	120.43	.	.	.	LTV EC20 FISH
	5	2	0	3.01	129	12.61	1232.35	120.43	.	.	.	LTV EC20 DAPHNID
	5	2	0	3.01	129	12.61	1232.35	120.43	.	.	.	SS EC20
	5	2	0	3.01	129	12.61	1232.35	120.43	.	.	.	EC20 POPULATION

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL[a] detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
ANTHRACENE	1	2	0	4.45	620	2.20	6993.39	24.81	.	.	.	NAWQ ACTUAL
	1	2	0	4.45	620	2.20	6993.39	24.81	.	.	.	SS EC20
	1	2	0	4.45	620	2.20	6993.39	24.81	.	.	.	EC20 POPULATION
	1	2	0	4.45	620	2.20	6993.39	24.81	219984.30	2481346.71	0.00	NAWQ ADVISORY
	1	2	0	4.45	620	2.20	6993.39	24.81	24.44	275.71	0.09	LCV FISH
	1	2	0	4.45	620	2.20	6993.39	24.81	6.29	70.90	0.35	LTV EC20 FISH
	1	2	0	4.45	620	2.20	6993.39	24.81	1.05	11.82	2.10	LCV DAPHNIDS
	1	2	0	4.45	620	2.20	6993.39	24.81	0.27	3.03	8.20	LTV EC20 DAPHNID
	2	2	0	4.45	445	1.58	616.33	2.19	.	.	.	NAWQ ACTUAL
	2	2	0	4.45	445	1.58	616.33	2.19	.	.	.	SS EC20
	2	2	0	4.45	445	1.58	616.33	2.19	.	.	.	EC20 POPULATION
	2	2	0	4.45	445	1.58	616.33	2.19	157891.96	218681.27	0.00	NAWQ ADVISORY
	2	2	0	4.45	445	1.58	616.33	2.19	17.54	24.30	0.09	LCV FISH
	2	2	0	4.45	445	1.58	616.33	2.19	4.51	6.25	0.35	LTV EC20 FISH
	2	2	0	4.45	445	1.58	616.33	2.19	0.75	1.04	2.10	LCV DAPHNIDS
	2	2	0	4.45	445	1.58	616.33	2.19	0.19	0.27	8.20	LTV EC20 DAPHNID
	3	2	0	4.45	565	2.00	599.27	2.13	.	.	.	NAWQ ACTUAL
	3	2	0	4.45	565	2.00	599.27	2.13	.	.	.	SS EC20
	3	2	0	4.45	565	2.00	599.27	2.13	.	.	.	EC20 POPULATION
	3	2	0	4.45	565	2.00	599.27	2.13	200469.56	212627.43	0.00	NAWQ ADVISORY
	3	2	0	4.45	565	2.00	599.27	2.13	22.27	23.63	0.09	LCV FISH
	3	2	0	4.45	565	2.00	599.27	2.13	5.73	6.08	0.35	LTV EC20 FISH
	3	2	0	4.45	565	2.00	599.27	2.13	0.95	1.01	2.10	LCV DAPHNIDS
	3	2	0	4.45	565	2.00	599.27	2.13	0.24	0.26	8.20	LTV EC20 DAPHNID
	4	2	0	4.45	500	1.77	38534.72	136.73	.	.	.	NAWQ ACTUAL
	4	2	0	4.45	500	1.77	38534.72	136.73	.	.	.	SS EC20
	4	2	0	4.45	500	1.77	38534.72	136.73	.	.	.	EC20 POPULATION
	4	2	0	4.45	500	1.77	38534.72	136.73	177406.69	13672633.95	0.00	NAWQ ADVISORY
	4	2	0	4.45	500	1.77	38534.72	136.73	19.71	1519.18	0.09	LCV FISH
	4	2	0	4.45	500	1.77	38534.72	136.73	5.07	390.65	0.35	LTV EC20 FISH
	4	2	0	4.45	500	1.77	38534.72	136.73	0.84	65.11	2.10	LCV DAPHNIDS
	4	2	0	4.45	500	1.77	38534.72	136.73	0.22	16.67	8.20	LTV EC20 DAPHNID
	5	4	0	4.45	855	3.03	6848.50	24.30	.	.	.	NAWQ ACTUAL
	5	4	0	4.45	855	3.03	6848.50	24.30	.	.	.	SS EC20
	5	4	0	4.45	855	3.03	6848.50	24.30	.	.	.	EC20 POPULATION
	5	4	0	4.45	855	3.03	6848.50	24.30	303365.45	2429940.45	0.00	NAWQ ADVISORY
	5	4	0	4.45	855	3.03	6848.50	24.30	33.71	269.99	0.09	LCV FISH
	5	4	0	4.45	855	3.03	6848.50	24.30	8.67	69.43	0.35	LTV EC20 FISH
	5	4	0	4.45	855	3.03	6848.50	24.30	1.44	11.57	2.10	LCV DAPHNIDS
	5	4	0	4.45	855	3.03	6848.50	24.30	0.37	2.96	8.20	LTV EC20 DAPHNID

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL[a] detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
ANTHRACENE (continued)	10	1	0	4.45	6500	23.06	6500.00	23.06	.	.	.	NAWQ ACTUAL
	10	1	0	4.45	6500	23.06	6500.00	23.06	.	.	.	SS EC20
	10	1	0	4.45	6500	23.06	6500.00	23.06	.	.	.	EC20 POPULATION
	10	1	0	4.45	6500	23.06	6500.00	23.06	2306287.03	2306287.03	0.00	NAWQ ADVISORY
	10	1	0	4.45	6500	23.06	6500.00	23.06	256.25	256.25	0.09	LCV FISH
	10	1	0	4.45	6500	23.06	6500.00	23.06	65.89	65.89	0.35	LTV EC20 FISH
	10	1	0	4.45	6500	23.06	6500.00	23.06	10.98	10.98	2.10	LCV DAPHNIDS
	10	1	0	4.45	6500	23.06	6500.00	23.06	2.81	2.81	8.20	LTV EC20 DAPHNID
AROCLOR-1221	1	2	0	7.14	1500	0.01	17262.14	0.13	.	.	.	NAWQ ACTUAL
	1	2	0	7.14	1500	0.01	17262.14	0.13	.	.	.	LCV DAPHNIDS
	1	2	0	7.14	1500	0.01	17262.14	0.13	.	.	.	LTV EC20 DAPHNID
	1	2	0	7.14	1500	0.01	17262.14	0.13	.	.	.	SS EC20
	1	2	0	7.14	1500	0.01	17262.14	0.13	3.75	43.12	0.00	NAWQ ADVISORY
	1	2	0	7.14	1500	0.01	17262.14	0.13	0.00	0.01	10.00	EC20 POPULATION
	1	2	0	7.14	1500	0.01	17262.14	0.13	0.00	0.00	60.00	LCV FISH
	1	2	0	7.14	1500	0.01	17262.14	0.13	0.00	0.00	80.00	LTV EC20 FISH
	2	2	0	7.14	325	0.00	6047.34	0.04	.	.	.	NAWQ ACTUAL
	2	2	0	7.14	325	0.00	6047.34	0.04	.	.	.	LCV DAPHNIDS
	2	2	0	7.14	325	0.00	6047.34	0.04	.	.	.	LTV EC20 DAPHNID
	2	2	0	7.14	325	0.00	6047.34	0.04	.	.	.	SS EC20
	2	2	0	7.14	325	0.00	6047.34	0.04	0.81	15.11	0.00	NAWQ ADVISORY
	2	2	0	7.14	325	0.00	6047.34	0.04	0.00	0.00	10.00	EC20 POPULATION
	2	2	0	7.14	325	0.00	6047.34	0.04	0.00	0.00	60.00	LCV FISH
	2	2	0	7.14	325	0.00	6047.34	0.04	0.00	0.00	80.00	LTV EC20 FISH
	3	2	0	7.14	1350	0.01	14028.24	0.10	.	.	.	NAWQ ACTUAL
	3	2	0	7.14	1350	0.01	14028.24	0.10	.	.	.	LCV DAPHNIDS
	3	2	0	7.14	1350	0.01	14028.24	0.10	.	.	.	LTV EC20 DAPHNID
	3	2	0	7.14	1350	0.01	14028.24	0.10	.	.	.	SS EC20
	3	2	0	7.14	1350	0.01	14028.24	0.10	3.37	35.04	0.00	NAWQ ADVISORY
	3	2	0	7.14	1350	0.01	14028.24	0.10	0.00	0.01	10.00	EC20 POPULATION
	3	2	0	7.14	1350	0.01	14028.24	0.10	0.00	0.00	60.00	LCV FISH
	3	2	0	7.14	1350	0.01	14028.24	0.10	0.00	0.00	80.00	LTV EC20 FISH
	4	2	0	7.14	1200	0.01	47801.10	0.35	.	.	.	NAWQ ACTUAL
	4	2	0	7.14	1200	0.01	47801.10	0.35	.	.	.	LCV DAPHNIDS
	4	2	0	7.14	1200	0.01	47801.10	0.35	.	.	.	LTV EC20 DAPHNID
	4	2	0	7.14	1200	0.01	47801.10	0.35	.	.	.	SS EC20
	4	2	0	7.14	1200	0.01	47801.10	0.35	3.00	119.41	0.00	NAWQ ADVISORY
	4	2	0	7.14	1200	0.01	47801.10	0.35	0.00	0.03	10.00	EC20 POPULATION
	4	2	0	7.14	1200	0.01	47801.10	0.35	0.00	0.01	60.00	LCV FISH
	4	2	0	7.14	1200	0.01	47801.10	0.35	0.00	0.00	80.00	LTV EC20 FISH

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL[a] detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
AROCLOR-1221 (continued)	5	2	0	7.14	1290	0.01	12323.49	0.09	.	.	.	NAWQ ACTUAL
	5	2	0	7.14	1290	0.01	12323.49	0.09	.	.	.	LCV DAPHNIDS
	5	2	0	7.14	1290	0.01	12323.49	0.09	.	.	.	LTV EC20 DAPHNID
	5	2	0	7.14	1290	0.01	12323.49	0.09	.	.	.	SS EC20
	5	2	0	7.14	1290	0.01	12323.49	0.09	3.22	30.78	0.00	NAWQ ADVISORY
	5	2	0	7.14	1290	0.01	12323.49	0.09	0.00	0.01	10.00	EC20 POPULATION
	5	2	0	7.14	1290	0.01	12323.49	0.09	0.00	0.00	60.00	LCV FISH
	5	2	0	7.14	1290	0.01	12323.49	0.09	0.00	0.00	80.00	LTV EC20 FISH
AROCLOR-1232	1	2	0	7.14	1500	0.01	17262.14	0.13	.	.	.	NAWQ ACTUAL
	1	2	0	7.14	1500	0.01	17262.14	0.13	.	.	.	LCV DAPHNIDS
	1	2	0	7.14	1500	0.01	17262.14	0.13	.	.	.	LTV EC20 DAPHNID
	1	2	0	7.14	1500	0.01	17262.14	0.13	.	.	.	SS EC20
	1	2	0	7.14	1500	0.01	17262.14	0.13	1.87	21.56	0.01	NAWQ ADVISORY
	1	2	0	7.14	1500	0.01	17262.14	0.13	0.00	0.01	16.00	EC20 POPULATION
	1	2	0	7.14	1500	0.01	17262.14	0.13	0.00	0.00	124.00	LCV FISH
	1	2	0	7.14	1500	0.01	17262.14	0.13	0.00	0.00	148.00	LTV EC20 FISH
	2	2	0	7.14	325	0.00	6047.34	0.04	.	.	.	NAWQ ACTUAL
	2	2	0	7.14	325	0.00	6047.34	0.04	.	.	.	LCV DAPHNIDS
	2	2	0	7.14	325	0.00	6047.34	0.04	.	.	.	LTV EC20 DAPHNID
	2	2	0	7.14	325	0.00	6047.34	0.04	.	.	.	SS EC20
	2	2	0	7.14	325	0.00	6047.34	0.04	0.41	7.55	0.01	NAWQ ADVISORY
	2	2	0	7.14	325	0.00	6047.34	0.04	0.00	0.00	16.00	EC20 POPULATION
	2	2	0	7.14	325	0.00	6047.34	0.04	0.00	0.00	124.00	LCV FISH
	2	2	0	7.14	325	0.00	6047.34	0.04	0.00	0.00	148.00	LTV EC20 FISH
	3	2	0	7.14	1350	0.01	14028.24	0.10	.	.	.	NAWQ ACTUAL
	3	2	0	7.14	1350	0.01	14028.24	0.10	.	.	.	LCV DAPHNIDS
	3	2	0	7.14	1350	0.01	14028.24	0.10	.	.	.	LTV EC20 DAPHNID
	3	2	0	7.14	1350	0.01	14028.24	0.10	.	.	.	SS EC20
	3	2	0	7.14	1350	0.01	14028.24	0.10	1.69	17.52	0.01	NAWQ ADVISORY
	3	2	0	7.14	1350	0.01	14028.24	0.10	0.00	0.01	16.00	EC20 POPULATION
	3	2	0	7.14	1350	0.01	14028.24	0.10	0.00	0.00	124.00	LCV FISH
	3	2	0	7.14	1350	0.01	14028.24	0.10	0.00	0.00	148.00	LTV EC20 FISH
	4	2	0	7.14	1200	0.01	47801.10	0.35	.	.	.	NAWQ ACTUAL
	4	2	0	7.14	1200	0.01	47801.10	0.35	.	.	.	LCV DAPHNIDS
	4	2	0	7.14	1200	0.01	47801.10	0.35	.	.	.	LTV EC20 DAPHNID
	4	2	0	7.14	1200	0.01	47801.10	0.35	.	.	.	SS EC20
	4	2	0	7.14	1200	0.01	47801.10	0.35	1.50	59.70	0.01	NAWQ ADVISORY
	4	2	0	7.14	1200	0.01	47801.10	0.35	0.00	0.02	16.00	EC20 POPULATION
	4	2	0	7.14	1200	0.01	47801.10	0.35	0.00	0.00	124.00	LCV FISH
	4	2	0	7.14	1200	0.01	47801.10	0.35	0.00	0.00	148.00	LTV EC20 FISH

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL* detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
AROCLOR-1232 (continued)	5	2	0	7.14	1290	0.01	12323.49	0.09	.	.	.	NAWQ ACTUAL
	5	2	0	7.14	1290	0.01	12323.49	0.09	.	.	.	LCV DAPHNIDS
	5	2	0	7.14	1290	0.01	12323.49	0.09	.	.	.	LTV EC20 DAPHNID
	5	2	0	7.14	1290	0.01	12323.49	0.09	.	.	.	SS EC20
	5	2	0	7.14	1290	0.01	12323.49	0.09	1.61	15.39	0.01	NAWQ ADVISORY
	5	2	0	7.14	1290	0.01	12323.49	0.09	0.00	0.01	16.00	EC20 POPULATION
	5	2	0	7.14	1290	0.01	12323.49	0.09	0.00	0.00	124.00	LCV FISH
	5	2	0	7.14	1290	0.01	12323.49	0.09	0.00	0.00	148.00	LTV EC20 FISH
AROCLOR-1242	1	2	0	7.14	1500	0.01	17262.14	0.13	.	.	.	NAWQ ACTUAL
	1	2	0	7.14	1500	0.01	17262.14	0.13	.	.	.	LCV DAPHNIDS
	1	2	0	7.14	1500	0.01	17262.14	0.13	.	.	.	LTV EC20 DAPHNID
	1	2	0	7.14	1500	0.01	17262.14	0.13	.	.	.	SS EC20
	1	2	0	7.14	1500	0.01	17262.14	0.13	1.09	12.51	0.01	NAWQ ADVISORY
	1	2	0	7.14	1500	0.01	17262.14	0.13	0.01	0.08	1.58	EC20 POPULATION
	1	2	0	7.14	1500	0.01	17262.14	0.13	0.00	0.04	2.90	LTV EC20 FISH
	1	2	0	7.14	1500	0.01	17262.14	0.13	0.00	0.01	9.00	LCV FISH
	2	2	0	7.14	325	0.00	6047.34	0.04	.	.	.	NAWQ ACTUAL
	2	2	0	7.14	325	0.00	6047.34	0.04	.	.	.	LCV DAPHNIDS
	2	2	0	7.14	325	0.00	6047.34	0.04	.	.	.	LTV EC20 DAPHNID
	2	2	0	7.14	325	0.00	6047.34	0.04	.	.	.	SS EC20
	2	2	0	7.14	325	0.00	6047.34	0.04	0.24	4.38	0.01	NAWQ ADVISORY
	2	2	0	7.14	325	0.00	6047.34	0.04	0.00	0.03	1.58	EC20 POPULATION
	2	2	0	7.14	325	0.00	6047.34	0.04	0.00	0.02	2.90	LTV EC20 FISH
	2	2	0	7.14	325	0.00	6047.34	0.04	0.00	0.00	9.00	LCV FISH
	3	2	0	7.14	1350	0.01	14028.24	0.10	.	.	.	NAWQ ACTUAL
	3	2	0	7.14	1350	0.01	14028.24	0.10	.	.	.	LCV DAPHNIDS
	3	2	0	7.14	1350	0.01	14028.24	0.10	.	.	.	LTV EC20 DAPHNID
	3	2	0	7.14	1350	0.01	14028.24	0.10	.	.	.	SS EC20
	3	2	0	7.14	1350	0.01	14028.24	0.10	0.98	10.16	0.01	NAWQ ADVISORY
	3	2	0	7.14	1350	0.01	14028.24	0.10	0.01	0.06	1.58	EC20 POPULATION
	3	2	0	7.14	1350	0.01	14028.24	0.10	0.00	0.04	2.90	LTV EC20 FISH
	3	2	0	7.14	1350	0.01	14028.24	0.10	0.00	0.01	9.00	LCV FISH
	4	2	0	7.14	1200	0.01	47801.10	0.35	.	.	.	NAWQ ACTUAL
	4	2	0	7.14	1200	0.01	47801.10	0.35	.	.	.	LCV DAPHNIDS
	4	2	0	7.14	1200	0.01	47801.10	0.35	.	.	.	LTV EC20 DAPHNID
	4	2	0	7.14	1200	0.01	47801.10	0.35	.	.	.	SS EC20
	4	2	0	7.14	1200	0.01	47801.10	0.35	0.87	34.63	0.01	NAWQ ADVISORY
	4	2	0	7.14	1200	0.01	47801.10	0.35	0.01	0.22	1.58	EC20 POPULATION
	4	2	0	7.14	1200	0.01	47801.10	0.35	0.00	0.12	2.90	LTV EC20 FISH
	4	2	0	7.14	1200	0.01	47801.10	0.35	0.00	0.04	9.00	LCV FISH

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL* detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark type
AROCLOR-1242 (continued)	5	2	0	7.14	1290	0.01	12323.49	0.09	.	.	. NAWQ ACTUAL
	5	2	0	7.14	1290	0.01	12323.49	0.09	.	.	. LCV DAPHNIDS
	5	2	0	7.14	1290	0.01	12323.49	0.09	.	.	. LTV EC20 DAPHNID
	5	2	0	7.14	1290	0.01	12323.49	0.09	.	.	. SS EC20
	5	2	0	7.14	1290	0.01	12323.49	0.09	0.93	8.93	0.01 NAWQ ADVISORY
	5	2	0	7.14	1290	0.01	12323.49	0.09	0.01	0.06	1.58 EC20 POPULATION
	5	2	0	7.14	1290	0.01	12323.49	0.09	0.00	0.03	2.90 LTV EC20 FISH
	5	2	0	7.14	1290	0.01	12323.49	0.09	0.00	0.01	9.00 LCV FISH
AROCLOR-1248	1	2	0	7.14	1500	0.01	17262.14	0.13	.	.	. NAWQ ACTUAL
	1	2	0	7.14	1500	0.01	17262.14	0.13	.	.	. SS EC20
	1	2	0	7.14	1500	0.01	17262.14	0.13	54.33	625.27	0.00 NAWQ ADVISORY
	1	2	0	7.14	1500	0.01	17262.14	0.13	0.05	0.63	0.20 LCV FISH
	1	2	0	7.14	1500	0.01	17262.14	0.13	0.03	0.31	0.40 LTV EC20 FISH
	1	2	0	7.14	1500	0.01	17262.14	0.13	0.01	0.10	1.26 EC20 POPULATION
	1	2	0	7.14	1500	0.01	17262.14	0.13	0.00	0.05	2.50 LTV EC20 DAPHNID
	1	2	0	7.14	1500	0.01	17262.14	0.13	0.00	0.03	4.30 LCV DAPHNIDS
	2	2	0	7.14	325	0.00	6047.34	0.04	.	.	. NAWQ ACTUAL
	2	2	0	7.14	325	0.00	6047.34	0.04	.	.	. SS EC20
	2	2	0	7.14	325	0.00	6047.34	0.04	11.77	219.05	0.00 NAWQ ADVISORY
	2	2	0	7.14	325	0.00	6047.34	0.04	0.01	0.22	0.20 LCV FISH
	2	2	0	7.14	325	0.00	6047.34	0.04	0.01	0.11	0.40 LTV EC20 FISH
	2	2	0	7.14	325	0.00	6047.34	0.04	0.00	0.03	1.26 EC20 POPULATION
	2	2	0	7.14	325	0.00	6047.34	0.04	0.00	0.02	2.50 LTV EC20 DAPHNID
	2	2	0	7.14	325	0.00	6047.34	0.04	0.00	0.01	4.30 LCV DAPHNIDS
	3	2	0	7.14	1350	0.01	14028.24	0.10	.	.	. NAWQ ACTUAL
	3	2	0	7.14	1350	0.01	14028.24	0.10	.	.	. SS EC20
	3	2	0	7.14	1350	0.01	14028.24	0.10	48.90	508.13	0.00 NAWQ ADVISORY
	3	2	0	7.14	1350	0.01	14028.24	0.10	0.05	0.51	0.20 LCV FISH
	3	2	0	7.14	1350	0.01	14028.24	0.10	0.02	0.25	0.40 LTV EC20 FISH
	3	2	0	7.14	1350	0.01	14028.24	0.10	0.01	0.08	1.26 EC20 POPULATION
	3	2	0	7.14	1350	0.01	14028.24	0.10	0.00	0.04	2.50 LTV EC20 DAPHNID
	3	2	0	7.14	1350	0.01	14028.24	0.10	0.00	0.02	4.30 LCV DAPHNIDS
	4	2	0	7.14	1200	0.01	47801.10	0.35	.	.	. NAWQ ACTUAL
	4	2	0	7.14	1200	0.01	47801.10	0.35	.	.	. SS EC20
	4	2	0	7.14	1200	0.01	47801.10	0.35	43.47	1731.44	0.00 NAWQ ADVISORY
	4	2	0	7.14	1200	0.01	47801.10	0.35	0.04	1.73	0.20 LCV FISH
	4	2	0	7.14	1200	0.01	47801.10	0.35	0.02	0.87	0.40 LTV EC20 FISH
	4	2	0	7.14	1200	0.01	47801.10	0.35	0.01	0.27	1.26 EC20 POPULATION
	4	2	0	7.14	1200	0.01	47801.10	0.35	0.00	0.14	2.50 LTV EC20 DAPHNID
	4	2	0	7.14	1200	0.01	47801.10	0.35	0.00	0.08	4.30 LCV DAPHNIDS

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL* detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark type
AROCLOR-1248 (continued)	5	2	0	7.14	1290	0.01	12323.49	0.09	.	.	. NAWQ ACTUAL
	5	2	0	7.14	1290	0.01	12323.49	0.09	.	.	. SS EC20
	5	2	0	7.14	1290	0.01	12323.49	0.09	46.73	446.38	0.00 NAWQ ADVISORY
	5	2	0	7.14	1290	0.01	12323.49	0.09	0.05	0.45	0.20 LCV FISH
	5	2	0	7.14	1290	0.01	12323.49	0.09	0.02	0.22	0.40 LTV EC20 FISH
	5	2	0	7.14	1290	0.01	12323.49	0.09	0.01	0.07	1.26 EC20 POPULATION
	5	2	0	7.14	1290	0.01	12323.49	0.09	0.00	0.04	2.50 LTV EC20 DAPHNID
	5	2	0	7.14	1290	0.01	12323.49	0.09	0.00	0.02	4.30 LCV DAPHNIDS
AROCLOR-1254	1	2	0	7.14	3000	0.02	34181.62	0.25	.	.	. NAWQ ACTUAL
	1	2	0	7.14	3000	0.02	34181.62	0.25	.	.	. SS EC20
	1	2	0	7.14	3000	0.02	34181.62	0.25	1.09	12.38	0.02 NAWQ ADVISORY
	1	2	0	7.14	3000	0.02	34181.62	0.25	0.04	0.48	0.52 LTV EC20 FISH
	1	2	0	7.14	3000	0.02	34181.62	0.25	0.03	0.39	0.63 EC20 POPULATION
	1	2	0	7.14	3000	0.02	34181.62	0.25	0.02	0.25	1.00 LCV FISH
	1	2	0	7.14	3000	0.02	34181.62	0.25	0.02	0.21	1.20 LTV EC20 DAPHNID
	1	2	0	7.14	3000	0.02	34181.62	0.25	0.01	0.12	2.10 LCV DAPHNIDS
	5	4	0	7.14	2580	0.02	17590.93	0.13	.	.	. NAWQ ACTUAL
	5	4	0	7.14	2580	0.02	17590.93	0.13	.	.	. SS EC20
	5	4	0	7.14	2580	0.02	17590.93	0.13	0.93	6.37	0.02 NAWQ ADVISORY
	5	4	0	7.14	2580	0.02	17590.93	0.13	0.04	0.25	0.52 LTV EC20 FISH
	5	4	0	7.14	2580	0.02	17590.93	0.13	0.03	0.20	0.63 EC20 POPULATION
	5	4	0	7.14	2580	0.02	17590.93	0.13	0.02	0.13	1.00 LCV FISH
	5	4	0	7.14	2580	0.02	17590.93	0.13	0.02	0.11	1.20 LTV EC20 DAPHNID
	5	4	0	7.14	2580	0.02	17590.93	0.13	0.01	0.06	2.10 LCV DAPHNIDS
	10	1	0	7.14	11300	0.08	11300.00	0.08	.	.	. NAWQ ACTUAL
	10	1	0	7.14	11300	0.08	11300.00	0.08	.	.	. SS EC20
	10	1	0	7.14	11300	0.08	11300.00	0.08	4.09	4.09	0.02 NAWQ ADVISORY
	10	1	0	7.14	11300	0.08	11300.00	0.08	0.16	0.16	0.52 LTV EC20 FISH
	10	1	0	7.14	11300	0.08	11300.00	0.08	0.13	0.13	0.63 EC20 POPULATION
	10	1	0	7.14	11300	0.08	11300.00	0.08	0.08	0.08	1.00 LCV FISH
	10	1	0	7.14	11300	0.08	11300.00	0.08	0.07	0.07	1.20 LTV EC20 DAPHNID
	10	1	0	7.14	11300	0.08	11300.00	0.08	0.04	0.04	2.10 LCV DAPHNIDS

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL[a] detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
AROCLOR-1260	1	2	0	7.14	3000	0.02	34181.62	0.25	.	.	.	NAWQ ACTUAL
	1	2	0	7.14	3000	0.02	34181.62	0.25	.	.	.	LCV DAPHNIDS
	1	2	0	7.14	3000	0.02	34181.62	0.25	.	.	.	LTV EC20 DAPHNID
	1	2	0	7.14	3000	0.02	34181.62	0.25	.	.	.	SS EC20
	1	2	0	7.14	3000	0.02	34181.62	0.25	0.20	2.25	0.11	NAWQ ADVISORY
	1	2	0	7.14	3000	0.02	34181.62	0.25	0.01	0.12	2.10	LTV EC20 FISH
	1	2	0	7.14	3000	0.02	34181.62	0.25	0.01	0.11	2.30	LCV FISH
	1	2	0	7.14	3000	0.02	34181.62	0.25	0.00	0.00	316.00	EC20 POPULATION
	3	2	0	7.14	2800	0.02	27128.51	0.20	.	.	.	NAWQ ACTUAL
	3	2	0	7.14	2800	0.02	27128.51	0.20	.	.	.	LCV DAPHNIDS
	3	2	0	7.14	2800	0.02	27128.51	0.20	.	.	.	LTV EC20 DAPHNID
	3	2	0	7.14	2800	0.02	27128.51	0.20	.	.	.	SS EC20
	3	2	0	7.14	2800	0.02	27128.51	0.20	0.18	1.79	0.11	NAWQ ADVISORY
	3	2	0	7.14	2800	0.02	27128.51	0.20	0.01	0.09	2.10	LTV EC20 FISH
	3	2	0	7.14	2800	0.02	27128.51	0.20	0.01	0.09	2.30	LCV FISH
	3	2	0	7.14	2800	0.02	27128.51	0.20	0.00	0.00	316.00	EC20 POPULATION
	4	2	0	7.14	2400	0.02	67504.47	0.49	.	.	.	NAWQ ACTUAL
	4	2	0	7.14	2400	0.02	67504.47	0.49	.	.	.	LCV DAPHNIDS
	4	2	0	7.14	2400	0.02	67504.47	0.49	.	.	.	LTV EC20 DAPHNID
	4	2	0	7.14	2400	0.02	67504.47	0.49	.	.	.	SS EC20
	4	2	0	7.14	2400	0.02	67504.47	0.49	0.16	4.45	0.11	NAWQ ADVISORY
	4	2	0	7.14	2400	0.02	67504.47	0.49	0.01	0.23	2.10	LTV EC20 FISH
	4	2	0	7.14	2400	0.02	67504.47	0.49	0.01	0.21	2.30	LCV FISH
	4	2	0	7.14	2400	0.02	67504.47	0.49	0.00	0.00	316.00	EC20 POPULATION
	5	4	0	7.14	2580	0.02	17590.93	0.13	.	.	.	NAWQ ACTUAL
	5	4	0	7.14	2580	0.02	17590.93	0.13	.	.	.	LCV DAPHNIDS
	5	4	0	7.14	2580	0.02	17590.93	0.13	.	.	.	LTV EC20 DAPHNID
	5	4	0	7.14	2580	0.02	17590.93	0.13	.	.	.	SS EC20
	5	4	0	7.14	2580	0.02	17590.93	0.13	0.17	1.16	0.11	NAWQ ADVISORY
	5	4	0	7.14	2580	0.02	17590.93	0.13	0.01	0.06	2.10	LTV EC20 FISH
	5	4	0	7.14	2580	0.02	17590.93	0.13	0.01	0.06	2.30	LCV FISH
	5	4	0	7.14	2580	0.02	17590.93	0.13	0.00	0.00	316.00	EC20 POPULATION
	10	1	0	7.14	11300	0.08	11300.00	0.08	.	.	.	NAWQ ACTUAL
	10	1	0	7.14	11300	0.08	11300.00	0.08	.	.	.	LCV DAPHNIDS
	10	1	0	7.14	11300	0.08	11300.00	0.08	.	.	.	LTV EC20 DAPHNID
	10	1	0	7.14	11300	0.08	11300.00	0.08	.	.	.	SS EC20
	10	1	0	7.14	11300	0.08	11300.00	0.08	0.74	0.74	0.11	NAWQ ADVISORY
	10	1	0	7.14	11300	0.08	11300.00	0.08	0.04	0.04	2.10	LTV EC20 FISH
	10	1	0	7.14	11300	0.08	11300.00	0.08	0.04	0.04	2.30	LCV FISH
	10	1	0	7.14	11300	0.08	11300.00	0.08	0.00	0.00	316.00	EC20 POPULATION

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL[a] detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark type
BENZO(A)ANTHRACENE	1	2	0	5.61	620	0.15	6993.39	1.72	.	.	NAWQ ACTUAL
	1	2	0	5.61	620	0.15	6993.39	1.72	.	.	LCV FISH
	1	2	0	5.61	620	0.15	6993.39	1.72	.	.	LTV EC20 FISH
	1	2	0	5.61	620	0.15	6993.39	1.72	.	.	LTV EC20 DAPHNID
	1	2	0	5.61	620	0.15	6993.39	1.72	.	.	SS EC20
	1	2	0	5.61	620	0.15	6993.39	1.72	.	.	EC20 POPULATION
	1	2	0	5.61	620	0.15	6993.39	1.72	56.37	635.80	0.00 NAWQ ADVISORY
	1	2	0	5.61	620	0.15	6993.39	1.72	0.23	2.64	0.65 LCV DAPHNIDS
	1	2	0	5.61	445	0.11	616.33	0.15	.	.	NAWQ ACTUAL
	2	2	0	5.61	445	0.11	616.33	0.15	.	.	LCV FISH
	2	2	0	5.61	445	0.11	616.33	0.15	.	.	LTV EC20 FISH
	2	2	0	5.61	445	0.11	616.33	0.15	.	.	LTV EC20 DAPHNID
	2	2	0	5.61	445	0.11	616.33	0.15	.	.	SS EC20
	2	2	0	5.61	445	0.11	616.33	0.15	.	.	EC20 POPULATION
	2	2	0	5.61	445	0.11	616.33	0.15	40.46	56.03	0.00 NAWQ ADVISORY
	2	2	0	5.61	445	0.11	616.33	0.15	0.17	0.23	0.65 LCV DAPHNIDS
	3	2	0	5.61	565	0.14	599.27	0.15	.	.	NAWQ ACTUAL
	3	2	0	5.61	565	0.14	599.27	0.15	.	.	LCV FISH
	3	2	0	5.61	565	0.14	599.27	0.15	.	.	LTV EC20 FISH
	3	2	0	5.61	565	0.14	599.27	0.15	.	.	LTV EC20 DAPHNID
	3	2	0	5.61	565	0.14	599.27	0.15	.	.	SS EC20
	3	2	0	5.61	565	0.14	599.27	0.15	.	.	EC20 POPULATION
	3	2	0	5.61	565	0.14	599.27	0.15	51.37	54.48	0.00 NAWQ ADVISORY
	3	2	0	5.61	565	0.14	599.27	0.15	0.21	0.23	0.65 LCV DAPHNIDS
	4	2	0	5.61	500	0.12	38534.72	9.46	.	.	NAWQ ACTUAL
	4	2	0	5.61	500	0.12	38534.72	9.46	.	.	LCV FISH
	4	2	0	5.61	500	0.12	38534.72	9.46	.	.	LTV EC20 FISH
	4	2	0	5.61	500	0.12	38534.72	9.46	.	.	LTV EC20 DAPHNID
	4	2	0	5.61	500	0.12	38534.72	9.46	.	.	SS EC20
	4	2	0	5.61	500	0.12	38534.72	9.46	.	.	EC20 POPULATION
	4	2	0	5.61	500	0.12	38534.72	9.46	45.46	3503.39	0.00 NAWQ ADVISORY
	4	2	0	5.61	500	0.12	38534.72	9.46	0.19	14.55	0.65 LCV DAPHNIDS
	5	4	0	5.61	855	0.21	6848.50	1.68	.	.	NAWQ ACTUAL
	5	4	0	5.61	855	0.21	6848.50	1.68	.	.	LCV FISH
	5	4	0	5.61	855	0.21	6848.50	1.68	.	.	LTV EC20 FISH
	5	4	0	5.61	855	0.21	6848.50	1.68	.	.	LTV EC20 DAPHNID
	5	4	0	5.61	855	0.21	6848.50	1.68	.	.	SS EC20
	5	4	0	5.61	855	0.21	6848.50	1.68	.	.	EC20 POPULATION
	5	4	0	5.61	855	0.21	6848.50	1.68	77.73	622.63	0.00 NAWQ ADVISORY
	5	4	0	5.61	855	0.21	6848.50	1.68	0.32	2.59	0.65 LCV DAPHNIDS

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL* detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark type
BENZO(A)ANTHRACENE (continued)	10	1	0	5.61	6500	1.60	6500.00	1.60	.	.	. NAWQ ACTUAL
	10	1	0	5.61	6500	1.60	6500.00	1.60	.	.	. LCV FISH
	10	1	0	5.61	6500	1.60	6500.00	1.60	.	.	. LTV EC20 FISH
	10	1	0	5.61	6500	1.60	6500.00	1.60	.	.	. LTV EC20 DAPHNID
	10	1	0	5.61	6500	1.60	6500.00	1.60	.	.	. SS EC20
	10	1	0	5.61	6500	1.60	6500.00	1.60	.	.	. EC20 POPULATION
	10	1	0	5.61	6500	1.60	6500.00	1.60	590.95	590.95	0.00 NAWQ ADVISORY
	10	1	0	5.61	6500	1.60	6500.00	1.60	2.45	2.45	0.65 LCV DAPHNIDS
BENZO(A)PYRENE	1	2	0	6.04	620	0.06	6993.39	0.64	.	.	. NAWQ ACTUAL
	1	2	0	6.04	620	0.06	6993.39	0.64	.	.	. LCV FISH
	1	2	0	6.04	620	0.06	6993.39	0.64	.	.	. LTV EC20 DAPHNID
	1	2	0	6.04	620	0.06	6993.39	0.64	.	.	. SS EC20
	1	2	0	6.04	620	0.06	6993.39	0.64	.	.	. EC20 POPULATION
	1	2	0	6.04	620	0.06	6993.39	0.64	43.50	490.62	0.00 NAWQ ADVISORY
	1	2	0	6.04	620	0.06	6993.39	0.64	0.19	2.13	0.30 LCV DAPHNIDS
	1	2	0	6.04	620	0.06	6993.39	0.64	0.02	0.21	2.99 LTV EC20 FISH
	2	2	0	6.04	445	0.04	616.33	0.06	.	.	. NAWQ ACTUAL
	2	2	0	6.04	445	0.04	616.33	0.06	.	.	. LCV FISH
	2	2	0	6.04	445	0.04	616.33	0.06	.	.	. LTV EC20 DAPHNID
	2	2	0	6.04	445	0.04	616.33	0.06	.	.	. SS EC20
	2	2	0	6.04	445	0.04	616.33	0.06	.	.	. EC20 POPULATION
	2	2	0	6.04	445	0.04	616.33	0.06	31.22	43.24	0.00 NAWQ ADVISORY
	2	2	0	6.04	445	0.04	616.33	0.06	0.14	0.19	0.30 LCV DAPHNIDS
	2	2	0	6.04	445	0.04	616.33	0.06	0.01	0.02	2.99 LTV EC20 FISH
	3	2	0	6.04	565	0.05	599.27	0.05	.	.	. NAWQ ACTUAL
	3	2	0	6.04	565	0.05	599.27	0.05	.	.	. LCV FISH
	3	2	0	6.04	565	0.05	599.27	0.05	.	.	. LTV EC20 DAPHNID
	3	2	0	6.04	565	0.05	599.27	0.05	.	.	. SS EC20
	3	2	0	6.04	565	0.05	599.27	0.05	.	.	. EC20 POPULATION
	3	2	0	6.04	565	0.05	599.27	0.05	39.64	42.04	0.00 NAWQ ADVISORY
	3	2	0	6.04	565	0.05	599.27	0.05	0.17	0.18	0.30 LCV DAPHNIDS
	3	2	0	6.04	565	0.05	599.27	0.05	0.02	0.02	2.99 LTV EC20 FISH
	4	2	0	6.04	500	0.05	38534.72	3.51	.	.	. NAWQ ACTUAL
	4	2	0	6.04	500	0.05	38534.72	3.51	.	.	. LCV FISH
	4	2	0	6.04	500	0.05	38534.72	3.51	.	.	. LTV EC20 DAPHNID
	4	2	0	6.04	500	0.05	38534.72	3.51	.	.	. SS EC20
	4	2	0	6.04	500	0.05	38534.72	3.51	.	.	. EC20 POPULATION
	4	2	0	6.04	500	0.05	38534.72	3.51	35.08	2703.39	0.00 NAWQ ADVISORY
	4	2	0	6.04	500	0.05	38534.72	3.51	0.15	11.71	0.30 LCV DAPHNIDS
	4	2	0	6.04	500	0.05	38534.72	3.51	0.02	1.18	2.99 LTV EC20 FISH

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL[a] detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark type
BENZO(A)PYRENE (continued)	5	4	0	6.04	855	0.08	6848.50	0.62	.	.	. NAWQ ACTUAL
	5	4	0	6.04	855	0.08	6848.50	0.62	.	.	. LCV FISH
	5	4	0	6.04	855	0.08	6848.50	0.62	.	.	. LTV EC20 DAPHNID
	5	4	0	6.04	855	0.08	6848.50	0.62	.	.	. SS EC20
	5	4	0	6.04	855	0.08	6848.50	0.62	.	.	. EC20 POPULATION
	5	4	0	6.04	855	0.08	6848.50	0.62	59.98	480.45	0.00 NAWQ ADVISORY
	5	4	0	6.04	855	0.08	6848.50	0.62	0.26	2.08	0.30 LCV DAPHNIDS
	5	4	0	6.04	855	0.08	6848.50	0.62	0.03	0.21	2.99 LTV EC20 FISH
	10	1	0	6.04	6500	0.59	6500.00	0.59	.	.	. NAWQ ACTUAL
	10	1	0	6.04	6500	0.59	6500.00	0.59	.	.	. LCV FISH
	10	1	0	6.04	6500	0.59	6500.00	0.59	.	.	. LTV EC20 DAPHNID
	10	1	0	6.04	6500	0.59	6500.00	0.59	.	.	. SS EC20
	10	1	0	6.04	6500	0.59	6500.00	0.59	.	.	. EC20 POPULATION
	10	1	0	6.04	6500	0.59	6500.00	0.59	456.01	456.01	0.00 NAWQ ADVISORY
	10	1	0	6.04	6500	0.59	6500.00	0.59	1.98	1.98	0.30 LCV DAPHNIDS
	10	1	0	6.04	6500	0.59	6500.00	0.59	0.20	0.20	2.99 LTV EC20 FISH
BENZO(B)FLUORANTHENE	1	2	0	6.84	620	0.01	6993.39	0.10	.	.	. NAWQ ADVISORY
	1	2	0	6.84	620	0.01	6993.39	0.10	.	.	. NAWQ ACTUAL
	1	2	0	6.84	620	0.01	6993.39	0.10	.	.	. LCV FISH
	1	2	0	6.84	620	0.01	6993.39	0.10	.	.	. LCV DAPHNIDS
	1	2	0	6.84	620	0.01	6993.39	0.10	.	.	. LTV EC20 FISH
	1	2	0	6.84	620	0.01	6993.39	0.10	.	.	. LTV EC20 DAPHNID
	1	2	0	6.84	620	0.01	6993.39	0.10	.	.	. SS EC20
	1	2	0	6.84	620	0.01	6993.39	0.10	.	.	. EC20 POPULATION
	1	2	0	6.84	620	0.01	6993.39	0.10	.	.	. NAWQ ADVISORY
	2	2	0	6.84	445	0.01	616.33	0.01	.	.	. NAWQ ACTUAL
	2	2	0	6.84	445	0.01	616.33	0.01	.	.	. LCV FISH
	2	2	0	6.84	445	0.01	616.33	0.01	.	.	. LCV DAPHNIDS
	2	2	0	6.84	445	0.01	616.33	0.01	.	.	. LTV EC20 FISH
	2	2	0	6.84	445	0.01	616.33	0.01	.	.	. LTV EC20 DAPHNID
	2	2	0	6.84	445	0.01	616.33	0.01	.	.	. SS EC20
	2	2	0	6.84	445	0.01	616.33	0.01	.	.	. EC20 POPULATION
	2	2	0	6.84	445	0.01	616.33	0.01	.	.	. NAWQ ADVISORY
	3	2	0	6.84	565	0.01	599.27	0.01	.	.	. NAWQ ACTUAL
	3	2	0	6.84	565	0.01	599.27	0.01	.	.	. LCV FISH
	3	2	0	6.84	565	0.01	599.27	0.01	.	.	. LCV DAPHNIDS
	3	2	0	6.84	565	0.01	599.27	0.01	.	.	. LTV EC20 FISH
	3	2	0	6.84	565	0.01	599.27	0.01	.	.	. LTV EC20 DAPHNID
	3	2	0	6.84	565	0.01	599.27	0.01	.	.	. SS EC20
	3	2	0	6.84	565	0.01	599.27	0.01	.	.	. EC20 POPULATION

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL[a] detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark type
BENZO(B)FLUORANTHENE (continued)	4	2	0	6.84	500	0.01	38534.72	0.56	.	.	NAWQ ADVISORY
	4	2	0	6.84	500	0.01	38534.72	0.56	.	.	NAWQ ACTUAL
	4	2	0	6.84	500	0.01	38534.72	0.56	.	.	LCV FISH
	4	2	0	6.84	500	0.01	38534.72	0.56	.	.	LCV DAPHNIDS
	4	2	0	6.84	500	0.01	38534.72	0.56	.	.	LTV EC20 FISH
	4	2	0	6.84	500	0.01	38534.72	0.56	.	.	LTV EC20 DAPHNID
	4	2	0	6.84	500	0.01	38534.72	0.56	.	.	SS EC20
	4	2	0	6.84	500	0.01	38534.72	0.56	.	.	EC20 POPULATION
	5	4	0	6.84	855	0.01	6848.50	0.10	.	.	NAWQ ADVISORY
	5	4	0	6.84	855	0.01	6848.50	0.10	.	.	NAWQ ACTUAL
	5	4	0	6.84	855	0.01	6848.50	0.10	.	.	LCV FISH
	5	4	0	6.84	855	0.01	6848.50	0.10	.	.	LCV DAPHNIDS
	5	4	0	6.84	855	0.01	6848.50	0.10	.	.	LTV EC20 FISH
	5	4	0	6.84	855	0.01	6848.50	0.10	.	.	LTV EC20 DAPHNID
	5	4	0	6.84	855	0.01	6848.50	0.10	.	.	SS EC20
	5	4	0	6.84	855	0.01	6848.50	0.10	.	.	EC20 POPULATION
	10	1	0	6.84	6500	0.09	6500.00	0.09	.	.	NAWQ ADVISORY
	10	1	0	6.84	6500	0.09	6500.00	0.09	.	.	NAWQ ACTUAL
	10	1	0	6.84	6500	0.09	6500.00	0.09	.	.	LCV FISH
	10	1	0	6.84	6500	0.09	6500.00	0.09	.	.	LCV DAPHNIDS
	10	1	0	6.84	6500	0.09	6500.00	0.09	.	.	LTV EC20 FISH
	10	1	0	6.84	6500	0.09	6500.00	0.09	.	.	LTV EC20 DAPHNID
	10	1	0	6.84	6500	0.09	6500.00	0.09	.	.	SS EC20
	10	1	0	6.84	6500	0.09	6500.00	0.09	.	.	EC20 POPULATION
BENZO(G,H,I)PERYLENE	1	2	0	6.58	620	0.02	6993.39	0.18	.	.	NAWQ ADVISORY
	1	2	0	6.58	620	0.02	6993.39	0.18	.	.	NAWQ ACTUAL
	1	2	0	6.58	620	0.02	6993.39	0.18	.	.	LCV FISH
	1	2	0	6.58	620	0.02	6993.39	0.18	.	.	LCV DAPHNIDS
	1	2	0	6.58	620	0.02	6993.39	0.18	.	.	LTV EC20 FISH
	1	2	0	6.58	620	0.02	6993.39	0.18	.	.	LTV EC20 DAPHNID
	1	2	0	6.58	620	0.02	6993.39	0.18	.	.	SS EC20
	1	2	0	6.58	620	0.02	6993.39	0.18	.	.	EC20 POPULATION
	2	2	0	6.58	445	0.01	616.33	0.02	.	.	NAWQ ADVISORY
	2	2	0	6.58	445	0.01	616.33	0.02	.	.	NAWQ ACTUAL
	2	2	0	6.58	445	0.01	616.33	0.02	.	.	LCV FISH
	2	2	0	6.58	445	0.01	616.33	0.02	.	.	LCV DAPHNIDS
	2	2	0	6.58	445	0.01	616.33	0.02	.	.	LTV EC20 FISH
	2	2	0	6.58	445	0.01	616.33	0.02	.	.	LTV EC20 DAPHNID
	2	2	0	6.58	445	0.01	616.33	0.02	.	.	SS EC20
	2	2	0	6.58	445	0.01	616.33	0.02	.	.	EC20 POPULATION

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL[a] detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
BENZO(G,H,I)PERYLENE (continued)	3	2	0	6.58	565	0.01	599.27	0.02	.	.	.	NAWQ ADVISORY
	3	2	0	6.58	565	0.01	599.27	0.02	.	.	.	NAWQ ACTUAL
	3	2	0	6.58	565	0.01	599.27	0.02	.	.	.	LCV FISH
	3	2	0	6.58	565	0.01	599.27	0.02	.	.	.	LCV DAPHNIDS
	3	2	0	6.58	565	0.01	599.27	0.02	.	.	.	LTV EC20 FISH
	3	2	0	6.58	565	0.01	599.27	0.02	.	.	.	LTV EC20 DAPHNID
	3	2	0	6.58	565	0.01	599.27	0.02	.	.	.	SS EC20
	3	2	0	6.58	565	0.01	599.27	0.02	.	.	.	EC20 POPULATION
	4	2	0	6.58	500	0.01	38534.72	1.01	.	.	.	NAWQ ADVISORY
	4	2	0	6.58	500	0.01	38534.72	1.01	.	.	.	NAWQ ACTUAL
	4	2	0	6.58	500	0.01	38534.72	1.01	.	.	.	LCV FISH
	4	2	0	6.58	500	0.01	38534.72	1.01	.	.	.	LCV DAPHNIDS
	4	2	0	6.58	500	0.01	38534.72	1.01	.	.	.	LTV EC20 FISH
	4	2	0	6.58	500	0.01	38534.72	1.01	.	.	.	LTV EC20 DAPHNID
	4	2	0	6.58	500	0.01	38534.72	1.01	.	.	.	SS EC20
	4	2	0	6.58	500	0.01	38534.72	1.01	.	.	.	EC20 POPULATION
	5	4	0	6.58	855	0.02	6848.50	0.18	.	.	.	NAWQ ADVISORY
	5	4	0	6.58	855	0.02	6848.50	0.18	.	.	.	NAWQ ACTUAL
	5	4	0	6.58	855	0.02	6848.50	0.18	.	.	.	LCV FISH
	5	4	0	6.58	855	0.02	6848.50	0.18	.	.	.	LCV DAPHNIDS
	5	4	0	6.58	855	0.02	6848.50	0.18	.	.	.	LTV EC20 FISH
	5	4	0	6.58	855	0.02	6848.50	0.18	.	.	.	LTV EC20 DAPHNID
	5	4	0	6.58	855	0.02	6848.50	0.18	.	.	.	SS EC20
	5	4	0	6.58	855	0.02	6848.50	0.18	.	.	.	EC20 POPULATION
	10	1	0	6.58	6500	0.17	6500.00	0.17	.	.	.	NAWQ ADVISORY
	10	1	0	6.58	6500	0.17	6500.00	0.17	.	.	.	NAWQ ACTUAL
	10	1	0	6.58	6500	0.17	6500.00	0.17	.	.	.	LCV FISH
	10	1	0	6.58	6500	0.17	6500.00	0.17	.	.	.	LCV DAPHNIDS
	10	1	0	6.58	6500	0.17	6500.00	0.17	.	.	.	LTV EC20 FISH
	10	1	0	6.58	6500	0.17	6500.00	0.17	.	.	.	LTV EC20 DAPHNID
	10	1	0	6.58	6500	0.17	6500.00	0.17	.	.	.	SS EC20
	10	1	0	6.58	6500	0.17	6500.00	0.17	.	.	.	EC20 POPULATION

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL* detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark type
BENZO(K)FLUORANTHENE	1	2	0	6.84	620	0.01	6993.39	0.10	.	.	NAWQ ADVISORY
	1	2	0	6.84	620	0.01	6993.39	0.10	.	.	NAWQ ACTUAL
	1	2	0	6.84	620	0.01	6993.39	0.10	.	.	LCV FISH
	1	2	0	6.84	620	0.01	6993.39	0.10	.	.	LCV DAPHNIDS
	1	2	0	6.84	620	0.01	6993.39	0.10	.	.	LTV EC20 FISH
	1	2	0	6.84	620	0.01	6993.39	0.10	.	.	LTV EC20 DAPHNID
	1	2	0	6.84	620	0.01	6993.39	0.10	.	.	SS EC20
	1	2	0	6.84	620	0.01	6993.39	0.10	.	.	EC20 POPULATION
	2	2	0	6.84	445	0.01	616.33	0.01	.	.	NAWQ ADVISORY
	2	2	0	6.84	445	0.01	616.33	0.01	.	.	NAWQ ACTUAL
	2	2	0	6.84	445	0.01	616.33	0.01	.	.	LCV FISH
	2	2	0	6.84	445	0.01	616.33	0.01	.	.	LCV DAPHNIDS
	2	2	0	6.84	445	0.01	616.33	0.01	.	.	LTV EC20 FISH
	2	2	0	6.84	445	0.01	616.33	0.01	.	.	LTV EC20 DAPHNID
	2	2	0	6.84	445	0.01	616.33	0.01	.	.	SS EC20
	2	2	0	6.84	445	0.01	616.33	0.01	.	.	EC20 POPULATION
	3	2	0	6.84	565	0.01	599.27	0.01	.	.	NAWQ ADVISORY
	3	2	0	6.84	565	0.01	599.27	0.01	.	.	NAWQ ACTUAL
	3	2	0	6.84	565	0.01	599.27	0.01	.	.	LCV FISH
	3	2	0	6.84	565	0.01	599.27	0.01	.	.	LCV DAPHNIDS
	3	2	0	6.84	565	0.01	599.27	0.01	.	.	LTV EC20 FISH
	3	2	0	6.84	565	0.01	599.27	0.01	.	.	LTV EC20 DAPHNID
	3	2	0	6.84	565	0.01	599.27	0.01	.	.	SS EC20
	3	2	0	6.84	565	0.01	599.27	0.01	.	.	EC20 POPULATION
	4	2	0	6.84	500	0.01	38534.72	0.56	.	.	NAWQ ADVISORY
	4	2	0	6.84	500	0.01	38534.72	0.56	.	.	NAWQ ACTUAL
	4	2	0	6.84	500	0.01	38534.72	0.56	.	.	LCV FISH
	4	2	0	6.84	500	0.01	38534.72	0.56	.	.	LCV DAPHNIDS
	4	2	0	6.84	500	0.01	38534.72	0.56	.	.	LTV EC20 FISH
	4	2	0	6.84	500	0.01	38534.72	0.56	.	.	LTV EC20 DAPHNID
	4	2	0	6.84	500	0.01	38534.72	0.56	.	.	SS EC20
	4	2	0	6.84	500	0.01	38534.72	0.56	.	.	EC20 POPULATION
	5	4	0	6.84	855	0.01	6848.50	0.10	.	.	NAWQ ADVISORY
	5	4	0	6.84	855	0.01	6848.50	0.10	.	.	NAWQ ACTUAL
	5	4	0	6.84	855	0.01	6848.50	0.10	.	.	LCV FISH
	5	4	0	6.84	855	0.01	6848.50	0.10	.	.	LCV DAPHNIDS
	5	4	0	6.84	855	0.01	6848.50	0.10	.	.	LTV EC20 FISH
	5	4	0	6.84	855	0.01	6848.50	0.10	.	.	LTV EC20 DAPHNID
	5	4	0	6.84	855	0.01	6848.50	0.10	.	.	SS EC20
	5	4	0	6.84	855	0.01	6848.50	0.10	.	.	EC20 POPULATION

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL* detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark type
BENZO(K)FLUORANTHENE (continued)	10	1	0	6.84	6500	0.09	6500.00	0.09	.	.	NAWQ ADVISORY
	10	1	0	6.84	6500	0.09	6500.00	0.09	.	.	NAWQ ACTUAL
	10	1	0	6.84	6500	0.09	6500.00	0.09	.	.	LCV FISH
	10	1	0	6.84	6500	0.09	6500.00	0.09	.	.	LCV DAPHNIDS
	10	1	0	6.84	6500	0.09	6500.00	0.09	.	.	LTV EC20 FISH
	10	1	0	6.84	6500	0.09	6500.00	0.09	.	.	LTV EC20 DAPHNID
	10	1	0	6.84	6500	0.09	6500.00	0.09	.	.	SS EC20
	10	1	0	6.84	6500	0.09	6500.00	0.09	.	.	EC20 POPULATION
BENZOIC ACID	1	2	0	1.87	3000	4046.89	33838.96	45647.50	.	.	NAWQ ACTUAL
	1	2	0	1.87	3000	4046.89	33838.96	45647.50	.	.	LCV DAPHNIDS
	1	2	0	1.87	3000	4046.89	33838.96	45647.50	.	.	LTV EC20 DAPHNID
	1	2	0	1.87	3000	4046.89	33838.96	45647.50	.	.	SS EC20
	1	2	0	1.87	3000	4046.89	33838.96	45647.50	8993.09	101438.89	0.45 NAWQ ADVISORY
	1	2	0	1.87	3000	4046.89	33838.96	45647.50	3.21	36.26	1259.00 EC20 POPULATION
	1	2	0	1.87	3000	4046.89	33838.96	45647.50	0.55	6.16	7409.00 LTV EC20 FISH
	1	2	0	1.87	3000	4046.89	33838.96	45647.50	0.31	3.52	12976.00 LCV FISH
	2	2	0	1.87	2150	2900.27	2835.31	3824.73	.	.	NAWQ ACTUAL
	2	2	0	1.87	2150	2900.27	2835.31	3824.73	.	.	LCV DAPHNIDS
	2	2	0	1.87	2150	2900.27	2835.31	3824.73	.	.	LTV EC20 DAPHNID
	2	2	0	1.87	2150	2900.27	2835.31	3824.73	.	.	SS EC20
	2	2	0	1.87	2150	2900.27	2835.31	3824.73	6445.04	8499.40	0.45 NAWQ ADVISORY
	2	2	0	1.87	2150	2900.27	2835.31	3824.73	2.30	3.04	1259.00 EC20 POPULATION
	2	2	0	1.87	2150	2900.27	2835.31	3824.73	0.39	0.52	7409.00 LTV EC20 FISH
	2	2	0	1.87	2150	2900.27	2835.31	3824.73	0.22	0.29	12976.00 LCV FISH
	3	2	0	1.87	2750	3709.65	2750.00	3709.65	.	.	NAWQ ACTUAL
	3	2	0	1.87	2750	3709.65	2750.00	3709.65	.	.	LCV DAPHNIDS
	3	2	0	1.87	2750	3709.65	2750.00	3709.65	.	.	LTV EC20 DAPHNID
	3	2	0	1.87	2750	3709.65	2750.00	3709.65	.	.	SS EC20
	3	2	0	1.87	2750	3709.65	2750.00	3709.65	8243.66	8243.66	0.45 NAWQ ADVISORY
	3	2	0	1.87	2750	3709.65	2750.00	3709.65	2.95	2.95	1259.00 EC20 POPULATION
	3	2	0	1.87	2750	3709.65	2750.00	3709.65	0.50	0.50	7409.00 LTV EC20 FISH
	3	2	0	1.87	2750	3709.65	2750.00	3709.65	0.29	0.29	12976.00 LCV FISH
	4	2	0	1.87	2450	3304.96	187826.42	253370.87	.	.	NAWQ ACTUAL
	4	2	0	1.87	2450	3304.96	187826.42	253370.87	.	.	LCV DAPHNIDS
	4	2	0	1.87	2450	3304.96	187826.42	253370.87	.	.	LTV EC20 DAPHNID
	4	2	0	1.87	2450	3304.96	187826.42	253370.87	.	.	SS EC20
	4	2	0	1.87	2450	3304.96	187826.42	253370.87	7344.35	563046.37	0.45 NAWQ ADVISORY
	4	2	0	1.87	2450	3304.96	187826.42	253370.87	2.63	201.25	1259.00 EC20 POPULATION
	4	2	0	1.87	2450	3304.96	187826.42	253370.87	0.45	34.20	7409.00 LTV EC20 FISH
	4	2	0	1.87	2450	3304.96	187826.42	253370.87	0.25	19.53	12976.00 LCV FISH

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H20 and SED	Minimum detection limit	Minimum pore water conc.	UCL[a] detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark type
BENZOIC ACID (continued)	5	4	0	1.87	4150	5598.20	33158.52	44729.62	.	.	. NAWQ ACTUAL
	5	4	0	1.87	4150	5598.20	33158.52	44729.62	.	.	. LCV DAPHNIDS
	5	4	0	1.87	4150	5598.20	33158.52	44729.62	.	.	. LTV EC20 DAPHNID
	5	4	0	1.87	4150	5598.20	33158.52	44729.62	.	.	. SS EC20
	5	4	0	1.87	4150	5598.20	33158.52	44729.62	12440.44	99399.15	0.45 NAWQ ADVISORY
	5	4	0	1.87	4150	5598.20	33158.52	44729.62	4.45	35.53	1259.00 EC20 POPULATION
	5	4	0	1.87	4150	5598.20	33158.52	44729.62	0.76	6.04	7409.00 LTV EC20 FISH
	5	4	0	1.87	4150	5598.20	33158.52	44729.62	0.43	3.45	12976.00 LCV FISH
	10	1	0	1.87	31000	41817.85	31000.00	41817.85	.	.	. NAWQ ACTUAL
	10	1	0	1.87	31000	41817.85	31000.00	41817.85	.	.	. LCV DAPHNIDS
	10	1	0	1.87	31000	41817.85	31000.00	41817.85	.	.	. LTV EC20 DAPHNID
	10	1	0	1.87	31000	41817.85	31000.00	41817.85	.	.	. SS EC20
	10	1	0	1.87	31000	41817.85	31000.00	41817.85	92928.55	92928.55	0.45 NAWQ ADVISORY
	10	1	0	1.87	31000	41817.85	31000.00	41817.85	33.22	33.22	1259.00 EC20 POPULATION
	10	1	0	1.87	31000	41817.85	31000.00	41817.85	5.64	5.64	7409.00 LTV EC20 FISH
	10	1	0	1.87	31000	41817.85	31000.00	41817.85	3.22	3.22	12976.00 LCV FISH
BENZYL ALCOHOL	1	2	0	1.10	620	4924.84	6993.39	55550.43	.	.	. NAWQ ACTUAL
	1	2	0	1.10	620	4924.84	6993.39	55550.43	.	.	. LCV DAPHNIDS
	1	2	0	1.10	620	4924.84	6993.39	55550.43	.	.	. LTV EC20 DAPHNID
	1	2	0	1.10	620	4924.84	6993.39	55550.43	.	.	. SS EC20
	1	2	0	1.10	620	4924.84	6993.39	55550.43	33502.28	377894.10	0.15 NAWQ ADVISORY
	1	2	0	1.10	620	4924.84	6993.39	55550.43	13.13	148.13	375.00 EC20 POPULATION
	1	2	0	1.10	620	4924.84	6993.39	55550.43	8.95	101.00	550.00 LTV EC20 FISH
	1	2	0	1.10	620	4924.84	6993.39	55550.43	8.36	94.31	589.00 LCV FISH
	2	2	0	1.10	445	3534.76	616.33	4895.66	.	.	. NAWQ ACTUAL
	2	2	0	1.10	445	3534.76	616.33	4895.66	.	.	. LCV DAPHNIDS
	2	2	0	1.10	445	3534.76	616.33	4895.66	.	.	. LTV EC20 DAPHNID
	2	2	0	1.10	445	3534.76	616.33	4895.66	.	.	. SS EC20
	2	2	0	1.10	445	3534.76	616.33	4895.66	24045.99	33303.84	0.15 NAWQ ADVISORY
	2	2	0	1.10	445	3534.76	616.33	4895.66	9.43	13.06	375.00 EC20 POPULATION
	2	2	0	1.10	445	3534.76	616.33	4895.66	6.43	8.90	550.00 LTV EC20 FISH
	2	2	0	1.10	445	3534.76	616.33	4895.66	6.00	8.31	589.00 LCV FISH
	3	2	0	1.10	565	4487.95	599.27	4760.14	.	.	. NAWQ ACTUAL
	3	2	0	1.10	565	4487.95	599.27	4760.14	.	.	. LCV DAPHNIDS
	3	2	0	1.10	565	4487.95	599.27	4760.14	.	.	. LTV EC20 DAPHNID
	3	2	0	1.10	565	4487.95	599.27	4760.14	.	.	. SS EC20
	3	2	0	1.10	565	4487.95	599.27	4760.14	30530.30	32381.87	0.15 NAWQ ADVISORY
	3	2	0	1.10	565	4487.95	599.27	4760.14	11.97	12.69	375.00 EC20 POPULATION
	3	2	0	1.10	565	4487.95	599.27	4760.14	8.16	8.65	550.00 LTV EC20 FISH
	3	2	0	1.10	565	4487.95	599.27	4760.14	7.62	8.08	589.00 LCV FISH

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL[a] detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
BENZYL ALCOHOL (continued)	4	2	0	1.10	500	3971.64	38534.72	306092.15	.	.	.	NAWQ ACTUAL
	4	2	0	1.10	500	3971.64	38534.72	306092.15	.	.	.	LCV DAPHNIDS
	4	2	0	1.10	500	3971.64	38534.72	306092.15	.	.	.	LTV EC20 DAPHNID
	4	2	0	1.10	500	3971.64	38534.72	306092.15	.	.	.	SS EC20
	4	2	0	1.10	500	3971.64	38534.72	306092.15	27017.97	2082259.50	0.15	NAWQ ADVISORY
	4	2	0	1.10	500	3971.64	38534.72	306092.15	10.59	816.25	375.00	EC20 POPULATION
	4	2	0	1.10	500	3971.64	38534.72	306092.15	7.22	556.53	550.00	LTV EC20 FISH
	4	2	0	1.10	500	3971.64	38534.72	306092.15	6.74	519.68	589.00	LCV FISH
	5	3	0	1.10	1070	8499.31	10367.99	82355.84	.	.	.	NAWQ ACTUAL
	5	3	0	1.10	1070	8499.31	10367.99	82355.84	.	.	.	LCV DAPHNIDS
	5	3	0	1.10	1070	8499.31	10367.99	82355.84	.	.	.	LTV EC20 DAPHNID
	5	3	0	1.10	1070	8499.31	10367.99	82355.84	.	.	.	SS EC20
	5	3	0	1.10	1070	8499.31	10367.99	82355.84	57818.45	560243.81	0.15	NAWQ ADVISORY
	5	3	0	1.10	1070	8499.31	10367.99	82355.84	22.66	219.62	375.00	EC20 POPULATION
	5	3	0	1.10	1070	8499.31	10367.99	82355.84	15.45	149.74	550.00	LTV EC20 FISH
	5	3	0	1.10	1070	8499.31	10367.99	82355.84	14.43	139.82	589.00	LCV FISH
	10	1	0	1.10	6500	51631.34	6500.00	51631.34	.	.	.	NAWQ ACTUAL
	10	1	0	1.10	6500	51631.34	6500.00	51631.34	.	.	.	LCV DAPHNIDS
	10	1	0	1.10	6500	51631.34	6500.00	51631.34	.	.	.	LTV EC20 DAPHNID
	10	1	0	1.10	6500	51631.34	6500.00	51631.34	.	.	.	SS EC20
	10	1	0	1.10	6500	51631.34	6500.00	51631.34	351233.57	351233.57	0.15	NAWQ ADVISORY
	10	1	0	1.10	6500	51631.34	6500.00	51631.34	137.68	137.68	375.00	EC20 POPULATION
	10	1	0	1.10	6500	51631.34	6500.00	51631.34	93.88	93.88	550.00	LTV EC20 FISH
	10	1	0	1.10	6500	51631.34	6500.00	51631.34	87.66	87.66	589.00	LCV FISH
BIS(2-ETHYLHEXYL)PHTHALATE	1	2	0	4.89	1180	1.52	5428.92	6.99	.	.	.	NAWQ ACTUAL
	1	2	0	4.89	1180	1.52	5428.92	6.99	.	.	.	SS EC20
	1	2	0	4.89	1180	1.52	5428.92	6.99	152.01	699.38	0.01	NAWQ ADVISORY
	1	2	0	4.89	1180	1.52	5428.92	6.99	0.51	2.33	3.00	LCV DAPHNIDS
	1	2	0	4.89	1180	1.52	5428.92	6.99	0.51	2.33	3.00	LTV EC20 DAPHNID
	1	2	0	4.89	1180	1.52	5428.92	6.99	0.18	0.83	8.40	LCV FISH
	1	2	0	4.89	1180	1.52	5428.92	6.99	0.03	0.14	50.00	EC20 POPULATION
	1	2	0	4.89	1180	1.52	5428.92	6.99	0.03	0.13	54.00	LTV EC20 FISH
	4	2	0	4.89	500	0.64	27638.29	35.61	.	.	.	NAWQ ACTUAL
	4	2	0	4.89	500	0.64	27638.29	35.61	.	.	.	SS EC20
	4	2	0	4.89	500	0.64	27638.29	35.61	64.41	3560.50	0.01	NAWQ ADVISORY
	4	2	0	4.89	500	0.64	27638.29	35.61	0.21	11.87	3.00	LCV DAPHNIDS
	4	2	0	4.89	500	0.64	27638.29	35.61	0.21	11.87	3.00	LTV EC20 DAPHNID
	4	2	0	4.89	500	0.64	27638.29	35.61	0.08	4.24	8.40	LCV FISH
	4	2	0	4.89	500	0.64	27638.29	35.61	0.01	0.71	50.00	EC20 POPULATION
	4	2	0	4.89	500	0.64	27638.29	35.61	0.01	0.66	54.00	LTV EC20 FISH

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL* detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
BIS(2-ETHYLHEXYL)PHTHALATE (cont.)	10	1	0	4.89	6500	8.37	6500.00	8.37	.	.	.	NAWQ ACTUAL
	10	1	0	4.89	6500	8.37	6500.00	8.37	.	.	.	SS EC20
	10	1	0	4.89	6500	8.37	6500.00	8.37	837.36	837.36	0.01	NAWQ ADVISORY
	10	1	0	4.89	6500	8.37	6500.00	8.37	2.79	2.79	3.00	LCV DAPHNIDS
	10	1	0	4.89	6500	8.37	6500.00	8.37	2.79	2.79	3.00	LTV EC20 DAPHNID
	10	1	0	4.89	6500	8.37	6500.00	8.37	1.00	1.00	8.40	LCV FISH
	10	1	0	4.89	6500	8.37	6500.00	8.37	0.17	0.17	50.00	EC20 POPULATION
	10	1	0	4.89	6500	8.37	6500.00	8.37	0.16	0.16	54.00	LTV EC20 FISH
CHLORDANE	1	2	0	2.78	1500	248.94	17262.14	2864.80	.	.	.	NAWQ ADVISORY
	1	2	0	2.78	1500	248.94	17262.14	2864.80	1464.34	16851.77	0.17	NAWQ ACTUAL
	1	2	0	2.78	1500	248.94	17262.14	2864.80	995.75	11459.21	0.25	LTV EC20 FISH
	1	2	0	2.78	1500	248.94	17262.14	2864.80	497.88	5729.60	0.50	SS EC20
	1	2	0	2.78	1500	248.94	17262.14	2864.80	350.62	4034.93	0.71	EC20 POPULATION
	1	2	0	2.78	1500	248.94	17262.14	2864.80	155.59	1790.50	1.60	LCV FISH
	1	2	0	2.78	1500	248.94	17262.14	2864.80	20.57	236.76	12.10	LTV EC20 DAPHNID
	1	2	0	2.78	1500	248.94	17262.14	2864.80	15.56	179.05	16.00	LCV DAPHNIDS
	2	2	0	2.78	325	53.94	6047.34	1003.61	.	.	.	NAWQ ADVISORY
	2	2	0	2.78	325	53.94	6047.34	1003.61	317.27	5903.58	0.17	NAWQ ACTUAL
	2	2	0	2.78	325	53.94	6047.34	1003.61	215.75	4014.43	0.25	LTV EC20 FISH
	2	2	0	2.78	325	53.94	6047.34	1003.61	107.87	2007.22	0.50	SS EC20
	2	2	0	2.78	325	53.94	6047.34	1003.61	75.97	1413.53	0.71	EC20 POPULATION
	2	2	0	2.78	325	53.94	6047.34	1003.61	33.71	627.26	1.60	LCV FISH
	2	2	0	2.78	325	53.94	6047.34	1003.61	4.46	82.94	12.10	LTV EC20 DAPHNID
	2	2	0	2.78	325	53.94	6047.34	1003.61	3.37	62.73	16.00	LCV DAPHNIDS
	3	2	0	2.78	1350	224.04	14028.24	2328.11	.	.	.	NAWQ ADVISORY
	3	2	0	2.78	1350	224.04	14028.24	2328.11	1317.91	13694.75	0.17	NAWQ ACTUAL
	3	2	0	2.78	1350	224.04	14028.24	2328.11	896.18	9312.43	0.25	LTV EC20 FISH
	3	2	0	2.78	1350	224.04	14028.24	2328.11	448.09	4656.22	0.50	SS EC20
	3	2	0	2.78	1350	224.04	14028.24	2328.11	315.56	3279.03	0.71	EC20 POPULATION
	3	2	0	2.78	1350	224.04	14028.24	2328.11	140.03	1455.07	1.60	LCV FISH
	3	2	0	2.78	1350	224.04	14028.24	2328.11	18.52	192.41	12.10	LTV EC20 DAPHNID
	3	2	0	2.78	1350	224.04	14028.24	2328.11	14.00	145.51	16.00	LCV DAPHNIDS
	4	2	0	2.78	1200	199.15	47801.10	7933.01	.	.	.	NAWQ ADVISORY
	4	2	0	2.78	1200	199.15	47801.10	7933.01	1171.47	46664.75	0.17	NAWQ ACTUAL
	4	2	0	2.78	1200	199.15	47801.10	7933.01	796.60	31732.03	0.25	LTV EC20 FISH
	4	2	0	2.78	1200	199.15	47801.10	7933.01	398.30	15866.01	0.50	SS EC20
	4	2	0	2.78	1200	199.15	47801.10	7933.01	280.49	11173.25	0.71	EC20 POPULATION
	4	2	0	2.78	1200	199.15	47801.10	7933.01	124.47	4958.13	1.60	LCV FISH
	4	2	0	2.78	1200	199.15	47801.10	7933.01	16.46	655.62	12.10	LTV EC20 DAPHNID
	4	2	0	2.78	1200	199.15	47801.10	7933.01	12.45	495.81	16.00	LCV DAPHNIDS

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL[a] detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
CHLORDANE (continued)	5	2	0	2.78	1290	214.09	12323.49	2045.19	.	.	.	NAWQ ADVISORY
	5	2	0	2.78	1290	214.09	12323.49	2045.19	1259.33	12030.54	0.17	NAWQ ACTUAL
	5	2	0	2.78	1290	214.09	12323.49	2045.19	856.35	8180.76	0.25	LTV EC20 FISH
	5	2	0	2.78	1290	214.09	12323.49	2045.19	428.17	4090.38	0.50	SS EC20
	5	2	0	2.78	1290	214.09	12323.49	2045.19	301.53	2880.55	0.71	EC20 POPULATION
	5	2	0	2.78	1290	214.09	12323.49	2045.19	133.80	1278.24	1.60	LCV FISH
	5	2	0	2.78	1290	214.09	12323.49	2045.19	17.69	169.02	12.10	LTV EC20 DAPHNID
	5	2	0	2.78	1290	214.09	12323.49	2045.19	13.38	127.82	16.00	LCV DAPHNIDS
CHRYSENE	1	2	0	5.91	620	0.08	6993.39	0.86	.	.	.	NAWQ ADVISORY
	1	2	0	5.91	620	0.08	6993.39	0.86	.	.	.	NAWQ ACTUAL
	1	2	0	5.91	620	0.08	6993.39	0.86	.	.	.	LCV FISH
	1	2	0	5.91	620	0.08	6993.39	0.86	.	.	.	LCV DAPHNIDS
	1	2	0	5.91	620	0.08	6993.39	0.86	.	.	.	LTV EC20 FISH
	1	2	0	5.91	620	0.08	6993.39	0.86	.	.	.	LTV EC20 DAPHNID
	1	2	0	5.91	620	0.08	6993.39	0.86	.	.	.	SS EC20
	1	2	0	5.91	620	0.08	6993.39	0.86	.	.	.	EC20 POPULATION
	2	2	0	5.91	445	0.05	616.33	0.08	.	.	.	NAWQ ADVISORY
	2	2	0	5.91	445	0.05	616.33	0.08	.	.	.	NAWQ ACTUAL
	2	2	0	5.91	445	0.05	616.33	0.08	.	.	.	LCV FISH
	2	2	0	5.91	445	0.05	616.33	0.08	.	.	.	LCV DAPHNIDS
	2	2	0	5.91	445	0.05	616.33	0.08	.	.	.	LTV EC20 FISH
	2	2	0	5.91	445	0.05	616.33	0.08	.	.	.	LTV EC20 DAPHNID
	2	2	0	5.91	445	0.05	616.33	0.08	.	.	.	SS EC20
	2	2	0	5.91	445	0.05	616.33	0.08	.	.	.	EC20 POPULATION
	3	2	0	5.91	565	0.07	599.27	0.07	.	.	.	NAWQ ADVISORY
	3	2	0	5.91	565	0.07	599.27	0.07	.	.	.	NAWQ ACTUAL
	3	2	0	5.91	565	0.07	599.27	0.07	.	.	.	LCV FISH
	3	2	0	5.91	565	0.07	599.27	0.07	.	.	.	LCV DAPHNIDS
	3	2	0	5.91	565	0.07	599.27	0.07	.	.	.	LTV EC20 FISH
	3	2	0	5.91	565	0.07	599.27	0.07	.	.	.	LTV EC20 DAPHNID
	3	2	0	5.91	565	0.07	599.27	0.07	.	.	.	SS EC20
	3	2	0	5.91	565	0.07	599.27	0.07	.	.	.	EC20 POPULATION
	4	2	0	5.91	500	0.06	38534.72	4.74	.	.	.	NAWQ ADVISORY
	4	2	0	5.91	500	0.06	38534.72	4.74	.	.	.	NAWQ ACTUAL
	4	2	0	5.91	500	0.06	38534.72	4.74	.	.	.	LCV FISH
	4	2	0	5.91	500	0.06	38534.72	4.74	.	.	.	LCV DAPHNIDS
	4	2	0	5.91	500	0.06	38534.72	4.74	.	.	.	LTV EC20 FISH
	4	2	0	5.91	500	0.06	38534.72	4.74	.	.	.	LTV EC20 DAPHNID
	4	2	0	5.91	500	0.06	38534.72	4.74	.	.	.	SS EC20
	4	2	0	5.91	500	0.06	38534.72	4.74	.	.	.	EC20 POPULATION

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL* detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
CHRYSENE (continued)	5	4	0	5.91	855	0.11	6791.58	0.84	.	.	.	NAWQ ADVISORY
	5	4	0	5.91	855	0.11	6791.58	0.84	.	.	.	NAWQ ACTUAL
	5	4	0	5.91	855	0.11	6791.58	0.84	.	.	.	LCV FISH
	5	4	0	5.91	855	0.11	6791.58	0.84	.	.	.	LCV DAPHNIDS
	5	4	0	5.91	855	0.11	6791.58	0.84	.	.	.	LTV EC20 FISH
	5	4	0	5.91	855	0.11	6791.58	0.84	.	.	.	LTV EC20 DAPHNID
	5	4	0	5.91	855	0.11	6791.58	0.84	.	.	.	SS EC20
	5	4	0	5.91	855	0.11	6791.58	0.84	.	.	.	EC20 POPULATION
	10	1	0	5.91	6500	0.80	6500.00	0.80	.	.	.	NAWQ ADVISORY
	10	1	0	5.91	6500	0.80	6500.00	0.80	.	.	.	NAWQ ACTUAL
	10	1	0	5.91	6500	0.80	6500.00	0.80	.	.	.	LCV FISH
	10	1	0	5.91	6500	0.80	6500.00	0.80	.	.	.	LCV DAPHNIDS
	10	1	0	5.91	6500	0.80	6500.00	0.80	.	.	.	LTV EC20 FISH
	10	1	0	5.91	6500	0.80	6500.00	0.80	.	.	.	LTV EC20 DAPHNID
	10	1	0	5.91	6500	0.80	6500.00	0.80	.	.	.	SS EC20
	10	1	0	5.91	6500	0.80	6500.00	0.80	.	.	.	EC20 POPULATION
DI-N-BUTYLPHTHALATE	1	2	0	5.20	620	0.39	6993.39	4.41	.	.	.	NAWQ ACTUAL
	1	2	0	5.20	620	0.39	6993.39	4.41	.	.	.	SS EC20
	1	2	0	5.20	620	0.39	6993.39	4.41	0.09	1.00	4.40	NAWQ ADVISORY
	1	2	0	5.20	620	0.39	6993.39	4.41	0.00	0.02	251.00	EC20 POPULATION
	1	2	0	5.20	620	0.39	6993.39	4.41	0.00	0.02	270.00	LTV EC20 FISH
	1	2	0	5.20	620	0.39	6993.39	4.41	0.00	0.01	500.00	LTV EC20 DAPHNID
	1	2	0	5.20	620	0.39	6993.39	4.41	0.00	0.01	717.00	LCV FISH
	1	2	0	5.20	620	0.39	6993.39	4.41	0.00	0.01	717.00	LCV DAPHNIDS
	2	2	0	5.20	445	0.28	616.33	0.39	.	.	.	NAWQ ACTUAL
	2	2	0	5.20	445	0.28	616.33	0.39	.	.	.	SS EC20
	2	2	0	5.20	445	0.28	616.33	0.39	0.06	0.09	4.40	NAWQ ADVISORY
	2	2	0	5.20	445	0.28	616.33	0.39	0.00	0.00	251.00	EC20 POPULATION
	2	2	0	5.20	445	0.28	616.33	0.39	0.00	0.00	270.00	LTV EC20 FISH
	2	2	0	5.20	445	0.28	616.33	0.39	0.00	0.00	500.00	LTV EC20 DAPHNID
	2	2	0	5.20	445	0.28	616.33	0.39	0.00	0.00	717.00	LCV FISH
	2	2	0	5.20	445	0.28	616.33	0.39	0.00	0.00	717.00	LCV DAPHNIDS
	3	2	0	5.20	565	0.36	599.27	0.38	.	.	.	NAWQ ACTUAL
	3	2	0	5.20	565	0.36	599.27	0.38	.	.	.	SS EC20
	3	2	0	5.20	565	0.36	599.27	0.38	0.08	0.09	4.40	NAWQ ADVISORY
	3	2	0	5.20	565	0.36	599.27	0.38	0.00	0.00	251.00	EC20 POPULATION
	3	2	0	5.20	565	0.36	599.27	0.38	0.00	0.00	270.00	LTV EC20 FISH
	3	2	0	5.20	565	0.36	599.27	0.38	0.00	0.00	500.00	LTV EC20 DAPHNID
	3	2	0	5.20	565	0.36	599.27	0.38	0.00	0.00	717.00	LCV FISH
	3	2	0	5.20	565	0.36	599.27	0.38	0.00	0.00	717.00	LCV DAPHNIDS

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL[a] detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
DI-N-BUTYLPHTHALATE (continued)	4	2	0	5.20	500	0.32	38534.72	24.31	.	.	.	NAWQ ACTUAL
	4	2	0	5.20	500	0.32	38534.72	24.31	.	.	.	SS EC20
	4	2	0	5.20	500	0.32	38534.72	24.31	0.07	5.53	4.40	NAWQ ADVISORY
	4	2	0	5.20	500	0.32	38534.72	24.31	0.00	0.10	251.00	EC20 POPULATION
	4	2	0	5.20	500	0.32	38534.72	24.31	0.00	0.09	270.00	LTV EC20 FISH
	4	2	0	5.20	500	0.32	38534.72	24.31	0.00	0.05	500.00	LTV EC20 DAPHNID
	4	2	0	5.20	500	0.32	38534.72	24.31	0.00	0.03	717.00	LCV FISH
	4	2	0	5.20	500	0.32	38534.72	24.31	0.00	0.03	717.00	LCV DAPHNIDS
	5	4	0	5.20	855	0.54	6848.50	4.32	.	.	.	NAWQ ACTUAL
	5	4	0	5.20	855	0.54	6848.50	4.32	.	.	.	SS EC20
	5	4	0	5.20	855	0.54	6848.50	4.32	0.12	0.98	4.40	NAWQ ADVISORY
	5	4	0	5.20	855	0.54	6848.50	4.32	0.00	0.02	251.00	EC20 POPULATION
	5	4	0	5.20	855	0.54	6848.50	4.32	0.00	0.02	270.00	LTV EC20 FISH
	5	4	0	5.20	855	0.54	6848.50	4.32	0.00	0.01	500.00	LTV EC20 DAPHNID
	5	4	0	5.20	855	0.54	6848.50	4.32	0.00	0.01	717.00	LCV FISH
	5	4	0	5.20	855	0.54	6848.50	4.32	0.00	0.01	717.00	LCV DAPHNIDS
	10	1	0	5.20	6500	4.10	6500.00	4.10	.	.	.	NAWQ ACTUAL
	10	1	0	5.20	6500	4.10	6500.00	4.10	.	.	.	SS EC20
	10	1	0	5.20	6500	4.10	6500.00	4.10	0.93	0.93	4.40	NAWQ ADVISORY
	10	1	0	5.20	6500	4.10	6500.00	4.10	0.02	0.02	251.00	EC20 POPULATION
	10	1	0	5.20	6500	4.10	6500.00	4.10	0.02	0.02	270.00	LTV EC20 FISH
	10	1	0	5.20	6500	4.10	6500.00	4.10	0.01	0.01	500.00	LTV EC20 DAPHNID
	10	1	0	5.20	6500	4.10	6500.00	4.10	0.01	0.01	717.00	LCV FISH
	10	1	0	5.20	6500	4.10	6500.00	4.10	0.01	0.01	717.00	LCV DAPHNIDS
DI-N-OCTYLPHTHALATE	1	2	0	5.55	620	0.17	6993.39	1.97	.	.	.	NAWQ ADVISORY
	1	2	0	5.55	620	0.17	6993.39	1.97	.	.	.	NAWQ ACTUAL
	1	2	0	5.55	620	0.17	6993.39	1.97	.	.	.	SS EC20
	1	2	0	5.55	620	0.17	6993.39	1.97	0.00	0.02	100.00	LTV EC20 FISH
	1	2	0	5.55	620	0.17	6993.39	1.97	0.00	0.01	310.00	LTV EC20 DAPHNID
	1	2	0	5.55	620	0.17	6993.39	1.97	0.00	0.00	570.00	LCV DAPHNIDS
	1	2	0	5.55	620	0.17	6993.39	1.97	0.00	0.00	1995.00	EC20 POPULATION
	1	2	0	5.55	620	0.17	6993.39	1.97	0.00	0.00	5700.00	LCV FISH
	2	2	0	5.55	445	0.13	616.33	0.17	.	.	.	NAWQ ADVISORY
	2	2	0	5.55	445	0.13	616.33	0.17	.	.	.	NAWQ ACTUAL
	2	2	0	5.55	445	0.13	616.33	0.17	.	.	.	SS EC20
	2	2	0	5.55	445	0.13	616.33	0.17	0.00	0.00	100.00	LTV EC20 FISH
	2	2	0	5.55	445	0.13	616.33	0.17	0.00	0.00	310.00	LTV EC20 DAPHNID
	2	2	0	5.55	445	0.13	616.33	0.17	0.00	0.00	570.00	LCV DAPHNIDS
	2	2	0	5.55	445	0.13	616.33	0.17	0.00	0.00	1995.00	EC20 POPULATION
	2	2	0	5.55	445	0.13	616.33	0.17	0.00	0.00	5700.00	LCV FISH
	2	2	0	5.55	445	0.13	616.33	0.17	0.00	0.00	5700.00	LCV FISH

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL* detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
DI-N-OCTYLPHTHALATE (continued)	3	2	0	5.55	565	0.16	599.27	0.17	.	.	.	NAWQ ADVISORY
	3	2	0	5.55	565	0.16	599.27	0.17	.	.	.	NAWQ ACTUAL
	3	2	0	5.55	565	0.16	599.27	0.17	.	.	.	SS EC20
	3	2	0	5.55	565	0.16	599.27	0.17	0.00	0.00	100.00	LTV EC20 FISH
	3	2	0	5.55	565	0.16	599.27	0.17	0.00	0.00	310.00	LTV EC20 DAPHNID
	3	2	0	5.55	565	0.16	599.27	0.17	0.00	0.00	570.00	LCV DAPHNIDS
	3	2	0	5.55	565	0.16	599.27	0.17	0.00	0.00	1995.00	EC20 POPULATION
	3	2	0	5.55	565	0.16	599.27	0.17	0.00	0.00	5700.00	LCV FISH
	4	2	0	5.55	500	0.14	38534.72	10.86	.	.	.	NAWQ ADVISORY
	4	2	0	5.55	500	0.14	38534.72	10.86	.	.	.	NAWQ ACTUAL
	4	2	0	5.55	500	0.14	38534.72	10.86	.	.	.	SS EC20
	4	2	0	5.55	500	0.14	38534.72	10.86	0.00	0.11	100.00	LTV EC20 FISH
	4	2	0	5.55	500	0.14	38534.72	10.86	0.00	0.04	310.00	LTV EC20 DAPHNID
	4	2	0	5.55	500	0.14	38534.72	10.86	0.00	0.02	570.00	LCV DAPHNIDS
	4	2	0	5.55	500	0.14	38534.72	10.86	0.00	0.01	1995.00	EC20 POPULATION
	4	2	0	5.55	500	0.14	38534.72	10.86	0.00	0.00	5700.00	LCV FISH
	5	4	0	5.55	855	0.24	6848.50	1.93	.	.	.	NAWQ ADVISORY
	5	4	0	5.55	855	0.24	6848.50	1.93	.	.	.	NAWQ ACTUAL
	5	4	0	5.55	855	0.24	6848.50	1.93	.	.	.	SS EC20
	5	4	0	5.55	855	0.24	6848.50	1.93	0.00	0.02	100.00	LTV EC20 FISH
	5	4	0	5.55	855	0.24	6848.50	1.93	0.00	0.01	310.00	LTV EC20 DAPHNID
	5	4	0	5.55	855	0.24	6848.50	1.93	0.00	0.00	570.00	LCV DAPHNIDS
	5	4	0	5.55	855	0.24	6848.50	1.93	0.00	0.00	1995.00	EC20 POPULATION
	5	4	0	5.55	855	0.24	6848.50	1.93	0.00	0.00	5700.00	LCV FISH
	10	1	0	5.55	6500	1.83	6500.00	1.83	.	.	.	NAWQ ADVISORY
	10	1	0	5.55	6500	1.83	6500.00	1.83	.	.	.	NAWQ ACTUAL
	10	1	0	5.55	6500	1.83	6500.00	1.83	.	.	.	SS EC20
	10	1	0	5.55	6500	1.83	6500.00	1.83	0.02	0.02	100.00	LTV EC20 FISH
	10	1	0	5.55	6500	1.83	6500.00	1.83	0.01	0.01	310.00	LTV EC20 DAPHNID
	10	1	0	5.55	6500	1.83	6500.00	1.83	0.00	0.00	570.00	LCV DAPHNIDS
	10	1	0	5.55	6500	1.83	6500.00	1.83	0.00	0.00	1995.00	EC20 POPULATION
	10	1	0	5.55	6500	1.83	6500.00	1.83	0.00	0.00	5700.00	LCV FISH
DIBENZOFURAN	1	2	0	4.12	620	4.70	6993.39	53.05	.	.	.	NAWQ ACTUAL
	1	2	0	4.12	620	4.70	6993.39	53.05	.	.	.	LCV FISH
	1	2	0	4.12	620	4.70	6993.39	53.05	.	.	.	LTV EC20 FISH
	1	2	0	4.12	620	4.70	6993.39	53.05	.	.	.	LTV EC20 DAPHNID
	1	2	0	4.12	620	4.70	6993.39	53.05	.	.	.	SS EC20
	1	2	0	4.12	620	4.70	6993.39	53.05	.	.	.	EC20 POPULATION
	1	2	0	4.12	620	4.70	6993.39	53.05	2.35	26.53	2.00	NAWQ ADVISORY
	1	2	0	4.12	620	4.70	6993.39	53.05	0.00	0.05	1003.00	LCV DAPHNIDS

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL* detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark type
DIBENZOFURAN (continued)	2	2	0	4.12	445	3.38	616.33	4.68	.	.	NAWQ ACTUAL
	2	2	0	4.12	445	3.38	616.33	4.68	.	.	LCV FISH
	2	2	0	4.12	445	3.38	616.33	4.68	.	.	LTV EC20 FISH
	2	2	0	4.12	445	3.38	616.33	4.68	.	.	LTV EC20 DAPHNID
	2	2	0	4.12	445	3.38	616.33	4.68	.	.	SS EC20
	2	2	0	4.12	445	3.38	616.33	4.68	.	.	EC20 POPULATION
	2	2	0	4.12	445	3.38	616.33	4.68	1.69	2.34	2.00 NAWQ ADVISORY
	2	2	0	4.12	445	3.38	616.33	4.68	0.00	0.00	1003.00 LCV DAPHNIDS
	3	2	0	4.12	565	4.29	599.27	4.55	.	.	NAWQ ACTUAL
	3	2	0	4.12	565	4.29	599.27	4.55	.	.	LCV FISH
	3	2	0	4.12	565	4.29	599.27	4.55	.	.	LTV EC20 FISH
	3	2	0	4.12	565	4.29	599.27	4.55	.	.	LTV EC20 DAPHNID
	3	2	0	4.12	565	4.29	599.27	4.55	.	.	SS EC20
	3	2	0	4.12	565	4.29	599.27	4.55	.	.	EC20 POPULATION
	3	2	0	4.12	565	4.29	599.27	4.55	2.14	2.27	2.00 NAWQ ADVISORY
	3	2	0	4.12	565	4.29	599.27	4.55	0.00	0.00	1003.00 LCV DAPHNIDS
	4	2	0	4.12	500	3.79	38534.72	292.32	.	.	NAWQ ACTUAL
	4	2	0	4.12	500	3.79	38534.72	292.32	.	.	LCV FISH
	4	2	0	4.12	500	3.79	38534.72	292.32	.	.	LTV EC20 FISH
	4	2	0	4.12	500	3.79	38534.72	292.32	.	.	LTV EC20 DAPHNID
	4	2	0	4.12	500	3.79	38534.72	292.32	.	.	SS EC20
	4	2	0	4.12	500	3.79	38534.72	292.32	.	.	EC20 POPULATION
	4	2	0	4.12	500	3.79	38534.72	292.32	1.90	146.16	2.00 NAWQ ADVISORY
	4	2	0	4.12	500	3.79	38534.72	292.32	0.00	0.29	1003.00 LCV DAPHNIDS
	5	4	0	4.12	855	6.49	6848.50	51.95	.	.	NAWQ ACTUAL
	5	4	0	4.12	855	6.49	6848.50	51.95	.	.	LCV FISH
	5	4	0	4.12	855	6.49	6848.50	51.95	.	.	LTV EC20 FISH
	5	4	0	4.12	855	6.49	6848.50	51.95	.	.	LTV EC20 DAPHNID
	5	4	0	4.12	855	6.49	6848.50	51.95	.	.	SS EC20
	5	4	0	4.12	855	6.49	6848.50	51.95	.	.	EC20 POPULATION
	5	4	0	4.12	855	6.49	6848.50	51.95	3.24	25.98	2.00 NAWQ ADVISORY
	5	4	0	4.12	855	6.49	6848.50	51.95	0.01	0.05	1003.00 LCV DAPHNIDS
	10	1	0	4.12	6500	49.31	6500.00	49.31	.	.	NAWQ ACTUAL
	10	1	0	4.12	6500	49.31	6500.00	49.31	.	.	LCV FISH
	10	1	0	4.12	6500	49.31	6500.00	49.31	.	.	LTV EC20 FISH
	10	1	0	4.12	6500	49.31	6500.00	49.31	.	.	LTV EC20 DAPHNID
	10	1	0	4.12	6500	49.31	6500.00	49.31	.	.	SS EC20
	10	1	0	4.12	6500	49.31	6500.00	49.31	.	.	EC20 POPULATION
	10	1	0	4.12	6500	49.31	6500.00	49.31	24.65	24.65	2.00 NAWQ ADVISORY
	10	1	0	4.12	6500	49.31	6500.00	49.31	0.05	0.05	1003.00 LCV DAPHNIDS

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL[a] detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
DIETHYLPHTHALATE	1	2	0	2.47	620	210.08	6993.39	2369.67	.	.	.	NAWQ ACTUAL
	1	2	0	2.47	620	210.08	6993.39	2369.67	.	.	.	LCV FISH
	1	2	0	2.47	620	210.08	6993.39	2369.67	.	.	.	LCV DAPHNIDS
	1	2	0	2.47	620	210.08	6993.39	2369.67	.	.	.	LTV EC20 FISH
	1	2	0	2.47	620	210.08	6993.39	2369.67	.	.	.	LTV EC20 DAPHNID
	1	2	0	2.47	620	210.08	6993.39	2369.67	.	.	.	SS EC20
	1	2	0	2.47	620	210.08	6993.39	2369.67	7.78	87.77	27.00	NAWQ ADVISORY
	1	2	0	2.47	620	210.08	6993.39	2369.67	0.21	2.37	1000.00	EC20 POPULATION
	2	2	0	2.47	445	150.79	616.33	208.84	.	.	.	NAWQ ACTUAL
	2	2	0	2.47	445	150.79	616.33	208.84	.	.	.	LCV FISH
	2	2	0	2.47	445	150.79	616.33	208.84	.	.	.	LCV DAPHNIDS
	2	2	0	2.47	445	150.79	616.33	208.84	.	.	.	LTV EC20 FISH
	2	2	0	2.47	445	150.79	616.33	208.84	.	.	.	LTV EC20 DAPHNID
	2	2	0	2.47	445	150.79	616.33	208.84	.	.	.	SS EC20
	2	2	0	2.47	445	150.79	616.33	208.84	5.58	7.73	27.00	NAWQ ADVISORY
	2	2	0	2.47	445	150.79	616.33	208.84	0.15	0.21	1000.00	EC20 POPULATION
	3	2	0	2.47	565	191.45	599.27	203.06	.	.	.	NAWQ ACTUAL
	3	2	0	2.47	565	191.45	599.27	203.06	.	.	.	LCV FISH
	3	2	0	2.47	565	191.45	599.27	203.06	.	.	.	LCV DAPHNIDS
	3	2	0	2.47	565	191.45	599.27	203.06	.	.	.	LTV EC20 FISH
	3	2	0	2.47	565	191.45	599.27	203.06	.	.	.	LTV EC20 DAPHNID
	3	2	0	2.47	565	191.45	599.27	203.06	.	.	.	SS EC20
	3	2	0	2.47	565	191.45	599.27	203.06	7.09	7.52	27.00	NAWQ ADVISORY
	3	2	0	2.47	565	191.45	599.27	203.06	0.19	0.20	1000.00	EC20 POPULATION
	4	2	0	2.47	500	169.42	38534.72	13057.26	.	.	.	NAWQ ACTUAL
	4	2	0	2.47	500	169.42	38534.72	13057.26	.	.	.	LCV FISH
	4	2	0	2.47	500	169.42	38534.72	13057.26	.	.	.	LCV DAPHNIDS
	4	2	0	2.47	500	169.42	38534.72	13057.26	.	.	.	LTV EC20 FISH
	4	2	0	2.47	500	169.42	38534.72	13057.26	.	.	.	LTV EC20 DAPHNID
	4	2	0	2.47	500	169.42	38534.72	13057.26	.	.	.	SS EC20
	4	2	0	2.47	500	169.42	38534.72	13057.26	6.27	483.60	27.00	NAWQ ADVISORY
	4	2	0	2.47	500	169.42	38534.72	13057.26	0.17	13.06	1000.00	EC20 POPULATION
	5	4	0	2.47	855	289.71	6848.50	2320.58	.	.	.	NAWQ ACTUAL
	5	4	0	2.47	855	289.71	6848.50	2320.58	.	.	.	LCV FISH
	5	4	0	2.47	855	289.71	6848.50	2320.58	.	.	.	LCV DAPHNIDS
	5	4	0	2.47	855	289.71	6848.50	2320.58	.	.	.	LTV EC20 FISH
	5	4	0	2.47	855	289.71	6848.50	2320.58	.	.	.	LTV EC20 DAPHNID
	5	4	0	2.47	855	289.71	6848.50	2320.58	.	.	.	SS EC20
	5	4	0	2.47	855	289.71	6848.50	2320.58	10.73	85.95	27.00	NAWQ ADVISORY
	5	4	0	2.47	855	289.71	6848.50	2320.58	0.29	2.32	1000.00	EC20 POPULATION

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL* detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
DIETHYLPHTHALATE (continued)	10	1	0	2.47	6500	2202.49	6500.00	2202.49	.	.	.	NAWQ ACTUAL
	10	1	0	2.47	6500	2202.49	6500.00	2202.49	.	.	.	LCV FISH
	10	1	0	2.47	6500	2202.49	6500.00	2202.49	.	.	.	LCV DAPHNIDS
	10	1	0	2.47	6500	2202.49	6500.00	2202.49	.	.	.	LTV EC20 FISH
	10	1	0	2.47	6500	2202.49	6500.00	2202.49	.	.	.	LTV EC20 DAPHNID
	10	1	0	2.47	6500	2202.49	6500.00	2202.49	.	.	.	SS EC20
	10	1	0	2.47	6500	2202.49	6500.00	2202.49	81.57	81.57	27.00	NAWQ ADVISORY
	10	1	0	2.47	6500	2202.49	6500.00	2202.49	2.20	2.20	1000.00	EC20 POPULATION
FLUORANTHENE	1	2	0	4.90	620	0.78	6993.39	8.80	.	.	.	NAWQ ACTUAL
	1	2	0	4.90	620	0.78	6993.39	8.80	.	.	.	LCV FISH
	1	2	0	4.90	620	0.78	6993.39	8.80	.	.	.	LTV EC20 FISH
	1	2	0	4.90	620	0.78	6993.39	8.80	.	.	.	LTV EC20 DAPHNID
	1	2	0	4.90	620	0.78	6993.39	8.80	.	.	.	SS EC20
	1	2	0	4.90	620	0.78	6993.39	8.80	0.46	5.18	1.70	NAWQ ADVISORY
	1	2	0	4.90	620	0.78	6993.39	8.80	0.02	0.28	32.00	EC20 POPULATION
	1	2	0	4.90	620	0.78	6993.39	8.80	0.00	0.00	65795.00	LCV DAPHNIDS
	2	2	0	4.90	445	0.56	616.33	0.78	.	.	.	NAWQ ACTUAL
	2	2	0	4.90	445	0.56	616.33	0.78	.	.	.	LCV FISH
	2	2	0	4.90	445	0.56	616.33	0.78	.	.	.	LTV EC20 FISH
	2	2	0	4.90	445	0.56	616.33	0.78	.	.	.	LTV EC20 DAPHNID
	2	2	0	4.90	445	0.56	616.33	0.78	.	.	.	SS EC20
	2	2	0	4.90	445	0.56	616.33	0.78	0.33	0.46	1.70	NAWQ ADVISORY
	2	2	0	4.90	445	0.56	616.33	0.78	0.02	0.02	32.00	EC20 POPULATION
	2	2	0	4.90	445	0.56	616.33	0.78	0.00	0.00	65795.00	LCV DAPHNIDS
	4	2	0	4.90	500	0.63	38534.72	48.51	.	.	.	NAWQ ACTUAL
	4	2	0	4.90	500	0.63	38534.72	48.51	.	.	.	LCV FISH
	4	2	0	4.90	500	0.63	38534.72	48.51	.	.	.	LTV EC20 FISH
	4	2	0	4.90	500	0.63	38534.72	48.51	.	.	.	LTV EC20 DAPHNID
	4	2	0	4.90	500	0.63	38534.72	48.51	.	.	.	SS EC20
	4	2	0	4.90	500	0.63	38534.72	48.51	0.37	28.54	1.70	NAWQ ADVISORY
	4	2	0	4.90	500	0.63	38534.72	48.51	0.02	1.52	32.00	EC20 POPULATION
	4	2	0	4.90	500	0.63	38534.72	48.51	0.00	0.00	65795.00	LCV DAPHNIDS
	5	4	0	4.90	855	1.08	6848.50	8.62	.	.	.	NAWQ ACTUAL
	5	4	0	4.90	855	1.08	6848.50	8.62	.	.	.	LCV FISH
	5	4	0	4.90	855	1.08	6848.50	8.62	.	.	.	LTV EC20 FISH
	5	4	0	4.90	855	1.08	6848.50	8.62	.	.	.	LTV EC20 DAPHNID
	5	4	0	4.90	855	1.08	6848.50	8.62	.	.	.	SS EC20
	5	4	0	4.90	855	1.08	6848.50	8.62	0.63	5.07	1.70	NAWQ ADVISORY
	5	4	0	4.90	855	1.08	6848.50	8.62	0.03	0.27	32.00	EC20 POPULATION
	5	4	0	4.90	855	1.08	6848.50	8.62	0.00	0.00	65795.00	LCV DAPHNIDS

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL[a] detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
FLUORANTHENE (continued)	10	1	0	4.90	6500	8.18	6500.00	8.18	.	.	.	NAWQ ACTUAL
	10	1	0	4.90	6500	8.18	6500.00	8.18	.	.	.	LCV FISH
	10	1	0	4.90	6500	8.18	6500.00	8.18	.	.	.	LTV EC20 FISH
	10	1	0	4.90	6500	8.18	6500.00	8.18	.	.	.	LTV EC20 DAPHNID
	10	1	0	4.90	6500	8.18	6500.00	8.18	.	.	.	SS EC20
	10	1	0	4.90	6500	8.18	6500.00	8.18	4.81	4.81	1.70	NAWQ ADVISORY
	10	1	0	4.90	6500	8.18	6500.00	8.18	0.26	0.26	32.00	EC20 POPULATION
	10	1	0	4.90	6500	8.18	6500.00	8.18	0.00	0.00	65795.00	LCV DAPHNIDS
GAMMA-BHC (LINDANE)	1	2	0	3.72	150	2.86	1726.21	32.89	.	.	.	NAWQ ACTUAL
	1	2	0	3.72	150	2.86	1726.21	32.89	.	.	.	EC20 POPULATION
	1	2	0	3.72	150	2.86	1726.21	32.89	35.73	411.15	0.08	NAWQ ADVISORY
	1	2	0	3.72	150	2.86	1726.21	32.89	25.98	299.02	0.11	SS EC20
	1	2	0	3.72	150	2.86	1726.21	32.89	2.60	29.90	1.10	LTV EC20 FISH
	1	2	0	3.72	150	2.86	1726.21	32.89	0.26	2.99	11.00	LTV EC20 DAPHNID
	1	2	0	3.72	150	2.86	1726.21	32.89	0.20	2.27	14.50	LCV DAPHNIDS
	1	2	0	3.72	150	2.86	1726.21	32.89	0.20	2.25	14.60	LCV FISH
	2	2	0	3.72	35	0.67	590.10	11.24	.	.	.	NAWQ ACTUAL
	2	2	0	3.72	35	0.67	590.10	11.24	.	.	.	EC20 POPULATION
	2	2	0	3.72	35	0.67	590.10	11.24	8.34	140.55	0.08	NAWQ ADVISORY
	2	2	0	3.72	35	0.67	590.10	11.24	6.06	102.22	0.11	SS EC20
	2	2	0	3.72	35	0.67	590.10	11.24	0.61	10.22	1.10	LTV EC20 FISH
	2	2	0	3.72	35	0.67	590.10	11.24	0.06	1.02	11.00	LTV EC20 DAPHNID
	2	2	0	3.72	35	0.67	590.10	11.24	0.05	0.78	14.50	LCV DAPHNIDS
	2	2	0	3.72	35	0.67	590.10	11.24	0.05	0.77	14.60	LCV FISH
	3	2	0	3.72	135	2.57	1402.82	26.73	.	.	.	NAWQ ACTUAL
	3	2	0	3.72	135	2.57	1402.82	26.73	.	.	.	EC20 POPULATION
	3	2	0	3.72	135	2.57	1402.82	26.73	32.15	334.13	0.08	NAWQ ADVISORY
	3	2	0	3.72	135	2.57	1402.82	26.73	23.39	243.00	0.11	SS EC20
	3	2	0	3.72	135	2.57	1402.82	26.73	2.34	24.30	1.10	LTV EC20 FISH
	3	2	0	3.72	135	2.57	1402.82	26.73	0.23	2.43	11.00	LTV EC20 DAPHNID
	3	2	0	3.72	135	2.57	1402.82	26.73	0.18	1.84	14.50	LCV DAPHNIDS
	3	2	0	3.72	135	2.57	1402.82	26.73	0.18	1.83	14.60	LCV FISH
	4	2	0	3.72	120	2.29	4780.11	91.08	.	.	.	NAWQ ACTUAL
	4	2	0	3.72	120	2.29	4780.11	91.08	.	.	.	EC20 POPULATION
	4	2	0	3.72	120	2.29	4780.11	91.08	28.58	1138.54	0.08	NAWQ ADVISORY
	4	2	0	3.72	120	2.29	4780.11	91.08	20.79	828.03	0.11	SS EC20
	4	2	0	3.72	120	2.29	4780.11	91.08	2.08	82.80	1.10	LTV EC20 FISH
	4	2	0	3.72	120	2.29	4780.11	91.08	0.21	8.28	11.00	LTV EC20 DAPHNID
	4	2	0	3.72	120	2.29	4780.11	91.08	0.16	6.28	14.50	LCV DAPHNIDS
	4	2	0	3.72	120	2.29	4780.11	91.08	0.16	6.24	14.60	LCV FISH

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL* detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
GAMMA-BHC (LINDANE) (continued)	5	2	0	3.72	129	2.46	1232.35	23.48	.	.	.	NAWQ ACTUAL
	5	2	0	3.72	129	2.46	1232.35	23.48	.	.	.	EC20 POPULATION
	5	2	0	3.72	129	2.46	1232.35	23.48	30.73	293.52	0.08	NAWQ ADVISORY
	5	2	0	3.72	129	2.46	1232.35	23.48	22.35	213.47	0.11	SS EC20
	5	2	0	3.72	129	2.46	1232.35	23.48	2.23	21.35	1.10	LTV EC20 FISH
	5	2	0	3.72	129	2.46	1232.35	23.48	0.22	2.13	11.00	LTV EC20 DAPHNID
	5	2	0	3.72	129	2.46	1232.35	23.48	0.17	1.62	14.50	LCV DAPHNIDS
	5	2	0	3.72	129	2.46	1232.35	23.48	0.17	1.61	14.60	LCV FISH
HEPTACHLOR	1	2	0	5.44	150	0.05	1726.21	0.63	.	.	.	NAWQ ACTUAL
	1	2	0	5.44	150	0.05	1726.21	0.63	.	.	.	LTV EC20 DAPHNID
	1	2	0	5.44	150	0.05	1726.21	0.63	13.62	156.69	0.00	SS EC20
	1	2	0	5.44	150	0.05	1726.21	0.63	5.45	62.68	0.01	NAWQ ADVISORY
	1	2	0	5.44	150	0.05	1726.21	0.63	0.54	6.27	0.10	EC20 POPULATION
	1	2	0	5.44	150	0.05	1726.21	0.63	0.06	0.73	0.86	LTV EC20 FISH
	1	2	0	5.44	150	0.05	1726.21	0.63	0.04	0.50	1.26	LCV FISH
	1	2	0	5.44	150	0.05	1726.21	0.63	0.02	0.20	3.18	LCV DAPHNIDS
	2	2	0	5.44	35	0.01	590.10	0.21	.	.	.	NAWQ ACTUAL
	2	2	0	5.44	35	0.01	590.10	0.21	.	.	.	LTV EC20 DAPHNID
	2	2	0	5.44	35	0.01	590.10	0.21	3.18	53.56	0.00	SS EC20
	2	2	0	5.44	35	0.01	590.10	0.21	1.27	21.43	0.01	NAWQ ADVISORY
	2	2	0	5.44	35	0.01	590.10	0.21	0.13	2.14	0.10	EC20 POPULATION
	2	2	0	5.44	35	0.01	590.10	0.21	0.01	0.25	0.86	LTV EC20 FISH
	2	2	0	5.44	35	0.01	590.10	0.21	0.01	0.17	1.26	LCV FISH
	2	2	0	5.44	35	0.01	590.10	0.21	0.00	0.07	3.18	LCV DAPHNIDS
	3	2	0	5.44	135	0.05	1402.82	0.51	.	.	.	NAWQ ACTUAL
	3	2	0	5.44	135	0.05	1402.82	0.51	.	.	.	LTV EC20 DAPHNID
	3	2	0	5.44	135	0.05	1402.82	0.51	12.25	127.33	0.00	SS EC20
	3	2	0	5.44	135	0.05	1402.82	0.51	4.90	50.93	0.01	NAWQ ADVISORY
	3	2	0	5.44	135	0.05	1402.82	0.51	0.49	5.09	0.10	EC20 POPULATION
	3	2	0	5.44	135	0.05	1402.82	0.51	0.06	0.59	0.86	LTV EC20 FISH
	3	2	0	5.44	135	0.05	1402.82	0.51	0.04	0.40	1.26	LCV FISH
	3	2	0	5.44	135	0.05	1402.82	0.51	0.02	0.16	3.18	LCV DAPHNIDS
	4	2	0	5.44	120	0.04	4780.11	1.74	.	.	.	NAWQ ACTUAL
	4	2	0	5.44	120	0.04	4780.11	1.74	.	.	.	LTV EC20 DAPHNID
	4	2	0	5.44	120	0.04	4780.11	1.74	10.89	433.89	0.00	SS EC20
	4	2	0	5.44	120	0.04	4780.11	1.74	4.36	173.56	0.01	NAWQ ADVISORY
	4	2	0	5.44	120	0.04	4780.11	1.74	0.44	17.36	0.10	EC20 POPULATION
	4	2	0	5.44	120	0.04	4780.11	1.74	0.05	2.02	0.86	LTV EC20 FISH
	4	2	0	5.44	120	0.04	4780.11	1.74	0.03	1.38	1.26	LCV FISH
	4	2	0	5.44	120	0.04	4780.11	1.74	0.01	0.55	3.18	LCV DAPHNIDS

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL[a] detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
HEPTACHLOR (continued)	5	2	0	5.44	129	0.05	1232.35	0.45	.	.	.	NAWQ ACTUAL
	5	2	0	5.44	129	0.05	1232.35	0.45	.	.	.	LTV EC20 DAPHNID
	5	2	0	5.44	129	0.05	1232.35	0.45	11.71	111.86	0.00	SS EC20
	5	2	0	5.44	129	0.05	1232.35	0.45	4.68	44.74	0.01	NAWQ ADVISORY
	5	2	0	5.44	129	0.05	1232.35	0.45	0.47	4.47	0.10	EC20 POPULATION
	5	2	0	5.44	129	0.05	1232.35	0.45	0.05	0.52	0.86	LTV EC20 FISH
	5	2	0	5.44	129	0.05	1232.35	0.45	0.04	0.36	1.26	LCV FISH
	5	2	0	5.44	129	0.05	1232.35	0.45	0.01	0.14	3.18	LCV DAPHNIDS
INDENO(1,2,3-CD)PYRENE	1	2	0	6.58	620	0.02	6993.39	0.18	.	.	.	NAWQ ADVISORY
	1	2	0	6.58	620	0.02	6993.39	0.18	.	.	.	NAWQ ACTUAL
	1	2	0	6.58	620	0.02	6993.39	0.18	.	.	.	LCV FISH
	1	2	0	6.58	620	0.02	6993.39	0.18	.	.	.	LCV DAPHNIDS
	1	2	0	6.58	620	0.02	6993.39	0.18	.	.	.	LTV EC20 FISH
	1	2	0	6.58	620	0.02	6993.39	0.18	.	.	.	LTV EC20 DAPHNID
	1	2	0	6.58	620	0.02	6993.39	0.18	.	.	.	SS EC20
	1	2	0	6.58	620	0.02	6993.39	0.18	.	.	.	EC20 POPULATION
	2	2	0	6.58	445	0.01	616.33	0.02	.	.	.	NAWQ ADVISORY
	2	2	0	6.58	445	0.01	616.33	0.02	.	.	.	NAWQ ACTUAL
	2	2	0	6.58	445	0.01	616.33	0.02	.	.	.	LCV FISH
	2	2	0	6.58	445	0.01	616.33	0.02	.	.	.	LCV DAPHNIDS
	2	2	0	6.58	445	0.01	616.33	0.02	.	.	.	LTV EC20 FISH
	2	2	0	6.58	445	0.01	616.33	0.02	.	.	.	LTV EC20 DAPHNID
	2	2	0	6.58	445	0.01	616.33	0.02	.	.	.	SS EC20
	2	2	0	6.58	445	0.01	616.33	0.02	.	.	.	EC20 POPULATION
	3	2	0	6.58	565	0.01	599.27	0.02	.	.	.	NAWQ ADVISORY
	3	2	0	6.58	565	0.01	599.27	0.02	.	.	.	NAWQ ACTUAL
	3	2	0	6.58	565	0.01	599.27	0.02	.	.	.	LCV FISH
	3	2	0	6.58	565	0.01	599.27	0.02	.	.	.	LCV DAPHNIDS
	3	2	0	6.58	565	0.01	599.27	0.02	.	.	.	LTV EC20 FISH
	3	2	0	6.58	565	0.01	599.27	0.02	.	.	.	LTV EC20 DAPHNID
	3	2	0	6.58	565	0.01	599.27	0.02	.	.	.	SS EC20
	3	2	0	6.58	565	0.01	599.27	0.02	.	.	.	EC20 POPULATION
	4	2	0	6.58	500	0.01	38534.72	1.01	.	.	.	NAWQ ADVISORY
	4	2	0	6.58	500	0.01	38534.72	1.01	.	.	.	NAWQ ACTUAL
	4	2	0	6.58	500	0.01	38534.72	1.01	.	.	.	LCV FISH
	4	2	0	6.58	500	0.01	38534.72	1.01	.	.	.	LCV DAPHNIDS
	4	2	0	6.58	500	0.01	38534.72	1.01	.	.	.	LTV EC20 FISH
	4	2	0	6.58	500	0.01	38534.72	1.01	.	.	.	LTV EC20 DAPHNID
	4	2	0	6.58	500	0.01	38534.72	1.01	.	.	.	SS EC20
	4	2	0	6.58	500	0.01	38534.72	1.01	.	.	.	EC20 POPULATION

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL* detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark type
INDENO(1,2,3-CD)PYRENE (continued)	5	4	0	6.58	855	0.02	6848.50	0.18	.	.	NAWQ ADVISORY
	5	4	0	6.58	855	0.02	6848.50	0.18	.	.	NAWQ ACTUAL
	5	4	0	6.58	855	0.02	6848.50	0.18	.	.	LCV FISH
	5	4	0	6.58	855	0.02	6848.50	0.18	.	.	LCV DAPHNIDS
	5	4	0	6.58	855	0.02	6848.50	0.18	.	.	LTV EC20 FISH
	5	4	0	6.58	855	0.02	6848.50	0.18	.	.	LTV EC20 DAPHNID
	5	4	0	6.58	855	0.02	6848.50	0.18	.	.	SS EC20
	5	4	0	6.58	855	0.02	6848.50	0.18	.	.	EC20 POPULATION
	10	1	0	6.58	6500	0.17	6500.00	0.17	.	.	NAWQ ADVISORY
	10	1	0	6.58	6500	0.17	6500.00	0.17	.	.	NAWQ ACTUAL
	10	1	0	6.58	6500	0.17	6500.00	0.17	.	.	LCV FISH
	10	1	0	6.58	6500	0.17	6500.00	0.17	.	.	LCV DAPHNIDS
	10	1	0	6.58	6500	0.17	6500.00	0.17	.	.	LTV EC20 FISH
	10	1	0	6.58	6500	0.17	6500.00	0.17	.	.	LTV EC20 DAPHNID
	10	1	0	6.58	6500	0.17	6500.00	0.17	.	.	SS EC20
	10	1	0	6.58	6500	0.17	6500.00	0.17	.	.	EC20 POPULATION
N-NITROSO-DI-N-PROPYLAMINE	1	2	0	1.36	620	2706.40	6993.39	30527.23	.	.	NAWQ ADVISORY
	1	2	0	1.36	620	2706.40	6993.39	30527.23	.	.	NAWQ ACTUAL
	1	2	0	1.36	620	2706.40	6993.39	30527.23	.	.	LCV FISH
	1	2	0	1.36	620	2706.40	6993.39	30527.23	.	.	LCV DAPHNIDS
	1	2	0	1.36	620	2706.40	6993.39	30527.23	.	.	LTV EC20 FISH
	1	2	0	1.36	620	2706.40	6993.39	30527.23	.	.	LTV EC20 DAPHNID
	1	2	0	1.36	620	2706.40	6993.39	30527.23	.	.	SS EC20
	1	2	0	1.36	620	2706.40	6993.39	30527.23	.	.	EC20 POPULATION
	2	2	0	1.36	445	1942.50	616.33	2690.37	.	.	NAWQ ADVISORY
	2	2	0	1.36	445	1942.50	616.33	2690.37	.	.	NAWQ ACTUAL
	2	2	0	1.36	445	1942.50	616.33	2690.37	.	.	LCV FISH
	2	2	0	1.36	445	1942.50	616.33	2690.37	.	.	LCV DAPHNIDS
	2	2	0	1.36	445	1942.50	616.33	2690.37	.	.	LTV EC20 FISH
	2	2	0	1.36	445	1942.50	616.33	2690.37	.	.	LTV EC20 DAPHNID
	2	2	0	1.36	445	1942.50	616.33	2690.37	.	.	SS EC20
	2	2	0	1.36	445	1942.50	616.33	2690.37	.	.	EC20 POPULATION
	3	2	0	1.36	565	2466.31	599.27	2615.89	.	.	NAWQ ADVISORY
	3	2	0	1.36	565	2466.31	599.27	2615.89	.	.	NAWQ ACTUAL
	3	2	0	1.36	565	2466.31	599.27	2615.89	.	.	LCV FISH
	3	2	0	1.36	565	2466.31	599.27	2615.89	.	.	LCV DAPHNIDS
	3	2	0	1.36	565	2466.31	599.27	2615.89	.	.	LTV EC20 FISH
	3	2	0	1.36	565	2466.31	599.27	2615.89	.	.	LTV EC20 DAPHNID
	3	2	0	1.36	565	2466.31	599.27	2615.89	.	.	SS EC20
	3	2	0	1.36	565	2466.31	599.27	2615.89	.	.	EC20 POPULATION

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL[a] detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark type
N-NITROSO-DI-N-PROPYLAMINE (continued)	4	2	0	1.36	500	2182.58	38534.72	168210.15	.	.	NAWQ ADVISORY
	4	2	0	1.36	500	2182.58	38534.72	168210.15	.	.	NAWQ ACTUAL
	4	2	0	1.36	500	2182.58	38534.72	168210.15	.	.	LCV FISH
	4	2	0	1.36	500	2182.58	38534.72	168210.15	.	.	LCV DAPHNIDS
	4	2	0	1.36	500	2182.58	38534.72	168210.15	.	.	LTV EC20 FISH
	4	2	0	1.36	500	2182.58	38534.72	168210.15	.	.	LTV EC20 DAPHNID
	4	2	0	1.36	500	2182.58	38534.72	168210.15	.	.	SS EC20
	4	2	0	1.36	500	2182.58	38534.72	168210.15	.	.	EC20 POPULATION
	5	4	0	1.36	855	3732.21	6848.50	29894.80	.	.	NAWQ ADVISORY
	5	4	0	1.36	855	3732.21	6848.50	29894.80	.	.	NAWQ ACTUAL
	5	4	0	1.36	855	3732.21	6848.50	29894.80	.	.	LCV FISH
	5	4	0	1.36	855	3732.21	6848.50	29894.80	.	.	LCV DAPHNIDS
	5	4	0	1.36	855	3732.21	6848.50	29894.80	.	.	LTV EC20 FISH
	5	4	0	1.36	855	3732.21	6848.50	29894.80	.	.	LTV EC20 DAPHNID
	5	4	0	1.36	855	3732.21	6848.50	29894.80	.	.	SS EC20
	5	4	0	1.36	855	3732.21	6848.50	29894.80	.	.	EC20 POPULATION
	10	1	0	1.36	6500	28373.53	6500.00	28373.53	.	.	NAWQ ADVISORY
	10	1	0	1.36	6500	28373.53	6500.00	28373.53	.	.	NAWQ ACTUAL
	10	1	0	1.36	6500	28373.53	6500.00	28373.53	.	.	LCV FISH
	10	1	0	1.36	6500	28373.53	6500.00	28373.53	.	.	LCV DAPHNIDS
	10	1	0	1.36	6500	28373.53	6500.00	28373.53	.	.	LTV EC20 FISH
	10	1	0	1.36	6500	28373.53	6500.00	28373.53	.	.	LTV EC20 DAPHNID
	10	1	0	1.36	6500	28373.53	6500.00	28373.53	.	.	SS EC20
	10	1	0	1.36	6500	28373.53	6500.00	28373.53	.	.	EC20 POPULATION
N-NITROSODIPHENYLAMINE	1	2	0	3.13	620	45.96	6993.39	518.43	.	.	NAWQ ACTUAL
	1	2	0	3.13	620	45.96	6993.39	518.43	.	.	LTV EC20 DAPHNID
	1	2	0	3.13	620	45.96	6993.39	518.43	.	.	SS EC20
	1	2	0	3.13	620	45.96	6993.39	518.43	18.38	207.37	2.50 NAWQ ADVISORY
	1	2	0	3.13	620	45.96	6993.39	518.43	1.15	12.96	40.00 EC20 POPULATION
	1	2	0	3.13	620	45.96	6993.39	518.43	0.14	1.56	332.00 LCV FISH
	1	2	0	3.13	620	45.96	6993.39	518.43	0.14	1.53	339.00 LTV EC20 FISH
	1	2	0	3.13	620	45.96	6993.39	518.43	0.04	0.50	1042.00 LCV DAPHNIDS
	2	2	0	3.13	445	32.99	616.33	45.69	.	.	NAWQ ACTUAL
	2	2	0	3.13	445	32.99	616.33	45.69	.	.	LTV EC20 DAPHNID
	2	2	0	3.13	445	32.99	616.33	45.69	.	.	SS EC20
	2	2	0	3.13	445	32.99	616.33	45.69	13.20	18.28	2.50 NAWQ ADVISORY
	2	2	0	3.13	445	32.99	616.33	45.69	0.82	1.14	40.00 EC20 POPULATION
	2	2	0	3.13	445	32.99	616.33	45.69	0.10	0.14	332.00 LCV FISH
	2	2	0	3.13	445	32.99	616.33	45.69	0.10	0.13	339.00 LTV EC20 FISH
	2	2	0	3.13	445	32.99	616.33	45.69	0.03	0.04	1042.00 LCV DAPHNIDS

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H20 and SED	Minimum detection limit	Minimum pore water conc.	UCL[a] detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
N-NITROSODIPHENYLAMINE (continued)	3	2	0	3.13	565	41.88	599.27	44.42	.	.	.	NAWQ ACTUAL
	3	2	0	3.13	565	41.88	599.27	44.42	.	.	.	LTV EC20 DAPHNID
	3	2	0	3.13	565	41.88	599.27	44.42	.	.	.	SS EC20
	3	2	0	3.13	565	41.88	599.27	44.42	16.75	17.77	2.50	NAWQ ADVISORY
	3	2	0	3.13	565	41.88	599.27	44.42	1.05	1.11	40.00	EC20 POPULATION
	3	2	0	3.13	565	41.88	599.27	44.42	0.13	0.13	332.00	LCV FISH
	3	2	0	3.13	565	41.88	599.27	44.42	0.12	0.13	339.00	LTV EC20 FISH
	3	2	0	3.13	565	41.88	599.27	44.42	0.04	0.04	1042.00	LCV DAPHNIDS
	4	2	0	3.13	500	37.07	38534.72	2856.62	.	.	.	NAWQ ACTUAL
	4	2	0	3.13	500	37.07	38534.72	2856.62	.	.	.	LTV EC20 DAPHNID
	4	2	0	3.13	500	37.07	38534.72	2856.62	.	.	.	SS EC20
	4	2	0	3.13	500	37.07	38534.72	2856.62	14.83	1142.65	2.50	NAWQ ADVISORY
	4	2	0	3.13	500	37.07	38534.72	2856.62	0.93	71.42	40.00	EC20 POPULATION
	4	2	0	3.13	500	37.07	38534.72	2856.62	0.11	8.60	332.00	LCV FISH
	4	2	0	3.13	500	37.07	38534.72	2856.62	0.11	8.43	339.00	LTV EC20 FISH
	4	2	0	3.13	500	37.07	38534.72	2856.62	0.04	2.74	1042.00	LCV DAPHNIDS
	5	4	0	3.13	855	63.38	6848.50	507.69	.	.	.	NAWQ ACTUAL
	5	4	0	3.13	855	63.38	6848.50	507.69	.	.	.	LTV EC20 DAPHNID
	5	4	0	3.13	855	63.38	6848.50	507.69	.	.	.	SS EC20
	5	4	0	3.13	855	63.38	6848.50	507.69	25.35	203.07	2.50	NAWQ ADVISORY
	5	4	0	3.13	855	63.38	6848.50	507.69	1.58	12.69	40.00	EC20 POPULATION
	5	4	0	3.13	855	63.38	6848.50	507.69	0.19	1.53	332.00	LCV FISH
	5	4	0	3.13	855	63.38	6848.50	507.69	0.19	1.50	339.00	LTV EC20 FISH
	5	4	0	3.13	855	63.38	6848.50	507.69	0.06	0.49	1042.00	LCV DAPHNIDS
	10	1	0	3.13	6500	481.85	6500.00	481.85	.	.	.	NAWQ ACTUAL
	10	1	0	3.13	6500	481.85	6500.00	481.85	.	.	.	LTV EC20 DAPHNID
	10	1	0	3.13	6500	481.85	6500.00	481.85	.	.	.	SS EC20
	10	1	0	3.13	6500	481.85	6500.00	481.85	192.74	192.74	2.50	NAWQ ADVISORY
	10	1	0	3.13	6500	481.85	6500.00	481.85	12.05	12.05	40.00	EC20 POPULATION
	10	1	0	3.13	6500	481.85	6500.00	481.85	1.45	1.45	332.00	LCV FISH
	10	1	0	3.13	6500	481.85	6500.00	481.85	1.42	1.42	339.00	LTV EC20 FISH
	10	1	0	3.13	6500	481.85	6500.00	481.85	0.46	0.46	1042.00	LCV DAPHNIDS
NAPHTHALENE	1	2	0	3.59	620	15.94	6993.39	179.76	.	.	.	NAWQ ACTUAL
	1	2	0	3.59	620	15.94	6993.39	179.76	.	.	.	SS EC20
	1	2	0	3.59	620	15.94	6993.39	179.76	7.59	85.60	2.10	NAWQ ADVISORY
	1	2	0	3.59	620	15.94	6993.39	179.76	0.04	0.40	450.00	LTV EC20 FISH
	1	2	0	3.59	620	15.94	6993.39	179.76	0.03	0.30	600.00	LTV EC20 DAPHNID
	1	2	0	3.59	620	15.94	6993.39	179.76	0.03	0.29	620.00	LCV FISH
	1	2	0	3.59	620	15.94	6993.39	179.76	0.02	0.18	1000.00	EC20 POPULATION
	1	2	0	3.59	620	15.94	6993.39	179.76	0.01	0.15	1163.00	LCV DAPHNIDS

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL* detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
NAPHTHALENE (continued)	2	2	0	3.59	445	11.44	616.33	15.84	.	.	.	NAWQ ACTUAL
	2	2	0	3.59	445	11.44	616.33	15.84	.	.	.	SS EC20
	2	2	0	3.59	445	11.44	616.33	15.84	5.45	7.54	2.10	NAWQ ADVISORY
	2	2	0	3.59	445	11.44	616.33	15.84	0.03	0.04	450.00	LTV EC20 FISH
	2	2	0	3.59	445	11.44	616.33	15.84	0.02	0.03	600.00	LTV EC20 DAPHNID
	2	2	0	3.59	445	11.44	616.33	15.84	0.02	0.03	620.00	LCV FISH
	2	2	0	3.59	445	11.44	616.33	15.84	0.01	0.02	1000.00	EC20 POPULATION
	2	2	0	3.59	445	11.44	616.33	15.84	0.01	0.01	1163.00	LCV DAPHNIDS
	4	2	0	3.59	500	12.85	38534.72	990.49	.	.	.	NAWQ ACTUAL
	4	2	0	3.59	500	12.85	38534.72	990.49	.	.	.	SS EC20
	4	2	0	3.59	500	12.85	38534.72	990.49	6.12	471.66	2.10	NAWQ ADVISORY
	4	2	0	3.59	500	12.85	38534.72	990.49	0.03	2.20	450.00	LTV EC20 FISH
	4	2	0	3.59	500	12.85	38534.72	990.49	0.02	1.65	600.00	LTV EC20 DAPHNID
	4	2	0	3.59	500	12.85	38534.72	990.49	0.02	1.60	620.00	LCV FISH
	4	2	0	3.59	500	12.85	38534.72	990.49	0.01	0.99	1000.00	EC20 POPULATION
	4	2	0	3.59	500	12.85	38534.72	990.49	0.01	0.85	1163.00	LCV DAPHNIDS
	5	4	0	3.59	855	21.98	6848.50	176.03	.	.	.	NAWQ ACTUAL
	5	4	0	3.59	855	21.98	6848.50	176.03	.	.	.	SS EC20
	5	4	0	3.59	855	21.98	6848.50	176.03	10.47	83.83	2.10	NAWQ ADVISORY
	5	4	0	3.59	855	21.98	6848.50	176.03	0.05	0.39	450.00	LTV EC20 FISH
	5	4	0	3.59	855	21.98	6848.50	176.03	0.04	0.29	600.00	LTV EC20 DAPHNID
	5	4	0	3.59	855	21.98	6848.50	176.03	0.04	0.28	620.00	LCV FISH
	5	4	0	3.59	855	21.98	6848.50	176.03	0.02	0.18	1000.00	EC20 POPULATION
	5	4	0	3.59	855	21.98	6848.50	176.03	0.02	0.15	1163.00	LCV DAPHNIDS
	10	1	0	3.59	6500	167.08	6500.00	167.08	.	.	.	NAWQ ACTUAL
	10	1	0	3.59	6500	167.08	6500.00	167.08	.	.	.	SS EC20
	10	1	0	3.59	6500	167.08	6500.00	167.08	79.56	79.56	2.10	NAWQ ADVISORY
	10	1	0	3.59	6500	167.08	6500.00	167.08	0.37	0.37	450.00	LTV EC20 FISH
	10	1	0	3.59	6500	167.08	6500.00	167.08	0.28	0.28	600.00	LTV EC20 DAPHNID
	10	1	0	3.59	6500	167.08	6500.00	167.08	0.27	0.27	620.00	LCV FISH
	10	1	0	3.59	6500	167.08	6500.00	167.08	0.17	0.17	1000.00	EC20 POPULATION
	10	1	0	3.59	6500	167.08	6500.00	167.08	0.14	0.14	1163.00	LCV DAPHNIDS

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL[a] detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
PHENANTHRENE	1	2	0	4.57	620	1.67	6993.39	18.82	.	.	.	NAWQ ACTUAL
	1	2	0	4.57	620	1.67	6993.39	18.82	.	.	.	LCV FISH
	1	2	0	4.57	620	1.67	6993.39	18.82	.	.	.	LTV EC20 FISH
	1	2	0	4.57	620	1.67	6993.39	18.82	.	.	.	SS EC20
	1	2	0	4.57	620	1.67	6993.39	18.82	.	.	.	EC20 POPULATION
	1	2	0	4.57	620	1.67	6993.39	18.82	3.88	43.77	0.43	NAWQ ADVISORY
	1	2	0	4.57	620	1.67	6993.39	18.82	0.02	0.17	110.00	LTV EC20 DAPHNID
	1	2	0	4.57	620	1.67	6993.39	18.82	0.01	0.09	200.00	LCV DAPHNIDS
	2	2	0	4.57	445	1.20	616.33	1.66	.	.	.	NAWQ ACTUAL
	2	2	0	4.57	445	1.20	616.33	1.66	.	.	.	LCV FISH
	2	2	0	4.57	445	1.20	616.33	1.66	.	.	.	LTV EC20 FISH
	2	2	0	4.57	445	1.20	616.33	1.66	.	.	.	SS EC20
	2	2	0	4.57	445	1.20	616.33	1.66	.	.	.	EC20 POPULATION
	2	2	0	4.57	445	1.20	616.33	1.66	2.79	3.86	0.43	NAWQ ADVISORY
	2	2	0	4.57	445	1.20	616.33	1.66	0.01	0.02	110.00	LTV EC20 DAPHNID
	2	2	0	4.57	445	1.20	616.33	1.66	0.01	0.01	200.00	LCV DAPHNIDS
	4	2	0	4.57	500	1.35	38534.72	103.72	.	.	.	NAWQ ACTUAL
	4	2	0	4.57	500	1.35	38534.72	103.72	.	.	.	LCV FISH
	4	2	0	4.57	500	1.35	38534.72	103.72	.	.	.	LTV EC20 FISH
	4	2	0	4.57	500	1.35	38534.72	103.72	.	.	.	SS EC20
	4	2	0	4.57	500	1.35	38534.72	103.72	.	.	.	EC20 POPULATION
	4	2	0	4.57	500	1.35	38534.72	103.72	3.13	241.20	0.43	NAWQ ADVISORY
	4	2	0	4.57	500	1.35	38534.72	103.72	0.01	0.94	110.00	LTV EC20 DAPHNID
	4	2	0	4.57	500	1.35	38534.72	103.72	0.01	0.52	200.00	LCV DAPHNIDS
	5	4	0	4.57	855	2.30	6848.50	18.43	.	.	.	NAWQ ACTUAL
	5	4	0	4.57	855	2.30	6848.50	18.43	.	.	.	LCV FISH
	5	4	0	4.57	855	2.30	6848.50	18.43	.	.	.	LTV EC20 FISH
	5	4	0	4.57	855	2.30	6848.50	18.43	.	.	.	SS EC20
	5	4	0	4.57	855	2.30	6848.50	18.43	.	.	.	EC20 POPULATION
	5	4	0	4.57	855	2.30	6848.50	18.43	5.35	42.87	0.43	NAWQ ADVISORY
	5	4	0	4.57	855	2.30	6848.50	18.43	0.02	0.17	110.00	LTV EC20 DAPHNID
	5	4	0	4.57	855	2.30	6848.50	18.43	0.01	0.09	200.00	LCV DAPHNIDS
	10	1	0	4.57	6500	17.49	6500.00	17.49	.	.	.	NAWQ ACTUAL
	10	1	0	4.57	6500	17.49	6500.00	17.49	.	.	.	LCV FISH
	10	1	0	4.57	6500	17.49	6500.00	17.49	.	.	.	LTV EC20 FISH
	10	1	0	4.57	6500	17.49	6500.00	17.49	.	.	.	SS EC20
	10	1	0	4.57	6500	17.49	6500.00	17.49	.	.	.	EC20 POPULATION
	10	1	0	4.57	6500	17.49	6500.00	17.49	40.69	40.69	0.43	NAWQ ADVISORY
	10	1	0	4.57	6500	17.49	6500.00	17.49	0.16	0.16	110.00	LTV EC20 DAPHNID
	10	1	0	4.57	6500	17.49	6500.00	17.49	0.09	0.09	200.00	LCV DAPHNIDS

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL[a] detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
PHENOL	1	2	0	1.46	620	2149.77	6993.39	24248.64	.	.	.	NAWQ ACTUAL
	1	2	0	1.46	620	2149.77	6993.39	24248.64	.	.	.	LTV EC20 DAPHNID
	1	2	0	1.46	620	2149.77	6993.39	24248.64	.	.	.	SS EC20
	1	2	0	1.46	620	2149.77	6993.39	24248.64	102.37	1154.70	21.00	NAWQ ADVISORY
	1	2	0	1.46	620	2149.77	6993.39	24248.64	9.35	105.43	230.00	LTV EC20 FISH
	1	2	0	1.46	620	2149.77	6993.39	24248.64	1.57	17.71	1369.00	LCV FISH
	1	2	0	1.46	620	2149.77	6993.39	24248.64	1.07	12.09	2005.00	LCV DAPHNIDS
	1	2	0	1.46	620	2149.77	6993.39	24248.64	0.48	5.43	4467.00	EC20 POPULATION
	2	2	0	1.46	445	1542.98	616.33	2137.03	.	.	.	NAWQ ACTUAL
	2	2	0	1.46	445	1542.98	616.33	2137.03	.	.	.	LTV EC20 DAPHNID
	2	2	0	1.46	445	1542.98	616.33	2137.03	.	.	.	SS EC20
	2	2	0	1.46	445	1542.98	616.33	2137.03	73.48	101.76	21.00	NAWQ ADVISORY
	2	2	0	1.46	445	1542.98	616.33	2137.03	6.71	9.29	230.00	LTV EC20 FISH
	2	2	0	1.46	445	1542.98	616.33	2137.03	1.13	1.56	1369.00	LCV FISH
	2	2	0	1.46	445	1542.98	616.33	2137.03	0.77	1.07	2005.00	LCV DAPHNIDS
	2	2	0	1.46	445	1542.98	616.33	2137.03	0.35	0.48	4467.00	EC20 POPULATION
	3	2	0	1.46	565	1959.06	599.27	2077.87	.	.	.	NAWQ ACTUAL
	3	2	0	1.46	565	1959.06	599.27	2077.87	.	.	.	LTV EC20 DAPHNID
	3	2	0	1.46	565	1959.06	599.27	2077.87	.	.	.	SS EC20
	3	2	0	1.46	565	1959.06	599.27	2077.87	93.29	98.95	21.00	NAWQ ADVISORY
	3	2	0	1.46	565	1959.06	599.27	2077.87	8.52	9.03	230.00	LTV EC20 FISH
	3	2	0	1.46	565	1959.06	599.27	2077.87	1.43	1.52	1369.00	LCV FISH
	3	2	0	1.46	565	1959.06	599.27	2077.87	0.98	1.04	2005.00	LCV DAPHNIDS
	3	2	0	1.46	565	1959.06	599.27	2077.87	0.44	0.47	4467.00	EC20 POPULATION
	4	2	0	1.46	500	1733.68	38534.72	133614.07	.	.	.	NAWQ ACTUAL
	4	2	0	1.46	500	1733.68	38534.72	133614.07	.	.	.	LTV EC20 DAPHNID
	4	2	0	1.46	500	1733.68	38534.72	133614.07	.	.	.	SS EC20
	4	2	0	1.46	500	1733.68	38534.72	133614.07	82.56	6362.57	21.00	NAWQ ADVISORY
	4	2	0	1.46	500	1733.68	38534.72	133614.07	7.54	580.93	230.00	LTV EC20 FISH
	4	2	0	1.46	500	1733.68	38534.72	133614.07	1.27	97.60	1369.00	LCV FISH
	4	2	0	1.46	500	1733.68	38534.72	133614.07	0.86	66.64	2005.00	LCV DAPHNIDS
	4	2	0	1.46	500	1733.68	38534.72	133614.07	0.39	29.91	4467.00	EC20 POPULATION
	5	4	0	1.46	855	2964.60	6848.50	23746.28	.	.	.	NAWQ ACTUAL
	5	4	0	1.46	855	2964.60	6848.50	23746.28	.	.	.	LTV EC20 DAPHNID
	5	4	0	1.46	855	2964.60	6848.50	23746.28	.	.	.	SS EC20
	5	4	0	1.46	855	2964.60	6848.50	23746.28	141.17	1130.78	21.00	NAWQ ADVISORY
	5	4	0	1.46	855	2964.60	6848.50	23746.28	12.89	103.24	230.00	LTV EC20 FISH
	5	4	0	1.46	855	2964.60	6848.50	23746.28	2.17	17.35	1369.00	LCV FISH
	5	4	0	1.46	855	2964.60	6848.50	23746.28	1.48	11.84	2005.00	LCV DAPHNIDS
	5	4	0	1.46	855	2964.60	6848.50	23746.28	0.66	5.32	4467.00	EC20 POPULATION

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL[a] detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark	Benchmark type
PHENOL (continued)	10	1	0	1.46	6500	22537.90	6500.00	22537.90	.	.	.	NAWQ ACTUAL
	10	1	0	1.46	6500	22537.90	6500.00	22537.90	.	.	.	LTV EC20 DAPHNID
	10	1	0	1.46	6500	22537.90	6500.00	22537.90	.	.	.	SS EC20
	10	1	0	1.46	6500	22537.90	6500.00	22537.90	1073.23	1073.23	21.00	NAWQ ADVISORY
	10	1	0	1.46	6500	22537.90	6500.00	22537.90	97.99	97.99	230.00	LTV EC20 FISH
	10	1	0	1.46	6500	22537.90	6500.00	22537.90	16.46	16.46	1369.00	LCV FISH
	10	1	0	1.46	6500	22537.90	6500.00	22537.90	11.24	11.24	2005.00	LCV DAPHNIDS
	10	1	0	1.46	6500	22537.90	6500.00	22537.90	5.05	5.05	4467.00	EC20 POPULATION
PYRENE	1	2	0	4.88	620	0.82	6993.39	9.22	.	.	.	NAWQ ADVISORY
	1	2	0	4.88	620	0.82	6993.39	9.22	.	.	.	NAWQ ACTUAL
	1	2	0	4.88	620	0.82	6993.39	9.22	.	.	.	LCV FISH
	1	2	0	4.88	620	0.82	6993.39	9.22	.	.	.	LCV DAPHNIDS
	1	2	0	4.88	620	0.82	6993.39	9.22	.	.	.	LTV EC20 FISH
	1	2	0	4.88	620	0.82	6993.39	9.22	.	.	.	LTV EC20 DAPHNID
	1	2	0	4.88	620	0.82	6993.39	9.22	.	.	.	SS EC20
	1	2	0	4.88	620	0.82	6993.39	9.22	.	.	.	EC20 POPULATION
	2	2	0	4.88	445	0.59	616.33	0.81	.	.	.	NAWQ ADVISORY
	2	2	0	4.88	445	0.59	616.33	0.81	.	.	.	NAWQ ACTUAL
	2	2	0	4.88	445	0.59	616.33	0.81	.	.	.	LCV FISH
	2	2	0	4.88	445	0.59	616.33	0.81	.	.	.	LCV DAPHNIDS
	2	2	0	4.88	445	0.59	616.33	0.81	.	.	.	LTV EC20 FISH
	2	2	0	4.88	445	0.59	616.33	0.81	.	.	.	LTV EC20 DAPHNID
	2	2	0	4.88	445	0.59	616.33	0.81	.	.	.	SS EC20
	2	2	0	4.88	445	0.59	616.33	0.81	.	.	.	EC20 POPULATION
	4	2	0	4.88	500	0.66	38534.72	50.80	.	.	.	NAWQ ADVISORY
	4	2	0	4.88	500	0.66	38534.72	50.80	.	.	.	NAWQ ACTUAL
	4	2	0	4.88	500	0.66	38534.72	50.80	.	.	.	LCV FISH
	4	2	0	4.88	500	0.66	38534.72	50.80	.	.	.	LCV DAPHNIDS
	4	2	0	4.88	500	0.66	38534.72	50.80	.	.	.	LTV EC20 FISH
	4	2	0	4.88	500	0.66	38534.72	50.80	.	.	.	LTV EC20 DAPHNID
	4	2	0	4.88	500	0.66	38534.72	50.80	.	.	.	SS EC20
	4	2	0	4.88	500	0.66	38534.72	50.80	.	.	.	EC20 POPULATION
	5	4	0	4.88	855	1.13	6848.50	9.03	.	.	.	NAWQ ADVISORY
	5	4	0	4.88	855	1.13	6848.50	9.03	.	.	.	NAWQ ACTUAL
	5	4	0	4.88	855	1.13	6848.50	9.03	.	.	.	LCV FISH
	5	4	0	4.88	855	1.13	6848.50	9.03	.	.	.	LCV DAPHNIDS
	5	4	0	4.88	855	1.13	6848.50	9.03	.	.	.	LTV EC20 FISH
	5	4	0	4.88	855	1.13	6848.50	9.03	.	.	.	LTV EC20 DAPHNID
	5	4	0	4.88	855	1.13	6848.50	9.03	.	.	.	SS EC20
	5	4	0	4.88	855	1.13	6848.50	9.03	.	.	.	EC20 POPULATION

Table F.10 (continued)

Analyte	Reach	Number analyzed in reach (sediment)	Number detects in reach (sediment)	Log coefficient between H2O and SED	Minimum detection limit	Minimum pore water conc.	UCL* detection limit	UCL pore water conc.	MDL quotient	UCL quotient	Benchmark type
PYRENE (continued)	10	1	0	4.88	6500	8.57	6500.00	8.57	.	.	NAWQ ADVISORY
	10	1	0	4.88	6500	8.57	6500.00	8.57	.	.	NAWQ ACTUAL
	10	1	0	4.88	6500	8.57	6500.00	8.57	.	.	LCV FISH
	10	1	0	4.88	6500	8.57	6500.00	8.57	.	.	LCV DAPHNIDS
	10	1	0	4.88	6500	8.57	6500.00	8.57	.	.	LTV EC20 FISH
	10	1	0	4.88	6500	8.57	6500.00	8.57	.	.	LTV EC20 DAPHNID
	10	1	0	4.88	6500	8.57	6500.00	8.57	.	.	SS EC20
	10	1	0	4.88	6500	8.57	6500.00	8.57	.	.	EC20 POPULATION

*The maximum detection limit is used in cases where the UCL detection limit was missing.

Table F.11. Mean and upper confidence limit (UCL) concentrations of chemicals in fish fillets (mg/kg), toxicological benchmarks for wildlife (mg/kg), and quotients for hazards to piscivorous wildlife

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Mean[a] fish concentration	UCL[b] fish concentration	Lower piscivore criterion	Mean piscivore quotient	UCL piscivore quotient	Reference dose	RFD dietary concentration	Mean RFD piscivore quotient	UCL RFD piscivore quotient
4,4'-DDD	1	15	5	0.00085	0.006	0.01	0.0849	0.5900	.	.	.	.
	3	34	2	0.00030	0.017	0.01	0.0300	1.7080	.	.	.	.
	4	18	4	0.00367	0.009	0.01	0.3671	0.9039	.	.	.	.
	5	17	12	0.00155	0.006	0.01	0.1555	0.5826	.	.	.	.
	10	8	7	0.00069	0.001	0.01	0.0687	0.1219	.	.	.	.
	15	4	1	0.00474	0.200	0.01	0.4738	20.0000	.	.	.	.
4,4'-DDE	1	16	8	0.00530	0.064	0.01	0.5298	6.4285	.	.	.	.
	2	13	6	0.00529	0.018	0.01	0.5292	1.8272	.	.	.	.
	3	34	34	0.00104	0.009	0.01	0.1044	0.9104	.	.	.	.
	4	18	12	0.01109	0.024	0.01	1.1089	2.4405	.	.	.	.
	5	18	9	0.00803	0.013	0.01	0.8030	1.3229	.	.	.	.
	10	8	2	0.00256	0.003	0.01	0.2561	0.2948	.	.	.	.
	13	2	2	0.00387	0.007	0.01	0.3873	0.6820	.	.	.	.
4,4'-DDT	2	13	2	0.00047	0.001	0.01	0.0467	0.0859	0.00050	0.0063	0.075	0.137
	4	18	1	0.00158	0.200	0.01	0.1577	20.0000	0.00050	0.0063	0.252	32.000
	5	18	5	0.00070	0.001	0.01	0.0703	0.1291	0.00050	0.0063	0.113	0.207
ALDRIN	2	14	2	0.00013	0.000	.	.	.	0.00003	0.0004	0.343	0.440
	4	14	2	0.00085	0.001	.	.	.	0.00003	0.0004	2.265	3.559
	5	18	2	0.00046	0.005	.	.	.	0.00003	0.0004	1.238	14.537
	13	3	2	0.00096	0.001	.	.	.	0.00003	0.0004	2.561	3.478
AROCLOR-1254	1	16	13	0.03328	0.199	0.04	0.8320	4.9765	.	.	.	.
	2	10	9	0.12149	0.753	0.04	3.0373	18.8272	.	.	.	.
	3	31	31	0.09903	0.186	0.04	2.4757	4.6583	.	.	.	.
	4	18	15	0.05439	0.270	0.04	1.3596	6.7500	.	.	.	.
	5	17	14	0.05830	0.320	0.04	1.4576	8.0000	.	.	.	.
	13	2	2	0.08718	0.190	0.04	2.1794	4.7500	.	.	.	.
	15	4	4	0.12234	0.200	0.04	3.0585	5.0000	.	.	.	.
AROCLOR-1260	1	16	16	0.24586	0.897	0.04	6.1464	22.4140	.	.	.	.
	2	14	14	0.66853	1.406	0.04	16.7132	35.1598	.	.	.	.
	3	36	36	0.39085	0.771	0.04	9.7714	19.2634	.	.	.	.
	4	18	17	0.43314	2.790	0.04	10.8284	69.7380	.	.	.	.
	5	19	19	0.34776	0.890	0.04	8.6939	22.2399	.	.	.	.
	10	8	7	0.02198	0.073	0.04	0.5494	1.8275	.	.	.	.
	13	4	4	0.28812	0.390	0.04	7.2030	9.7500	.	.	.	.
	15	4	4	0.31050	0.650	0.04	7.7625	16.2500	.	.	.	.

Table F.11 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Mean[a] fish concentration	UCL[b] fish concentration	Lower piscivore criterion	Mean piscivore quotient	UCL piscivore quotient	Reference dose	RFD dietary concentration	Mean RFD piscivore quotient	UCL RFD piscivore quotient
ARSENIC	1	28	17	0.06163	0.098	3.00	0.0205	0.0327	0.00100	0.0125	4.930	7.858
	2	13	5	0.03796	0.098	3.00	0.0127	0.0327	0.00100	0.0125	3.036	7.842
	3	35	19	0.05308	0.075	3.00	0.0177	0.0250	0.00100	0.0125	4.246	6.004
	4	27	25	0.08793	0.107	3.00	0.0293	0.0357	0.00100	0.0125	7.034	8.578
	5	25	23	0.07461	0.092	3.00	0.0249	0.0308	0.00100	0.0125	5.969	7.382
	10	15	14	0.07143	0.097	3.00	0.0238	0.0323	0.00100	0.0125	5.714	7.745
	13	10	4	0.04514	0.059	3.00	0.0150	0.0197	0.00100	0.0125	3.611	4.721
	15	16	10	0.06469	0.113	3.00	0.0216	0.0376	0.00100	0.0125	5.175	9.014
BERYLLIUM	1	25	4	0.00147	0.003	25.00	0.0001	0.0001	0.00500	0.0625	0.023	0.052
	3	35	7	0.00092	0.005	25.00	0.0000	0.0002	0.00500	0.0625	0.015	0.087
	5	25	2	0.00002	0.027	25.00	0.0000	0.0011	0.00500	0.0625	0.000	0.432
	10	10	1	0.00001	0.037	25.00	0.0000	0.0015	0.00500	0.0625	0.000	0.592
	15	16	5	0.00132	0.019	25.00	0.0001	0.0008	0.00500	0.0625	0.021	0.304
BIS(2-ETHYLHEXYL)PHTHALATE	3	33	1	0.04709	0.410	.	.	.	.	.	.	.
CHLORDANE	1	16	11	0.01647	0.109	.	.	.	.	.	.	.
	2	14	9	0.01144	0.082	.	.	.	.	.	.	.
	3	34	34	0.03989	0.074	.	.	.	.	.	.	.
	4	18	18	0.02838	0.097	.	.	.	.	.	.	.
	5	18	18	0.01062	0.045	.	.	.	.	.	.	.
	10	8	8	0.00832	0.016	.	.	.	.	.	.	.
	13	4	2	0.01369	0.073	.	.	.	.	.	.	.
	15	4	4	0.01225	0.022	.	.	.	.	.	.	.
COPPER	5	25	6	0.04648	170.000	50.00	0.0009	3.4000	1.30000	16.2500	0.003	10.462
DI-N-OCTYLPHTHALATE	3	33	1	0.02405	0.410	.	.	.	.	.	.	.
MERCURY	1	28	28	0.05367	0.082	0.01	5.3673	8.1945	0.00030	0.0037	14.313	21.852
	2	13	13	0.06384	0.135	0.01	6.3843	13.4967	0.00030	0.0037	17.025	35.991
	3	35	35	0.42259	0.616	0.01	42.2590	61.5506	0.00030	0.0037	112.691	164.135
	4	27	27	0.18534	0.391	0.01	18.5336	39.0647	0.00030	0.0037	49.423	104.173
	5	25	25	0.06598	0.108	0.01	6.5984	10.7910	0.00030	0.0037	17.596	28.776
	10	15	15	0.19008	0.280	0.01	19.0085	27.9963	0.00030	0.0037	50.689	74.657
	13	10	10	0.10551	0.367	0.01	10.5512	36.7416	0.00030	0.0037	28.137	97.978
	15	16	16	0.13209	0.218	0.01	13.2087	21.8292	0.00030	0.0037	35.223	58.211

Table F.11 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Mean[a] fish concentration	UCL[b] fish concentration	Lower piscivore criterion	Mean piscivore quotient	UCL piscivore quotient	Reference dose	RFD dietary concentration	Mean RFD piscivore quotient	UCL RFD piscivore quotient
SELENIUM	1	28	26	0.74833	0.834	0.50	1.4967	1.6690	0.00300	0.0375	19.955	22.253
	2	13	11	0.72604	0.851	0.50	1.4521	1.7014	0.00300	0.0375	19.361	22.685
	3	35	2	0.23139	0.577	0.50	0.4628	1.1538	0.00300	0.0375	6.170	15.383
	4	27	14	0.55653	0.686	0.50	1.1131	1.3727	0.00300	0.0375	14.841	18.303
	10	15	8	0.52186	0.582	0.50	1.0437	1.1650	0.00300	0.0375	13.916	15.533
	15	16	8	0.52464	0.679	0.50	1.0493	1.3590	0.00300	0.0375	13.990	18.119
ZINC	1	28	28	6.58972	7.546	60.00	0.1098	0.1258	0.20000	2.5000	2.636	3.019
	2	13	13	5.74198	6.566	60.00	0.0957	0.1094	0.20000	2.5000	2.297	2.626
	3	35	35	5.76390	6.551	60.00	0.0961	0.1092	0.20000	2.5000	2.306	2.620
	4	27	27	5.74666	6.545	60.00	0.0958	0.1091	0.20000	2.5000	2.299	2.618
	5	24	24	6.97721	10.930	60.00	0.1163	0.1822	0.20000	2.5000	2.791	4.372
	10	15	15	5.22138	5.967	60.00	0.0870	0.0994	0.20000	2.5000	2.089	2.387
	13	10	10	6.31303	6.977	60.00	0.1052	0.1163	0.20000	2.5000	2.525	2.791
	15	16	16	5.77205	6.899	60.00	0.0962	0.1150	0.20000	2.5000	2.309	2.760

[a]The mean concentration is the geometric mean.

[b]UCL concentration was compared with the maximum value and the smaller has been used as the "UCL concentration."

Table F.12. Minimum and upper confidence limit (UCL) detection limits for chemicals not detected in fish fillets (mg/kg), toxicological benchmarks for wildlife (mg/kg), and quotients for hazards to piscivorous wildlife

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	UCL[a] detection limit	Reference dose	RFD dietary concentration	Lower piscivore criterion	Minimum criterion	Minimum detection limit quo.	UCL detection limit quo.
1,2,4-TRICHLOROBENZENE	1	6	0	0.68000	0.87000	0.00131	0.0164	.	0.0164	41.527	53.130
	2	8	0	0.70000	1.90000	0.00131	0.0164	.	0.0164	42.748	116.031
	3	34	0	0.19000	0.41000	0.00131	0.0164	.	0.0164	11.603	25.038
	4	6	0	0.66000	0.72000	0.00131	0.0164	.	0.0164	40.305	43.969
	15	3	0	0.67000	0.71000	0.00131	0.0164	.	0.0164	40.916	43.359
1,2-DICHLOROBENZENE	1	6	0	0.68000	0.87000	0.09000	1.1250	.	1.1250	0.604	0.773
	2	8	0	0.70000	1.90000	0.09000	1.1250	.	1.1250	0.622	1.689
	3	34	0	0.19000	0.41000	0.09000	1.1250	.	1.1250	0.169	0.364
	4	6	0	0.66000	0.72000	0.09000	1.1250	.	1.1250	0.587	0.640
	15	3	0	0.67000	0.71000	0.09000	1.1250	.	1.1250	0.596	0.631
1,3-DICHLOROBENZENE	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.70000	1.90000	.	.	.	.	.	.
	3	34	0	0.19000	0.41000	.	.	.	.	.	.
	4	6	0	0.66000	0.72000	.	.	.	.	.	.
	15	3	0	0.67000	0.71000	.	.	.	.	.	.
1,4-DICHLOROBENZENE	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.70000	1.90000	.	.	.	.	.	.
	3	34	0	0.19000	0.41000	.	.	.	.	.	.
	4	6	0	0.66000	0.72000	.	.	.	.	.	.
	15	3	0	0.67000	0.71000	.	.	.	.	.	.
2,4,5-TRICHLOROPHENOL	1	6	0	3.40000	4.30000	0.10000	1.2500	.	1.2500	2.720	3.440
	2	8	0	3.50000	9.30000	0.10000	1.2500	.	1.2500	2.800	7.440
	3	34	0	0.93000	2.10000	0.10000	1.2500	.	1.2500	0.744	1.680
	4	13	0	3.30000	4.10000	0.10000	1.2500	.	1.2500	2.640	3.280
	5	9	0	3.30000	4.20000	0.10000	1.2500	.	1.2500	2.640	3.360
	13	2	0	3.40000	3.50000	0.10000	1.2500	.	1.2500	2.720	2.800
	15	4	0	3.40000	3.80000	0.10000	1.2500	.	1.2500	2.720	3.040
2,4,6-TRICHLOROPHENOL	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.70000	1.90000	.	.	.	.	.	.
	3	34	0	0.19000	0.41000	.	.	.	.	.	.
	4	13	0	0.66000	0.83000	.	.	.	.	.	.
	5	9	0	0.66000	0.83000	.	.	.	.	.	.
	13	2	0	0.69000	0.70000	.	.	.	.	.	.
	15	4	0	0.67000	0.77000	.	.	.	.	.	.

Table F.12 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	UCL[1] detection limit	Reference dose	RFD dietary concentration	Lower piscivore criterion	Minimum criterion	Minimum detection limit quo.	UCL detection limit quo.
2,4-DICHLOROPHENOL	1	6	0	0.68000	0.87000	0.00300	0.0375	.	0.0375	18.133	23.200
	2	8	0	0.70000	1.90000	0.00300	0.0375	.	0.0375	18.667	50.667
	3	34	0	0.19000	0.41000	0.00300	0.0375	.	0.0375	5.067	10.933
	4	14	0	0.66000	0.83000	0.00300	0.0375	.	0.0375	17.600	22.133
	5	9	0	0.66000	0.83000	0.00300	0.0375	.	0.0375	17.600	22.133
	13	2	0	0.69000	0.70000	0.00300	0.0375	.	0.0375	18.400	18.667
	15	4	0	0.67000	0.77000	0.00300	0.0375	.	0.0375	17.867	20.533
2,4-DIMETHYLPHENOL	1	6	0	0.68000	0.87000	0.02000	0.2500	.	0.2500	2.720	3.480
	2	8	0	0.70000	1.90000	0.02000	0.2500	.	0.2500	2.800	7.600
	3	34	0	0.19000	0.41000	0.02000	0.2500	.	0.2500	0.760	1.640
	4	14	0	0.66000	0.83000	0.02000	0.2500	.	0.2500	2.640	3.320
	5	9	0	0.66000	0.83000	0.02000	0.2500	.	0.2500	2.640	3.320
	13	2	0	0.69000	0.70000	0.02000	0.2500	.	0.2500	2.760	2.800
	15	4	0	0.67000	0.77000	0.02000	0.2500	.	0.2500	2.680	3.080
2,4-DINITROPHENOL	1	6	0	3.40000	4.30000	.	.	.	.	.	.
	2	8	0	3.50000	9.30000	.	.	.	.	.	.
	3	34	0	0.93000	2.10000	.	.	.	.	.	.
	4	13	0	3.30000	4.10000	.	.	.	.	.	.
	5	9	0	3.30000	4.20000	.	.	.	.	.	.
	13	2	0	3.40000	3.50000	.	.	.	.	.	.
	15	4	0	3.40000	3.80000	.	.	.	.	.	.
2,4-DINITROTOLUENE	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.70000	1.90000	.	.	.	.	.	.
	3	34	0	0.19000	0.41000	.	.	.	.	.	.
	4	6	0	0.66000	0.72000	.	.	.	.	.	.
	15	3	0	0.67000	0.71000	.	.	.	.	.	.
2,6-DINITROTOLUENE	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.70000	1.90000	.	.	.	.	.	.
	3	34	0	0.19000	0.41000	.	.	.	.	.	.
	4	6	0	0.66000	0.72000	.	.	.	.	.	.
	15	3	0	0.67000	0.71000	.	.	.	.	.	.
2-CHLORONAPHTHALENE	1	6	0	0.68000	0.87000	0.08000	1.0000	.	1.0000	0.680	0.870
	2	8	0	0.70000	1.90000	0.08000	1.0000	.	1.0000	0.700	1.900
	3	34	0	0.19000	0.41000	0.08000	1.0000	.	1.0000	0.190	0.410
	4	6	0	0.66000	0.72000	0.08000	1.0000	.	1.0000	0.660	0.720
	15	3	0	0.67000	0.71000	0.08000	1.0000	.	1.0000	0.670	0.710

Table F.12 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	UCL[1] detection limit	Reference dose	RFD dietary concentration	Lower piscivore criterion	Minimum criterion	Minimum detection limit quo.	UCL detection limit quo.
2-CHLOROPHENOL	1	6	0	0.68000	0.87000	0.00500	0.0625	.	0.0625	10.880	13.920
	2	8	0	0.70000	1.90000	0.00500	0.0625	.	0.0625	11.200	30.400
	3	34	0	0.19000	0.41000	0.00500	0.0625	.	0.0625	3.040	6.560
	4	14	0	0.66000	0.83000	0.00500	0.0625	.	0.0625	10.560	13.280
	5	9	0	0.66000	0.83000	0.00500	0.0625	.	0.0625	10.560	13.280
	13	2	0	0.69000	0.70000	0.00500	0.0625	.	0.0625	11.040	11.200
	15	4	0	0.67000	0.77000	0.00500	0.0625	.	0.0625	10.720	12.320
2-METHYLNAPHTHALENE	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.70000	1.90000	.	.	.	.	.	.
	3	34	0	0.19000	0.41000	.	.	.	.	.	.
	4	6	0	0.66000	0.72000	.	.	.	.	.	.
	5	3	0	0.03500	0.11000	.	.	.	.	.	.
	15	3	0	0.67000	0.71000	.	.	.	.	.	.
2-METHYLPHENOL	1	6	0	0.68000	0.87000	0.05000	0.6250	.	0.6250	1.088	1.392
	2	8	0	0.70000	1.90000	0.05000	0.6250	.	0.6250	1.120	3.040
	3	34	0	0.19000	0.41000	0.05000	0.6250	.	0.6250	0.304	0.656
	4	13	0	0.66000	0.83000	0.05000	0.6250	.	0.6250	1.056	1.328
	5	9	0	0.66000	0.83000	0.05000	0.6250	.	0.6250	1.056	1.328
	13	2	0	0.69000	0.70000	0.05000	0.6250	.	0.6250	1.104	1.120
	15	4	0	0.67000	0.77000	0.05000	0.6250	.	0.6250	1.072	1.232
2-NITROANILINE	1	6	0	3.40000	4.30000	.	.	.	.	.	.
	2	8	0	3.50000	9.30000	.	.	.	.	.	.
	3	34	0	0.93000	2.10000	.	.	.	.	.	.
	4	5	0	3.30000	3.60000	.	.	.	.	.	.
	15	3	0	3.40000	3.50000	.	.	.	.	.	.
2-NITROPHENOL	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.70000	1.90000	.	.	.	.	.	.
	3	34	0	0.19000	0.41000	.	.	.	.	.	.
	4	13	0	0.66000	0.83000	.	.	.	.	.	.
	5	9	0	0.66000	0.83000	.	.	.	.	.	.
	13	2	0	0.69000	0.70000	.	.	.	.	.	.
	15	4	0	0.67000	0.77000	.	.	.	.	.	.
3,3'-DICHLOROBENZIDINE	1	6	0	1.40000	1.70000	.	.	.	.	.	.
	2	8	0	1.40000	3.70000	.	.	.	.	.	.
	3	34	0	0.37000	0.83000	.	.	.	.	.	.
	4	6	0	1.30000	1.40000	.	.	.	.	.	.
	15	3	0	1.30000	1.40000	.	.	.	.	.	.

Table F.12 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	UCL[1] detection limit	Reference dose	RFD dietary concentration	Lower piscivore criterion	Minimum criterion	Minimum detection limit quo.	UCL detection limit quo.
3-NITROANILINE	1	6	0	3.40000	4.30000	.	.	.	.	.	.
	3	27	0	0.93000	2.10000	.	.	.	.	.	.
	4	2	0	3.30000	3.60000	.	.	.	.	.	.
4,4'-DDD	2	14	0	0.01000	0.10000	.	.	0.01	0.0100	1.000	10.000
	13	4	0	0.01000	0.01000	.	.	0.01	0.0100	1.000	1.000
4,4'-DDE	15	4	0	0.05000	0.20000	.	.	0.01	0.0100	5.000	20.000
4,4'-DDT	1	16	0	0.01000	0.20000	0.00050	0.0063	0.01	0.0063	1.600	32.000
	3	34	0	0.01000	0.01708	0.00050	0.0063	0.01	0.0063	1.600	2.733
	10	8	0	0.01000	0.01000	0.00050	0.0063	0.01	0.0063	1.600	1.600
	13	3	0	0.01000	0.01000	0.00050	0.0063	0.01	0.0063	1.600	1.600
	15	4	0	0.05000	0.20000	0.00050	0.0063	0.01	0.0063	8.000	32.000
4,6-DINITRO-2-METHYLPHENOL	1	6	0	3.40000	4.30000	.	.	.	.	.	.
	2	8	0	3.50000	9.30000	.	.	.	.	.	.
	3	34	0	0.93000	2.10000	.	.	.	.	.	.
	4	13	0	3.30000	4.10000	.	.	.	.	.	.
	5	8	0	3.30000	4.20000	.	.	.	.	.	.
	13	2	0	3.40000	3.50000	.	.	.	.	.	.
	15	4	0	3.40000	3.80000	.	.	.	.	.	.
4-BROMOPHENYL-PHENYLETHER	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.70000	1.90000	.	.	.	.	.	.
	3	34	0	0.19000	0.41000	.	.	.	.	.	.
	4	6	0	0.66000	0.72000	.	.	.	.	.	.
	15	3	0	0.67000	0.71000	.	.	.	.	.	.
4-CHLORO-3-METHYLPHENOL	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.70000	1.90000	.	.	.	.	.	.
	3	34	0	0.19000	0.41000	.	.	.	.	.	.
	4	15	0	0.66000	0.83000	.	.	.	.	.	.
	5	9	0	0.66000	0.83000	.	.	.	.	.	.
	13	2	0	0.69000	0.70000	.	.	.	.	.	.
	15	4	0	0.67000	0.77000	.	.	.	.	.	.
4-CHLOROANILINE	1	6	0	0.68000	0.87000	0.00400	0.0500	.	0.0500	13.600	17.400
	2	2	0	0.70000	1.80000	0.00400	0.0500	.	0.0500	14.000	36.000
	3	34	0	0.19000	0.41000	0.00400	0.0500	.	0.0500	3.800	8.200
	4	6	0	0.66000	0.72000	0.00400	0.0500	.	0.0500	13.200	14.400
	15	3	0	0.67000	0.71000	0.00400	0.0500	.	0.0500	13.400	14.200

Table F.12 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	UCL[1] detection limit	Reference dose	RFD dietary concentration	Lower piscivore criterion	Minimum criterion	Minimum detection limit quo.	UCL detection limit quo.
4-CHLOROPHENYL-PHENYLETHER	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.70000	1.90000	.	.	.	.	.	.
	3	34	0	0.19000	0.41000	.	.	.	.	.	.
	4	6	0	0.66000	0.72000	.	.	.	.	.	.
	15	3	0	0.67000	0.71000	.	.	.	.	.	.
4-METHYLPHENOL	1	6	0	0.68000	0.87000	0.05000	0.6250	.	0.6250	1.088	1.392
	2	8	0	0.70000	1.90000	0.05000	0.6250	.	0.6250	1.120	3.040
	3	34	0	0.19000	0.41000	0.05000	0.6250	.	0.6250	0.304	0.656
	4	14	0	0.66000	0.83000	0.05000	0.6250	.	0.6250	1.056	1.328
	5	9	0	0.66000	0.83000	0.05000	0.6250	.	0.6250	1.056	1.328
	13	2	0	0.69000	0.70000	0.05000	0.6250	.	0.6250	1.104	1.120
	15	4	0	0.67000	0.77000	0.05000	0.6250	.	0.6250	1.072	1.232
4-NITROANILINE	1	6	0	3.40000	4.30000	0.00131	0.0164	.	0.0164	207.634	262.595
	2	8	0	3.50000	9.30000	0.00131	0.0164	.	0.0164	213.740	567.939
	3	34	0	0.93000	2.10000	0.00131	0.0164	.	0.0164	56.794	128.244
	4	2	0	3.30000	3.60000	0.00131	0.0164	.	0.0164	201.527	219.847
4-NITROPHENOL	1	6	0	3.40000	4.30000	.	.	.	.	.	.
	2	8	0	3.50000	9.30000	.	.	.	.	.	.
	3	34	0	0.93000	2.10000	.	.	.	.	.	.
	4	13	0	3.30000	4.10000	.	.	.	.	.	.
	5	9	0	3.30000	4.20000	.	.	.	.	.	.
	13	2	0	3.40000	3.50000	.	.	.	.	.	.
	15	4	0	3.40000	3.80000	.	.	.	.	.	.
ACENAPHTHENE	1	6	0	0.68000	0.87000	0.06000	0.7500	.	0.7500	0.907	1.160
	2	8	0	0.70000	1.90000	0.06000	0.7500	.	0.7500	0.933	2.533
	3	34	0	0.19000	0.41000	0.06000	0.7500	.	0.7500	0.253	0.547
	4	6	0	0.66000	0.72000	0.06000	0.7500	.	0.7500	0.880	0.960
	15	3	0	0.67000	0.71000	0.06000	0.7500	.	0.7500	0.893	0.947
ACENAPHTHYLENE	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.70000	1.90000	.	.	.	.	.	.
	3	34	0	0.19000	0.41000	.	.	.	.	.	.
	4	6	0	0.66000	0.72000	.	.	.	.	.	.
	15	3	0	0.67000	0.71000	.	.	.	.	.	.
ALDRIN	1	16	0	0.01000	0.20000	0.00003	0.0004	.	0.0004	26.667	533.333
	3	34	0	0.00772	0.00854	0.00003	0.0004	.	0.0004	20.587	22.773
	10	8	0	0.01000	0.01000	0.00003	0.0004	.	0.0004	26.667	26.667
	15	4	0	0.05000	0.20000	0.00003	0.0004	.	0.0004	133.333	533.333

Table F.12 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	UCL[1] detection limit	Reference dose	RFD dietary concentration	Lower piscivore criterion	Minimum criterion	Minimum detection limit quo.	UCL detection limit quo.
ANTHRACENE	1	6	0	0.68000	0.87000	0.30000	3.7500	.	3.7500	0.181	0.232
	2	8	0	0.70000	1.90000	0.30000	3.7500	.	3.7500	0.187	0.507
	3	34	0	0.19000	0.41000	0.30000	3.7500	.	3.7500	0.051	0.109
	4	6	0	0.66000	0.72000	0.30000	3.7500	.	3.7500	0.176	0.192
	15	3	0	0.67000	0.71000	0.30000	3.7500	.	3.7500	0.179	0.189
ANTIMONY	1	28	0	0.28000	0.58000	0.00040	0.0050	0.30	0.0050	56.000	116.000
	2	13	0	0.46000	0.60000	0.00040	0.0050	0.30	0.0050	92.000	120.000
	3	35	0	0.30000	0.59000	0.00040	0.0050	0.30	0.0050	60.000	118.000
	4	27	0	0.48000	0.61000	0.00040	0.0050	0.30	0.0050	96.000	122.000
	5	25	0	0.46000	0.63000	0.00040	0.0050	0.30	0.0050	92.000	126.000
	10	15	0	0.35000	0.61000	0.00040	0.0050	0.30	0.0050	70.000	122.000
	13	10	0	0.46000	0.57000	0.00040	0.0050	0.30	0.0050	92.000	114.000
	15	16	0	0.35000	0.57000	0.00040	0.0050	0.30	0.0050	70.000	114.000
AROCLOR-1254	10	8	0	0.01000	0.05000	.	.	0.04	0.0400	0.250	1.250
BENZO(A)ANTHRACENE	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.70000	1.90000	.	.	.	.	.	.
	3	34	0	0.19000	0.41000	.	.	.	.	.	.
	4	6	0	0.66000	0.72000	.	.	.	.	.	.
	15	3	0	0.67000	0.71000	.	.	.	.	.	.
BENZO(A)PYRENE	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.70000	1.90000	.	.	.	.	.	.
	3	33	0	0.19000	0.41000	.	.	.	.	.	.
	4	6	0	0.66000	0.72000	.	.	.	.	.	.
	15	3	0	0.67000	0.71000	.	.	.	.	.	.
BENZO(B)FLUORANTHENE	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.70000	1.90000	.	.	.	.	.	.
	3	33	0	0.19000	0.41000	.	.	.	.	.	.
	4	6	0	0.66000	0.72000	.	.	.	.	.	.
	15	3	0	0.67000	0.71000	.	.	.	.	.	.
BENZO(G,H,I)PERYLENE	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.70000	1.90000	.	.	.	.	.	.
	3	32	0	0.19000	0.41000	.	.	.	.	.	.
	4	6	0	0.66000	0.72000	.	.	.	.	.	.
	15	3	0	0.67000	0.71000	.	.	.	.	.	.

Table F.12 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	UCL[1] detection limit	Reference dose	RFD dietary concentration	Lower piscivore criterion	Minimum criterion	Minimum detection limit quo.	UCL detection limit quo.
BENZO(K)FLUORANTHENE	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.70000	1.90000	.	.	.	.	.	.
	3	33	0	0.19000	0.41000	.	.	.	.	.	.
	4	6	0	0.66000	0.72000	.	.	.	.	.	.
	15	3	0	0.67000	0.71000	.	.	.	.	.	.
BENZOIC ACID	1	6	0	3.40000	4.30000	4.00000	50.0000	.	50.0000	0.068	0.086
	2	8	0	3.50000	9.30000	4.00000	50.0000	.	50.0000	0.070	0.186
	3	34	0	0.93000	2.10000	4.00000	50.0000	.	50.0000	0.019	0.042
	4	2	0	3.30000	3.60000	4.00000	50.0000	.	50.0000	0.066	0.072
BENZYL ALCOHOL	1	6	0	0.68000	0.87000	0.09000	1.1250	.	1.1250	0.604	0.773
	2	8	0	0.70000	1.90000	0.09000	1.1250	.	1.1250	0.622	1.689
	3	34	0	0.19000	0.41000	0.09000	1.1250	.	1.1250	0.169	0.364
	4	6	0	0.66000	0.72000	0.09000	1.1250	.	1.1250	0.587	0.640
	15	3	0	0.67000	0.71000	0.09000	1.1250	.	1.1250	0.596	0.631
BERYLLIUM	2	13	0	0.00300	0.00300	0.00500	0.0625	25.00	0.0625	0.048	0.048
	4	27	0	0.00300	0.00300	0.00500	0.0625	25.00	0.0625	0.048	0.048
	13	3	0	0.00300	0.00300	0.00500	0.0625	25.00	0.0625	0.048	0.048
BIS(2-CHLOROETHOXY)METHANE	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.70000	1.90000	.	.	.	.	.	.
	3	34	0	0.19000	0.41000	.	.	.	.	.	.
	4	6	0	0.66000	0.72000	.	.	.	.	.	.
	15	3	0	0.67000	0.71000	.	.	.	.	.	.
BIS(2-CHLOROETHYL)ETHER	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.70000	1.90000	.	.	.	.	.	.
	3	34	0	0.19000	0.41000	.	.	.	.	.	.
	4	7	0	0.66000	0.73000	.	.	.	.	.	.
	15	3	0	0.67000	0.71000	.	.	.	.	.	.
BIS(2-CHLOROISOPROPYL)ETHER	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.70000	1.90000	.	.	.	.	.	.
	3	34	0	0.19000	0.41000	.	.	.	.	.	.
	4	6	0	0.66000	0.72000	.	.	.	.	.	.
	15	3	0	0.67000	0.71000	.	.	.	.	.	.
BIS(2-ETHYLHEXYL)PHTHALATE	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.70000	1.90000	.	.	.	.	.	.
	4	6	0	0.66000	0.72000	.	.	.	.	.	.
	15	3	0	0.67000	0.71000	.	.	.	.	.	.

Table F.12 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	UCL[1] detection limit	Reference dose	RFD dietary concentration	Lower piscivore criterion	Minimum criterion	Minimum detection limit quo.	UCL detection limit quo.
BUTYLBENZYLPHTHALATE	1	6	0	0.68000	0.87000	0.20000	2.5000	.	2.5000	0.272	0.348
	2	8	0	0.70000	1.90000	0.20000	2.5000	.	2.5000	0.280	0.760
	3	34	0	0.19000	0.41000	0.20000	2.5000	.	2.5000	0.076	0.164
	4	6	0	0.66000	0.72000	0.20000	2.5000	.	2.5000	0.264	0.288
	15	3	0	0.67000	0.71000	0.20000	2.5000	.	2.5000	0.268	0.284
CADMIUM	1	28	0	0.11000	0.23000	0.00050	0.0063	0.25	0.0063	17.600	36.800
	2	13	0	0.18000	0.24000	0.00050	0.0063	0.25	0.0063	28.800	38.400
	3	35	0	0.12000	0.24000	0.00050	0.0063	0.25	0.0063	19.200	38.400
	4	27	0	0.19000	0.24000	0.00050	0.0063	0.25	0.0063	30.400	38.400
	5	25	0	0.19000	0.28000	0.00050	0.0063	0.25	0.0063	30.400	44.800
	10	15	0	0.14000	0.25000	0.00050	0.0063	0.25	0.0063	22.400	40.000
	13	10	0	0.18000	0.24000	0.00050	0.0063	0.25	0.0063	28.800	38.400
	15	16	0	0.14000	0.23000	0.00050	0.0063	0.25	0.0063	22.400	36.800
CHROMIUM	1	28	0	0.28000	0.58000	.	.	1.00	1.0000	0.280	0.580
	2	13	0	0.46000	0.60000	.	.	1.00	1.0000	0.460	0.600
	3	35	0	0.30000	0.59000	.	.	1.00	1.0000	0.300	0.590
	4	27	0	0.48000	0.61000	.	.	1.00	1.0000	0.480	0.610
	5	25	0	0.46000	0.63000	.	.	1.00	1.0000	0.460	0.630
	10	15	0	0.35000	0.61000	.	.	1.00	1.0000	0.350	0.610
	13	10	0	0.45000	0.59000	.	.	1.00	1.0000	0.450	0.590
	15	16	0	0.35000	0.57000	.	.	1.00	1.0000	0.350	0.570
CHRYSENE	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.70000	1.90000	.	.	.	.	.	.
	3	34	0	0.19000	0.41000	.	.	.	.	.	.
	4	6	0	0.66000	0.72000	.	.	.	.	.	.
	15	3	0	0.67000	0.71000	.	.	.	.	.	.
COPPER	1	28	0	0.28000	0.58000	1.30000	16.2500	50.00	16.2500	0.017	0.036
	2	13	0	0.46000	0.60000	1.30000	16.2500	50.00	16.2500	0.028	0.037
	3	35	0	0.30000	0.59000	1.30000	16.2500	50.00	16.2500	0.018	0.036
	4	27	0	0.48000	0.61000	1.30000	16.2500	50.00	16.2500	0.030	0.038
	10	15	0	0.35000	0.61000	1.30000	16.2500	50.00	16.2500	0.022	0.038
	13	10	0	0.45000	0.59000	1.30000	16.2500	50.00	16.2500	0.028	0.036
	15	16	0	0.35000	0.57000	1.30000	16.2500	50.00	16.2500	0.022	0.035
DI-N-BUTYLPHTHALATE	1	6	0	0.68000	0.87000	0.10000	1.2500	.	1.2500	0.544	0.696
	2	8	0	0.70000	1.90000	0.10000	1.2500	.	1.2500	0.560	1.520
	3	34	0	0.19000	0.41000	0.10000	1.2500	.	1.2500	0.152	0.328
	4	6	0	0.66000	0.72000	0.10000	1.2500	.	1.2500	0.528	0.576
	15	3	0	0.67000	0.71000	0.10000	1.2500	.	1.2500	0.536	0.568

Table F.12 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	UCL' detection limit	Reference dose	RFD dietary concentration	Lower piscivore criterion	Minimum criterion	Minimum detection limit quo.	UCL detection limit quo.
DI-N-OCTYLPHTHALATE	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.08200	1.90000	.	.	.	.	.	.
	4	6	0	0.66000	0.72000	.	.	.	.	.	.
	15	3	0	0.67000	0.71000	.	.	.	.	.	.
DIBENZ(A,H)ANTHRACENE	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.70000	1.90000	.	.	.	.	.	.
	3	33	0	0.19000	0.41000	.	.	.	.	.	.
	4	6	0	0.66000	0.72000	.	.	.	.	.	.
	15	3	0	0.67000	0.71000	.	.	.	.	.	.
DIBENZOFURAN	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.70000	1.90000	.	.	.	.	.	.
	3	34	0	0.19000	0.41000	.	.	.	.	.	.
	4	6	0	0.66000	0.72000	.	.	.	.	.	.
	15	3	0	0.67000	0.71000	.	.	.	.	.	.
DIETHYLPHTHALATE	1	6	0	0.68000	0.87000	0.80000	10.0000	.	10.0000	0.068	0.087
	2	8	0	0.08000	1.90000	0.80000	10.0000	.	10.0000	0.008	0.190
	3	34	0	0.19000	0.41000	0.80000	10.0000	.	10.0000	0.019	0.041
	4	6	0	0.66000	0.72000	0.80000	10.0000	.	10.0000	0.066	0.072
	15	3	0	0.67000	0.71000	0.80000	10.0000	.	10.0000	0.067	0.071
DIMETHYLPHTHALATE	1	6	0	0.68000	0.87000	1.00000	12.5000	.	12.5000	0.054	0.070
	2	8	0	0.70000	1.90000	1.00000	12.5000	.	12.5000	0.056	0.152
	3	34	0	0.19000	0.41000	1.00000	12.5000	.	12.5000	0.015	0.033
	4	6	0	0.66000	0.72000	1.00000	12.5000	.	12.5000	0.053	0.058
	15	3	0	0.67000	0.71000	1.00000	12.5000	.	12.5000	0.054	0.057
FLUORANTHENE	1	6	0	0.68000	0.87000	0.04000	0.5000	.	0.5000	1.360	1.740
	2	8	0	0.70000	1.90000	0.04000	0.5000	.	0.5000	1.400	3.800
	3	34	0	0.19000	0.41000	0.04000	0.5000	.	0.5000	0.380	0.820
	4	7	0	0.66000	0.73000	0.04000	0.5000	.	0.5000	1.320	1.460
	15	3	0	0.67000	0.71000	0.04000	0.5000	.	0.5000	1.340	1.420
FLUORENE	1	6	0	0.68000	0.87000	0.04000	0.5000	.	0.5000	1.360	1.740
	2	8	0	0.70000	1.90000	0.04000	0.5000	.	0.5000	1.400	3.800
	3	34	0	0.19000	0.41000	0.04000	0.5000	.	0.5000	0.380	0.820
	4	6	0	0.66000	0.72000	0.04000	0.5000	.	0.5000	1.320	1.440
	15	3	0	0.67000	0.71000	0.04000	0.5000	.	0.5000	1.340	1.420

Table F.12 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	UCL[1] detection limit	Reference dose	RFD dietary concentration	Lower piscivore criterion	Minimum criterion	Minimum detection limit quo.	UCL detection limit quo.
HEXACHLOROBENZENE	1	6	0	0.68000	0.87000	0.00080	0.0100	.	0.0100	68.000	87.000
	2	8	0	0.70000	1.90000	0.00080	0.0100	.	0.0100	70.000	190.000
	3	34	0	0.19000	0.41000	0.00080	0.0100	.	0.0100	19.000	41.000
	4	6	0	0.66000	0.72000	0.00080	0.0100	.	0.0100	66.000	72.000
	15	3	0	0.67000	0.71000	0.00080	0.0100	.	0.0100	67.000	71.000
HEXACHLOROBUTADIENE	1	6	0	0.68000	0.87000	0.00200	0.0250	.	0.0250	27.200	34.800
	2	8	0	0.70000	1.90000	0.00200	0.0250	.	0.0250	28.000	76.000
	3	34	0	0.19000	0.41000	0.00200	0.0250	.	0.0250	7.600	16.400
	4	6	0	0.66000	0.72000	0.00200	0.0250	.	0.0250	26.400	28.800
	15	3	0	0.67000	0.71000	0.00200	0.0250	.	0.0250	26.800	28.400
HEXACHLOROCYCLOPENTADIENE	1	6	0	0.68000	0.87000	0.00700	0.0875	.	0.0875	7.771	9.943
	2	8	0	0.70000	1.90000	0.00700	0.0875	.	0.0875	8.000	21.714
	3	34	0	0.19000	0.41000	0.00700	0.0875	.	0.0875	2.171	4.686
	4	6	0	0.66000	0.72000	0.00700	0.0875	.	0.0875	7.543	8.229
	15	3	0	0.67000	0.71000	0.00700	0.0875	.	0.0875	7.657	8.114
HEXACHLOROETHANE	1	6	0	0.68000	0.87000	0.00100	0.0125	.	0.0125	54.400	69.600
	2	8	0	0.70000	1.90000	0.00100	0.0125	.	0.0125	56.000	152.000
	3	34	0	0.19000	0.41000	0.00100	0.0125	.	0.0125	15.200	32.800
	4	6	0	0.66000	0.72000	0.00100	0.0125	.	0.0125	52.800	57.600
	15	3	0	0.67000	0.71000	0.00100	0.0125	.	0.0125	53.600	56.800
INDENO(1,2,3-CD)PYRENE	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.70000	1.90000	.	.	.	.	.	.
	3	33	0	0.19000	0.41000	.	.	.	.	.	.
	4	6	0	0.66000	0.72000	.	.	.	.	.	.
	15	3	0	0.67000	0.71000	.	.	.	.	.	.
ISOPHORONE	1	6	0	0.68000	0.87000	0.20000	2.5000	.	2.5000	0.272	0.348
	2	8	0	0.70000	1.90000	0.20000	2.5000	.	2.5000	0.280	0.760
	3	34	0	0.19000	0.41000	0.20000	2.5000	.	2.5000	0.076	0.164
	4	6	0	0.66000	0.72000	0.20000	2.5000	.	2.5000	0.264	0.288
	15	3	0	0.67000	0.71000	0.20000	2.5000	.	2.5000	0.268	0.284
LEAD	1	28	0	0.28000	0.58000	.	.	15.00	15.0000	0.019	0.039
	2	13	0	0.46000	0.60000	.	.	15.00	15.0000	0.031	0.040
	3	25	0	0.30000	0.59000	.	.	15.00	15.0000	0.020	0.039
	4	17	0	0.48000	0.61000	.	.	15.00	15.0000	0.032	0.041
	5	5	0	0.46000	0.51000	.	.	15.00	15.0000	0.031	0.034
	10	5	0	0.35000	0.44000	.	.	15.00	15.0000	0.023	0.029
	13	10	0	0.45000	0.59000	.	.	15.00	15.0000	0.030	0.039
	15	16	0	0.35000	0.57000	.	.	15.00	15.0000	0.023	0.038

Table F.12 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	UCL[1] detection limit	Reference dose	RFD dietary concentration	Lower piscivore criterion	Minimum criterion	Minimum detection limit quo.	UCL detection limit quo.
N-NITROSO-DI-N-PROPYLAMINE	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.70000	1.90000	.	.	.	.	.	.
	3	34	0	0.19000	0.41000	.	.	.	.	.	.
	4	6	0	0.66000	0.72000	.	.	.	.	.	.
	15	3	0	0.67000	0.71000	.	.	.	.	.	.
N-NITROSODIPHENYLAMINE	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.70000	1.90000	.	.	.	.	.	.
	3	34	0	0.19000	0.41000	.	.	.	.	.	.
	4	6	0	0.66000	0.72000	.	.	.	.	.	.
	15	3	0	0.67000	0.71000	.	.	.	.	.	.
NAPHTHALENE	1	6	0	0.68000	0.87000	0.00400	0.0500	.	0.0500	13.600	17.400
	2	8	0	0.70000	1.90000	0.00400	0.0500	.	0.0500	14.000	38.000
	3	34	0	0.19000	0.41000	0.00400	0.0500	.	0.0500	3.800	8.200
	4	6	0	0.66000	0.72000	0.00400	0.0500	.	0.0500	13.200	14.400
	5	1	0	0.05700	0.05700	0.00400	0.0500	.	0.0500	1.140	1.140
	15	3	0	0.67000	0.71000	0.00400	0.0500	.	0.0500	13.400	14.200
NICKEL	1	28	0	0.28000	1.10000	0.02000	0.2500	50.00	0.2500	1.120	4.400
	2	13	0	0.46000	0.60000	0.02000	0.2500	50.00	0.2500	1.840	2.400
	3	35	0	0.30000	0.59000	0.02000	0.2500	50.00	0.2500	1.200	2.360
	4	27	0	0.48000	0.61000	0.02000	0.2500	50.00	0.2500	1.920	2.440
	5	5	0	0.46000	0.51000	0.02000	0.2500	50.00	0.2500	1.840	2.040
	10	15	0	0.35000	0.61000	0.02000	0.2500	50.00	0.2500	1.400	2.440
	13	10	0	0.45000	0.59000	0.02000	0.2500	50.00	0.2500	1.800	2.360
	15	16	0	0.35000	0.57000	0.02000	0.2500	50.00	0.2500	1.400	2.280
NITROBENZENE	1	6	0	0.68000	0.87000	0.00050	0.0063	.	0.0063	108.800	139.200
	2	8	0	0.70000	1.90000	0.00050	0.0063	.	0.0063	112.000	304.000
	3	34	0	0.19000	0.41000	0.00050	0.0063	.	0.0063	30.400	65.600
	4	6	0	0.66000	0.72000	0.00050	0.0063	.	0.0063	105.600	115.200
	15	3	0	0.67000	0.71000	0.00050	0.0063	.	0.0063	107.200	113.600
PENTACHLOROPHENOL	1	6	0	3.40000	4.30000	0.03000	0.3750	.	0.3750	9.067	11.467
	2	8	0	3.50000	9.30000	0.03000	0.3750	.	0.3750	9.333	24.800
	3	34	0	0.93000	2.10000	0.03000	0.3750	.	0.3750	2.480	5.600
	4	13	0	3.30000	4.10000	0.03000	0.3750	.	0.3750	8.800	10.933
	5	9	0	3.30000	4.20000	0.03000	0.3750	.	0.3750	8.800	11.200
	13	2	0	3.40000	3.50000	0.03000	0.3750	.	0.3750	9.067	9.333
	15	4	0	3.40000	3.80000	0.03000	0.3750	.	0.3750	9.067	10.133

Table F.12 (continued)

Analyte	Reach	Number analyzed in reach (fish)	Number detects in reach (fish)	Minimum detection limit	UCL[1] detection limit	Reference dose	RFD dietary concentration	Lower piscivore criterion	Minimum criterion	Minimum detection limit quo.	UCL detection limit quo.
PHENANTHRENE	1	6	0	0.68000	0.87000	.	.	.	.	.	.
	2	8	0	0.70000	1.90000	.	.	.	.	.	.
	3	34	0	0.19000	0.41000	.	.	.	.	.	.
	4	6	0	0.66000	0.72000	.	.	.	.	.	.
	15	3	0	0.67000	0.71000	.	.	.	.	.	.
PHENOL	1	6	0	0.68000	0.87000	0.60000	7.5000	.	7.5000	0.091	0.116
	2	8	0	0.70000	1.90000	0.60000	7.5000	.	7.5000	0.093	0.253
	3	34	0	0.19000	0.41000	0.60000	7.5000	.	7.5000	0.025	0.055
	4	13	0	0.66000	0.83000	0.60000	7.5000	.	7.5000	0.088	0.111
	5	9	0	0.66000	0.83000	0.60000	7.5000	.	7.5000	0.088	0.111
	13	2	0	0.69000	0.70000	0.60000	7.5000	.	7.5000	0.092	0.093
	15	4	0	0.67000	0.77000	0.60000	7.5000	.	7.5000	0.089	0.103
PYRENE	1	6	0	0.68000	0.87000	0.03000	0.3750	.	0.3750	1.813	2.320
	2	8	0	0.70000	1.90000	0.03000	0.3750	.	0.3750	1.867	5.067
	3	34	0	0.19000	0.41000	0.03000	0.3750	.	0.3750	0.507	1.093
	4	6	0	0.66000	0.72000	0.03000	0.3750	.	0.3750	1.760	1.920
	15	3	0	0.67000	0.71000	0.03000	0.3750	.	0.3750	1.787	1.893
SELENIUM	5	25	0	0.46000	0.63000	0.00300	0.0375	0.50	0.0375	12.267	16.800
	13	10	0	0.45000	0.59000	0.00300	0.0375	0.50	0.0375	12.000	15.733
SILVER	1	28	0	0.11000	0.23000	0.00300	0.0375	10.00	0.0375	2.933	6.133
	2	13	0	0.18000	0.24000	0.00300	0.0375	10.00	0.0375	4.800	6.400
	3	35	0	0.12000	0.24000	0.00300	0.0375	10.00	0.0375	3.200	6.400
	4	27	0	0.19000	0.24000	0.00300	0.0375	10.00	0.0375	5.067	6.400
	5	25	0	0.19000	0.25000	0.00300	0.0375	10.00	0.0375	5.067	6.667
	10	15	0	0.14000	0.25000	0.00300	0.0375	10.00	0.0375	3.733	6.667
	13	10	0	0.18000	0.24000	0.00300	0.0375	10.00	0.0375	4.800	6.400
	15	16	0	0.14000	0.23000	0.00300	0.0375	10.00	0.0375	3.733	6.133
THALLIUM	1	28	0	0.02000	0.02000	.	.	.	.	.	.
	2	13	0	0.02000	0.02000	.	.	.	.	.	.
	3	35	0	0.02000	0.02000	.	.	.	.	.	.
	4	27	0	0.02000	0.02000	.	.	.	.	.	.
	5	16	0	0.02000	0.02000	.	.	.	.	.	.
	10	15	0	0.02000	0.02000	.	.	.	.	.	.
	13	10	0	0.02000	0.02000	.	.	.	.	.	.
	15	16	0	0.02000	0.02000	.	.	.	.	.	.

[a]The maximum detection limit is used in cases where the UCL detection limit was missing.

Appendix G

BRADEN BRANCH

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BRADEN BRANCH SCREENING-LEVEL RISK ASSESSMENT

Braden Branch is a known source of ^{60}Co contamination to Melton Hill Reservoir at Clinch River Mile (CRM) 50.5. The source of this contamination was the site of the former American Nuclear Corporation (ANC), which released ^{60}Co into the watershed of Braden Branch. Samples were collected in Braden Branch during Phase 1 of the Clinch River Remedial Investigation to characterize this site. The purpose of this appendix is to summarize the data from sampling of Braden Branch and to present a screening-level assessment of the risk to human health associated with exposure to the contaminated areas.

G.1 STUDY AREA

Braden Branch Creek is a small stream that enters Melton Hill Reservoir at approximately CRM 50.5 (Fig. G.1). This is several hundred meters upstream and on the opposite shoreline from the Oak Ridge Marina. The creek is separated from Melton Hill Reservoir by a railroad berm. Surface water is exchanged between the two water bodies via a culvert that passes through the berm. Damming caused by the berm creates an embayment on the upstream side, which acts as a settling pond for particles washed from the Braden Branch watershed.

G.2 HISTORICAL BACKGROUND

In 1968, personnel from ORNL noted abnormally high radioactivity in a water sample from the Braden Branch area of the Clinch River. The source of this radioactivity was traced to the formmer ANC located on Braden Branch Creek. Under the jurisdiction of the U.S. Atomic Energy Commission (until 1965) and the State of Tennessee (between 1965 and 1970 when ANC closed), ANC used ^{60}Co as a radiation source for medical instruments between 1962 and 1970.

After the contamination was detected in the Clinch River, radiation surveys near the site revealed exposure rates in the mR/hr to R/hr range. The ANC facility was closed in 1970, and clean-up efforts commenced. The clean up was restricted to the immediate area around the plant. No effort was made to clean up contamination in the Braden Branch embayment or areas downstream. The Division of Radiological Health of the Tennessee Department of Environment and Conservation (TDEC) obtains results of monthly radiation surveys in the area (approximately 50 acres) and from annual measurements near the building site. Public access to the ANC building and surrounding land is restricted.

Sediment samples were collected from the Braden Branch embayment in 1977 and 1987. In 1977, ^{60}Co concentrations in surface sediment within the Braden Branch embayment were as high as 1287 pCi/g dry wt. The highest concentration found in surface sediment in the embayment during a 1987 survey was 152.0 pCi/g. Explanations for this drop in concentration are (1) radioactive decay; the half-life of ^{60}Co is approximately five years, which means that 1287 pCi/g dry wt in 1977 would have been reduced to 320 pCi/g by 1987, and (2) the redistribution and dilution of contaminated sediment could be responsible for spreading and mixing contaminated sediment within the embayment and into Melton Hill Reservoir. The observation that the highest ^{60}Co concentrations in 1977 were in the upper end of the

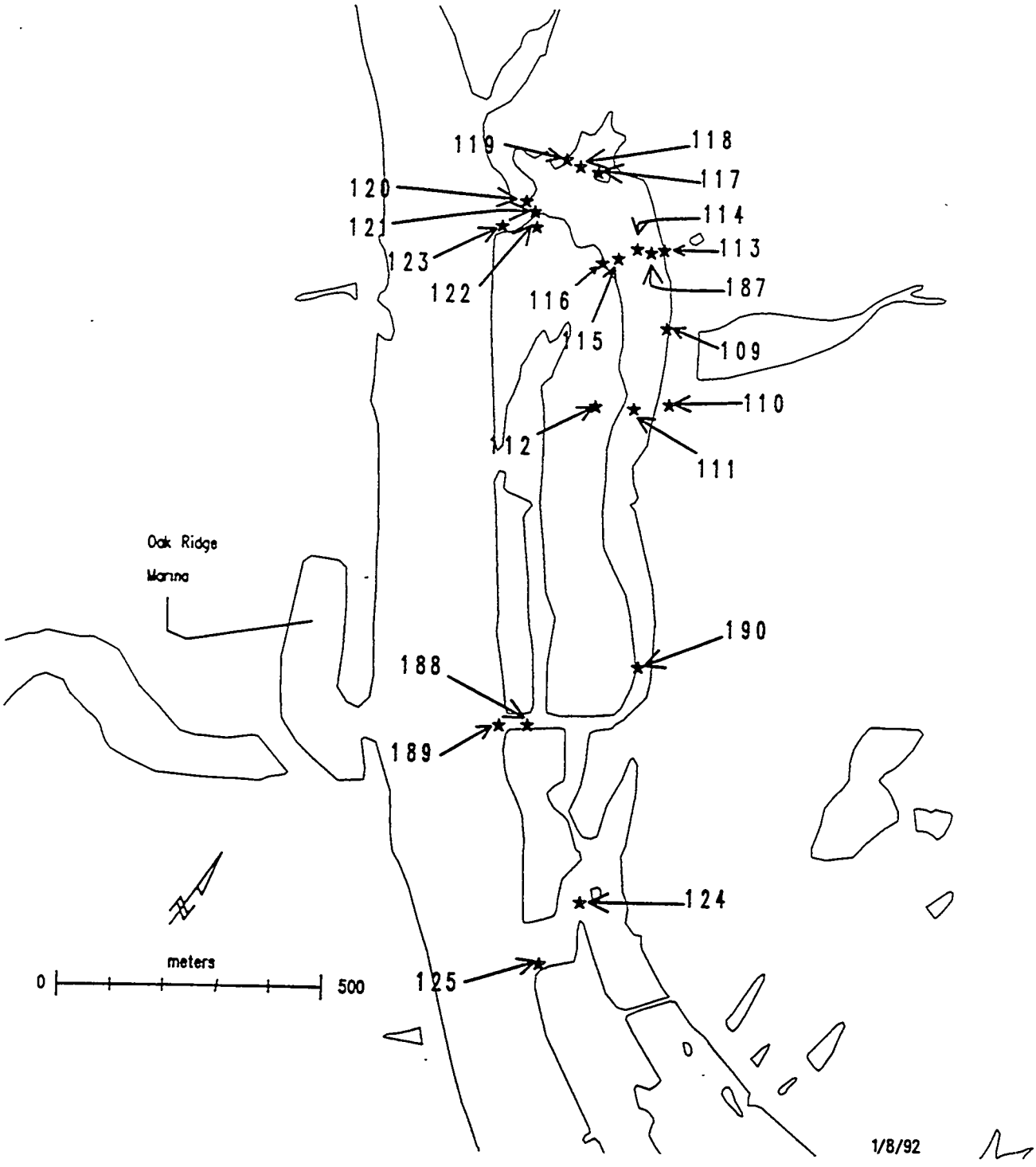

Fig. G.1. Braden Branch near-shore sample sites.

embayment but in 1987 were in the lower end suggests that there is some redistribution of ^{60}Co. Finally, along with redistribution, contaminated sediments may be buried by "cleaner" sediments. There is some historic evidence of this as well. For example, in the 1987 survey of the embayment, a ^{60}Co concentration in the top 6 in. of sediment at one site was 39.9 pCi/g dry wt, while the concentration in the 6–12 in. segment was 383.0 pCi/g dry wt. However, this pattern is by no means consistent throughout the embayment.

G.3 RECENT DATA

Sediment sampling was conducted in the immediate vicinity of Braden Branch as Phase 1 of the CRRI. A total of 20 sediment grab samples were taken between July 25 and August 10, 1990 (Table G.1). These samples were taken with a Ponar grab sampler for the purpose of characterizing the radionuclide concentrations in the surface sediment only. A single sediment core was also taken within 300 m of the confluence of Braden Branch and Melton Hill Reservoir (Table G.2). This core was divided into separate samples by depth intervals (2 cm to a depth of 48 cm) and analyzed to provide a vertical profile of sediment contamination (Table G.3). Sample locations for grab samples (ID nos. 109–125, and 188–190) and for the core sample (ID no. 187) are shown on Fig. G.1.

G.4 REFERENCE CONCENTRATIONS

Radionuclides are present throughout the world due to natural occurrence and to man-made sources. Sediment samples taken from Norris Reservoir provide reference or "background" concentrations for radionuclides and other contaminants being examined in the CRRI. Norris Reservoir background levels of ^{60}Co, which originated from atmospheric testing of nuclear weapons and not from DOE facilities in Oak Ridge, are below minimum detectable activity.

G.5 DATA SUMMARY

Table G.4 summarizes ^{60}Co surface sediment concentrations from the 20 grab samples and the top 2 cm of the core sample collected in 1990. Fig. G.2 shows the ^{60}Co concentration at each of the sample locations. Locations with the highest concentrations (>1.01 pCi/g) are, with the exception of sample no. 190 (^{60}Co concentration = 4.53 pCi/g), within 200 m of the culvert under the railroad bridge where Braden Branch enters Melton Hill Reservoir.

Figure G.3 shows ^{60}Co concentration by depth in core no. 18700G and compares these concentrations with those from a core taken from Melton Hill Reservoir at CRM 23.9 (core no. 8200G). The profile for the Braden Branch core indicates that there are two concentration peaks. The first is at a depth of 22 cm with a concentration of 20.07 pCi/g. The second peak is at 33 cm with an associated concentration of 39.33 pCi/g. The concentrations from the two downstream cores (near Solway Bridge and Melton Hill Dam) are all less than 1.0 pCi/g dry wt, and most of the concentrations in these cores are below the detectable limit. The concentrations of ^{60}Co in the Braden Branch core are considerably higher than the minimum detectable levels (0–0.3 pCi/g) to a depth of 45 cm.

Table G.1. Data Listing For CR-ERP Braden Branch Sediment Grab Sample Radiological Analyses

RIVER SYSTEM POSITION	RIVER MILE/KM	SAMPLE MATRIX	CR-ERP SAMPLE ID	ANALYSIS	RESULT	RAD UNCERTAINTY (1 S.D.)	UNITS	DATA QUALIFIER
1	CRM 50.1	GRAB	12400B	CO-60	0.0434	0.0167	PCI/G (DRY)	J
1	CRM 50.1	GRAB	12400B	CS-137	0.1512	0.0114	PCI/G (DRY)	V/V
1	CRM 50.1	GRAB	12500B	CO-60	0.0242	0.0092	PCI/G (DRY)	J
1	CRM 50.1	GRAB	12500B	CS-137	0.0798	0.0117	PCI/G (DRY)	V/V
1	CRM 50.5	GRAB	10900B	CO-60	7.4079	0.0596	PCI/G (DRY)	J
1	CRM 50.5	GRAB	10900B	CS-137	1.4640	0.0292	PCI/G (DRY)	V/V
1	CRM 50.5	GRAB	11000B	CO-60	9.0599	0.0564	PCI/G (DRY)	J
1	CRM 50.5	GRAB	11000B	CS-137	0.9334	0.0249	PCI/G (DRY)	V/V
1	CRM 50.5	GRAB	11100B	CO-60	6.8871	0.0592	PCI/G (DRY)	J
1	CRM 50.5	GRAB	11100B	CS-137	1.0347	0.0254	PCI/G (DRY)	V/V
1	CRM 50.5	GRAB	11200B	CO-60	2.3001	0.0146	PCI/G (DRY)	J
1	CRM 50.5	GRAB	11200B	CS-137	0.3763	0.0063	PCI/G (DRY)	V/V
1	CRM 50.5	GRAB	11300B	CO-60	1.0990	0.0202	PCI/G (DRY)	J
1	CRM 50.5	GRAB	11300B	CS-137	0.2218	0.0094	PCI/G (DRY)	V/V
1	CRM 50.5	GRAB	11400B	CO-60	6.8564	0.0367	PCI/G (DRY)	J
1	CRM 50.5	GRAB	11400B	CS-137	1.9501	0.0188	PCI/G (DRY)	V/V
1	CRM 50.5	GRAB	11500B	CO-60	8.2378	0.0336	PCI/G (DRY)	V/V
1	CRM 50.5	GRAB	11500B	CS-137	1.2485	0.0145	PCI/G (DRY)	V/V
1	CRM 50.5	GRAB	11600B	CO-60	3.5694	0.0380	PCI/G (DRY)	J
1	CRM 50.5	GRAB	11600B	CS-137	0.4006	0.0147	PCI/G (DRY)	V/V
1	CRM 50.5	GRAB	11700B	CO-60	0.8311	0.0212	PCI/G (DRY)	J
1	CRM 50.5	GRAB	11700B	CS-137	0.1940	0.0094	PCI/G (DRY)	V/V
1	CRM 50.5	GRAB	11800B	CO-60	1.4336	0.0349	PCI/G (DRY)	V/V
1	CRM 50.5	GRAB	11800B	CS-137	0.5020	0.0165	PCI/G (DRY)	V/V
1	CRM 50.5	GRAB	11900B	CO-60	1.0119	0.0221	PCI/G (DRY)	J
1	CRM 50.5	GRAB	11900B	CS-137	0.2470	0.0157	PCI/G (DRY)	V/V
1	CRM 50.5	GRAB	12000B	CO-60	0.2024	0.0112	PCI/G (DRY)	J
1	CRM 50.5	GRAB	12000B	CS-137	0.0493	0.0087	PCI/G (DRY)	V/V
1	CRM 50.5	GRAB	12100B	CO-60	0.7870	0.0295	PCI/G (DRY)	J
1	CRM 50.5	GRAB	12100B	CS-137	0.3352	0.0176	PCI/G (DRY)	V/V
1	CRM 50.5	GRAB	12200B	CO-60	0.1221	0.0099	PCI/G (DRY)	J
1	CRM 50.5	GRAB	12200B	CS-137	0.0554	0.0056	PCI/G (DRY)	V/V
1	CRM 50.5	GRAB	12300B	CO-60	0.2999	0.0187	PCI/G (DRY)	J
1	CRM 50.5	GRAB	12300B	CS-137	0.2022	0.0128	PCI/G (DRY)	V/V
1	CRM 50.5	GRAB	18800B	CO-60	0.0294	0.0061	PCI/G (DRY)	J
1	CRM 50.5	GRAB	18800B	CS-137	0.1727	0.0051	PCI/G (DRY)	V/V
1	CRM 50.5	GRAB	18900B	CO-60	0.0383	0.0252	PCI/G (DRY)	J
1	CRM 50.5	GRAB	18900B	CS-137	0.1455	0.0131	PCI/G (DRY)	V/V
1	CRM 50.5	GRAB	19000B	CO-60	4.5291	0.0653	PCI/G (DRY)	J
1	CRM 50.5	GRAB	19000B	CS-137	0.7173	0.0287	PCI/G (DRY)	V/V

Includes only routine samples and detected values

Table G.2. Summary Statistics For Braden Branch Sediment Core Data
Summarized for All Reaches

TYPE OF ANALYSIS	ANALYSIS	OBS.	MINIMUM VALUE	MIN QUAL.	MAXIMUM VALUE	MAX QUAL.	AVERAGE VALUE	SAMPLE UNITS
RAD	CO-60	24	0.088889	UJ	39.3257	V/V	10.3075	PCI/G (DRY)
	CS-137	24	0.037668	V/V	1.6667	V/V	0.9500	PCI/G (DRY)

Table G.3. Data Listing For CR-ERP Braden Branch Sediment Core Sample Radiological Analyses

RIVER SYSTEM POSITION	RIVER MILE/KM	CR-ERP SAMPLE ID	DEPTH INCREMENT (CM)	ANALYSIS	RESULT	RAD UNCERTAINTY (1 S.D.)	UNITS	DATA QUALIFIER
1	CRM 50.5	18701G	000-002	CO-60	6.2766	0.1383	PCI/G (DRY)	V/V
1	CRM 50.5	18701G	000-002	CS-137	1.6667	0.0638	PCI/G (DRY)	V/V
1	CRM 50.5	18702G	002-004	CO-60	5.1992	0.0922	PCI/G (DRY)	V/V
1	CRM 50.5	18702G	002-004	CS-137	1.3208	0.0503	PCI/G (DRY)	V/V
1	CRM 50.5	18703G	004-006	CO-60	4.9715	0.2657	PCI/G (DRY)	V/V
1	CRM 50.5	18703G	004-006	CS-137	1.4611	0.1632	PCI/G (DRY)	V/V
1	CRM 50.5	18704G	006-008	CO-60	5.3959	0.2762	PCI/G (DRY)	V/V
1	CRM 50.5	18704G	006-008	CS-137	1.4549	0.1492	PCI/G (DRY)	V/V
1	CRM 50.5	18705G	008-010	CO-60	5.8007	0.2669	PCI/G (DRY)	V/V
1	CRM 50.5	18705G	008-010	CS-137	1.4235	0.1317	PCI/G (DRY)	V/V
1	CRM 50.5	18706G	010-012	CO-60	5.9770	0.2627	PCI/G (DRY)	V/V
1	CRM 50.5	18706G	010-012	CS-137	1.5107	0.1412	PCI/G (DRY)	V/V
1	CRM 50.5	18707G	012-014	CO-60	7.0478	0.2605	PCI/G (DRY)	V/V
1	CRM 50.5	18707G	012-014	CS-137	1.3025	0.1143	PCI/G (DRY)	V/V
1	CRM 50.5	18708G	014-016	CO-60	9.0371	0.2889	PCI/G (DRY)	V/V
1	CRM 50.5	18708G	014-016	CS-137	1.1554	0.1210	PCI/G (DRY)	V/V
1	CRM 50.5	18709G	016-018	CO-60	13.9271	0.3647	PCI/G (DRY)	V/V
1	CRM 50.5	18709G	016-018	CS-137	1.0659	0.1403	PCI/G (DRY)	V/V
1	CRM 50.5	18710G	018-020	CO-60	19.3943	0.3995	PCI/G (DRY)	V/V
1	CRM 50.5	18710G	018-020	CS-137	0.8505	0.1418	PCI/G (DRY)	V/V
1	CRM 50.5	18711G	020-022	CO-60	20.0659	0.4084	PCI/G (DRY)	V/V
1	CRM 50.5	18711G	020-022	CS-137	0.8959	0.1581	PCI/G (DRY)	V/V
1	CRM 50.5	18712G	022-024	CO-60	9.7592	0.3371	PCI/G (DRY)	V/V
1	CRM 50.5	18712G	022-024	CS-137	1.4125	0.1493	PCI/G (DRY)	V/V
1	CRM 50.5	18713G	024-026	CO-60	6.8679	0.2773	PCI/G (DRY)	V/V
1	CRM 50.5	18713G	024-026	CS-137	1.2887	0.1387	PCI/G (DRY)	V/V
1	CRM 50.5	18714G	026-028	CO-60	8.6687	0.2941	PCI/G (DRY)	V/V
1	CRM 50.5	18714G	026-028	CS-137	1.5325	0.1502	PCI/G (DRY)	V/V
1	CRM 50.5	18715G	028-030	CO-60	13.1120	0.3320	PCI/G (DRY)	V/V
1	CRM 50.5	18715G	028-030	CS-137	0.9544	0.1383	PCI/G (DRY)	V/V
1	CRM 50.5	18716G	030-032	CO-60	21.1804	0.4244	PCI/G (DRY)	V/V
1	CRM 50.5	18716G	030-032	CS-137	1.2865	0.1326	PCI/G (DRY)	V/V
1	CRM 50.5	18717G	032-034	CO-60	39.3257	0.5852	PCI/G (DRY)	V/V
1	CRM 50.5	18717G	032-034	CS-137	1.0687	0.1781	PCI/G (DRY)	V/V
1	CRM 50.5	18718G	034-036	CO-60	27.2194	0.3912	PCI/G (DRY)	V/V
1	CRM 50.5	18718G	034-036	CS-137	0.5357	0.1020	PCI/G (DRY)	V/V
1	CRM 50.5	18719G	036-038	CO-60	8.4264	0.2171	PCI/G (DRY)	V/V
1	CRM 50.5	18719G	036-038	CS-137	0.1783	0.0620	PCI/G (DRY)	V/V
1	CRM 50.5	18720G	038-040	CO-60	6.2693	0.1973	PCI/G (DRY)	V/V
1	CRM 50.5	18721G	040-042	CO-60	2.4843	0.1525	PCI/G (DRY)	V/V
1	CRM 50.5	18721G	040-042	CS-137	0.0377	0.0422	PCI/G (DRY)	V/V
1	CRM 50.5	18722G	042-044	CO-60	0.6897	0.0821	PCI/G (DRY)	V/V
1	CRM 50.5	18723G	044-046	CO-60	0.1954	0.0570	PCI/G (DRY)	V/V

Includes only routine samples and detected values

Table G.4. Summary Statistics For Braden Branch Sediment Grab Data
Summarized for All Reaches

TYPE OF ANALYSIS	ANALYSIS	OBS.	MINIMUM VALUE	MIN QUAL.	MAXIMUM VALUE	MAX QUAL.	AVERAGE VALUE	SAMPLE UNITS
RAD	CO-60	20	0.024233	J	9.05986	J	2.73849	PCI/G (DRY)
	CS-137	20	0.049297	V/V	1.95006	V/V	0.52404	PCI/G (DRY)

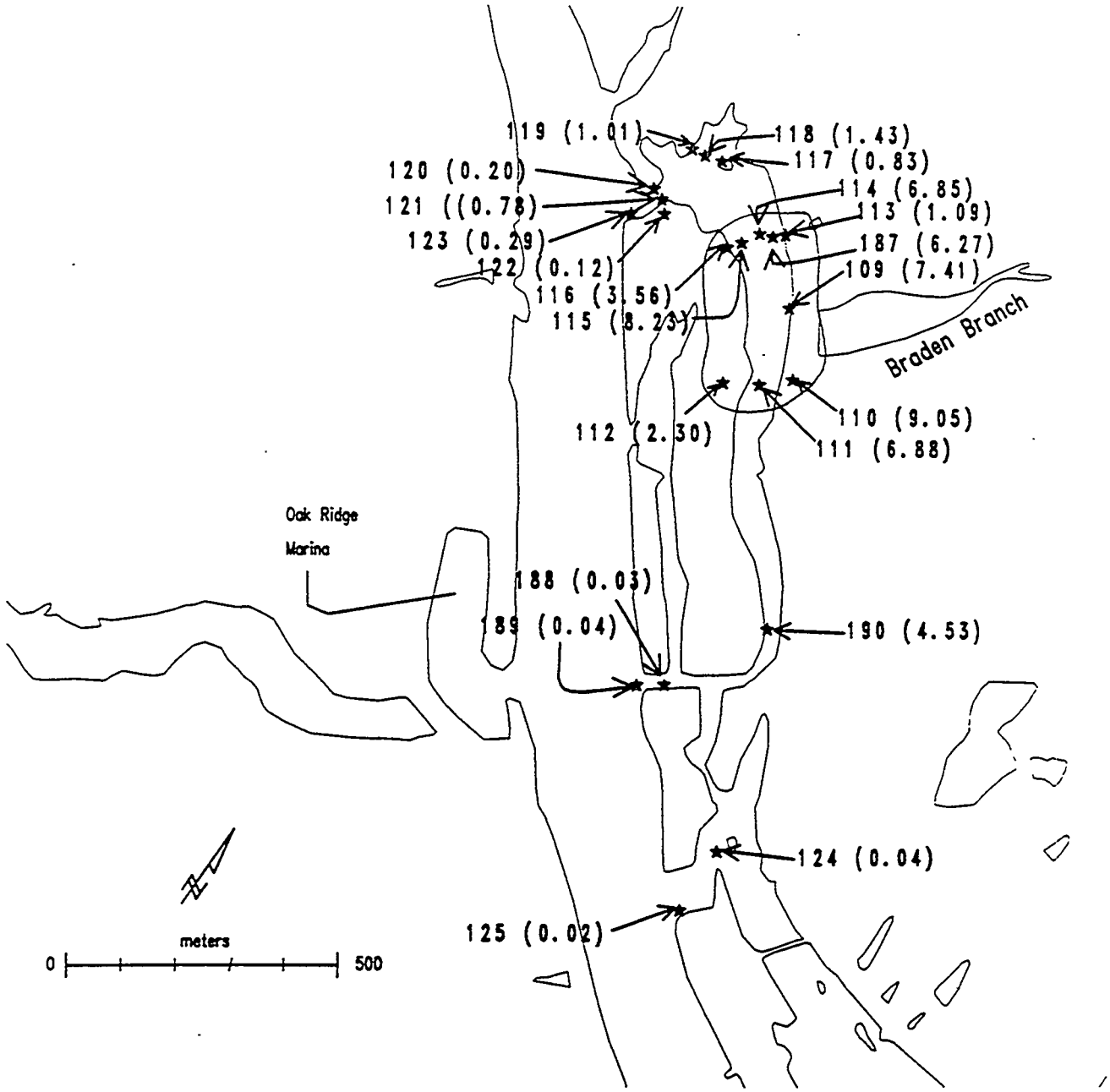

Fig. G.2. Cobalt-60 concentrations at Braden Branch.

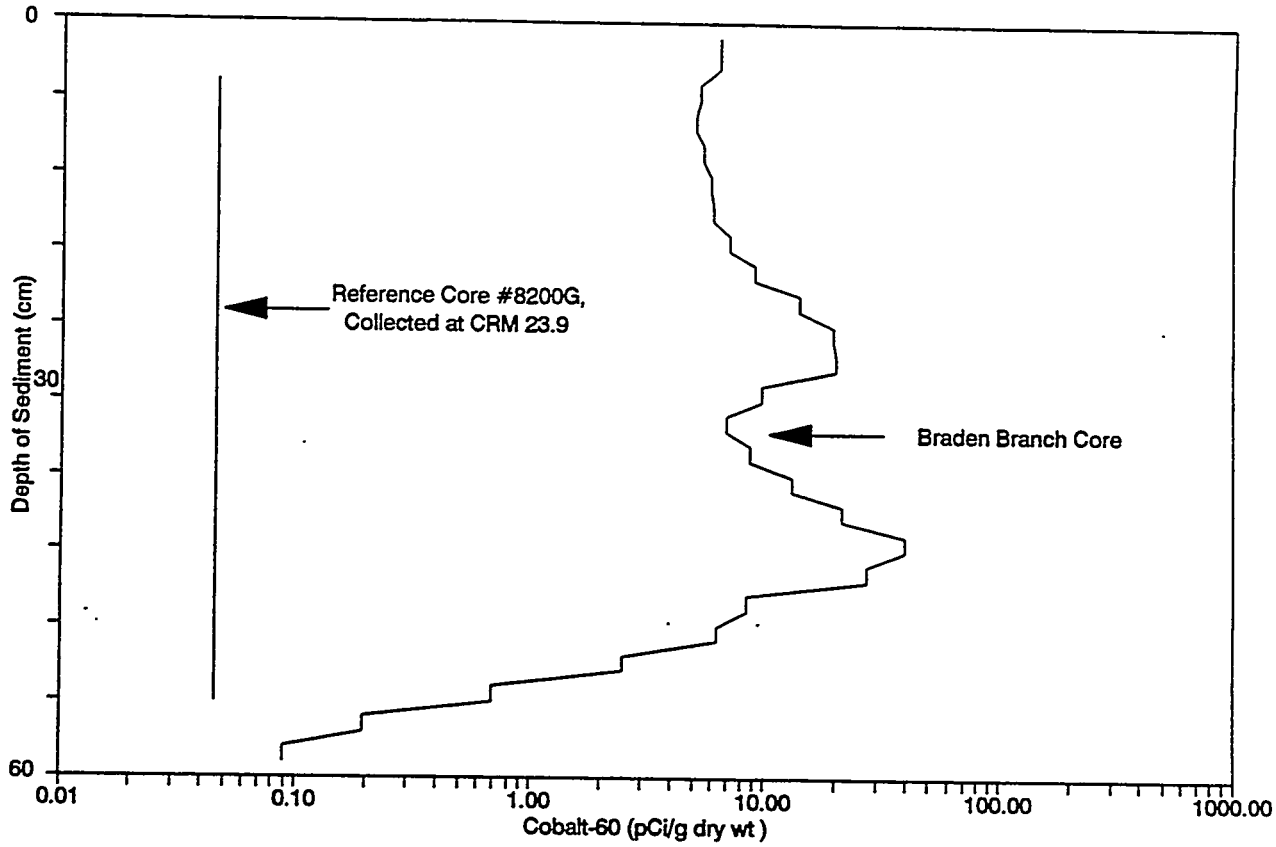

Fig. G.3. Cobalt concentrations in Braden Branch core (no. 18700G).

G.6 SUMMARY AND INTERPRETATION

The ^{60}Co sediment concentrations in the Melton Hill Reservoir in the immediate vicinity of the Braden Branch culvert are at least an order of magnitude above the minimum detection levels (0.3 pCi/g). The highest concentrations are within approximately 200 m of the culvert under the railroad bridge where Braden Branch flows into Melton Hill Reservoir. The concentration at the sample 1900G location suggests that contaminant transport has occurred in a southeasterly direction within the small channel. Low concentrations at the channel outlets suggest that downstream transport of ^{60}Co into the main channel of Melton Hill Reservoir may have been minimal in the recent past.

The ^{60}Co concentration profile from the sediment core indicates that there are several peaks in ^{60}Co concentrations that are two orders of magnitude above background levels. While concentrations in downstream cores suggest that downstream movement of contamination has been minimal, the results are inconclusive. The near-background concentrations in these cores could indicate that contaminant dilution has occurred or simply that the cores were not taken where contaminants had deposited.

These results and the results from previous studies indicate that Braden Branch has been a source of ^{60}Co contamination to Melton Hill Reservoir. Furthermore, the elevated concentrations in the surface sediments suggest that Braden Branch may still be contributing measurable amounts of ^{60}Co to the reservoir.

G.7 SCREENING HEALTH RISK ASSESSMENT

Quantitative accessment of human health risk from exposure to contaminants in the environment is extremely difficult because the data necessary to determine exposure and doses are difficult to obtain. These data include the speed and efficiency of contamination transport along various exposure routes, the magnitude and duration of the exposure, and the relationship between exposure and health risk. Because of the difficulty of acquiring such data, a set of assumptions are typically used to provide screening estimates of lifetime risk of an incremental cancer incidence. The Environmental Protection Agency has developed risk factors for radionuclides and provides guidance in their use to allow the conversion of contaminant concentrations in the environment into estimates of human health risk resulting from various exposure routes (EPA 1991a, b).

Results from screening level risk analysis for 1990 samples, which were collected in Braden Branch embayment, are presented in Table G.5 for nonconservative screening and in Table G.6 for conservative screening. The pathway of most concern is the external exposure pathway. Conservative screening risk due to direct exposure to sediments is 1×10^{-4}, which indicates it may be of concern. Nonconservative screening risk due to external exposure is 5×10^{-7}. All screening risk values from ingestion and inhalation pathways are $<1 \times 10^{-7}$ and, therefore, are of little concern.

It should be noted that the sediments in the Braden Branch area are exposed for some part of the year but probably not enough to allow for the 2000 h/year exposure included in the calculations; therefore, our calculations are conservative and probably are relevant only to the case in which sediments are dredged and used as a source of topsoil.

Table G.5 Results of adult nonconservative screening for carcinogens in surface sediment of Braden Branch where at least one measurement in a reach was above detection limits.

Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
				Bq/kg	1/Bq	Bq/yr	
Sed. Exposure	Radionuclides	Co-60	20/20	2.92E+01 (G M)	2.3E-07	2.3E+00	5.3E-07
		Cs-137	20/20	1.18E+01 (G M)	5.4E-08	2.6E+00	1.4E-07
		TOTAL					6.7E-07
Sed. Exposure							6.7E-07
				Bq/kg	1/Bq	Bq/life	
Sed. Ingestion	Radionuclides	Co-60	20/20	2.92E+01 (G M)	4.1E-10	3.2E+00	1.3E-09
		Cs-137	20/20	1.18E+01 (G M)	7.6E-10	1.3E+00	9.8E-10
		TOTAL					2.3E-09
Sed. Ingestion							2.3E-09
							6.7E-07

Table G.6 Results of adult conservative screening for carcinogens in surface sediment of Braden Branch where at least one measurement in a reach was above detection limits.

Media	Contaminant type	Contaminant	Ratio of detects to total samples	Concentration (type)	Cancer slope factor	Intake rate	Carcinogen screening index
				Bq/kg	1/Bq	Bq/yr	
Sed. Exposure	Radionuclides	Co-60	20/20	3.35E+02 (Max)	2.3E-07	5.3E+02	1.2E-04
		Cs-137	20/20	3.86E+01 (UCL)	5.4E-08	1.7E+02	9.1E-06
		TOTAL					1.3E-04

Sed. Exposure							1.3E-04

				Bq/kg	1/Bq	Bq/life	
Sed. Ingestion	Radionuclides	Co-60	20/20	3.35E+02 (Max)	4.1E-10	3.7E+02	1.5E-07
		Cs-137	20/20	3.86E+01 (UCL)	7.6E-10	4.2E+01	3.2E-08
		TOTAL					1.8E-07

Sed. Ingestion							1.8E-07

				Bq/kg	1/Bq	Bq/life	
Sed. Inhalation	Radionuclides	Co-60	20/20	3.35E+02 (Max)	4.1E-09	2.3E-01	9.6E-10
		Cs-137	20/20	3.86E+01 (UCL)	5.1E-10	7.4E-02	3.8E-11
		TOTAL					1.0E-09

Sed. Inhalation							1.0E-09

							==========
							1.3E-04
							==========

There is virtually no risk from ^{60}Co in deep, undisturbed sediment. Exchange with the water column is minimal, and water acts as an effective shield to gamma radiation. If the sediment is exposed due to draw-down of the water, the potential risk is similar to that of ^{60}Co in exposed sediment. The external exposure is then dominated by the size of the area containing ^{60}Co and the length of time an individual remains in the area of contamination as well as any physical features that act to partially or completely shield an individual from the gamma radiation.

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OS008277
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ENVIRONMENTAL RESTORATION PROGRAM

Quality Assurance/Quality Control Summary Report for Phase 1 of the Clinch River Remedial Investigation

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Date Issued—July 1994

Prepared by
Environmental Sciences Division
Oak Ridge National Laboratory
ESD Publication 4021

Prepared for
U.S. Department of Energy
Office of Environmental Restoration and Waste Management
under budget and reporting code EW 20

Environmental Restoration and Waste Management Programs
Oak Ridge National Laboratory
Oak Ridge, Tennessee 37831-6285
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U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-84OR21400

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ACRONYMS

%D	percent difference
%R	percent recovery
AA	atomic absorption
ACD	Analytical Chemistry Division (ORNL) Department (K-25)
AES	atomic emission spectroscopy
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
BMAP	Biological Monitoring and Abatement Program
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLP	Contract Laboratory Program
CPA	Chemical and Physical Analysis Group
CRDL	contract-required detection limit
CRM	Clinch River mile
CRRI	Clinch River Remedial Investigation
CR/WBR	Clinch River/Watts Bar Reservoir
CVAA	cold vapor atomic absorption
DBC	dibutylchlorendate
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
DER	duplicate error ratios
DL	detection limit
DMC	Document Management Center
DMR	Discharge Monitoring Report
DOE	U.S. Department of Energy
DOE-ORO	Department of Energy Oak Ridge Operations
DQO	data quality objective
EAL	Environmental Analysis Laboratory
EFPC	East Fork Poplar Creek
EML	Environmental Monitoring Laboratory
EMSL	Environmental Monitoring Systems Laboratory
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
ERM	Emory River Mile
ESD	Environmental Sciences Division
ESSAP	Environmental Survey and Site Assessment Program
FDA	U.S. Food and Drug Administration
FFA	Federal Facility Agreement
GC	gas chromatography
HSWA	Hazardous and Solid Wastes Amendments
ICP/MS	inductively coupled plasma/mass spectrometry
ICS	interference check sample

ICSA	Interference check sample, solution A
IT	International Technology (Corporation)
LCS	laboratory control sample
MDA	minimum detectable activities
MS	mass spectrometry
MSA	method of standard addition
MSD	matrix spike duplicate
MSR	matrix spike recovery
NBZ	Nitrobenzene-d5
NIST	National Institute of Standards and Technology
NPL	National Priorities List
OAL	Organic Analysis Laboratory
ORAU	Oak Ridge Associated Universities
ORNL	Oak Ridge National Laboratory
OREIS	Oak Ridge Environmental Information System
ORR	Oak Ridge Reservation
PRM	Powell River Mile
PCB	polychlorinated biphenyl
PCK	Poplar Creek kilometer
PETC	Proficiency Environmental Testing Control
QA	quality assurance
QC	quality control
RAL	Radiological Analysis Laboratory
RCRA	Resource Conservation and Recovery Act of 1976
RFI	RCRA Facility Investigation
RI	remedial investigation
RPD	relative percent difference
RRF	relative response factor
RSD	relative standard deviation
SA	spike added
SAIC	Science Applications International Corporation
SARA	Superfund Amendments and Reauthorization Act of 1986
SAS	Statistical Analysis System
SOP	standard operating procedure
SOW	Statement of Work
SPARCC	sensitivity, precision, accuracy, representativeness, completeness, and comparability
SQL	sample quantitation limit
SR	sample result
SSR	spiked sample result
STD	standard deviation
SVOs	semivolatile organics
TDEC	Tennessee Department of Environment and Conservation
TIC	tentatively identified compound
TRM	Tennessee River mile

TVA	Tennessee Valley Authority
WOC	White Oak Creek
WOCE	White Oak Creek Embayment

EXECUTIVE SUMMARY

The Clinch River Remedial Investigation (CRRI) is designed to address the transport, fate, and distribution of waterborne contaminants released from the U.S. Department of Energy Oak Ridge Reservation and to assess potential risks to human health and the environment associated with these contaminants. Primary areas of investigation are Melton Hill Reservoir, the Clinch River from Melton Hill Dam to its confluence with the Tennessee River, Poplar Creek, and Watts Bar Reservoir.

Phase 1 of the CRRI was a preliminary study in selected areas of the Clinch River/Watts Bar Reservoir. Fish, sediment, and water samples were collected and analyzed for inorganic, organic, and radiological parameters. Phase 1 was designed to (1) obtain high-quality data to confirm existing historical data for contaminant levels; (2) determine the range of contaminant concentrations present in the river-reservoir system; (3) identify specific contaminants of concern; and (4) establish the reference (background) concentrations for those contaminants.

Quality assurance (QA) objectives for Phase 1 were that (1) scientific data generated would withstand scientific scrutiny; (2) data would be gathered using appropriate procedures for field sampling, chain-of-custody, laboratory analyses, and data reporting; and (3) data would be of known precision and accuracy. These objectives were met through the development and implementation of (1) a QA oversight program of audits and surveillances; (2) standard operating procedures accompanied by a training program; (3) field sampling and analytical laboratory quality control requirements; (4) data and records management systems; and (5) validation of the data by an independent reviewer.

Approximately 1700 inorganic samples, 1500 organic samples, and 2200 radiological samples were analyzed and validated. The QA completeness objective for the project was to obtain valid analytical results for at least 95% of the samples collected. Overall completeness for all Phase 1 media and analyses was 88%.

Valid data were obtained for 98% of the water samples. Most of the rejected analyses occurred because of improper sample preservation, holding times exceedance, and/or poor surrogate recoveries.

Both sediment core and grab samples were evaluated. Valid data were obtained for 96% of the core samples and 91% of the grab samples. Rejected data occurred because of low spike recoveries, holding times exceedance, and calibration difficulties.

For fish tissue analyses, only 68% of the data was considered valid; 50% of the semivolatile data was rejected because of inadequate surrogate recoveries. The CRRI completeness objective of 95% was attained for all analysis types except the semivolatiles.

A review of the QA systems and quality control (QC) data associated with the Phase 1 investigation is presented to evaluate whether the data were of sufficient quality to satisfy

Phase 1 objectives. The data quality indicators of precision, accuracy, representativeness, comparability, completeness, and sensitivity were evaluated to determine any limitations associated with the data. To provide an overall qualitative assessment of the data, each analyte (or analyte group) was assigned a grade of A, >90% acceptable data (very adequate); B, 70% to 90% acceptable data (mostly adequate with some deficiencies); or C, <70% acceptable data (inadequate).

For water data the overall assessment grade for inorganic results was very adequate, with representativeness and comparability grades as mostly adequate. Pesticide/PCB organic analytes were graded only mostly adequate because of the absence of results from Poplar Creek. Semivolatile organic compounds and radionuclides, except tritium, were all graded very adequate; tritium data was graded inadequate.

For sediment results the overall assessment for gamma-emitting radionuclide analyses for grab and core samples was graded very adequate. Organic and inorganic analyses of sediment grabs were judged to be inadequate, and further sampling and analysis is warranted. Inorganic analyses of sediment core samples were judged to be mostly adequate except for arsenic, chromium, copper, lead, nickel, mercury, selenium, and zinc, which were determined to be inadequate because of excessive detection limits. Organic data from sediment cores were judged to be mostly adequate and acceptable for risk screening analysis; however, because of high detection limits and the number of rejected samples, additional sampling is warranted. Alpha-emitting radionuclide data were judged to be mostly adequate; the only limitation is that there is no measure of field precision. Only one reference site sample was collected, which prevents statistically valid comparison to be made with affected sites. This limits the value of the entire sediment data base.

For fish tissue data the overall assessment graded inorganic analyses very adequate except for lead analyses, which were graded mostly adequate. The PCB and radionuclides data were also graded very adequate. The pesticides data met validation requirements for risk assessment and were judged mostly adequate, but some QC results were less than desirable, indicating consideration of further sampling and analysis for pesticides in Phase 2. Although 50% of the semivolatile fish data were usable, the overall objective was compromised so the semivolatiles data were graded inadequate.

In summary, reproducible, precise, and accurate measurements consistent with CRRI objectives and the limitations of the sampling and analytical procedures used were obtained for most of the data collected in support of Phase 1. Because a phased approach is being employed in the CRRI, iterative sampling efforts for Phase 2 will incorporate the lessons learned from Phase 1 and correct for those problems that resulted in any pieces of insufficient data.

1. INTRODUCTION

1.1 PURPOSE OF REPORT

The purpose of this report is to present and provide an assessment of the results of field sampling and analytical laboratory quality assurance (QA) and quality control (QC) activities performed during Phase 1 of the Department of Energy (DOE) remedial investigation (RI) of the Clinch River/Watts Bar Reservoir (CR/WBR) system. These QA/QC results are presented herein to document that the data collected during Phase 1 are of sufficient quality to use for the intended purpose. The results of Phase 1 are presented in the data summary report (Cook et al. 1992), and this report serves as a companion to the data summary report.

1.2 BACKGROUND AND REGULATORY DRIVERS

The Clinch River remedial investigation (CRRI) focuses on the portions of the Clinch and Tennessee rivers that may have been adversely affected by contaminants released from the DOE Oak Ridge Reservation (ORR) from the mid-1940s to the present. The contaminants released from the ORR to the Clinch and Tennessee rivers originated from research, industrial, and waste disposal activities conducted on the ORR at the Oak Ridge National Laboratory (ORNL), the Oak Ridge Gaseous Diffusion Plant (now known as the Oak Ridge K-25 Site), and the Oak Ridge Y-12 Plant. The contaminants released from these facilities into the Clinch River include a variety of radionuclides, metals, and organic compounds. The primary areas of investigation are the Melton Hill and Watts Bar reservoirs [with particular emphasis on the Clinch River arm of Watts Bar Reservoir (Melton Hill to the Clinch River–Tennessee River confluence)] and Poplar Creek. The areal extent of the CRRI is discussed in Cook et al. (1992).

The DOE ORR was added to the National Priorities List (NPL) in December 1989. A Federal Facility Agreement (FFA) [under Sect. 120 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendment and Reauthorization Act (SARA) and Sect. 6001 of the Resource Conservation and Recovery Act (RCRA) of 1976] between DOE, the U.S. Environmental Protection Agency (EPA) Region IV, and the Tennessee Department of Environment and Conservation (TDEC) became effective on January 1, 1992. These parties coordinate DOE's CERCLA/RCRA response obligation with corrective measures required and conducted by DOE under its current permit under the Hazardous and Solid Waste Amendments (HSWA) to RCRA of 1984. Section 3004(v) of the HSWA of RCRA specifically addresses requirements for corrective actions for releases of hazardous wastes or constituents beyond the boundaries of RCRA-permitted sites. In addition TDEC, DOE, and EPA expect that the response actions under the FFA, together with corrective measures, will achieve comprehensive remediation of releases and potential releases of contaminants from the ORR. The CRRI is being conducted in compliance with the FFA and with Sect. 3004(v) of RCRA.

1.3 OBJECTIVES AND APPROACH OF THE CLINCH RIVER REMEDIAL INVESTIGATION

An assessment of the quality of the data collected during Phase 1 of the CRRI must begin with the objectives of Phase 1 of the RI and the data quality objectives (DQOs) of the investigation. This section describes the overall objectives and the phased approach of the CRRI.

The primary objectives of the CRRI (Energy Systems 1990) are the following:

- To define the nature and extent of contamination of the off-site surface water and sediment environment downstream from the ORR, which resulted from operations and waste disposal activities at DOE's facilities on the ORR
- To quantify any risk posed to human health and to the environment resulting from the existing off-site contamination
- To preliminarily identify and evaluate potential corrective measures and remedial action alternatives

A phased approach is being employed in the CRRI because a large number of samples may be required to characterize such a large and complex river and reservoir system. The phased approach relies heavily on iterative screening-level risk analysis for estimating human and ecological health and is based on obtaining the data needed for risk analyses and for evaluating remediation alternatives. Primary components of the phased RI approach include scoping studies and Phase 1 and 2 studies.

The scoping studies were performed before the work plan for the CRRI was developed and approved. In the scoping studies, extant data were synthesized and used in a screening-level risk analysis, which served to (1) preliminarily identify contaminants of concern in the CR/WBR system and (2) identify areas of the river and reservoir in which additional data collection was necessary for site characterization, risk assessment, and evaluation of remediation alternatives. The scoping studies were summarized in Olsen et al. (1992), Suter (1991), and Hoffman et al. (1991).

The Phase 1 study followed the scoping study and consisted of collecting and analyzing samples from areas selected to represent areas that have a range of contamination (including reference sites located upstream from the ORR). The objectives of the Phase 1 study (Energy Systems 1990) were the following:

- To obtain high-quality data to confirm preliminary results from the scoping studies
- To determine the range of contaminant concentrations present in the off-site environment
- To identify the contaminants of concern
- To establish the reference concentrations for those contaminants

Data collected during the Phase 1 investigation must be of sufficient quality to meet each of the general objectives. The specific QA objectives for all data collected during Phase 1 were to obtain reproducible, precise, and accurate measurements consistent with the intended

use of the data and the limitations of the sampling and analytical procedures used. The Phase 1 study has been completed and is summarized in Cook et al. (1992).

During Phase 1, water, sediment, and fish tissue samples were collected from reaches of the river/reservoir system and analyzed for organic, inorganic, and radiochemical contaminants. The CR/WBR system was divided into ten reaches (Table 1.1) following those of Hoffman et al. (1991). For information purposes, Table 1.1 lists all ten reaches, but not all the reaches were sampled for all three matrixes during Phase 1. For example, sediment cores were not collected for reaches 6, 13, 15 or 18, and water samples were not collected for reaches 15 or 18. Fish samples were not collected for reaches 16 or 18. The lack of Phase 1 data from these reaches does not affect the data completeness because no samples were planned for these reaches.

Table 1.1. Stream and river reaches used in the CRRI site characterization and screening risk assessment

Reach number	Reach name (description)	River mile/km[a]
1	Melton Hill Reservoir (from the Oak Ridge Marina to Melton Hill Dam)	CRM 52.0–23.1
2	Clinch (Clinch River from Melton Hill Dam to Poplar Creek)	CRM 23.0–12.1
3	Poplar Creek (Poplar Creek below the confluence of the East Fork)	PCK 8.9–0.0
4	Poplar Creek Clinch (the Clinch River from the mouth of Poplar Creek to the confluence with the Tennessee River)	CRM 12.0–0.0
5	Watts Bar Reservoir (the Tennessee River from the confluence of the Clinch River to Watts Bar Dam)	TRM 567.5–530.0
6	Emory River	ERM 14.0–0.0
10	Norris Reservoir (the Clinch River above Norris Dam)	CRM 103
13	Poplar Creek (Poplar Creek above the confluence of the East Fork)	PCK 11.0–9.0
15	Chickamauga Reservoir (below Watts Bar Dam)	TRM 529.9–515.0
18	Tennessee River arm of WBR (from Fort Loudon and Tellico dams to the confluence of the Clinch River)	TRM 602.0–567.6

[a]CRM = Clinch River mile, PCK = Poplar Creek kilometer, TRM = Tennessee River mile, and ERM = Emory River mile.

The information collected during Phase 1 will be used to further focus the Phase 2 study on specific contaminants and areas or locations that might require further study. Specifically, the objectives of the Phase 2 study are to (1) perform iterative screening risk analyses as additional data become available, (2) quantitatively estimate potential risks posed to human health and the environment, and (3) perform additional focused sampling during Phase 2.

These risk analyses will guide more extensive sampling and analysis and risk assessment, ultimately leading to a baseline risk assessment presented in a final RI report. In addition, the Phase 2 study will include a preliminary evaluation of potential remediation alternatives and identification of effective and acceptable corrective measures.

After the Phase 1 sampling and analysis began, a task was initiated to characterize the near-shore sediment in the CR/WBR. The primary objective of the near-shore sediment task is to provide information on the risks posed to human health from surface sediments (between 0 and 10 cm depth in the sediments) in shallow waters of the near-shore areas. These sediments are exposed to the air during the winter season, when the water levels in these reservoirs are lowered as part of the water management activities of the Tennessee Valley Authority (TVA), or they are from areas that are permanently submerged but that may have the potential for human contact resulting from dredging operations for private boat docks and other similar activities. This task supports the efforts of TVA and the U.S. Army Corps of Engineers to evaluate permit applications for sediment-disturbing activities (e.g., dredging for private boat access channels, installation of boat docks, stabilizing of shorelines). An interagency working group composed of TVA, the Corps of Engineers, DOE, TDEC, EPA, and staff from the CRRI preliminarily evaluates the levels of contamination prior to TVA and the Corps of Engineers performing their evaluation. Almost 600 surface sediment samples in near-shore areas of Watts Bar Reservoir and the Clinch River were collected as part of this task. The results of this sampling are summarized in Cook et al. (1992), and the QA/QC program for this near-shore sediment sampling task is discussed in this report.

1.4 OBJECTIVES OF THE QA/QC DATA SUMMARY FOR THE PHASE 1 REMEDIAL INVESTIGATION

The objectives of this QA/QC report are to present and assess the results of the QA/QC activities for Phase 1 of the CRRI. Chapter 2 describes the QA/QC program and the methods used for field and laboratory QA/QC activities. Chapter 3 presents a more detailed evaluation of the results of the field QA/QC program, and Chap. 4 evaluates the results of the laboratory QA/QC activities and the results of the analysis of water, sediment, and fish tissue samples. Chapter 5 provides an assessment of the overall quality of the data. Chapter 5 also contains a summary of QA/QC lessons identified during Phase 1 and specific recommendations for additional sampling and analysis.

2. QUALITY ASSURANCE/QUALITY CONTROL PROGRAM

The QA/QC Program for Phase 1 of the CRRI was designed to comply with both EPA QAMS-005/80 (EPA 1980a) and American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME) NQA-1 (ASME 1989) guidelines. (Note that Phase 1 predated DOE Order 5700.6C.) Project-specific QA requirements and the general QA objectives for Phase 1 data were defined in the RCRA Facility Investigation (RFI) Plan (Energy Systems 1990).

The QA objectives for Phase 1 data were the following:

- Scientific data generated would withstand scientific scrutiny.
- Data would be gathered using appropriate procedures for field sampling, chain-of-custody, laboratory analyses, and data reporting.
- Data would be of known precision and accuracy.

The QA objective for all data collected during Phase 1 was, therefore, to obtain reproducible, precise, and accurate measurements consistent with the intended use of the data and the limitations of the sampling and analytical procedures used.

These objectives were met through the development and implementation of (1) a QA oversight program of audits and surveillances, (2) standard operating procedures (SOPs) accompanied by a training program, (3) field sampling and analytical laboratory QC requirements, and (4) data and records management systems.

2.1 AUDITS AND SURVEILLANCES

Audits and surveillances were performed by DOE Oak Ridge Operations (DOE-ORO); Martin Marietta Energy Systems, Inc., Central QA; and the Energy Systems Environmental Restoration (ER) QA specialist who reviewed and evaluated the adequacy of field and laboratory performance and ascertained whether the QA/QC Plan was completely and uniformly implemented. Results of these audits and surveillances were documented and reported to management. Follow-up corrective actions were taken as needed. Implementation was monitored by the Clinch River QA specialist and verified by the auditing organization.

The chronology of audits and surveillances was as follows:

March 1990	DOE-ORO multifunctional appraisal of ORNL
June 1990	DOE-ORO environmental protection audit
November 1991	Beginning of Energy Systems ER QA specialist monthly surveillance
December 1991	Energy Systems Corporate audit

2.2 STANDARD OPERATING PROCEDURES AND TRAINING PROGRAM

Whenever applicable, existing procedures were used for CRRI activities. Field sampling procedures from Kimbrough et al. (1990) were used, and many EPA Contract Laboratory Program (CLP) analytical procedures (field and laboratory) were specified. Procedures were developed to support technical and administrative activities of the CRRI when none existed. These activities included the following:

- Sampling processes
- Sample handling/custody
- Calibration of equipment used in obtaining samples and/or data
- Analytical processes
- Data reduction, validation, and reporting
- Internal QC checks
- Audits
- Surveillance and corrective action processes
- Specific routine functions required to assess data precision and completeness

The CRRI training program consists of a training plan, which defines requirements for training frequency and trainer designation; a training needs assessment, which identifies personnel to be trained; and the actual training on CRRI procedures. Training is completed as required in the appropriate SOP, and training records are maintained by the training coordinator for the CRRI. Generally, the extent of training is commensurate with the scope, complexity, and nature of the activity and the education, experience, and proficiency of the person.

2.3 SAMPLING UNCERTAINTY

Sample data always contain a degree of uncertainty that needs to be evaluated in order to determine if the sample data meet the project objectives as set forth in the project data quality objectives. There are five major sources of uncertainty for sample data, and each source of uncertainty contains contributions from both systematic uncertainty and random uncertainty. Summing the systematic uncertainty from each source produces the total measurement bias. Summing the random uncertainty from each source produces the total measurement variability or precision. The five major sources of uncertainty for sample data are (1) natural sample variability, (2) sampling error, (3) laboratory subsampling error, (4) laboratory analytical error, and (5) reporting error. The objective of a QA/QC program is to evaluate the contribution to both bias and precision from each source.

Natural sample variability has components of both spatial and temporal heterogeneity. The CRRI Phase 1 Sampling and Analysis Plan was designed to collect samples in areas of the CR/WBR that had unique sets of possible contributing pollution sources. This was done in order to qualitatively characterize the contribution from each pollution source in the system and to produce an estimate of the spatial heterogeneity of pollution in the system. No

attempt was made in Phase 1 to characterize the CR/WBR system for temporal heterogeneity. A more complete nature and extent characterization of the CR/WBR system is planned for Phase 2.

The variability contributed by natural sample variability is difficult to measure and may be reasonably evaluated only by the subjective judgment of an expert in the field. Natural sample variability contribution to sampling uncertainty can not be separated as an individual component by evaluation of QC samples.

Bias and variability from some components of sampling error may be evaluated by the collection and analysis of various types of field QC blanks. Equipment rinse blanks, field blanks, and trip blanks may be analyzed to evaluate contributions of bias due to sample collection equipment, sample containers, and storage for volatile organic compound analysis, respectively. Field duplicate and field split collection and analysis provide a measurement of the sampling uncertainty.

Laboratory QC samples can be used to evaluate the contribution of laboratory subsampling error and laboratory analytical error to total measurement error. Method blanks and matrix spike samples may be analyzed to evaluate contributions of bias due to laboratory subsampling and laboratory analysis. Laboratory duplicates may be analyzed to evaluate the contribution of laboratory subsampling error and laboratory analysis error to sampling uncertainty.

2.4 FIELD QUALITY CONTROL

QC measures for field operations, including selection of sampling locations, field data recording, and sample collection, were implemented to meet the Phase 1 project objectives. Sampling sites for each matrix (fish, sediment, or water) and QC sample collection frequencies were specified by the CRRI Plan (Energy Systems 1990), with final determination of each site and QC sample collection the responsibility of the sample team leader. Methods for field activities, including record keeping, establishment and maintenance of sample custody, instrument calibration, and sample identification, were specified in SOPs; sample collection procedures followed those of Kimbrough et al. (1990).

All field activities followed standard record keeping and chain-of-custody procedures. These included recording site-specific information in waterproof notebooks, with routine reviews of the notebooks. Sample custody was established by the sampling team upon collection, through the use of standard chain-of-custody forms, and was maintained throughout sample processing and delivery to analytical services. The goal for frequency of submittal of field QC samples was once for every 20 samples, as appropriate. Field QC samples included field duplicates, field splits, equipment-cleaning rinse samples, and field rinse water blanks. Matrix-specific field QC activities are discussed in Chap. 3.

2.5 LABORATORY QUALITY CONTROL PROGRAM

The CRRI Program required the independent review and validation of the analytical laboratory data for all Phase 1 analyses. The review and validation were conducted by a third-

party subcontractor following EPA and/or project-specified guidelines to ensure a uniform and comprehensive review.

The laboratory QC Program ensured that all data generated and reported were scientifically valid, consistent with accepted methods, and of known accuracy. Results from QC samples were used to document data quality, verify that the analytical system was functioning for a given matrix/analyte, identify when additional corrections need to be made to the analytical system, and determine the effect of these corrections. The QC data provided an important indication of how well the data quality objectives were met. The types of laboratory QC samples used included laboratory control samples (LCSs), matrix spikes, surrogate spikes, replicates, and performance evaluation samples. The assessment of laboratory QC samples used during Phase 1 is summarized in Chap. 4.

The QA objectives for precision and accuracy in the laboratory were defined by control limits established for the EPA CLP. Acceptance criteria for the radiological analyses were generated by each laboratory.

All laboratories performing chemical analyses participated in performance evaluation sample programs during their period of performance for Phase 1 samples. The performance of each laboratory for a specific method is discussed in Chap. 4. An assessment of these results as they may impact the use of Phase 1 data is presented in Chap. 5.

The Environmental Sciences Division (ESD) gamma analysis laboratory's participation in the EPA/Environmental Monitoring Systems Laboratory (EMSL) Interlaboratory Comparison Program and the Oak Ridge Associated Universities (ORAU) Radiological Laboratory's use of laboratory control standards are discussed in Sect. 4.5.

2.6 DATA QUALITY INDICATORS

Both qualitative and quantitative criteria are used as indicators of the quality of the data. In determining whether the data are usable, especially in the decision process, the integrity and authenticity of the data must be evaluated, and the analytical uncertainty must be known. Indicators generally used to assess the data quality are precision, accuracy, representativeness, comparability, completeness, and sensitivity.

2.6.1 Precision

Precision is the degree of mutual agreement between independent measurements made under identical, specified conditions. Standard deviation (STD), relative standard deviation (RSD), and relative percent difference (RPD) are used to express precision. Analysis of laboratory replicates provides an assessment of the precision associated with the laboratory method. Analysis of field duplicates provides a total assessment of the overall precision of the sample data because it includes both the field and laboratory variability. Evaluation of sampling precision may be determined from the difference between the overall precision and the analytical precision. The usefulness of the precision data is limited to samples that contain contaminants at concentrations above the method detection limit (DL). Also, the analytical process must be in statistical control, or the estimates of precision will not be meaningful.

$$\text{RSD} = 100\ (\text{STD/mean})\ .$$

$$\text{RPD} = \frac{|D_1 - D_2|}{(D_1 + D_2)/2} \times 100\ ,$$

where D_1 is the value of the first measurement, and D_2 is the value of the second measurement.

2.6.2 Accuracy

Accuracy is the closeness of agreement between an observed value and an accepted reference value. When applied to a set of observations, accuracy will be a combination of a random component and a common systematic error component (bias). Bias is calculated as:

$$\text{Bias} = (x_s - x_u) - K\ ,$$

where

x_s = measure value for spiked sample,
x_u = measure value for unspiked sample,
K = known value of the spike in the sample.

Accuracy was primarily measured in Phase 1 through the use of LCSs, matrix spikes, surrogate spikes, and performance evaluation samples. When used correctly, blanks, both in the field and the analytical laboratory, provided a means for checking for bias resulting from contamination. Blanks must be treated the same as the samples. When contamination is found, the causes must be eliminated. Use of blank results to correct sample results can add more variability to the result because blanks results are also subject to analytical error. No blank corrections were performed on the Phase 1 data. Calibration standards at the required concentrations and frequency were used to estimate the data variability. Analytical error may occur from variability in calibration constants, infrequent recalibration or over-calibration of the analytical system, and unstable calibration standards.

2.6.3 Representativeness

Representativeness expresses the degree to which the data accurately reflect the analyte or parameter of interest at an environmental site. Several factors may contribute to whether a sample result is representative of the sampling site. SOPs and approved analytical methods must be used both in the field and in the analytical laboratory. Any measures taken to ensure that bias has not been introduced into the sampling and analysis will contribute to sample representativeness. These measures include proper preservation; use of standard analytical methods; adherence to appropriate holding times; and use of field and laboratory blanks, equipment rinsates, and proper containers.

2.6.4 Comparability

Comparability is the confidence with which one data set can be compared with another data set generated by a different sampling event or by a different laboratory. The use of accepted methods and SOPs and participation in intralaboratory performance evaluation testing demonstrate comparability. Sample collection, preservation, storage, preparation, analysis, and reporting must be consistent for comparability to be achievable.

2.6.5 Completeness

Completeness is a measure of the amount of valid data obtained from the sampling and analysis process. Analytical completeness is typically expressed as the total number of samples taken for which acceptable analytical data are generated divided by the total number of samples collected. Sampling completeness is defined as the number of samples actually collected divided by the total number of samples planned to be collected.

2.6.6 Sensitivity

Sensitivity is the capability of methodology or instrumentation to discriminate between samples having differing concentrations of analytes (Taylor 1987). Sensitivity is defined by the limit of detection, the limit of quantitation, the instrument DL, and the method limit of detection. The ability to accurately report a contaminant of concern at or above the DL is a primary concern in evaluating false positives and false negatives. Holding times and sample preservation must also be evaluated for effects on sensitivity.

2.7 DATA AND RECORDS MANAGEMENT

Data management activities ensured the organization, consistency, traceability, integrity, and security of the data sets generated during Phase 1 to enable the program to meet its objectives. Data and programs from field sampling, analytical analyses, and risk assessment activities are maintained in the program data base.

Standardized identification codes were used to ensure internal consistency and compatibility with external data bases such as the Oak Ridge Environmental Information System (OREIS). Sufficient information was recorded to ensure that data were traceable to the sampling task and location; the sample identification, sample depth, and sampling date; the analytical laboratory; the batch; the result; and the data qualifier. Data were reviewed by technical staff for completeness. Data were maintained so as to minimize the introduction of error resulting from faulty entry, transcription, storage, or management. Most data reside on the ORNL IBM 3090 mainframe computer, are manipulated with Statistical Analysis System (SAS) software, and are stored as SAS data sets. Data sets are protected from unauthorized access, deletion, and modification by the ACF2 security system on the IBM 3090. Daily and weekly backups are performed by computer operations staff. SAS and other compatible software (Lotus 1-2-3 and dBASE) are used with individual personal computers.

The Phase 1 data will be maintained by the program for continued analysis by technical staff in preparation for Phase 2 sampling activities. Phase 1 data have been transferred to OREIS for general accessibility.

Records generated by the program that are required to (1) provide a complete and accurate history of sample collection, analysis, and data reporting; (2) document conduct of program business; and (3) support any future legal or administrative actions that may be taken are retained in the project files. Similarly, records that furnish documentation or evidence of quality (e.g., program work plans and results of QA oversight activities) were designated QA records and added to the project files.

Records identified for Phase 1 sampling and analysis activities included project plans and approvals, field and laboratory notebooks, chain-of-custody and request-for-analysis forms, instrument listings for gamma spectroscopy, analytical laboratory data packages, and data validation summary reports.

A hard-copy repository is maintained in the Clinch River ER Program Document Management Center (DMC), which is located at ORNL, Building 1505. This repository and associated index data base provide for the organization, protection, retrievability, and accountability of project records. The indexing system provides sufficient information to permit identification of the record and the items or activities to which it applies.

A CERCLA administrative record file has been created for the CRRI and will be the recipient of officially designated documents.

2.8 DATA VALIDATION

The primary goal of the Clinch River ER QA Program is to ensure that the analysis of all environmental samples produces data of known quality. According to EPA, "the quality of data is known when all components associated with its derivation are thoroughly documented, with such documentation being verifiable and defensible" (EPA 1990). To meet this goal, the Phase 1 data were validated using available EPA guidelines. According to EPA guidance found in QAMS 005/80 (EPA 1980a), data validation is "a systematic process for reviewing a body of data against a set of criteria to provide assurance that the data are adequate for their intended use. Data validation consists of data editing, screening, checking, auditing, verification, certification, and review." Extensive validation of the Phase 1 data was not preplanned; therefore, the extent of the validation had to be tailored to the laboratory QC documentation that was available several months after the sample analyses were complete. Approximately 198 sample data packages were prepared by the analytical laboratories and validated by a third-party subcontractor. Subcontractor personnel performing the validation were required by the Clinch River ER Program statement of work (SOW) to be trained, experienced, and proven able to perform the review procedures. The Clinch River ER Program required, reviewed, and approved resumes and work training records.

2.8.1 Data Reporting

The data were compiled by each laboratory into sample data packages that contained sample raw data and all QC associated with each sample. Sample results were also received electronically by the project data base manager and merged into a large working data base. Following compilation of the sample data packages, a subcontractor independent of the analytical laboratory that generated the data was employed by the Clinch River ER Program to validate the analytical results.

The subcontractor's data review deliverables consisted of the following:

- A data validation narrative summarizing by fraction the problems found that affected the data quality and the potential impact on the sample results (each narrative includes the name and signature of the data reviewer)
- A completed checklist that detailed the review elements and QC problems
- Report forms for each sample with validation flags attached to each analyte result
- A list of data review qualifiers and their meanings for use in the data evaluation

After validation was completed, the subcontractor reentered the inorganic and organic sample results along with the validation flags. Each flag was also accompanied by one or more reason codes that summarized the flag assignment. Because the radiological data packages were produced from electronic data already in the program data base, only the validation flags and reason codes were entered into the data base by the subcontractor.

2.8.2 Validation Criteria

Organic data packages were assessed by Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses (EPA 1988d), and inorganic data packages were assessed by Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses (EPA 1988c), as applicable. Because there were no available EPA guidelines for the inductively coupled plasma/mass spectrometry (ICP/MS) analyses, program-specific guidelines were written that addressed holding times, calibration, blanks, matrix spikes, field duplicates, DL results, sample quantitation, and internal standards. Radiological parameters were assessed by Laboratory Data Validation Guidelines for Evaluating Radionuclide Analysis, Revision 3 (SAIC 1991), since no EPA or DOE CLP requirements were available for radionuclides. The validation process included an assessment of a variety of QA/QC practices, including holding times, matrix spike recovery (MSR) rates, surrogate recovery rates, calibration standards, and method blanks. The guidelines used for review and validation of radiological analyses were not in existence at the time the analyses were performed. As a result, some evaluation criteria elements were missing from the data packages. These exceptions were noted in the data review narrative and addressed as nonconformances. Also, if the frequencies of blanks, controls, matrix spikes, duplicates, or calibration of the gamma-spectrometry analyses differed from the Science Applications International Corporation (SAIC) document, these were noted in the data package narrative. SAIC had developed radiological review and validation guidelines using CLP requirements for other types of analyses as a framework. Using the SAIC-generated guidelines, the validator conducted the most comprehensive review of the radiological data possible. The validator, the Clinch River ER Program technical staff, and the analytical laboratories were able to evaluate each nonconformance and its effect on the technical validity and legal defensibility of the data. Validation flags (or qualifiers) were assigned by the reviewer to each result depending on the quality of the data as determined by the reviewer. The QA objectives for precision and accuracy in the laboratory were defined by control limits established by each method or the laboratory if method-specific limits were not available.

2.8.3 Qualification of the Data

Summaries of the inorganic and organic sample batches validated (summaries by laboratory and method) are presented in Appendix A. A summary of the radiological analyses is presented in Sect. 4.5. A total of 198 packages containing ~1700 inorganic samples, 1500 organic samples, and 2200 radiological samples were validated. The validators reported QC deficiencies to the Clinch River ER Program using a nonconformance reporting and tracking process. There were 219 nonconformance reports containing ~1230 nonconforming items were received by the Clinch River ER Program. A FoxPro data base was used to track each nonconforming item and to provide responses back to the validator's QA personnel. Each deficiency was tracked to closure by the subcontracting validation team and Clinch River ER Program personnel. A key word that summarized a type of quality problem was assigned to each nonconforming item to track trends. Figure 2.1 illustrates the distribution of the types of problems that were found.

Figures B.1–B.13 in Appendix B further summarize the nonconforming items by analytical laboratory and method. Several types of problems were considered repairable during the validation process. These included missing information, transcription errors, illegible information, missing chain-of-custody forms, errors in calculation, and missing or incorrect units.

Two major areas for nonconformances were method use and missing data information. The term "method use" was used to apply to those situations wherein the method was not strictly adhered to and/or interpretation was questioned. Table 2.1 summarizes the distribution of nonconformances between analysis types, laboratories, and methods.

During review and validation of the analytical data, two sets of flags were assigned to the data. The first set of flags was assigned by the analytical laboratory, as required by each individual method. These flags are summarized in Tables 2.2 and 2.3. The second set of flags was assigned by the data validators. These flags are summarized in Table 2.4. The validation flags were also accompanied by one or more reason codes (Table 2.5). Analytical results included the concentration of the analyte in the sample if it was present and measurable. When an analyte was not detected in a sample, the sample quantitation limit for that particular sample was reported as the result accompanied by a "U" prefix. When spectral data indicated the presence of a compound that met the identification criteria but the result was less than the sample quantitation limit, a "J" flag was assigned, indicating that the result was an estimated value. In data analyses, these "J" values were treated as normal results.

Additional data checking was performed as the data were summarized and evaluated for the health and ecological screening assessment. Table 2.6 presents an overall summary of the QC problems found during data validation using the numerical reason codes assigned with each validation flag. This summary shows that six areas account for more than 75% of the validation flags. These are holding times being exceeded, unconventional procedure being used, surrogate recovery criteria not being met, multiple problems being encountered, MSRs not being met, and method validation being undocumented. The number of rejected samples is summarized in Appendix A and discussed in detail in Chap. 3.

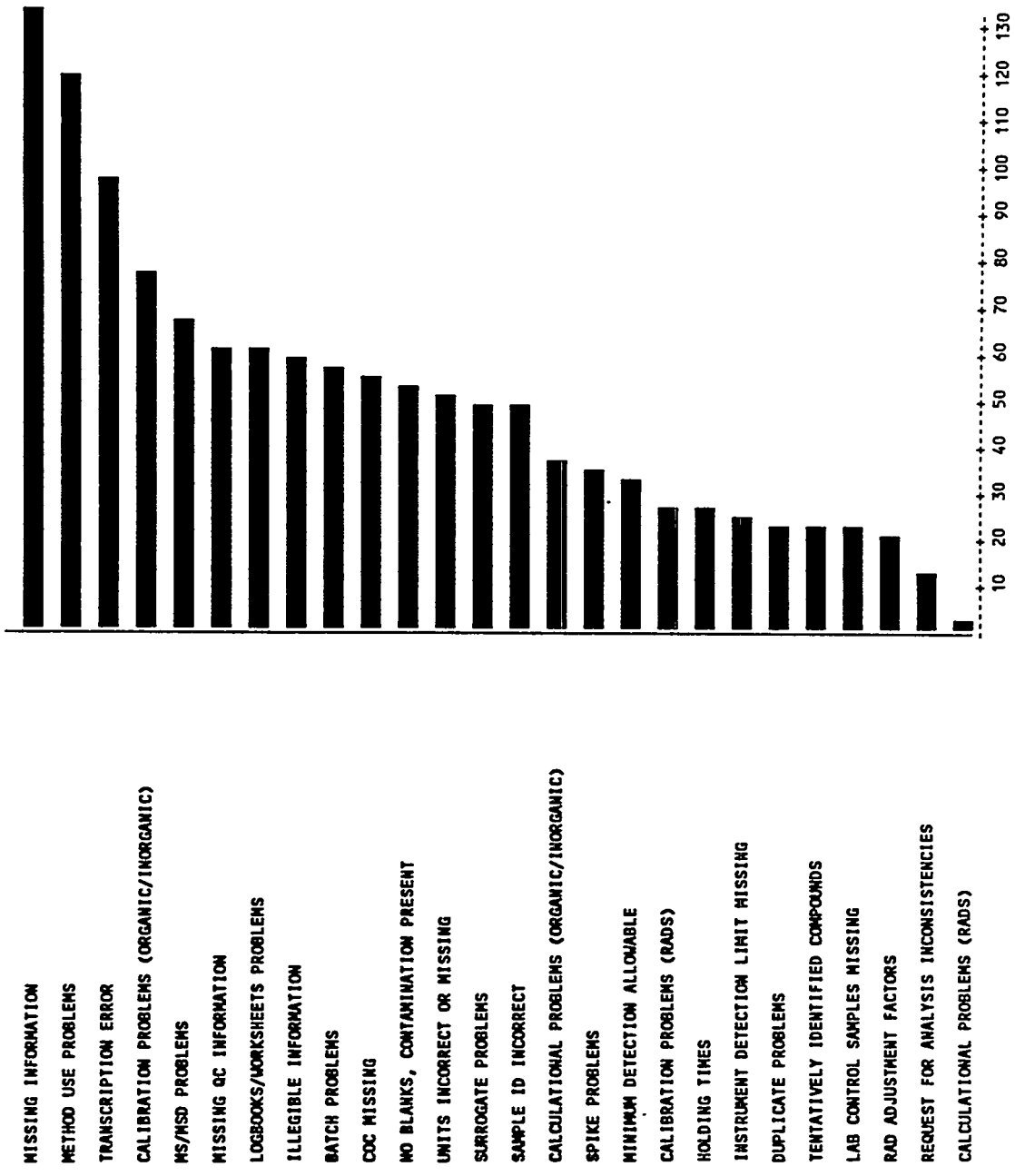

Fig. 2.1. Total nonconformances from analytical validation

Table 2.1. Distribution of nonconformances by laboratory and method

Laboratory	Method	Matrix	Number of nonconformances
	Radiological		
ORNL/ESD	Gamma analyses	All[a]	225
ORAU	Alpha/beta analyses	All	38
Total			**263**
	Organic		
ORNL/OAL	SVO	Fish	128
ORNL/OAL	Pesticides/PCBs	Fish	78
ORNL/CPA	PCBs	Fish	31
K-25	SVO	Water, sediment	70
K-25	Pesticides/PCBs	Water, sediment	80
Total			**387**
	Inorganic		
ORNL/EAL	Mercury	Fish	50
ORNL/CPA	AA/ICP	Fish	138
K-25	AA/ICP	Water	43
IT	AA/ICP	Sediment	350
Total			**581**

[a]All = sediment, water, and fish

ORNL = Oak Ridge National Laboratory, ESD = Environmental Sciences Division, ORAU = Oak Ridge Associated Universities, OAL = Organic Analysis Laboratory, SVO = semivolatile organic, PCB = polychlorinated biphenyl, CPA = Chemical and Physical Analysis Group, EAL = Environmental Analysis Laboratory, IT = International Technology Corporation, AA/ICP = atomic absorption/inductively coupled plasma

Table 2.2. Organic analysis data flags

Flag	Description
U	This flag indicates the analyte was analyzed for, but was not detected above, the reported sample quantitation limit. The sample quantitation limit is corrected for dilution and percent moisture
J	This flag indicates an estimated value. It is used when there are tentatively identified compounds with a 1:1 response assumed or when the mass spectral data indicate the presence of a compound that meets the identification criteria but the result is less than the sample quantitation limit but greater than zero
N	This flag is used when the analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification." This flag is only used for tentatively identified compounds, where the identification is based on a mass spectral library search
P	This flag is used for a pesticide/Aroclor target analyte when there is greater than a 25% difference for detected concentrations between the two GC columns. The lower of the two values is reported on Form I and flagged with a "P"
C	This flag applies to pesticide results where the identification has been confirmed by GC/MS. If GC/MS confirmation was attempted but was unsuccessful, this flag should not be used
B	This flag is used when the analyte is found in the associated blank as well as in the sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action. This flag must be used for a tentatively identified compound (TIC) as well as for a positively identified target compound
E	This flag identifies compounds whose concentrations exceed the calibration range of the GC/MS instrument for that specific analysis. All such compounds with a response greater than full scale should have the concentration flagged with an "E" on Form I for the original analysis
D	This flag identifies all compounds identified in an analysis at a secondary dilution factor. A "DL" suffix is appended to the sample number on Form I for the diluted sample and all concentration values reported on that Form I are flagged with the "D" flag. This flag alerts data users that any discrepancies between the concentrations reported may be due to dilution of the sample or extract
A	This flag indicates that a TIC is a suspected aldol-condensation product
X	This is a laboratory-specified flag. It must be fully described in the case narrative

Table 2.3. Inorganic analysis data flags

Flag	Description
	Concentration qualifiers
B	This flag is used when the reported value was obtained from a reading that was less than the contract-required detection limit but greater than or equal to the instrument detection limit
U	This flag indicates the analyte was analyzed for but not detected
	Quality qualifiers
E	This flag is used when the reported value was estimated because of the presence of interference
M	This flag indicates duplicate injection precision was not met
N	This flag indicates spiked sample recovery was not within control limits
S	This flag indicates the reported value was determined using the method of standard additions (MSA)
W	This flag indicates postdigestion spike for Furnace AA analysis was out of control limits while sample absorbance was less than 50% of spike absorbance
*	This flag indicates the duplicate analysis was not within control limits
+	This flag indicates the correlation coefficient for the MSA is less than 0.995
	Method qualifiers
P	This flag denotes ICP
A	This flag denotes Flame AA
F	This flag denotes Furnace AA
CV	This flag denotes Manual Cold Vapor AA
AV	This flag denotes Automated Cold Vapor AA
AS	This flag denotes Semi-Automated Spectrophotometric
C	This flag denotes Manual Spectrophotometric
T	This flag denotes Titrimetric
NR	This flag is used if the analyte is not required to be analyzed

Table 2.4. Validation data flags

Flag	Description
U	This flag indicates the analyte was analyzed for, but was not detected above, the reported sample quantitation limit
J	This flag indicates the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample
N	This flag indicates the analysis showed the presence of an analyte for which there is presumptive evidence to make a "tentative identification"
NJ	This flag indicates the analysis showed the presence of an analyte that has been "tentatively identified," and the associated numerical value represents its approximate concentration
UJ	This flag indicates the analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample
R	This flag indicates the sample results have been rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified
X	This flag indicates fish tissue that was held frozen while awaiting extraction exceeded the allowable holding time for water samples. However, these criteria are not applicable to biological samples, and the results are considered valid
UX	This flag indicates that the compound was analyzed for but was not detected and that water holding times were exceeded (See the description for "X")
V/V	This flag indicates that the result has been verified and is a valid result

Note: Data qualifiers were applied to the sample analysis result by the analytical laboratories and/or independent data validator. In cases where there was no data qualifier required, "V/V" has been inserted in the data qualifier field for this report.

Table 2.5. Validation reason codes

Code	Description
1	Holding times exceeded
2	Mass calibration did not meet ion abundance criteria
3	Initial calibration relative response factor (RRF) <0.05
4	Initial calibration %RSD >30%
5	Continuing calibration RRF <0.05
6	Continuing calibration %D >25%
7	Evaluation check for linearity %RSD >10%
8	Calibration factors of compounds did not meet criteria
9	Retention time of compounds outside established windows
10	Breakdown of DDT or Endrin >20%
11	Retention time of DBC, %D criteria not met
12	Blank contamination
13	Surrogate recovery criteria not met
14	Matrix spike and/or matrix spike duplicate recovery outside limit
15	Matrix spike/matrix spike duplicate, RPD outside limits
16	Internal standard area outside limits
17	Internal standard area retention time >30 sec
18	Daily calibration not performed properly
19	Calibration standards recovery outside limits
20	Standard curve correlation coefficient <0.995
21	Mid-range CN standard not distilled
22	Interference check sample recovery outside limits
23	Duplicate analyses RPD outside limits
24	Laboratory control sample recovery outside limits
25	Duplicate injections, %RSD >20%
26	Postdigestion spike recovery outside limits
27	Method of standard additions criteria not met
28	Serial dilution criteria not met
29	Sample not preserved properly
30	Calibration verification indicates an unacceptable change in system efficiency

Table 2.5 (continued)

Code	Description
31	Calibration verification indicates an unacceptable change in system energy calibration
32	Calibration verification indicates an unacceptable change in system background
33	Calibration verification indicates an unacceptable change in system resolution
34	Calibration verification indicates an unacceptable change in system plateau curve
35	Calibration verification indicates an unacceptable change in system alpha/beta crosstalk factors
36	Initial/continuing calibration not performed at required intervals
37	Sample-specific chemical recovery outside limits
38	Activity incorrectly calculated
39	Uncertainty overestimated due to not propagating the uncertainty for the average of the peak results. This applies to the uncertainty only and does not reflect on the quality of the result
40	Sample aliquot size less than acceptable value
41	Net negative results with uncertainty smaller than absolute value
42	Minimum detectable activities (MDA) reported as less than value
43	Interference peak present in region of interest
44	Radionuclide peak energy greater than 40 keV difference from observed peak (alpha)
45	Radionuclide peak energy greater than 2 keV difference from observed peak (gamma)
46	Less than 50% of total gamma abundance present in sample spectrum
47	Duplicate analyses duplicate error ratios outside limits
48	Mount mass/area exceeded for alpha/beta
49	Degraded system performance
50	Blank not analyzed at required frequency
51	Second column confirmation not performed
52	Conventional procedure not followed; inadequate QC available for validation
53	Validity of analytical method undocumented
54	Interference found in the ICSA
55	Uncertainty incorrectly calculated

Table 2.5 (continued)

Code	Description
56	Analytical uncertainties not reported
57	Inadequate chromatographic resolution for positive identification
58	Multiple problems affecting analytical performance
59	Analysis terminated prematurely
60	Calibration curve not established
61	Instrument baseline shift
62	Sample identity/origin uncertain
63	Analysis occurred outside 12-h GC/MS tune window
64	No results provided

Table 2.6. Frequency of reason codes for qualified and rejected data

Reason code	Validation reason	Occurrence of reason codes %		
		Qualified	Rejected	Total
1	Holding times exceeded	67.22	5.19	52.17
52	Conventional procedure not followed; inadequate quality control available for validation	7.84	26.94	12.47
13	Surrogate recovery criteria not met	3.14	27.64	9.08
58	Multiple problems affecting analytical performance	0.47	26.59	6.81
14	Matrix spike and/or matrix spike duplicate recovery outside limit	3.21	7.78	4.32
53	Validity of analytical method undocumented	4.86	0.24	3.74
6	Continuing calibration percent difference (%D) >25%	2.40	0.82	2.01
42	Minimum detectable activity reported as less than value	1.87	0.00	1.42
18	Daily calibration not performed properly	1.34	0.90	1.23
12	Blank contamination	1.29	0.00	0.98
26	Postdigestion spike recovery outside limits	1.03	0.01	0.78
63	Analysis occurred outside 12-h gas chromatograph/mass spectrometer window	1.03	0.01	0.78
51	Second column confirmation not performed	0.87	0.11	0.68
60	Calibration curve not established	0.62	0.14	0.51
19	Calibration standards recovery outside limits	0.32	0.63	0.40
39	Uncertainty overestimated due to not propagating the uncertainty for the average of the peak results. This applies to the uncertainty only and does not reflect on the quality of the result	0.48	0.00	0.36
24	Laboratory control sample recovery outside limits	0.36	0.00	0.28
5	Continuing calibration RRF <0.05	0.09	0.80	0.26
37	Sample-specific chemical recovery outside limits	0.26	0.14	0.23
11	Retention time of DBC, %D criteria not met	0.00	0.88	0.21
28	Serial dilution criteria not met	0.26	0.00	0.19

Table 2.6 (continued)

Reason code	Validation reason	Occurrence of reason codes %		
		Qualified	Rejected	Total
54	Interference found in the interference-check-solution A	0.13	0.19	0.15
4	Initial calibration %RSD >30%	0.19	0.00	0.14
22	Interference check sample recovery outside limits	0.17	0.00	0.13
62	Sample identity/origin uncertain	0.00	0.47	0.11
16	Internal standard area outside limits	0.14	0.00	0.10
29	Sample not preserved properly	0.08	0.11	0.09
47	Duplicate analyses duplicate error ratios outside limits	0.06	0.00	0.05
27	Method of standard additions criteria not met	0.06	0.00	0.04
32	Calibration verification indicates an unacceptable change in system background	0.05	0.01	0.04
9	Retention time of compounds outside established windows	0.00	0.16	0.04
23	Duplicate analyses relative percent difference outside limits	0.05	0.00	0.03
61	Instrument baseline shift	0.03	0.05	0.03
50	Blank not analyzed at required frequency	0.04	0.00	0.03
15	Matrix spike/matrix spike duplicate, RPD outside limits	0.03	0.00	0.02
59	Analysis terminated prematurely	0.00	0.06	0.02
20	Standard curve correlation coefficient <0.995	0.00	0.06	0.01
25	Duplicate injections, RSD >20%	0.02	0.00	0.01
38	Activity incorrectly calculated	0.00	0.01	0.01
8	Calibration factors of compounds did not meet criteria	0.01	0.00	0.01
3	Initial calibration relative response factor (RRF) <0.05	0.00	0.02	0.01
41	Net negative results with uncertainty smaller than absolute value	0.00	0.01	0.00
57	Inadequate chromatographic resolution for positive identification	0.00	0.00	0.00
10	Breakdown of DDT or Endrin >20%	0.00	0.01	0.00

Table 2.6 (continued)

Reason code	Validation reason	Occurrence of reason codes %		
		Qualified	Rejected	Total
35	Calibration verification indicates an unacceptable change in system alpha/beta crosstalk factors	0.00	0.01	0.00

3. FIELD QUALITY CONTROL

Samples and data collected to evaluate QC for Phase 1 field activities were outlined in the CRRI Plan (Energy Systems 1990). The frequency and type of QC samples collected depended on the matrix being sampled and the analyses requested. Because of this specificity, this chapter is organized by sample matrix. Each section contains an overview of the QC samples and procedures planned, the control results observed, and an assessment of the QC data collected. The specific QA objectives for all data were to obtain reproducible, precise, and accurate measurements consistent with the intended use of the data and the limitations of the sampling and analytical procedures used. For this report, field QC includes, but is not limited to sample collection, custody, processing, preservation, container selection, and transport, as well as field record keeping. Each of these actions will be discussed as appropriate by matrix.

Each site was either representative of average conditions in a particular reach of the CR/WBR system or representative of conditions directly downstream from known or suspected contaminant sources. Two reference sites for water (Norris Reservoir and Poplar Creek upstream from the ORR), one reference site in Norris reservoir for sediment, and two reference sites for fish (Norris Reservoir and Poplar Creek upstream from the ORR) were included to represent sites unaffected by surface water contamination originating on the ORR.

Quality control samples were collected to address the following indicators for field quality: precision, representativeness, comparability, and completeness. (See Sect. 2.5.) The other two QA parameters discussed in Sect. 2.5—accuracy and sensitivity—are applicable to analytical processes rather than field processes. Completeness and precision are quantitative measurements that are evaluated numerically; comparability and representativeness are qualitative and must be assessed by other means. These field QC activities are discussed in the following sections for each of the three matrices.

The QA completeness objective for this project was to obtain valid analytical results for at least 95% of the planned samples. The first step in calculating total completeness was to assess sampling completeness. Completeness of sample collection was measured by comparing the number planned versus the number collected and submitted for analysis. Completeness for field QC purposes included a comparison of those submitted for a particular analysis with those rejected because of errors in collection, processing, preservation, or other procedures related to field activities.

Sample precision was controlled through the collection of field duplicates and splits, depending on sample collection and processing techniques for each matrix. The criteria for evaluating the acceptability of this measure of precision were as follows. If the mean concentration for a particular analyte of a duplicate or split sample pair exceeded five times the average detection limit for that analyte and the RPD was <20% (35% for sediments), then the level of precision could be judged acceptable. If the RPD was >20%, then the level of precision was assessed in terms of the total sampling and analysis variability. RPD was calculated as follows.

$$RPD = \frac{|D_1 - D_2|}{(D_1 + D_2)/2} \times 100 ,$$

where D_1 was the value of the first measurement and D_2 was the value of the second measurement.

If the mean concentration observed in duplicate pairs for a particular analyte was less than five times the average detection limit and the absolute value of the difference between the duplicate samples was less than the detection limit, then the level of precision was judged to be acceptable. If the difference was greater than the detection limit, precision was unacceptable. If both values were nondetects, no evaluation of precision could be made.

Comparability for field activities is the confidence with which data collected at different times from the same site may be compared. Objectives for comparability between samples are met by (1) applying narrowly defined sampling methodologies, (2) performing site surveillance and using standard sampling devices and monitoring devices, (3) training personnel, (4) documenting sampling locations, (5) defining stringent control limits for QC checks, and (6) reporting results in units that are consistent with national standards.

Sample representativeness is an assessment of (1) how well environmental conditions are represented by the sites sampled, (2) whether observed sample contamination occurred due to field sampling activity, and (3) how well the sample collection technique performed at detecting the true analyte concentration for the anticipated condition. Representativeness is evaluated relative to field activities through a review of site selection rationale, frequency of sampling individual sites, number of samples collected, sampling technique, and selection of analytical parameters to be characterized, as well as through a review of rinse blank data.

Field QC samples were treated identically to routine samples in terms of sample identification, custody, request for analytical services, and data processing. Results for QC samples were not used to adjust the results obtained for original samples. QC samples included blank, replicate, and split samples as described here.

Trip blank: A sealed container of organic-free water used to identify contamination contributed to field samples during transport. Trip blanks were transported to and from the field in the same manner as routine samples. Information from trip blanks is relevant to analyses of volatile organic compounds, which were not requested for any matrix sampled during Phase 1 of the CRRI.

Equipment rinsate: Final rinse water from the cleaning of sample collection and processing equipment either in the laboratory or in the field between sites. Analysis of the rinsate determines if the cleaning procedures are adequate to avoid carryover of contamination from one sample to another. Rinsate samples were collected for both field and laboratory cleaning operations for water sample collection. No rinsates were collected for sediment or fish samples.

Field blank: Distilled water samples transported to the field, opened during water sample collection, and closed following collection to simulate any atmospheric or other source of contamination related to the actual water sample collection process. Field blanks were not collected for sediment or fish samples.

Field duplicate: Duplicate samples from one sampling location collected to indicate whether the field sampling technique was reproducible. Duplicate sample collection involved repeating the sample collection process for each sample taken from a discrete site. Specific field duplicate samples involved the collection of two individual samples from the same spot using the same sampling device and procedures to fill separate sample containers.

Field split: A sample collected by a single sample event that is homogenized and then split into at least two portions. Samples are to assess field homogenization techniques and laboratory precision.

3.1 WATER

3.1.1 Introduction

Water samples were collected during Phase 1 to confirm suspected low dissolved concentrations of contaminants identified in scoping studies (Suter 1991, Hoffman et al. 1991, Olsen et al. 1992). Characterization of the nature and extent of surface water contamination in the CR/WBR system during Phase 1 of the CRRI was limited to collection of one to three water samples at each site (Fig. 2.2) (Energy Systems 1990, Cook et al. 1992). One routine water sample was collected from twelve sites, and two routine samples from three sites for a total of eighteen samples from fifteen sites that corresponded to sediment and biota sampling sites (Cook et al., 1992). Water samples were analyzed for total and filtered inorganic analytes, total organic analytes, ^{3}H, ^{90}Sr, total and evaporated ^{137}Cs, and total and evaporated ^{60}Co. Quality control samples were included at a regular frequency, at least one every twenty regular samples, as outlined in Table 3.1. Site descriptions were documented at the time of collection in a field logbook. Samples were not collected to assess temporal variability in water quality throughout the reservoir.

Quality control samples collected for inorganic and organic analytes in water included (1) duplicates for precision, (2) rinse water samples from the final cleaning step for sample collection and processing equipment to assess comparability, and (3) distilled water blanks to check for contaminants introduced into the sample from sources other than the field sampling activity at a given site to assess representativeness. Additionally, a comparison of dissolved and total inorganic analyses was made to assess the adequacy of filtration and analytical procedures. No QC samples were collected for radiological analysis.

3.1.2 Field Quality Control Assessment

The representativeness and comparability of these data, assessed through the dissolved-to-total results, were not acceptable for lead at three sites; cadmium and zinc at two sites; and mercury and silver at one site. Representativeness and comparability criteria assessed through blank results were not acceptable for lead at two sites and for beryllium, cadmium, calcium, chromium, copper, iron, magnesium, nickel, potassium, and zinc at one site. Precision, assessed through a comparison of field duplicates, was not acceptable for lead at two sites and for cadmium and zinc one site. Duplicate samples for assessment of precision were collected for 5 of 18 sites. Completeness for field sampling activities was 100%. These results indicate that, for the sites and analytes listed, sources other than field sampling activities may account for the inorganic values reported in the Phase 1 data summary report (Cook et al. 1992). However, the overall QC assessment is that the data were adequate for the criteria of

Table 3.1. List of all CRRI Phase 1 water samples submitted for analysis[a,b]

Date	Site	Regular	Duplicate	Trip blank	Rinse check	Field blank
12Dec89	CRM 1.0	101O	107O			
		102M	108M			
		102T	108T			
08Jan90	CRM 103	111O				
		112M				
		112T				
11Jan90	TRM 531	131O	1311O			
		131M	1311M			
		131T	1311T			
	TRM 547	132O	1321O			
		132M	1321M			
		132T	1321T			
17Jan90	CRM 9.6	133O		1400		
		133M		140M		
		133T		140T		
	CRM 14.5	134O		1400		
		134M		140M		
		134T		140T		
	CRM 19.6	135O		1400		
		135M		140M		
		135T		140T		
18Jan90	TRM 567	136O				
		136M				
		136T				
	CRM 0.5	137O	1371O			
		137M	1371M			
		137T	1371T			
22Jan90	CRM 24	138O				
		138M				
		138T				
	CRM 43	139O	1391O			

Table 3.1 (Continued)

Date	Site	Regular	Duplicate	Trip blank	Rinse check	Field blank
		139M	1391M			
		139T	1391T			
24Jan90	PCK 0.25	141O		150O		
		141M		150M		
		141T		150T		
	PCK 2.2	142O		150O	1412O	
		142M		150M	1412M	
		142T		150T	1412T	
01Feb90	PCK 7.4	143O			1442O	
		143M			1442M	
		143T			1442T	
	PCK 8.8	144O			1452O	
		144M			1452M	
		144T			1452T	
	PCK 9.6	145O			1422O	
		145M			1422M	
		145T			1422T	
07Feb90	TRM 557	146O			1432T	
		146M			1432M	
		146T			1432T	
	CRM 50.5	1470			1462O	1470O
		147M			1462M	1470M
		147T			1462T	1470T

[a]This table is presented here to permit a comparison of the sample collection rate with the completeness and bracketing objectives of the QC program.

[b]O = Total organic analysis, M = Inorganic analysis (dissolved), and T = total inorganic analysis.

representativeness and comparability.

A complete assessment of precision, completeness, comparability, and representativeness would need to consider factors such as environmental variability, which is beyond the scope of the Phase 1 investigation, and laboratory-introduced error, which is discussed in Chap. 4. This QC information focuses discussion of the quality of Phase 1 water data in terms of (1) the adequacy and control of field collection and processing procedures combined with (2) the adequacy and control of analytical laboratory processing and analysis procedures to assess whether observed results reflect actual conditions at these sites. The adequacy of precision results as a whole; the consistency of cation results (Cook et al. 1992); and the lack of contamination throughout a set of blank, rinse, or dissolved-to-total pair samples collected and processed at the same time indicate that field procedures were adequate for accomplishing the objectives of the Phase 1 plan (Energy Systems 1990). The observed, more random occurrence of unacceptable QC results suggests that analytical processes may be a source of sample contamination. The QC sample results showing inorganic contamination, as just highlighted, may not reflect actual conditions at these sites.

All values for ^{3}H were rejected during data validation because of the use of sample preservation that was inappropriate for the analytical procedure specified. This resulted in the ^{3}H data being considered unacceptable for their intended purposes. Samples for ^{3}H analysis will be collected and analyzed during Phase 2 of the CRRI. There were no other parameters rejected from the water data base as a result of improper preservation. All field QC samples are summarized in Table 3.1. Custody for all Phase 1 samples, established in the field, was adequately maintained throughout the processing and delivery of samples to the analytical laboratories. Sample preservation practices as specified in the Phase 1 plan (Energy Systems 1990) were followed.

For a more detailed discussion of the field QC for water samples, see Appendix C.

3.2 SEDIMENT

3.2.1 Introduction

The original Clinch River RCRA Investigation Plan (Energy Systems 1990) called for sediment cores to be collected at 14 locations representing both background and contaminated areas. Three sediment cores were to be collected and analyzed for organic, inorganic, and alpha- and gamma-emitting radionuclide contaminants. Sediment surface grab samples were also to be collected at each of the 14 locations. The plan also allowed for additional samples to be collected if appropriate based on data and information collected during Phase 1.

The plan for Phase 1 of the CRRI (Energy Systems 1990) identified the types and frequencies of QC samples to be collected for sediment during Phase 1. The plan stated that field sampling would include trip blanks, field rinsates, field blanks, and field duplicates for each sediment core collected. During implementation of Phase 1 sampling, it was determined that taking QC samples for each core was unnecessarily excessive. Instead field splits were collected from at least 25% of the total number of cores collected and analyzed for gamma-emitting radionuclides, inorganics, and organics. These were collected by homogenizing two contiguous sections of the core and splitting the homogenate into equal portions, which were

then submitted blindly to the analytical laboratories. Trip blanks, field rinse blanks, and field rinsates were not collected for sediment sampling during Phase 1.

Field splits were collected for the sediment grab samples collected for the near-shore sediment characterization project, which was added during Phase 1 and not described in the Phase 1 plan. These field splits were collected using a Ponar grab sampling device. At least two samples from the same location were collected, homogenized in a bucket, and split into two separate samples. All sediment grab samples were analyzed for gamma-emitting radionuclides.

3.2.2 Field Quality Control Assessment

Sediment sampling locations used during Phase 1 provided the necessary amount of information to (1) determine the range of concentrations of contaminants of concern, (2) identify areas for focused further sampling, and (3) focus the analysis to a smaller number of contaminants of concern. Fourteen sites were sampled as planned, resulting in 100% sampling completeness. However, because only one reference location was sampled, statistical comparison between reference concentrations and concentrations in the study area was not possible. This oversight will be rectified as part of Phase 2 work.

Assessment of data quality as a result of field procedures is limited because true field duplicates were not collected. Rather, field QC samples were splits, which provided a measure of homogenization and field procedures and not precision. Assessment of the organic contaminant data relative to field QC was difficult because nearly all organic contaminant concentrations were below detection limits. However, the RPDs of the detection limits were within acceptable bounds, indicating that the field methods were sound and that the concentrations are below the detection limit. The RPDs for inorganic contaminants are within acceptable bounds except for selenium. Additional data are required before removing selenium as a contaminant of concern. Gamma-emitting radionuclide RPDs from both core and grab samples are well within bounds and suggest that precision was high. No conclusion regarding the precision of the alpha-emitting radionuclides could be made because no field splits were analyzed.

It is difficult to determine if there was contamination of samples from containers or during field collection activities because no rinse blanks were collected. However, the number of non-detects in the organic data and the fact that no anomalous values in the inorganic and radionuclide data indicate that contamination was not a problem. Also, each core was collected in separate tube liners that were never reused. Therefore, the data should be representative of field conditions.

For a more detailed discussion of the field QC for sediment samples, see Appendix C.

3.3 FISH

3.3.1 Introduction

The original plan for Phase 1 of the CRRI (Energy Systems 1990) called for the collection of eight specimens each of two species of fish [bluegill sunfish (Lepomis macrochirus) and channel catfish (Ictalurus punctatus)] and as many as available (up to eight)

of a third species [largemouth bass (Micropterus salmoides)] from 13 different sites (plus one optional site in Poplar Creek). The samples collected from White Oak Creek Embayment (WOCE) will not be discussed here, however, because they have already been discussed in a separate report on the WOCE (Blaylock et al. 1993). Two additional sites were added later [Grassy Creek (catfish only) at CRM 14.7 and upper Chickamauga Reservoir at TRM 518], which brings the total number of sites to be discussed in this report to 15 (Table 3.2).

Different combinations of one or more of these species were submitted for organic (PCB, pesticide, and semivolatile); inorganic (metal); and radionuclide analysis. Bluegill were submitted for metals and gamma emitters; bass for metals, PCBs, and gamma emitters; and catfish for PCBs, pesticides, SVOs, gamma emitters, and ^{90}Sr. The numbers of samples submitted for radiological analysis may be less than the number submitted for other analyses because of the lack of sufficient tissue quantity, which necessitated combining some samples for analysis.

QC samples (matrix spike blank, matrix spike, and split samples) were to be included with each batch of regular samples (~15 to 20 samples). Matrix spike results are discussed in Chap. 4 on laboratory QC.

3.3.2 Field Quality Control Assessment

The field QC problem that had the greatest impact on the usable data was the improper preparation of largemouth bass fillets, which resulted in the rejection of the PCB analyses of these samples. Sample collection was generally complete and achieved the proposed goals of collecting enough fish from a variety of sample sites to corroborate historical data and to provide adequate information to conduct preliminary human health and ecological risk screening. The availability of largemouth bass samples was limited as expected, and at many sites the number of bass samples was insufficient for analyses of among-species differences. There were few obvious differences among species, so bass results were combined with other species for data analysis. Although there was little apparent difference among species, future sampling should be designed to collect greater numbers of bass because they are such a popular game fish.

Sampling from the primary reference site (Norris Reservoir) provided adequate information to perform statistical comparisons of the study sites to the reference site (Cook et al. 1992). However, the second reference site (Poplar Creek/Hartland Bridge) was inadequate for this purpose because of its proximity to contaminated areas, and future sampling should include other reference areas.

Split-sample analyses of precision were generally good (>75% acceptable) for most metals, pesticides, and Aroclor 1260. Poor results were obtained for beryllium and Aroclor 1254, and insufficient information was obtained for several other metals and SVOs. Poor precision as indicated by either the duplicate samples or the split samples does not render the data unusable but does produce higher uncertainty in the results of any analyses that make use of these data.

For a more detailed discussion of the field QC for fish samples, see Appendix C.

Table 3.2. Sample sites for Phase 1 fish collection in the Clinch River/Watts Bar system

Site number	Reach	River mile or kilometer	Name
1	10	CRM 105.0[a]	Norris Reservoir (reference site)
2	1	CRM 51.0	Upper Melton Hill Reservoir
3	1	CRM 24.0	Lower Melton Hill Reservoir
4[b]	4	WOCM 0.8	White Oak Cr. embayment (near CRM 20.9)
5	2	CRM 20.6	Jones Island
6	2	CRM 14.7	Grassy Creek mouth
7	13	PCK 9.6	Poplar Cr. at Hartland Bridge
8	3	PCK 8.6	Poplar Cr. at East Fork Poplar Cr. mouth
9	3	PCK 7.4	Poplar Cr. at Mitchell Branch mouth
10[c]	3	PCK 2.2	Poplar Cr. at K-1007B pond outfall
11	3	PCK 0.8	Poplar Cr. embayment
12	4	CRM 9.5	Brashear's Island
13	4	CRM 0.5	Kingston park
14	5	TRM 557.0	Mid Watts Bar Reservoir
15	5	TRM 530.5	Lower Watts Bar Reservoir
16	15	TRM 518.0	Upper Chickamauga Reservoir

[a]Largemouth bass and bluegill were collected from CRM 105.5 but channel catfish were collected in the Powell River arm of Norris Reservoir at PRM 30.

[b]White Oak Creek (WOC) results were reported in Blaylock et al. (1992) as this area is no longer considered part of the CRRI.

[c]Fish at sites 10 and 11 were sometimes combined because of small sample sizes.

4. ANALYTICAL SAMPLE DATA EVALUATION

4.1 INTRODUCTION

Approximately 1700 inorganic samples, 1500 organic samples, and 2200 radiological samples, were submitted for laboratory analysis. These samples were analyzed for potential contaminants of concern using EPA-approved procedures wherever possible. Each laboratory implemented a QC program to ensure that all data generated and reported were scientifically valid, consistent with accepted methods, and of known accuracy. This chapter summarizes the results of the laboratory QC data. The chapter begins by defining the type of QC samples data generated by the laboratories. Next, a summary of the data validation process is presented. The remainder of the chapter summarizes the results of the laboratory QC program. Additional information on the laboratory QC program is presented in Appendix A.

4.1.1 Method Quality Control

Method quality control consists of those practices common to a group or batch of samples that have been analyzed simultaneously by the same analytical method.

Instrument tuning is evaluated to determine if the instrument was properly configured to maximize analyte sensitivity. This evaluation is part of the gas chromatograph/mass spectrometer (GC/MS) methods, where criteria specify tuning compounds, concentrations, and frequencies.

Calibration is assessed to document the accuracy and sensitivity of the instrument for the target analytes. Method criteria usually specify the number of standards, the concentration levels, the frequency of analysis, and the required response factors and precision criteria.

Blanks assess contamination levels in the sampling process, in transport of the samples from the site to the laboratory, and in the analytical process itself that may bias the analytical results.

Control samples contain known concentrations of analytes and are used to assess method bias, precision, and comparability.

Matrix spikes assess the bias of the method for the matrix, as well as the precision of the method when performed in duplicate. MSR is calculated as follows:

$$MSR = ((SSR-SR)/SA) \ X \ 100$$

where

MSR = matrix spike recovery (percent),
SSR = spiked sample result,
SR = sample result,
SA = spike added.

Duplicates assess the precision of the sampling process and/or the analytical method. The RPD and DER are used to evaluate duplicate control requirements. (See Chap. 2.)

4.1.2 Sample Quality Control

Sample quality control consists of those elements that are applicable to individual samples.

Holding time deviations from method and/or project requirements are noted. Exceeding holding times may result in contaminant loss. For purposes of this document, sample extraction holding time is the time elapsed between when the sample was extracted and when the sample was collected. Sample analysis holding time for semivolatiles and pesticides/PCBs is the time elapsed between when the sample was analyzed and when the sample was extracted. Sample analysis holding time for metals is the time elapsed between when the sample was analyzed and when the sample was collected.

Internal standards are used to evaluate the stability of the instrumentation between calibration runs.

Analyte identification consists of evaluating the sample spectra against standards and or standard libraries of spectra to ensure that acceptable identifications are made. Retention times or relative retention times are also evaluated against standard criteria.

Surrogates are organic compounds not found in environmental samples that are added to a sample to evaluate the accuracy and bias of the method. The recovery of each surrogate is calculated as follows:

Analyte quantitation must be reviewed in terms of detection limits as well as specificity for the contaminants of concern. Any detection limits that exceed regulatory or action levels must be identified. The laboratory's ability to detect the analyte of concern in the sample matrix at the prescribed threshold must be documented. Increasing variability in the estimate of the concentration will increase the uncertainty of the end product (e.g., risk assessment). The detection limits must reflect dilutions, interferences, or correction for moisture.

4.1.3 Supporting Quality Assurance

Other QA/QC elements consist of additional documentation necessary to assess the analytical laboratory conduct of operations and sample tracking and general laboratory QC.

Chain-of-custody records document sample possession from the time of collection to disposal. All discrepancies between the sample identification and the information contained on the chain-of-custody documents must be addressed. Sample security must be demonstrated as required by the project objectives.

Logbooks used to record all information pertinent to the analysis of the samples are reviewed to ensure technical adequacy and legal defensibility.

Internal QC measures include performance evaluation samples and laboratory control samples that determine analytical accuracy and method performance. Control charts may be evaluated to determine the statistical performance of the laboratory.

Certifications of the laboratory from performance evaluation programs such as the Water Pollution Studies, Water Supply Studies, State Drinking Water Programs, EMSL, CLP,

Environmental Monitoring Laboratory (EML), Analytical Products Group Proficiency Evaluation Testing Control (PETC) Program, and others will support the performance of the laboratories for those analytes reported.

Standard operating procedures within the laboratory ensure that the samples are analyzed and data reported using approved and documented techniques.

4.2 INORGANIC ANALYSES

The K-25 Analytical Chemistry Department (ACD) analyzed water samples for metals but subcontracted the sediment metals analyses to International Technology Corporation (IT) laboratories. Fish tissue samples were analyzed for metals by the ORNL Analytical Chemistry Division (ACD).

4.2.1 Atomic Absorption (AA) Water Analyses

AA analyses of water samples were conducted at the K-25 ACD by graphite furnace for antimony, arsenic, cadmium, lead, selenium, silver, and thallium. Mercury was determined by cold vapor AA (CVAA). The USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis, Multi-media, Multi-Concentration, 7/87 (EPA 1987) was used as the analytical protocol.

Sixty-eight samples were analyzed in four batches for the eight metals listed above. The major QC problems were blank contamination and spike recoveries that did not meet the required limits. Of the total 544 analyses, only one thallium result was rejected because of the postdigestion spike recovery that did not meet criteria (sample 144M).

Evaluation of the holding times, calibrations, blanks, laboratory control samples, and spiked samples indicate that these QC samples meet the method requirements and that accuracy is acceptable for all detectable contaminants, with the exception of thallium in sample 144M. The corresponding unfiltered sample, 144T, did not contain any thallium. Antimony, selenium, and lead results reported at or near the detection limit must be considered estimated because of blank and spike results that did not meet the criteria. Based on the duplicate control results, precision is acceptable.

4.2.2 AA Soil/Sediment Analyses

AA analyses of soil/sediment samples were conducted at IT laboratories by graphite furnace for antimony, arsenic, lead, selenium, silver, and thallium. Mercury was determined by CVAA. The USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis, Multi-media, Multi-Concentration, 7/87 (EPA 1987) was used as the analytical protocol for most of the samples.

Three hundred seventy-two samples were analyzed in 14 batches for the seven metals listed above. The major QC problems were spike recoveries, calibrations that did not meet criteria, laboratory control sample recoveries outside limits, and duplicate RPDs outside criteria. One hundred twenty-two mercury results were rejected primarily because the calibration did not meet requirements, although 6 of the 122 also missed the holding time. Fifteen antimony results were rejected because the calibration curve standard coefficient was

<0.995, with an additional 156 antimony results rejected because of MSRs not being met. Sixty-six selenium results were rejected because MSRs were not met. One hundred sixty-seven silver results were rejected because of inadequate spike recoveries and analysis interferences. Of the total number of analyses, the following approximate percentages of data were rejected: antimony, 46%; mercury, 33%; selenium, 17%; and silver, 45%.

Evaluations of the holding times, calibrations, and blanks indicate that most of these QC samples meet the method requirements and that accuracy is acceptable for arsenic, lead, and thallium. Antimony, mercury, selenium, and silver results were either rejected or considered as estimates because of blank and spike results that did not meet the criteria. Those results labeled "J" may exhibit a negative bias because of low spike recoveries. Based on the duplicate control results, precision is acceptable. At least ten analyses were available for every reach by analyte combination except antimony for Reach 2 and silver for Reach 4.

4.2.3 AA Analysis of Fish Tissue

AA analysis of fish tissue was conducted by the EAL at the ORNL ACD. Fish tissue was prepared by the ORNL $HNO_3/HClO_4$ method (AC-MM10915) and analyzed by a CVAA method (AC-MM1214922) for mercury. The cold vapor method measures mercury using a standard addition technique. A National Institute of Standards and Technology (NIST) standard was used for the standard addition.

One hundred seventy-eight samples (169 regular samples and 9 field splits) were analyzed for mercury in 12 batches. The major QC problems were conventional holding times exceeded, conventional procedures not followed, and calibration curves not established. None of these problems resulted in the rejection of any samples.

Although the method used for the analysis of mercury in fish tissue was considered unconventional by the data validators, the results from laboratory QC suggest that the method is accurate and reliable. The recovery rates of calibration standards and laboratory control samples were accurate. Based on the laboratory QC, these data meet the data quality objectives (DQOs) and are totally usable for the screening risk assessment.

4.2.4 ICP Water Analyses

ICP analysis of water samples was conducted by the K-25 ACD for beryllium, calcium, chromium, copper, iron, magnesium, nickel, potassium, sodium, and zinc. The USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis, Multi-media, Multi-Concentration (EPA 1988a) was used as the analytical protocol.

Sixty-four samples were analyzed in four batches for the ten metals just listed. The major QC problems were blank contamination and shift in the instrument baseline. Of the 638 analyses, only 7 iron results were rejected as a result of both of these problems (~1%).

Evaluations of holding times, calibrations, laboratory control samples, and spike recoveries indicate that these QC samples met the method requirements and accuracy is acceptable. Duplicate criteria were met, so precision was within 20% and therefore acceptable. Iron results in samples 1422M, 1432M, 1442M, 145M, 1452M, 146M, and 147M were rejected because of contamination. Four of these samples were field QC samples. At

least four iron results are available for Reaches 1, 2, 3, 4, 5, and 10, but only one result is available for Reach 13.

4.2.5 ICP Sediment Analyses

ICP analysis of sediment samples was conducted by IT laboratories for beryllium, calcium, chromium, copper, iron, magnesium, nickel, potassium, sodium, and zinc. The USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis, Multi-media, Multi-Concentration (EPA 1988a) was used as the analytical protocol for most of the samples.

Fourteen sample batches containing 372 samples were processed for six metals. Spike recoveries not within limits, duplicate RPDs out of criteria, and serial dilution criteria not met were the top three quality control problems found. However, none of these QC problems was severe enough to warrant rejection of any of these data.

Evaluation of holding times, calibrations, laboratory control samples, blanks, duplicates, and spike recoveries indicate that these QC samples met the method requirements for beryllium, cadmium, and nickel. Accuracy and precision for these elements are acceptable. It should be noted that 26%, 33%, and 65% of the chromium, copper, and zinc data, respectively, were flagged as estimated, indicating possible bias.

4.2.6 ICP and ICP/MS Analysis of Fish Tissue

ICP and ICP/MS analyses of fish tissue were conducted by the CPA at the ORNL ACD. For the analysis of metals, ICP/MS was used to measure arsenic, beryllium, and thallium, and ICP/atomic emission spectroscopy (AES) was used to measure antimony, cadmium, chromium, copper, lead, nickel, selenium, silver, and zinc. An internal method was used for sample preparation. A VG Plasma Quad PQ2 was used for the ICP/MS analyses, and a JY-48 instrument was used for the ICP/AES analyses. The ICP/MS measurements were made using the standard addition technique.

One hundred seventy-seven samples (169 regular samples and 8 field splits) were analyzed for 12 metals in 10 batches. Because of analytical problems, one zinc analysis was not performed. The major QC problems were (1) calibration standards recovery outside limits, (2) conventional procedures not followed, and (3) validity of method undocumented. Most of the QC problems resulted in the data being flagged as an estimated value but not rejected outright. However, 96 of the 2291 analyses (including 85 regular analyses) were rejected because of deficiencies in calibration standards recovery (52 lead, 7 beryllium, 20 nickel, and 9 thallium analyses) and standard curve correlation coefficients (8 beryllium analyses).

QC problems during calibration resulted in the rejection of 4.6% (94 of 2027) of the analyses performed on regular samples. However, measures of accuracy as determined with MSRs were consistently within control criteria for all the analytes except for lead, which had three percent recoveries slightly below the acceptable lower limit of 75%.

Most (74) of the rejected analyses were nondetects that were from samples collected from sites (Norris Reservoir, Melton Hill Reservoir, Poplar Creek/Hartland Bridge, and lower Watts Bar Reservoir) that are not immediately downstream of ORR surface waters. Because the rejections are mostly nondetects, the means calculated from the remaining data will be higher than if the rejected data were included. Even without the rejected data, at least ten

analyses were available for every reach by analyte combination except for beryllium in Reach 13 (Poplar Creek/Hartland Bridge), lead in Reaches 5 (lower Watts Bar Reservoir) and 10 (Norris Reservoir), and nickel in Reach 5 (lower Watts Bar Reservoir). The rejected analytes were rarely detected in the acceptable data; lead, nickel, and thallium were never detected, and beryllium was detected in only 12% of the samples. Therefore, the rejection of a small portion of these analyses should have little effect on the ultimate data analysis and risk screening.

4.3 ORGANIC ANALYSES

The K-25 ACD analyzed water samples for semivolatiles and pesticides/PCBs. Organic soils analyses were performed both by the K-25 ACD and by IT laboratories. Fish samples were analyzed for semivolatiles and pesticides/PCBs by the ORNL ACD.

4.3.1 Semivolatile Water and Sediment Analyses

Semivolatile analyses of water and sediment samples were conducted at the K-25 ACD by GC/MS. The USEPA Contract Laboratory Program Statement of Work for Organic Analysis, Multi-media, Multi-Concentration (EPA 1988b) was used as the analytical protocol. Sample 35800 was analyzed by IT, but the data were rejected because of exceeded holding times.

Three hundred forty-two samples were analyzed for 65 organic compounds in 23 batches. The major QC problems were calibration standards percent RSD outside limits, surrogate recovery criteria not met, and blank contamination. However, of the 22,230 analyses, only 3% (617) were rejected because of deficiencies in meeting holding time, calibration, and surrogate recovery requirements.

Samples 14420, 19090, 19120, 19150, 31070, 33030, 31110, 31120, 73040, 73050, 73060, and 73070 were rejected for a large number of analytes because holding times were exceeded. All but four of these samples were rinsate blanks or reference samples. Calibration difficulties affected quantitation of 2,4-dinitrophenol, 4-nitrophenol, benzyl alcohol, 2-methylphenol, 4-methylphenol, 2,4,6-trichlorophenol, and 2,4,5-trichlorophenol for a few of the samples. However, only 72 (0.3%) of the routine sample analyses were rejected, so for the majority of the semivolatile analyses, precision and accuracy CLP requirements were satisfied.

4.3.2 SVO Analysis of Fish Tissue

Semivolatile analyses of fish tissue were performed by the OAL of ORNL ACD. Semivolatiles were analyzed using a modified GC/MS procedure with no acid surrogates. Laboratory QC elements included matrix spikes, method blanks, internal standardization, initial calibration, continuing calibration, and GC/MS tuning.

One hundred twenty-three samples (116 regular samples and 7 field splits) were analyzed for 65 SVOs in 17 batches. The major QC problems were (1) holding times were exceeded, (2) continuing calibration percent difference was >25%, (3) surrogate recovery criteria were not met, (4) conventional procedures were not followed, and (5) multiple problems affecting analytical performance and analysis occurred outside the 12-h GC/MS tune window. The most

serious QC problems (continuing calibration RRF <0.05, conventional procedures not being followed, and multiple problems affecting analytical performance resulted in the rejection of 48% (3609 of 7539) of the semivolatile analyses.

Several serious laboratory QC problems resulted in the rejection of nearly half of the SVO analyses. This left eight or fewer acceptable analyses for each analyte in every reach except Reach 3 (Poplar Creek), which had >30 acceptable values for each analyte. This is noteworthy because the Poplar Creek reach is adjacent to the K-25 facility and is probably more likely to be contaminated with SVOs than any other reach. However, given the poor matrix spike and surrogate spike recoveries, the acceptable data are also highly suspect. The acceptable data are probably insufficient for a reliable risk screening analysis, although it is unlikely that this class of contaminants would exist in very high concentrations in fish tissue anyway.

4.3.3 Pesticide/PCB Water and Sediment Analyses

Pesticide/PCB analyses of water and sediment samples were conducted at the K-25 ACD by GC/electron capture detector for the target compound list of pesticides/PCBs. The sediment samples were extracted at IT Corporation in Knoxville in accordance with the preparation protocol outlined in the USEPA Contract Laboratory Program Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration (EPA 1988b). The water samples were extracted by K-25 ACD personnel, using an extraction procedure that differed slightly from that outlined in the EPA CLP SOW. Semivolatile and pesticide/PCB extracts were prepared from separate sample aliquots. A separatory funnel extraction procedure was used. A modified version of the EPA CLP SOW, which required analysis on only a single column, was used as the analytical protocol. The analyses were performed on two Hewlett Packard Model HP5890 gas chromatographs equipped with electron capture detectors.

Twenty-one sample batches were processed containing 364 samples. Holding time, surrogate recovery, and matrix spike/MSD recovery violations were the major QC problems. The data are potentially biased low because of missed holding times. The low bias contributes an increased probability of false negatives. Surrogate recovery is intended to quantitate bias of the sample results because of laboratory sample preparation and analysis. The pesticide/PCB content for sediment samples appears to be biased high. However, most of the data package case narratives indicate the presence of an interfering peak that probably contributed to the high recovery values for the surrogate compound. This makes it impossible to determine the amount or direction of bias for this data set.

There was a slightly elevated failure rate (35%) for sediment MS/MSD recovery. However, much of the sediment MS/MSD recovery failure rate was because of nondetect results for early-eluting spike compounds. There were large interference peaks in many of the sample chromatograms, which required dilution analysis. For the MS/MSD samples, this frequently caused the early-eluting compounds to either fail to be detected (a potential false negative problem) or to be imprecisely quantitated. Much of the sample data were rejected during the validation process to prevent the possibility of false negative results. The necessity of dilution analysis, required to reduce the data signal to less than full-scale response of the detector for the entire chromatogram, also resulted in elevated detection limits for most of these data. The average sediment MS/MSD RPD was 15%. This level of precision is relatively good, especially considering the matrix interference problem for these samples.

4.3.4 Pesticide/PCB Analysis of Fish Tissue

Pesticide/PCB analyses of fish tissue were performed by the OAL of ORNL ACD. Fish tissue was extracted by sonification in methylene chloride with sodium sulfate. Extracts were concentrated and solvent-exchanged with hexane using Kuderna-Danish concentrators and nitrogen blowdown. Pesticide extracts were acid washed using concentrated sulfuric acid. The extracts were analyzed on a DB-5 capillary column and a DB-1701 megabore column using electron capture collection.

One hundred twenty-three samples (116 regular samples and 7 field splits) were analyzed for 11 pesticides (aldrin, DDE, DDD, DDT, alpha chlordane, alpha chlordene, gamma chlordane, gamma chlordene, oxychlordane, chlordene, and technical chlordane) and two PCBs (Aroclor 1254 and Aroclor 1260) in 11 batches. The major QC problems were (1) holding times were exceeded, (2) a calibration curve was not established, and (3) daily calibration was not performed properly. These problems did not result in the rejection of any analyses, but many analyses were qualified as estimates. However, less common problems (such as the retention time of compounds being outside established windows, retention time of DBC criteria not being met, and no second column confirmation) did result in the rejection of 4.5% (68 of 1508) of the analyses.

The number of analyses that were rejected was <5% of the total and was fairly evenly distributed among the various sites sampled. Thus, the effect of these few missing analyses on the ultimate data analysis and risk screening assessment will probably be minimal. A potentially more important problem is the poor recoveries of matrix and surrogate spikes. This resulted in no rejections primarily because of the lack of specific EPA criteria for fish analyses. MSR averages were 45.5%, 44.8%, and 70.4% for the three spiked compounds. Most of the surrogate recoveries were below the minimum acceptable limit of 60% for water samples. The concentrations of these pesticide and PCB compounds as reported by the OAL probably should be considered to be lower than actual values by about a factor of two. An additional problem with the analysis of some pesticides is the potential for interference from high concentrations of other compounds, resulting in quantitation difficulties. The laboratory analysts recommended that reported concentrations of aldrin, DDE, and DDD be considered suspect because of interference from high concentrations of PCBs and chlordanes.

4.3.5 PCB Analysis of Fish Tissue

PCB analyses of fish tissue were also performed by the CPA of the ORNL ACD. An internal procedure was used for sample preparation and analysis.

One hundred and seventy-five samples (162 regular samples and 13 field splits) were analyzed for two PCBs in nine batches. The major QC problems were (1) holding times were exceeded, (2) second column confirmation was not performed, (3) conventional procedures were not followed, and (4) validity of methods used was undocumented. Most of the QC problems resulted in the data being flagged as an estimated value but not rejected outright. Two of these problems (conventional procedures not being followed and validity of methods being undocumented) alone or in combination did result in the rejection of 10.9% (38 of 350) of the analyses.

The validation process resulted in the rejection of <5% of the analyses from the regular samples. The rejected analyses were distributed among several reaches, so adequate data were

still available for all reaches. Accuracy information from the matrix spike samples and LCSs suggests that the method provided fairly reliable data that would be sufficient for Phase 1 data analysis and risk screening. Because the PCB accuracy information from this laboratory [the ORNL Chemical and Physical Analysis Group (CPA)] was markedly better than that from OAL, these PCB data were selected over those from OAL for data analysis and risk screening.

4.4 RADIOLOGICAL ANALYSES

4.4.1 Gamma Analysis of Sediment, Water, and Fish Tissue

Gamma analysis was done by the ESD RAL at ORNL. The method used by the laboratory was nondestructive and did not require any additional sample preparation prior to analysis. Target radionuclides and sample matrixes were ^{137}Cs and ^{60}Co in sediment, fish, and water. The laboratory used two spectrometers to analyze the Clinch River ER Program samples. The ND9900 is a minicomputer-based spectrometer connected to eight solid-state detectors and was used primarily for low-level gamma ray analyses. However, only detectors 1, 2, 3, 6, and 7 were used for the Clinch River ER Program samples. The ND6700 spectrometer consists of three solid-state detectors connected to a microcomputer-based data acquisition and analysis system. This instrument was generally used for the analysis of higher activity samples. Only detectors 1 and 3 were used for the analyses. The data acquisition and analysis components of both instruments were manufactured by Canberra Industries (formerly Nuclear Data). The detectors and associated electronic components were manufactured by several vendors, including Canberra, EG&G ORTEC, and Princeton Gamma.

The ESD RAL analyzed 1195 regular samples consisting of 948 sediment, 210 fish, and 37 water samples. Of these 1195 samples, 28 were field splits. In addition, 100 laboratory duplicates and 395 LCSs were analyzed. An independent validator reviewed these data for sensitivity, precision, accuracy, representativeness, completeness, and comparability (SPARCC). For the purposes of validation, the samples were grouped into 112 batches based on the instrument and week in which they were analyzed.

It should be noted that nationally recognized guidelines for the validation of radiological data were not established at the time of these analyses. Of the 2323 measurements submitted for validation, only 3 were rejected. Additional information on the validation results is presented below.

This section discusses the quality of the results for the regular (including field splits) samples from the perspective of laboratory SPARCC. Section 2.4 defines and describes these data quality indicators in greater detail. The summary of the validation results is the basis of this discussion.

There are 1195 possible analyses for each of the two target radionuclides. Of these, the ESD RAL performed 1187 ^{137}Cs analyses (99.3% complete) and 1134 ^{60}Co analyses (94.9% complete). The two rejected ^{137}Cs and one rejected ^{60}Co results do not significantly lower these completeness estimates. The missing ^{60}Co results were all below the sample detection limit or MDA. These analyses were performed early in the Clinch River ER Program when MDA estimates were not required from the laboratory.

The validators noted accuracy problems in 22 ^{60}Co (1.9%) and 25 ^{137}Cs (2.1%) analyses. Low recovery in the associated LCSs was the reason for qualifying these results. However, none of the results were rejected for this reason, and the effect on data quality was minimal.

Precision problems were noted in 14 ^{60}Co (1.2%) and 10 ^{137}Cs (0.8%) analyses. These problems were caused by high values of the associated DER. No results were rejected because of precision problems, and the effect on data quality was minimal.

Based on the results of the EPA interlaboratory comparison study, the data generated by the ESD RAL are comparable with those generated by other laboratories. Furthermore the EPA data indicate that the ESD RAL also produced accurate and precise measurements.

The laboratory experienced minor problems related to representativeness. Sixty-seven ^{60}Co (5.9%) and fifty-eight ^{137}Cs (4.2%) results exceeded holding time requirements. Nine ^{60}Co (0.8%) and eight ^{137}Cs (0.7%) results were improperly preserved. However, neither of these problems was serious enough to warrant rejection of results.

4.4.2 Alpha and Beta Analysis of Sediment, Water, and Fish Tissue

The ORAU Environmental Survey and Site Assessment Program (ESSAP) radiological laboratory conducted the alpha and beta analyses on the Phase 1 samples. Target radionuclides and matrixes included ^{3}H in water; ^{90}Sr in fish and sediment; and ^{241}Am, ^{238}Pu, $^{239\text{-}240}Pu$, ^{234}U, ^{235}U, and ^{238}U in sediment. In addition, curium isotopes were estimated from the ^{241}Am spectrum, but these results were not necessarily accurate or precise. Alpha and beta determinations were destructive techniques that required laboratory preparation of the samples prior to spectrometric analysis. The ORAU ESSAP used three instruments in the analysis of the Clinch River ER Program samples. A Tennelec model LB-5110 low-background alpha and beta counter was used for the ^{90}Sr determinations. Tritium determinations were made with a Packard model 1900 liquid scintillation spectrometer. A spectrometer containing components from Canberra, Tennelec, and EG&G ORTEC was used for alpha analyses.

The ORAU ESSAP analyzed 196 sediment, 87 fish, and 32 water samples for a total of 315 regular samples. In addition, 40 laboratory duplicates, 56 blanks, 8 spikes, and 11 LCSs were analyzed. An independent validator reviewed these data for SPARCC. For the purposes of validation, the samples were grouped into eight batches.

It must be noted that national guidelines for the validation of radiological data were not established at the time of these analyses. Of the 981 measurements submitted for validation, 38 were rejected. Additional detail on the validation results is presented below.

This section discusses the quality of the results for the regular (including field splits) samples from the perspective of laboratory SPARCC. Section 2.4 defines and describes these data quality indicators in greater detail. The summary of the validation results is the basis of this discussion.

There are 98 possible analyses for the target alpha radionuclides. Of these, the laboratory performed all of the americium, plutonium, and uranium isotopic analyses. Two rejected ^{241}Am results (98.0% complete) and three rejected plutonium and uranium results (97.0%) lowered the completeness estimates slightly. Analyses for ^{245}Cu, ^{246}Cu, and ^{248}Cu were

reported in less than half of the samples. Curium is estimated from the americium spectrum, and the interference because of ^{241}Am was too large to permit accurate measurement of the curium isotopes. Three ^{90}Sr results (1.5%) and 16 ^{3}H (100%) results were rejected. The ^{3}H rejections were caused by improper sample preservation prior to laboratory submission.

The validators noted accuracy problems in 24 ^{90}Sr (13.6%) analyses. Low recovery in the associated LCSs was the reason for qualifying these results. However, none of the results were rejected for this reason, and the effect on data quality was minimal.

Precision problems were noted in six ^{90}Sr (3.0%) analyses. These problems were caused by high values of the associated DERs. No results were rejected because of precision problems, and the effect on data quality was minimal.

The laboratory experienced several problems related to representativeness. Sixteen ^{3}H, 142 ^{90}Sr, and numerous alpha results exceeded the holding time requirements. All of the ^{3}H samples were improperly preserved, leading to rejection of all of these data. The violation of holding times for the ^{90}Sr and alpha radionuclides was not severe enough to warrant rejection of these data.

4.5 PERFORMANCE EVALUATION AND INTERLABORATORY COMPARISON SAMPLE RESULTS

4.5.1 ORNL

ORNL ACD performance evaluation sample results were reviewed for the year 1990, during which Clinch River fish tissue samples were being analyzed. Inorganic analytes in water and soil and organics in water were analyzed. Sample results were scored by the sponsoring organization and determined to be within predetermined acceptable/unacceptable ranges. The results are summarized in Kornegay et al. 1991.

4.5.1.1 EPA Environmental Monitoring Systems Laboratory, Las Vegas (EMSL-LV)

The results of quarterly performance evaluation samples for inorganic CLP methods were reviewed. The laboratory performed consistently until the fourth quarter, when a preparation error resulted in a low score, making actual performance difficult to review. Review of the sample reports and laboratory responses for the other quarters showed a positive bias for quantifying zinc in both soil and water. For several out-of-range analytes, reanalysis of the performance evaluation samples often gave results within the EPA ranges, leading ACD to speculate that high results may be because of contamination.

Organic CLP performance evaluation results showed improvement over the year. First and second quarter scores were low because of low recoveries of chlorinated hydrocarbon semivolatiles. Corrective measures were taken to improve recovery, as evidenced by better scores in the third and fourth quarter. These results were for water samples and may not reflect properly on the analysis of fish tissue.

4.5.1.2 PETC Program at ORNL

PETC samples were analyzed at a monthly frequency for inorganic and organic constituents in water at two concentration levels. Performance was rated as acceptable, marginal, or unacceptable, based on the mean results of all laboratories participating that month. The summary of results for 1990 show few marginal and even fewer unacceptable results.

4.5.1.3 EPA Performance Evaluation Discharge Monitoring Report (DMR)-QA Study Number 010-ORNL

Analysis results for inorganic and other analytes in water were compared to known values. Performance was acceptable overall, with only cadmium exceeding the warning limits.

4.5.1.4 Water Supply Performance Evaluation Study

Four Water Supply Performance Evaluation samples (WP-024, WP-025, WS-025, and WS-026) were analyzed for inorganics and organics in 1990. Trace metal results were generally within acceptance limits, but a few exceeded warning limits. There were no trends nor systematic biases evident for any given trace metal. Organic performance was not as consistent. Several unacceptable results were noted for lower concentrations of insecticide, phthalate, and trihalomethane analytes. Methoxychlor was the only analyte misquantified in both organic samples. Unacceptable results were not consistently greater than or lower than the limits. Therefore, there is no indication of whether the problems might have been contamination or poor recovery.

4.5.2 IT Corporation

The IT Corporation analytical laboratory was subcontracted by the K-25 laboratory to conduct inorganic analyses of sediment samples. During this time IT Corporation was also analyzing samples for the ORNL RI/feasibility study project under the management of Bechtel National, Inc. Bechtel performed on-site inspections of the laboratories and reviewed their participation in performance evaluation programs. Our review of the Bechtel audit reports revealed no findings that caused us to question the integrity of the IT data.

4.5.2.1 EPA EMSL-LV

IT analyzed EMSL-LV performance evaluation samples in 1990 and had a laboratory average score of 88%. Accuracy of performance evaluation samples was, therefore, determined to be acceptable.

4.5.3 K-25 Site

K-25 analyzed water samples for both inorganics and organics and sediment samples for organics. Sample results were scored by the sponsoring organization and determined to be within predetermined acceptable/unacceptable ranges. The results are summarized in Kornegay et al. 1991.

4.5.3.1 EPA EMSL-LV

CLP performance evaluation summary results for organics were reviewed. The laboratory response to EPA for the fourth quarter revealed a temperature control problem that resulted in the misquantification of three semivolatile compounds. The laboratory reported values exceeded upper action levels, giving a positive bias to subsequent interpretations. Overall, laboratory performance was good.

CLP performance evaluation summary results for inorganics were available only for the first and second quarter. Performance for these samples was acceptable. The lower score was because of misquantification of cadmium and lead in the soil sample and silver in one of the water samples. No obvious errors were noted in the response. Cadmium and silver both exceeded limits, and slightly elevated blank values were cited.

4.5.3.2 PETC Program at K-25

PETC samples were analyzed at a monthly frequency for inorganic and organic constituents in water at two concentration levels. Level 2 is generally two to five times more concentrated than Level 1. Performance was rated as acceptable, marginal, or unacceptable, based on the mean results of all laboratories participating that month.

The summary of inorganic results for 1990 were reviewed. Several metals had more than one result determined to be marginal or unacceptable. For example, aluminum had 5 of 12 results marginal or unacceptable for Level 1. The average aluminum recovery was 150%. Similarly, zinc had consistently high recoveries, with an average of 120% and two unacceptable results. Selenium had three unacceptable values because of either very high (250%) or very low (<50%) recoveries. Lead and arsenic also had several marginal or unacceptable values.

Organic results were reviewed for the one reported month. One month of data does not allow us to draw conclusions about long-term laboratory performance. However, these general observations were noted for contaminants of interest at the Clinch River: recoveries were good for pesticides, polycyclic aromatics, and contaminants observed in K-25 source monitoring (e.g., chloroform and trichloroethene), and recoveries were low for phthalates and for some substituted phenols (e.g., 4-nitrophenol and pentachlorophenol).

4.5.3.3 EPA Performance Evaluation DMR-QA Study Number 010-K-25

The DMR-QA study results for 1990 were reviewed. Analysis results for inorganic and other analytes in water were compared to known values. Performance was acceptable overall, with arsenic and manganese exceeding the warning limits.

4.5.3.4 Water Supply Performance Evaluation Study

Four Water Supply Performance Evaluation samples (WP-024, WP-025, and WP-026) were analyzed in 1990. Only WP-026 included trace metals and organics. Three trace metal results exceeded acceptance limits. Beryllium and cadmium were positively biased, and mercury was negatively biased. Notes indicate that metal analysis problems were operational and resulted from poor technique. Organic performance was acceptable.

5. OVERALL DATA ASSESSMENT

This chapter provides an overall assessment of the Phase 1 water, sediment, and fish data. This assessment is based on the field and laboratory QC results presented in Chaps. 3 and 4, respectively. Sections 5.1–5.3 provide an assessment of each matrix in terms of the data quality indicators (representativeness, sensitivity, precision, accuracy, completeness, and comparability). This assessment is quantitative when possible and qualitative when necessary. When the impact of an individual quality indicator (e.g., completeness) on the overall objectives of Phase 1 could be adequately expressed as a proportion of the samples affected, letter grades and descriptions were assigned as follows:

A >90% acceptable data (very adequate)
B 70–90% acceptable data (mostly adequate with some deficiencies)
C <70% acceptable data (inadequate)

When the assessment of the adequacy of a given data matrix was based on more than one factor (and was therefore subjective to some degree), the letter grade assigned was based on the best judgment of CRRI personnel. An overall grade was also assigned for each of the three matrixes. Section 5.4 includes a list of lessons learned during Phase 1 that were applicable to Phase 2 planning.

5.1 DATA ASSESSMENT OF WATER RESULTS

The overall assessment of water data collected during Phase 1 is presented in Table 5.1. The inorganic results were assessed as being >90% acceptable overall, with representativeness and comparability graded between 70% and 90% acceptable. Pesticide/PCB organic analytes were graded as 70% to 90% acceptable, a function of the completeness grade of <70% acceptable because of the absence of results from Poplar Creek. Semivolatile organic (SVO) compounds and radionuclides (with the exception of ^{3}H) were all graded as >90% acceptable; ^{3}H data were graded inadequate.

Precision and completeness for field activities are very adequate. However, representativeness and comparability assessed for field activities indicate inorganic cross-contamination from a source other than collection or preparation procedures (Sect. C.1.4). Precision, accuracy, and sensitivity as assessed for laboratory observation were within acceptable ranges for all analyte groups. However, review of inorganic results for blank samples suggests that contamination of certain samples was introduced by the analytical scheme, impacting representativeness and comparability of the results and supporting the conclusions drawn in Sect. 3.1.2. Completeness of analyses for PCBs/pesticides was not acceptable, with no results reported for the Poplar Creek K-25 Site area. During Phase 2 a number of samples are planned to be collected from the Poplar Creek area for PCBs/pesticides analyses.

5.1.1 Representativeness

Measures used to ensure representativeness of the water samples include careful site selection, standard operating procedures, field blanks, field rinsates, trip blanks, analytical method blanks, proper preservation, standard analytical methods, and adherence to holding

Table 5.1. Overall assessment of water data collected during Phase 1[a]

	Parameters[b]						
	Total	Repr.	Sens.	Prec.	Accu.	Cmpl.	Cmpa.
Inorganics							
Antimony	A	B	A	A	A	A	A
Arsenic	A	B	A	A	A	A	A
Beryllium	A	B	A	A	A	A	A
Cadmium	A	B	A	A	A	A	A
Calcium	A	B	A	A	A	A	A
Chromium	A	B	A	A	A	A	A
Copper	A	B	A	A	A	A	A
Iron	A	B	A	A	A	A	A
Lead	A	B	A	A	A	A	A
Magnesium	A	B	A	A	A	A	A
Nickel	A	B	A	A	A	A	A
Mercury	A	B	A	A	A	A	A
Potassium	A	B	A	A	A	A	A
Selenium	A	B	A	A	A	A	A
Silver	A	B	A	A	A	A	A
Sodium	A	B	A	A	A	A	A
Thallium	A	B	A	A	A	A	A
Zinc	A	B	A	A	A	A	A
Organics—Pesticides/PCBs							
Aldrin	A	B	A	A	A	C	A
Alpha-BHC	A	B	A	A	A	C	A
Alpha-chlordane	A	B	A	A	A	C	A
Aroclor-1016	A	B	A	A	A	C	A
Aroclor-1221	A	B	A	A	A	C	A
Aroclor-1232	A	B	A	A	A	C	A
Aroclor-1242	A	B	A	A	A	C	A

Table 5.1 (continued)

	Parameters[b]						
	Total	Repr.	Sens.	Prec.	Accu.	Cmpl.	Cmpa.
Aroclor-1248	A	B	A	A	A	C	A
Aroclor-1254	A	B	A	A	A	C	A
Aroclor-1260	A	B	A	A	A	C	A
Beta-BHC	A	B	A	A	A	C	A
Delta-BHC	A	B	A	A	A	C	A
Dieldrin	A	B	A	A	A	C	A
Endosulfan I	A	B	A	A	A	C	A
Endosulfan II	A	B	A	A	A	C	A
Endosulfan sulfate	A	B	A	A	A	C	A
Endrin	A	B	A	A	A	C	A
Endrin ketone	A	B	A	A	A	C	A
Gamma-BHC (Lindane)	A	B	A	A	A	C	A
Gamma-chlordane	A	B	A	A	A	C	A
Heptachlor	A	B	A	A	A	C	A
Heptachlor epoxide	A	B	A	A	A	C	A
Toxaphene	A	B	A	A	A	C	A
4,4'-DDD	A	B	A	A	A	C	A
4,4'-DDE	A	B	A	A	A	C	A
4,4'-DDT	A	B	A	A	A	C	A
Organics—Semivolatiles							
Acenaphthene	A	B	C	A	A	A	A
Acenaphthylene	A	B	C	A	A	A	A
Anthracene	A	B	C	A	A	A	A
Benzo(a)anthracene	A	B	A	A	A	A	A
Benzo(a)pyrene	A	B	C	A	A	A	A
Benzo(b)fluoranthene	A	B	A	A	A	A	A
Benzo(g,h,i)perylene	A	B	C	A	A	A	A
Benzo(k)fluoranthene	A	B	A	A	A	A	A

Table 5.1 (continued)

	Parameters[b]						
	Total	Repr.	Sens.	Prec.	Accu.	Cmpl.	Cmpa.
Benzoic acid	A	B	A	A	A	A	A
Benzyl alcohol	A	B	A	A	A	A	A
Bis(2-chloroethoxy)methane	A	B	A	A	A	A	A
Bis(2-chloroethyl)ether	A	B	A	A	A	A	A
Bis(2-ethylhexyl)phthalate	A	B	A	A	A	A	A
Chrysene	A	B	A	A	A	A	A
Di-n-butylphthalate	A	B	A	A	A	A	A
Di-n-octylphthalate	A	B	A	A	A	A	A
Dibenz(a,h)anthracene	A	B	C	A	A	A	A
Dibenzofuran	A	B	A	A	A	A	A
Diethylphthalate	A	B	A	A	A	A	A
Dimethylphthalate	A	B	A	A	A	A	A
Fluoranthene	A	B	C	A	A	A	A
Fluorene	A	B	C	A	A	A	A
Hexachlorobenzene	A	B	A	A	A	A	A
Hexachlorobutadiene	A	B	A	A	A	A	A
Hexachlorocyclopentadiene	A	B	A	A	A	A	A
Hexachloroethane	A	B	A	A	A	A	A
Indeno(1,2,3-cd)pyrene	A	B	A	A	A	A	A
Isophorone	A	B	A	A	A	A	A
Methoxychlor	A	B	A	A	A	A	A
N-nitroso-di-n-propylamine	A	B	C	A	A	A	A
N-nitrosodiphenylamine	A	B	A	A	A	A	A
Naphthalene	A	B	A	A	A	A	A
Nitrobenzene	A	B	A	A	A	A	A
Pentachlorophenol	A	B	A	A	A	A	A
Phenanthrene	A	B	C	A	A	A	A
Phenol	A	B	A	A	A	A	A
Pyrene	A	B	C	A	A	A	A
1,2-dichlorobenzene	A	B	A	A	A	A	A

Table 5.1 (continued)

	Parameters[b]						
	Total	Repr.	Sens.	Prec.	Accu.	Cmpl.	Cmpa.
1,2,4-trichlorobenzene	A	B	A	A	A	A	A
1,3-dichlorobenzene	A	B	A	A	A	A	A
1,4-dichlorobenzene	A	B	A	A	A	A	A
2-chloronaphthalene	A	B	A	A	A	A	A
2-chlorophenol	A	B	A	A	A	A	A
2-methylnaphthalene	A	B	A	A	A	A	A
2-methylphenol	A	B	A	A	A	A	A
2-nitroaniline	A	B	A	A	A	A	A
2-nitrophenol	A	B	A	A	A	A	A
2,4-dichlorophenol	A	B	A	A	A	A	A
2,4-dimethylphenol	A	B	A	A	A	A	A
2,4-dinitrophenol	A	B	A	A	A	A	A
2,4-dinitrotoluene	A	B	A	A	A	A	A
2,4,5-trichlorophenol	A	B	A	A	A	A	A
2,4,6-trichlorophenol	A	B	A	A	A	A	A
2,6-dinitrotoluene	A	B	A	A	A	A	A
3-nitroaniline	A	B	A	A	A	A	A
3,3'-dichlorobenzidine	A	B	A	A	A	A	A
4-bromophenyl-phenylether	A	B	A	A	A	A	A
4-chloro-3-methylphenol	A	B	A	A	A	A	A
4-chloroaniline	A	B	A	A	A	A	A
4-chlorophenyl-phenylether	A	B	A	A	A	A	A
4-methylphenol	A	B	A	A	A	A	A
4-nitroaniline	A	B	A	A	A	A	A
4-nitrophenol	A	B	A	A	A	A	A
4,6-dinitro-2-methylphenol	A	B	C	A	A	A	A

Table 5.1 (continued)

	Parameters[b]						
	Total	Repr.	Sens.	Prec.	Accu.	Cmpl.	Cmpa.
	Radionuclides						
^{60}Co	A	B	A	A	A	A	A
^{137}Cs	A	B	A	A	A	A	A
^{3}H	A	B	A	A	A	C	C
^{90}Sr	A	B	A	A	A	A	A

[a] Grades: A, >90% acceptable (very adequate); B, 70 to 90% acceptable (mostly adequate with some deficiencies); C, <70% acceptable (inadequate)

[b] Repr. = representativeness, Sens. = sensibility, Prec. = precision, Accu. = accuracy, Cmpl. = completeness, Cmpa. = comparability.

times. Tritium results were rejected because of improper preservation. Because of lead contamination in rinse blanks, contamination from sources other than the sample matrix may be responsible for dissolved lead at PCK 9.6 (Reach 13) and total lead at PCK 7.6 (Reach 3). Values for dissolved inorganic contaminants from site CRM 50.5 are considered suspicious because of blank contamination. Analytes detected in both blank and regular samples did not consist of contaminants of concern for Phase 1 of the CRRI (Energy Systems 1990) and, therefore, should not affect risk assessment calculations.

5.1.2 Sensitivity

All nondetect results from the CRRI Phase I, which represent DLs for the particular analysis, were compared to the DLs for the analysis methods used. For the purpose of this discussion, use of the term "acceptable performance" indicates the mean analysis DL is equal to or less than the method-prescribed DL. The inorganic and organic analyses generally exhibited acceptable performance.

The DL associated with each measurement is used as the quantitative measure of sensitivity. The CRRI plan (Energy Systems 1990) defined Phase 1 sensitivity requirements as those DLs specified in the requested analytical method. The adequacy of the analytical DLs was assessed by estimating the risk posed to human health based on a nonconservative screening of the nondetected contaminants. This approach identified 13 carcinogens and one noncarcinogen for which lower analytical DLs are needed to provide DLs for these compounds that do not produce screening indexes of $>10^{-4}$ for carcinogens or >1.0 for noncarcinogens. All the carcinogens identified are either polycyclic aromatic hydrocarbons or nitrosamines. Table 5.1 does not list two—benzidine and N-nitrosodimethylamine—because they are usually tentatively identified compounds. The noncarcinogen identified was 4,6-dinitro-2-methylphenol. The findings for all 13 compounds identified resulted from the fish and water exposure pathways. These 13 compounds should be compared to records of releases from the ORR so that those compounds not released from the ORR can be eliminated from consideration. Appropriate analytical methods may then be sought that can achieve the desired sensitivity.

5.1.3 Precision

Precision was evaluated through the use of field and laboratory duplicates. Acceptable RSD results for calcium, magnesium, potassium, and sodium indicate that the sample collection method had acceptable precision. However, precision was unacceptable for dissolved cadmium and lead at CRM 1, bis(2-ethylhexyl)phthalate at TRM 531, dissolved iron and total lead at TRM 547, dissolved lead at CRM 0.5, and dissolved iron and dissolved zinc at CRM 43. Overall, for inorganics, the CLP objectives for analytical precision of less than 20% RPD on samples with concentrations greater than five times the CRDL have been met. For organics, no water laboratory duplicates were performed.

5.1.4 Accuracy

Accuracy was assessed by reviewing the results of LCSs, performance evaluation samples, matrix spikes, and surrogate spikes. Because of a baseline shift causing negative values, iron results for samples 1422M, 1432M, 1442M, 145M, 1452M, 146M, and 147M were rejected. The effect of these rejections was that only one result was available for iron for Reach 13. Overall, for inorganics analyzed by AA and ICP, the CLP objectives for bias of <25% have

been met. For organics, five of the six surrogates indicate good accuracy ($\geq$97% recovery) for the CLP method. Recoveries for pesticide surrogates and matrix spike compounds, as well as calibrations, indicate that accuracy was acceptable.

5.1.5 Completeness

The completeness objective of 95% was obtained for metals, SVOs, and gamma-spectrometric analyses; 50% of the alpha and beta analyses was rejected because of the tritium preservation problem discussed in Sect. 5.1.1. Results for one third of the samples for PCB/pesticide analyses were not reported from the analytical laboratory.

5.1.6 Comparability

Comparability is ensured by the use of like methods for sampling and analysis. All analytical methods used in the analyses of water samples for inorganic and semivolatile compounds were approved by EPA. However, a modified version of the CLP method for analysis of pesticides and PCBs was used that did not verify results by second column confirmation.

5.1.7 Risk Assessment

Results of the screening of the surface water data are inconclusive for human health risk because of the limited number of Phase 1 samples and the uncertainty associated with using the source monitoring data to predict the concentrations of the contaminants in the different reaches. Additionally, since no PCB/pesticide results are reported for the Poplar Creek K-25 site area, risk evaluations for these contaminants could not be completed for Reach 3.

One potential impact to the human health risk assessment due to the unacceptable representativeness of the available water data is an inaccurate approximation of contaminant concentrations that could lead to either overestimated or underestimated risk and hazard estimates. As a result, the level of uncertainty associated with these calculations is increased.

5.2 DATA ASSESSMENT OF SEDIMENT RESULTS

The overall data assessment for the sediment results is presented in Tables 5.2 and 5.3. All gamma-emitting radionuclide analyses for both sediment grab and core samples were judged to be very adequate. Organic and inorganic analyses of sediment grabs were judged to be inadequate, and further sampling and analysis is warranted. Inorganic analyses of sediment core samples were judged to be adequate except for arsenic, chromium, copper, lead, nickel, mercury, selenium, and zinc, which were determined to be inadequate because of excessive DLs. Organic data from sediment cores were judged to be adequate for risk screening analysis. However, because of high DLs and the number of rejected samples, additional sampling is warranted. Alpha-emitting radionuclide data were judged to be adequate; the only limitation is that there is no measure of field precision. Only one reference site sample was collected, which prevents statistically valid comparisons to be made with affected sites. This limits the value of the entire sediment data base.

Table 5.2. Overall assessment of sediment core data collected during Phase 1

	Parameters[a]						
	Total	Repr.	Sens.	Prec.	Accu.	Cmpl.	Cmpa.
			Inorganics				
Antimony	B	C	A	B	C	C	A
Arsenic	C	A	C	B	B	A	A
Beryllium	A	A	A	B	A	A	A
Cadmium	A	A	A	B	B	A	A
Chromium	C	A	C	B	B	A	A
Copper	C	A	C	B	B	A	A
Lead	C	A	C	B	B	A	A
Nickel	C	A	C	B	A	A	A
Mercury	C	A	C	B	C	C	A
Selenium	B	C	A	B	B	A	A
Silver	B	A	A	B	C	C	A
Thallium	B	C	B	B	A	A	A
Zinc	C	A	C	B	B	A	A
			Organics—Pesticides/PCBs				
Aldrin	B	B	A	B	A	B	A
Alpha-BHC	B	B	A	B	A	B	A
Alpha-chlordane	B	B	A	B	A	B	A
Aroclor-1016	B	B	A	B	A	B	A
Aroclor-1221	B	B	A	B	A	B	A
Aroclor-1232	B	B	A	B	A	B	A
Aroclor-1242	B	B	A	B	A	B	A
Aroclor-1248	B	B	A	B	A	B	A
Aroclor-1254	A	A	A	B	A	A	A
Aroclor-1260	A	A	A	B	A	A	A
Beta-BHC	B	B	A	B	A	B	A
Delta-BHC	B	B	A	B	A	B	A
Dieldrin	A	A	A	B	A	A	A
Endosulfan I	B	B	A	B	A	B	A
Endosulfan II	A	A	A	B	A	A	A
Endosulfan sulfate	A	A	A	B	A	A	A
Endrin	A	A	A	B	A	A	A
Endrin ketone	A	A	A	B	A	A	A
Gamma-BHC (Lindane)	B	B	A	B	A	B	A
Gamma-chlordane	B	B	A	B	A	B	A
Heptachlor	B	B	A	B	A	B	A
Heptachlor epoxide	B	B	A	B	A	B	A
Toxaphene	A	A	A	B	A	A	A

Table 5.2 (Continued)

	Parameters[a]						
	Total	Repr.	Sens.	Prec.	Accu.	Cmpl.	Cmpa.
4,4'-DDD	A	A	A	B	A	A	A
4,4'-DDE	A	A	A	B	A	A	A
4,4'-DDT	A	A	A	B	A	A	A
Organics—Semivolatiles							
Acenaphthene	A	A	A	B	A	A	A
Acenaphthylene	A	A	A	B	A	A	A
Anthracene	A	A	A	B	A	A	A
Benzo(a)anthracene	A	A	A	B	A	A	A
Benzo(a)pyrene	A	A	A	B	A	A	A
Benzo(b)fluoranthene	A	A	A	B	A	A	A
Benzo(g,h,i)pyrylene	A	A	A	B	A	A	A
Benzo(k)fluoranthene	A	A	A	B	A	A	A
Benzoic acid	A	A	A	B	A	A	A
Benzyl alcohol	A	A	A	B	A	A	A
Bis(2-chloroethoxy)methane	A	A	A	B	A	A	A
Bis(2-chloroethyl)ether	A	A	A	B	A	A	A
Bis(2-ethylhexyl)phthalate	A	A	A	B	A	A	A
Chrysene	A	A	A	B	A	A	A
Di-n-butylphthalate	A	A	A	B	A	A	A
Di-n-octyphthalate	A	A	A	B	A	A	A
Dibenz(a,h)anthracene	A	A	A	B	A	A	A
Dibenzofuran	A	A	A	B	A	A	A
Diethylphthalate	A	A	A	B	A	A	A
Dimethylphthalate	A	A	A	B	A	A	A
Fluoranthene	A	A	A	B	A	A	A
Fluorene	A	A	A	B	A	A	A
Hexachlorobenzene	A	A	A	B	A	A	A
Hexachlorobutadiene	A	A	A	B	A	A	A
Hexachlorocyclopenta-diene	A	A	A	B	A	A	A
Hexachloroethane	A	A	A	B	A	A	A
Indeno(1,2,3-cd)pyrene	A	A	A	B	A	A	A
Isophorone	A	A	A	B	A	A	A
Methoxychior	A	A	A	B	A	A	A
N-nitro-di-n-propylamine	A	A	A	B	A	A	A
N-nitrosodiphenylamine	A	A	A	B	A	A	A
Napthalene	A	A	A	B	A	A	A
Nitrobenzene	A	A	A	B	A	A	A
Pentachlorophenol	A	A	A	B	A	A	A

Table 5.2 (Continued)

	Parameters[a]						
	Total	Repr.	Sens.	Prec.	Accu.	Cmpl.	Cmpa.
Phenanthrene	A	A	A	B	A	A	A
Phenol	A	A	A	B	A	A	A
Pyrene	A	A	A	B	A	A	A
1,2-dichlorobenzene	A	A	A	B	A	A	A
1,2,4-trichlorobenzed	A	A	A	B	A	A	A
1,3-dichlorobenzene	A	A	A	B	A	A	A
1,4-dichlorobenzene	A	A	A	B	A	A	A
2-chloronaphthalene	A	A	A	B	A	A	A
2-chlorophenol	A	A	A	B	A	A	A
2-methylnaphthalene	A	A	A	B	A	A	A
2-methylphenol	A	A	A	B	A	A	A
2-nitroanilene	A	A	A	B	A	A	A
2-nitrophenol	A	A	A	B	A	A	A
2,4-dichlorophenol	A	A	A	B	A	A	A
2,4-dimethylphenol	A	A	A	B	A	A	A
2,4-dinitrophenol	A	A	A	B	A	B	A
2,4-dinitrotoluene	A	A	A	B	A	A	A
2,4,5-trichlorophenol	A	A	A	B	A	A	A
2,4,6-trichlorophenol	A	A	A	B	A	A	A
2,6-dinitrotoluene	A	A	A	B	A	A	A
3-nitroaniline	A	A	A	B	A	A	A
3,3'-dichlororbenzidine	A	A	A	B	A	A	A
4-bromophenyl-phenylether	A	A	A	B	A	A	A
4-chloro-3-methylphenol	A	A	A	B	A	A	A
4-chloroaniline	A	A	A	B	A	A	A
4-chlorophenyl-phenylether	A	A	A	B	A	A	A
4-methylphenol	A	A	A	B	A	A	A
4-nitroaniline	A	A	A	B	A	A	A
4-nitrophenol	A	A	A	B	A	A	A
4,6-dinitro-2-methylphenol	A	A	A	B	A	A	A
	Radionuclides						
^{241}Am	A	A	A	B	A	A	A
$^{243,244}Cm$	C	C	C	C	C	A	A
$^{245,246}Cm$	C	C	C	C	C	A	A
^{248}Cm	C	C	C	C	C	A	A
^{60}Co	A	A	A	B	A	A	A
^{137}Cs	A	A	A	B	A	A	A
^{238}Pu	A	A	A	B	A	A	A

Table 5.2 (Continued)

	Parameters[a]						
	Total	Repr.	Sens.	Prec.	Accu.	Cmpl.	Cmpa.
$^{239,240}Pu$	A	A	A	B	A	A	A
^{90}Sr	A	A	A	B	A	A	A
^{234}U	A	A	A	B	A	A	A
^{235}U	A	A	A	B	A	A	A
^{238}U	A	A	A	B	A	A	A

[a]Repr. = representativeness, Sens. = sensibility, Prec. = precision, Accu. = accuracy, Cmpl. = completeness, Cmpa. = comparability.

Table 5.3. Overall assessment of sediment grab data collected during Phase 2

	Parameters[a]						
	Total	Repr.	Sens.	Prec.	Accu.	Cmpl.	Cmpa.
^{60}Co	A	A	B	A	A	A	A
^{137}Cs	A	A	A	A	A	A	A

[a]Repr. = representativeness, Sens. = sensibility, Prec. = precision, Accu. = accuracy, Cmpl. = completeness, Cmpa. = comparability.

5.2.1 Representativeness

Sediment samples were intentionally biased toward areas of known or suspected deposition areas. These sites included deep-channel areas of Watts Bar Reservoir and the Clinch River arm of the reservoir and Poplar Creek. Therefore, results from the Phase 1 sediment sampling do not represent the average reservoir conditions but do represent the higher levels found in reservoir sediment. Additionally, near-shore sediment grabs were collected to characterize sediment contamination in the shallow-water, near-shore areas. Although some grabs were taken in deep water, the majority of near-shore samples collected are representative of the near-shore sediment conditions in the reservoir.

Most of the PCB/pesticide data from the sediment core from Norris Reservoir (1800O) were rejected. Because there is only one reference site sample, there are no background/ reference concentrations with which to compare. This is a critical failure of the Phase 1 sampling and analysis that must be accounted for during the first part of Phase 2. The same PCBs/pesticides were rejected from one core from lower Watts Bar Reservoir (3000O). However, because data from two other cores in this reach were collected, the overall utility of the data is still adequate. Data for 2,4-dinitrophenol, 2-methylphenol, and benzyl alcohol from CRM 9.5 in Reach 4 were rejected. Because this area is the focus of additional sampling and analysis, the loss of these data is not significant.

Measures used to ensure representativeness include field blanks, field rinsates, trip blanks, analytical method blanks, proper preservation, standard analytical methods, and adherence to holding times. Samples 1442O, 1909O, 1912O, 1915O, 3107O, 3303O, 3111O, 3112O, 7304O, 7305O, 7306O, and 7307O were rejected for a large number of analytes because of exceeded holding times. All of the samples except 1442O were from the homogenized reference cores used to check laboratory analytical consistency over time. Rejection of these samples does not affect the quality of the overall data.

5.2.2 Sensitivity

The inorganic analyses exhibited acceptable performance. The organic analyses mean DLs were greater than the method DLs for the semivolatile compounds by a factor of 4. The analyses mean DLs were greater than the method DLs for many of the pesticide/PCB compounds by a factor of ~40. A major contributing factor to the elevated pesticide/PCB DLs was the presence of interference peaks in the chromatograms which required dilution analysis for most of those samples. These interferences may be due to lab contamination and/or matrix effects. One possible corrective measure for the elevated DLs for organic analysis in sediment samples is the use of a modified preparation procedure for these samples to remove the interfering compounds.

5.2.3 Precision

Precision was evaluated by laboratory duplicates. No field duplicates were collected, and consequently precision of field methods alone could not be evaluated. However field splits were collected and analyzed, which provides a measure of precision that includes both field and laboratory variability. Results from the field splits for inorganics, organics, and gamma-emitting radionuclides were all acceptable except for some pesticides in core 7100O. No field splits were collected for alpha-emitting radionuclides; therefore, no evaluation of field precision could be made. Because all the organic contaminants were below the DLs, no evaluation of RPD was performed. Average RPDs for the inorganics and gamma-emitting

radionuclides were within the 35% field duplicate criteria, except for selenium. Overall, for inorganics, the CLP objectives for analytical precision have been met, except for aluminum, chromium, copper, magnesium, manganese, and zinc. Overall, for organics, the CLP objectives for analytical precision were met more than 85% of the time. The average level of precision for the sediment pesticide laboratory duplicates was 15% despite matrix interference problems. According to the LCS and performance evaluation sample results, at least 95% of the radiological data were of acceptable precision.

5.2.4 Accuracy

To assess accuracy during the CRRI site characterization, LCSs, performance evaluation samples, matrix spikes, and surrogate spikes were evaluated. Overall, for inorganics analyzed by AA and ICP, the CLP objectives for bias of <25% have been met for arsenic, lead, thallium, beryllium, cadmium, and nickel. Chromium, copper, zinc, antimony, mercury, selenium, and silver results may be biased because of spike recoveries that did not meet the CLP requirements. For organics, all of the six semivolatile surrogates indicate good accuracy ($\geq$97% recovery) for the CLP method. The matrix spike compounds averaged 82–95% recovery. Calibration difficulties affected quantitation of 2,4-dinitrophenol, 4-nitrophenol, benzyl alcohol, 2-methylphenol, 4-ethylphenol, 2,4,6-trichlorophenol, and 2,4,5-trichlorophenol for a few of the samples. Surrogate recoveries for the pesticide analyses indicate possible positive bias because of interferences. According to the LCS and performance evaluation sample results, at least 95% of the radiological data were of acceptable accuracy.

5.2.5 Completeness

The completeness objective of 95% was obtained for core samples analyzed for semivolatile and radiological analyses. Approximately 92% of the pesticide/PCB samples were completed. Because a large number of these rejected data was from the reference cores that were homogenized and submitted over time, the actual number of rejected samples is higher than expected. Eliminating these samples from the data set would raise the percent completeness for PCB/pesticides above 95%. Eighty-eight percent of the inorganics were completed. Incompleteness resulted from rejection of antimony, mercury, selenium, and silver results because of inadequate spike recoveries and analysis interferences. Less than five grab samples were analyzed for pesticides/PCBs and semivolatiles, and all were rejected because of exceeded holding times. All of the grab radiological analyses met the completeness objective.

The total number of sediment cores collected equaled the number planned. However, several sites were changed during the implementation of Phase 1 sampling. No sediment cores were collected at Poplar Creek mile 1.4 (PCK 2.2), which is at the K-1007B holding pond outfall, or Poplar Creek at the confluence of East Fork Poplar Creek (PCK 8.9); although an attempt was made, no sediment was present. Additionally, no sediment samples were collected from Fort Loudon Reservoir. Sediment cores and surface grabs were collected in Grassy Creek embayment (CRM 14.5), middle Melton Hill Reservoir in Walker Branch embayment (CRM 33), and upper Melton Hill Reservoir at the Solway Bridge (CRM 44.1).

5.2.6 Comparability

Comparability was ensured by the use of like methods for sampling and analysis. All analytical methods used in the analyses of core and grab samples for inorganic and

semivolatile compounds were approved by EPA. However, a modified version of the CLP method for analysis of pesticides and PCBs was used for the cores, which did not verify results by second column confirmation.

5.2.7 Risk Assessment

The high percentage of rejected samples for mercury, selenium, and silver is largely due to the lack of completeness (inadequate spike recoveries and analysis interferences) associated with these metals. This deficit could impact the useability of the data, especially since the samples were biased (i.e., critical samples). The majority of the sites having a large number of rejected samples indicated that concentrations of the remaining samples were below the DLs, thus the effect on the risk assessment is not of major concern. A far greater deficiency in the sediment sampling, which would significantly impact the risk assessment, is the lack of background/reference core data and the relatively few numbers of deep core samples. It will be necessary in the baseline risk assessment to differentiate between naturally occurring/anthropogenic levels of constituents and site-related contaminants. With no data or relatively little data, this distinction cannot be made, and it will be assumed that all contaminants included in the baseline risk assessment is site related.

5.3 DATA ASSESSMENT OF FISH TISSUE RESULTS

To provide an overall qualitative assessment of the fish tissue analytical results, each analyte (or analyte group) was assigned a letter grade of A, B, or C (Table 5.4).

- All inorganic analyses were given a grade of A, except for lead, which was assigned a B.
- The PCB (ORNL CPA) and the radionuclides data were also graded A.
- The pesticides data met validation requirements and were judged adequate for risk assessment (grade B), but some QC results (e.g., MSRs) were less than desirable. Therefore, further sampling and analysis for pesticides should be considered in Phase 2.
- Although 50% of the SVO data were usable, the overall objective was compromised, so the SVO data were given a grade of C and considered inadequate.

The field and laboratory QC assessments used to quantify the overall quality of fish data are summarized below. More detailed discussions of the QC assessment are included in Chaps. 3 and 4.

5.3.1 Representativeness

Because fish are mobile organisms and sometimes travel great distances every effort was made to collect samples that were representative of the location being sampled. The ability to detect gradually decreasing concentrations of mercury and ^{137}Cs from the sites nearest the sources of the contaminants [White Oak Creek (WOC) and East Fork Poplar Creek (EFPC)] to those downstream suggests that our samples were indeed representative of the sites that were sampled (Cook et al. 1992). Ensuring representativeness also included maintaining standard sampling and processing techniques and consistent sample preservation. Standardization was maintained throughout Phase 1 except for the processing of largemouth bass tissue. Bass fillets were skinned, which is contrary to the procedures used by TVA, which

Table 5.4. Data assessment summary for fish tissue analyses for each of the data quality indicators and in total[a]

	Total	Repr.	Sens.	Prec.	Accu.	Cmpl.	Cmpa.
			Inorganics				
Antimony	A	A	A	A	A	A	A
Arsenic	A	A	A	A	A	A	A
Beryllium	A	A	A	C	A	A	A
Cadmium	A	A	A	A	A	A	A
Chromium	A	A	A	A	A	A	A
Copper	A	A	A	B	A	A	A
Lead	B	A	A	A	B	B	A
Nickel	A	A	A	A	A	B	A
Mercury	A	A	A	A	A	A	A
Selenium	A	A	A	A	A	A	A
Silver	A	A	A	A	A	A	A
Thallium	A	A	A	A	A	A	A
Zinc	A	A	A	A	A	A	A
			Organics—Pesticides/PCBs				
Aldrin	B	A	A	A	C	A	B
Alpha-chlordane	B	A	A	B	C	A	B
Alpha-chlordene	B	A	A	A	C	A	B
Aroclor-1254 (CPA)[b]	A	B	A	B	A	A	A
Aroclor-1254 (OAL)[b]	B	B	A	B	C	A	B
Aroclor-1260 (CPA)[b]	A	B	A	B	A	A	A
Aroclor-1260 (OAL)[b]	B	B	A	A	C	A	B
Clordene	B	A	A	A	C	A	B
Gamma-chlordane	B	A	A	A	B	A	B
Gamma-chlordene	B	A	A	A	C	A	B
Tech chlordane	B	A	A	A	C	A	B
Oxychlordane	B	A	A	B	C	A	B
4,4'-DDD	B	A	A	A	C	A	B
4,4'-DDE	B	A	A	B	C	A	B
4,4'-DDT	B	A	A	A	C	A	B

Table 5.4 (Continued)

	Total	Repr.	Sens.	Prec.	Accu.	Cmpl.	Cmpa.
	Organics—Semivolatiles						
Acenaphthene	C	A	A	C	C	C	B
Acenaphthylene	C	A	A	C	C	C	B
Anthracene	C	A	A	C	C	C	B
Benzo(a)anthracene	C	A	A	C	C	C	B
Benzo(a)pyrene	C	A	A	C	C	C	B
Benzo(b)fluoranthene	C	A	A	C	C	C	B
Benzo(g,h,i)pyrylene	C	A	A	C	C	C	B
Benzo(k)fluoranthene	C	A	A	C	C	C	B
Benzoic acid	C	A	A	C	C	C	B
Benzyl alcohol	C	A	A	C	C	C	B
Bis(2-chloroethoxy)methane	C	A	A	C	C	C	B
Bis(2-chloroethyl)ether	C	A	A	C	C	C	B
Bis(2-chloroisopropyl)ether	C	A	A	C	C	C	B
Bis(2-ethylhexyl)phthalate	C	A	A	C	C	C	B
Butylbenzylphthalate	C	A	A	C	C	C	B
Chrysene	C	A	A	C	C	C	B
Di-n-butylphthalate	C	A	A	C	C	C	B
Di-n-octyphthalate	C	A	A	C	C	C	B
Dibenz(a,h)anthracene	C	A	A	C	C	C	B
Dibenzofuran	C	A	A	C	C	C	B
Diethylphthalate	C	A	A	C	C	C	B
Dimethylphthalate	C	A	A	C	C	C	B
Fluoranthene	C	A	A	C	C	C	B
Fluorene	C	A	A	C	C	C	B
Hexachlorobenzene	C	A	A	C	C	C	B
Hexachlorobutadiene	C	A	A	C	C	C	B
Hexachlorocyclopentadiene	C	A	A	C	C	C	B
Hexachloroethane	C	A	A	C	C	C	B
Indeno(1,2,3-cd)pyrene	C	A	A	C	C	C	B
Isophorone	C	A	A	C	C	C	B

Table 5.4 (Continued)

	Total	Repr.	Sens.	Prec.	Accu.	Cmpl.	Cmpa.
N-nitro-di-n-propylamine	C	A	A	C	C	C	B
N-nitrosodiphenylamine	C	A	A	C	C	C	B
Napthalene	C	A	A	C	C	C	B
Nitrobenzene	C	A	A	C	C	C	B
Pentachlorophenol	C	A	A	C	C	C	B
Phenanthrene	C	A	A	C	C	C	B
Phenol	C	A	A	C	C	C	B
Pyrene	C	A	A	C	C	C	B
1,2-dichlorobenzene	C	A	A	C	C	C	B
1,2,4-trichlorobenzed	C	A	A	C	C	C	B
1,3-dichlorobenzene	C	A	A	C	C	C	B
1,4-dichlorobenzen	C	A	A	C	C	C	B
2-chloronaphthalene	C	A	A	C	C	C	B
2-chlorophenol	C	A	A	C	C	C	B
2-methylnaphthalene	C	A	A	C	C	C	B
2-methylphenol	C	A	A	C	C	C	B
2-nitroanilene	C	A	A	C	C	C	B
2-nitrophenol	C	A	A	C	C	C	B
2,4-dichlorophenol	C	A	A	C	C	C	B
2,4-dimethylphenol	C	A	A	C	C	C	B
2,4-dinitrophenol	C	A	A	C	C	C	B
2,4-dinitrotoluene	C	A	A	C	C	C	B
2,4,5-trichlorophenol	C	A	A	C	C	C	B
2,4,6-trichlorophenol	C	A	A	C	C	C	B
2,6-dinitrotoluene	C	A	A	C	C	C	B
3-nitroaniline	C	A	A	C	C	C	B
3,3'-dichlororbenzidine	C	A	A	C	C	C	B
4-bromophenyl-phenylether	C	A	A	C	C	C	B
4-chloro-3-methylphenol	C	A	A	C	C	C	B
4-chloroaniline	C	A	A	C	C	C	B
4-chlorophenyl-phenylether	C	A	A	C	C	C	B

Table 5.4 (Continued)

	Total	Repr.	Sens.	Prec.	Accu.	Cmpl.	Cmpa.
4-methylphenol	C	A	A	C	C	C	B
4-nitroaniline	C	A	A	C	C	C	B
4-nitrophenol	C	A	A	C	C	C	B
4,6-dinitro-2-methylphenol	C	A	A	C	C	C	B
		Radionuclides					
^{60}Co	A	A	A	A	A	A	A
^{137}Cs	A	A	A	A	A	A	A
^{90}Sr	B	A	A	A	B	B	A

[a]Repr. = representativeness, Sens. = sensibility, Prec. = precision, Accu. = accuracy, Cmpl. = completeness, Cmpa. = comparability.
[b]Largemouth bass data were not representative.

has a large regional data base on PCBs in fish tissue. Because of this difference in the preparation of fillets, direct comparisons to much of the historical data were not possible. In addition, skinning of fillets during preparation is not representative of the way many consumers prepare this species and could, therefore, result in an underestimate of the PCB concentrations and the ultimate risk to consumers. As a result, the largemouth bass PCB data were not used in data analysis or risk assessment. The lack of largemouth bass PCB data compromise our Phase 1 objectives to a small degree. However, because PCB concentrations in bass are typically lower than those found in catfish, the mean concentrations used for risk assessment, probably result in an overestimation of the risk associated with the consumption of multiple species.

5.3.2 Sensitivity

The inorganic analyses exhibited acceptable performance. The organic analyses exhibited acceptable performance with the exception of all BNA compounds (factor of 2), Aldrin (factor of 4), and 4,4'-DDT, 4,4'-DDD, and 4,4'-DDE (factor of 2.5).

5.3.3 Precision

Laboratory precision was evaluated with true laboratory duplicates only for the radionuclides (^{137}Cs, ^{60}Co, and ^{90}Sr), and those results indicated an acceptable level of precision for those analytes. Because matrix spike duplicate (MSD) analyses were not performed during the inorganic and organic analyses, a true measure of analytical precision could not be made. However, field split samples provided a measure of precision that included both field and laboratory variability. Although many of the split samples provided no useful information because of the lack of detectable concentrations, those samples with detectable levels indicated that precision estimates were good for four metals (arsenic, mercury, selenium, and zinc), all the pesticides, and Aroclor 1260. Poor results were obtained for beryllium and Aroclor 1254 analyses. Beryllium was rarely detected and even then at relatively low levels, so the lack of better precision for this analyte probably has little effect on the resulting data analyses and risk calculations. Aroclor 1254 is a contaminant of concern, and the lack of more precise analytical techniques is of concern. However, because Aroclor 1254 is often summed with Aroclor 1260 (which has a mean concentration five times greater than Aroclor 1254 over the entire system) (Cook et al. 1992), to provide an estimate of total PCBs, the precision of Aroclor 1254 estimation is not nearly as crucial as that of Aroclor 1260, which is fairly good. The resulting effect of any precision deficiencies on the completion of Phase 1 objectives is minor.

5.3.4 Accuracy

Analytical accuracy was evaluated with LCSs, matrix spikes, and surrogate spikes. Because no EPA-established guidelines exist that define acceptable recovery rates for lab control samples, matrix spikes, or surrogate spikes for fish tissue, the data were not rejected based on poor recoveries and the overall assessment of accuracy was therefore a subjective one. The accuracy of inorganic analyses measured with LCSs (mercury) and matrix spikes (ICP metals) was excellent. Mean percent recoveries were within 15% of full recovery for all metals except for lead, which was still within acceptable limits (mean = 77%). Phase 1 objectives were not compromised as a result of the accuracy of inorganic analyses of fish tissue.

The accuracy of organic analyses was measured with LCSs, matrix spikes, and surrogate recoveries. The results of these analyses suggest that (1) PCB data from the ORNL CPA are reliable, (2) PCB and pesticide data from the ORNL OAL are suspect because of low matrix spike and surrogate spike recoveries and may underestimate actual concentrations by a factor of 2 or more, and (3) SVO data from ORNL OAL are highly suspect because of poor matrix spike and surrogate spike recoveries. Poor PCB data from ORNL OAL do not impact the achievement of Phase 1 objectives because good PCB data were obtained from ORNL CPA. The accuracy of the pesticides data is suspect; any conclusions resulting from its use should be viewed with caution. The suspected quality of the SVO data is also worrisome, but high concentrations of these compounds are not anticipated in fish tissue anyway.

The accuracy of radionuclide analyses was measured with LCSs and chemical spike recoveries. The results of these analyses were generally within control limits, and only a few ^{90}Sr analyses were rejected because of control limits being exceeded. The effect of these few rejections is minimal on the completion of Phase 1 objectives.

5.3.5 Completeness

Nearly all planned fish samples were collected, and two additional sites were sampled as well. Laboratory completeness is summarized in Tables 5.5 and 5.6. The Clinch River ER Program completeness objective of 95% was attained for all analysis types except for the SVOs. Except for the SVOs, 95% completeness was attained for all individual analytes except beryllium, lead, nickel, and Aroclor 1254, which had completeness percentages of 91%, 70%, 88%, and 93%, respectively. Lead and nickel were not detected in any samples, so the rejection of some analyses probably has an insignificant impact on the Phase 1 objectives. Beryllium and Aroclor 1254 were detected in several samples, but so few were rejected (15 and 8, respectively) that the impact is also considered rather insignificant.

5.3.6 Comparability

The ORNL CPA, ORNL OAL, and the ESD Radiological Analysis Laboratory (RAL) participated in interlaboratory comparison programs with external laboratories to evaluate the comparability of PCB, chlordane, and radionuclide analyses, respectively. The results of these comparisons suggest that our PCB and radionuclide data are comparable with that of other laboratories but that chlordane results may underestimate the results obtained by others. In addition, the fish collection, preparation, and analysis are nearly identical to those of the ORNL Biological Monitoring and Abatement Program (BMAP), which allows a direct comparison of results between the two programs. The BMAP program evaluates contamination in the biotic communities of EFPC and WOC, both tributaries of Watts Bar Reservoir. The resulting effect of any comparability deficiencies on the completion of Phase 1 objectives is minor.

5.3.7 Risk Assessment

The lack of PCB data for largemouth bass because of inconsistent preparation had little effect on the results of the risk assessment screening exercise performed during Phase 1. Without the bass data, only catfish data were used in the assessment. Because PCB concentrations in catfish are typically higher than those in bass, the absence of bass data probably resulted in slightly higher risk values associated with human consumption of fish. However, in keeping with the conservative approach of the risk screening exercise, the use

Table 5.5. Summary of water, sediment, and fish samples submitted to laboratory and rejected during validation

Analyte	Water			Buried sediment			Surface sediment			Fish		
	Sub.	Rej.	% Rej.	Sub.	Rej.	% Rej.	Sub.	Rej.	% Rej.	Sub.	Rej.	% Rej.
					Inorganics							
Antimony	38	0	0.0	332	163	49.1				169	0	0.0
Arsenic	38	0	0.0	332	1	0.3				169	0	0.0
Beryllium	36	0	0.0	332	0	0.0				169	15	8.9
Cadmium	38	0	0.0	332	0	0.0				169	0	0.0
Calcium	36	0	0.0									
Chromium	36	0	0.0	332	0	0.0				169	0	0.0
Copper	36	0	0.0	332	0	0.0				169	0	0.0
Iron	36	3	8.3									
Lead	38	0	0.0	332	0	0.0				169	50	29.6
Magnesium	36	0	0.0									
Mercury	38	0	0.0	332	115	34.6				169	0	0.0
Nickel	36	0	0.0	332	0	0.0				169	20	11.8
Potassium	36	0	0.0									
Selenium	38	0	0.0	332	59	17.8				169	0	0.0
Silver	38	0	0.0	331	157	47.4				169	0	0.0
Sodium	36	0	0.0									
Thallium	38	1	2.6	330	0	0.0				169	9	5.3
Zinc	36	0	0.0	332	0	0.0				168	0	0.0

Table 5.5 (Continued)

Analyte	Water			Buried sediment			Surface sediment			Fish		
	Sub.	Rej.	% Rej.	Sub.	Rej.	% Rej.	Sub.	Rej.	% Rej.	Sub.	Rej.	% Rej.
					Organics							
Acenaphthene	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
Acenaphthylene	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
Aldrin	12	0	0.0	278	37	13.3	1	1	100.0	116	5	4.3
Alpha-BHC	12	0	0.0	278	37	13.3	1	1	100.0			
Alpha-chlordane	12	0	0.0	278	37	13.3	1	1	100.0	116	7	6.0
Alpha-chlordene										116	3	2.6
Anthracene	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
Aroclor-1016	12	0	0.0	278	37	13.3	1	1	100.0			
Aroclor-1221	12	0	0.0	278	37	13.3	1	1	100.0			
Aroclor-1232	12	0	0.0	278	37	13.3	1	1	100.0			
Aroclor-1242	12	0	0.0	278	37	13.3	1	1	100.0			
Aroclor-1248	12	0	0.0	278	37	13.3	1	1	100.0			
Aroclor-1254	12	0	0.0	278	3	1.1	1	1	100.0	119	13	10.9
Aroclor-1260	12	0	0.0	278	5	1.8	1	1	100.0	119	0	0.0
Benzo(a)anthracene	18	0	0.0	278	0	0.0	1	1	100.0	116	59	50.9
Benzo(a)pyrene	18	0	0.0	279	0	0.0	1	1	100.0	116	60	51.7
Benzo(b)fluoranthene	18	0	0.0	279	0	0.0	1	1	100.0	116	60	51.7
Benzo(g,h,i)perylene	18	0	0.0	279	0	0.0	1	1	100.0	116	61	52.6

Table 5.5 (Continued)

Analyte	Water			Buried sediment			Surface sediment			Fish		
	Sub.	Rej.	% Rej.	Sub.	Rej.	% Rej.	Sub.	Rej.	% Rej.	Sub.	Rej.	% Rej.
Benzo(k)fluoranthene	18	0	0.0	279	0	0.0	1	1	100.0	116	60	51.7
Benzoic acid	18	0	0.0	279	0	0.0	1	1	100.0	116	66	56.9
Benzyl alcohol	18	0	0.0	279	8	2.9	1	1	100.0	116	59	50.9
Beta-BHC	12	0	0.0	278	37	13.3	1	1	100.0			
Bis(2-chloroethoxy)methane	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
Bis(2-chloroethyl)ether	18	0	0.0	279	0	0.0	1	1	100.0	116	58	50.0
Bis(2-chloroisopropyl)ether	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
Bis(2-ethylhexyl)phthalate	18	0	0.0	279	0	0.0	1	1	100.0	116	60	51.7
Butylbenzylphthalate	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
Chlordene										116	0	0.0
Chrysene	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
Delta-BHC	12	0	0.0	278	37	13.3	1	1	100.0			
Di-n-butylphthalate	18	0	0.0	280	1	0.4	1	1	100.0	116	59	50.9
Di-n-octylphthal	18	0	0.0	279	0	0.0	1	1	100.0	116	60	51.7
Dibenz(a,h)anthracene	18	0	0.0	279	0	0.0	1	1	100.0	116	60	51.7
Dibenzofuran	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
Dieldrin	12	0	0.0	278	5	1.8	1	1	100.0			
Diethylphthalate	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
Dimethylphthalate	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9

Table 5.5 (Continued)

Analyte	Water			Buried sediment			Surface sediment			Fish		
	Sub.	Rej.	% Rej.	Sub.	Rej.	% Rej.	Sub.	Rej.	% Rej.	Sub.	Rej.	% Rej.
2-nitrophenol	18	1	5.6	279	0	0.0	1	1	100.0	116	40	34.5
2,4-dichlorophenol	18	1	5.6	279	0	0.0	1	1	100.0	116	39	33.6
2,4-dimethylphenol	18	1	5.6	279	0	0.0	1	1	100.0	116	39	33.6
2,4-dinitrophenol	18	1	5.6	279	23	8.2	1	1	100.0	116	40	34.5
2,4-dinitrotoluene	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
2,4,5-trichlorophenol	18	3	16.7	279	0	0.0	1	1	100.0	116	40	34.5
2,4,6-trichlorophenol	18	3	16.7	279	0	0.0	1	1	100.0	116	40	34.5
2,6-dinitrotoluene	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
3-nitroaniline	18	0	0.0	279	0	0.0	1	1	100.0	116	81	69.8
3,3'-dichlorobenzidine	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
4-bromophenyl-phenylether	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
4-chloro-3-methylphenol	18	1	5.6	279	0	0.0	1	1	100.0	116	38	32.8
4-chloroaniline	18	0	0.0	279	0	0.0	1	1	100.0	116	65	56.0
4-chlorophenyl-phenylether	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
4-methylphenol	18	1	5.6	280	1	0.4	1	1	100.0	115	38	33.0
4-nitroaniline	18	0	0.0	279	0	0.0	1	1	100.0	116	66	56.9
4-nitrophenol	18	1	5.6	279	13	4.7	1	1	100.0	116	40	34.5
4,4'-DDD	12	0	0.0	278	5	1.8	1	1	100.0	116	2	1.7
4,4'-DDE	12	0	0.0	278	5	1.8	1	1	100.0	116	3	2.6

Table 5.5 (Continued)

Analyte	Water			Buried sediment			Surface sediment			Fish		
	Sub.	Rej.	% Rej.	Sub.	Rej.	% Rej.	Sub.	Rej.	% Rej.	Sub.	Rej.	% Rej.
4,4'-DDT	12	0	0.0	278	5	1.8	1	1	100.0	116	2	1.7
4,6-dinitro-2-methylphenol	18	1	5.6	279	0	0.0	1	1	100.0	116	41	35.3
				Radionuclides								
^{241}Am				94	2	2.1						
$^{243,244}Cm94$				94	2	2.1						
$^{245,246}Cm$				36	1	2.8						
^{248}Cm				34	0	0.0						
^{60}Co	33	0	0.0	390	0	0.0	509	1	0.2	211	0	0.0
^{137}Cs	33	0	0.0	440	0	0.0	509	2	0.4	214	0	0.0
^{3}H	16	16	100.0									
^{238}Pu				94	3	3.2						
$^{239,240}Pu$				94	3	3.2						
^{90}Sr	16	0	0.0	94	1	1.1				87	0	0.0
^{234}U				94	3	3.2						
^{235}U				94	3	3.2						
^{238}U				94	3	3.2						

Table 5.5 (Continued)

Analyte	Water			Buried sediment			Surface sediment			Fish		
	Sub.	Rej.	% Rej.	Sub.	Rej.	% Rej.	Sub.	Rej.	% Rej.	Sub.	Rej.	% Rej.
Endosulfan I	12	0	0.0	278	37	13.3	1	1	100.0			
Endosulfan II	12	0	0.0	278	5	1.8	1	1	100.0			
Endosulfan sulfate	12	0	0.0	278	5	1.8	1	1	100.0			
Endrin	12	0	0.0	278	5	1.8	1	1	100.0			
Endrin ketone	12	0	0.0	278	5	1.8	1	1	100.0			
Fluoranthene	18	0	0.0	279	0	0.0	1	1	100.0	116	58	50.0
Fluorene	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
Gamma-BHC (Lindane)	12	0	0.0	278	37	13.3	1	1	100.0			
Gamma-chlordane	12	0	0.0	278	37	13.3	1	1	100.0	116	6	5.2
Gamma-chlordene										116	3	2.6
Heptachlor	12	0	0.0	278	37	13.3	1	1	100.0			
Heptachlor epoxide	12	0	0.0	278	37	13.3	1	1	100.0			
Hexachlorobenzene	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
Hexachlorobutadiene	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
Hexachlorocyclopentadiene	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
Hexachloroethane	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
Indeno(1,2,3-cd)	18	0	0.0	279	0	0.0	1	1	100.0	116	60	51.7
Isophorone	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
Methoxychlor	12	0	0.0	278	5	1.8	1	1	100.0			

Table 5.5 (Continued)

Analyte	Water			Buried sediment			Surface sediment			Fish		
	Sub.	Rej.	% Rej.	Sub.	Rej.	% Rej.	Sub.	Rej.	% Rej.	Sub.	Rej.	% Rej.
N-nitroso-di-n-propylamine	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
N-nitrosodiphenylamine	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
Naphthalene	18	0	0.0	279	0	0.0	1	1	100.0	116	58	50.0
Nitrobenzene	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
Oxychlordane										116	6	5.2
Pentachlorophenol	18	1	5.6	279	0	0.0	1	1	100.0	116	40	34.5
Phenanthrene	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
Phenol	18	1	5.6	279	0	0.0	1	1	100.0	116	40	34.5
Pyrene	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
Toxaphene	12	0	0.0	278	17	6.1	1	1	100.0			
1,2-dichlorobenzene	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
1,2,4-trichlorobenzene	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
1,3-dichlorobenzene	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
1,4-dichlorobenzene	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
2-chloronaphthalene	18	0	0.0	279	0	0.0	1	1	100.0	116	59	50.9
2-chlorophenol	18	1	5.6	279	0	0.0	1	1	100.0	116	39	33.6
2-methylnaphthal	18	0	0.0	279	0	0.0	1	1	100.0	116	56	48.3
2-methylphenol	18	1	5.6	279	8	2.9	1	1	100.0	116	40	34.5
2-nitroaniline	18	0	0.0	279	0	0.0	1	1	100.0	116	60	51.7

Table 5.6 Summary of the number of regular samples (i.e., excludes QC samples) rejected as a result of data validation

Analysis type	Laboratory	Total number of analyses	Number of accepted analyses	Number of rejected analyses	Percent rejected of total
		Field matrix—water			
Metals	K-25	664	660	4	0.6
Pesticide/PCBs	K-25	324	324	0	0
Semivolatiles	K-25	1,170	1,152	18	1.5
Rads	ORAU	32	16	16	50.0
Rads	ORNL/ESD	66	66	0	0
Totals for water analyses		**2,256**	**2,218**	**38**	**1.7**
		Field matrix—core			
Metals	K-25/IT	4,313	3,818	495	11.5
Pesticide/PCBs	K-25	7,506	6,881	625	8.3
Semivolatiles	K-25	18,136	18,082	54	0.3
Rads	ORAU	822	801	21	2.6
Rads	ORNL/ESD	830	830	0	0
Totals for core analyses		**31,607**	**30,412**	**1,195**	**3.8**
		Field matrix—grab			
Pesticide/PCBs	K-25/IT	27	0	27	100
Semivolatiles	K-25/IT	65	0	65	100
Rads	ORNL/ESD	1,018	1,015	3	0.3
Totals for grab analyses		**1,110**	**1,015**	**95**	**8.6**
		Field matrix—fish			
Metals	ORNL/CPA	2,027	1,933	94	4.6
Mercury	ORNL/EAL	169	169	0	0
PCBs	ORNL/CPA	238	230	8	3.4
Pesticide/PCBs	ORNL/OAL	1,508	1,440	68	4.5
Semivolatiles	ORNL/OAL	7,539	3,930	3,609	47.9
Rads	ORAU	87	87	0	0
Rads	ORNL/ESD	425	425	0	0
Totals for fish analyses		**11,993**	**8,214**	**3,779**	**31.5**
Totals for all analyses		**46,966**	**41,859**	**5,107**	**10.9**

of only the most contaminated species (catfish in this case) was probably more appropriate in any case.

SVO data analyzed in fish tissue are considered inadequate because of low accuracy and completeness evaluations. Impacts to the human health risk assessment from this inadequacy are possible overestimates or underestimates of the contaminant concentrations in fish tissue, resulting in erroneous cancer risk or hazard index calculations. However, from a human health risk standpoint, the semivolatile concentrations would be greatly reduced by the cooking of the fish before human consumption; therefore, the impact from the rejection of SVO samples on the risk assessment is considered minimal.

It should be noted that all samples for the eleven carcinogenic contaminants identified as requiring lower analytical DLs to ensure adequate protection of human health, were rejected in Reaches 5, 10, and 13. More than 50% of the samples in Reaches 1 and 4 were also rejected. The samples for the noncarcinogen having elevated DLs were all rejected in Reach 10, and greater than 50% of the samples were rejected in Reaches 1, 5, and 13. For those reaches having no useable data, risk estimates obviously cannot be calculated, and for those reaches with a large percentage of rejected samples, the remaining data may not be representative of the site conditions. If data were available for these reaches, lower DLs could possibly be achieved, and thus, reduce the number of nondetected contaminants having risk estimates $>10^{-4}$.

Another limitation of the fish analyses is that no reference data are available from Reach 18 (the Tennessee River). These data are needed to differentiate between anthropogenic levels of contamination and site related contamination.

5.4 LESSONS LEARNED

The purpose of this report was not only to evaluate the quality and applicability of the Phase 1 data but also to identify those problems that can be addressed and corrected during future sampling and analysis. These problems are presented by field matrix and by laboratory analysis.

5.4.1 Water Sampling, Processing, and Preservation

- Do not acidify tritium water samples.

5.4.2 Sediment Sampling, Processing, and Preservation

- Collect additional samples in reference locations.
- Collect field duplicates, equipment rinse blanks, and trip blanks to provide a better method of evaluating data for representativeness and precision.
- Deliver samples to the laboratory in time to meet holding time restrictions.
- Evaluate QC data immediately upon receipt from laboratory.
- Have data base that links QC data to sample batches.

5.4.3 Fish Sampling, Processing, and Preservation

- Prepare fish tissue such that it is consistent with EPA guidelines and the methods of other agencies gathering similar information (i.e., do not skin the bass fillets).
- Select additional reference sites.
- Provide a sufficient amount of tissue to the laboratories for matrix spike and MSD analyses.
- Deliver fish samples to the laboratories in time to be extracted within 180 days of collection so that the concern of prolonged pre-extraction holding times is minimized.
- Collect equipment rinse blanks to provide a better method of evaluating data for representativeness and precision.

5.4.4 Laboratory Analysis

- Ensure that the quantity of matrix spike is sufficient for the required accuracy and precision analyses.
- Insist that the laboratories perform at least one matrix spike and spike duplicate with every batch of 20 or fewer samples.
- Develop control limits for matrix spike and surrogate spike recovery rates specific to fish tissue analysis.
- Find a better method to analyze several pesticides (aldrin and DDT derivatives) in fish that are affected by high concentrations of PCBs and chlordane in the present method.
- Obtain and validate a modified sample preparation procedure for organics in sediment samples that permits removing matrix-interfering compounds from sample extract without removing the target compounds.
- Require that laboratories provide all data in electronic format.
- Require that laboratories provide all supporting QC data.
- Require that radiological laboratories provide documentation that links each sample with appropriate efficiency and background spectra.
- Require that radiological laboratories provide net activity estimates in addition to minimum detectable activity for all analyses below the sample quantitation limit.
- Require that radiological laboratories perform background determinations on a regular schedule.
- Require that laboratories establish statistical process control procedures to provide a quantitative measure of laboratory performance.
- Require that radiological laboratories ensure that spectrometer sensitivity is set properly to provide reliable estimates of minimum detectable activity.
- Improve DLs for inorganics in sediments.

5.4.5 Sample Tracking

- Improve sample tracking to ensure that all required data are received from the analytical laboratories or, if data are not received, that resampling can be performed.

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Appendix A.

ANALYTICAL DATA EVALUATION

A. ANALYTICAL DATA EVALUATION

A total of 198 packages containing ~1700 inorganic samples, 1500 organic samples, and 2200 radiological samples, were analyzed by various laboratories during Phase 1.

A.1 INORGANIC ANALYSES

A.1.1 Atomic Absorption Water Analyses

Atomic Absorption (AA) analyses of water samples were conducted at the K-25 Analytical Chemistry Division (ACD) by graphite furnace for antimony, arsenic, cadmium, lead, selenium, silver, and thallium. Mercury was determined by cold vapor AA (CVAA). The USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis, Multi-media, Multi-Concentration (EPA 1987) was used as the analytical protocol. Sixty-eight samples were analyzed in four batches (Tables A.1, A.2).

Holding times. All holding times were within limits.

Calibration. Calibration specifications ensure that the instrument is capable of producing acceptable quantitative data. The calibrations for four of the batches either met all the requirements or deviations did not warrant any action by the validator. The continuing calibration verification for thallium in batch 1462M was outside the appropriate control limits. However, no action was recommended by the validators because no thallium was reported in the samples (1472M and 1472T).

Blanks. The analysis of blanks provides a means of assessing the existence and magnitude of contamination introduced by way of the analytical scheme. No contamination that required action was reported in batches CRMI-I, 1462M, or 136M. Because the lead levels in the blanks for batches 1462M and 1422M were greater than the instrument detection limit (IDL) but less than the action level, the lead results in all samples in each batch were reported as not detected with the detection limit (DL) raised.

Matrix spikes. Spiked sample analysis provides information about the effect of the sample matrix on the digestion and measurement methodology. Spike recovery must be within the limits of 75–125%. However, spike recovery limits do not apply when sample concentration exceeds the spike concentration by a factor of 4 or more. All criteria were met, except for batch 1422M, where antimony results were flagged J/UJ in all samples. The spike recoveries for antimony were affected by either a problem with the autosampler or with sample deposition during analysis. Table A.3 summarizes the matrix spike recoveries (MSRs). All of the recoveries were within limits, except for antimony and selenium. Seventy-five percent of the spike recoveries for these two elements were within limits.

Duplicates. Results of duplicate analyses serve as an indicator of the precision of the methods and the sample results. A control limit of 20% is used for the relative percent difference (RPD) when the sample values are greater than five times the contract-required

detection limit (CRDL). A control limit of plus or minus the CRDL is used for the limit when the sample results are less than five times CRDL. All criteria were met for four of the batches; no actions were warranted for the fifth batch. All of the laboratory duplicates were within the limits (Table A.4).

Laboratory quality control samples. The laboratory control sample (LCS) analysis is designed to serve as a monitor of the efficiency of the digestion procedure. An aqueous LCS must be analyzed on a digestion batch basis. All aqueous LCS results must fall within the control limits of 80–120% recovery except antimony and silver, which have no control limits. All of the samples met the criteria as shown in Table A.5.

Method of standard additions. All criteria were generally met when required except for batch CRMI-I. Arsenic failed to meet the spike recoveries in all samples, so results were qualified as UJ.

A.1.2 AA Soil/Sediment Analyses

AA analyses of soil/sediment samples were conducted at International Technology (IT) laboratories by graphite furnace for antimony, arsenic, lead, selenium, silver, and thallium. Mercury was determined by CVAA. The USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis, Multi-media, Multi-Concentration, (EPA 1987) was used as the analytical protocol for most of the samples. Three hundred seventy-two samples were analyzed in 14 batches for the seven metals listed above (Tables A.6, A.7).

Holding times. All samples met the holding time requirements, with the following exceptions. The mercury results were qualified with a J for 13 samples. In batch 900531-005, all AA results and all positive mercury results for samples 1410T, 1411T, 2607T, and 2608T were qualified as estimated, and all mercury nondetects were qualified as rejected. All mercury results for samples 7101T and 7102T were qualified as estimated (J/UJ). In batch 900308-014, two samples, 900308-071 and -072, were flagged J.

Calibration. Calibration specifications ensure that the instrument is capable of producing acceptable quantitative data. The calibrations for the data either met all the requirements or deviations did not warrant any action by the validator, with the following exceptions. In batches 900323-137, 900404-076, and 900412-003, apparently the mercury standard curve was established with only three standards instead of the required four. As a consequence, ~33% of the mercury data analyzed at IT was estimated. In batch 891212-086, the positive selenium results in 891214-044, -045, -046, and -047 were qualified as estimated (J). Antimony results in all samples in batch 900223-007 were qualified as estimated nondetects (UJ), because the calibration curve correlation coefficient was less than 0.995. The time of sample analysis was not provided for mercury, thallium, and lead, so calibration frequency could not be evaluated.

Blanks. The analysis of blanks provides a means of assessing the existence and magnitude of contamination introduced by way of the analytical scheme. All criteria were met or deviations did not warrant any action by the validator except for batches 900611-035 and 900412-003. In batch 900611-035, a soil preparation blank was not analyzed for lead by the graphite furnace AA method. As a result, lead results in all samples were estimated (J). In batch 900412-003, silver results less that the action level were qualified as undetected (U). For batch 891212-086, the antimony result in sample 891212-040 was qualified U, and the DL

was raised to the quantitated value. The time of sample analysis was not provided for mercury, thallium, and lead, so frequency of blank analysis could not be evaluated.

Matrix spikes. Spiked sample analysis provides information about the effect of the sample matrix on the digestion and measurement methodology. Spike recovery must be within the limits of 75–125%. However, spike recovery limits do not apply when sample concentration exceeds the spike concentration by a factor of 4 or more. All MSRs were met with the following exceptions: for batch 910607, antimony results were qualified J/UJ, and selenium results were qualified J/R; for batch 900627-014, some selenium, arsenic, cadmium, and zinc results were qualified J or UJ. In batch 900323-137, recoveries did not meet criteria for antimony, arsenic, selenium, and silver; results were flagged accordingly. For batch 900404-076, all sample results for selenium (J/UJ), silver (J/R), antimony (J/R), and arsenic (J/UJ) were qualified as noted because recovery limits were exceeded. In batch 900117-002, antimony, silver, and zinc in samples 900117-021 and 900177-029 and mercury and selenium in sample 900117-021 did not meet the required recovery criteria and were flagged accordingly. In batch 900427-161, arsenic and silver failed the spike recovery criteria. Arsenic also failed criteria in batch 900611-035. In batch 900412-003, all samples results were flagged J/UJ for selenium and silver, J/R for antimony, and J/U for arsenic because of failure to meet recovery criteria. For batch 900531-005, arsenic results were qualified J/U. In batch 891212-086, the matrix spike analysis for samples 891214-039 failed to meet the required recovery criterion for antimony, arsenic, and selenium. Therefore, antimony and arsenic results in selected samples were qualified as estimated (J/UJ), and selenium results in selected samples were qualified as estimated (J) or unusable (R). Matrix spike analysis did not meet the required recovery for antimony, mercury, and lead in batch 900223-007 and was, thus, qualified as follows: nondetected antimony results were rejected, and all other results were flagged J. Nondetected selenium results in batch 900308-014 were rejected because of MSRs. Matrix spike did not meet the required recoveries for antimony, lead, and selenium in batch 900612-050 and were qualified J/UJ, J/U, or J/R accordingly. Tables A.8 and A.9 summarize the spike and postdigestion spike recoveries. Approximately 50% or less of the spike recoveries for antimony, arsenic, selenium, and silver were within the control limits.

Duplicates. Results of duplicates analyses serve as an indicator of the precision of the methods and the sample results. A control limit of 35% is used for the RPD when the sample values are greater than five times CRDL. A control limit of plus or minus CRDL is used for the limit when the sample results are less than five times CRDL. No deviations were found for batches 910607, 900323-137, 900117-002, and 900223-007. No laboratory duplicate analysis was performed for batches 900627-014, 900404-076, 900427-161, 900611-035, and 900308-014. No duplicate forms were included in the data package for batches 900412-003 and 900612-050. Table A.10 summarizes the duplicate performance. Eighty-three percent or more of the duplicate results were within the limits for the seven AA metals.

Laboratory control samples. All solid LCS results must fall within the control limits established by the supplier [usually Environmental Protection Agency (EPA) or National Institute of Standards and Technology (NIST)]. All criteria were met or warranted no action by the validators for batches 900117-002, 900611-035, 900427-161, 900223-007. In batch 900627-014, the LCS was outside the windows for arsenic, lead, selenium, silver, and thallium, resulting in some results being qualified J or UJ. Control limits were not presented for batches 910607, 900323-137, 900404-076, and 900412-003. All of the LCSs met the 80–120% recovery requirements at least 90% of the time (Table A.11).

Method of standard additions. The duplicate injection for sample 900627-030 in batch 900627-014 did not agree within 20% for antimony. One lead sample in batch 900412-003 did not meet the duplicate injection criterion. Because antimony was undetected in the sample, no action was taken by the validator. Results for sample 900412-030 in batch 900412-003 were flagged because method of standard addition (MSA) was required but not done. For batch 900531-005, the positive lead results in sample 900531-005 was qualified J, the nondetected selenium results in all samples except 900531-023 were qualified UJ, and the thallium results in samples 900531-008 and 900531-010 were qualified UJ. In batch 891212-086, nondetected antimony, selenium, and thallium results in selected samples were qualified as estimated (UJ), and positive arsenic and selenium results in selected samples were qualified as estimated (J). MSA was not used to measure selenium in sample 891214-039; therefore, the positive selenium result in that sample was qualified as estimated (J). Criteria were not evaluated for batch 900427-161 because of the format of the data presented.

A.1.3 AA Analysis of Fish Tissue

AA analysis of fish tissue was conducted by the Environmental Analysis Laboratory (EAL) at the Oak Ridge National Laboratory (ORNL) ACD. Fish tissue was prepared by the ORNL $HNO_3/HClO_4$ method (AC-MM10915) and analyzed by a CVAA method (AC-MM1214922) for mercury. The cold vapor method measures mercury using a standard addition technique. An NIST standard was used for the standard addition. One hundred seventy-eight samples (169 regular samples and 9 field splits) were analyzed for mercury in 12 batches (Tables A.12, A.13).

Holding times. The problem here was for pre-extraction holding times (from sample collection to extraction), which exceeded the 7-d criteria for water. No data were rejected because no specific pre-extraction holding time criteria existed for fish tissue and because the 7-d water criteria are not applicable to fish tissue that has been maintained in a frozen state as these samples were. Postextraction holding times were all within the 40-d limit established for mercury in water.

Calibration. Calibration curves were not established for the 12 batches; however, eight of the batches were accompanied by analysis of one or two known EPA standards. EPA standards ICV5 (490 μg/L), WP386 (500 μg/L), and WP287 (500 μg/L) were used with a range of 99.4–103.4% recovery (%R). The MSA, not standard curves, was used for quantitation; therefore, no calibration curves were generated.

Blanks. Instrument blank analyses were not required for MSA method. Either one or two preparation blanks accompanied each of 11 batches; one large batch of 71 samples used four. The average preparation blank value found was 0.05 μg/L, with a range of 0.04 to 0.07 μg/L. All samples were greater than acceptable levels, so no action was needed. The laboratory reported the samples with the blanks subtracted.

Surrogate spikes. No surrogate compounds were spiked into the samples prior to extraction.

Matrix spikes. One sample from 8 of the 12 batches was spiked with mercury, but the amount of the spike was too small compared with the concentration in the tissue to provide useful information.

Laboratory control samples. Forty-two LCSs were analyzed in the 12 batches, with recovery rates ranging from 85% to 109% and an average recovery rate of 98%. All LCSs were within the acceptable range.

Method of standard addition. A one-point standard addition method was used for all analyses according to ORNL ACD method AC-MM1214922. A dilution of NIST 3133 was used for the MSA standard. A known amount of NIST 3133 was added to the CVAA sample to obtain each MSA value.

A.1.4 Inductively Coupled Plasma Water Analyses

Inductively coupled plasma (ICP) analysis of water samples was conducted by the K-25 ACD for beryllium, calcium, chromium, copper, iron, magnesium, nickel, potassium, sodium, and zinc. The USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis, Multi-media, Multi-Concentration, (EPA 1988a) was used as the analytical protocol. Sixty-four samples were analyzed in four batches for the ten metals listed above (Tables A.14, A.15).

Holding times. All holding times were within limits.

Calibration. Calibration specifications ensure that the instrument is capable of producing acceptable quantitative data. Calibration sequences and frequencies were within requirements.

Blanks. The analysis of blanks provides a means of assessing the existence and magnitude of contamination introduced via the analytical scheme. No contamination that required action was reported in batches 1462M and 112M. In batch 1422M, higher than acceptable values were determined for calcium, iron, magnesium, sodium, and zinc from levels of contaminants found in either the preparation blank or the continuing calibration blank. Sample results less than the action levels for those analytes were qualified as U. Because of a baseline shift causing negative values for iron greater than twice the IDL in the calibration blanks, the results for iron in all samples for this batch were rejected (samples 1422M, 1432M, 1442M, 145M, 1452M, 146M, and 147M). Four of the samples were rinsate blanks. In batch 136M, beryllium, calcium, iron, magnesium, sodium, and zinc were found at concentrations greater than the IDL; therefore, sample results were reported as nondetected (U-12) with the DL raised.

Matrix spikes. Spiked sample analysis provides information about the effect of the sample matrix on the digestion and measurement methodology. All criteria were met. Table A.3 summarizes the MSRs in water.

Duplicates. Results of duplicates analyses serve as an indicator of the precision of the methods and the sample results. All criteria were met. Table A.4 summarizes the duplicates in water.

Laboratory control samples. The LCS analysis is designed to serve as a monitor of the efficiency of the digestion procedure. An aqueous LCS must be analyzed on a digestion batch basis. All samples met criteria (Table A.5).

Serial dilution. Serial dilution analysis is performed to ascertain whether significant physical or chemical interferences exist because of the sample matrix. All criteria were met.

A.1.5 ICP Sediment Analyses

ICP analysis of sediment samples was conducted by IT laboratories for beryllium, calcium, chromium, copper, iron, magnesium, nickel, potassium, sodium, and zinc. The USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis, Multi-media, Multi-Concentration, (EPA 1988a) was used as the analytical protocol for most of the samples. Fourteen sample batches containing ~372 samples were processed for six metals (Tables A.16, A.17).

Holding times. All requirements for holding times were met with one exception. In batch 900531-005, all ICP results for samples 1410T, 1411T, 2607T, and 2608T were qualified as estimated (J/UJ) because the holding times were exceeded.

Calibration. Calibration specifications ensure that the instrument is capable of producing acceptable quantitative data. The calibration requirements for the data either met all the requirements or deviations did not warrant any action by the validator.

Blanks. The analysis of blanks provides a means of assessing the existence and magnitude of contamination introduced via the analytical scheme. All requirements were met, or deviations did not warrant any action by the validator. Zinc contamination was found in several of the preparation blanks, but sample results exceeded the action level with the following exception. In batch 900531-005, zinc was detected at a concentration greater than the IDL, so the zinc result for sample 900531-023 was qualified as U. In batch 891212-086, copper and zinc were detected; therefore, the copper results in selected samples were qualified as U, with the DL raised to the quantitated values.

Interference check samples. The ICP interference check samples (ICS) verified the laboratory's interelement and background correction factors. No deviations were found except for batches 900611-035, 900117-002, and 900223-007. In these batches, positive results greater than twice the IDL were found. The iron levels in all samples were greater than 50% of their levels in the check sample solution. As a result, positive zinc results in all samples were estimated because of iron interference. In batch 900223-007, the ICS solution A was not analyzed at the end of the run, which caused several analytes to be flagged as estimated (J).

Matrix spikes. Spiked sample analysis provides information about the effect of the sample matrix on the digestion and measurement methodology. All MSRs were within limits for batches 910607, 900611-035, 900427-161, and 900611-035. For batch 900627-014, some cadmium and zinc results were qualified J or UJ. For batch 900404-076, all sample results for zinc (J/UJ), chromium (J/U), and copper (J/U) were qualified as noted because recovery limits were exceeded. In batch 900117-002, zinc results in samples 900117-021 and 900177-029 did not meet the required recovery criteria and were flagged accordingly. For batch 900412-003, zinc results were flagged J because recovery was out of limits. For batch 900531-005, positive zinc results were qualified J, and copper, chromium, and cadmium results were qualified J/UJ. For batch 891212-086, the matrix spike analyses did not meet the required recovery criteria; therefore, the nondetected silver results in all samples were qualified as unusable (R), and the copper results in selected samples were qualified as estimated (J/UJ). For batch 900223-007, the matrix spike analysis did not meet the required recovery for beryllium, cadmium, chromium, copper, nickel, and zinc and was, therefore, flagged as estimated (J). Matrix spikes did not meet the required recoveries for cadmium and copper in batch 900612-050 and were qualified J/UJ, J/U, or J/R accordingly. Tables A.8 and A.9 summarize the spike and

postdigestion spike recoveries. Cadmium, copper, and zinc were the only three metals that did not meet the 75–125% limits for the spike recoveries at least 80% of the time. For the postdigestion spike recovery, aluminum and manganese only met the limits 50% of the time.

Duplicates. Results of duplicates analyses serve as an indicator of the precision of the methods and the sample results. All requirements were met for batches 910607 and 900323-137. No laboratory duplicate analysis was performed for batches 900627-014, 900404-076, 900427-161, 900611-035, 900223-007, or 900308-014. The laboratory duplicate in batch 900117-002 did not meet the required RPD criteria for zinc, so results were flagged J. Table A.10 summarizes the duplicate performance. Aluminum, chromium, copper, magnesium, manganese, and zinc were within the limits less than 75% of the time.

Laboratory control samples. The LCS analysis is designed to serve as a monitor of the efficiency of the digestion procedure. A solid LCS must be analyzed at least on a monthly basis. All criteria were met or did not require any action by the validators. LCSs were not evaluated for batches 910607, 900323-137, 900404-076, and 900412-003 because EPA control limits were not provided by the laboratory. Table A.11 summarizes the performance of the LCSs. Criteria were met for all analytes at least 90% of the time.

ICP serial dilution. Serial dilution analysis is performed to ascertain whether significant physical or chemical interferences exist because of the sample matrix. All requirements were met, except for batches 900323-137, 900404-076, 900611-035, 900427-161, and 891212-086. In batches 900323-137 and 900404-076, the zinc results were qualified J because of failure to meet criteria. For batch 900611-035, the percent difference (%D) for zinc exceeded requirements, so zinc results were flagged J. Serial dilutions were needed for almost all samples for zinc for batch 900427-161, but only two sample reports were provided indicating serial dilution. However, no action was taken by the validator. In batch 891212-086, the ICP serial dilution analysis %D for zinc in sample 891214-039 exceeded the 15% difference requirement; therefore, the positive zinc results in samples 891212-104 through -109 and 891214-037 through -052 were qualified as estimated (J).

A.1.6 ICP and ICP/Mass Spectrometry Analysis of Fish Tissue

ICP and ICP/mass spectrometry (MS) analysis of fish tissue was conducted by ORNL CPA. For the analysis of metals, ICP/MS was used to measure arsenic, beryllium, and thallium, and ICP/atomic emission spectroscopy (AES) was used to measure antimony, cadmium, chromium, copper, lead, nickel, selenium, silver, and zinc. An internal method was used for sample preparation. A VG Plasma Quad PQ2 was used for the ICP/MS analyses and a JY-48 instrument was used for the ICP/AES analyses. The ICP/MS measurements were made using the standard addition technique. One hundred seventy-seven samples (169 regular samples and 8 field splits) were analyzed for 12 metals in 10 batches (Tables A.18, A.19, A.20).

Holding times. Pre-extraction holding times (sample collection to extraction) exceeded the 7-d criteria for water for some analyses. No data were rejected because no specific pre-extraction holding time criteria exist for fish tissue and because the 7-d water criteria are not applicable to fish tissue. Postextraction holding times were all within limits.

Calibration. Single-element NIST standards were used to prepare calibration solutions for the ICP/MS; multi-element Spex standards were used for ICP/AES standard solution

preparation. EPA solution ICAP-19 was used as a calibration verification solution with recoveries in the range of 85–109%. Lead failed calibration recovery criteria in some batches, resulting in the rejection of 52 samples. There was a question as to whether the ICP/AES was calibrated initially with a one-point standard, but the calibration was verified. For this reason, along with other calibration discrepancies, some data were reported as estimated (J or UJ). Some results for nickel, beryllium, and thallium were rejected for failure to meet calibration criteria. The ICP/MS was properly calibrated, and verification samples were analyzed. Calibration %R ranges for the ICP/AES were from 64% to 120% for all parameters and all concentrations. Calibration %R ranges for the ICP/MS were from 78% to 124% except for beryllium, which was near the DL with a 146% recovery. Fifteen beryllium analyses were rejected because of calibration deficiencies.

Blanks. Preparation blanks were performed with each batch. Results were similar to recovery ranges listed for metals in soils. ICP/MS analyses (As, Be, and Tl) showed measurable concentrations in preparation blanks. Preparation blank corrections were performed on reported values. Calibration (instrument) blanks were not performed with the ICP/MS analyses.

Surrogate spikes. No surrogate compounds were spiked into the samples prior to extraction.

Matrix spikes. Ten samples in eight different batches were spiked with known quantities of all 12 metals. Except for three values for lead, all recoveries were between 75 and 125% (Fig. A.15). Mean recoveries for each metal ranged from 89% to 107% except for lead, which had an average recovery of 77%. No samples were qualified or rejected because of matrix spike results.

A.2 ORGANIC ANALYSES

A.2.1 Semivolatile Water and Sediment Analyses

Semivolatile analyses of water and sediment samples were conducted at the K-25 ACD by gas chromatography (GC)/MS for the analytes listed in Tables A.21 and A.22. The USEPA Contract Laboratory Program Statement of Work for Organic Analysis, Multi-media, Multi-Concentration, (EPA 1988b) was used as the analytical protocol. Sample 3580O was analyzed by IT, but the data were rejected because of exceeded holding times. Three hundred forty-two samples were analyzed for 65 organic compounds in 23 batches (Table A.21).

Holding times. All holding time requirements were met or warranted no action by the validator with the following exceptions. Some samples missed the holding time by 1 d, but the data were used "as is" by the validator. Samples in batch 040590 were extracted 7 days outside the holding time except one. Sample 1912O was extracted 109 days outside the holding time, resulting in all nondetects being rejected. Samples 3107O and 1915O in batch 041990 were extracted 84 days and 122 days outside of the holding time, respectively. Nondetects were qualified as rejected (R) for these samples and detects estimated (J). Samples in batches 041690, 041390, 032290, 070690 were extracted 3 to 8 days outside the holding time, so the positive results were flagged estimated. Samples in batch 062190 were extracted and analyzed outside the contractually required holding time limit, and all results were qualified as J/UJ. Holding times for extraction exceeded 30 days for batch 061690,

resulting in rejected data for 7307O, 7306O, 7305O, 7304O, 3112O, and 3111O. Sample results for 7308O and 7309O in batch 061490 missed the extraction holding time by 37 days and 3303O by 146 days. Sample data for 3303O were rejected; the results for the other two samples were flagged J/UJ. Sample data for 1909O in batch 030690 were rejected because of extraction holding times exceeding limits. Other samples in the batch were flagged J/UJ. All samples in batch 050890 exceeded extraction holding time by 6 days, and sample 3302O exceeded the analysis holding time by 19 days. All sample results for batch 050890 were qualified as estimated (J/UJ).

Calibration. Calibration specifications ensure that the instrument is capable of producing acceptable quantitative data. All calibration requirements were met or warranted no action by the validators with the following exceptions. Some compounds were outside the limits for the percent relative standard deviation (RSD) and %D and were flagged J/UJ, as appropriate. For several batches, the calibrations for 2,4,6-trichlorophenol and 2,4,5-trichlorophenol were not properly done, so data for these compounds were rejected. In batch 121989, two compounds were outside the limits in the initial calibration verification, and 33 compounds were outside the limits in the five continuing calibration verification analysis runs, but no action was taken because none of the compounds were detected in any of the environmental samples and the percent RSD and %D values were all less than 50%. In batches 050890 and 070690, benzyl alcohol and 2-methylphenol were not quantitated, resulting in rejected data for both compounds. In batch 050890, 2,4-dinitrophenol was not detected in the continuing calibration for June 8, 1990. The results for 2,4-dinitrophenol were rejected in all associated samples. Hexachlorocyclopentadiene had a %D of 52.6%, which required flagging nondetects (UJ) for samples 7311O, 8610O, 8611O, and 8701O. Exceeded calibration limits in batch 061490 affected numerous compounds and samples.

Instrument tuning. All tuning criteria were met or warranted no action by the validator.

Blanks. The analysis of blanks provides a means of assessing the existence and magnitude of contamination introduced via the analytical scheme. All blanks met the method requirements or were flagged accordingly. For batch 012490, bis(2-ethylhexyl)phthalate was found in the blank, but the sample concentrations exceeded the action level. This compound was also found in the method blanks for batch 012290. Some results in batches 121989, 122089, and 030690 were qualified at the contract-required DL with a U because of bis(2-ethylhexyl)phthalate contamination in the blank. In batches 041990 and 062190, an unknown compound and diacetone alcohol contamination required that data be flagged accordingly. Phthalate and tentatively identified compound contamination in the blanks for batch 032290 resulted in data flags. Samples in batch 061490 were affected by blank contamination and flagged accordingly. Several tentatively identified compounds were detected in all the blanks for batch 050890, and data were qualified appropriately.

Surrogate spikes. All surrogate recoveries met the method requirements or were flagged accordingly. Tables A.23 and A.24 summarize the surrogate recoveries for this data set. All samples in batch 012990 had values for terphenyl-d14, which were outside the control limits. Samples in batch 061690 were reanalyzed because of zero surrogate recoveries during the first analysis. No deviations for the samples occurred during reanalysis, but the blank analysis recoveries were still zero.

Matrix spikes and duplicates. All criteria were met or no action was warranted by the validator, with the following exceptions. No matrix spike or matrix spike duplicate (MSD) was

analyzed for batches 011690, 012090, 012490, 012990, 041890, 041390, 021390, and 021090. Table A.25 summarizes the MSRs for this data set. Table A.26 summarizes the matrix spike RPDs. For batch 122089, several compounds did not meet the criteria, but no action was taken because none of the spike compounds were detected in the environmental samples. However, 4-nitrophenol results were rejected for sample 2221-O. In batch 040590, positive results for 2,4-dinitrotoluene and pentachlorophenol for sample 1912O were qualified as J because of missed limits. A mix-up in the matrix spike pair for batch 032290 could not be resolved because of inadequate documentation (see NCR-92-CRR-068, no. 5). For batch 030690, the %R for 4-nitrophenol was outside limits, but no action was taken because the compound was not present in the samples.

Internal standards. All criteria were met. Sample 121O had an internal standard area greater than 100%. Area counts for perylene-d12 were outside the acceptable range for samples 2208-0 and 2210-0, but no action was taken because none of the compounds associated with this chromatographic region were detected in the environmental samples. One internal standard area was outside criteria in batch 041690, resulting in sample results for 5727O being qualified as J/UJ. One internal standard area was outside criteria in batch 050890 for matrix spike sample 6903O, and no action was taken.

A.2.2 Semivolatile Organic Analysis of Fish Tissue

Semivolatile analyses of fish tissue were performed by the Organic Analysis Laboratory (OAL) of ORNL ACD. Semivolatiles were analyzed using a modified GC/MS procedure with no acid surrogates. Laboratory quality control (QC) elements included matrix spikes, method blanks, internal standardization, initial calibration, continuing calibration, and GC/MS tuning. One hundred twenty-three samples (116 regular samples and 7 field splits) were analyzed for 65 semivolatile organics in 17 batches (Tables A.27, A.28).

Holding times. The holding times problem was for pre-extraction holding times (from sample collection to extraction), which exceeded the 7-d criteria for water. No data were rejected because (1) no specific pre-extraction holding time criteria exist for fish tissue and (2) the 7-d water criteria are not applicable to fish tissue.

Calibration. Most of the 17 batches had acceptable tuning criteria. One batch (D409) incurred tuning problems; six batches (C503, C522, C524, C405, D403, D507) had one or more samples analyzed outside the 12-h tuning window, causing the positive results to be flagged as estimated. C517 had one daily standard outside the 12-h window. Two initial calibration forms (D410, D417) had dates incorrectly listed; one form (C523) reported a different sample batch number on April 12, 1990; seven batches (C503, C504, C507, C517, C522, C524, C405) had one compound that failed the percent RSD criteria. Various problems were encountered with all batches of continuing calibration data, the majority of which included one or more compounds that failed relative response factor criteria and several compounds that failed %D criteria.

Blanks. Most of the 17 batches had no major problems, except for the omission of Form 1F and tentatively identified compound (TIC) raw data from over half of the packages. Three batches (D403, D410, D425) had target compound lists (TCLs) greater than the reportable level; one batch (D403) had 11 TICs incorrectly reported on Form 1F. These problems did not result in any rejected analyses.

Matrix spikes. One sample in 8 of 17 batches was spiked with known quantities of pyrene and benzo(a)anthracene. Spike recoveries for pyrene ranged from 1.8 to 11.8%, with a mean recovery of 6.0% (n = 8). Spike recoveries for benzo(a)anthracene ranged from 4.6% to 29.3%, with a mean recovery of 6.0% (n = 8). MSDs were not performed. Because there are no official control limits for MSR in fish tissue, no analyses were qualified.

Surrogate spikes. Surrogate recoveries of nitrobenzene-d5 ranged from 0% to 32%, with 8 of 139 values within sediment control limits of 23–120%. Surrogate recoveries of 2-fluorophenol ranged from 8% to 68%, with 58 of 139 values within sediment control limits of 30 to 115%. Surrogate recoveries of terphenyl-d14 ranged from 10% to 106%, with 131 of 139 values within sediment control limits of 18–137%. Because there are no official control limits for surrogate recovery in fish tissue, no analyses were rejected because of surrogate recoveries being substandard.

A.2.3 Pesticide/Polychlorinated Biphenyl Water and Sediment Analyses

Pesticide/polychlorinated bipheynl (PCB) analyses of water and sediment samples were conducted at the K-25 ACD by gas chromatography/electron capture detector for the TCL of pesticides/PCBs. The sediment samples were extracted at IT Corporation in Knoxville in accordance with the preparation protocol outlined in the *USEPA Contract Laboratory Program Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration,* (EPA 1988b). The water samples were extracted by K-25 ACD personnel, using an extraction procedure that differed slightly from that outlined in the EPA Contract Laboratory Program (CLP) statement of work (SOW). Semivolatile and pesticide/ PCB extracts were prepared from separate sample aliquots. A separatory funnel extraction procedure was used. A modified version of the EPA CLP SOW that required analysis on only a single column was used as the analytical protocol. The analyses were performed on two Hewlett Packard Model HP5890 gas chromatographs equipped with electron capture detectors. Twenty-one sample batches were processed containing 364 samples (Tables A.29, A.30).

Holding times. Approximately 300 samples were extracted outside the holding time limit for water samples. All results for these samples, both positive and nondetect, were qualified as estimated for these samples. Several samples were analyzed outside holding time limits. All of these samples were also extracted outside holding time limits. Therefore, no additional data qualification was required.

Calibration. Five sample batches had one or two compounds that failed the initial calibration criterion. One batch could not be evaluated for initial calibration linearity because of the lack of initial calibration standard analysis. Seventeen sample batches had one or more compounds that failed the continuing calibration %D criterion at some time in the analytical sequence. The initial calibration linearity criterion affects only single-component analytes (all pesticides except toxaphene). These violations require qualification of positive results for those compounds in affected samples as estimated. Because very few positive results were noted in these samples, there was a minimal impact on data quality.

Blanks. There were no positive results reported for the target compounds. Therefore, there should be no bias contributed to the data because of blank contamination. However, one data package case narrative mentioned there were potential interference peaks on two blank chromatograms.

Surrogate spikes. The percentage of surrogate recoveries that failed to meet the established recovery criterion was 20% of sediment samples and 4% of water samples. The average recovery of surrogate spike was 132% for sediment samples and 90% for water samples. Surrogate recovery for water and sediment sample data is presented in Tables A.31 and A.32, respectively.

Matrix spikes and spike duplicates. The percentage of matrix spike/MSD recoveries that failed to meet the established recovery criterion was 35% for sediment samples (Table A.33) and 0% for water samples. The percentage of matrix spike/MSD RPDs that failed to meet the established RPD criterion was 9% for sediment samples (Table A.33) and 0% for water samples. The average sediment matrix spike/MSD RPD was 15%.

A.2.4 Pesticide/PCB Analysis of Fish Tissue

Pesticide/PCB analyses of fish tissue were performed by the OAL of ORNL ACD. Fish tissue was extracted by sonification in methylene chloride with sodium sulfate. Extracts were concentrated and solvent-exchanged with hexane using Kuderna-Danish concentrators and nitrogen blowdown. Pesticide extracts were acid washed using concentrated sulfuric acid. The extracts were analyzed on a DB-5 capillary column and a DB-1701 megabore column using electron capture collection. One hundred twenty-three samples (116 regular samples and 7 field splits) were analyzed for 11 pesticides (aldrin, DDE, DDD, DDT, alpha chlordane, alpha chlordene, gamma chlordane, gamma chlordene, oxychlordane, chlordene, and technical chlordane) and two PCBs (Aroclor 1254 and Aroclor 1260) in 11 batches (Tables A.34, A.35).

Holding times. The holding times problem was primarily for pre-extraction holding times (from sample collection to extraction), which exceeded the 7-d criteria for water. No data were rejected because no specific pre-extraction holding time criteria exist for fish tissue and because the 7-d water criteria are not applicable to fish tissue.

Calibration. A single-point calibration was used for all analyses. The analytical method for water and soil requires a three-point calibration. All positive results were qualified as estimated (J).

Blanks. Contamination was detected in at least one method blank in 7 of 12 sample batches. These method blanks were associated with 71 samples. The major contaminants found were Aroclor 1254 and technical chlordane.

Matrix spikes. One sample in 8 of 11 batches was spiked with 0.5 ppm of alpha chlordane, 0.5 ppm of gamma chlordane, and 10 ppm of Aroclor 1260. Spike recoveries for alpha chlordane ranged from 14.1% to 62.8%, with a mean recovery of 44.8%. Spike recoveries for gamma chlordane ranged from 12.5% to 111.8%, with a mean recovery of 70.4%. Spike recoveries for Aroclor 1260 ranged from 18.3% to 64.6%, with a mean recovery of 45.5%. These results are illustrated in Fig. A.16. MSDs were not performed. Because there are no official control limits for MSR in fish tissue, no analyses were qualified.

Surrogate spikes. Surrogate recoveries of decachlorobiphenyl ranged from 13% to 111%, with 36 of 152 values within sediment control limits of 60–150%. Surrogate recoveries of tetrachloro-m-xylene ranged from 10% to 111%, with 27 of 152 values within sediment-control limits of 60–150%. Because there are no official control limits for surrogate recovery in fish tissue, no analyses were rejected for surrogate recoveries being substandard.

Interlaboratory performance evaluation. An additional measure of analytical quality was provided by an interlaboratory split sample study. Four cooperating laboratories (ORNL OAL, Tennessee Valley Authority (TVA), the state of Tennessee Environmental Laboratory, and the EPA Region IV facility) received identically prepared aliquots of the same samples for analysis of total chlordane (sum of all detectable congeners). The OAL values for total chlordane were consistently lower than those of the other laboratories. ORNL values were on average 68% lower than the mean of the other laboratories for those samples in which chlordane was detected.

A.2.5 PCB Analysis of Fish Tissue

PCB analyses of fish tissue were also performed by ORNL CPA. An internal procedure was used for sample preparation and analysis. One hundred and seventy-five samples (162 regular samples and 13 field splits) were analyzed for two PCBs in nine batches (Tables A.36, A.37).

Holding times. The holding times problem was for pre-extraction holding times (from sample collection to extraction) which exceeded the 7-d criteria for water. No data were rejected, because no specific pre-extraction holding time criteria exist for fish tissue and the 7-d water criteria are not applicable to fish tissue. Postextraction holding times were all within limits.

Calibration. A single-point calibration, which is acceptable for PCB analyses, was used. Calibrations for Aroclor 1254 were within control limits and ranged from 85% to 113 %R.

Blanks. In most batches, both calibration and preparation blanks were used. Calibration blank results were at or below the reporting limit in each batch, and preparation blanks were very low (near the reporting limits in each case where analyzed). No action was required on any blank, and blank corrections were not performed.

Surrogate spikes. No surrogate compounds were spiked into the samples prior to extraction.

Matrix spikes. At least one sample in eight of nine batches was spiked with a known quantity of Aroclor 1254 (5.3 ppm) and Aroclor 1260 (4.7 ppm). In two cases, only one of the Aroclors was spiked. Spike recoveries for Aroclor 1254 ranged from 77.3& to 125.5%, with a mean recovery of 101.6% (n = 12). Spike recoveries for Aroclor 1260 ranged from 93.6% to 111.4%, with a mean recovery of 101.8% (n = 12). These results are summarized in Fig. A.17. MSDs were not performed. Because there are no official control limits for MSR in fish tissue, no analyses were qualified.

Laboratory control samples. At least one LCS for both Aroclor 1254 and 1260 was analyzed in every batch. Percent recoveries for Aroclor 1254 ranged from 83.3 to 154.0, with a mean recovery of 112.6 (n = 21). Percent recoveries for Aroclor 1260 ranged from 63.8 to 108.3, with a mean recovery of 91.1 (n = 21). No analyses were qualified because of laboratory control deficiencies.

Interlaboratory performance evaluation. An additional measure of analytical quality was provided by an interlaboratory split sample study. Four cooperating laboratories (ORNL CPA, TVA, the state of Tennessee Environmental Laboratory, and the EPA Region IV facility)

received identically prepared aliquots of 18 samples for analysis of total PCBs (Aroclor 1254 plus Aroclor 1260). The results from CPA for total PCBs were not statistically different from those of the other laboratories.

A.3 RADIOLOGICAL ANALYSES

A.3.1 Gamma Analysis of Sediment, Water, and Fish Tissue

Gamma analysis was done by the Environmental Sciences Division (ESD) Radiological Analysis Laboratory (RAL) at ORNL. The method used by the laboratory was nondestructive and did not require any additional sample preparation prior to analysis. Target radionuclides and sample matrixes were ^{137}Cs and ^{60}Co in sediment, fish, and water. The laboratory used two spectrometers to analyze the Clinch River ER Program samples. The ND9900 is a minicomputer-based spectrometer connected to eight solid-state detectors and was used primarily for low-level gamma ray analyses. However, only detectors 1, 2, 3, 6, and 7 were used for the Clinch River ER Program samples. The ND6700 spectrometer consists of three solid-state detectors connected to a microcomputer-based data acquisition and analysis system. This instrument was generally used for the analysis of higher activity samples. Only detectors 1 and 3 were used for the analyses. The data acquisition and analysis components of both instruments were manufactured by Canberra Industries (formerly Nuclear Data). The detectors and associated electronic components were manufactured by several vendors, including Canberra, EG&G ORTEC, and Princeton Gamma.

The ESD RAL analyzed 1195 regular samples consisting of 948 sediment, 210 fish, and 37 water samples. Of these 1195 samples, 28 were field splits. In addition, 100 laboratory duplicates and 395 LCSs were analyzed. An independent validator reviewed these data for precision, accuracy, representativeness, completeness, and comparability. For the purposes of validation, the samples were grouped into 112 batches based on the instrument and week in which they were analyzed. Tables A.38 and A.39 list the type and number of samples analyzed by instrument and batch.

Initial calibrations. Initial energy and resolution calibrations were performed when each detector was initially placed into service. Efficiency calibrations for the various sample geometries were done intermittently during the period of the Clinch River ER Program analyses. Aliquots of certified standards traceable to NIST were placed into the sample containers routinely used by the laboratory and counted long enough to minimize the uncertainty resulting from counting errors. Although most calibration data were available, there was insufficient documentation to fully trace the efficiency factors used for analysis to the calibration standard data.

Calibration checks. A calibration check was done daily for each detector by counting a ^{137}Cs standard for 1 min. The date and peak area were recorded in a laboratory notebook, and the peak area was plotted on a control check for each detector. Weekly energy and resolution checks were also performed for each detector by counting a mixed-source New England Nuclear standard. The peak channel and resolution corresponding to low-, medium-, and high-energy lines were checked and recorded in a laboratory notebook. The validators found 11 ^{137}Cs and 11 ^{60}Co analyses to have an unacceptable change in calibration checks (Table A.40). However, none of these measurements were rejected.

Holding times. Fifty-eight ^{137}Cs and 67 ^{60}Co measurements were flagged during validation as exceeding holding time requirements. In none of these cases were the data rejected.

Backgrounds. Background analyses were performed intermittently for each detector using distilled water as the sample. Typical counting times ranged from 3000 to 6000 min to remove short-term variations and minimize the propagated error when subtracting a background from a sample result. Table A.41 shows the frequency by instrument and detector of the background determinations during the time period of Clinch River ER Program analyses. None of the background analyses showed evidence of contamination.

Laboratory control samples. Analytical accuracy was assessed by measuring a variety of LCSs containing a known concentration of one or more radionuclides. An EPA-supplied clay sample spiked with ^{137}Cs was analyzed most frequently. In addition, several other control samples were run less frequently. These include NIST sediment samples 4350 (NBS-4350) and 4354 (NBS-4354) and a tuna fish sample from the International Atomic Energy Agency (IAEA-352). The ratio of measured activity to known activity was used as the accuracy measure. Table A.42 presents a summary of the LCS results. Only seven instances of analyses outside of limits were encountered. Twenty-five ^{137}Cs results and twenty-two ^{60}Co results were flagged during validation as having LCS results out of limits (Table A.40). Because none of these results was rejected, the effect on data quality is minimal.

Laboratory duplicates. Laboratory precision was monitored by periodically performing reanalysis of regular samples that had been submitted to the laboratory. The RPD typically used to assess precision can be misleading when applied to radiological results. The RPD does not consider the uncertainty in the measurement because of the statistical fluctuations of the spectrometric counting process. These fluctuations can result in an RPD falling outside of the acceptable limits when, actually, the two measurements are statistically indistinguishable. The duplicate error ratio (DER) is a measure that takes into account the uncertainty associated with radiometric results. A DER <1 indicates acceptable precision, and a value >1 indicates unacceptable precision. Table A.43 summarizes these results by instrument and matrix. Eight ^{137}Cs and twelve ^{60}Co results were affected by a DER out of limits (Table A.40). Because none of these results were rejected by the validators, the effect on data quality is minimal.

Performance evaluation. The ESD RAL participated in the environmental radioactivity laboratory intercomparison program conducted by EPA. A major objective of this program is to aid laboratories in developing and maintaining both an intralaboratory and interlaboratory QC program. Simulated environmental samples containing known amounts of one or more radionuclides were periodically distributed to the ESD RAL and other participating laboratories. The ESD RAL performed the required analyses in triplicate and submitted the results to EPA. EPA statistically analyzed the data from all participating laboratories and prepared a summary report.

During 1989, 1990, and 1991, 17 EPA performance evaluation samples were analyzed by the ESD RAL. Table A.44 presents the mean and standard deviations of the ESD RAL analyses. These statistics measure the central tendency and dispersion of the analytical results. The normalized range and deviation are also given in Table A.44. The normalized range is an indicator of laboratory precision. A value less than 2.0 indicates acceptable precision. If the value is between 2.0 and 3.0, the precision is in the warning zone; if it exceeds 3.0, it is out of control. All of the normalized ranges shown in Table A.44 are less than 1.0, indicating

acceptable precision in the results. The normalized deviation is a measure of accuracy. The upper and lower warning levels are +2 and –2. All of the values presented in Table A.44 fall within this range.

A.3.2 Alpha and Beta Analysis of Sediment, Water, and Fish Tissue

The Oak Ridge Associated Universities (ORAU) Environmental Survey and Site Assessment Program (ESSAP) radiological laboratory conducted the alpha and beta analyses on the Phase 1 samples. Target radionuclides and matrixes included ^{3}H in water; ^{90}Sr in fish and sediment; and ^{241}Am, ^{238}Pu, $^{239\text{-}240}Pu$, ^{234}U, ^{235}U, and ^{238}U in sediment. In addition, curium isotopes were estimated from the ^{241}Am spectrum, but these results were not necessarily accurate or precise. Alpha and beta determinations were destructive techniques that required laboratory preparation of the samples prior to spectrometric analysis. The ORAU ESSAP used three instruments in the analysis of the Clinch River ER Program samples. A Tennelec model LB-5110 low-background alpha and beta counter was used for the ^{90}Sr determinations. Tritium determinations were made with a Packard model 1900 liquid scintillation spectrometer. A spectrometer containing components from Canberra, Tennelec, and EG&G ORTEC was used for alpha analyses.

The ORAU ESSAP analyzed 196 sediment, 87 fish, and 32 water samples for a total of 315 regular samples. In addition, 40 laboratory duplicates, 56 blanks, 8 spikes, and 11 LCSs were analyzed. An independent validator reviewed these data for sensitivity, precision, accuracy, representativeness, completeness, and comparability. For the purposes of validation, the samples were grouped into eight batches. Tables A.45 and A.46 list the type and number of samples analyzed in each batch.

Initial calibrations. Initial energy and resolution calibrations were performed when each detector was initially placed into service. Recalibrations were also made when control charts, equipment repair, or moving of equipment invalidate earlier calibration data. Efficiency calibrations for the various sample geometries were done using certified standards traceable to NIST. If NIST standards were unavailable, then other industry-recognized standards such as New Brunswick Laboratory were used.

Calibration checks. Counts of check sources were made prior to each day's use. The results of these analyses were plotted and tracked on control charts. None of the results for the regular samples were flagged because of calibration problems.

Sample preservation. The 16 water samples submitted for ^{3}H analysis (batch 741) were not acidified following collection. Failure to acidify these samples could result in a loss of ^{3}H prior to analysis. Consequently, these results were rejected. In addition, the 16 ^{90}Sr water samples (batch 740) were flagged as estimated (J) because of improper sample preservation.

Holding times. Holding times were exceeded for 742 analyses. As a result, 726 analyses were flagged as estimated (J). The 16 ^{3}H analyses that were rejected because of improper sample preservation were also flagged as having exceeded holding times.

Blanks. The number of blanks run with each batch is shown in Table A.47. Evidence of contamination was found in several of the blank analyses. No results were rejected because of this problem, but 144 analyses were flagged as estimated (J).

Chemical recovery. Chemical recovery for alpha analyses was determined by spiking each sample with a known amount of a radionuclide tracer and analyzing for this tracer in addition to the target radionuclides. Chemical recovery for ^{90}Sr was determined gravimetrically. Table A.48 summarizes the recovery for each alpha batch, and Table A.49 summarizes the ^{90}Sr recoveries. Twenty analyses were rejected because of out-of-limit recoveries, and an additional 113 analyses were flagged as estimated (J).

Laboratory control samples. Analytical accuracy was assessed by measuring a variety of LCSs containing a known concentration of one or more radionuclides. Two EPA-supplied standards were analyzed for ^{90}Sr and ^{3}H (EPA 2454-1 and EPA 2458-1, respectively). A mixed-source standard from NIST (NBS 4353) was used to assess the accuracy of the uranium measurements. This sample was later spiked with known amounts of ^{241}Am and ^{239}Pu (NBS 4353+) and used to assess accuracy for these radionuclides. Table A.50 presents a summary of the LCS results. Only four instances of analyses outside of limits were encountered. Twenty-seven ^{90}Sr results were flagged during validation as having LCS results out of limits (Table A.40). Because none of these results were rejected, the effect on data quality is minimal.

Laboratory duplicates. Laboratory precision was monitored by periodically performing duplicate analyses of regular samples that had been submitted to the laboratory. Precision was measured by the DER for the reasons discussed previously in Sect. 4.5.1. Table A.51 summarizes these results. Six analyses were flagged as estimated (J) because of the DER being out of limits.

Table A.1. Atomic absorption analyses of water samples conducted at K-25

	Total		Water	
Batch	Field samples	Routine samples	Field samples	Routine samples
112M	6	14	6	14
136M	8	12	8	12
1422M	10	10	10	10
1462M	2		2	
CRMI-1	2	2	2	2
Total	28	38	28	38

Table A.2. Atomic absorption analyses of water samples conducted at K-25

	Measurements			Accept				Reject
Analyte	Total	Accept	Reject	0	12	14	26	26
Antimony	66	66	0	34		18	14	
Arsenic	66	66	0	46			20	
Cadmium	66	66	0	65	1			
Lead	66	66	0	24	42		1	
Mercury	66	66	0	66				
Selenium	66	66	0	46		20	9	
Silver	66	66	0	49			17	
Thallium	66	65	1	64			1	1
Total	528	527	1	394	43	38	62	1

Table A.3. Inorganic accuracy in water samples summary of matrix spike recoveries conducted at the K-25 laboratory

Metals	Control limits (%)	Number in	Number out	Percentage within limits
Aluminum	75–125	0	0	NS
Antimony	75–125	3	1	75
Arsenic	75–125	3	0	100
Barium	75–125	0	0	NS
Beryllium	75–125	4	0	100
Cadmium	75–125	4	0	100
Calcium	75–125	0	0	NS
Chromium	75–125	3	0	100
Cobalt	75–125	0	0	NS
Copper	75–125	3	0	100
Iron	75–125	3	0	100
Lead	75–125	4	0	100
Magnesium	75–125	0	0	NS
Manganese	75–125	0	0	NS
Mercury	75–125	5	0	100
Nickel	75–125	3	0	100
Potassium	75–125	0	0	NS
Selenium	75–125	3	1	75
Silver	75–125	4	0	100
Sodium	75–125	0	0	NS
Thallium	75–125	4	0	100
Vanadium	75–125	0	0	NS
Zinc	75–125	3	0	100

NS = not spiked

Table A.4. Inorganic precision in water samples summary of laboratory duplicates conducted at the K-25 laboratory

Metals	RPD[a] limit	Number in	Number out	Percentage wiithin limits
Aluminum	20	0	0	
Antimony	20	4	0	100
Arsenic	20	4	0	100
Barium	20	0	0	
Beryllium	20	3	0	100
Cadmium	20	4	0	100
Calcium	20	3	0	100
Chromium	20	3	0	100
Cobalt	20	0	0	
Copper	20	3	0	100
Iron	20	3	0	100
Lead	20	4	0	100
Magnesium	20	3	0	100
Manganese	20	0	0	
Mercury	20	5	0	100
Nickel	20	3	0	100
Potassium	20	3	0	100
Selenium	20	4	0	100
Silver	20	4	0	100
Sodium	20	3	0	100
Thallium	20	4	0	100
Vanadium	20	0	0	
Zinc	20	3	0	100

[a]relative percent difference

Table A.5. Inorganic accuracy in water samples summary of laboratory control samples conducted by the K-25 laboratory

Metals	Total number	Percentage within 80–120%
Aluminum	0	
Antimony	5	100
Arsenic	5	100
Barium	0	
Beryllium	4	100
Cadmium	5	100
Calcium	4	100
Chromium	4	100
Cobalt0		
Copper	4	100
Iron	4	100
Lead	5	100
Magnesium	4	100
Manganese	0	
Mercury	0	
Nickel	4	100
Potassium	4	100
Selenium	5	100
Silver	5	60
Sodium	4	100
Thallium	5	100
Vanadium	0	
Zinc	4	100

Table A.6. Atomic absorption anyalyses conducted at International Technology laboratories

Batch	Total		Core		Grab field samples	Water field samples
	Field samples	Routine samples	Field samples	Routine samples		
891212-086		40		40		
900117-002		25		25		
900223-007		15		15		
900308-014		30		30		
900323-137	1	21	1	21		
900404-076		51		51		
900412-003		47		47		
900427-161	1	39	1	39		
900531-005		19		19		
900611-035	1	16	1	16		
900612-050		9		9		
900627-014		17		17		
900629		2		2		
910510		1		1		
910607	1	2		2	1	
910614-044	6	28	4	28		2
Total	10	362	7	362	1	2

Table A.7. Atomic absorption anyalyses conducted at International Technology laboratories

	Measurements			Accept													Reject			
Analyte	Total	Accept	Reject	0	1	12	14	18	19	22	24	25	26	27	50	54	0	10	14	54
Antimony	372	201	171	127	6	1	53						28						171	
Arsenic	372	371	1	119	6		248				17		27	7				1		
Lead	372	372	0	155	6		125				16	5	17	2	17	37				
Mercury	370	370	0	204	17		27	122												
Selenium	372	306	66	14	6		228		3		17	2	200	11					66	
Silver	371	204	167	83	6	12	87			4	17		70				2		140	25
Thallium	369	369	0	330	6		1				17		16							
Total	2598	2193	405	1032	53	13	769	122	3	4	84	7	358	20	17	37	2	1	377	25

Table A.8. Inorganic accuracy in soil samples summary of spike recoveries conducted at International Technology laboratories

Metals	Control Limits (%)	Number in	Number out	Percentage within limits
Aluminum	75–125	4	0	100
Antimony	75–125	11	28	28
Arsenic	75–125	21	18	54
Barium	75–125	4	0	100
Beryllium	75–125	31	3	91
Cadmium	75–125	28	10	74
Calcium	75–125	0	0	NS
Chromium	75–125	31	6	84
Cobalt	75–125	4	0	100
Copper	75–125	28	9	76
Iron	75–125	4	0	100
Lead	75–125	35	7	83
Magnesium	75–125	0	0	NS
Manganese	75–125	4	0	100
Mercury	75–125	32	3	91
Nickel	75–125	35	0	100
Potassium	75–125	0	0	NS
Selenium	75–125	11	28	28
Silver	75–125	15	26	37
Sodium	75–125	0	0	NS
Thallium	75–125	37	1	97
Vanadium	75–125	4	0	100
Zinc	75–125	26	11	70

NS = not spiked

Table A.9. Inorganic accuracy in soil samples summary of postdigestion spike recoveries

Metals	Number in	Number out	Percentage within limits
Aluminum	1	1	50
Antimony	14	0	100
Arsenic	15	0	100
Barium	2	0	100
Beryllium	4	0	100
Cadmium	7	1	88
Calcium	0	0	NS
Chromium	6	0	100
Cobalt	2	0	100
Copper	6	0	100
Iron	0	2	0
Lead	7	2	78
Magnesium	0	0	NS
Manganese	1	1	50
Mercury	0	0	NS
Nickel	4	0	100
Potassium	0	0	NS
Selenium	16	2	89
Silver	8	4	67
Sodium	0	0	NS
Thallium	4	0	100
Vanadium	2	0	100
Zinc	11	0	100

NS = not spiked

Table A.10. Inorganic precision in soil samples summary of laboratory duplicates conducted at International Technology laboratories

Metals	RPD[a] limits (%)	Number in	Number out	Percentage within limits
Aluminum	35	0	3	0
Antimony	35	23	0	100
Arsenic	35	19	4	83
Barium	35	3	0	100
Beryllium	35	18	0	100
Cadmium	35	20	0	100
Calcium	35	3	1	75
Chromium	35	9	9	50
Cobalt	35	4	0	100
Copper	35	13	5	72
Iron	35	2	2	50
Lead	35	23	2	92
Magnesium	35	3	1	75
Manganese	35	1	1	50
Mercury	35	12	2	86
Nickel	35	12	3	80
Potassium	35	5	0	100
Selenium	35	24	0	100
Silver	35	21	2	91
Sodium	35	4	0	100
Thallium	35	19	3	86
Vanadium	35	3	0	100
Zinc	35	11	7	61

[a]relative percent difference

Table A.11. Inorganic accuracy in soil samples summary of laboratory control samples

Metals	Total number	Percentage within 80–120%
Aluminum	17	100
Antimony	50	100
Arsenic	51	100
Barium	17	100
Beryllium	36	100
Cadmium	46	98
Calcium	19	95
Chromium	37	95
Cobalt	18	94
Copper	38	95
Iron	19	95
Lead	50	100
Magnesium	19	95
Manganese	19	95
Mercury	42	100
Nickel	36	97
Potassium	19	95
Selenium	55	96
Silver	33	91
Sodium	19	95
Thallium	52	100
Vanadium	18	94
Zinc	37	97

Table A.12. Atomic absorption analyses of fish tissue conducted by Environmental Analysis Laboratory at Oak Ridge National Laboratory

	Total		Fish	
Batch	Field samples	Routine samples	Field samples	Routine samples
EAL11914	1	20	1	20
EAL11953		10		10
EAL11954	1	7	1	7
EAL11955	1	3	1	3
EAL11956		10		10
EAL11957		10		10
EAL12033	3	58	3	58
EAL12098		8		8
EAL12161	1	13	1	13
EAL12162	1	17	1	17
EAL12163	1	5	1	5
EAL12306		8		8
Total	9	169	9	169

Table A.13. Atomic absorption analyses of fish tissue examined for mercury by Environmental Analysis Laboratory at Oak Ridge National Laboratory

	Measurements			Accept			
Analyte	Total	Accept	Reject	0	1	52	60
Mercury	178	178	0	4	174	174	166
Total				4	174	174	166

Table A.14. Inductively coupled plasma analyses of water samples conducted by the K-25 Analytical Chemistry Division

Batch	Total		Water	
	Field samples	Routine samples	Field samples	Routine samples
112M	6	14	6	14
136M	8	12	8	12
1422M	10	10	10	10
1462M	2		2	
Total	26	36	26	36

Table A.15. Inductively coupled plasma analyses of water samples conducted by the K-25 Analytical Chemistry Department for ten metals

	Measurements			Accept			Reject
Analyte	Total	Accept	Reject	0	12	61	61
Beryllium	62	62	0	57	5		
Calcium	62	62	0	51	11		
Chromium	62	62	0	62			
Copper	62	62	0	62			
Iron	62	55	7	26	22	13	7
Magnesium	62	62	0	47	15		
Nickel	62	62	0	62			
Potassium	61	61	0	61			
Sodium	61	61	0	47	14		
Zinc	62	62	0	14	48		
Total	618	611	7	489	115	13	7

Table A.16. Inductively coupled plasma analyses of sediment conducted by International Technology laboratories

Batch	Total		Core		Grab field samples	Water field samples
	Field samples	Routine samples	Field samples	Routine samples		
891212-086		40		40		
900117-002		25		25		
900223-007		15		15		
900308-014		30		30		
900323-137	1	21	1	21		
900404-076		51		51		
900412-003		47		47		
900427-161	1	39	1	39		
900531-005		19		19		
900611-035	1	16	1	16		
900612-050		9		9		
900627-014		17		17		
900629		2		2		
910510		1		1		
910607	1	2		2	1	
910614-044	6	28	4	28		
Total	10	362	7	362	1	2

Table A.17. Inductively coupled plasma analyses of sediment samples conducted by International Technology laboratories

Analyte	Measurements			Accept										
	Total	Accept	Reject	0	1	12	14	15	22	23	26	27	28	54
Beryllium	372	372	0	340	6	11	15		14					
Cadmium	372	372	0	249	6	1	97			2	28	5		
Calcium	1	1	0	1										
Chromium	372	372	0	266	6		106		14	1				
Copper	372	372	0	221	6	17	144		14	2				
Iron	1	1	0							1				
Magnesium	1	1	0	1										
Nickel	372	372	0	351	6		15		14					
Potassium	1	1	0	1										
Sodium	1	1	0			1								
Zinc	372	372	0	108	6	1	201	13	15	2			112	21
Total	2237	2237	0	1538	36	31	578	13	71	8	28	5	112	21

Table A.18. Inductively coupled plasma and inductively coupled plasma and mass spectrometry analyses of fish tissue conducted at Oak Ridge National Laboratory/Chemical and Physical Analysis Group

Systems Development Group	Total		Fish	
	Field samples	Routine samples	Field samples	Routine samples
CPA10495	1	17	1	17
CPA10497	1	21	1	21
CPA10549	2	20	2	20
CPA10550		20		20
CPA10682	1	20	1	20
CPA10772		20		20
CPA10885	1	12	1	12
CPA10886		8		8
CPA10915	2	23	2	23
CPA11093		8		8
Total	8	169	8	169

Table A.19. Inductively coupled plasma and inductively coupled plasma and mass spectrometry analyses of fish tissue examined for metals at Oak Ridge National Laboratory/ Chemical and Physical Analysis Group

Analyte	Measurements			Accept						Reject
	Total	Accept	Reject	12	14	19	23	52	53	19
Antimony	177	177	0					177	177	
Cadmium	177	177	0					177	177	
Chromium	177	177	0					177	177	
Copper	177	177	0			3	8	177	177	
Lead	177	125	52		25	26		125	125	52
Nickel	177	157	20			22		157	157	20
Selenium	177	177	0	2				177	177	
Silver	177	177	0					177	177	
Zinc	176	176	0			22		176	176	
Total	1592	1520	72	2	25	73	8	1520	1520	72

Table A.20. Inductively coupled plasma and inductively coupled plasma and mass spectrometry analyses of fish tissue examined for metals at Oak Ridge National Laboratory/ Chemical and Physical Analysis Group

	Measurements			Accept				Reject	
Analytes	Total	Accept	Reject	14	19	52	53	19	20
Arsenic	177	177	0	1	12	177	177		
Beryllium	177	162	15		44	162	162	7	8
Thallium	177	168	9		8	168	168	9	
Total	531	502	24	1	64	507	507	16	8

Table A.21. Semivolatile analyses of water and sediment samples conducted at K-25

	Total		Core		Water	
Batch	Field samples	Routine samples	Field samples	Routine samples	Field samples	Routine samples
011690		2				2
012090	5	7			5	7
012290		13		13		
012490		4		4		
012990	3	4			3	4
020490	3	3			3	3
021090	2	2			2	2
021390	1				1	
030690		15		15		
032290		26		26		
040590	1	22	1	22		
041390		24		24		
041690		14		14		
041890		19		19		
041990		13		13		
050890	1	38	1	38		
053190	1	25	1	25		
061490	1	14	1	14		
061690		4		4		
062190		13		13		
070690		9		9		
121989		30		30		
122089		19		19		
Total	18	320	4	302	14	18

Table A.22. Semivolatile analyses of water and sediment samples conducted at K-25

Analyte	Measurements			Accept								Reject							
	Total	Accept	Reject	0	1	4	6	12	13	16	57	1	3	5	6	13	14	18	60
1,2,4-Trichlorobenzene	338	331	7	90	240		7	1				6				4			
1,2-Dichlorobenzene	338	331	7	90	240		7	1				6				4			
1,3-Dichlorobenzene	338	331	7	90	240		7	1				6				4			
1,4-Dichlorobenzene	338	331	7	90	240		7	1				6				4			
2,4,5-Trichlorophenol	338	327	11	88	238		7	1				6				3		2	
2,4,6-Trichlorophenol	338	327	11	88	238		7	1				6				3		2	
2,4-Dichlorophenol	338	329	9	88	240		7	1				6				3			
2,4-Dimethylphenol	338	329	9	88	240		7	1				6				3			
2,4-Dinitrophenol	338	305	33	88	217		8					6		25	12	3			
2,4-Dinitrotoluene	338	331	7	90	241		8					6				5			
2,6-Dinitrotoluene	338	331	7	90	240		7	1				6				4			
2-Chloronaphthalene	338	331	7	90	240		7	1				6				4			
2-Chlorophenol	338	329	9	88	240		7	1				6				3			
2-Methylnaphthalene	338	331	7	90	240		7	1				6				4			
2-Methylphenol	338	320	18	88	231		7	1				6				3			9
2-Nitroaniline	338	331	7	90	240		7	1				6				4			
2-Nitrophenol	338	329	9	88	240		7	1				6				3			
3,3'-Dichlorobenzidine	338	331	7	90	241		47			1		6				5			
3-Nitroaniline	338	328	10	82	241	40	48					6	3			5			
4,6-Dinitro-2-methylphenol	338	329	9	88	241		18					6				3			
4-Bromophenyl-phenylether	338	331	7	90	241		8					6				5			
4-Chloro-3-methylphenol	338	329	9	88	240		7	1				6				3			
4-Chloroaniline	338	331	7	68	240	27	29	1				6				4			
4-Chlorophenyl-phenylether	338	331	7	90	241		8					6				5			
4-Methylphenol	338	330	8	88	241		7	1				5				3			
4-Nitroaniline	338	331	7	90	241	5	39					6				5			
4-Nitrophenol	338	315	23	87	228	1	9					6		14	1	3	2		
Acenaphthene	338	331	7	90	241		8					6				5			

Table A.22. (continued)

Analyte	Measurements			Accept								Reject							
	Total	Accept	Reject	0	1	4	6	12	13	16	57	1	3	5	6	13	14	18	60
Acenaphthylene	338	331	7	90	240		7	1				6				4			
Anthracene	338	331	7	90	241		8					6				5			
Benzo(a)anthracene	338	331	7	90	241		7			1		6				5			
Benzo(a)pyrene	338	331	7	90	241		8			1		6				5			
Benzo(b)fluoranthene	338	331	7	90	241		7			1	1	6				5			
Ben^X(g,h,i)perylene	338	331	7	90	241		8			1		6				5			
Benzo(k)fluoranthene	338	331	7	90	241		9			1	1	6				5			
Benzoic acid	338	331	7	83	240		15	1				6				1			
Benzyl alcohol	338	322	16	90	231		7	1				6				4			9
Bis(2-chloroethoxy)methane	338	331	7	90	240		7	1				6				4			
Bis(2-chloroethyl)ether	338	331	7	90	240		7	1				6				4			
Bis(2-chloroisopropyl)ether	338	331	7	90	240		16	1				6				4			
Bis(2-ethylhexyl)phthalate	338	332	6	53	242		16	98		1		4				5			
Butylbenzylphthalate	338	331	7	90	241		8			1		6				5			
Chrysene	338	331	7	90	241		7			1		6				5			
Di-n-butylphthalate	338	333	5	90	243		7		2			3				3			
Di-n-octylphthalate	338	331	7	90	241		9			1		6				5			
Dibenz(a,h)anthracene	338	331	7	90	241		8			1		6				5			
Dibenzofuran	338	331	7	90	241		8					6				5			
Diethylphthalate	338	331	7	90	241		19	1				6				5			
Dimethylphthalate	338	331	7	90	240		7	1				6				4			
Fluoranthene	338	331	7	90	241		6					6				5			
Fluorene	338	331	7	90	241		8					6				5			
Hexachlorobenzene	338	331	7	90	241		8					6				5			
Hexachlorobutadiene	338	331	7	90	240		7	1				6				4			
Hexachlorocyclopentadiene	338	331	7	90	240		9	1				6				4			
Hexachloroethane	338	331	7	90	240		7	1				6				4			
Indeno(1,2,3-cd)pyrene	338	331	7	90	241		8			1		6				5			

Table A.22. (continued)

Analyte	Measurements			Accept								Reject							
	Total	Accept	Reject	0	1	4	6	12	13	16	57	1	3	5	6	13	14	18	60
Isophorone	338	331	7	90	240		16	1				6				4			
N-Nitroso-di-n-propylamine	338	331	7	90	240		16	1				6				4			
N-Nitrosodiphenylamine	338	331	7	90	241		8					6				5			
Naphthalene	338	331	7	90	240		7	1				6				4			
Nitrobenzene	338	331	7	90	240		42	1				6				4			
Pentachlorophenol	338	329	9	88	241		8					6				3			
Phenanthrene	338	331	7	90	241		8					6				5			
Phenol	338	329	9	88	240		8	1				6				3			
Pyrene	338	332	6	90	242		19			1		5				5			
Total	18590			5747	15578	73	729	132	2	13	2	383	3	39	13	269	2	4	18

Table A.23. Organic accuracy in water summary of surrogate recoveries conducted at the K-25 laboratory

Analytes *Semivolatile*	Control limits (%)	Number in	Number out	Percentage within limits
S1 = Nitrobenzene-d5	35–114	31	1	97
S2 = 2-Fluorobiphenyl	43–116	32	0	100
S3 = Terphenyl-d14	33–141	20	12	62
S4 = Phenol-d6	10–94	32	0	100
S5 = 2-Fluorophenol	21–100	31	1	97
S6 = 2,4,6-Tribromophenol	10–123	32	0	100

Table A.24. Organic accuracy in soil summary of surrogate recoveries conducted at the K-25 laboratory

Analytes *Semivolatile*	Control Limits (%)	Number in	Number out	Percentage within limits
S1 = Nitrobenzene-d5	23–120	382	14	96
S2 = 2-Fluorobiphenyl	30–115	383	13	97
S3 = Terphenyl-d14	18–137	393	3	99
S4 = Phenol-d6	24–113	379	17	96
S5 = 2-Fluorophenol	25–121	384	12	97
S6 = 2,4,6-Tribromophenol	19–122	385	11	97

Table A.25. Organic accuracy in soil summary of matrix spike/matrix spike duplicate conducted at the K-25 laboratory

Analytes	Control limits (%)	Number in	Number out	Percentage within limits
Phenol	26–90	42	2	95
2-Chlorophenol	25–102	42	2	95
1,4-Dichlorobenzene	28–104	40	4	91
N-Nitroso-di-n-propylamine	41–126	39	5	89
1,2,4-Trichlorobenzene	38–107	41	3	93
4-Chloro-3-methylphenol	26–103	40	4	91
Acenapthene	31–137	42	2	95
4-Nitrophenol	11–114	36	8	82
2,4-Dinitrotoluene	28–89	37	7	84
Pentachlorophenol	17–109	41	3	93
Pyrene	35–142	42	2	95

Table A.26. Organic precision in soil summary of matrix spike/relative percent differences conducted at the K-25 laboratory

Analytes	Relative percent difference (%)	Number in	Number out	Percentage within limits
Phenol	35	22	0	100
2-Chlorophenol	50	22	0	100
1,4-Dichlorobenzene	27	19	3	86
N-Nitroso-di-n-propylamine	38	20	2	91
1,2,4-Trichlorobenzene	23	19	3	86
4-Chloro-3-methylphenol	33	21	1	95
Acenapthene	19	20	2	91
4-Nitrophenol	50	20	2	91
2,4-Dinitrotoluene	47	22	0	100
Pentachlorophenol	47	21	1	95
Pyrene	36	22	0	100

Table A.27. Semivolatile analyses of fish tissue (by SDG) conducted by the Organic Analysis Laboratory at Oak Ridge National Laboratory

	Total		Fish	
Batch	Field samples	Routine samples	Field samples	Routine samples
C405	1	2	1	2
C406		6		6
C503		8		8
C504		10		10
C507	1	6	1	6
C508		2		2
C516		6		6
C517	1	8	1	8
C521		9		9
C522	1	9	1	9
C523		8		8
C524	1	10	1	10
D403		7		7
D409		3		3
D410		10		10
D411		6		6
D417	1		1	
D425	1	6	1	6
Total	7	116	7	1

Table A.28. Semivolatile analyses of fish tissue conducted by the Organic Analysis Laboratory at Oak Ridge National Laboratory

Analyte	Measurements			Accept										Reject						
	Total	Accept	Reject	0	1	4	5	6	13	16	52	58	63	5	13	52	53	58	59	63
1,2,4-Trichlorobenzene	123	61	62	16	45								7		62	62		62		
1,2-Dichlorobenzene	123	61	62	16	45								7		62	62		62		
1,3-Dichlorobenzene	123	61	62	16	45								7		62	61	1	62		
1,4-Dichlorobenzene	123	61	62	16	45								7		62	62		62		
2,4,5-Trichlorophenol	123	82	41	8	59				25		65	14	7		27	41		41		
2,4,6-Trichlorophenol	123	82	41	8	59				25		65	14	7		27	41		41		
2,4-Dichlorophenol	123	83	40	8	60				26		66	15	7		27	40		40		
2,4-Dimethylphenol	123	83	40	8	60				26		66	15	7		27	40		40		
2,4-Dinitrophenol	123	82	41	8	59			9	25		65	14	7	1	27	41		41		
2,4-Dinitrotoluene	123	61	62	16	45								7		62	62		62		
2,6-Dinitrotoluene	123	61	62	16	45								7		62	62		62		
2-Chloronaphthalene	123	60	63	16	44								7	1	62	62		62		
2-Chlorophenol	123	83	40	8	60				26		66	15	7		27	40		40		
2-Methylnaphthalene	123	64	59	16	48				3		3	3	7		59	59		59		
2-Methylphenol	123	82	41	8	59			2	25		65	14	7		27	41		41		
2-Nitroaniline	123	59	64	14	45			3					7	11	62	62		62		
2-Nitrophenol	123	82	41	8	59				25		65	14	7		27	41		41		
3,3'-Dichlorobenzidine	123	61	62	10	45		10	41		1			7		61	62		62		
3-Nitroaniline	123	37	86		29	8	25	26						39	62	62		62		
4,6-Dinitro-2-methylphenol	123	81	42	6	58			22	25	9	64	14	7	1	28	42		41		
4-Bromophenyl-phenylether	123	61	62	14	45			12					7		62	62		62		
4-Chloro-3-methylphenol	123	84	39	8	61				27		67	16	7		27	39		39		
4-Chloroaniline	123	55	68	2	45			28					7	6	62	62		62		
4-Chlorophenyl-phenylether	123	61	62	16	45								7		62	62		62		
4-Methylphenol	123	83	40	8	60				26		66	15	7		27	40		40		
4-Nitroaniline	123	54	69	16	38			19					6	8	62	62		62		
4-Nitrophenol	123	82	41	8	59			2	25		65	14	7		28	41		41		

Table A.28. (continued)

Analyte	Measurements			Accept										Reject						
	Total	Accept	Reject	0	1	4	5	6	13	16	52	58	63	5	13	52	53	58	59	63
Acenaphthene	123	61	62	16	45								7		62	62		62		
Acenaphthylene	123	61	62	16	45								7		62	62		62		
Anthracene	123	61	62	14	45			12					7		62	62		62		
Benzo(a)anthracene	123	61	62	16	45					1			7		62	62		62		
Benzo(a)pyrene	123	60	63	14	44					3			7		62	62		62	1	
Benzo(b)fluoranthene	123	60	63	14	44					3			7		62	62		62	1	
Benzo(g,h,i)perylene	123	59	64	14	43					3			6		62	62		62	1	1
Benzo(k)fluoranthene	123	60	63	14	44					3			7		62	62		62	1	
Benzoic acid	123	54	69	16	38								6	8	62	62		62		
Benzyl alcohol	123	61	62	16	45								7		61	62		62		
Bis(2-chloroethoxy)methane	123	61	62	16	45								7		62	62		62		
Bis(2-chloroethyl)ether	123	62	61	16	46			3	1		1	1	7		61	61		61		
Bis(2-chloroisopropyl)ether	123	61	62	16	45								7		62	62		61	1	
Bis(2-ethylhexyl)phthalate	123	60	63	16	44			7		1			7		62	62		62	1	
Butylbenzylphthalate	123	61	62	16	45			1		1			7		62	62		62		
Chrysene	123	61	62	16	45					1			7		62	62		62		
Di-n-butylphthalate	123	61	62	14	45			12					7		62	62		62		
Di-n-octylphthalate	123	60	63	14	44			16		3			8		62	62		62	1	
Dibenz(a,h)anthracene	123	60	63	14	44					3			7		62	62		62	1	
Dibenzofuran	123	61	62	16	45								7		62	62		62		
Diethylphthalate	123	61	62	16	45								7		61	61		61		
Dimethylphthalate	123	61	62	16	45								7		62	62		62		
Fluoranthene	123	62	61	14	46			13	1		1	1	7		61	61		61		
Fluorene	123	61	62	16	45								7		62	62		62		
Hexachlorobenzene	123	61	62	14	45			12					7		62	62		62		
Hexachlorobutadiene	123	61	62	16	45								7		62	62		62		
Hexachlorocyclopentadiene	123	61	62	16	45			25					7		62	62		62		

Table A.28. (continued)

Analyte	Measurements			Accept										Reject						
	Total	Accept	Reject	0	1	4	5	6	13	16	52	58	63	5	13	52	53	58	59	63
Hexachloroethane	123	61	62	16	45								7		62	62		62		
Indeno(1,2,3-cd)pyrene	123	60	63	13	44			2		3			7		62	62		62	1	
Isophorone	123	61	62	16	45								7		61	62		62		
N-Nitroso-di-n-propylamine	123	61	62	16	45								7		62	62		62		
N-Nitrosodiphenylamine	123	61	62	14	45			11					7		62	62		62		
Naphthalene	123	62	61	16	46				1		1	1	7		61	61		61		
Nitrobenzene	123	61	62	16	45								7		62	62		62		
Pentachlorophenol	123	82	41	6	59			21	25	10	65	14	7		27	41		41		
Phenanthrene	123	61	62	14	45			12					7		62	62		62		
Phenol	123	82	41	8	59			2	25		65	14	7		28	41		41		
Pyrene	123	61	62	16	45					1			7		62	62		62		
Total	7995	4214	3781	857	3092	8	35	313	362	46	921	208	446	75	3534	3723	1	3722	9	1

Table A.29. Pesticide/PCB analyses of water and sediment samples conducted at the K-25 laboratory

	Total		Core		Water	
Batch	Field samples	Routine samples	Field samples	Routine samples	Field samples	Routine samples
3	6	24		13	6	11
4	1	15	1	15		
5	1	19	1	19		
6		15		15		
7		22		22		
9	1	15		14	1	1
10		11		11		
11		14		14		
12		21		21		
13		15		15		
14	1	17		17	1	
15		9		9		
17		14		14		
18	1	9	1	9		
19		20		20		
20		22		22		
21		1		1		
22		15		15		
23	1	28	1	28		
25		8		8		
Total	12	314	4	302	8	12

Table A.30. Pesticide/PCB analyses of water and sediment samples conducted at K-25

	Measurements			Accept					Reject			
Analyte	Total	Accept	Reject	0	1	8	13	51	1	11	13	14
4,4'-DDD	326	316	10	58	258		35	3	5	3	2	
4,4'-DDE	326	316	10	58	258		35		5	3	2	
4,4'-DDT	326	316	10	58	258	1	35	1	5	3	2	
Aldrin	326	276	50	40	236		35		5	3	2	40
Alpha-BHC	326	276	50	40	236		35		5	3	2	40
Alpha-chlordane	326	276	50	40	236		35		5	3	2	40
Aroclor-1016	326	276	50	40	236		35		5	3	2	40
Aroclor-1221	326	276	50	40	236		35		5	3	2	40
Aroclor-1232	326	276	50	40	236		35		5	3	2	40
Aroclor-1242	326	276	50	40	236		35		5	3	2	40
Aroclor-1248	326	276	50	40	236		35		5	3	2	40
Aroclor-1254	326	318	8	40	256	2	37	54	5	3		
Aroclor-1260	326	316	10	58	258		35	1	5	3	2	
Beta-BHC	326	276	50	40	236		35		5	3	2	40
Delta-BHC	326	276	50	40	236		35		5	3	2	40
Dieldrin	326	316	10	58	258		35		5	3	2	
Endosulfan I	326	276	50	40	236		35		5	3	2	40
Endosulfan II	326	316	10	58	258		35		5	3	2	
Endosulfan sulfate	326	316	10	58	258		35		5	3	2	
Endrin	326	316	10	58	258		35		5	3	2	
Endrin ketone	326	316	10	58	258		35		5	3	2	
Gamma-BHC (Lindane)	326	276	50	40	236		35		5	3	2	40
Gamma-chlordane	326	276	50	40	236		35		5	3	2	40
Heptachlor	326	276	50	40	236		35		5	3	2	40
Heptachlor epoxide	326	276	50	40	236		35		5	3	2	40
Methoxychlor	326	316	10	58	258		35		5	3	2	
Toxaphene	326	303	23	57	246		35	1	5	3	2	13
Total				1277	6622	3	947	60	135	81	52	613

Table A.31. Organic accuracy in water samples summary of surrogate recoveries conducted at K-25

Pesticide/PCB	Recovery limits (%)	In	Out	Percentage within limits
Dibutylchlorendate	24–154	27	1	96

Table A.32. K-25 laboratory organic accuracy and precision in sediment samples of surrogate and matrix spike recoveries

Pesticide/ PCB	Recovery limits (%)	RPD limits (%)	Rec in	Rec out	Percentage within recovery limitis	RPD in	RPD out	Percentage within RPD limits
DBC	20–150		347	89	80			
Gamma-BHC	46–127	50	15	29	34	15	1	94
Heptachlor	35–130	31	21	23	48	12	4	75
Aldrin	34–132	43	20	24	45	11	3	79
Dieldrin	31–134	38	40	4	91	20	1	95
Endrin	42–139	45	38	6	86	21	0	100
4,4'-DDT	23–134	50	37	7	84	20	1	95

Table A.33. K-25 laboratory pesticide/PCB QC results summary

QC parameter[a]	Number total	Low	High	Percentage within limits	Average REC or RPD
Surr rec: water	28	10	135	96%	90%
Surr rec: soil	436	37	824	80%	132%
MS/MSD rec: soil		0	528	65%	
MS/MSD RPD: soil		0	66	91%	15%

[a] *MS/MSD = matrix spike/matrix spike duplicate, RPD = relative percent difference.*
* *One water MS/MSD, recovery range 70–98%, RPD range 0–14.*

Table A.34. Pesticide/PCB analyses of fish tissue conducted by the Organic Analysis Laboratory at Oak Ridge National Laboratory

	Total		Fish	
Batch	Field samples	Routine samples	Field samples	Routine samples
93212A	1	9	1	9
93212B		9		9
93212C	1	16	1	16
93271	1	6	1	6
93272		8		8
93273		10		10
93274	1	6	1	6
93332A		6		6
93332B	1	19	1	19
93383A	1	17	1	17
93383B	1	10	1	10
Total	7	116	7	116

Table A.35. Samples analyzed for 11 pesticides and 2 PCBs by the Organic Analysis Laboratory at Oak Ridge National Laboratory

	Measurements			Accept							Reject		
Analyte	Total	Accept	Reject	0	1	9	12	18	51	60	9	11	51
4,4'-DDD	123	121	2	9	95		1	47	16	3			2
4,4'-DDE	123	120	3	17	94			66	1	18		3	1
4,4'-DDT	123	121	2	26	95			17		9		2	
Aldrin	123	118	5	26	92			17		9	4	1	1
Alpha-chlordane	123	116	7		90		6	93	4	22		6	1
Alpha-chlordene	123	120	3	9	94			47	15	3		1	2
Aroclor-1254	1	1	0		1								
Aroclor-1260	1	1	0		1								
Chlordene	123	123	0	20	97			21	8				
Gamma-chlordane	123	117	6		91		14	93	4	22	1	5	1
Gamma-chlordene	123	120	3	8	94			65	16	4	1	1	1
Oxychlordane	123	117	6	10	91	1	3	59	11	13	1	4	3
Technical chlordane	123	116	7		90		32	38	1	2		6	1
Total	1355	1311	44	125	1025	1	56	563	76	105	7	29	13

Table A.36. Pesticide/PCB analyses of fish tissue conducted by the Chemical and Physical Analysis Group at Oak Ridge National Laboratory

Batch	Total		Fish	
	Field samples	Routine samples	Field samples	Routine samples
CPA10195	2	8	2	8
CPA10258	2	16	2	16
CPA10460	2	36	2	36
CPA10548	2	22	2	22
CPA10681	1	17	1	17
CPA10767	1	20	1	20
CPA10884	1	12	1	12
CPA10914	2	23	2	23
CPA11094		8		8
Total	13	162	13	162

Table A.37. Pesticide/PCB analyses of fish tissue conducted by the Chemical and Physical Analysis Group at Oak Ridge National Laboratory

Analyte	Measurements			Accept						Reject		
	Total	Accept	Reject	0	1	12	51	52	53	1	52	53
Aroclor-1254	175	146	29	6	120	11	95	130	36	20	24	24
Aroclor-1260	175	166	9	4	140		110	158	51	9	9	9
Total	350	312	38	10	260	11	205	288	87	29	33	33

Table A.38. Gamma analysis of sediment, water, and fish tissue conducted by Environmental Sciences Division at Oak Ridge National Laboratory

	Total		Core		Fish		Grab		Water
Batch	Field samples	Routine samples	Field samples	Routine samples	Field samples	Routine samples	Field samples	Routine samples	Routine samples
03DEC89		1						1	
10DEC89		7		7					
17DEC89		14		14					
31DEC89		5		1		3		1	
07JAN90		18		12		6			
14JAN90		9		4		4		1	
21JAN90		14		4		10			
28JAN90	1	13		10	1	3			
04FEB90	1	14		6	1	6			2
11FEB90	1	13		2	1	11			
18FEB90		1						1	
25FEB90		18		14					4
04MAR90		15		5				2	8
11MAR90		30		14		12			4
18MAR90	2	27		16	2	7		1	3
25MAR90		10		3		4		3	
01APR90		13		11		1		1	
08APR90		2		1		1			
15APR90		23		12		8		2	1
22APR90	3	24	1	11	2	10			3
29APR90	1	12	1	6		4			2
06MAY90		22		13		8		1	
13MAY90	1	15	1	15					
20MAY90		5		1		3		1	
27MAY90		7		6		1			
03JUN90		1		1					
10JUN90		4		3				1	
17JUN90		4		4					
24JUN90	1	27		13	1	14			
01JUL90		6		2		2			2
08JUL90		4		3					1
15JUL90		2				2			
22JUL90		9		2		2		5	
29JUL90		13		3		1		9	
05AUG90		14		4				10	
12AUG90		15		2				13	
19AUG90		17		2				15	

Table A.38. (continued)

Batch	Total		Core		Fish		Grab		Water
	Field samples	Routine samples	Field samples	Routine samples	Field samples	Routine samples	Field samples	Routine samples	Routine samples
26AUG90		23		1				22	
02SEP90		22		5				17	
09SEP90		34		6		3		25	
16SEP90	1	19		3	1	1		15	
23SEP90		32		11		1		20	
30SEP90		36		12		3		21	
07OCT90	3	60	1	37	2	7		16	
14OCT90		57		30		10		16	1
21OCT90		48		25		6		17	
28OCT90		27		18				7	2
04NOV90		38		24				14	
11NOV90		24		19				5	
18NOV90		8		7				1	
25NOV90		2		2					
02DEC90		8						8	
09DEC90		7						7	
16DEC90		10						10	
30DEC90		7				2		5	
06JAN91		18				4		14	
13JAN91		19				4		15	
20JAN91		12				1		11	
27JAN91		5				3		2	
03FEB91		3				3			
10FEB91	1	15				1	1	14	
17FEB91		1						1	
24FEB91		22						22	
03MAR91		11						11	
10MAR91		3				1		2	
17MAR91		2		1		1			
24MAR91		8		6		2			
31MAR91		10		2		4		4	
07APR91		7				4		3	
14APR91		1				1			
21APR91		5						5	
28APR91	1	11					1	11	
05MAY91	1	12					1	12	
19MAY91		1		1					

Table A.38. (continued)

	Total		Core		Fish		Grab		Water
Batch	Field samples	Routine samples	Field samples	Routine samples	Field samples	Routine samples	Field samples	Routine samples	Routine samples
26MAY91		3						3	
02JUN91	2	14					2	14	
09JUN91	3	19					3	19	
16JUN91	3	11	1				2	11	
23JUN91	2	24		3		12	2	9	
30JUN91		13				3		10	
Total	28	1160	5	440	11	200	12	487	33

Table A.39. Gamma analysis of sediment, water, and fish tissue conducted by Environmental Sciences Division at Oak Ridge National Laboratory

Analyte	Measurements			Accept										Reject	
	Total	Accept	Reject	0	1	23	24	29	32	38	39	42	47	35	38
Co-60	1175	1174	1	272	67	2	22	9	11	2	225	670	12	1	
Cs-137	1228	1226	2	1013	58	2	25	8	11			150	8		2
Total	2403	2400	3	1285	125	4	47	17	22	2	225	820	20	1	2

Table A.40. Number of accepted and rejected analyses and associated explanation codes for Environmental Sciences Division/Radiological Analysis Laboratory

Radionuclide	Number of analyses			Accept									Reject	
	Submit	Accept	Reject	0	1	24	29	32	38	39	42	47	35	38
Co-60	1134	1133	1	232	67	22	9	11	2	225	669	14	1	
Cs-137	1187	1185	2	972	58	25	8	11			150	10		2
Total	2321	2318	3	1204	125	47	17	22	2	225	819	24	1	2

Explanation codes
1 = holding time exceeded
24 = laboratory control sample recovery outside limits
29 = sample not properly preserved
32 = calibration verification indicates unacceptable change in system background
35 = calibration verification indicates alpha/beta cross-talk factors
38 = activity calculated incorrectly
39 = uncertainty overestimated due to incorrect error propagation
42 = minimum detectable activity does not reflect instrument sensitivity
47 = duplicate error ratio outside limits

Table A.41. Frequency by instrument and detector of background analyses conducted by Environmental Sciences Division/Radiological Analysis Laboratory

	ND6700 detector	ND9900 detector					
Date	1	3	1	2	3	6	7
			1989				
November	1	1					
December				1	1	1	1
			1990				
January							
February				1	1	1	1
March			1				
April	1	1	1	1	1	1	1
May							
June							
July							
August							
September		1	1		1	1	
October	3	2	2	2	2	2	
November	1	1	2	1	2	1	
December	3	3	1	1	1	1	1
			1991				
January	1	1	1	1	1	1	1
February			1	1	1	1	1
March		2	1	1	1	1	1
April			2	1	2	1	1
May	2	1	2	2	2	2	2
June		1	1	1	1	2	1

Table A.44. (continued)

Date	Matrix	Analyte	Average	Standard development	Normalized range	Normalized deviation
10AUG90	Water	I-131	38.00	0.00	0.00	-0.29
05OCT90	Water	Co-60	20.67	1.53	0.35	0.23
		Zn-65	120.33	9.29	0.89	0.77
		Ru-106	145.00	8.72	0.63	-0.69
		Cs-134	10.67	0.58	0.12	-0.46
		Cs-137	12.67	1.15	0.24	0.23
		Ba-133	110.67	7.51	0.80	0.10
30OCT90	Water	Cs-134	7.00	0.00	0.00	0.00
		Cs-137	5.00	0.00	0.00	0.00
08FEB91	Water	Co-60	40.33	0.58	0.12	0.12
		Zn-65	155.00	5.20	0.35	0.69
		Ru-106	196.00	5.29	0.31	0.91
		Cs-134	7.33	0.58	0.12	-0.23
		Cs-137	8.67	0.58	0.12	0.23
		Ba-133	75.00	1.00	0.15	0.00
15FEB91	Water	I-131	77.33	5.51	0.74	0.51
16APR91	Water	Cs-134	22.67	0.58	0.12	-0.46
		Cs-137	25.67	0.58	0.12	0.23
07JUN91	Water	Co-60	9.67	0.58	0.12	-0.12
		Zn-65	113.67	4.04	0.43	0.89
		Ru-106	145.33	4.73	0.35	-0.42
		Cs-134	14.33	0.58	0.12	-0.23
		Cs-137	15.67	0.58	0.12	0.58
		Ba-133	61.00	1.00	0.20	-0.29
04OCT91	Water	Co-60	28.00	0.00	0.00	-0.35
		Zn-65	73.00	3.61	0.59	0.00
		Ru-106	194.00	13.45	0.77	-0.43
		Cs-134	9.33	0.58	0.12	-0.23
		Cs-137	10.33	0.58	0.12	0.12
		Ba-133	93.00	1.00	0.12	-0.87
22OCT91	Water	Co-60	18.33	0.58	0.12	-0.58
		Cs-134	8.33	0.58	0.12	-0.58
		Cs-137	10.33	0.58	0.12	-0.23

Table A.45. Alpha and beta analysis of sediment, water, and fish tissue conducted at Oak Ridge Associated Universities

	Total	Core	Fish	Water
Batch	Routine samples	Routine samples	Routine samples	Routine samples
740	16			16
741	16			16
742	67		67	
824	40	40		
825	20		20	
826	40	40		
1000	58	58		
1000A	58	58		
Total	315	196	87	32

Table A.46. Alpha and beta analysis of sediment, water, and fish tissue conducted at Oak Ridge Associated Universities

	Measurements			Accept							Reject			
Analyte	Total	Accept	Reject	0	1	12	24	29	37	47	1	29	37	41
Am-241	98	96	2	16	78	47			8				2	
Cm-243,244	98	96	2	17	78	47			7				2	
Cm-245,246	40	39	1	17	21				2				1	
Cm-248	38	38	0	16	21				2					
H-3	16	0	16								16	16		
Pu-238	98	95	3	15	76	8			9				3	
Pu-239,240	98	95	3	14	76	12			8				3	
Sr-90	201	199	2	32	142	5	27	16	8	6				2
U-234	98	95	3	7	78	19			23				3	
U-235	98	95	3	7	78	1			23				3	
U-238	98	95	3	7	78	5			23				3	
Total				148	726	144	27	16	113	6	16	16	20	2

Table A.42. Environmental Sciences Division/Radiological Analysis Laboratory control sample results

Description	Radionuclide	Limits (%)	In	Out	Percentage in
		ND6700			
EPA Clay	Cs-137	70-130	74	0	100
NBS 4350	K-40	70-130	4	0	100
	Co-60	70-130	4	0	100
	Cs-13	70-130	4	0	100
	Eu-152	70-130	4	0	100
NBS 4354	Co-60	70-130	9	0	100
	Cs-137	70-130	11	1	92
		ND9900			
EPA Clay	Cs-137	70-130	184	0	100
IAEA 352	K-40	70-130	24	0	100
	Cs-137	70-130	20	4	83
NBS 4350	K-40	70-130	3	0	100
	Co-60	70-130	3	0	100
	Cs-137	70-130	3	0	100
	Eu-152	70-130	2	1	33
NBS 4354	Co-60	70-130	116	0	100
	Cs-137	70-130	116	1	99

Table A.43. Environmental Sciences Division/Radiological Analysis Laboratory duplicate analysis results by instrument and matrix

Analyte	DER limit	In	Out	Percentage in
		ND6700—Sediment		
Co-60	<1	11	1	92
Cs-137	<1	11	1	92
		ND9900—Sediment		
Co-60	<1	66	0	100
Cs-137	<1	69	0	100
		ND9900—Fish		
Co-60	<1	21	0	100
Cs-137	<1	23	0	100

Table A.44. Results of Environmental Protection Agency interlaboratory comparison samples analyzed by Environmental Sciences Division/Radiological Analysis Laboratory

Date	Matrix	Analyte	Average	Standard development	Normalized range	Normalized deviation
10FEB89	Water	Cr-51	223.67	3.51	0.17	-0.82
		Co-60	10.00	0.00	0.00	0.00
		Zn-65	169.00	3.00	0.22	1.08
		Ru-106	169.33	2.08	0.13	-0.83
		Cs-134				
		Cs-137	10.33	0.58	0.12	0.12
18APR89	Water	Cs-134	18.67	0.58	0.12	-0.46
		Cs-137	20.00	0.00	0.00	0.00
09JUN89	Water	Ba-133	48.33	0.58	0.12	-0.23
		Co-60	30.00	1.00	0.24	-0.35
		Zn-65	170.33	6.35	0.38	0.54
		Ru-106	129.00	14.18	1.44	0.13
		Cs-134	37.67	2.08	0.47	-0.46
		Cs-137	20.67	1.15	0.24	0.23
06OCT89	Water	Ba-133	56.33	2.89	0.49	-0.77
		Co-60	30.33	1.53	0.36	0.12
		Zn-65	129.33	2.08	0.18	0.04
		Ru-106	143.33	1.15	0.07	-1.91
		Cs-134	27.00	1.73	0.36	-0.69
		Cs-137	61.00	4.36	0.95	0.69
31OCT89	Water	Cs-134	5.00	0.00	0.00	0.00
		Cs-137	5.33	1.15	0.24	0.12
09FEB90	Water	Co-60	15.67	0.58	0.12	0.23
		Zn-65	146.00	4.58	0.38	0.87
		Ru-106	134.67	10.79	0.84	-0.54
		Cs-134	17.33	0.58	0.12	-0.23
		Cs-137	18.67	0.58	0.12	0.23
		Ba-133	76.33	4.16	0.68	0.58
17APR90	Water	Cs-134	14.33	0.58	0.12	-0.23
		Cs-137	15.67	1.15	0.24	0.23
08JUN90	Water	Co-60	24.67	1.15	0.24	0.23
		Zn-65	154.33	5.86	0.43	0.73
		Ru-106	209.67	6.03	0.34	-0.03
		Cs-134	23.00	1.00	0.24	-0.35
		Cs-137	28.00	1.00	0.24	1.04
		Ba-133	102.00	4.36	0.47	0.52

Table A.47. List of samples analyzed by Oak Ridge Associated Universities/Environmental Survey Site Assessment Program

Batch	Regular			Quality control			
	Sediment	Fish	Water	Duplicates	Blanks	Spikes	Controls
				Beta			
740	0	0	16	3	4	0	0
741	0	0	16	1	2	0	0
742	0	67	0	6	12	0	5
825	0	20	0	2	0	0	0
826	40	0	0	8	10	0	2
1000A	58	0	0	3	6	1	2
				Alpha			
824	40	0	0	9	9	0	2
1000	58	0	0	8	13	7	0
Total	196	87	32	40	56	8	11

Table A.48. Chemical recovery results for alpha analyses conducted by Oak Ridge Associated Universities/Environmental Survey Site Assessment Program

Batch	Sample type	Tracer	Limits (%)	In	Out	Percentage in
824	Regular	Am-243	50–100	34	6	85
		Pu-236	50–100	37	3	92
		U-232	50–100	33	7	82
	Blank	Am-243	50–100	6	2	75
		Pu-236	50–100	7	2	75
		U-232	50–100	5	3	62
	LCS[a]	Am-243	50–100	1	0	100
		Pu-236	50–100	1	0	100
		U-232	50–100	2	0	100
	Duplicate	Am-243	50–100	5	2	71
		Pu-236	50–100	7	1	88
		U-232	50–100	7	0	100
1000	Regular	Am-243	50–100	51	7	88
		Pu-236	50–100	51	7	88
		U-232	50–100	34	24	59
	Blank	Am-243	50–100	9	4	69
		Pu-236	50–100	10	3	77
		U-232	50–100	5	8	38

Table A.48. (continued)

Batch	Sample type	Tracer	Limits (%)	In	Out	Percentage in
	Spike	Am-243	50–100	6	1	86
		Pu-236	50–100	5	2	71
		U-232	50–100	3	2	60
	Duplicate	Am-243	50–100	7	1	88
		Pu-236	50–100	7	1	88
		U-232	50–100	6	2	75

[a]*laboratory control sample*

Table A.49. Chemical recovery results for strontium-90 analyses conducted by Oak Ridge Associated Universities/Environmental Survey Site Assessment Program

Batch	Sample type	Limits (%)	In	Out	Percentage in
742	Regular	50–100	64	3	96
	Blank	50–100	12	0	100
	LCS[a]	50–100	5	0	100
	Duplicate	50-100	6	0	100
825	Regular	50–100	20	0	100
	Blank	50–100	5	0	100
	LCS	50–100	2	0	100
	Duplicate	50–100	2	0	100
826	Regular	50–100	40	0	100
	Blank	50–100	10	0	100
	LCS	50–100	2	0	100
	Duplicate	50–100	8	0	100
1000A	Regular	50–100	55	3	95
	Blank	50–100	4	2	67
	LCS	50–100	2	0	100
	Spike	50–100	1	0	100
	Duplicate	50–100	2	1	67

[a]*laboratory control sample*

Table A.50. Laboratory control sample results conducted by Oak Ridge Associated Universities/Environmental Survey Site Assessment Program

Description	Radionuclide	Limits (%)	In	Out	Percentage in
EPA 2454-1	Sr-90	70–130	17	2	89
EPA2458-1	H-3	70–130	1	0	100
NBS 4353	U-234	70–130	3	1	75
	U-238	70–130	4	0	100
NBS4353+	Am-241	70–130	7	0	100
	Pu-239	70–130	7	0	100
	U-234	70–130	4	1	80
	U-238	70–130	4	1	80

Table A.51. Duplicate analysis results conducted by Oak Ridge Associated Universities/Environmental Survey Site Assessment Program

Batch	Radionuclide	DER[a] limit	In	Out	Percentage in
741	Sr-90	<1	3	1	75
742	Sr-90	<1	6	0	100
824	Am-241	<1	7	0	100
	Cm-243,244	<1	6	0	100
	Cm-245,246	<1	6	0	100
	Cm-248	<1	6	0	100
	Pu-238	<1	8	0	100
	Pu-239,240	<1	8	0	100
	U-234	<1	7	0	100
	U-235	<1	7	0	100
	U-238	<1	7	0	100
825	Sr-90	<1	2	0	100
826	Sr-90	<1	7	1	88
1000	Am-241	<1	8	0	100
	Cm-243,244	<1	8	0	100
	Pu-238	<1	8	0	100
	Pu-239,240	<1	8	0	100
	U-234	<1	7	1	88
	U-235	<1	8	0	100
	U-238	<1	8	0	100
1000A	Sr-90	<1	3	0	100

[a]*duplicate error ratios*

Appendix B.

ADDITIONAL FIGURES

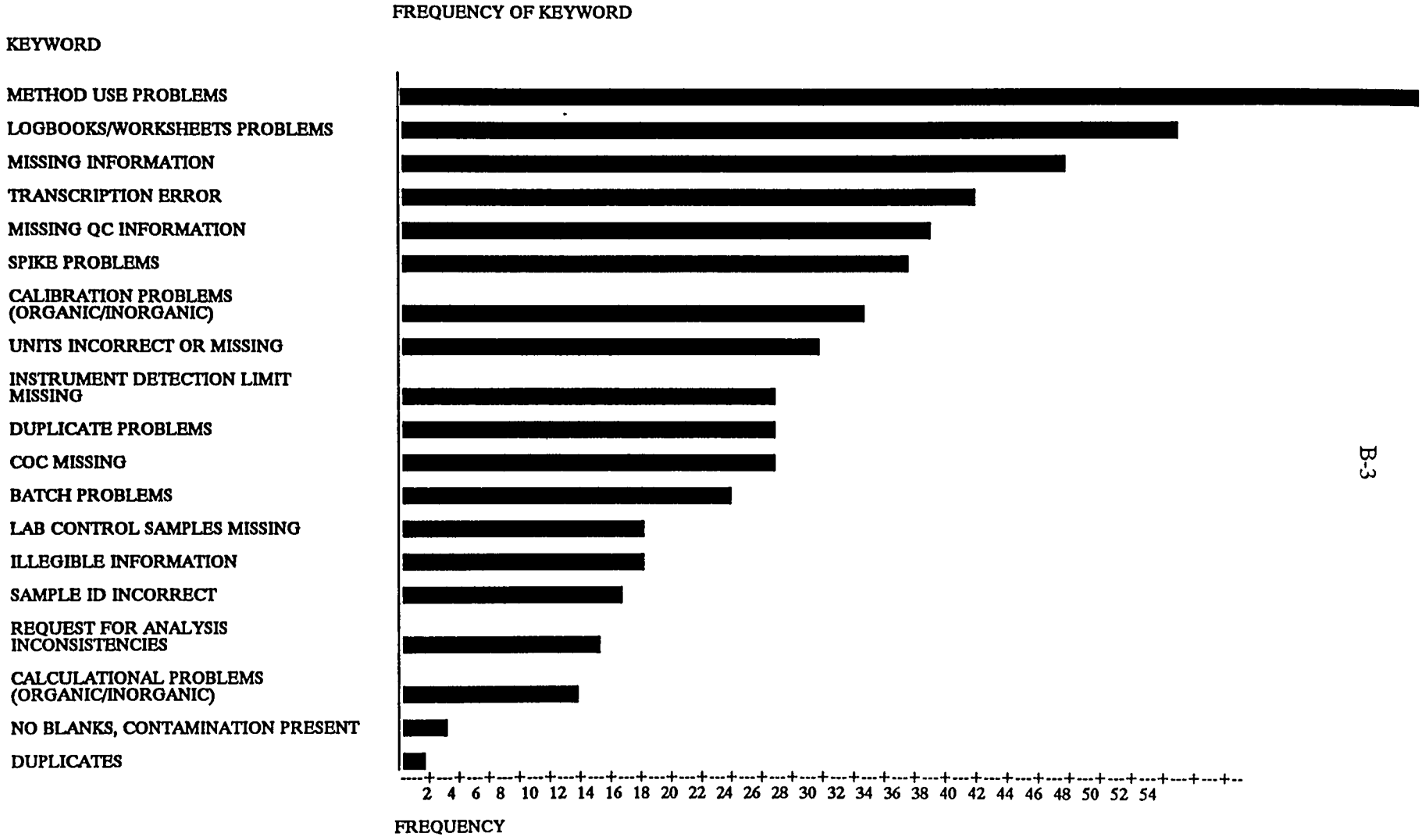

Fig. B.1. Nonconformances from analytical validation by the IT laboratory using AA/ICP methods.

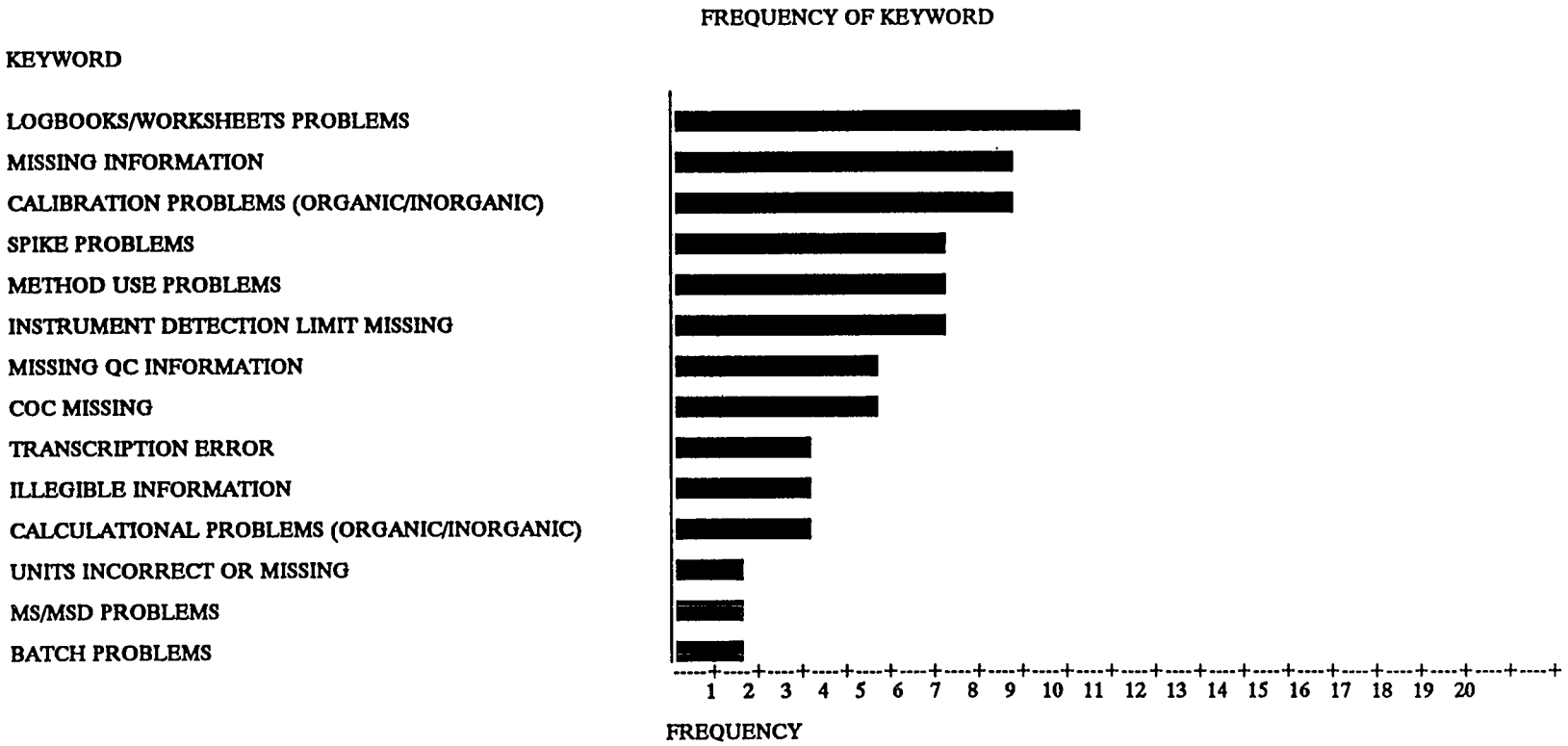

Fig. B.2. Nonconformances from analytical validation by the K-25 laboratory using AA/ICP methods.

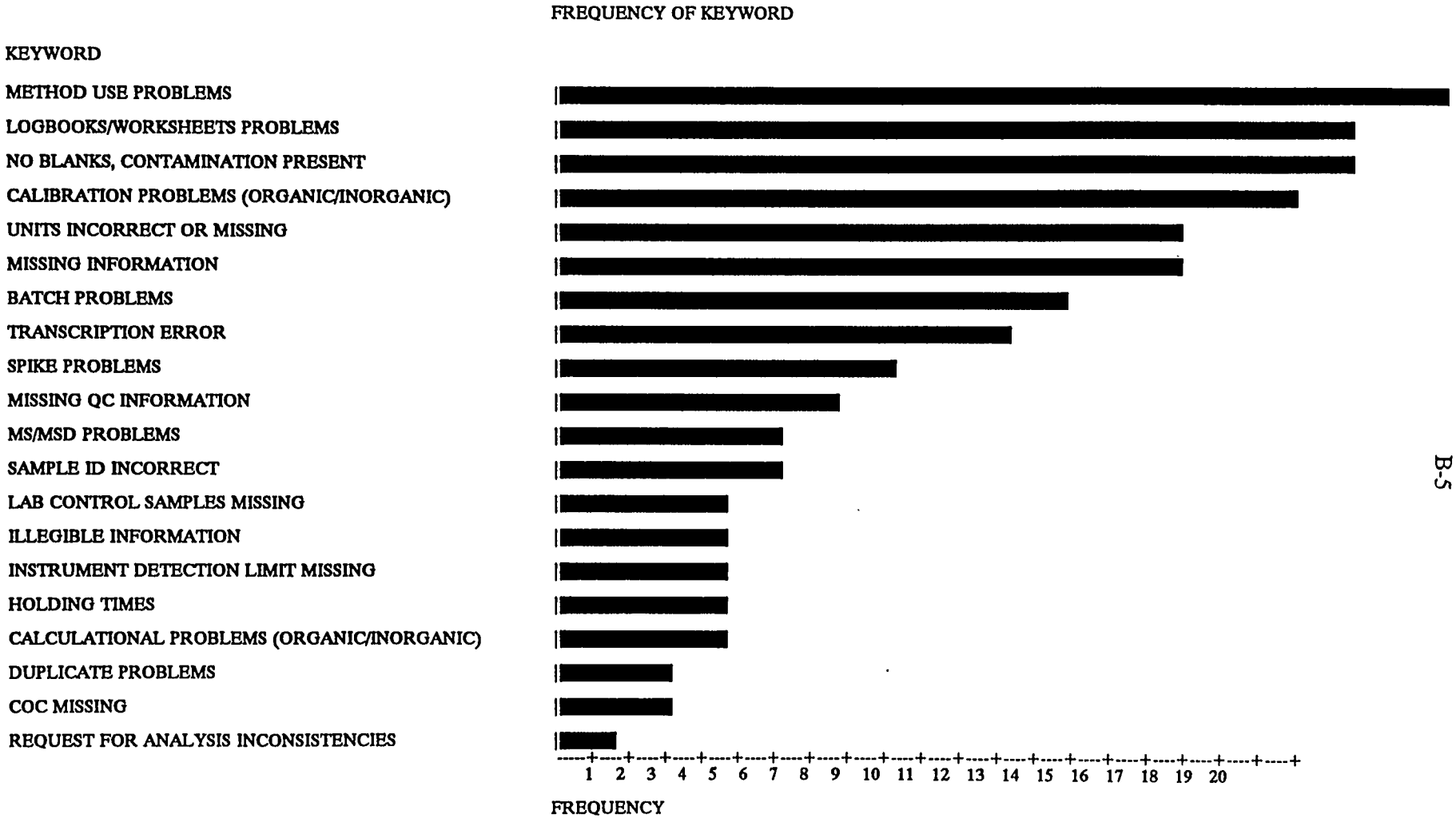

Fig. B.3. Nonconformances from analytical validation by the ORNL/CPA laboratory using the ICP method.

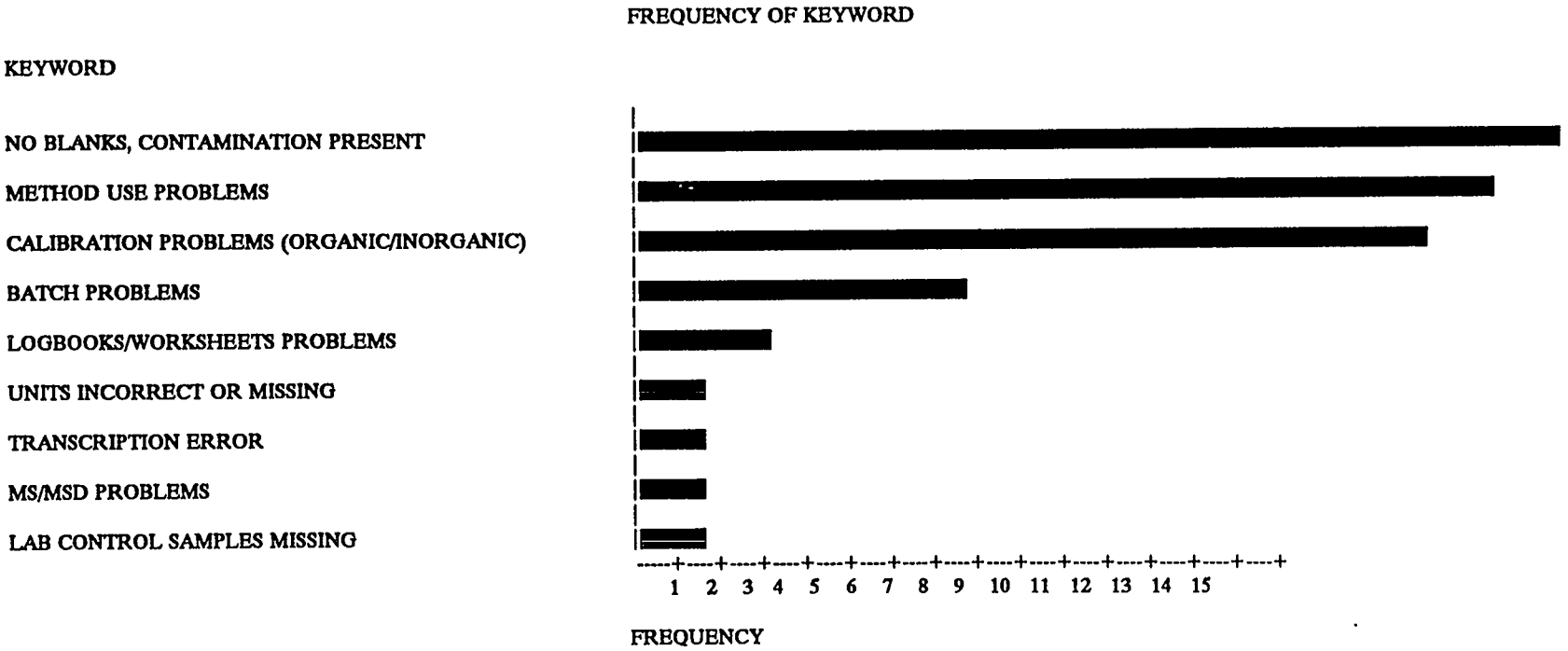

Fig. B.4. Nonconformances from analytical validation by the ORNL/EAL laboratory using the AA method.

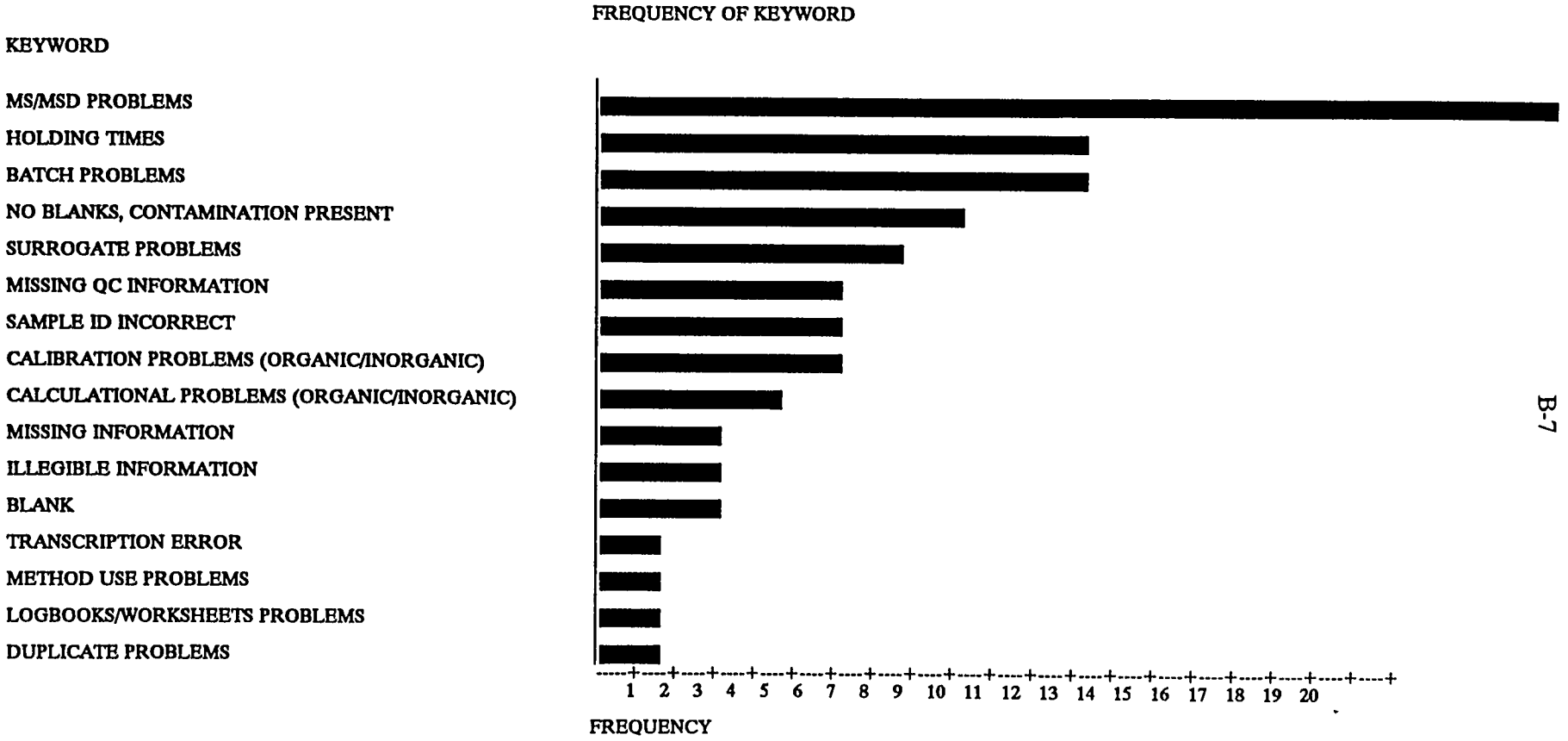

Fig. B.5. Nonconformances from analytical validation by the K-25 laboratory using the semivolatiles method.

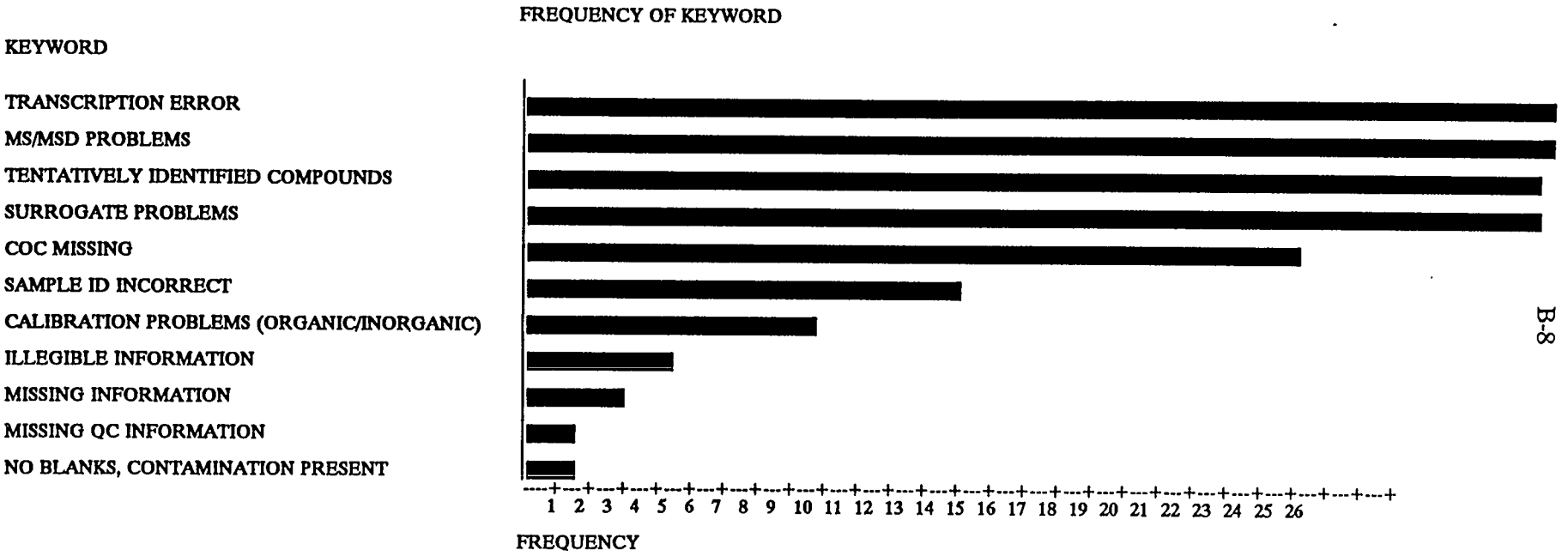

Fig. B.6. Nonconformances from analytical validation by the ORNL/OAL laboratory using the semivolatiles method.

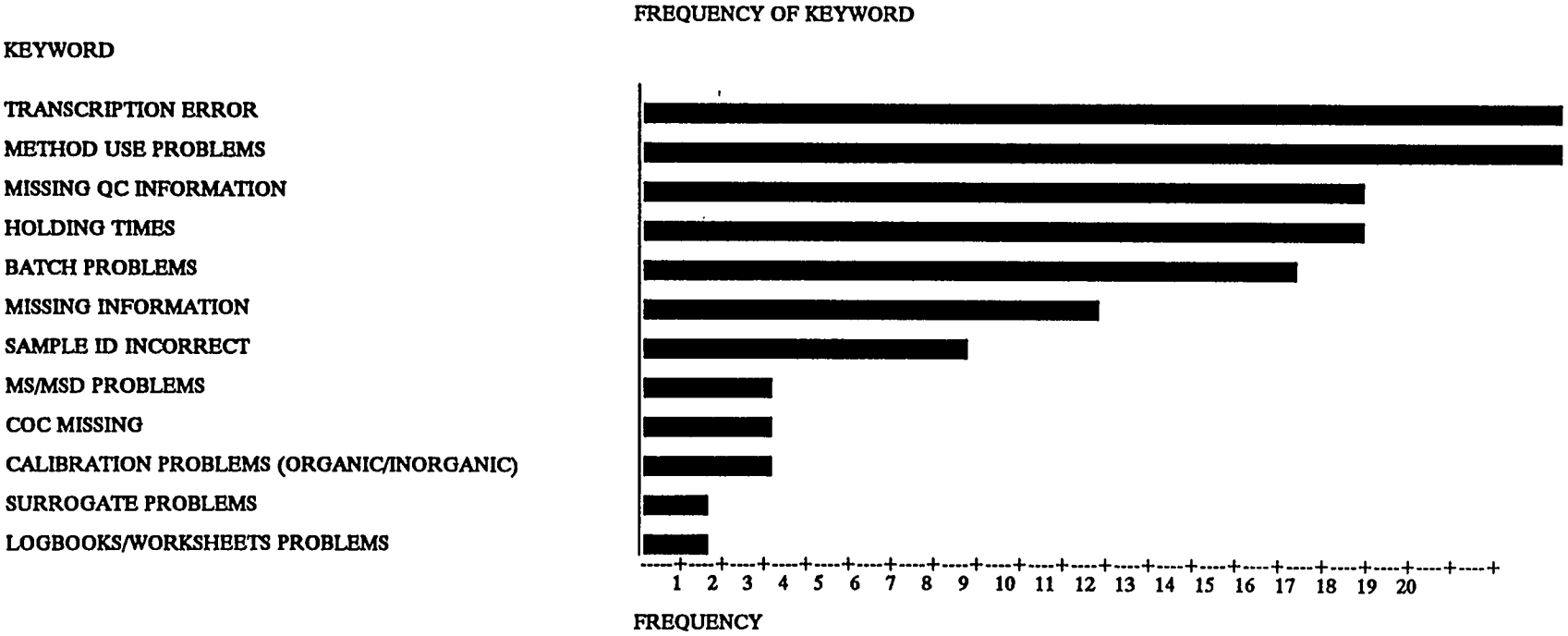

Fig. B.7. Nonconformances from analytical validation by the K-25 laboratory using the pesticide/PCB method.

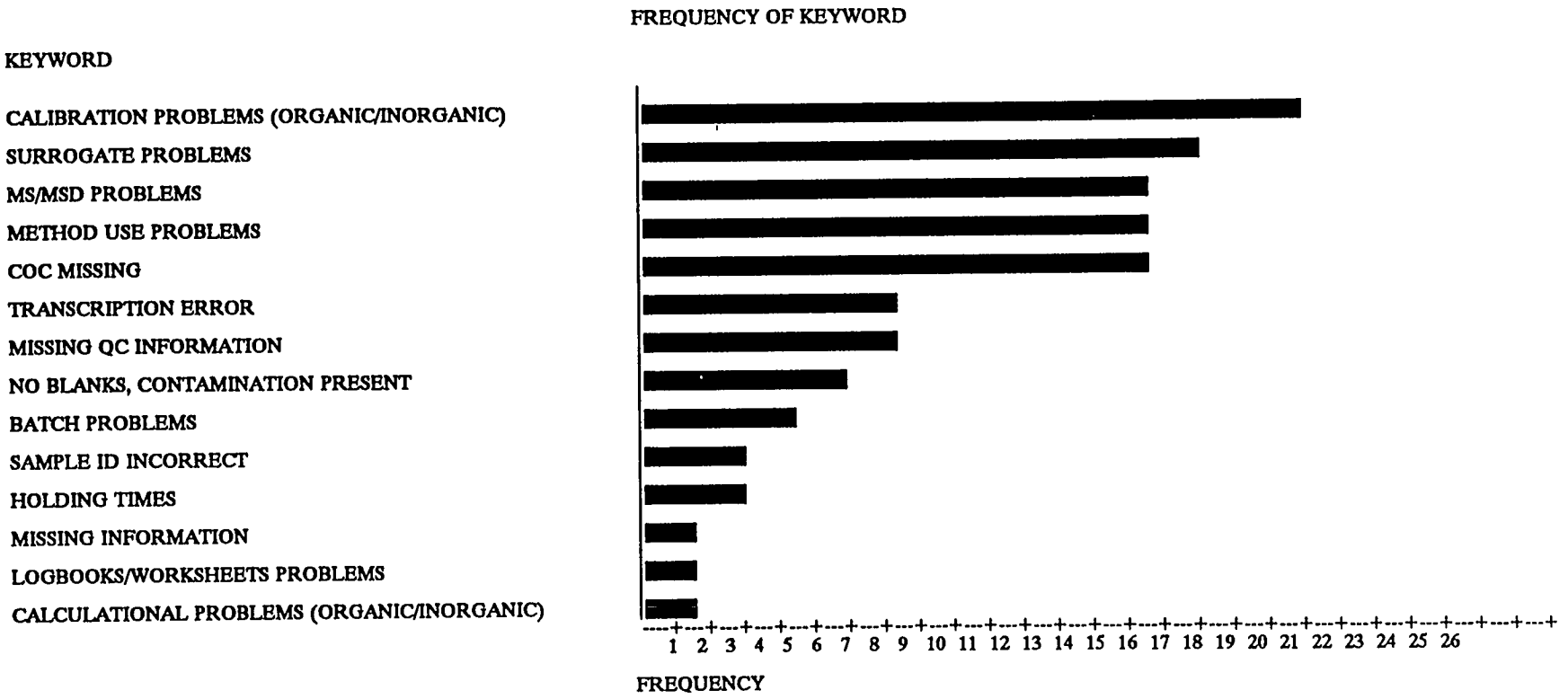

Fig. B.8. Nonconformances from analytical validation by the ORNL/OAL laboratory using pesticide/PCB methods.

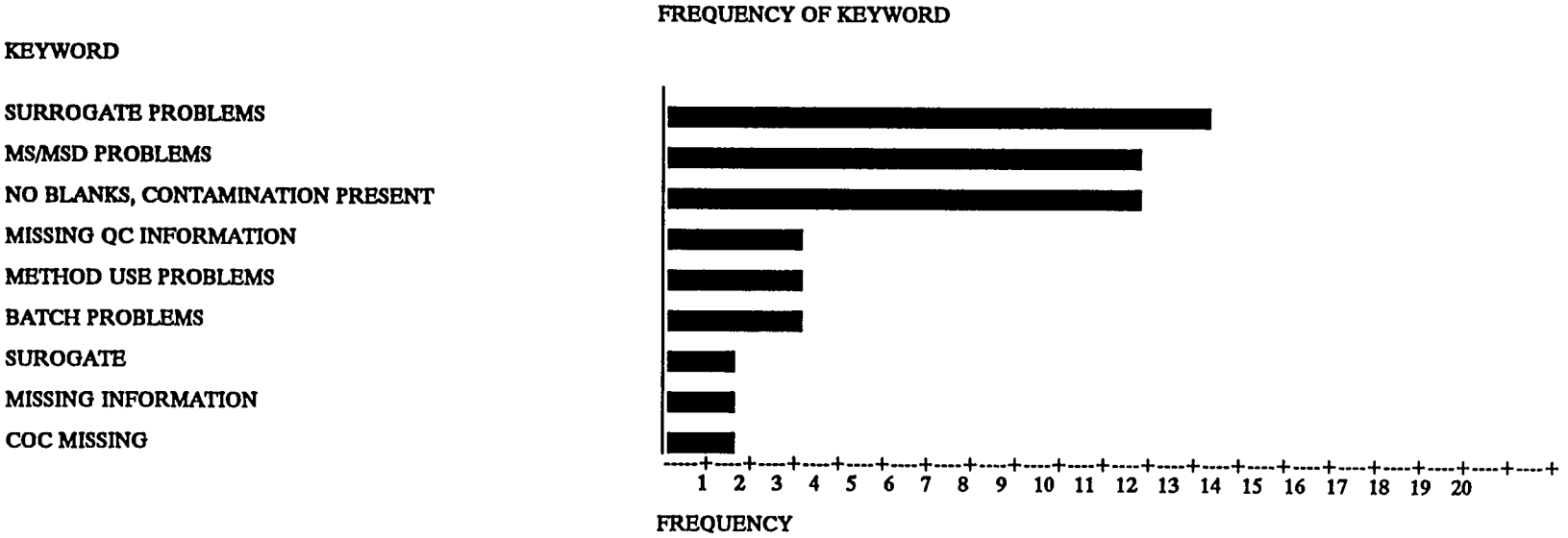

Fig. B.9. Nonconformances from analytical validation by the ORNL/CPA laboratory using pesticide/PCB methods.

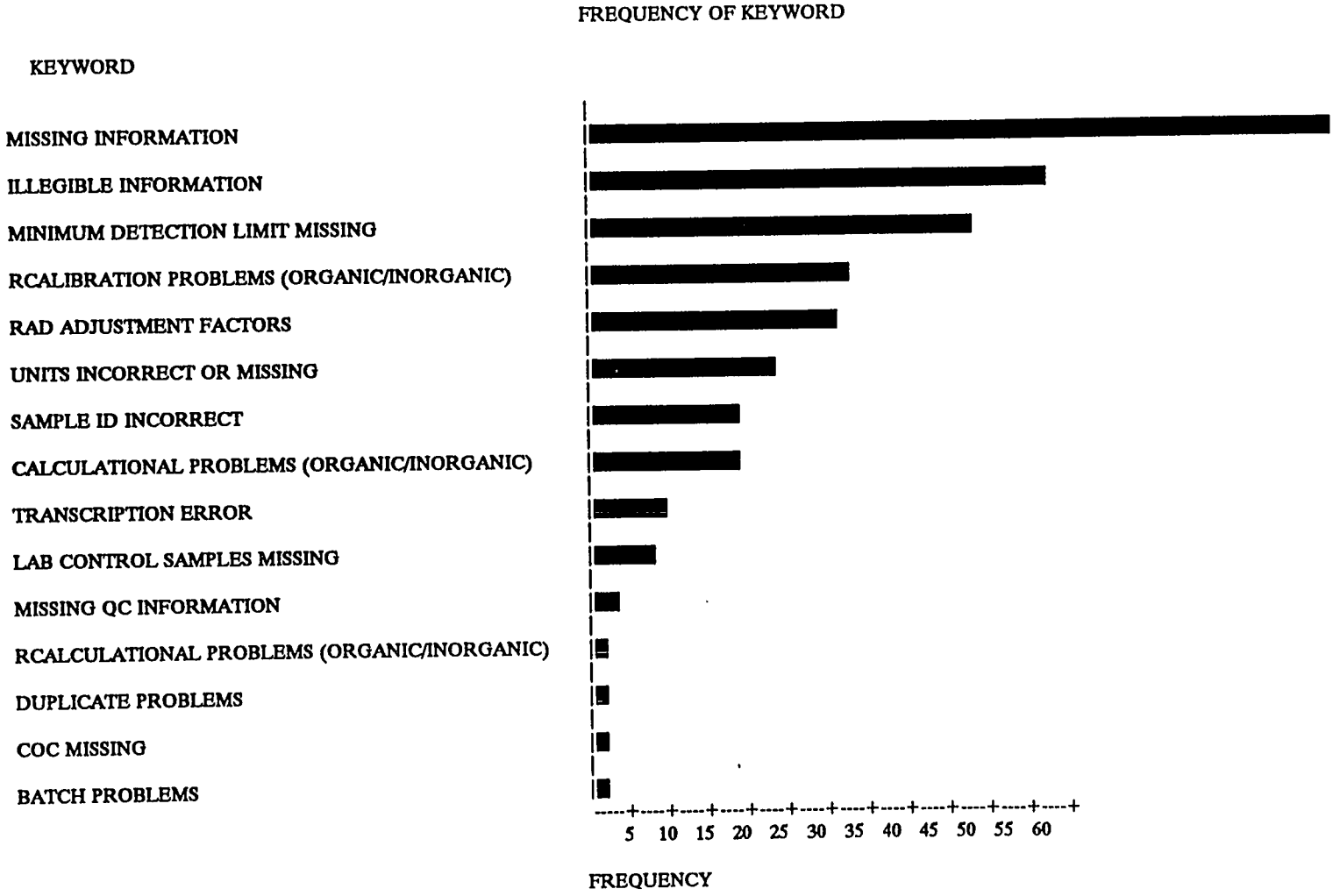

Fig. B.10. Nonconformances from analytical validation by the ORNL/ESD RAL using the gamma spectroscopy method.

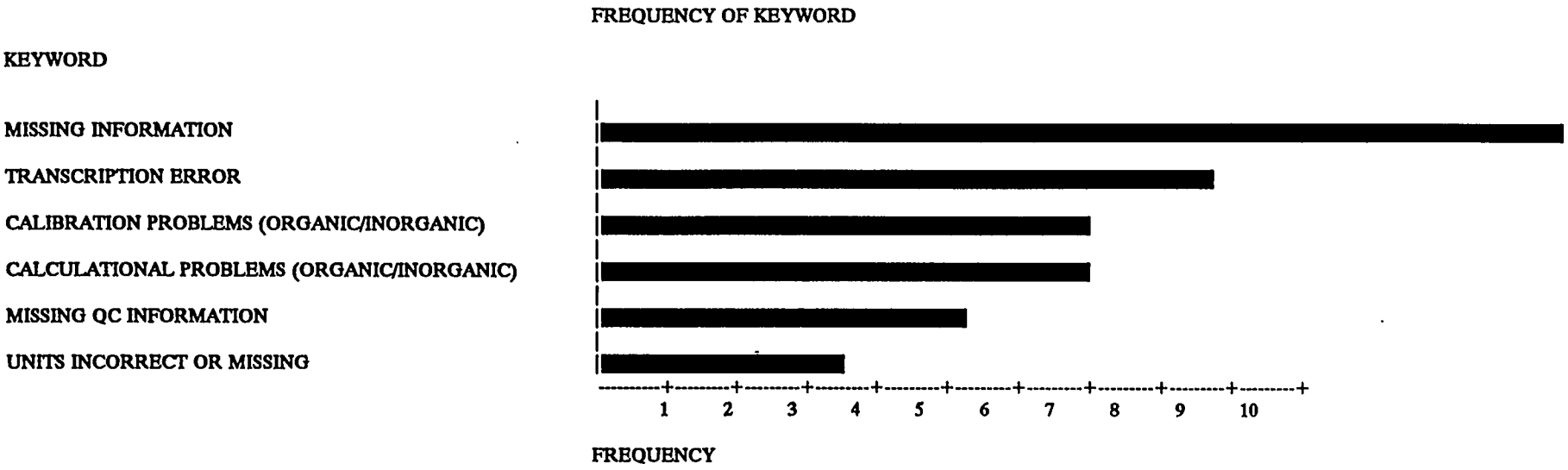

Fig. B.11. Nonconformances from analytical validation by the ORAU laboratory using the alpha spectroscopy method.

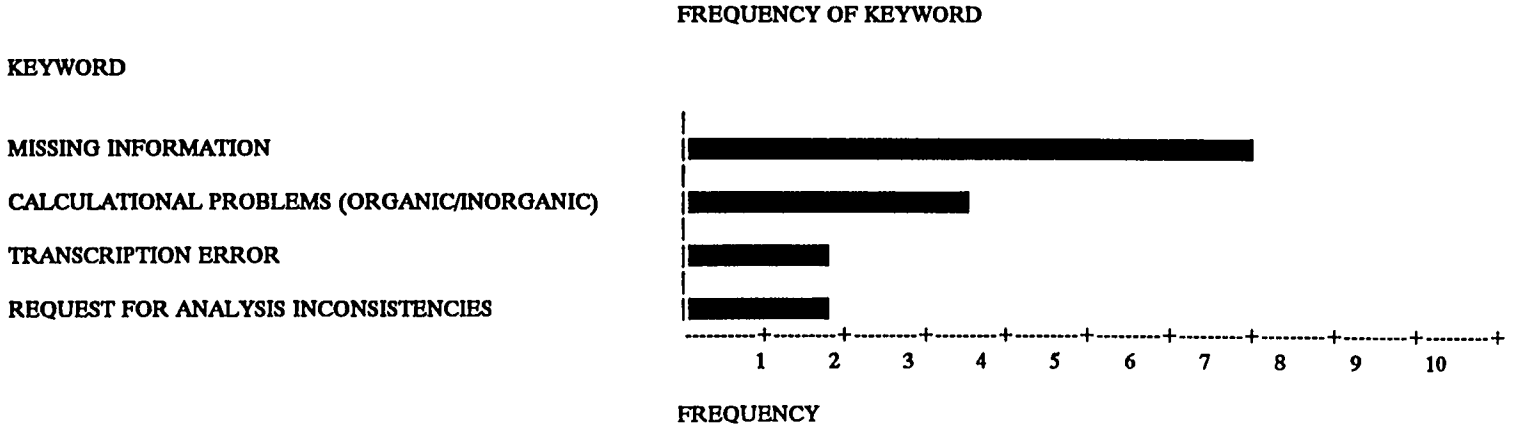

Fig. B.12. Nonconformances from analytical validation by the ORAU laboratory using the Sr-90 method.

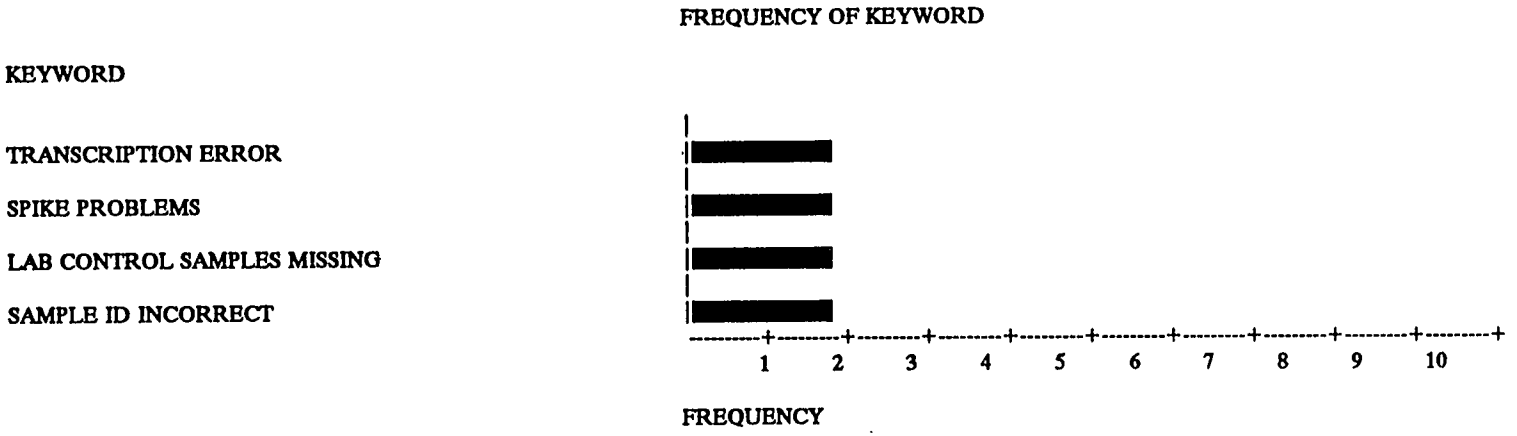

Fig. B.13. Nonconformances from analytical validation by the ORAU laboratory using the tritium method.

Appendix C.

FIELD QUALITY CONTROL

C. FIELD QUALITY CONTROL

C.1. WATER SAMPLING

Water quality control samples were collected to bracket field total organic, total inorganic, and dissolved inorganic samples (Table 3.1). Fifty-four field samples were collected for analytes from 18 sites on nine sample collection dates. For these field samples, 42 QC samples were collected on eight dates from 15 sites. Fifteen duplicate samples were collected for all analytes from five sites on three dates. Six trip blanks were collected for all analytes from five sites on two dates. Eighteen rinse blanks were collected for all analytes from six sites on three dates. Three field blanks were collected from one site on one date for all analytes.

C.1.1 Field Sampling Completeness

The completeness of sample collection for field QC, a comparison of the sites included for sampling in the Clinch River Remedial Investigation (CRRI) Phase 1 plan (Energy Systems 1990) with those actually sampled was 100%; no samples were rejected because of collection errors. Completeness in terms of the processing and submittal of samples compares the samples submitted for a particular analysis with those rejected because of errors in processing, preservation, or other related activities is assessed in Sect. 3.1.

C.1.2 Representativeness

Results from all rinse water samples from field and laboratory equipment cleaning operations are presented in Table C.1. Sample identification numbers and analytes that were not detected are not presented. Rinse sample contamination was detected for calcium (eight samples), iron, magnesium, sodium, and zinc (four samples each), cadmium and lead (three samples each), nickel and beryllium (one sample each). For organic analytes, bis(2-ethylhexyl)phthalate was detected in one sample.

The values from equipment rinsate samples, with the exception of lead noted below, do not reflect measurable increases in these analytes for the field samples with which they were paired (Table 3.1). Calcium and magnesium rinse sample values were <1% of the field sample values, sodium was less than 5%, and iron was less than 10% of the field sample values. Beryllium, cadmium, nickel, and zinc were not observed in the field samples with which they were associated. The values for dissolved lead at Poplar Creek kilometer (PCK) 9.6 and total lead at PCK 7.6 were greater than the associated field sample values (Table C.1); contamination from sources other than the field sampling activity may be responsible. Lead values in associated field samples for these sites were less than the average DL (Cook et al. 1992).

Blank samples were collected to assess the possibility of contamination from sample containers, collection procedures, or other nonmatrix sources (Table C.2). Contamination was detected in two inorganic samples. Cadmium, calcium, chromium, copper, iron, magnesium, nickel, sodium, and zinc were detected in one sample [Clinch River mile (CRM) 50.5];

selenium was observed in the other, representing CRM 9.6, CRM 14.5 and CRM 19.6 (Table C.2). Bis(2-ethylhexyl)phthalate was observed in one organic blank sample.

Though selenium was present in a trip blank, it was not detected in any field samples associated with that blank (CRM 9.6, CRM 14.5, or CRM 19.7 [Cook et al. 1992]). It may be concluded that the impact of selenium in this trip blank on completion of Phase 1 objectives is minimal, however the presence of detectable levels of contaminants in blank samples is an unacceptable result.

Analytes detected in the CRM 50.5 field blank sample, which were detected in the associated field sample include dissolved calcium at 10% of the field sample, dissolved iron at three times the field value, dissolved magnesium at <5% of the field sample value, potassium at 38% of the field sample value, and sodium at 50% of the field sample value. None of the other analytes observed in the field blank for this site were found in the field sample. Blank results indicate that the field blank for CRM 50.5 was contaminated; thus, any values for dissolved inorganic contaminants from this site should be considered suspicious. Analytes detected in both blank and field samples did not consist of contaminants of concern for Phase 1 of the CRRI (Energy Systems 1990) and, therefore, should not affect risk assessment calculations. However, as stated above, the presence of detectable levels of contaminants at any percentage of field sample values represents an unacceptable result for the representativeness of the samples.

With these exceptions, the comparability and representativeness of Phase 1 results were acceptable. Blanks will be further evaluated for Phase 2 of the CRRI.

C.1.3 Field Duplicates

Water sample duplicates were collected to assess the precision of the sample collection process. The precision of field duplicate sample collection was assessed by (1) Calculating the analyte-specific RPD for paired duplicate samples with mean values greater than five times the average DL (Table C.3) and (2) Calculating the absolute value of the difference between pairs for comparison with the average DL, for paired duplicate samples with analyte-specific mean values less than five times the average DL (Table C.4). Precision is considered acceptable either for RPD values less than 20% in the first case or absolute values of paired differences less than the average DL in the second case. For values within 5% of these acceptance levels, environmental variability may influence the perceived precision.

Duplicate pairs for total and dissolved calcium, magnesium, mercury, potassium, and sodium, as well as for organics di-n-octylphthalate and diethylphthalate, had acceptable levels of precision for all field duplicate pairs in which the analytes were detected (see Tables C.3 and C.4). Precision was unacceptable for bis(2-ethylhexyl)phthalate and dissolved iron at Tennessee River mile (TRM) 531, dissolved iron and total lead at TRM 547, dissolved lead at CRM 0.5, dissolved cadmium and lead at CRM 1, and dissolved iron and dissolved zinc at CRM 43.

The acceptable precision results for all samples analyzed for calcium, magnesium, potassium, and sodium suggest that the sample collection method is acceptable. The low RPD values for these analytes also suggests that, for the sample pairs collected, that environmental variability between duplicate samples is small. Sample pairs with unacceptable levels of precision for particular analytes may reflect specific contaminants originating from

a source other than the field sampling activity. In general, these results indicate that sampling precision was acceptable for Phase 1 data. Field duplicates will be collected for Phase 2 of the CRRI.

C.1.4 Sample Processing and Preservation

Quality control of sample processing was assessed through a comparison of dissolved-to-total inorganic analyte pairs. Values for dissolved (filtered through 0.45-μm-pore-sized acid-washed filters) and total concentrations for particular sample pairs were compared. This comparison must consider the differences in solubility between specific analytes. For inorganic elements that are insoluble at the pH, oxidation-reduction and hardness values normally observed for surface waters throughout the Clinch River/Watts Bar Reservoir (CR/WBR) system, both values for which a specific dissolved analyte is equal to or greater than the total are considered unacceptable. For this discussion, the list of insoluble analytes includes beryllium, cadmium, chromium, copper, iron, lead, mercury, nickel, selenium, silver, and zinc. Analytes considered soluble under conditions observed in the CR/WBR should be equally proportioned in total and dissolved samples. Calcium, magnesium, potassium, and sodium should have similar dissolved and total values. QC issues for this comparison include (1) the adequacy of filtration equipment cleaning, (2) inconsistencies in analytical handling, and (3) purity of the preservative.

The field and duplicate dissolved-total sample pair comparisons are presented in Table C.5. Comparison of dissolved with total inorganic results for field and duplicate pairs was acceptable for all detected results for calcium, copper, iron, magnesium, potassium, and sodium. Dissolved-to-total cadmium and zinc values were unacceptable for CRM 1. Unacceptable dissolved-to-total comparisons were made for both mercury and silver at PCK 7.4. The cadmium dissolved-to-total comparison for CRM 43 was unacceptable. Cadmium and zinc dissolved-to-total values were unacceptable for CRM 103. Lead results for several sites, including CRM 0.5, CRM 1, PCK 9.6, and CRM 50.5, had unacceptable dissolved-to-total comparisons.

The impact of these unacceptable dissolved-to-total comparisons is limited for most sites because acceptable analytical comparisons were observed for similar sites within the same reach. However, unacceptable dissolved-to-total comparisons for lead at PCK 9.6 and cadmium and zinc in Norris Reservoir (CRM 103) are exceptions; contamination from other sources must be accounted for before Phase 1 sampling results from these sites can be used for their intended reference purposes. Additional sample collection will be performed at these and other reference sites in order to better characterize these sites for comparison with field sites during Phase 2 of the CRRI.

Rinse and field QC dissolved-to-total sample comparisons were unacceptable for beryllium and lead in the rinse blank for PCK 9.6; cadmium, calcium, chromium, copper, iron, magnesium, nickel, potassium, sodium, and zinc in the field blank for CRM 50.5; zinc in the rinse check for CRM 50.5; and lead in the rinse blank for TRM 557 (Table C.6). Iron values in the field sample are questionable because the QC blank values are four times greater than that observed in the field sample (Cook et al. 1992). These unacceptable comparisons do not impact the interpretation of Phase 1 results from these sites because the contamination either did not consist of contaminants of concern for Phase 1 (Energy Systems 1990), or do not coincide with measurable levels in field or duplicate samples. However, as noted in

Sect. C.1.2 above, the presence of detectable quantities of contaminants in blank samples is an unacceptable result.

All tritium results were rejected during validation and verification due to improper preservation. The validation failure of all ^{3}H values was unacceptable for processing completeness, negatively affecting completion of Phase 1 objectives. The improper preservation of ^{3}H represents the importance of defining the parameters for both analytical and verification/validation purposes prior to initiation of sample collection. Tritium will be analyzed for during Phase 2 of the CRRI.

The lack of consistent contamination in either the blanks or the dissolved-to-total pairs for a series of samples collected and processed at the same time indicates that equipment cleaning procedures and preservative purity were adequate to prevent cross contamination. The more random cross contamination observed suggests that inconsistencies in analytical processing may be the source for the observed blank and dissolved sample contamination. Analytical services will be controlled by preparation and negotiation of statements of work with analytical laboratories prior to the beginning of sample collection for Phase 2 of the CRRI.

C.2. SEDIMENT SAMPLING

C.2.1 Field Sampling Completeness

Sediment cores and surface grabs were collected at 14 sites throughout the study area. However, substitutions for several sampling locations identified in the plan were made during Phase 1. No sediment cores were collected at Poplar Creek mile 1.4 (PCK 2.2), which is at the K-1007B holding pond outfall, or Poplar Creek at the confluence of East Fork Poplar Creek (EFPC) (PCK 8.9); although an attempt was made, no sediment was present. Additionally, no sediment samples were collected from Fort Loudoun Reservoir. Sediment cores and surface grabs were collected in Grassy Creek embayment (CRM 14.5), middle Melton Hill Reservoir in Walker Branch embayment (CRM 33), and upper Melton Hill Reservoir at the Solway Bridge (CRM 44.1). These sites were not described in the work plan but were identified as possible contaminated areas during Phase 1. Overall the sampling is 100% complete.

C.2.2 Representativeness

One of the goals of Phase 1 sampling for sediment was to quantify the upper range of contaminant concentrations to provide a conservative estimate of the risks associated with exposure. Sediment core sampling sites were intentionally selected to be in areas suspected or known to have the highest concentrations of contaminants; therefore, results should be biased high and do not represent the average concentrations in the system. However, these data do represent the areas they are intended to represent.

During the course of Phase 1, a near-shore sediment characterization task was initiated. Because sediment grabs were collected near the shore in the exact areas where sediment-disturbing activities were proposed, the grabs are representative of those areas. An additional 400 to 500 sediment surface grabs were collected in near-shore areas throughout WBR, and results are representative of contaminant levels in these areas.

C.2.3 Field Duplicates

No field duplicates were collected. However, field splits were collected for both sediment cores and sediment surface grabs. Table C.7 presents the sediment cores, sample identification numbers, depth increments, and study reaches for which field splits were collected. Cores from Poplar Creek (Reach 3) and Norris Reservoir (Reach 10) do not have field splits. No conclusion regarding the precision of the alpha-emitting radionuclides can be made because no field splits were analyzed for these contaminants. The criteria for acceptability of field splits of sediment is for the RPD to be 35% or less when concentrations are greater than five times the average DL. For sample concentrations less than five times the average DL, the difference between the routine sample and the split sample concentrations must be less than twice the average DL to be acceptable.

All organic contaminants in the field split samples were below DLs; therefore, evaluation of RPDs was not performed. An evaluation of the difference between samples and splits was performed (Table C.8). However, using the DL as a concentration estimate and evaluating the differences between split concentrations (Table C.8) show that DLs for nearly all field splits for organic samples are within acceptable limits. The only splits that were out of control were from core 7100O and are only for some of the pesticides and PCBs (Table C.8).

Table C.9 presents the results for inorganic contaminants evaluations. The first part of Table C.9 presents the acceptability criteria (DL × 2) and includes selenium only because this is the only inorganic contaminant that was out of control for any split. The second part of Table C.9 consists of chromium only because this is the only contaminant that was out of control based on the RPDs being less than 35%. Two selenium splits and a single chromium split were the only samples that were out of control. The rest of the inorganic contaminant splits were acceptable.

All four splits for alpha-emitting radionuclides were within acceptable criteria for both ^{60}Co and ^{137}Cs.

Table C.10 presents the DERs for ^{60}Co and ^{137}Cs for sediment grab samples. Fourteen field splits were collected. Seven of these had ^{60}Co concentrations below detectable limits for the routine and/or the duplicate sample, and a single ^{137}Cs sample was below the DL. No RPD was calculated for these. All DER values for surface grab split samples were within acceptable criteria except for samples 56000B and 746000B which had values above 1.

C.2.4 Chain of Custody

Chain of custody was maintained for all samples from the time of collection to delivery to the analytical laboratories.

C.2.5 Sample Preparation and Preservation

All sediment core and grab samples were collected, prepared, and stored according to methods appropriate for the analysis for which each sample was submitted.

C.2.6 Laboratory Control Sediment Cores

Four cores were collected and completely homogenized by placing the entire core in a glass mixing bowl and stirring with a Teflon spoon. Appropriately sized aliquots were placed in glass jars, frozen, and submitted for analysis at different times along with routine samples to evaluate consistency over time within each laboratory. These cores were collected and analyzed for inorganic contaminants, one each from Norris Reservoir (1400T), Melton Hill Reservoir (7100T), and the Clinch River arm of Watts Bar Reservoir (2600T). A sample from each of these cores was submitted for analysis on ten different occasions. Four cores were collected for reference analysis of organics, one from Norris Reservoir (1900O), two from Melton Hill Reservoir (8700O and 7300O), and one from the Clinch River arm of Watts Bar Reservoir (3100O). Samples from the organic reference cores were submitted between three and seven times (depending on the core) during Phase 1. A single reference core from Norris Reservoir (1400G) was collected for alpha-emitting radionuclides. A sample from this core was analyzed on four separate occasions.

A mean concentration was calculated for each contaminant within a homogenized core. RPDs were calculated by comparing each aliquot concentration to the mean concentration. An RPD of 35% or less was defined as acceptable for sediment samples.

RPDs for inorganic contaminants are reported in Table C.11, and RPDs for radionuclides are reported in Table C.12. RPDs for organic contaminants were not calculated, because nearly every sample was below DLs.

Most inorganic contaminants were within acceptable limits throughout Phase 1 analysis. Inorganic contaminants that consistently exceeded control limits include cadmium, copper, chromium, and silver.

Radionuclide contaminants that consistently exceeded control limits include ^{245}Cm, ^{246}Cm, ^{248}Cm, ^{239}Pu, and ^{240}Pu. These contaminants were designated low priority during the screening risk assessment.

Much of the data from these cores were rejected because holding times were exceeded. This is discussed in more detail in Sect. 4. In fact, most of the rejected sediment data are from these cores.

C.3. FISH SAMPLING

C.3.1 Field Sampling Completeness

The minimum number of samples required to meet the objectives of Phase 1 was eight bluegill and eight catfish at each of 13 sites (White Oak Creek Embayment excluded). This goal was achieved at all sites except Poplar Creek/K1007 (only two bluegill) and Poplar Creek/Hartland Bridge (only four catfish, Table C.13). Because only two bluegill were collected at Poplar Creek/K1007, these data were combined with those from a nearby site (Poplar Creek embayment) for data analysis. As expected, the availability of largemouth bass was limited throughout the system, and eight samples were collected only at upper Chickamauga Reservoir. The number of bass collected at the other sites ranged from 0 to 5.

C.3.2 Representativeness

To characterize the entire CR/WBR system, sample sites were selected throughout the system ranging from those areas that are immediately impacted by surface water runoff from Oak Ridge Reservation (ORR) to those that are not affected by surface water releases from the ORR. Results will not be presented on a system wide basis but rather by reach or by site. Phase 1 sampling locations throughout the CR/WBR system were selected to generally characterize the extent of the contamination in those reaches of most concern (Reaches 1, 2, 3, 4, and 5, Table 3.2). More sites were sampled in those areas such as Poplar Creek (sites 8–11, Reach 3) and the Clinch River arm of Watts Bar Reservoir (sites 5, 6, 12, and 13, Reaches 2 and 4) that are nearest the ORR to better define the likely maximum concentrations of contaminants. Fewer sites were sampled in areas further downstream of the ORR (sites 14, 15, and 16, Reaches 5 and 15). Samples were also collected from Reach 1 (Melton Hill Reservoir, sites 2 and 3), which receives a limited amount of surface water input from the ORR. Two reference sites (Norris Reservoir and Poplar Creek at Hartland Bridge) were also sampled to provide background levels of contamination.

Because fish are mobile organisms, they are not necessarily representative of the contamination at the site from which they are collected. However, they are representative of the fish populations at that site. Because some species have larger home ranges and a greater tendency to roam than others, the representativeness of a single fish is highly dependent on the species. For example, bluegill typically have smaller home ranges than either bass or catfish and would be expected to be more representative of the location of their collection than either of those two species. By collecting several fish at each site, we are hopeful that the mean concentration is representative of the site. In addition, every effort was made to collect fish as near to the same size as possible to minimize differences among fish of the same species within a site.

After reviewing the data, the usefulness of the Hartland Bridge site as a reference is questionable. Although the site is upstream of the K-25 facility and of the confluence of EFPC (which is the source of contamination, primarily mercury, from the Y-12 Plant), the data suggest that the Hartland Bridge site is not far enough from the contaminated areas to prevent fish immigration from these areas. Mercury concentrations in most of the fish sampled from the Hartland Bridge site were very low, but a few had levels that were similar to those fish collected from the mouth of EFPC, which is only 1 km away.

C.3.3 Field Duplicates

The idea of a field duplicate of a fish sample is somewhat different than that of a water or sediment sample. However, the intent of duplicate samples regardless of the matrix is the same: to provide a measure of the variability from sampling error and/or within site spatial variation in contamination. The reality of collecting a duplicate fish is really not possible because differences in size, diet, and other factors can result in marked differences in contaminant body burdens. Variability because of sampling error is not a concern in this case, but by collecting several fish of the same species and similar size we were able to get an estimate of the among-fish (within-site) variability in contaminant concentrations. Table C.14 presents the RSDs for selected analytes for each site sampled. There are no requirements that these RSDs be within particular control limits. However, this information will be useful for placing other sources of variation in perspective and for determining the number of samples required in future sampling.

C.3.4 Field Splits

Selected samples were split into two equal aliquots each and analyzed separately to evaluate sample homogenization and the precision of the analytical methods. Eight bluegill and six bass samples were submitted to the CPA of the ACD of ORNL for split-mercury analysis. All 14 split-sample results were judged to be of acceptable precision (Table C.15). Six bluegill and six bass samples were also submitted to the CPA for split sample analysis of 12 ICP metals. For all the ICP metals combined, 79% (26 of 33) of those split samples that could be evaluated were within acceptable limits (Table C.15). Only beryllium had more than one unacceptable comparison (three of three were unacceptable). No measure of precision could be made for antimony, chromium, lead, silver, and thallium because there were no detectable results in the split samples.

Eight catfish samples were submitted to the OAL of ACD at ORNL in replicate for split samples of semivolatile organics, pesticides, and PCBs. Of the 520 semivolatile analyses performed, only two measurable results were reported. This is insufficient to make any evaluation of precision based on split sample results. Because 99.9% of the semivolatile analyses resulted in undetectable concentrations, the lack of a measure of precision is not a problem, assuming the accuracy is correct. Accuracy of these analyses will be discussed in Chap. 4.

Split samples analyzed for 11 pesticides resulted in 54 (of 88 total) split pairs with adequate data to measure precision acceptability (Table C.16). None of the split samples had a detectable value for chlordene, so no evaluation of this analyte could be made. As with semivolatiles, the lack of a precision measure for chlordene analysis is not a serious problem because of the high degree of nondetects (93%). Of the 54 estimates of precision, 50 (93%) met acceptable criteria.

Split samples analyzed by the OAL for Aroclor 1254 were within acceptable limits 50% of the time (four of eight pairs), and Aroclor 1260 split samples were within acceptable limits 100% of the time (eight of eight pairs, Table C.17). Six bass and 19 catfish samples were also submitted to the CPA for split sample analysis of PCBs. Split samples analyzed for Aroclor 1254 were within acceptable limits 45% of the time (10 of 22 pairs), and Aroclor 1260 split samples were within acceptable limits 79% of the time (19 of 24 pairs, Table C.17).

C.3.5 Chain of Custody

Chain of custody was maintained for all samples from the time of collection to delivery to the analytical laboratories.

C.3.6 Sample Preparation and Preservation

With one notable exception, fish samples were prepared in a proper and acceptable manner, handled and packaged such that any external contamination was prevented, and stored in a constantly frozen state. The exception was in the way that largemouth bass samples were prepared. As per the procedures described in the Phase 1 Plan (Energy Systems 1990), largemouth bass fillets were skinned during processing. This is acceptable for catfish but not for bass or bluegill (the bluegill samples were not skinned), according to Food and Drug Administration (FDA) guidelines for fish tissue preparation (FDA 1990). This is particularly relevant in PCB analysis because of the fine layer of fat tissue (i.e., lipids) located

immediately adjacent to the skin. PCBs are hydrophobic and, thus, accumulate in areas of high lipid concentration. Removal of the skin could result in lower PCB concentrations than what would be found if the fish had not been skinned. The use of skinned bass fillets is also contrary to the methods of Tennessee Valley Authority (TVA), which has collected a large amount of information on contaminants in fish for the CR/WBR system and other east Tennessee reservoirs. The data from skinned bass samples are not directly comparable with the TVA data. For these reasons, largemouth bass PCB data were excluded from the Phase 1 data summary and risk screening.

Rinse blanks of fish processing implements (i.e., fillet knives) were not collected, though it is practically impossible for cross-contamination to occur given the multitude of precautionary actions that are part of standard processing procedures.

Table C.1. Quality control sample results for equipment rinse blank samples submitted for dissolved and total inorganic analyses (detected analytes only)

Analyte (average DL[a])	Poplar Creek kilometer 9.6	Poplar Creek kilometer 7.6		Tennessee River mile 557		Clinch River mile 50.5	
Inorganic	Dissolved	Dissolved	Total	Dissolved	Total	Dissolved	Total
Site affected by these samples/Rinse blank sample identification numbers							
Beryllium (3.9 ug/L)	3.9						
Cadmium (0.2 ug/L)							0.32
Calcium (74.4 ug/L)		282	372	107	195	75	67
Iron (12.0 ug/L)					85		49
Lead (1.6 ug/L)	2.5		1.8	1.1			
Magnesium (24.2 ug/L)						16	22
Nickel (19 ug/L)					19		
Sodium (186.4 ug/L)						211	151
Zinc (9.6 ug/L)						14	13

[a]detection limit

Table C.2. Trip and field blank water samples submitted for dissolved and total inorganic analyses

Inorganic analyte (average DL[a]) (ug/L)	CRM[b] 9.6 CRM 14.5 CRM 19.6	CRM 50.5
	140T	1470M
Sites affected by these samples/Trip or field blank		
Cadmium (0.2)		0.21
Calcium (74.4)		2350
Chromium (9.8)		34
Copper (4.4)		28
Iron (12.0)		449
Magnesium (24.2)		293
Nickel (19)		46
Potassium (234)		641
Selenium (0.9)	0.97	
Sodium (186.4)		2480
Zinc (9.6)		229

[a]detection limit
[b]Clinch River Mile

Table C.3. Precision assessment for field duplicate water samples. Relative percent difference values greater than 20% reflect unacceptable levels of precision

Inorganic analyte (average DL[a]) (ug/L)	CRM[b] 1.0		TRM[c] 531		TRM 547		CRM 0.5		CRM 43		
	102M / 108M	102T / 108T	131M / 1311M	131T / 1311T	132M / 1321M	132T / 1321T	137M / 1371M	137T / 1371T	139M / 1391M	139T / 1391T	Average RPD[d]
	Sites affected by these samples/Sample identification numbers (routine/duplicate)										
Cadmium (0.2)	<[e]	U[f]	U	U	U	U	U	U	<	U	N/A[g]
Calcium (74.4)	NA[h]	NA	3.7	2.1	4.0	1.1	0.4	10.1	3.2	0.3	2.5
Iron (12.0)	NA	NA	<	3.8	<	1.4	<	14.3	173.8	0.3	N/A
Lead (1.6)	<	<	<	<	<	<	147.8	<	<	<	N/A
Magnesium (24.2)	NA	NA	2.2	1.6	3.6	1.1	1.0	8.9	3.5	1.0	2.3
Mercury (0.2)	U	U	U	U	U	U	U	<	U	U	N/A
Potassium (234)	NA	NA	6.9	7.2	9.0	5.1	0.0	9.0	5.2	0.0	4.2
Sodium (186.4)	NA	NA	2.9	2.3	3.0	1.5	0.8	10.5	2.6	1.1	2.5
Zinc (9.6)	<	<	<	<	U	U	<	<	<	<	N/A
Organic	101O / 107O		131O / 1311O		132O / 1321O		137O / 1371O		139O / 1391O		
Bis(2-ethylhexyl)phthalate (9.4)	U		195.6		<		U		<		
Di-n-octylphthalate (10)	U		U		<		U		U		
Diethylphthalate (10)	U		U		<		U		U		

[a] *detection limit,*
[b] *Clinch River Mile,*
[c] *Tennessee River Mile,*
[d] *relative percent difference,*
[e] *average duplicate concentration less than five times the average DL,*
[f] *not detected,*
[g] *not applicable,*
[h] *not analyzed.*

Table C.4. Test for precision of duplicate pairs with average values <5 times the mean detection limit for particular water analytes

Inorganic analyte (average DL[a]) (ug/L)	*CRM[b] 1.0*		*TRM[c] 531*		*TRM 547*		*CRM 0.5*		*CRM 43*	
	102M/ 108M	*102T/ 108T*	*131M/ 1311M*	*131T/ 1311T*	*132M/ 1321M*	*132T/ 1321T*	*137M/ 1371M*	*137T/ 1371T*	*139M/ 1391M*	*139T/ 1391T*
	Sites affected by these samples/Sample identification numbers (routine/duplicate)									
Cadmium (0.2)	*0.6*	*U[d]*	*U*	*U*	*U*	*U*	*U*	*U*	*0.14*	*U*
Calcium (74.4)	*NA[e]*	*NA*	*>[f]*	*>*	*>*	*>*	*>*	*>*	*>*	*>*
Iron (12.0)	*NA*	*NA*	*23*	*3.8*	*19.3*	*>*	*2.8*	*>*	*>*	*>*
Lead (1.6)	*4.9*	*0.5*	*0.9*	*0.34*	*0.24*	*1.64*	*>*	*0.8*	*1.2*	*0.5*
Magnesium (24.2)	*NA*	*NA*	*>*	*>*	*>*	*>*	*>*	*>*	*>*	*>*
Mercury (0.2)	*U*	*U*	*U*	*U*	*U*	*U*	*U*	*0.014*	*U*	*U*
Potassium (234)	*NA*	*NA*	*>*	*>*	*>*	*>*	*>*	*>*	*>*	*>*
Sodium (186.4)	*NA*	*NA*	*>*	*>*	*>*	*>*	*>*	*>*	*>*	*>*
Zinc (9.6)	*1.9*	*2.6*	*2.9*	*2.0*	*U*	*U*	*0.4*	*2.0*	*10.6*	*1.0*

Organic	*101O/ 107O*	*131O/ 1311O*	*132O/ 1321O*	*137O/ 1371O*	*139O/ 1391O*
Bis(2-ethylhexyl) phthalate (9.4)	*U*	*>*	*7*	*U*	*Z 8*
Di-n-octylphthalate (10)	*U*	*U*	*9.3*	*U*	*U*
Diethylphthalate (10)	*U*	*U*	*9*	*U*	*U*

[a] *detection limit,*
[b] *Clinch River Mile,*
[c] *Tennessee River Mile,*
[d] *not detected,*
[e] *not analyzed,*
[f] *average duplicate concentration greater than or equal to 5 times the average DL.*

Value is the absolute value of the difference between duplicate pairs for comparison with the average DL.

Numbers greater than the value of the DL reflect unacceptable levels of precision.

C.5. Test comparing dissolved and total inorganic results for regular and field duplicate samples

Analyte / Sites	Sample identification number	Cadmium	Copper	Iron	Lead	Mercury	Silver	Zinc
		Insoluble inorganic analytes only						
TRM 531	131	U	U	A	U	U	U	U
	1311	U	U	A	U	U	U	U
TRM 547	132	U	U	A	U	U	U	U
	1321	U	U	A	U	U	U	U
TRM 557	146	U	U	A	U	U	U	U
TRM 567	136	U	U	A	U	U	U	U
CRM 0.5	137	U	U	A	U	U	U	U
	1371	U	U	A	O	A	U	U
CRM 1.0	102	O	U	---	A	U	U	O
	108	O	U	---	O	U	U	A
CRM 9.6	133	U	U	A	U	U	U	U
PCK 9.6	145	U	U	A	O	U	U	U
PCK 8.8	144	U	U	A	A	U	A	U
PCK 7.4	143	U	U	A	A	O	O	U
PCK 2.2	142	U	U	A	U	U	U	U
PCK 0.25	141	U	U	A	U	U	U	U
CRM 14.5	134	U	A	A	U	U	U	A
CRM 19.7	135	U	U	A	U	U	U	U
CRM 24	138	U	U	A	U	U	U	U
CRM 43	139	O	U	A	U	U	U	U
	1391	O	U	A	U	U	U	U
CRM 50.5	147	U	U	A	O	U	U	U
CRM 103.0	112	U	U	U	U	U	U	O

A = site-analyte combinations with acceptable comparisons, O = unacceptable comparisions, "-" = non-requested analytes, and U = nondetected values.

Results for soluble analytes, including calcium, magnesium, potassium and sodium, as well as antimony, arsenic, beryllium, chromium nickel, selenium and thallium, which were not detected in any samples, are not presented.

Table C.6. Test comparing dissolved and total inorganic results for quality control blank and equipment rinse samples (insoluable, inorganic analytes only)

Inorganic Analyte	CRM[a] 9.6, 14.5, 19.7	PCK[b] 0.25, 2.2	PCK 9.6	PCK 7.6	PCK 8.8	TRM[c] 557 51	CRM 50.5	
	140	150	1422	1442	1452	1432	1470	1462
	Site affected by these samples/Rinse blank sample identification number							
Beryllium	U	U	O	U	U	U	U	U
Cadmium	U	U	U	U	U	U	O	A
Calcium	U	U	U	A	U	A	O	A
Chromium	U	U	U	U	U	U	O	U
Copper	U	U	U	U	U	U	O	U
Iron	U	U	U	U	U	A	O	A
Lead	U	U	O	A	U	O	U	U
Magnesium	U	U	U	U	U	U	O	A
Nickel	U	U	U	U	U	A	O	U
Potassium	U	U	U	U	U	U	O	U
Selenium	A	U	U	U	U	U	U	U
Sodium	U	U	U	U	U	U	O	A
Zinc	U	U	U	U	U	U	O	O

[a]Clinch River Mile,
[b]Poplar Creek Kilometer,
[c]Tennessee River Mile,
A = site-analyte combinations with acceptable comparisons, O = unacceptable comparisions, U = nondetected values.

Results for soluble analytes, including calcium, magnesium, potassium, and sodium, as well as antimony, arsenic, beryllium, chromium nickel, selenium, and thallium, which were not detected in any samples, are not presented.

Table C.7. Number of sediment cores and field splits collected during Phase 1

	Total number of cores	Number of field splits
Organics	14	4
Inorganics	14	7
Radionuclides	14	4

Table C.8. Evaluation of organic analysis of field splits from sediment cores[a]

	DL x 2[b] (mg/kg)	4800O	6900O	7100O	8100O
Aldrin	(0.48)	A	A	O	A
Alpha-BHC	(0.48)	A	A	O	A
Alpha-Chlordane	(4.76)	A	O	A	A
Aroclor-1016	(4.76)	A	A	O	A
Aroclor-1221	(4.76)	A	A	O	A
Aroclor-1232	(4.76)	A	A	O	A
Aroclor-1242	(4.76)	A	A	O	A
Aroclor-1248	(4.76)	A	A	O	A
Beta-BHC	(0.48)	A	A	O	A
Delta-BHC	(0.48)	A	A	O	A
Endosulfan I	(0.48)	A	A	O	A
Gamma-BHC (Lindane)	(0.48)	A	O	O	A
Gamma-chlordane	(4.76)	A	A	A	A
Heptachlor	(0.48)	A	A	A	A
Heptachlor epoxide	(0.48)	A	A	A	A

[a]If reported concentrations were less than 5 times the average DL the difference between the routine and duplicate concentrations must be within 2-times the DL to be acceptable. If the reported concentrations was greater than 5 times the average DL or there were no nondetects reported, the relative percent difference (RPD) must be less than 36%. "A" indicates difference or RPD is within acceptable limits;
[b]detection limit.

Table C.9. Evaluation of inorganic analysis of field splits from sediment cores[a]

	DL x 2 (mg/kg)	4700t	6700t	71000t	71100t	71600t	71700t	7900t
Inorganic contaminants with concentrations less than five times DL								
Selenium	(0.74)	A	A	A	A	O	O	A
Inorganic contaminants with no reported DL								
Chromium		A	A	A	A	A	O	A

[a]If reported concentrations were less than five times the average DL the difference between the routine and duplicate concentrations must be within two-times the DL to be acceptable. If the reported concentrations was greater than five times the average DL or there were no nondetects reported, the relative percent difference (RPD) must be less than 36%. "A" indicates difference or RPD is within acceptable limits.

Table C.10. Relative percent differences of radionuclide concentrations for field splits of sediment grabs

Sample identification	Duplicate sample identification	^{60}Co DER[a]	^{137}Cs DER
56000B	56100B	0.09	2.24
60500B	60600B		0.31
63100B	63200B	0.01	1.89
64300B	64700B	0.11	0.72
65800B	65900B		0.70
67000B	67100B	0.41	0.47
68500B	68600B	0.59	0.25
68900B	69000B	0.75	0.46
69100B	69200B		0.78
69800B	69900B		0.03
70500B	70600B	0.27	0.46
72400B	72500B	0.35	0.70
73300B	73400B		0.27
74600B	74700B		8.18

[a]duplicate error ratios

Table C.11. Relative percent differences for laboratory test samples submitted for inorganic analysis

	1402	1403	1404	1405	1406	1407	1408	1409	1410	1411	Mean RPD[a]
Arsenic	8.72	2.88	39.66	55.10	43.49	5.95	19.52	37.02	53.69	7.60	27.36
Beryllium	13.21	4.52	17.74	200.00	32.99	10.88	4.52	17.74	13.21	10.88	32.57
Chromium	7.05	6.92	15.76	200.00	65.15	2.04	34.03	5.74	22.99	26.57	38.63
Copper	14.60	23.61	29.89	200.00	68.08	19.01	27.43	3.61	6.28	1.41	39.39
Lead	17.63	24.96	17.63	36.90	26.63	28.21	62.07	1.88	51.25	11.93	27.91
Mercury	1.24	11.76	11.76	1.24	23.78	11.76	1.24	200.00	23.78	1.24	28.78
Nickel	14.39	10.15	1.06	200.00	55.90	14.39	14.88	2.95	14.33	22.33	35.04
Zinc	15.60	34.47	19.35	175.91	52.07	0.39	5.37	13.67	14.64	25.55	35.70
	2601	2602	2603	2604	2605	2606	2607	2608	2609	2610	Mean RPD
Arsenic	5.40	55.02	27.42	11.96	46.89	17.93	10.53	43.16	23.16	31.19	27.27
Beryllium	19.78	11.50	11.50	6.72	1.98	1.98	21.96	22.05	22.05	6.72	12.62
Cadmium	18.50	12.45	51.05	12.45	32.25	102.79	43.60	36.38	75.97	55.37	44.08
Chromium	12.59	8.34	26.43	5.26	8.34	12.59	8.34	37.17	12.61	6.35	13.80
Copper	10.01	1.80	1.80	20.17	5.80	7.20	7.20	41.58	1.05	15.27	11.19
Lead	17.06	4.18	18.44	2.08	4.79	16.50	5.89	33.99	13.36	9.47	12.58
Mercury	10.92	16.82	3.61	200.00	200.00	200.00	1.82	38.65	10.36	69.52	75.17
Nickel	8.10	0.96	11.87	5.19	2.43	4.47	28.39	35.69	13.15	5.91	11.62
Selenium	40.66	77.51	35.69	35.69	200.00	200.00	0.69	42.82	67.28	0.69	70.10
Zinc	24.24	5.59	30.99	2.78	4.94	1.30	21.85	29.85	11.30	9.64	14.25
	7101	7102	7103	7104	7105	7106	7107	7108	7109	7110	Mean RPD
Arsenic	2.12	21.71	11.46	45.61	26.09	48.16	62.39	63.97	9.52	2.12	29.31
Beryllium	7.85	47.47	25.94	47.47	1.68	1.40	1.68	27.97	32.41	29.10	22.30
Cadmium	125.23	200.00	125.23	106.16	117.33	200.00	78.75	72.84	26.29	20.31	107.21
Chromium	0.68	50.79	24.67	43.79	35.26	55.18	11.88	60.72	16.58	23.61	32.32
Copper	15.44	2.76	2.76	37.96	8.57	20.13	4.78	11.09	13.77	26.35	14.36
Lead	11.06	39.20	41.79	11.42	34.88	16.92	56.43	3.71	4.70	11.42	23.16
Mercury	9.97	4.57	4.57	28.03	18.73	4.57	15.66	15.66	43.67	200.00	34.54
Nickel	44.89	103.79	5.12	57.36	3.46	53.49	3.46	5.17	40.78	84.74	40.23
Silver	126.01	126.01	111.60	126.01	66.03	57.93	48.79	45.48	200.00	200.00	110.79
Zinc	16.82	200.00	27.90	28.88	16.42	42.19	9.88	9.03	34.22	0.78	38.61

[a] *relative percent difference*

Table C.12. Relative percent differences for laboratory test samples submitted for alpha-emitting radionuclide analysis

	1413	1414	1415	1416	Mean RPD[a]
Am-241	62.86	19.61	19.61	4.26	26.58
Cm-243,244	9.71	47.21	72.05	0.43	32.35
Cm-245,246	48.27	31.64	44.87	67.92	48.17
Cm-248	32.63	63.24	56.47	22.70	43.76
Pu-238	22.22	46.15	22.22	22.22	28.21
Pu-239,240	66.67	66.67	0.00	66.67	50.00
Sr-90	-1000.00			-90.91	-545.45
U-234	7.71	4.54	12.28	29.54	13.52
U-235	23.26	17.14	17.14	5.13	15.67
U-238	2.37	8.33	13.43	9.21	8.34

[a]relative percent difference

Table C.13. Number of regular samples submitted for each analytical group by location

	Mercury		Metals		PCBs		SVOs and pesticides	Gamma rads			^{90}Sr
Site	BG	LMB	BG	LMB	CHC	CHC	CHC	CHC	BG	LMB	CHC
1	10	5	10	5	5	8	8	8	5	4	8
2	10	5	10	5	5	8	8	8	2	5	8
3	10	3	10	3	3	8	8	8	2	3	0
5	11	2	11	2	2	8	8	8	10	2	0
6	0	0	0	0	0	6	6	6	0	0	6
7	10	0	10	0	0	4	4	4	2	0	4
8	9	0	9	0	0	8	8	8	4	0	8
9	9	4	9	4	4	8	8	8	2	4	0
10	2	1	2	1	1	10	10	9	5	1	10
11	8	2	8	2	2	10	10	7	0	2	10
12	9	3	9	3	3	8	8	8	9	3	0
13	10	5	10	5	5	10	10	10	5	5	10
14	10	2	10	2	2	9	9	8	2	2	9
15	10	3	30	3	3	10	10	10	2	2	10
16	8	8	8	8	8	4	4	3	2	8	4
	126	43	126	43	43	119	119	113	52	41	87

PCB = polychlorinated biphenyls, SVOs = semivolatile organics, BG = blue gill, LMB = largemouth bass, CHC = channel fish

Table C.14. Summary of relative standard deviations of concentrations of mercury, zinc, ^{137}Cs, Aroclor 1254, and Aroclor 1260 in fish tissue for Phase 1 sampling locations

Analyte	Site	Mean	Standard deviation	Relative standard deviation	Mean relative standard deviation
Mercury	1	0.21	0.10	47.6	
	2	0.08	0.05	62.5	
	3	0.04	0.02	50.0	
	5	0.09	0.10	111.1	
	7	0.17	0.22	129.4	
	8	0.57	0.22	38.6	
	9	0.55	0.19	34.5	
	10	0.34	0.12	35.3	
	12	0.43	0.18	41.9	
	13	0.11	0.06	54.5	
	14	0.06	0.04	66.7	
	15	0.10	0.08	80.0	
	16	0.15	0.09	60.0	62.5
Cs-137	1	0.07	0.06	85.7	
	2	0.06	0.04	66.7	
	3	0.06	0.04	66.7	
	5	0.49	0.52	106.1	
	6	0.19	0.10	52.6	
	7	0.08	0.04	50.0	
	8	0.10	0.07	70.0	
	9	0.09	0.03	33.3	
	10	0.08	0.04	50.0	
	11	0.17	0.09	52.9	
	12	0.20	0.25	125.0	
	13	0.13	0.06	46.2	
	14	0.09	0.05	55.6	
	15	0.07	0.05	71.4	
	16	0.08	0.05	62.5	66.3
Aroclor 1260	1	0.03	0.03	100.0	

Table C.14. (continued)

Analyte	Site	Mean	Standard deviation	Relative standard deviation	Mean relative standard deviation
	2	0.74	0.95	128.4	
	3	0.21	0.10	47.6	
	5	0.99	0.70	70.7	
	6	0.68	0.51	75.0	
	7	0.30	0.08	26.7	
	8	0.33	0.28	84.8	
	9	0.94	0.87	92.6	
	10	0.56	0.42	75.0	
	11	0.36	0.12	33.3	
	12	0.70	0.71	101.4	
	13	0.88	1.03	117.0	
	14	0.26	0.15	57.7	
	15	0.67	0.34	50.7	
	16	0.39	0.25	64.1	75.0

Table C.15. Summary of duplicate analyses performed on inorganic analyses of fish samples

Fish number	As	Be	Cu	Hg	Ni	Se	Zn
			Bluegill				
1000	-	-	-	A	-	A	A
1012	A	-	-	A	-	A	A
1087				A			
8402				A			
8405	-	-	-	A	-	A	A
8430	-	-	-	A	-	-	A
8450	A	O	-	A	-	-	A
8461	-	-	-	A	-	O	A
			Bass				
1024	A	-	-	A	-	A	A
1050	A	O	-	A	-	-	A
1067	O	-	-	A	-	A	A
1068	A	-	-	A	-	A	A
1456	A	-	O	A	A	A	A
8452	A	O	-	A	-	-	O

A = the duplicate measure was within the acceptance criteria, O = the measure was out of control limits, and "-" = no measure was calculated because the concentration of each sample of the replicate pair was undetectable.

Table C.16. Summary of duplicate analyses performed on pesticide analyses of fish samples

Fish number	aldrin	tech chl	DDD	DDE	DDT	A-ch dane	A-ch dene	G-ch dane	G-ch dene	oxy chl
					Catfish					
1121	A	A	-	A	A	A	-	A	-	-
5014	A	A	-	A	A	O	A	A	A	O
6559	-	A	-	-	-	O	-	A	A	A
7796	-	A	-	-	-	A	-	A	A	A
9726	-	A	A	A	-	A	-	A	A	A
9751	-	A	A	O	-	A	A	A	A	-
9763	A	A	A	A	-	A	A	A	A	-
9780	-	A	A	A	-	A	A	A	A	A

A = the duplicate measure was within the acceptance criteria, O = the meausure was out of control limits, and "-" = no measure was calculated because the concentration of each sample of the replicate pair was undetectable.

Analytes include aldrin, technical chlordane, DDD, DDE, DDT, alpha chlordane, alpha chlordene, gamma chlordane, gamma chlordene, oxychlordane.

Table C.17. Summary of duplicate analyses performed on polychlorinatd biphenyls (PCB) analyses of fish samples

Fish number	CPA[a]/ORNL[b]		OAL[c]/ORNL	
	PCB 1254	PCB 1260	PCB 1254	PCB 1260
		Bass		
1024	A	A		
1050	A	-		
1067	-	A		
1068	-	A		
1456	A	A		
8452	O	O		
		Catfish		
1121	-	O	A	A
5007	O	O		
5013	A	A		
5014			E	A
5024	A	A		
6559	O	O	A	A
7499	O	A		
7767	O	A		
7770	O	A		
7772	O	O		
7775	O	A		
7776	O	A		
7777	O	A		
7779	A	A		
7796			E	A
9726	A	A	A	A
9731	A	A		
9732	O	A		
9751	O	A	A	A
9763	A	A	E	A
9780	A	A	E	A

[a]Chemical and Physical Analysis Group,
[b]Oak Ridge National Laboratory,
[c]Organic Analysis Laboratory,
A = the duplicate measure was within the acceptance criteria, O = the measure was out of control limits, "-" = no measure was calculated because the concentration of each sample of the replicate pair was undetectable.

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