Ecological Risk Assessment for French Gulch/Wellington-Oro Mine Site

Breckenridge, Colorado

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AD	Adult
AGS	American Geological Services, Inc.
AUF	Area Use Factor
AWQC	Ambient Water Quality Criteria
BCC	Bioaccumulative chemical of concern
BR	Blue River
BSD	Breckenridge Sanitation District
BW	Body Weight
CBMA	Country Boy Mine Adit
CDMG	Colorado Division of Minerals and Geology
CDOW	Colorado Division of Wildlife
CDPHE	Colorado Department of Public Health and the Environment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CF	Conversion Factor
COC	Chemical of Concern
COPC	Chemical of Potential Concern
DQO	Data Quality Objective
DW	Dry Weight
EMB	Embryo
EPT	Ephemeroptera, Plecoptera and Tricoptera
ERA	Ecological Risk Assessment
ERAGS	Ecological Risk Assessment Guidance for Superfund
ERL	Effects Range Low
ERM	Effects Range Median
EPC	Exposure Point Concentration
FC	French Creek
FG	French Gulch
FROG	French Gulch Remediation Opportunities Group
GIS	Geographic Information System
GLWQG	Great Lakes Water Quality Guidance
HI	Hazard Index
HQ	Hazard Quotient
IR	Ingestion Rate
JV	Juvenile
KDS	Kenny Dog Springs
LOAEL	Lowest-Observed-Adverse-Effect-Level
MGB	Magnum Brown Drive
NAWQA	National Water Quality Assessment

NEC	No Effect Concentration
NWCCOG	Northwest Colorado Council of Governments
NDIS	Natural Diversity Information Source
NOAA	National Oceanic and Atmospheric Administration
NOAEL	No-Observed-Adverse-Effect-Level
NPS	Non-point Source
PEC	Probable Effect Concentration
PEL	Probable Effects Level
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RAS	Radon Abatement Services Inc.
RBP	Rapid Bioassessment Protocol
RLCVT	Reliance Drive Culvert
SAP	Sampling and Analysis Plan
SCM	Site Conceptual Model
SCoP	System for Conservation Planning
SEC	Sediment Effects Concentration
SERA	Screening Ecological Risk Assessment
SET	Severe Effects Threshold
SQG	Sediment Quality Guidelines
SRC	Syracuse Research Corporation
START	Superfund Technical Assessment and Response Team
TEC	Threshold Effect Concentration
TEL	Threshold Effects Level
TRV	Toxicity Reference Value
TVS	Table Value Standards
UF	Uncertainty Factor
URS	URS Operating Services, Inc.
UOS	URS Operating Services, Inc.
USBOR	United States Bureau of Reclamation
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
W-O	Wellington-Oro
WP	Waste Pile
WQCC	Water Quality Control Commission

1.0 INTRODUCTION

1.1 Purpose

This document is an ecological risk assessment for the French Gulch/Wellington-Oro Mine Site (French Gulch) near Breckenridge, Colorado (Figure 1-1). Reasons for potential ecological concern at the site include historic releases of solid waste materials from mining, milling and smelting activities that occurred in the area, as well as on-going releases of contaminated groundwater and surface water.

The purpose of an ecological risk assessment (ERA) is to describe the likelihood, nature, and extent of adverse effects which environmental chemical contamination may be having on the ecological receptors at the site. This information, along with other relevant information, is used by risk managers to make decisions whether remedial actions are needed to protect the environment. If remediation is warranted, an investigation is performed to evaluate the relative merits of a range of alternatives remedial actions which might be undertaken to achieve risk management goals at the site.

1.2 Approach

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

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

Following completion of the SERA, the USEPA undertook further data collection efforts to support a more detailed and thorough evaluation of ecological impacts at the site. These efforts included collection of additional surface water, data, site-specific surface water toxicity testing (Lockheed Martin, 2000), and an analysis of the aquatic habitat quality in French Gulch and the Blue River.

The current report utilizes the new data along with the historical data to provide an updated and refined ecological risk evaluation for the site.

1.3 Organization

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

Section 2 - This section details the location, description, environmental setting, and history of the French Gulch Site.

Section 3 - This section discusses the available data for the French Gulch Site including a description of the nature and extent of heavy metal contamination present in surface water, sediment, fish tissue and surface soil.

Section 4 - This section presents the ecological problem formulation, including the site conceptual model, the chemicals of concern, and the presentation of assessment and measurement endpoints.

Section 5 - This section presents the ecological exposure assessment for all aquatic and terrestrial receptors of concern.

Section 6 - This section presents the ecological effects assessment, including descriptions of toxicity benchmarks for aquatic receptors (benthic invertebrates, fish), terrestrial receptors (plants, soil invertebrates), and amphibians, as well as wildlife toxicity reference values (TRVs).

Section 7 - This section presents the ecological risk characterization for all aquatic and terrestrial receptors of concern.

Section 8 - This section presents the uncertainties associated with the ERA and the potential impact of these uncertainties on risk estimates.

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

2.0 SITE CHARACTERIZATION

2.1 Site Location

The French Gulch/Wellington-Oro Site (French Gulch Site) is located in Summit County, Colorado, approximately 80 miles west of Denver, near the town of Breckenridge (Figure 1-1).

2.2 Site Description

French Gulch is an east-west trending valley located on the western slope of the continental divide. Surface water drainage through the French Gulch valley flows from east to west, discharging to the Blue River. The Blue River then flows north (except for a segment where it disappears one mile downstream of the confluence with French Gulch) for 10 miles, discharging to the Dillon Reservoir near the town of Frisco. A schematic map of the site layout is provided in Figure 2-1.

Mining History

The French Gulch valley includes several abandoned mine and mill sites (Figure 2-1, Figure 2-2). A timeline of specific mining activities within the French Gulch valley is provided in Table 2-1.

The Wellington-Oro (W-O) mining complex was the largest lode mining operation in French Gulch. Originally operating separately, the Oro mine was combined with the Wellington mine in 1907. The majority of mining activities occurred from the 1880's until the 1930's, with some mining continuing until the 1970's. During this time, lead, zinc, copper, silver, and gold ores were removed from over 12 miles of tunnels, adits, drifts, stopes, and crosscuts (AGS, 1999). In 1908, a 100-ton gravity mill was built at the W-O mine complex to concentrate lead, zinc, and pyrite. The gravity mill was in operation until 1929. A 50-ton roaster and magnetic separation plant was constructed in 1912 to remove iron and sulfur from the zinc ores (AGS, 1999). In 1927, the roaster and magnetic separation plant was replaced by a more economical flotation mill.

Beginning in the late 1850's, the French Gulch valley floor and the Blue River were extensively mined using placer mining techniques, including the operation of floating placer dredges.

Dredging operations ceased in the 1940's (AGS, 1999). Placer mining activities completely altered the topography of the valley floor and rerouted the flows of French Gulch and the Blue River. The dredge boats removed the alluvial valley material, leaving behind 40 to 50 foot piles of boulders, cobbles, and gravel (Figure 2-3). Currently, the resulting dredged material covers the French Gulch valley floor for approximately 3.5 miles from the confluence of French Gulch with the Blue River (Richard, 1997). In addition, much of the Blue River bottom is covered with the dredged material (Figure 2-4).

Current Impacts of Mine Waste on the Environment

Currently, French Gulch and the Blue River receive metal loadings from the mine and mill sites from both surface and groundwater sources. Surface sources consist of mill tailings, roaster fines, and mine waste rock (Morrissey, 1995). Groundwater contamination is associated with drainage from flooded underground mine workings and seepage of leachate from surface tailings and mine waste piles. A hydrogeological investigation completed in 1994 by the Colorado Division of Minerals and Geology (CDMG) and USEPA (Morrissey, 1995) concluded that significant metals loading into French Gulch occurs from the shale bedrock and that metals are transported via groundwater pathways to French Gulch. Conflicting information exists regarding the relative contribution of surface leaching of metals from the mine waste rock, roaster fines, and mill tailings. Using radioisotope techniques, Radon Abatement Systems, Inc. (RAS) (1996) considered the increase of metals in French Gulch from surface wastes to be minimal. However, AdrianBrown (1997) calculated that approximately 30 percent of the total zinc in French Gulch originated from surface waste associated with the Wellington-Oro mining complex.

2.3 Site Environmental Setting

2.3.1 Topography

French Gulch is the primary drainage in the French Gulch system, originating near Mount Guyot, which is located west of the Continental Divide. French Gulch flows west to its confluence with the Blue River, near Breckenridge (Figure 2-5). The Blue River originates in the watershed near Hoosier Pass and meanders adjacent to State Highway 9 through Breckenridge and eventually empties into the Dillon Reservoir (Figure 2-6).

Because of concerns over impacts of mine waste on French Gulch, the flow of French Gulch was modified in 1993 by the CDMG. This project diverted the upgradient, relatively clean main branch of French Gulch southward around site areas of dredged material, forming the South Branch of French Gulch. The purpose of the diversion was to segregate clean stream water prior to flowing across contaminated areas, lessening the amount of metals being carried away in the water (AdrianBrown, 1999b). The original stream course, for which a limited flow remains and continues through the mining site area, is now referred to as the North Branch of French Gulch.

The divided northern and southern branches of French Gulch re-join at Dead Elk Pond (Figure 2-1). Sampling station FG-8 is located on the South Branch at the inlet into Dead Elk Pond, while FG-7 is located on the North Branch at the inlet into Dead Elk Pond. The FG-9A and FG-9 sampling locations are located downstream of Dead Elk Pond and represent the combination of the two branches of French Gulch (AdrianBrown, 1999b).

The South Branch receives minimal drainage from the W-O mine site while the North Branch receives the majority of mine water drainage. For most of the year, the majority of surface water flow in French Gulch travels below the W-O mine site through the South Branch. During peak high flow conditions, the North Branch of French Gulch may be breached with the flow reaching the South Branch. The water sources for the North Branch are believed to occur via alluvial groundwater discharge and subsurface flow in the placer tailings that originate from losing stream reaches.

2.3.2 Geology and Hydrogeology

Lovering (1934) described the geology of the Breckenridge Mining District, including the geology in the W-O mine area. Sedimentary cretaceous bedrock in the W-O mining complex are represented by the Pierre Shale (dark shale), Neobrara Formation (black shale and limestone), Benton Shale (black shale), and Dakota Quarzite (quartzite and black shale). The Morrison formation that consists of sandstone and red, gray and black shale represent Jurassic bedrock. Carboniferous formations include the Maroon formation, which is comprised of shale and conglomerate, and possibly the Weber formation (Pennsylvanian), which may be present in some areas. Tertiary igneous formations include quartz monzonite porphyry, intermediate quartz monzonite porphyry, and monzonite porphyry. Granite, gneiss, and schist represent Pre-Cambrian metamorphic formations in the W-O mine area. The mineralized veins and metamorphic replacement deposits related to the contact-metamorphosed Jurassic and Cretaceous sediments and the Tertiary monzonite porphyry bodies are associated with historical lode mining operations in the W-O area (AdrianBrown, 1999a; AGS, 1999). Quaternary glacial material consisting of alluvium and colluvium cover the valley floor to a depth of up to 50 feet deep. Alluvial material in French Gulch ranges in width from approximately 1000 feet to over 0.25 miles; however, a significant amount of the alluvial material has been disturbed by placer dredging activities.

Several north to northeast trending faults cut through the sedimentary and igneous intrusions in the W-O mine area. Sedimentary strata are faulted and folded into a large graben (down-dropped fault block) and syncline structural feature, which is the Oro Fault Block. The Wellington Fault Block is located to the east of the Great Northern and "J" Faults. The Oro Fault Block is bounded by the Bullhide Fault on the west and the Great Northern Fault and "J" Faults on the east (AdrianBrown, 1999a). The 11-10 Fault is a splay from the Bullhide Fault (AGS, 1999). The Oro and #3 Mine shafts and their associated workings were developed within the graben and syncline features. The Wellington Mine was developed within both the downthrown Oro Fault block and the upthrown Wellington Fault block (AGS, 1999). Ore veins are often associated with fault zones and mine stopes sometimes followed the faults (AdrianBrown, 1999a; AGS, 1999).

Vertical displacement on the Bullhide Fault is 880 feet and the dip-slip movement of approximately 900 feet (Lovering, 1934). Similar displacement is observed for the Great Northern and "J" Faults. In addition, there is also evidence of horizontal movement in the Bullhide, "J", and Great Northern Faults. The 11-10 Fault has a net slip of 110 feet, a vertical displacement of up to 50 feet, and a significant strike slip component of approximately 45-50 feet (AGS, 1999).

At the western limit of the mine, the water level in the mine is above the level of French Gulch. As a result, water discharges from the mine to the valley. Discharge to French Gulch from the mine occurs mainly in a diffuse manner. Some discharge occurs through faults and fractures that discharge to the alluvium. Some of the mine-pool discharge flows down French Gulch as shallow alluvial groundwater flow. At sampling station FG-6C (Figure 2-1), mine water discharges from the mine in the form of a series of springs approximately 200 feet down-gradient of the Oro shaft. This series of springs discharge mine-pool water all year round. Other intermittent springs are located in the piles of dredge tailings that line the valley floor. AdrianBrown (1999c) completed an average annual mine pool water balance flow that concluded the following:

- The mine pool receives inputs of water from infiltration of snowmelt and rain (79 gallons per minute, gpm), infiltration of upstream flow (51 gpm) and inflow from regional groundwater (less than 1 gpm).

- The mine pool discharges to French Gulch at an approximate rate of 145 gpm and to regional groundwater at less than 1 gpm.

- Flow from the mine pool into French Gulch is occurs both by surface water (127 gpm) and by groundwater recharge (18 gpm).

The estimated average dissolved zinc load at sampling station FG-9 near Dead Elk Pond is estimated at 152 pounds per day. The estimated average dissolved zinc load directly down gradient of the mine is about 270 pounds per day, indicating that about 44% of the dissolved zinc load that enters French Gulch is attenuated between the mine and station FG-9 (AdrianBrown, 1999b).

2.3.3 Ecological Setting

French Gulch, the Blue River, and associated riparian and upland areas provide possible habitat for fish, aquatic invertebrates, terrestrial plants, terrestrial soil invertebrates, mammals, birds, reptiles and amphibians. Specific species that may reside within the French Gulch Site are identified in the following subsections based on historical data and reported ranges within the state of Colorado. These specific species are referred to as potential ecological receptors of concern as they may be exposed to mine related metals contamination in surface water, sediment, soil and the aquatic and terrestrial food chain.

2.3.3.1 Aquatic Setting

Absent impacts from mining operations and other anthropogenic influences and stressors, mountain streams and rivers in Colorado generally provide good habitat for a variety of trout and other coldwater fish and benthic invertebrates. Studies on the identity and abundance of fish and benthic macroinvertebrates species in and around French Gulch and the Blue River are summarized below.

Benthic Invertebrates

Currently, there are three available studies of benthic macroinvertebrate communities in the French Gulch Site area. These three studies are described below, and the species of invertebrates identified at each sampling station are summarized in Table 2-2.

Clements (1995). In May and October of 1995, the benthic invertebrate community was sampled at three stations in the French Gulch site area, including two stations in French Gulch and one station in the Blue River (see Figure 2-7). Station FC-1 is a reference station for French Gulch, station FC-2 is located downstream of tailings, and Station BR-4 is located in the Blue River, downstream of its confluence with French Gulch (Figure 2-7). Benthic invertebrates were quantitatively sampled using a Hess sampler (three replicates per site) from shallow (less than 0.5 m) riffle areas at each station. The study also measured the dissolved and total concentrations of zinc in surface water samples, the acute (48 hour) toxicity of surface water samples to the cladoceran *Ceriodaphnia dubia*, and water quality parameters (conductivity, pH, hardness, alkalinity).

USGS (1996). In August 1996, benthic macroinvertebrate samples were collected as part of the USGS Upper Colorado River Basin National Water Quality Assessment (NAWQA) (USGS, 1996). Samples were collected at two sampling stations, one located in French Gulch just upstream of the confluence with the Blue River, and the other located in the Blue River approximately ¼ mile downstream of the confluence with French Gulch (Figure 2-7).

CDOW (2001). Aquatic macroinvertebrates were collected at 3 locations in French Gulch (FG-1, FG-8 and FG-9) and at 4 locations in the Blue River (BR-1, BR-2, BR-3, and BR-5) in conjunction with the aquatic habitat analysis conducted by CDOW in May 2000 (Figure 2-1). Three USEPA Rapid Bioassessment Protocol (RBP) metrics were selected for invertebrate evaluation in the habitat analysis: the number of Ephemeroptera, Plecoptera and Tricoptera (EPT) taxa present, the percent Ephemeroptera taxa compared to the total number of organisms collected, and the number of mayfly taxa present. The aquatic habitat analyses is discussed further as part of Section 7.

Fish

Several studies are available that contain information on the fish species found in French Gulch and the Blue River. These studies are described below, and the fish species identified during each study are listed in Table 2-3.

<u>CDPHE & USEPA (1989)</u>. In September of 1989, the CDPHE and the USEPA sampled fish from seven locations (FG0, FG1, FG2, FG4, FG6A, FG8 and FG9) in French Gulch and three sampling locations (BR1, BR2, and BR3) in the Blue River (CDPHE & USEPA, 1989). These stations are shown in Figure 2-1. One protected fish species - the Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*) - was identified in the headwaters of French Gulch.

<u>Deacon & Mize (1997)</u>. In 1996, the USGS sampled fish communities throughout the Upper Colorado River Basin, as part of the NAWQA program (Deacon and Mize, 1997). One sampling station on the Blue River (near BR-1) and one sampling station on French Gulch (near FG-9) were included in this study. Two brown and 36 brook trout were observed on the Blue River near BR-1. No fish were observed in French Gulch near FG-9.

<u>USGS & USEPA (1997)</u>. In 1997, the USGS and USEPA collected trout from two sampling stations (BR-1 and BR-2) on the Blue River for tissue analysis (USGS & USEPA, 1997). Both brook and brown trout were collected from BR-2, however, only brown trout were collected from BR-1.

<u>CDOW (2001)</u>. As a part of the aquatic habitat analysis conducted by CDOW in May of 2000, fish were collected from two reaches in French Gulch and two reaches in the Blue River (Figure 2-1). This evaluation confirmed that Colorado River cutthroat trout inhabited the upper headwaters of French Gulch and that no fish are present in the lower French Gulch reaches prior to its confluence with the Blue River.

2.3.3.2 Terrestrial Wildlife and Habitat

Information on terrestrial wildlife and habitats in the vicinity of the site is available from several sources, including Andrews and Righter (1992), Fitzgerald et al. (1994), Natural Diversity Information Source (NDIS) (1999), Colorado Department of Wildlife (CDOW) (1999), and the National Audubon Society (2000).

Vegetative Cover

The NDIS System for Conservation Planning provides a Geographic Information System (GIS) database of the vegetation structure with a 30-m by 30-m resolution for Summit County, Colorado (NDIS, 1999). The vegetation types in French Gulch consist of grass-forb and willow-dominated (*Salix spp*.) communities with stands of conifer and conifer/aspen vegetation types on the adjacent slopes. Conifers in the area include lodgepole pine (*Pinus contorta*), Engelmann spruce (*Picea engelmannii*), blue spruce (*Picea pungens*), sub-alpine fir (*Abies lasiocarpa*) and Douglas fir (*Pseudotsuga menziesii*). The grass, forb, and willow-dominated communities are intermixed with barren piles of the dredged river rock, which dominate the majority of the valley floor.

Amphibians and Reptiles

Potential habitat for the boreal toad (*Bufo boreas boreas*) can be found intermittently along certain sections of the Blue River. Boreal toads are found in wetlands, streams, and shallow ponds and lakes at elevations between 7,000 and 12,900 feet (NDIS, 1999). A reproducing population of boreal toads is located in Cucumber Gulch, which drains into the Blue River from the west, just downstream of the confluence of the Blue River and French Gulch. The boreal toad population in Cucumber Gulch is one of four known populations in Colorado. NDIS (1999) also identifies the Northern leopard frog (*Rana pipiens*) as a potential resident within the French Gulch Site. The leopard frog is a State Species of Special Concern (CDOW, 1999). The only other amphibians and reptiles known to occur in Summit County are the tiger salamander (*Ambystoma tigrinum*), chorus frog (*Pseudacris triseriata*), and the western terrestrial garter snake (*Thamnophis elegans*).

Birds

In areas that are not heavily disturbed by mining, the riparian zones along French Gulch and the Blue River are characterized by a willow scrub habitat that provides potential habitat for many songbirds. In addition, this riparian habitat provides an important source of prey for raptors in the area. Piscivorus birds such as the osprey (*Pandion haliaetus*) or the bald eagle (*Haliaeetus leucocephalus*) could potentially ingest fish from French Gulch and the Blue River. Table 2-4 provides a list of the bird species that have been observed in Summit County and that could potentially use the French Gulch Site area.

Mammals

Elk (*Cervus elaphus*) are known to concentrate in the French Gulch and Blue River areas in the summer (NDIS, 1999). Mule deer (*Odocoileus hemionus*), bighorn sheep (*Ovis canadensis*), mountain lion (*Felis concolor*) and black bear (*Ursus americanus*) are other large mammals found in the area. The corridor along Highway 9 from Breckenridge to Frisco has been designated a potential human/bear conflict area. Other medium and small mammals in the area include *Lepus, Sylvilagus, Spermophilus,* and *Tamias* species and Microtine rodents. The abundance of mines and tunnels in the French Gulch area provide excellent habitat for Townsend's big-eared bat (*Plecotus townsendii pallescens*). Townsend's big-eared bat could potentially roost in the abandoned mining areas and feed on insects that concentrate around water bodies such as Dead Elk Pond or slow moving pools of water. Table 2-5 provides a list of the mammals in Summit County that could potentially inhabit the French Gulch area.

2.3.3.3 Rare, Endangered and Threatened Species

Information on protected avian and mammalian species potentially inhabiting the French Gulch area and Summit County, Colorado were obtained from Fitzgerald et al. (1994) and Andrews and Righter (1992). Information on the listing of these wildlife species as endangered, threatened, or imperiled was obtained from the NDIS (1999), CDOW (1999), and the National Audubon Society (2000). The NDIS website lists species that are considered as candidate, sensitive, unique or rare by the Colorado Natural Heritage Program for Summit County. This website also lists species that the CDOW consider to be declining in Colorado. The CDOW website lists species, which are considered threatened and endangered in Colorado at a State and Federal level. In addition, the National Audubon Society provides a "Watchlist" of breeding bird species for each state. These Watchlists identify bird species that are experiencing declines in population size, breeding and wintering habitat, and/or a decline in breeding and wintering ranges.

The CDOW (1999) lists the whooping crane (*Grus americana*), lynx (*Lynx lynx*), the northern river otter (*Lutra canadensis*), and the boreal toad (*Bufo boreas boreas*) as Federally and/or State endangered species that maybe in the county area. The whooping crane, considered a rare migrant to Summit County, is known from only one record. A whooping crane was observed on October 8, 1989, on Dillon Reservoir. A population of northern river otters has been reintroduced into Summit County; however, the otters require a relatively high water quality and a food base of abundant fish and crustaceans (Fitzgerald et al., 1994). Lynx have been reintroduced to several areas in Colorado, but no sightings of lynx have been reported in the French Gulch area.

Federal and State threatened species include the bald eagle (*Haliaeetus leucocephalus*), spotted owl (*Strix occidentalis*), and the greenback cutthroat trout (*Oncorhynchus clarki stomias*). A native population of Colorado River greenback cutthroat trout (*Oncorhynchus clarki pleuriticus*) is a species of special concern, as identified by CDOW, and is known to populate French Gulch upstream of the W-O mine complex and have been captured at sampling stations FG-0, FG-1, and FG-2 (CDPHE and USEPA, 1989). State Species of Special Concern include Barrow's goldeneye (*Bucephala islandica*), the peregrine falcon (*Falco peregrinus*), and the sage grouse (*Centrocercus urophasianus*). Other State listed Species of Concern include the northern leopard frog (*Rana pipiens*) and the bluehead sucker (*Catostomus discobolus*). In addition to many of the species listed above, the CDOW has identified other species of interest that are exhibiting declines in population size and/or distribution (NDIS, 1999). These declining species include the flammulated owl (*Otus flammeolus*), horned lark (*Eremophila alpestris*), lark bunting (*Calamospiza melanocorys*), rufous hummingbird (*Selasphorous rufus*), Swainson's hawk (*Buteo swainsoni*), and the three-toed woodpecker (*Picoides tridactylus*).

Avian species known to occur in Summit County and considered to be imperiled by the Colorado Natural Heritage Program include the American redstart (*Setophaga ruticilla*), bald eagle, Barrow's goldeneye, black-crowned night-heron (*Nycticorax nycticorax*), boreal owl (*Aegolius funereus*), eared grebe (*Podiceps nigricollis*), great blue heron (*Ardea herodias*), merlin (*Falco columbarius*), northern goshawk (*Accipiter gentilis*), northern harrier (*Circus cyaneus*), osprey (*Pandion haliaetus*), peregrine falcon, red-headed woodpecker (*Melanerpes erythrocephalus*), ring-billed gull (*Larus delawarensis*), spotted owl, whooping crane, and willet (*Catoptrophorus semipalmatus*). Imperiled mammalian species in Summit County include the bushy-tailed woodrat (*Neotoma cinerea rupicola*), dwarf shrew (*Sorex nanus*), golden-mantled ground squirrel (*Spermophilus lateralis*), least chipmunk (*Tamias minimus*), lynx, meadow vole (*Microtus pennsylvanicus*), northern pocket gopher (*Thomomys talpoides*), pygmy shrew (*Sorex hoyi*), and Townsend's big-eared bat (*Plecotus townsendii pallescens*). In addition to the CDOW's declining species such as the flammulated owl, lark bunting, sage grouse, and Swainson's hawk, the National Audubon Society includes Franklin's gull (*Larus pipixscan*) and the prairie falcon (*Falco mexicanus*) on its Watchlist for Colorado.

2.4 Site History

2.4.1 Sampling Activities and Investigations

The first studies of chemical concentrations in the French Gulch area were conducted by Moran and Wentz in 1972 (Moran and Wentz, 1974). Moran and Wentz (1974) collected surface water from several streams across the state of Colorado potentially impacted by mining operations in Colorado. Two of the sampling stations in this study were located on French Gulch. The first French Gulch sampling station was located upstream of tailings and the second was located just downstream of Dead Elk Pond. Three sampling stations were located on the Blue River. The first was located upstream of confluence with French Gulch near BR-Adams. The second was located just downstream of the confluence near BR-2 and the third downstream of the confluence of the Blue River near BR-4. Elevated concentrations of lead, zinc, manganese, and iron were observed in the lower reaches (below the W-O mine complex) of French Gulch compared to the upper reach sample. Elevated metal concentrations were also observed in the Blue River below its confluence with French Gulch.

McConnell observed similar elevated concentrations in 1979 (AGS, 1999). However, full-scale investigations into the metal contamination of French Gulch and the Blue River were not initiated until the late 1980's after observed fish kills of newly stocked fingerlings in the Blue River. The subsequent investigations were completed by multiple parties examining the source and fate of the metals contamination.

A chronology of sampling activities and programs in the French Gulch area is provided in Table 2-6. The more recent studies that are most relevant to the baseline ERA are summarized in the following subsections. Figure 2-1 depicts the current and historic sampling locations in French Gulch and the Blue River.

French Gulch NPS Project

The French Gulch Non-Point Source (NPS) Project was initiated in 1990 by the State of Colorado to address non-point source discharges from the W-O mine and mill site into French Gulch. The project was jointly conducted by the Colorado Division of Minerals and Geology (CDMG) and the USEPA Region VIII Water Management Division (Morrissey, 1995). NPS programs are authorized by Section 319 of the Federal Clean Water Act. The USEPA administers Section 319 NPS provisions by providing grants to state agencies. The CDPHE

Water Quality Control Division is the responsible agency for administering Colorado's non-point source program. CDMG was designated as the "operating agency" for the French Gulch NPS Project (Morrissey, 1995). CDPHE and EPA collected surface water samples from several locations on French Gulch (FG-0 to FG-9) and the Blue River (BR-1 to BR-3) on eight separate occasions from May of 1989 to July of 1996.

Breckenridge Sanitation District (BSD)

From 1986 to 1994, the BSD collected surface water from three sampling stations on the Blue River for the purpose of assessing the potential impacts of wastewater sludge land application (BSD, 1997). The sampling stations included:

- Near the Recreation Center bridge (located approximately 600 feet downstream of the Blue River's confluence with French Gulch),
- Near Cemetery Road (approximately 440 feet downstream of the Recreation Center Bridge sampling station); and
- Near County Road 3 (5,460 feet downstream of the Cemetery Road sampling station).

United States Bureau of Reclamation (USBOR)

In 1989, the USBOR identified several locations where acidic mine discharges flowed into French Gulch (Stover, 1989). In 1991, the USBOR delineated the mill tailings and mine waste areas around the W-O mine complex and identified mill tailings, roaster fines, and mine water as potential sources of contaminated surface waters in French Gulch (Stover, 1991). In addition, ground water monitoring wells were installed to evaluate the hydrology of the mine site. In 1992, the USEPA continued surface water sampling efforts in the area. Surface water samples were collected intermittently in French Gulch and the Blue River until 1996.

French Gulch Remediation Opportunities Group (FROG)

In the mid-1990's, the State of Colorado requested that the Northwest Colorado Council of Governments (NWCCOG) establish a community group in the Breckenridge area to address the problems in French Gulch. The NWCCOG formed the French Gulch Remediation Opportunities Group (FROG) and invited individuals living in the area or with an interest in the area to attend meetings to discuss the clean-up and remediation of French Gulch. Once the FROG became organized, the Keystone Center replaced the NWCCOG as the facilitator.

The FROG Monitoring and Remediation subcommittee initiated a surface water sampling study in 1997 to further characterize the extent of the contamination of the Blue River. The NWCCOG agreed to collect the surface water samples that were analyzed by the CDOW River Watch Program's Laboratory in Fort Collins, Colorado.

Five sampling stations were established by NWCCOG along the Blue River. These stations are shown on Figure 2-1. Station 654 is located north of the town of Breckenridge to the south and station 655 is located near the Park Avenue Bridge. These two stations are located on the Blue River, above its confluence with French Gulch. Station 656 is located on the Blue River just downstream of the confluence near the Recreation Center Bridge. Station 643 is located further downstream near County Road 3, while Station 657 is located just before the Swan River confluence.

Surface water was sampled roughly every two weeks from April to September and monthly from October to December from April 24, 1997 to September 23, 1998. The CDOW lab analyzed the samples for total and dissolved concentrations of cadmium, copper, iron, lead, manganese, and zinc.

USGS National Ambient Water Quality Assessment

The USGS initiated the NAWQA program in 1991 to characterize the current conditions and trends in the water quality of streams and rivers in the United States. The Blue River and French Gulch were included in this study as part of the Upper Colorado River Basin Study Unit. The USGS collected surface water samples from several stations along French Gulch and the Blue River (Figure 2-1) during September 1992, October 1993, November 1993, June 1996, and July 1996.

AdrianBrown Consultants

In September 1998, AdrianBrown initiated a surface water-sampling program scheduled to collect monthly surface water samples from March to November each year. Currently, there are 10 sampling stations (FG-5, FG-5.5, FG-6C, PT-1, FG-7, FG-8, FG-9, BR-1, BR-2, BR-3) along French Gulch and the Blue River (Figure 2-1) (AdrianBrown, 1999a). At the present time, AdrianBrown continues to collect surface water data.

2.4.2 Regulatory Actions

During the mid 1980's, the City of Breckenridge reclaimed and improved the Blue River from south of town to a few miles downstream of French Gulch. The reclamation involved dredging and removing the old placer tailings, reconstructing the stream channel and revegetating the stream banks (SAIC, 1994, as cited in AGS, 1999). Subsequent to the reclamation, the CDOW initiated a stocking program to re-establish a trout population in the Blue River. As a result of this stocking, the acutely toxic conditions associated with French Gulch were first observed (AGS, 1999).

French Gulch Diversion Project

In May of 1993, the CDMG diverted the upgradient, relatively clean main branch of French Gulch around the mill tailings south of French Gulch road forming the South Branch of French Gulch (Figure 2-1). The original stream course, for which a limited flow remains and continues through the mining site area, is now referred to as the North Branch of French Gulch. The objective of this diversion project was to allow spring high flow to bypass the mill tailings reducing ponding and the groundwater table in the south mill tailings area. The diversion eliminated most of the ponding, but did not significantly lower the groundwater table. There were no noticeable improvements in downgradient stream and groundwater quality as a result of this project (AGS, 1999; SAIC, 1994).

Blue River Water Quality Classification

For the purposes of classifying water quality, the Blue River has been divided into two sections from its headwaters to the Dillon Reservoir. Section 1 of the Blue River encompasses all of the Blue River from its source to the Dillon Reservoir with the exception of Segment 2. Segment 2 of the Blue River begins at its confluence with French Gulch and extends to a point one mile above its confluence with the Swan River. Segments 1 and 2 of the Blue River have been given an Aquatic Life Cold Water I and a Recreation I classification (WQCC, 1999). The aquatic life classification indicates that the waters are capable of supporting cold water biota or could potentially support cold water biota if adverse water quality conditions were corrected. Water quality criteria are calculated using Table Value Standards (TVS), which are water hardness dependent equations used to calculate acute and chronic toxicity thresholds. However, Segment 2 has temporary modifications for cadmium and zinc concentrations. Instead of the TVSs for cadmium and zinc that are used in the Aquatic Life Cold Water I designated streams, chronic cadmium and zinc concentrations of 4 and 1,700 ug/L, respectively, have been temporarily assigned to Segment 2 (WQCC, 1999). This temporary modification to the water quality standards expired on December 31, 1998, but was extended to December 31, 2002.

French Gulch Water Quality Classification

French Gulch has also been divided into two segments, designated Blue River Segment 10 and Blue River Segment 11. Segment 10 consists of all tributaries, wetlands, lakes, and reservoirs in the headwaters section of French Gulch from its source to a point about 1.5 miles east of Breckenridge. Segment 11 includes the mainstem of French Gulch from the point 1.5 miles east of Breckenridge to its confluence with the Blue River. Segments 10 and 11 have been classified as Aquatic Life Coldwater I waters (WQCC, 1999). Segment 10 has also been designated as a Recreation I stream. Segment 11 has been designated as a Recreation II stream and qualifies for a use-protection (UP) designation based on the present classification (WQCC, 1999). In addition, chronic concentrations of cadmium, lead, and zinc have been temporarily modified for Segment 11. Chronic concentrations of 7.7, 6, and 4000 ug/L have been temporarily assigned for cadmium, lead, and zinc, respectively (WQCC, 1999). This temporary modification expires on December 31, 2002.

3.0 DATA SUMMARY AND EVALUATION

Previous investigations of French Gulch and the Blue River described above (Section 2.4) were reviewed for the availability of reliable and relevant analytical and biological data that could be used in the baseline ERA. This section summarizes the data that were selected for use in the baseline ERA. Sections 3.1 to 3.4 review the available data for waste sources, surface water, sediment, and biological tissue, respectively.

3.1 Data on Source Media

3.1.1 Tailings, Waste Pile, and Roaster Fine Areas

Samples of tailings, waste piles and roaster fines were collected from the W-O Mining Complex area by USBOR (1997). Samples were analyzed for a suite of 26 parameters including arsenic, cadmium, copper, lead, and zinc. Much of this surface material was covered with clean soil in the fall of 1998 (AGS, 1999). Therefore, these samples do not represent the present condition of surface contamination in the W-O Mining complex area and were not evaluated in the baseline ERA.

3.1.2 Wellington-Oro Mine Pool

A number of groundwater studies have been conducted in the W-O mine complex area. The results of these studies indicate that the W-O Mine Pool is the primary source of metal contamination in French Gulch and the Blue River. The stopes in the mine and the fractured bedrock and faults provide the major pathways from the mine pool to French Gulch. In particular, the 11-10 and Bullhide Faults and their associated fault block have been identified as the primary conduits of metal discharge into French Gulch (RAS, 1996; RAS, 1997a; Kimball, 1997; Kimball et al., 1999). Snowmelt in the upper elevations of the French Gulch watershed recharge the regional bedrock groundwater table, resulting in a corresponding rise in the W-O Mine Pool. This, in turn, leads to an increase in the flow of metals into French Gulch via the stopes and faults in the W-O mine complex area (RAS, 1996; RAS, 1997b; AGS, 1999). However, because ecological receptors are not directly exposed to groundwater, these data are not utilized in the risk assessment.

3.1.3 Acid Mine Discharges

In 1989, the USBOR identified several locations where acidic mine discharges flowed into French Gulch (Stover, 1989). In 1996, samples were collected from discharges such as the Country Boy Mine Adit Discharge, Kenny Dog Springs (this location had been previously sampled in 1994), Magnum Brown Drive seep, the Reliance Drive culvert drainage, and seeps originating from the waste pile north of French Gulch Road. Samples were analyzed for dissolved and total recoverable metals and water quality parameters. These discharge points represent locations where some types of ecological receptors may be exposed, and these data are utilized in the risk assessment.

3.2 Surface Water Data

Since 1986, the CDPHE, USEPA, BSD, USGS, NWCCOG, and Adrian Brown have collected surface water samples from French Gulch and the Blue River. Each of these sampling events is described in the following subsections. Sampling locations from these studies are summarized in Table 3-1 and are shown in Figure 2-1.

3.2.1 Breckenridge Sanitation District

From 1986 to 1994, the BSD collected surface water from three sampling stations on the Blue River. These samples were analyzed for ammonia, nitrate, organic nitrogen, total nitrogen pH, total phosphorous, and dissolved aluminum, cadmium, copper, lead, nickel, and zinc (BSD, 1997). This study was conducted with the purpose of assessing the potential impacts of a wastewater sludge land application program on the Blue River. With the exception of zinc, the detection limits for the dissolved metals measured in surface water are higher than previously measured metals concentrations in the Blue River. Therefore, surface water data from these station are not comparable with more recent studies and have been excluded from the baseline ERA.

3.2.2 CDPHE and EPA French Gulch Non-Point Source Program

The French Gulch Non-Point Source (NPS) Project was initiated in 1990 by the State of Colorado to address non-point source discharges from the W-O mine and mill site into French Gulch. The project was jointly conducted by the CDPHE and the USEPA under Section 319 of the Federal Clean Water Act. CDPHE and EPA collected surface water samples from several locations on French Gulch (FG-0 to FG-9) and the Blue River(BR-1 to BR-3) (Figure 2-1). Sampling events occurred in May 1989, September 1989, and August 1994.

Samples were analyzed for dissolved and total recoverable metals and water quality parameters. These data are available from a CDPHE and EPA as an unpublished data set (CDPHE and USEPA, 1989). This data set is included within Appendix A and is utilized in the ERA.

3.2.3 Northwest Colorado Council of Governments (NWCCOG)

The NWCCOG collected surface water samples from the Blue River in 1997 and 1998 to better characterize the water quality of the Blue River. The surface water samples were analyzed for total and dissolved cadmium, copper, iron, lead, manganese, and zinc by the CDOW laboratory. These sampling stations are designated as 654 and 655 on the Blue River upstream of French Gulch, 643, 656, and 657 on the Blue River downstream of French Gulch. This data set is included within Appendix A and is utilized in the ERA.

3.2.4 USGS NAWQA Program Data

The USGS initiated the NAWQA program in 1991 to characterize the current conditions and trends in the water quality of streams and rivers in the United States. The Blue River and French Gulch were included in this study as part of the Upper Colorado River Basin Study Unit. The USGS collected surface water samples from five stations along French Gulch, three stations on the Blue River and one station on the Swan River (Figure 2-1) during September 1992, October 1993, November 1993, June 1996, and July 1996.

The surface water samples collected were analyzed for dissolved and recoverable metals and water quality. These data are included as an unpublished data set in Appendix A, and are utilized in the ERA.

3.2.5 AdrianBrown Consultants

In September 1998, AdrianBrown initiated a surface water-sampling program scheduled to collect monthly surface water samples from March to November each year. Currently, there are 10 sampling stations (FG-5, FG-5.5, FG-6C, PT-1, FG-7, FG-8, FG-9, BR-1, BR-2, BR-3) along French Gulch and the Blue River (Figure 2-1) (AdrianBrown, 1999a). Locations FG-7 and FG-8 were added to the surface water sampling location list in June, 1999. FG-5.5, which is located on the southern branch of French Gulch, directly south of FG-6C, was added in August 1999 (AdrianBrown, 2000). These samples are analyzed for dissolved cadmium, iron, lead, manganese, and zinc as well as water quality parameters. At the present time, AdrianBrown continues to collect surface water data. These data are utilized in the ERA.

3.3 Sediment Data

3.3.1 Deacon and Driver (1999)

Deacon and Driver (1999), working in conjunction with the USGS, collected sediment samples from French Gulch and the Blue River as part of the USGS NAWQA program. Sediment sample analytical results are available for aluminum, arsenic, cadmium, chromium, copper, iron, mercury, molybdenum, nickel, lead, selenium, silver, and zinc. Sediment samples were collected in October 1995 from three locations on the Blue River (BR-Adams, BR-BFG, and BR-Dillon) and one sampling location on French Gulch (FG-1). In September 1996, additional sediment samples were collected at FG-0, TS-3, TS-4, FG-7, FG-9A, and FG-9 sampling stations (see Table 3-1 and Figure 2-1 for locations). These data are utilized in the ERA.

3.3.2 AdrianBrown (1999b)

In the fall of 1998, AdrianBrown collected "stream" sediment samples from the South Branch of French Gulch and pond sediments from Dead Elk Pond (Figure 3-1) (AdrianBrown, 1999b). Two "bank" sediment samples were also collected. It is not clear whether these bank sediments are actually riparian soils. The sediment samples were analyzed for arsenic, lead, cadmium, iron, silver, zinc and gold. The data are presented and discussed further in the ecological exposure assessment (Section 5.1.2).

3.4 Biological Tissue Data

Under current water quality conditions, fish are not present in French Gulch downstream from the mined area to the mouth of the stream (as cited in Deacon and Mize, 1997). Therefore, no data are available on the tissue concentrations of metals in fish from the mining-impacted reach of French Gulch.

On July 16 and 17, 1997, the USGS collected trout from the BR-1 and BR-2 sampling sites in the Blue River (Figure 2-1). Electroshocking methods were employed in the collection of the trout. Brook and brown trout were collected from the BR-2 site (below French Gulch confluence); however, only brown trout were observed from the BR-1 site (above French Gulch confluence). The trout collected from the BR-2 site were not collected from the main channel, but from inflows and tributaries into the Blue River from an inflow area of "cleaner" water, near the BR-2 site (personal communication with Bill Schroeder, EPA).

Tissue samples analyzed from these trout included fillet, gonad, kidney and liver. These tissues were analyzed for arsenic, cadmium, copper, manganese, lead, and zinc (USGS, 1997). Information regarding the reported weight basis is not available, so concentrations were assumed to be reported as dry weight. These data are presented in Table 5-3 and are used in the risk assessment.

3.5 Soil Data

The USBOR (1999) examined the geologic properties and analyzed the mine waste rock, mill tailings, and roaster fines for metals. Samples of these materials were collected in French Gulch, around the W-O Mining Complex from the Extenuate, Lower Tailings, Upper Tailings, Mill Tailings, and Roaster Fines areas between October 8 and 24, 1996. Samples were collected using ten hollow stem auger drill holes, ten backhoe-excavated test pits, four in-place density tests in four test pits, and 131 surface and near-surface samples. Because surface samples were collected specifically in areas where tailings and roaster fines were located, the samples collected may not be representative of the overall French Gulch area and measured concentrations may be biased high.

In a separate study conducted by URS Operating Services, Inc. (URS), soil samples were collected from several locations along French Gulch Road. These samples were collected near an area characterized by dead trees, up slope and east of the Extenuate Pile, at a residence west of the Union Mill, and in the area near Country Boy Mine. Arsenic and cadmium concentrations were reported to correlate with relative lead concentrations (USEPA, 1998b).

3.6 Data Organization and Evaluation

Site Database

All relevant and reliable data for the site were assembled into an electronic database (Appendix A). This database is available upon request from USEPA Region 8.

Duplicate Records

Duplicate records contained in the database were identified by comparing individual analysis results for a parameter at a sampling station for a specific date (and time, if available). For example, two entries with the same value (11.2 mg/L), date, time, and laboratory sample number were present for the concentration of zinc in surface water at sampling station FG-7. In order to avoid double-counting, only one of these values was retained in the project database and the other was excluded. A summary of all duplicate records excluded in the project database is found in Appendix A.

Data Outliers

A preliminary review of the available data was performed to identify any potential outliers. One or more analytical values that appeared to be unusual compared to others in the data set were noted in several cases. For example, in the South Branch of French Gulch, a total of 42 samples of surface water were collected an analyzed. For lead, 41 of these samples had values between 0.1 and 17 ug/L, with an average of 7.2 ug/L. However, one sample had a value of 360 ug/L.

The basis for such potential outliers is not known. Some outliers might be attributable to errors during sampling, analysis, or data entry, while others may be authentic but non-representative samples. In order to identify analytical results that were outliers, the statistical approach (Rosner's test) recommended by Gilbert (1987) was used. This test examines the most extreme value in a data set (i.e., the value furthest removed from the mean), and calculates the probability that the value is drawn from the same population as the other values in the data set. The test is two-tailed (i.e., both unusually low and unusually high values are evaluated). Because the test assumes the data are distributed normally, while most environmental data sets are distributed approximately lognormally, the test was performed using the log-transformed data.

In accord with the recommendation of Gilbert (1987), the test was only performed on datasets that had at least 25 measurements. This precluded the ability to perform the test on sediment or fish tissue, so all values in these media were retained. For surface water, sufficient data were available to perform the test on data grouped into the following sets: South Branch French Gulch, French Gulch (downstream of Dead Elk Pond), French Gulch Reference (upstream of the mine impacts), Blue River (downstream of the confluence with French Gulch), and Blue River

Reference (upstream of the confluence with French Gulch). The test was not applied to samples from mine discharge areas or the North Branch of French Gulch, since these locations are very heterogeneous and very large variation between samples and locations is possible in this type of sample.

A total of 47 surface water analytical measurements out of a total of 6570 values (0.7%) were identified as outliers by Rosner's test. Of these, 10 were identified as being unexpectedly low, and 37 were unexpectedly high. These data points are indicated graphically in data plots provided in Appendix B. Samples retained for analysis are indicated by black diamonds, while outliers are shown by pink squares.

Treatment of Non-Detects

In accord with standard USEPA guidance for data usability, any sample result that was assigned a laboratory or data validation flag of "U" (non-detect) was evaluated by assuming a numeric value equal to ½ the reported detection limit.

4.0 PROBLEM FORMULATION

A screening level Problem Formulation was completed as part of the SERA in accordance with USEPA guidelines for performing ecological risk assessments (USEPA, 1992a, 1997, 1998a). The problem formulation presented in this section is based on that presented in the SERA, but incorporates the findings of the SERA screening risk characterization and identification of data gaps.

4.1 Site Conceptual Model

Figure 4-1 presents a site conceptual model (SCM) that summarizes pathways by which mining-related chemical contaminants may be released to and migrate through the environment, along with exposure pathways by which ecological receptors may be exposed to those contaminants. However, as indicated in the diagram, not all exposure pathways are likely to be of equal concern. For the purposes of this risk assessment, each exposure pathway has been classified as follows:

- The pathway is incomplete (i.e., there is no contact between the contaminated medium and the receptor). These cases are indicated by an open box.

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

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

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

The following sections present a more detailed description of migration pathways and exposure pathways for ecological receptors at the French Gulch Site, along with the rationale for including or excluding a pathway for quantitative evaluation. Those exposure pathways identified as complete, but not selected for quantitative evaluation, are further evaluated qualitatively in the uncertainty analyses (Section 8.0).

4.1.1 Sources

As discussed in Section 3.0, the primary sources of contamination at the site include various types of mining-related solid wastes (waste rock, tailings, roaster fines, etc.) as well as groundwater which has accumulated in mine shafts and adits (the mine pool). In some cases, ecological receptors may be exposed directly to these source materials, while other exposures occur as a result of contaminant migration through the environment to secondary media. These migration pathways are discussed below.

4.1.2 Release Mechanism

Several mechanisms exist by which chemicals that have entered the environment as a result of historic mining activities may be release into other environmental media at the site. These are summarized below.

Wind-born Transport

Under dry conditions, particles of solid waste or contaminated soil can be eroded by wind and transported to adjacent areas. Depending on the nature of the source materials and soils and on the meteorological conditions, this transport pathway is usually minor.

Transport in Surface Water Runoff

Flowing water can suspend particles of solid waste or contaminated soil and carry them with the water. This can result in contamination of surface soils near source areas (e.g., waste piles or tailings deposits), as well as transport of the particles into surface water bodies (e.g., streams and rivers). In addition, chemicals may be dissolved in surface water runoff and be transported in a dissolved rather than a particulate form.

Infiltration and Leaching to Groundwater

Chemicals dissolved in water may migrate downward under the force of gravity and enter groundwater. Dissolved chemicals in groundwater tend to move with the groundwater, and hence may be transported to surface water as recharge of streams or rivers, or may be released to the surface at seeps and springs.

4.1.3 Exposure Media and Exposed Receptors

Ecological receptors may be potentially exposed to chemical contamination in one or more of five exposure media (Figure 4-1), including surface water, sediment, aquatic prey items (food chain), surface soil, and terrestrial prey items (food chain). The potential for contact between ecological receptors and each of these exposure media is discussed in the following subsections.

4.1.3.1 Surface Water

Exposure of ecological receptors to contaminated surface water is the primary concern at this site. This includes direct contact of fish, benthic macroinvertebrates, reptiles and amphibians with surface water, as well as ingestion of surface water by terrestrial species (birds, mammals). These exposure pathways are evaluated quantitatively for fish and benthic macroinvertebrates, but were not evaluated for reptiles and amphibians due to lack of adequate toxicity data for these receptors.

4.1.3.2 Sediment

Benthic macroinvertebrates live in direct contact with sediment, and this exposure pathway is evaluated quantitatively in the risk assessment. Some benthic macroinvertebrates may also ingest fine particles of sediment while feeding, but this is likely to be a minor source of exposure compared to direct contact with the sediments. Likewise, some fish may occasionally ingest small amounts of sediment while feeding, but it is considered likely that this exposure pathway is minor compared to direct contact with surface water. Therefore, ingestion of sediments by aquatic receptors is not evaluated quantitatively.

Some terrestrial receptors that prey on aquatic food items may ingest sediment along with the prey item. In some cases, the dose of chemical ingested from the sediment can be significant compared to the dose ingested in the tissues of the y prey item, so this exposure pathway is evaluated quantitatively.

4.1.3.3 Aquatic Prey (Food Chain)

Most metals have a moderate tendency to accumulate in tissues of aquatic species, and some metals (e.g., mercury, lead) may tend to biomagnify. Fish are exposed to food web contaminants mainly by ingestion of benthic macroinvertebrates. However, the dose to fish from ingestion of chemicals in prey is usually thought to be minor compared to the direct exposure pathway. Similarly, some benthic macroinvertebrates are predatory and may be exposed by ingestion of other macroinvertebrates, but this exposure pathway is also likely to be minor compared to the direct exposure pathway. Thus, ingestion exposure of fish and benthic macroinvertebrates from ingestion of aquatic prey items is not evaluated quantitatively in this assessment.

For terrestrial organisms that do not reside directly in contaminated water or sediment, ingestion of contaminated aquatic prey items may be a significant source (at least on a relative basis) of exposure, so ingestion of fish and other aquatic prey by birds and mammals is evaluated quantitatively.

4.1.3.4 Surface Soil

Terrestrial plants and soil invertebrates that reside in soils that have been impacted by mine wastes are exposed by direct contact, and this pathway is likely to be significant in at least some locations. Likewise, some terrestrial receptors may ingest soil while feeding, and this pathway may also be potentially significant. However, this risk assessment does not attempt to quantify the risks from these soil-related pathways, for two reasons. First, the riparian zones along both French Gulch and the Blue River are extensively disturbed and substantial areas are covered with piles of river cobble (e.g., see Figure 2-3 and 2-4). These piles of excavated material severely limit plant cover and habitat use by wildlife. Second, data on the concentration of metals in riparian zone soils are mainly restricted to areas of highest contamination and greatest disturbance (i.e., the areas least likely to be utilized as habitat), and there are insufficient data from areas with lesser disturbance or contamination (i.e., the areas most likely to be utilized as habitat) to support a reliable quantitative risk evaluation. Thus, while there is little doubt that riparian soils are contain contaminants that could be above a level of potential concern to terrestrial receptors in some places, exposures or terrestrial receptors to soils are not evaluated quantitatively.

Terrestrial receptors may be exposed to soils not only by ingestion but also by dermal contact or inhalation of suspended particles. As noted above, data are too limited to support a reliable quantification of these pathways, but this is not thought to be a significant limitation, since dermal exposure and inhalation exposure are usually minor compared to oral exposure.

4.1.3.5 Terrestrial Prey Items (Food Chain)

Receptors feeding on terrestrial prey items (plants, small mammals, birds, etc) that reside in the contaminated riparian zone may be exposed to mine related contaminants, and this exposure pathway could be significant in some cases. However, for the same reasons as described above (habitat for prey species is limited, and environmental data are available only from the areas least likely to be used as habitat), exposure of terrestrial receptors from ingestion of terrestrial prey items is not evaluated quantitatively.

4.1.3.6 Groundwater Seeps/Discharges

Ecological receptors are not exposed to contaminated groundwater except at locations where the groundwater is released at the surface in springs or seeps. Because such areas are not usually diluted by flowing water (as are streams or rivers that are recharged with contaminated groundwater), exposure concentrations may be relatively high and exposures may be significant. For these reasons, exposure of terrestrial receptors (both bird and mammals) by ingestion of groundwater at seep areas is evaluated quantitatively. Exposure of reptiles and amphibians by direct contact with seep water could be of concern, but was not evaluated quantitatively due to lack of adequate toxicity data for these receptors.

4.1.3.7 Summary of Exposure Pathways Selected for Quantitative Evaluation

In summary, the following pathways are evaluated quantitatively in this risk assessment:

Medium	Pathway and Receptor
Surface water	Direct contact of fish and benthic macroinvertebrates Ingestion by birds and mammals
Sediment	Direct contact by benthic macroinvertebrates Ingestion by terrestrial birds and mammals
Aquatic prey items	Ingestion by mammals and birds
Groundwater seeps	Ingestion by terrestrial birds and mammals

4.2 Selection of Chemicals of Potential Concern

Chemicals of Potential Concern (COPCs) are chemicals which exist in the environment at concentrations that might be of potential concern to ecological receptors, and which are derived, at least in part, from site-related sources.

The procedure used to select COPCs for this ERA is presented schematically in Figure 4-2. The selection procedure was similar for aquatic and wildlife receptors, except that risks from beneficial minerals such as sodium, potassium, iron and calcium were not considered for wildlife receptors (since wildlife receptors have efficient homeostatic mechanisms to control the absorption of these minerals), but were considered for aquatic receptors.

The screening procedure was applied to surface water and sediment for each of the exposure scenarios of concern, as described in the site conceptual model (above). In brief, if there was no toxicity information to evaluate the potential effects of the chemical, the chemical was assigned to the Qualitative COPC category (Type 1). Chemicals that have an appropriate TRV but were detected in less than 5% of the samples from a medium (surface water, sediment) were usually excluded from further consideration, since chemicals that are rarely detected at a site are not likely to be site-related. However, if the detection limit for a chemical was too high to expect detection of the chemical if it were present at a level of concern, the chemical was assigned to the Qualitative COPC category (Type 2). If a TRV was available for a chemical and the maximum detected value of the (from anywhere on the site) was less than the TRV, it was concluded that the chemical does not occur at a level of potential concern and was not evaluated as a COPC. If the maximum detected value did exceed the TRV, then the chemical was evaluated quantitatively. It should be noted that this selection procedure is intended to be conservative: that is, the selection procedure is intended to eliminate only those chemicals that are clearly not of potential ecological concern, and to carry forward those chemicals that might be of concern.

For surface water, the concentration values evaluated included measurements of both total and dissolved metals. The TRVs used to evaluate surface water and sediment are described in Section 6. In brief, surface water risks to aquatic receptors were evaluated using the chronic Ambient Water Quality Criteria (AWQC) established by EPA. In cases where the chronic AWQC is hardness dependent (as it is for most metals), a hardness of 50 mg/L was assumed, since most values measured at the site are at or above this level. Surface water risks to wildlife were evaluated using water benchmark values established by Sample et al. (1996). Sediment risks to aquatic receptors were evaluated using the sediment quality criteria established by McDonald et al. (2000) or by Ingersoll et al. (1996), and sediment risks to wildlife from sediment ingestion were evaluated using the dietary benchmarks established by Sample et al. (1996). The results of the COPC selection procedure are detailed in Appendix C and are summarized in Table 4-1 (surface water) and Table 4-2 (sediment).

4.3 Identification of Goals and Endpoints

4.3.1 Ecological Management Goals

The overall management goal for ecological health at the French Gulch Site established by EPA in consultation with other stakeholders at the site is as follows:

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

The specific objectives of the ecological risk assessment for the French Gulch Site established by USEPA Region 8 at the time of the SERA were as follows:

- Identify the receptors (species) at potential risk, the contaminants of concern and the potential exposure pathways.
- Estimate the exposure levels and the adverse effect of these exposure levels for each receptor for each contaminant of concern.
- Identify any State or Federally listed endangered species.
- Identify if any wetland or riparian habitat are potentially affected.
- For French Gulch and the Blue River identify what the potential aquatic community would be, given the existing aquatic habitat and stream flow, if the source of contamination from the mine pool was removed.
- Identify if habitat of French Gulch and the Blue River is limiting use by fish species or if use is limited only by extent of metal contamination.

- Given the existing habitat and flow in French Gulch and the Blue River, what reduction in the contaminants of concern is needed to allow for a reproducing brown trout fishery, reproducing brook trout fishery and others.

- Given the existing riparian and wetland habitat, is a reduction in the contaminants of concern in surface water, sediments, soil or food needed to allow for protection of growth, reproduction and survival for wildlife species? For survival of terrestrial plants and soil invertebrates?

Based on the results of the SERA, the objectives of this ERA are revised to include the following specific goals:

- Utilize new site data to refine and confirm risk estimates for aquatic and terrestrial receptors

- Utilize site-specific toxicity testing to confirm calculated risk estimates and to help identify a preliminary remediation goal for surface water in the Blue River downstream of the confluence with French Gulch

- Refine the evaluation of habitat suitability in order to determine if French Gulch would support a viable trout population absent significant metals toxicity

4.3.2 Identification of Assessment and Measurement Endpoints

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

The following assessment and measurement endpoints are used to interpret potential ecological risks for the French Gulch Site. In some cases, more than one measurement endpoint is identified for a particular assessment endpoint. These instances permit a weight-of-evidence approach to be used in risk characterization. In other cases, a measurement endpoint may be relevant to more than one assessment endpoint.

Assessment and Associated Measurement Endpoints	
Assessment Endpoint	Measurement Endpoint
Protection of aquatic invertebrates and fish from adverse effects related to exposure to COPCs in the aquatic food chain.	Comparison of detected COPC concentrations in fish tissue with toxicity benchmarks for fish tissue residues.
Protection of aquatic invertebrates and fish from adverse effects related to exposure to COPCs in surface water and sediment.	Comparison of COPC concentrations in surface water and sediment to aquatic toxicity benchmarks. Toxicity testing of surface water to identify dilution (reduction of metals) necessary to allow for survival and growth of fish. Identify fish and aquatic invertebrate species that should be resident given the habitat parameters present.
Protection of terrestrial wildlife from adverse effects to growth, reproduction or survival related to exposure to COPCs in surface water, sediment, and food.	Comparison of the predicted average daily doses of COPCs from surface water, sediment and diet to toxicity reference values.
Habitat suitability	Use measured habitat parameters to quantify and compare habitat suitability at several locations

5.0 ECOLOGICAL EXPOSURE ASSESSMENT

The method used to characterize the exposure of ecological receptors depends upon the receptor being evaluated and the exposure pathway of potential concern. In most cases, exposures of aquatic (fish, benthic macroinvertebrates) or semi-aquatic (amphibians, reptiles) receptors to contaminants in the aquatic environment are characterized in terms of the concentration of contaminant in the direct contact media (surface water and sediment). Alternatively, exposure of aquatic receptors may be characterized in terms of the concentration of COPC in the tissues of the receptor. For terrestrial receptors (birds, mammals) that are exposed by ingestion of water, sediment or prey items, exposure is usually characterized in terms of ingested dose.

5.1 Exposure of Aquatic Receptors

5.1.1 Direct Contact with Surface Water

Aquatic invertebrates and fish are potentially exposed to COPCs in surface water via direct contact. Because concentrations of COPCs in surface water can vary significantly over time and location (sampling station), exposure is best characterized as a distribution of values at each location of concern. Summary statistics showing the detection frequency and the minimum, mean, and maximum concentration value for dissolved and total recoverable levels of each COPC at each surface water sampling station are presented in Tables 5-1(a) to 5-1(m). In general, risks to aquatic receptors are better predicted by the concentration of dissolved metals than total metals (Prothro, 1993), while risks to terrestrial receptors are related to total recoverable.

5.1.2 Direct Contact with Sediment

Benthic invertebrates are potentially exposed to COPCs in sediment via direct contact. Although concentrations of COPCs in sediment are usually not as time-variable as concentrations in surface water, concentrations do fluctuate as contaminated material is added or removed by surface water flow. In addition, there may be significant small scale variability in sediment concentrations at any specific sampling station. Therefore, exposure to sediments is also best characterized as a distribution of values at a specific location. However, in this case, there is only one measurement of sediment concentration available per sampling location, so exposure must be approximated as a single concentration value. These data are summarized in Table 5-2.

5.1.3 Fish Tissue Burdens

Fish are exposed to COPCs in surface water by direct contact, ingestion, and to COPCs in sediment and food by ingestion. These exposures result in accumulation of COPCs in fish tissues, and the level of COPC in the tissue is a direct indicator of the total exposure from all routes. Data on the level of arsenic, cadmium, copper, manganese, lead and zinc in fillet, gonad, liver, and kidney tissues were reported by USGS (1997) for trout collected from BR-1 and BR-2 in the Blue River. The tissues levels measured in this study are summarized in Table 5-3. It should be noted that the trout collected from the BR-2 site were not collected from the main channel, but from inflows and tributaries into the Blue River near the BR-2 site (personal communication with Bill Schroeder, EPA). As such, these fish may not be full-time residents in the Blue River, and so the tissue levels in these fish may not reflect the levels that occur in fish that reside in mining-impacted waters.

5.2 Exposure of Terrestrial Wildlife

Wildlife species may be exposed to COPCs by ingestion of surface water, sediment, soil, and aquatic and terrestrial food chain items. The following subsections describe the selection of specific wildlife species to use as representative receptors, along with the methods used to estimate intakes (doses) for these representative wildlife species for each exposure medium.

5.2.1 Identification of Representative Wildlife Species

It is not feasible to evaluate exposures and risks for each avian and mammalian species potentially present within the study area. For this reason, specific wildlife species are identified as representative wildlife species for the purpose of estimating quantitative exposures (doses) in the ERA. Selection criteria for representative wildlife species include trophic level, feeding habits, and other availability of life history information. At this site, the species selected for evaluation of wildlife exposures via ingestion of surface water, sediment and the aquatic food chain include:

Mink (*Mustela vison*)

The mink is selected to represent mammalian piscivores exposed by ingestion of aquatic prey items as well as by ingestion of surface water and by incidental ingestion of sediment

Great Blue Heron *(Ardea herodias)*

The heron is selected to represent avian piscivores exposed by ingestion of aquatic prey items as well as by ingestion of surface water and by incidental ingestion of sediment

Each of these species have been documented in Summit County (see Tables 2-4 and 2-5).

As noted above, exposure of wildlife from ingestion of soil and terrestrial food web items was not evaluated due to lack of data on soil contamination levels in areas that are likely to be serving as habitat for terrestrial wildlife.

5.2.2 Method for Estimating Dose

Exposure of terrestrial receptors from ingestion of contaminated media is usually characterized in terms of dose. Dose is not easily measurable in the field, but rather is calculated using an equation of the form:

Dose (mg/kg-day) = Conc. (mg/unit medium) × Intake (units of medium per day) / Body weight (kg)

Because terrestrial receptors are able to move about and are likely to receive exposures over a range of locations, the best predictor of exposure is the arithmetic mean concentration over the area where the receptor roams. However, because the true mean concentration cannot be calculated from a limited set of data, the 95% upper confidence limit (UCL) of the mean concentration is generally used as a conservative estimate of the concentration term. When the 95% UCL exceeds the highest detected concentration, the maximum value is used. The final value (the 95% UCL or the maximum, whichever is lower) is referred to as the Exposure Point Concentration (EPC).

Information on body weight, ingestion rates, and dietary composition for the great blue heron and the mink are available in the Wildlife Exposure Factors Handbook (USEPA, 1993a; USEPA, 1993b). These exposure factors are detailed in Appendix D and are summarized below:

Wildlife Exposure Factors				
Species	Water Ingestion Rate (L/day)	Food Ingestion Rate (kg/day)	Sediment Ingestion Rate (kg/day)	Body Weight (kg)
Great Blue Heron *(Ardea herodias)*	0.1	0.411	1E-03	2.34
Mink *(Mustela vison)*	0.058	0.089	2E-4	0.556

The fraction of the total daily food and water intake that occurs in an area of contamination is characterized by the Area Use Factor (AUF). That is, if a receptor spends about 50% of its time in the contaminated area (AUF = 0.5), it is assumed that about 50% of the daily food and water is ingested in the contaminated area. In order to be conservative, an AUF of 1.0 (100%) was assumed for both mink and heron. Assumption of a factor of 1.0 will tend to overestimate exposure and risk in the case where the receptor migrates between different locations and ingests food and water at locations that are not contaminated.

5.2.3 Ingested Dose from Surface Water

Exposure from ingestion of surface water is quantified using the following equation:

$$Dose_{water} = EPC_{water} \cdot \frac{IR_{water}}{BW} \cdot AUF$$

where:

$Dose_{water}$ = Daily intake of COPC (mg/kg-d)
EPC_{water} = Exposure Point Concentration of COPCs in surface water (mg/L)
IR_{water} = Ingestion rate of water (L/day)
AUF = Area Use Factor (unitless)
BW = Body weight (kg)

Table 5-4 presents the estimated exposure point concentrations and the associated doses for each COPC for each of semi-aquatic wildlife receptor from ingestion of surface water at each exposure area.

5.2.3 Ingested Dose from Sediments

Exposures to COPCs in sediment are quantified based on the following equation:

$$Dose_{sed} = EPC_{sed} \cdot \frac{IR_{sed}}{BW} \cdot AUF$$

where:

$Dose_{sed}$	=	Daily intake of COPC from sediment (mg/kg-d)
IR_{sed}	=	Ingestion rate of sediment (kg dry weight/day)
C_{sed}	=	Exposure Point Concentration (EPC) (95th upper confidence limit on the arithmetic mean or the maximum whichever is lower) of COPCs in sediment (mg/kg dry weight)
AUF	=	Area Use Factor (unitless)
BW	=	Body weight of the receptor of interest (kg wet weight).

Table 5-5 presents the estimated exposure point concentrations and associated doses for each representative wildlife species resulting from exposure to COPCs in sediment.

5.2.4 Ingested Dose from Aquatic Prey

The dietary intake of a COPC for each representative terrestrial wildlife species is estimated by the following equation:

$$Dose_{diet} = \frac{IR_{diet}}{BW} \cdot \sum \left(C_{food\ i} \cdot df_i \right)$$

where:

$Dose_{diet}$	=	Daily dietary intake
IR_{food}	=	Ingestion rate of food
$C_{food\ i}$	=	Concentration of COPC in food type "i" (aquatic invertebrate, fish, plant or soil invertebrate; mg/kg wet weight);
df_i	=	Dietary fraction (proportion in the diet) of food type "i" (unitless)
BW	=	Body weight (kg).

For the ERA, the diet for the two semiaquatic wildlife species is assumed to be composed of 100% fish (dff_{ish}), since this is the only aquatic prey type for which analytical data are available. The assumption that 100% of the diet is fish is not likely to result is a significant error in the estimation of ingested dose for either heron or mink, since the heron does ingest mainly fish, and other types of aquatic prey ingested by mink (crustaceans, benthic invertebrates) are likely to have tissues concentrations that are generally similar to fish.

Dry weight concentrations of COPCs in fish tissue (see Table 5-3) were converted to wet weight concentrations by multiplying by a wet weight-dry weight ratio of 0.24 (USFWS, 1998). The calculation of the EPC for fish is complicated by the fact that the available data are not for whole fish (as would be ingested by the heron and mink), but for several different types of tissues (fillet, liver, kidney, gonads). In order to estimate the approximate whole body concentration, the tissue-weighted average concentration was calculated as:

$$C_{whole\ body} = \sum \left(C_t \cdot f_t\right) / \sum f_t$$

where

C_t = Concentration in tissue type "t"
f_t = Whole body mass fraction of tissue type "t"

Representative values of f*t* for trout are summarized below:

Tissue	f_t	Source
Fillet (muscle)	67%	a
Liver	1.3%	a
Kidney	0.8%	a
Gonads (non-breeding)	1%	b

(a) Nichols et al. (1990)
(b) J. Nichols (personal communication)

Resulting EPCs for fish tissue are shown in Table 5-6, along with the estimated dietary in take by heron and mink. Note that the evaluation of this exposure pathway is completed only for two locations in the Blue River, because fish tissue data are not available for French Gulch.

6.0 ECOLOGICAL EFFECTS ASSESSMENT

The effects of a chemical contaminant on an ecological receptor are characterized by an exposure-response curve. The shape and location of the exposure response curve generally depends on the chemical, the receptor, the toxicological response, the exposure route, and the exposure duration. Key points on an exposure response curve that are often used to characterize the effects of a chemical may include the no-observed adverse effect level (NOAEL) or concentration (NOEC), the lowest observed adverse effect level (LOAEL) or concentration (LOEC), or the exposure level that causes a response in some specified fraction of the test animals (e.g., LD50, LC50, EC20, etc). These key points on an exposure response curve are usually referred to as Toxicity Reference Values (TRVs) or as toxicity benchmarks. When characterizing risks to environmental receptors, estimates of the NOAEL or NOEC are usually preferred, although estimates of the LOAEL or LOEC may also be informative. The following sections identify the best available TRVs or toxicity benchmarks for each COPC and each ecological receptor.

6.1 Aquatic Receptors

6.1.1 Toxicity Benchmarks for Surface Water

The USEPA (USEPA, 1995; USEPA, 1996b) has established acute and chronic Ambient Water Quality Criteria (AWQC) values for each of the COPCs selected for evaluation in surface water. The acute AWQC is intended to protect against short-term (48-96 hour) lethality, while the chronic AWQC is intended to protect against long-term effects on growth, reproduction, and survival. AWQC values are not species-specific, but are designed to protect at least 95% of the aquatic species for which toxicity data are available. Therefore, these AWQC values were selected as the toxicity benchmarks for evaluating direct risks to the aquatic community from direct contact with surface water.

For the COPCs at this site (metals), many of the AWQC values are dependent on the hardness of the water, so the precise value of the acute and chronic AWQC that applies to a sample depends on the hardness of that sample. EPA provides separate equations for calculating the AWQC depending on whether the site values are measured as dissolved or as total recoverable metals. There is general consensus that toxicity to aquatic receptors is dominated by the level of dissolved metals (Prothro 1993), so all exposure and risk calculations in this ERA are based on dissolved metals. The equations used to calculated the acute and chronic AWQC values for dissolved metals are presented in Table 6-1. Table 6-1 also lists the highest hardness tested in the dataset used to derive the AWQC equations. Because extrapolation beyond these values is uncertain, the maximum tested hardness was used as a conservative value in calculating AWQC values for samples with higher hardness values.

6.1.2 Toxicity Benchmarks for Sediment

Toxicity benchmarks for benthic invertebrates for exposure to COPCs in sediment were identified based on a review of sediment quality guidelines published in the literature. Several sets of sediment quality guidelines are available. The National Oceanic and Atmospheric Administration (NOAA) compiled a set of Effects Range Low (ERL) and Effects Range Median (ERM) levels for constituents in sediment (Long and Morgan, 1991). The Ontario Ministry of Environment has identified a set of Severe Effects Threshold (SET) values (Persaud et al., 1993). MacDonald Environmental Sciences Ltd. (1994) expanded on the work of Long and Morgan (1991) and developed a set of guidelines including threshold effects levels (TELs) and probable effects levels (PELs). These sediment quality guidelines are derived based on data primarily from marine environments.

Ingersoll et al. (1996) compiled freshwater sediment toxicity data from nine different sites in the United States and identified a series of sediment effect concentrations (SECs) for a series of metals in sediment. The SECs are defined as the concentrations of individual contaminants in sediment below which toxicity is rarely observed and above which toxicity is frequently observed. The database was compiled to classify toxicity data for Great Lakes sediment samples. Ingersoll et al.(1996) derived five different SECs according to the methodology of Long and Morgan (1990), Persaud et al. (1993) and MacDonald Environmental Sciences Ltd. (1994). The SECs include an ERL, ERM, TEL, PEL and no effect concentration (NEC). Ingersoll et al (1996) calculated these freshwater ERL, ERM, TEL and PEL values using the same procedures as NOAA and MacDonald Environmental Sciences Ltd. (1994).

NOAA ERL and ERM Values. The NOAA ERL represents the 10th percentile of values sorted in ascending order reported to be associated with an adverse effect. The NOAA ERM is the median value in the ranking. An ERL is defined by Long and Morgan (1990) and Long et al. (1995) as the concentration of a chemical in sediment below which adverse effects are rarely observed or predicted among sensitive species. An ERM is defined by Ingersoll et al (1996) as the concentration of a chemical above, which effects are frequently or always observed or predicted among most species. The ERLs calculated by Ingersoll et al. (1996) use the 15th percentile.

State of Florida TEL and PEL Values. MacDonald Environmental Sciences Ltd. (MES 1994) calculated TELs and PELs using an expanded database of Long and Morgan (1991). Freshwater data were excluded from the analyses. Sediment concentrations associated with an adverse effect were sorted in ascending order and an ERL (15th percentile) and ERM (50th percentile) were identified. The concentrations associated with no adverse effect were also sorted and a no effect range high (85th percentile) and no effect range median (50th percentile) were identified. The TEL is equal to the geometric mean of the ERL and no effect range median. The PEL is equal to the geometric mean of the ERM and the no effect range high. Although similar, the TEL and PEL values are lower than the ERL and ERM values. The values are lower because they are calculated using both "effect" and "no-effect" data; whereas, the ERL and ERM use only "effect" data. The NEC is the maximum concentration of a chemical in sediment that does not significantly adversely affect the particular response when compared to the control.

Consensus-Based Sediment Quality Guidelines (SQGs). In an effort to focus on agreement among the various sediment quality guidelines (previously discussed), MacDonald et al. (2000) issued consensus-based SQGs for 28 chemicals of concern. For each chemical of concern, a threshold effect concentration (TEC) and a probable effect concentration (PEC) were identified. The predictive reliability of these values was also evaluated. The criteria for establishing reliability of the consensus-based PECs was based on Long et al. (1998). This predictive ability analyses was focused on the ability of each SQG when applied alone to classify samples as either toxic or non-toxic. These criteria are intended to evaluate the narrative intent of the values. Sediment toxicity should be observed only rarely below the TEC and should be frequently observed above the PEC. Individual TECs were considered reliable if more than 75% of the sediment samples were correctly predicted to be non-toxic. Similarly, the individual PEC was considered reliable if greater than 75% of the sediment samples were correctly predicted to be toxic. Therefore the target levels of both false positives (samples incorrectly classified as toxic) and false negatives (samples incorrectly classified as non toxic) was 25% using the TEC and PEC. The SQGs were considered to be reliable only if a minimum of 20 samples were included in the predictive ability evaluation (MacDonald et al., 2000). The results of the reliability analyses are summarized in Table 6-2.

Because field collected sediments contain a mixture of chemicals, a second analyses was completed to investigate whether the toxicity of a sediment could be predicted based on the average of the PEC ratios for the sediment, using only the PEC values that were found to be reliable. It was found that 92% of sediment samples with a mean PEC quotient > 1.0 were toxic to one or more species of aquatic organisms. The relationship between the mean PEC quotient and incidence of toxicity is depicted in Figure 6-1. As seen, the mean PEC quotient was found to be highly correlated with incidence of toxicity ($R^2 = 0.98$) (MacDonald et al., 2000).

For this ERA, the consensus-based SQG TEC and PEC values from MacDonald et al. (2000) are used as a range of toxicity benchmarks for sediments. These values are summarized in Table 6-3. Consensus values are not available for aluminum, iron, manganese, molybdenum or silver. For silver, sediment toxicity benchmarks are the range of values reported by NOAA (ERL and ERM) (Long and Morgan, 1995) and the state of Florida (MacDonald Environmental Sciences Ltd., 1994). For aluminum, iron and manganese, sediment toxicity benchmarks are the lowest and highest SEC values from Ingersoll et al. (1996). Sediment toxicity benchmarks for could not be identified for molybdenum. Although some sediment benchmarks exist for selenium, these are based on protection of wildlife species (e.g., birds) rather than benthic organisms. In general, selenium is much less toxic to invertebrate than vertebrates animals (USDOI 1998). The lowest and highest benchmarks for each COPC in sediment are used to calculate a range of hazard quotients in Section 7.

6.1.3 Toxicity Benchmarks for Fish Tissue

Tissues levels of COPCs can sometimes be used as direct indicator of the potential for toxic effects. Jarvinen et al. (1999) provide a compilation of studies summarizing tissue residues of organic and inorganic chemicals in fish tissues and whether the tissues levels were or were not associated with the occurrence of adverse effects to the organism. Appendix E provides detailed summaries of the studies which provide information on the tissue levels associated with toxicity of each COPC, and the tissue-concentrations selected to serve as TRVs for each COPC are summarized in Table 6-4. All of the values shown are intended to represent no-effect concentrations. Tissue concentrations are converted from wet weight to dry weight using a conversion factor (CF) of 0.2 (Jarvinen and Ankley, 1999).

6.2 Wildlife Toxicity Reference Values (TRVs)

The TRVs selected to characterize risks to wildlife species are based on NOAEL and LOAEL for long-term effects on growth, reproduction and survival. This range of TRVs is used because the true threshold for adverse effects is presumed to occur somewhere in the interval between the NOAEL and the LOAEL, and the range provides an indication of the uncertainty in the true threshold for adverse effects.

Oral NOAEL and LOAEL TRVs for mink and heron were developed based on a critical review of published toxicity data. Three secondary sources (Opresko et al., 1995; Sample et al., 1996; and PRC, 1997) were used to identify key toxicological studies for each of the COCs. The studies were obtained and reviewed independently to determine the relevance and reliability of the study results for derivation of a TRV.

Separate TRVs (both NOAEL-based and LOAEL-based) were developed for exposure via water and the diet. This distinction is based on the observation that the absorption (and hence the toxicity) of metals in the diet is usually lower than metals dissolved in water. Both water and dietary TRVs are based on published toxicity data wherever possible. If toxicity data are available for only one of these media (water or food, but not both), a relative absorption factor of 50% was assumed to extrapolate to the other medium:

$$TRV(water) = TRV(food) \times 0.50$$
$$TRV(food) = TRV(water) / 0.50$$

This adjustment factor of 50% is based on professional judgement, but is supported by evidence that metals in water typically exist in a readily bioavailable form, and that dietary materials (proteins, carbohydrates, and other minerals) tend to bind metals and/or compete for uptake sites, hence reducing their bioavailability. This concept has been used previously by the USEPA in the derivation of food- and water-based reference doses for cadmium (IRIS, 1998). TRVs for food were also used for exposure via ingestion of soil and sediment.

When reliable toxicity data could not be located for a representative species, it was necessary to extrapolate toxicity data from studies using another species. In some cases, available toxicity data were too limited to allow precise definition of NOAEL and LOAEL values for relevant endpoints. To account for these data gaps, each TRV was derived from the study dose level identified as the NOAEL or LOAEL by dividing by an Uncertainty Factor (UF) as follows:

TRV = Study Dose / UF

The value of UF was calculated as the product of a series of sub-factors (listed in Table 6-5). In general, EPA Region VIII recommends that HQ values be calculated only in cases where the total UF used to derive a TRV is less than 100.

The detailed derivation of the TRVs for mink and heron are presented in Appendix F, and the resulting values are summarized in Table 6-6.

7.0 RISK CHARACTERIZATION

7.1 Results of the SERA and Identification of Goals for ERA

The screening-level risk characterization (SRC, 2001) identified the following risks to ecological receptors at the site:

- Dissolved metals concentrations in French Gulch surface water downstream of the W-O Mine complex to the confluence of the Blue River are above the range associated with acute and chronic toxicity to aquatic receptors. These concentrations were judged to be sufficient to account for the observed absence of trout populations (and other fish species) and limited benthic invertebrate communities in French Gulch.

- Dissolved metals concentrations in Blue River surface water downstream to BR-2 below the confluence with French Gulch are above the range associated with acute and chronic toxicity to aquatic receptors. These levels were judged to be sufficient to account for the relatively low trout populations and limited benthic invertebrate communities in this reach.

- The metals concentrations measured in French Gulch sediment (aluminum, arsenic, cadmium, copper, chromium, lead, manganese, mercury, nickel, silver and zinc) are above concentrations associated with toxicity to benthic invertebrates.

- Maximum concentrations of metals (cadmium, copper and zinc) measured in fish collected from BR-1 and BR-2 are within the range associated with adverse effects to the fish (growth, survival or reproduction).

- If wildlife species (great blue heron and mink) were to consume fish with tissue concentrations of cadmium, copper and zinc similar to the maximum concentrations measured in the tissues of fish from BR-2, then adverse effects are possible.

- The metals concentrations measured in French Gulch and Blue River surface water (aluminum, cadmium, lead, manganese and zinc) and sediments (aluminum and lead) are above those associated with adverse effects to wildlife (great blue heron and mink) resulting from ingestion.

The risk characterization presented in this Section represents an update of the information presented in the SERA, with the following additions and changes:

- Toxicity testing of surface water samples from four locations in French Gulch and one location in the Blue River was performed by EPA. These data were added to the risk characterization for aquatic receptors. The data were used to identify the necessary reduction of zinc concentrations to allow for the survival of fish.

- Several sets of surface water samples have been analyzed in the interim from the data used in the ERA to the present report. These data were added to the calculations in Section 5 for exposure and in this section for calculation of risks (hazard quotients) for aquatic receptors and terrestrial wildlife.

- The Colorado Division of Wildlife (CDOW) collected information on the quality of the habitat present in French Gulch and the Blue River for the support of benthic invertebrate and fish communities. This information is added to the risk characterization for aquatic receptors.

- More realistic calculations of exposure to birds and mammals from ingestion of fish, using estimated whole body concentrations rather than maximum tissue levels.

- Improved characterization of risks to aquatic receptors from surface water by using the distribution of surface water values at a station rather than only the average and maximum values.

7.2 Risk Characterization for Aquatic Receptors

7.2.1 Risks from Surface Water

Potential risks for aquatic receptors to COPCs in surface water were evaluated by six alternative approaches:

- Comparison of surface water concentrations of COPCs with AWQCs

- Comparison of surface water concentrations with genus/species mean acute and chronic toxicity values.

- Evaluation of existing surface water toxicity testing data for French Gulch and the Blue River. Comparison of toxicity observed to that observed for upstream (reference) surface water samples.

- Evaluation of existing data on the status of benthic macroinvertebrate communities in French Gulch and the Blue River. Comparison of upstream (reference) community structure with the downstream (metal-exposed) communities.

- Evaluation of existing data on the status of fish populations in French Gulch and the Blue River. Comparison of upstream (reference) populations with the downstream (metal-exposed) populations.

- Evaluation of existing data on the quality of habitat present in French Gulch and the Blue River for the support of benthic invertebrate and fish populations.

The individual results are provided below in Sections 7.2.1.1 to 7.2.1.6, with an overall weight-of-evidence evaluation in Section 7.2.1.7.

7.2.1.1 Hazard Quotients Based on AWQC Values

The first portion of the risk evaluation for aquatic receptors (aquatic invertebrates and fish) for exposure to COPCs in surface water is based on the Hazard Quotient (HQ) approach. The HQ is defined as the ratio of the exposure point concentration to the appropriate toxicity reference value:

HQ = Concentration / TRV

If the HQ is less than or equal to one, it is believed that no unacceptable risks will occur in the exposed aquatic population. If the value of HQ exceeds one, then unacceptable risks may occur, with the probability and/or severity of the adverse effect tending to increase as the value of HQ increases.

Because the toxicity of COPCs in surface water to aquatic receptors is usually dependant on the length of exposure time, the HQ is calculated both for short-term (acute) and long-term (chronic) exposure conditions, using EPA's acute and chronic AWQC values as the TRV. As noted above, because risks from metals in surface water are best predicted from the concentration of dissolved metals, all HQ results are based on the dissolved concentration. In cases where the acute and chronic AWQCs are hardness-dependent, any sample where hardness was not reported was not included in the HQ distribution.

The detailed calculations of HQ values for each COPC in each sample are presented in electronic format in Appendix G. The results are summarized graphically in Figures 7-1a to 7-1h. A figure is not presented for mercury, since mercury was not detected in any water sample collected from French Gulch or the Blue River, with the only detect occurring at Station WP-1.

Note that the results in these figures are plotted on a log-scale, so large differences between HQ values are somewhat compressed. In each figure, the upper panel reflects risks of acute toxicity from short-term exposures, while the lower panel reflects risks of chronic effects on growth or reproduction due to longer-term exposure. The bar for each station reflects the variability in concentration (and hence risk) between different samples of surface water from the station. Inspection of Figures 7-1a to 7-1h reveals the following main conclusions:

- HQ values are largely below a level of concern (HQ<1E+00) for aluminum, copper, nickel, and silver. Further, HQ values show relatively little spatial pattern, suggesting that these chemicals are not likely to be primarily attributable to releases from mine wastes.

- HQ values for iron are largely above a level of concern is samples from the North Branch of French Gulch, but are below a level of concern in other reaches, including the South Branch and below.

- Acute HQ values for lead are below a level of concern in nearly all locations, but chronic HQ values exceed a value of 1E+00 in some (but not all) samples from the North Branch of French Gulch. Chronic HQ values for lead are largely below a level of concern in the South Branch and in the Blue River.

- Acute HQ values for cadmium are above a level of concern in the North Branch, but are mainly below a level of concern elsewhere except after the North Branch rejoins the south Branch at FG-9. However, chronic HQ values for cadmium are above a level of concern over nearly all of the French Gulch (from FG-6 to FG-9) and even into the Blue

River. Chronic HQ values for cadmium are not above a level of concern in the upstream (reference) portions of French Gulch or the Blue River.

- HQ values for zinc are well above a level of concern for both acute and chronic toxicity at nearly all non-reference locations. Highest values are observed in samples from the North Branch, and HQ values increase in a clear spatial pattern from upstream to downstream along the South Branch. Values are well above a level of concern in the Blue River just downstream of the confluence with French Gulch, and do not drop below a level of concern until Station BR-3 and beyond.

In summary, these HQ calculations predict that surface waters from French Gulch and in the Blue River downstream of the confluence with French Gulch have high acute and chronic toxicity to aquatic receptors, with a large majority of the hazard being attributable to zinc. Cadmium, lead, and iron may contribute some incremental risk in some stations (mainly in the North Branch).

7.2.1.2 Comparison of Species/Genus Mean TRVs to Surface Water Concentrations

Evaluation of concentration data by comparison to AWQC values is useful in assessing risks to the aquatic community as a whole, but does not provide information on which species may be most at risk. Figure 7-2 compares the distributions of surface water concentrations for cadmium (Figure 7-2a) and zinc (Figure 7-2b) to TRVs derived for a number of different species and age groups of fish and benthic receptors. In both figures, TRVs for fish are shown on the left side, while TRVs for benthic organisms are shown on the right side. All of the TRVs for fish and benthic invertebrates are derived from the corresponding AWQC Documents prepared by EPA (1985b-e, 1987, 1996), as follows:

Acute TRV = Species or genus mean LC50 / 2
Chronic TRV = Species or genus mean chronic value

Because the toxicity of most of the contaminants of concern depends on water hardness, all of the data (both the toxicity values and the concentration values) were normalized to a hardness of 60 mg/L, since this is approximately the average hardness of water in the reference portion of French Gulch (stations FG-0, FG-1, FG-2, FG-3) and in the Blue River upstream of the confluence with French Gulch (stations 654, 655, BR-1 and BR-Adams St). This normalization is achieved using the following equation:

$$C(60) = C(H) \times TRV(60) / TRV(H)$$

where:

C(60) = normalized concentration
C(H) = original concentration (hardness = H)
TRV(60) = Acute AWQC (dissolved) at a hardness of 60 mg/L
TRV(H) = Acute AWQC (dissolved) at hardness = H

In the case of cadmium (Figure 7-2a), it may be seen that most concentrations in the North Branch of French Gulch approach or exceed reported acute and/or chronic TRVs values for brook, brown, and rainbow trout. In the South Branch, cadmium concentrations would be not be expected to cause effects at Stations FG-4 or FG-5, but would be expected to cause effects at Stations FG-5.5 to FG-10. Cadmium concentrations at most locations in French Gulch downstream from the W-O complex also enter a range of chronic concern for *Daphnia* spp. and snails, but would not be expected to cause effects on most other invertebrates.

In the case of zinc (Figure 7-2b), concentrations in French Gulch and the Blue River approach or exceed reported acute and/or chronic TRVs for most species of fish, including brook and rainbow trout. Zinc concentrations at all locations, with the exception of the reference locations, are also frequently in a range of acute toxicity for most invertebrates, including *Daphnia* spp., Tubificid worms, caddisflies, and *Gammarus* spp.

These graphs illustrate that zinc and cadmium are expected to have adverse effects on a number of different species of both fish and invertebrates in the aquatic community, and that severe community level effects are likely to exist due to the toxicity of these COPCs.

7.2.1.3 Surface Water Toxicity Testing

Exposure of aquatic test organisms in the laboratory to samples of surface water collected from the site provides a direct measurement of the response to contaminants present in the water. EPA has developed standard aquatic toxicity testing procedures for the testing of effluents and site waters (USEPA, 1988; USEPA, 1989b; and USEPA, 1993c). The standard routine freshwater aquatic toxicity tests (acute and chronic) use two common laboratory test organisms: the fathead minnow (*Pimephales promelas*) and the cladoceran (water flea) (*Ceriodaphnia dubia*) (USEPA, 1993c and USEPA, 1989b).

Two studies are available that provide information on the acute toxicity of surface water samples from French Gulch and the Blue River. The first was completed by Clements (1995) and the second by Lockheed Martin (2000). These studies are described below.

Clements (1995)

Clements (1995) collected surface water samples from two sampling stations in French Gulch (FC1 and FC2, as shown on Figure 2-7) and one sampling station from the Blue River (BR4, as shown on Figure 2-7) in may and October of 1995. Acute (48 hour) toxicity tests were completed using *Ceriodaphnia dubia*. For each station, neonates of *C. dubia* were exposed to 100%, 50%, 25%, 12.5%, 6.25% and 0% of the site sample. Cache la Poudre River water was used for the controls and diluent water. The results are reported as follows:

Percent Mortality of *Ceriodaphnia dubia* Exposed to Water Collected from French Gulch and the Blue River (Clements, 1995)							
Station	Date	Percentage Site Surface Water					
		0%	6.25%	12.5%	25%	50%	100%
FC1	May	0	0	0	0	0	15
	October	0	0	0	0	0	0
FC2	May	0	100	100	100	100	100
	October	0	100	100	100	100	100
BR4	May	0	0	0	0	0	100
	October	0	0	0	0	25	100

As shown, water collected from stations FC2 and BR4 were acutely toxic to *C. dubia*. Water from FC2 was acutely toxic at the lowest dilution tested (6.25%). Acute toxicity was also observed in the samples collected from BR4, with 25% mortality observed in the 50% dilution from the October sampling event. Based on comparison of the toxicity testing results with measured dissolved zinc concentrations, the authors concluded that the observed toxicity was associated with exposures to zinc.

Lockheed Martin (2000)

In March, 2000, USEPA Region 8 field personnel collected surface water samples and performed 48-hr static renewal toxicity tests using *Ceriodaphnia dubia* and fathead minnow (*Pimephales promelas)* in accord with the protocols described in USEPA (1993). A summary of the study and its findings are presented below.

Water samples were collected at five stations on French Gulch (FG-1, FG-6A, FG-7, FG-8, and FG-9) and three locations on the Blue River (BR-1, BR2 and BR-3). In most cases, the site water was tested at a number of dilutions, using moderately hard reconstituted water (MHRW) as the diluent. Because waters from FG-1 and BR-3 were expected to be essentially non-toxic, samples from those sites were not serially diluted and were tested only at 100%. The observed mortality for these samples and the estimated LC50 values are summarized below:

Sampling Station	Percent Mortality in 100% Site Water		Estimated LC50 (% Site Water)	
	C. dubia	*P. promelas*	*C. dubia*	*P. promelas*
FG-1	5%	5%	>100%	>100%
FG-6A	100% (a)	100% (a)	< 1%	<1%
FG-7	100% (a)	100% (a)	2%	5%
FG-8	100%	100%	9%	54%
FG-9	100% (a)	100% (a)	2%	29%
BR-1	0%	0%	>100%	>100%
BR-2	100%(a)	100% (a)	5%	23%
BR-3	9.5%	0%	>100%	>100%

(a) 100% lethality observed at concentrations lower than 100%; 100% not tested

As seen, water from the headwaters of French Gulch (FG-1) have low toxicity for both species, causing less than 5% mortality in 100% site water. However, samples from the portion of French Gulch that is impacted by mining (FG-6A to FG9) are all severely toxic, with 100% mortality in both species at site water concentrations of 100% or less. Water in the Blue River above the confluence with French Gulch (BR-1) does not cause lethality, while water from the Blue River directly downstream from the confluence (BR-2) is highly toxic. This acute lethality is reduced but not completely eliminated several miles downstream at BR-3.

Because the waters from French Gulch and the Blue River near the confluence with French Gulch are so severely toxic, it is not possible to draw conclusions as to whether there are any site-specific factors in the water which significantly influence the toxicity of the metals compared to what is expected based on studies in laboratory water. This is because the site waters must be diluted so extensively to obtain useful dose-response data that the data reflect the toxicity in the diluent water rather than the site water. However, the data do support the conclusion that the acute toxicity observed in site waters is attributable mainly to zinc. This may be demonstrated by comparing the concentration of zinc and cadmium in site waters diluted to the estimated LC50 for site water to LC50 values reported in the Aquatic Toxicity Information Retrieval (AQUIRE) database for larval fathead minnows and neonatal *C. daphnia*.

COPC	Receptor	Concentration in site waters at LC50 Dilution (ug/L)		Reported LC50 values from AQUIRE (ug/L)	
		GM	Range	GM	Range
Zinc	Fathead minnow	557	453-706	577	240-2160
	Ceriodaphnia dubia	83	43-177	111	65-153
Cadmium	Fathead minnow	0.94	0.15-2.0	67	5-323
	Ceriodaphnia dubia	0.14	0.01-0.33	71	17-560

As seen, the geometric mean concentrations of zinc at the LC50 dilutions for fathead minnow and *C. dubia* in site water are both quite close to the value expected from published literature studies that are entered into AQUIRE. In contrast, concentrations of cadmium at the LC50 dilutions are 50-70 fold lower than the expected values for both fathead minnow and *C. dubia*, indicating that cadmium is contributing only a small amount (perhaps a few percent) of the acute toxicity at the LC50 dilution.

Summary of Surface Water Toxicity Testing

Both studies of surface water toxicity from the site provide very clear evidence that surface waters of French Gulch both North and South Branches downstream of FG-5 to the confluence with the Blue River are acutely toxic to aquatic life, and that surface water of the Blue River below the confluence with French Gulch is also toxic at least downstream to BR2 and possibly beyond. Both studies also support the conclusion that dissolved zinc is the primary source of the surface water toxicity.

7.2.1.4 Benthic Macroinvertebrate Communities

Benthic invertebrates have been used to monitor effects of heavy metals on streams since the early 1900's (Carpenter, 1924). Benthic communities are directly exposed to varying water quality conditions and therefore integrate effects of contaminants over time (Voshell et al., 1989), and the abundance and diversity of benthic macroinvertebrate communities is an index of the relative degree of degradation from contaminants (Cairns and Pratt, 1993). It should be noted that concentrations of metals in surface water are often used as the primary index of habitat degradation, but metal concentrations in sediment may also be important.

Invertebrate community composition is assessed by identification of indicator species assemblages (Cairns and Pratt, 1993) and the use of benthic community metrics determined using rapid bioassessment protocols (Plafkin et al. 1989 and Resh and Jackson, 1993). The rationale for several of the recommended metrics is based on the observation that some Ephemeroptera, Plecoptera and Tricoptera (EPT) are sensitive to contaminants, whereas Chironomidae are generally tolerant. These generalizations, however, are based on organism tolerance of organic enrichment. Therefore, caution is required in application of these indices to assess effects of contaminants.

Clements (1995) suggests that the abundance and species richness of mayflies are the best indicators of water quality in metal-polluted streams in the Rocky Mountain ecoregion. Previous studies have shown that mayflies are sensitive to heavy metals and are usually the first group eliminated from metal-contaminated streams (Clements, 1994; Clements and Kiffney, 1995). Clements further concludes that total abundance and species richness of mayflies and abundance of Heptageniidae (*Rhithrogena hageni, Epeorus longimanus, E. deceptivurs* and *Cinygmula* sp.) are the most reliable indicators of metal pollution. In its simplest form, comparisons of mayfly abundance (or scarcity) between impacted stations and reference can be the most useful indicator of stream integrity.

Two studies are available that provide information on the status and health of benthic invertebrate communities in French Gulch and the Blue River. The first was completed by Clements in 1995 (Clements, 1995) and the second by the USGS in 1996 (USGS, 1996). These studies are described below.

Clements (1995)

Clements (1995) sampled the benthic invertebrate community at two stations in French Gulch and one station in the Blue River as depicted on Figure 2-7. Station FC-1 is a reference station for French Gulch, Station FC-2 is located downstream of tailings and Station BR4 is located in the Blue River downstream of its confluence with French Gulch (Figure 2-7). Benthic invertebrates were quantitatively sampled in May and October 1995 using a Hess sampler from shallow (<0.5 m) riffle areas with three replicates per site. Also measured concurrently during the study were the dissolved and total concentrations of zinc in surface water samples, the acute (48 hour) toxicity of surface water samples to *Ceriodaphnia dubia* and water quality parameters (conductivity, pH, hardness, alkalinity). The results of the study are summarized in Figures 7-3. Figure 7-3a shows the relative abundance of dominant taxa including stoneflies, dipterans, mayflies and caddisflies. Figure 7-3b shows the composition of the benthic invertebrate community and the total number of individuals and number of taxa.

The mayfly community at the upstream reference location (FC-1) is diverse and considered healthy. The mayfly community at FC-2, however, is absent. At BR-4, mayflies were abundant (mean = 205 to 361 per sample) comprising 23 to 50% of the total benthic community. The mayfly community at BR-4 is, however, less diverse compared to that at FC-1 and is dominated by two to three species (Clements, 1995).

Previous studies have shown that mayflies are sensitive to heavy metals and are usually the first group eliminated from metal-contaminated streams (Clements and Kiffney, 1995; Clements, 1994). Therefore, Clements (1995) concludes that the metals observed in surface water have eliminated the mayfly community at FC-2. Clements (1995) further concludes based on these results and other studies that the most reliable indicator of adverse effects to the benthic macroinvertebrate community associated with metals is the total abundance and species richness of mayflies and the abundance of Heptageniidae (*Thithrogena hageni, Epeorus longimanus, E. deceptivus* and *Cinygmula* sp.). The Heptageniidae mayflies are absent at FC-2 and greatly reduced at BR4 in comparison to FC-1, suggesting metals-related impacts to the benthic invertebrate community in French Gulch and the Blue River.

Stoneflies were absent at FC-2 during the May sampling event and showed some indication of recovery in October. There were, however, fewer individuals and taxa observed at FC-2 and BR-4 than the reference (FC-1) during both sampling events. Previous studies have shown that stoneflies are moderately tolerant to low levels of metals and are often one of the earlier groups to recover. Clements (1995) suggests that these results indicate moderate toxicity associated with metals.

The orthoclad chironomids were abundant at station BR4 and dominated the sparse benthic community at station FC2. Previous research has shown that orthoclad chironomids are highly tolerant of heavy metals and are common in metal-polluted streams. Clements (1994) concludes that the observed dominance of this group is likely to be associated with elevated metal exposures, and this conclusion is consistent with toxicity testing studies concurrently completed at the site.

USGS (1996)

Benthic macroinvertebrate samples were collected in August 1996 as part of the USGS NAWQA program. Samples were collected from two stations. One station is located at the mouth of French Gulch just upstream from the Blue River (USGS French Gulch sampling station). The other station is located approximately ¼ mile downstream of the mouth of French Gulch on the Blue River (USGS Blue River sampling station). These sampling stations are shown on Figure 2-7 and are located in between the sampling stations of Clements (1995). The USGS French Gulch station is located downstream of Clements FC-2 and the USGS Blue River station is located upstream of Clements BR-4. Benthic macroinvertebrate samples were collected at these stations using standard NAWQA protocols with collected organisms identified to the lowest taxonomic level and reported as total number of individuals and total number of taxa.

The available results from this study confirm those of Clements (1995). The USGS observed the following:

- Mayflies and stoneflies are present in each sample, however, only two to three species are found for each group at the French Gulch Site. The sample collected from French Gulch contain fewer species and numbers compared to the downstream sample from the Blue River.

- Caddisflies are present in each sample, however, only one genus is represented. Fewer numbers are found in the French Gulch station compared to the Blue River station. The caddisflies present are identified as typically found in streams with known metals loading

- Chironomids compose 75 percent of the benthic community at the French Gulch station and 79% of the benthic community at the Blue River station. These percentages are consistent with those found by Clements (1995) of 62% at FC-2 and 70% at BR-4.

CDOW (2001)

Benthic invertebrates were collected by CDOW at 3 locations in French Gulch (FG-1, -8 and -9) and at 4 locations in the Blue River (BR-1, -2, -3, and -5) in May 2000 (Figure 2-1). Macroinvertebrates were collected by kick netting, preserved in 70% ethyl alcohol and identified in the laboratory to the lowest practical level. The total number of taxa and total number of individuals per taxa were determined for each sample by Aquatics Associates of Fort Collins, Colorado. Three USEPA Rapid Bioassessment Protocol (RBP) metrics were selected by CDOW to evaluate changes in the aquatic macroinvertebrate community along French Gulch and the Blue River. These metrics included the number of Ephemeroptera (E), Plecoptera (P) and Tricoptera (T) taxa, the percent Ephemeroptera (the number of mayflies relative to the total number of organisms) and the number of Ephemeroptera (mayfly) taxa. The results of the benthic invertebrate sampling and analyses are summarized in the following table:

Benthic Invertebrate Community Sampled by CDOW in May 2001

Sample site	Location ID	Total number of taxa	Total number of organisms	Number of EPT taxa	Percent Ephemeroptera	Number of Ephemeroptera taxa
French Gulch 1	FG-1	50	1,417	23	67.8	7
French Gulch 8	FG-8	30	812	17	39.3	5
French Gulch 9	FG-9	12	654	5	20.5	3
Blue River 1	BR-1	30	410	8	1.2	3
Blue River 2	BR-2	26	318	14	39	1
Blue River 3	BR-3	51	959	22	50	8

As seen, the benthic invertebrate community in the headwaters of French Gulch upstream of the mine (FG-1) was dominated by EPT (Ephemeroptera, Plecoptera and Tricoptera) taxa (46% of total taxa). The total number of taxa and number of organisms decreased with distance downstream in French Gulch as will as the number of EPT taxa and percent Ephemeroptera. Most of the mayflies in the lower reach of French Gulch (FG-8 and FG-9) were one species (*Baetis bicaudatus)*.

The benthic invertebrate community of the Blue River upstream of French Gulch was also dominated by EPT taxa (53%). In the Blue River downstream of French Gulch several mayfly taxa disappeared, including members of the mayfly family Hepatageniidae and the genus *Rhithrogena* sp. which are sensitive to metal concentrations.

7.2.1.5 Fish Communities

Fish communities have a high degree of natural variability, but can be useful indicators of stream health (Moyle, 1994; USEPA 1989b). A fish community is defined as a group of fish that inhabit the same area of a stream and interact with each other. The structure of a fish community is determined by the species present, the relative abundance of the species, the distribution of life stages and distributions in space and time (Deacon & Mize, 1997). Studies on fish communities in French Gulch Site and the Blue River are described below.

CDPHE & USEPA (1989)

Preliminary fish electroshocking data are available for French Gulch and the Blue River from CDPHE and USEPA (CDPHE & USEPA, 1989). CDPHE and USEPA sampled fish from seven locations in French Gulch (FG0, FG1, FG2, FG4, FG6A, FG8 and FG9) and three sampling locations in the Blue River (BR1, BR2, BR3) in September of 1989 (CDPHE & USEPA, 1989).

Native Colorado River cutthroat trout (*Oncorhynchus clarkii*) were captured at FG-0, FG-1, and FG-2 (Figure 2-1). No fish were observed at FG-4, FG-6A, FG-8, or FG-9. One brown (Salmo trutta) and one brook (Salvelinus fontinalis) trout were collected from BR-1, while only one rainbow trout was captured near the BR-2 sampling station. Fish populations recovered near BR-3 producing 118 brown trout, 26 brook trout and 1 sculpin (CDPHE and USEPA, 1989).
Deacon & Mize (1997)

In 1996, the USGS sampled fish communities throughout the Upper Colorado River Basin as part of the National Water-Quality Assessment (NAWQA) program (Deacon and Mize, 1997). Within this sampling program, one sampling station was located on the Blue River (near BR-1) and one sampling station was located in French Gulch (near FG-9). Two sites were selected as background conditions and are considered to be unaffected by human activities. Fish were collected by electroshocking a stream reach 450 to 650 feet in length at wadeable sites and 1,500 to 3,000 feet in length at non-wadeable sites. Fish were identified, measured and then released. Type, trophic class and relative abundance of native and nonnative fish species were recorded (Deacon and Mize, 1997).

For the French Gulch sampling station, no fish were collected. For the Blue River sampling station (near the BR-1 reference upstream of the confluence with French Gulch), two brown trout and 36 brook trout were collected.

CDOW (2001)

Fish were collected by CDOW at two locations in French Gulch (FG-1 and FG-9) and two locations in the Blue River (BR-1 and BR-2). One collection pass was made at each sampling site using a pulsed, direct current backpack electrofishing unit.

A total of 12 Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*) were collected from the upper reach of French Gulch (FG-1). The smallest fish was five inches in length and the largest was 12.4 inches. The wide range in size indicates a naturally reproducing population. No fish of any type were collected at FG-9. Only 3-5 fish (brook trout and brown trout) were collected in the Blue River at BR-1 and BR-2, just upstream and downstream of the French Gulch confluence, respectively. The CDOW concluded that the numbers of trout in the Blue River at Breckenridge were depressed in comparison to other Colorado trout streams. For example, the Eagle River at Redcliff is similar in size to the Blue River in Breckenridge (although at a lower elevation), and the CDOW collected 49 to 79 brown trout per year in a 279 foot long reach of the Eagle River during 12 annual sampling events from 1990 through 2001.

Summary of Fish Community Surveys

The results of these studies support the following conclusions concerning fish populations and communities in French Gulch and the Blue River.

- In French Gulch, fish are present upstream of FG-4 but are absent downstream to the Blue River confluence.

- In the Blue River, fish are present upstream of the confluence with French Gulch at BR-1, but fish density is reduced at locations downstream of the confluence to BR-2.

7.2.1.6 Aquatic Habitat Analysis

In 2001, the CDOW completed a study to determine if the existing physical habitat limits the numbers of adult trout present in the Blue River near the confluence with French Gulch. Brown trout were chosen as the test species because this fish often inhabits Colorado mountain streams contaminated by metals.

Stream habitat quality parameters were collected in May of 2001 at five locations in French Gulch (FG-0, FG-1, FG-5.5, FG-8 and FG-9), four locations in the Blue River (BR-1, BR-2, BR-3 and BR-5), and two sites on Clear Creek (these were chosen as reference locations). The CDOW used these data to calculate the percent of stream substrate with usable resting habitat for adult brown trout at five of these stations. Observations of habitat parameters were made at multiple points across multiple transects at each sampling location. The distance between each sample point on across a transect was less than 10% of the total width of the transect. Depths, water flow velocity at the water column/substrate interface and water flow velocity at 0.6 of the water column depth was measured at each sample point across the transect. These data were entered into a computer database and analyzed using RHABSIM (Thomas Paynr and Associates, Arcata, California). This program determined a weighted usable area of habitat for each transect for brown trout. The highest value was given to a point where depth was greater than 1.5 feet and velocity less than 6 inches per second. The lowest value was given to points where depth was less than six inches and water velocity exceeded 6 inches per second. Intermediate values were based on the interaction of other depths and velocities. The number of square feet of weighted usable habitat per thousand feet of stream was calculated by the computer program for each transect and each sample location. The amount of usable habitat was expressed as a percentage of the total amount of stream substrate present at each site. These percentages were used to assess the suitability of habitat at each sample site to support brown trout populations, as follows:

Physical habitat summary information for French Gulch, Blue River and Clear Creek		
Sample Site	Stream substrate with usable habitat for resting adult brown trout (%)	Amount of weighted usable resting habitat for adult brown trout (ft^2/1000 linear feet)
French Gulch 1	21	5,272
Blue River 1	14	3,046
Blue River 2	16	3,500
Clear Creek Site 1	22	6,262
Clear Creek Site 2	24	7,569

As seen, the model predicts that about 21% of the French Gulch headwaters (reference) provide adequate resting habitat for adult brown trout. Similar values (22% to 24%) are obtained at the two reference locations on Clear Creek. In contrast, the physical habitat at both Blue River sampling stations (BR-1 and BR-2) is of lower quality for trout (14%-16% resting habitat), having been impacted as a result of mining activity and channelization (CDOW, personal communication). Based on the results of the habitat study, CDOW (2001) concluded that habitat (rather than zinc concentrations) in the main limiting factor for trout numbers at the Blue River sampling stations (BR-1 and BR-2). That is, even if zinc concentrations from French Gulch were reduced so that there was no potential toxicity at BR-2, the numbers of trout would likely remain reduced. This is because the habitat present is channelized and does not include cover and shelter from fast flowing waters necessary to sustain an abundant, self-sustaining trout population.

7.2.1.7 Weight of Evidence Evaluation for Surface Water

The weight-of-evidence evaluation is composed of multiple lines of evidence as previously discussed. Each of the elements is examined to compose the overall conclusions. The individual lines of evidence are summarized in the following text table:

Lines of Evidence for Risk Characterization for Aquatic Receptors and Surface Water		
Element	Method	Results
Hazard Quotients (HQs)	Comparison of toxicity benchmarks to surface water concentrations of metals	Acute toxicity associated primarily with cadmium and zinc predicted in French Gulch from the North Branch downstream to BR-2 in the Blue River.
Surface Water Toxicity Testing	Acute toxicity testing of surface water samples from French Gulch using two species.	Acute toxicity observed in North and South Branches of French Gulch downstream to BR-2 in the Blue River. Response of organisms associated with zinc and cadmium.
Benthic Invertebrate Community	Sampling and evaluation of the “health” of benthic invertebrate communities in French Gulch and the Blue River	Benthic communities are impacted in French Gulch and the Blue River. Impacts associated with zinc and cadmium.
Fish Populations and Communities	Sampling of fish populations in French Gulch and the Blue River	Fish are absent in French Gulch downstream of FG-5. Fish are absent or limited in the Blue River downstream of French Gulch downstream to BR-3.

All of these lines of evidence are strongly consistent with the conclusion that mining-related chemicals (primarily zinc and cadmium) present in surface waters cause severe toxicity to aquatic receptors (both fish and benthic organisms) in the middle and lower reaches of French Gulch, and that the impact of contaminants in French Gulch adversely impact the Blue River beginning at the confluence and extending several miles downstream.

7.2.2 Risks from Sediment

Potential risks for aquatic receptors (benthic macroinvertebrates) from COPCs in sediment may be evaluated by two separate measures:

- Calculation of Hazard Quotients that compare sediment concentrations of COPCs (metals) to sediment toxicity benchmarks.
- Calculation of a mean probable effect concentration ratio for each sediment sampling location to predict the incidence (probability) of observing toxicity in site sediments.

The individual results are provided as sections with the overall results examined collectively in a weight-of-evidence evaluation.

7.2.2.1 Hazard Quotients

HQ values for aquatic receptors (benthic invertebrates) due to contact with COPCs in sediment are calculated according to the following equation:

$$HQ_{sed} = \frac{C_{sed}}{Benchmark_{sed}}$$

where:

C_{sed}	=	Concentration of COPC in sediment (mg/kg dry weight)
$Benchmark_{sed}$	=	Sediment screening benchmark (mg/kg dry weight)

Figure 7-4 (Panels A to L) summarize the estimated HQ values for sediment. As noted previously (Section 5), only one sample of sediment has been analyzed at each sampling station, so the results shown in the figures are based on only a single concentration value. As discussed in Section 6, there are a range of alternative benchmarks available for most of the COPCs, so the HQs are calculated using both a low-end and a high-end estimate of the TRV. Thus, the height of the bars shown in the figures represents a range of alternative HQ estimates based on uncertainty in the true threshold effect level in sediment. Inspection of Figure 7-4 yields the following main conclusions:

- Predicted HQ values for sediment are generally below a level of concern for chromium, iron, nickel and mercury.

- HQ values for aluminum exceed a level of concern based on the lowest TRV but not the highest. Also, there is little spatial pattern in aluminum concentrations, suggesting that mining releases are not substantially influencing aluminum concentrations in sediment.

- HQ values for arsenic, cadmium, copper, lead, manganese, silver and zinc all approach or exceed a level of concern (HQ > 1E+00) based on either the low or the high estimate of the sediment TRV. HQ values well above 1E+00 occur at most locations in French Gulch and/or the Blue River, and the spatial pattern of values (high in the North Branch and South Branch of French Gulch and in the Blue River near the confluence) is consistent with a mining-related release. Highest HQ values are due to zinc.

These results indicate that contaminants in sediment are likely to have an adverse effect on the diversity and abundance of the benthic community at nearly all locations along French Gulch downstream of the W-O complex.

7.2.2.2 Mean Probable Effect Concentration Ratio

As described earlier in Section 6.1.3, MacDonald et al. (2000) found that the toxicity of sediment samples containing multiple chemicals could be reliably predicted from the mean PEC quotient (i.e., the average HQ for each metal for which a reliable PEC was available to serve as the TRV). The equation recommended by McDonald et al. (200) was:

Incidence of Toxicity (%) = $101 \cdot (1-0.36^{x})$ where x = mean PEC ratio

The following table summarizes the calculated mean PEC values for sediment samples at this site, along with the predicted incidence of toxicity from the sediment.

Calculation of the Mean PEC Quotient by Sampling Location and Predicted Incidence of Observing Sediment Toxicity (MacDonald et al., 2000)			
Location	Type	Mean PEC Quotient	Predicted Incidence of Toxicity
BR-Adams	Reference	0.64	49%
BR-BFG	Blue River	2.3	92%
BR-Dillon	Blue River	1.81	85%
FG-0	Reference	0.91	61%
FG-1	Reference	1.24	73%
FG-7	French Gulch-North Branch	12.98	100%
FG-9	French Gulch	6.9	100%
FG-9A	French Gulch	11.43	100%
TS-3	French Gulch-North Branch	25.51	100%
TS-4	French Gulch-North Branch	10.75	100%

McDonald et al. (2000) identified a mean PEC quotient of 0.5 as the threshold value for identifying toxic sediments. As seen above, at this site mean PEC quotients exceed a value of 0.5 at all locations, including reference stations. This suggests that at least some of the PECs used in the calculations may be too low, since healthy benthic communities do reside in the reference areas. However, it is clear that, on a relative basis, sediments in French Gulch are expected to have much higher toxicity than in the reference areas, and these calculations are fully consistent with direct observations of benthic community health (see Section 7.2.1.4, above).

7.2.2.3 Weight of Evidence Evaluation for Sediment

The following table summarizes the lines of evidence for the risk characterization for sediment.

Lines of Evidence for Screening Risk Characterization for Aquatic Receptors and Sediment		
Element	Method	Results
Hazard Quotients (HQs)	Comparison of toxicity benchmarks to sediment concentrations of COPCs (metals).	Toxicity is predicted to be associated with metals in French Gulch and the Blue River.
Mean PEC Ratio	Calculation of mean PEC quotient for each sampling location to predict probability of toxicity.	Probability of sediment toxicity at 100% for all French Gulch sampling locations. Probability lower (predicted incidence) at Blue River stations.

As seen, both lines of evidence strongly support the conclusion that COPCs in sediments of French Gulch are likely to cause toxicity in exposed benthic macroinvertebrates, resulting in reduction of density and/or diversity of the community.

7.2.3 Risks Based on Fish Tissue Burdens

Figure 7-5 compares the distribution of COPC detected in four tissue types (fillet, liver, kidney and gonads) and in whole body (calculated from the tissue-specific measurements) to estimated threshold levels that cause adverse effects in fish. Because TRVs are not available for every COPC for every tissue type, some parts of the figures are left blank.

As seen, some fish had tissue levels of cadmium, copper, and zinc that were above the corresponding tissue-specific TRVs. For example, cadmium , copper, and zinc tended to be above a level of concern in kidneys of trout from BR-2 but not BR-1. These results suggest that fish that reside in the Blue River downstream of the confluence with French Gulch are exposed to levels of several metals that may have adverse effects on the ability of the fish to grow and reproduce.

In considering these results, it is important to remember that fish from BR-2 may have had only limited exposure to the waters of the Blue River, since they were collected in the vicinity of inflowing tributaries. Thus, tissue levels of COPCs and risks of adverse effects may be somewhat higher in fish that do not have access to such refugia.

7.3 Risks to Wildlife

Potential risks to wildlife receptors from exposure to COPCs in surface water, sediment, and/or food are characterized by the ratio of the dose due to ingestion of COPCS (see Section 5.2) to the appropriate dose-based TRV (see Section 6.2):

$$HQ = Dose / TRV$$

When a receptor may be exposed to the same chemical by more than one pathway, the combined risks may be estimated by summing the HQ values for each pathway. The sum of the HQ values is referred to as the Hazard Index (HI). If the HQ or HI value is less than or equal to one, it is believed that no unacceptable risks will occur in the exposed wildlife receptor. If the value exceeds one, then potential risks may occur, with the expected severity and/or incidence of effects tending to increase as HQ or HI increases.

The detailed calculation of HQ and HI values for each COPC by ingestion of each medium (surface water, sediment, aquatic prey items) is presented in Appendix G. The results are summarized graphically in Figure 7-6 (Panels A to K). In each figure, the upper panel presents the predicted risks to mink, while the lower panel presents the predicted risk to the Great Blue Heron. As discussed in Section 6.2, the TRVs selected for use in characterizing potential risks to wildlife receptors include both the NOAEL and LOAEL. Thus, each risk estimate is presented as a range that reflects the uncertainty in the true threshold dose that causes adverse effects in the exposed receptor.

Inspection of Figure 7-6 yields the following main conclusions:

- Predicted HQ and HI values are below a level of concern for both mink and heron for most COPCs, including arsenic, cadmium, chromium, copper, manganese, mercury, molybdenum, selenium, and zinc.

- Ingestion of aluminum in sediment is predicted to be of potential concern to the mink. However, the level of risk is similar in reference areas and mining-impacted areas, suggesting that the range of NOAEL-LOAEL TRVs for aluminum for mammals may be somewhat too conservative.

- Ingestion of lead in sediment along French Gulch is predicted to be of moderate concern to the mink (HQ = 1 to 7) and the Great Blue Heron (HQ = 1 to 3). These values are higher than at reference areas.

- Data on COPCs levels in fish tissue are available only for the Blue River, and only for some COPCs. Thus, risks to wildlife from ingestion of aquatic prey items is not well characterized. However, at present, this pathway is not complete, since fish are not present in the mining-impacted reach French Gulch.

7.4 Summary of Findings

Risks to Aquatic Receptors from Surface Water

Dissolved metals in surface water in French Gulch downstream of the W-O Mine complex are acutely toxic to fish and invertebrates. Toxic levels also exist in the Blue River downstream of the confluence with French Gulch. These conclusions are supported by multiple lines of evidence, including: a) calculated HQ values, b) direct toxicity testing, c) tissue levels of metals in fish, and d) site-specific observations on fish and benthic invertebrates populations. Under current conditions, the metals concentrations in French Gulch surface water downstream of the W-O mine site prevent the survival of trout populations and other fish species, and restrict the diversity and abundance of benthic invertebrate communities.

In the absence of any site-specific data to the contrary, target levels of contaminants in surface water that would be needed to allow fish and benthic communities to return to French Gulch may be estimated either using the AWQC values for cadmium and zinc, or by choosing alternative (higher) values that would provide protection to a sub-set of species judged to be of greatest risk management concern at the site. Inspection of Figure 7-2a and 7-2b allows a preliminary estimate of the target levels that would be needed to protect species of potential risk management concern at this site.

Risks to Aquatic Invertebrates from Exposure to Sediment

Concentrations of several COPCs (arsenic, cadmium, copper, lead, manganese, silver and zinc) all approach or exceed the benchmark levels that have been associated with toxicity to benthic invertebrates. Predicted risks from sediments are highest in French Gulch, with lower (but still elevated) risks in the Blue River. Highest HQ values are due to zinc. Three separate studies indicate that benthic invertebrate communities in French Gulch and the Blue River are adversely impacted by the metals contamination in surface water and/or sediments, with reductions in density and diversity of multiple taxa, especially metal-sensitive species .

Risks to Wildlife from Surface Water, Sediment and Fish

Based on modeled estimates of exposure, risks to wildlife (mink, heron) from ingestion of COPCs in surface water are not likely to be of concern. Ingestion of lead in sediment may be of concern to both mammals and birds along French Gulch. Ingestion of fish from the Blue River near the confluence with French Gulch do not appear to be of concern. Hazards associated with ingestion of fish items from French Gulch might be higher, but at present this pathway cannot be evaluated and is not complete since no fish are present in French Gulch.

Habitat Quality and Use Attainability

A quantitative habitat quality evaluation performed by CDOW indicated that three streams with good fish populations (the upstream portion of French Gulch and two reference sites in Clear Creek) have 21-24% usable resting habitat for brown trout, while the Blue River (stations BR-1 and BR-2) has about 14-16% usable resting habitat. CDOW interpreted these model results to indicate that habitat in the Blue River near the confluence with French Gulch is sufficiently altered that even if zinc concentrations were reduced to non-toxic concentrations, the numbers of trout present in this reach would still remain reduced compared to streams with higher quality habitat.

8.0 UNCERTAINTIES

The HQ values presented in this risk assessment should not be interpreted as highly precise estimates of actual risk of ecological effects. Quantitative evaluation of ecological risks is limited by uncertainty (lack of knowledge) regarding a number of important data, exposure, toxicity, and risk factors. This lack of knowledge is usually addressed by making estimates based on whatever limited data are available, or by making assumptions based on professional judgement when no reliable data are available. Because of these assumptions and estimates, the results of the risk calculations are themselves uncertain, and it is important for risk managers and the public to keep this in mind when interpreting the results of an ERA.

8.1 Uncertainties in the Aquatic Risk Evaluation

8.1.1 Uncertainty Due to Exposure Pathways Omitted

Risks to aquatic receptors (fish, benthic macroinvertebrates) from contaminants in the aquatic ecosystem were evaluated for direct contact exposure pathways, but not for ingestion of aquatic prey items. This will lead to an underestimation of risk. The magnitude of this underestimation is not known, but it is considered likely that the direct contact pathway is more important than the ingestion pathway and that the magnitude of the error is relatively small.

8.1.2 Uncertainty in Surface Water and Sediment Concentrations

Analyzed samples of surface water and sediment may not fully characterize the spatial and temporal variability in actual levels of COPCs at the site. For example, short term peaks in surface water concentrations might occur in French Gulch during times of surface water runoff, or higher-than-average recharge from groundwater. If these peaks are not well represented in the set of surface water samples collected to date, risks of acute toxicity may be higher (either more severe and/or more frequent) than estimated. Conversely, some samples of surface water, sediment and soils were collected from areas suspected of being maximally impacted by mine wastes, so some of the data used to characterize risk may tend to be biased high.

In addition, systematic or random errors in sampling or chemical analyses may yield erroneous data. For example, about 0.7% of the total surface water analyses available were judged to be “outliers”. These types of sampling and analysis errors are generally only a small source of uncertainty, except when risk estimates are driven by the maximum values.

Finally, it is important to recognize that the toxicity of COPCs in surface water to aquatic receptors depends on the duration of exposure time, and that available TRVs are based on exposures of 48-96 hours (acute) or for 60-90 days or longer (chronic). Thus, concentration values used to calculate the HQ values would ideally reflect the average concentration over the time interval appropriate for the TRV. However, the available data on the concentration of metals in surface water samples are all "grab" samples that represent instantaneous measures of concentration. Hence, these values do not reflect either short-term or long-term variability in concentration over time. Thus, use of grab sample data to calculate acuate and chronic HQ values is a source of uncertainty, and might either underestimate or overestimate actual risks.

8.1.3 Uncertainty in Aquatic TRVs

Risks to aquatic receptors (fish, benthic organisms) from surface water were characterized mainly by used of EPA's AWQC values. These values are based on the distribution of toxicity data for a wide variety of aquatic species, including many that do not reside in the coldwater steams of the Rocky Mountain west. In addition, some of the AWQC values are based on data sets that have not been significantly updated in a number of years. Thus, these AWQC values may not be fully predictive of risks to aquatic receptors that are present at this site. In addition, most AWQC values are based on data sets that have only limited information of the sensitivities of reptiles and amphibians compared to fish and invertebrates, so risks to these organisms cannot be characterize with any certainty.

Likewise, risks to benthic organisms from exposure to sediments are based on a series of non-site specific studies of sediment toxicity to laboratory test species. However, the toxicity of a contaminant in sediment may be a complex function of the sediment properties (organic carbon content, pH, temperature, as well as the chemical and physical state of the contaminant in the sediment. Thus, studies at other sites may yield sediment benchmarks that are not highly accurate for this site.

Finally, TRVs or benchmarks are not available for a number of inorganic chemicals that were detected in surface water and/or sediment (see Tables 4-1 and 4-2). Thus, potential risks from these chemicals could not be assessed, and the lack of these benchmarks may result in the underestimation of potential risks.

8.1.4 Overall Uncertainty in Aquatic Risk Assessment

Despite the numerous sources of uncertainty noted above, there is essentially no uncertainty in the conclusion that the aquatic ecosystem of French Gulch and the Blue River has been severely impacted by mining-related chemicals. This conclusion is strongly supported by the agreement between multiple lines of evidence, including high calculated HQ values for cadmium and zinc, high toxicity observed in two site-specific toxicity tests, and direct observations of flow or absent ish and invertebrates communities in French Gulch and the Blue River.

8.2 Uncertainties in the Terrestrial Risk Evaluation

8.2.1 Uncertainty in Indicator Species

Risks to terrestrial receptors were assessed using data for only two of the many species likely to be present in the French Gulch and Blue River area. The representative species selected for quantitative evaluation (mink, heron) are intended to represent a range of taxonomic groups and life history types, and to represent the full range of possible exposures present in the area. However, in the absence of reliable toxicity data on all species present, it is possible that other mammalian and avian species might be either more sensitive or less sensitive.

8.2.2 Uncertainty Due to Exposure Pathways Omitted

The exposure pathways selected for quantitative evaluation in the ERA do not include all potential exposure pathways for terrestrial receptors. In most cases, the pathways not evaluated (e.g., inhalation and dermal exposure of wildlife to soil, ingestion of sediment and dietary items by fish) are believed to be minor and to contribute little to overall exposure and risk, so exclusion of these pathways is not of significant concern. In other cases (e.g., ingestion of soil, terrestrial food web items, or water from groundwater seeps by wildlife), pathways were not evaluated because data limitations preclude reliable quantification. Exclusion of these pathways could result in underestimation of total risk to some receptors, but the magnitude of the underestimation cannot be quantified.

8.2.3 Selection of Chemicals of Potential Concern (COPCs)

Risks to wildlife were quantified only for a subset of chemicals detected in surface water and sediment at the site, and exclusion of some chemicals might lead to an underestimation of total risk. This is especially true for chemicals that were assigned to the "qualitative COPC" category, either because no toxicity data are available (Type 1), or because the analytical detection limits were too high to reliably detect the chemical if it were present at a level of concern (Type 2). The magnitude of the underestimation of risk from these excluded chemicals cannot be quantified, but because risks from the chemicals which were retained are so large (especially for cadmium and zinc), this uncertainty is not important in the overall risk characterization for the site.

8.2.4 Uncertainty in Wildlife Exposure Factors and Dose Levels

Ingestion-related exposure assumptions for wildlife are based on literature-derived information concerning average body sizes, diet compositions, consumption rates, and metabolic rates. Much of this information is derived from laboratory-reared animals and may not be representative of wild organisms. Moreover, the actual diet composition of an organism will vary daily and seasonally. These uncertainties could either under- or overestimate the actual exposures of wildlife to COPCs in water, sediment, soil, and diet.

Estimates of wildlife exposure due to incidental sediment ingestion conservatively assume that 100% of the metals present are biologically available (100% will be ingested and absorbed in the gut). This assumption may overestimate chemical doses to wildlife doses, as absorption efficiencies for most metals are less than 100%.

It is also assumed in the calculation of chemical doses for wildlife that chemicals present in sediments have the same bioavailability as constituents in laboratory media. This assumption is conservative because laboratory testing purposely includes dosing regimes (method of administration and chemical form) to insure a uniform and maximum uptake of chemicals.

8.2.5 Uncertainty in Wildlife Toxicity Benchmarks

Information on the toxic effects on wildlife species is limited for many chemicals. Consequently, there are varying degrees of uncertainty associated with the wildlife toxicity reference values. These uncertainties may result in either an over- or underestimate of risk. The largest source of uncertainty associated with toxicity values is lack of knowledge on how best to extrapolate available toxicity data across species, endpoint, and durations. In addition, there is lack of knowledge on how to account for interactions (synergy, antagonism) between different chemicals when exposure to more than one chemical occurs simultaneously.

The method used to account for these uncertainties in the derivation of a TRV is, in general, intended to be conservative. The NOAEL and LOAEL TRVs are estimated based on: 1) a toxicity value selected from the available scientific literature; and 2) a series of uncertainty factors that account for extrapolation from the laboratory study result (for the toxicity value) to a TRV for a specific representative wildlife species. The process results in an inherently conservative TRV, as the toxicity values selected are the lowest from the reported range.

8.2.6 Overall Uncertainty in Terrestrial Risk Assessment

Based on the numerous uncertainties outlined above, risk estimates for terrestrial receptors (mink, heron) should not be considered certain. In particular, risks might be higher than estimated, and the finding that risks from ingestion of surface water and fish are not of apparent concern should be viewed as tentative.

8.3 Uncertainties in Habitat Assessment

Assessing the suitability and use attainability of any specified reach of aquatic habitat is usually difficult because habitat usage by fish and other aquatic receptors is a complex function of many independent variables. This includes, for example, channel width, water depth, water temperature, water oxygen levels, stream flow velocities, relative amounts of reaches, runs, pools and riffles, in-stream and bank cover, food availability, substrate suitability for spawning, interspecies competition, predator pressure (both wildlife and human), and upstream and downstream conditions. Also note that many of these parameters above are time-variable (e.g., flow, temperature, oxygen), and habitat suitability depends not only on the value of each parameter at any one moment, but on the average and extreme values (minimum and maximum) over time. While most fish have preferences for optimal values of these variables, most habitats are not optimal for all (or even any) of the key variables. Rather, habitat usability is determined by the combination of the many independent factors. At this site, data were collected on a number of important stream habitat variables, but quantitative assessment of aquatic habitat usability was based mainly on a consideration of available resting habitat, calculated from flow velocity and depth data (CDOW 2001). While resting habitat is one key determinant of habitat quality and a valuable indicator of use attainability, other factors not included in the quantitative evaluation may also be important. Thus, while there is little uncertainty in the conclusion that the habitat of the Blue River near French Gulch is not entirely optimal for trout, the exact population level that would exist in the absence of chemical stressors French Gulch is difficult to predict.

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Figures

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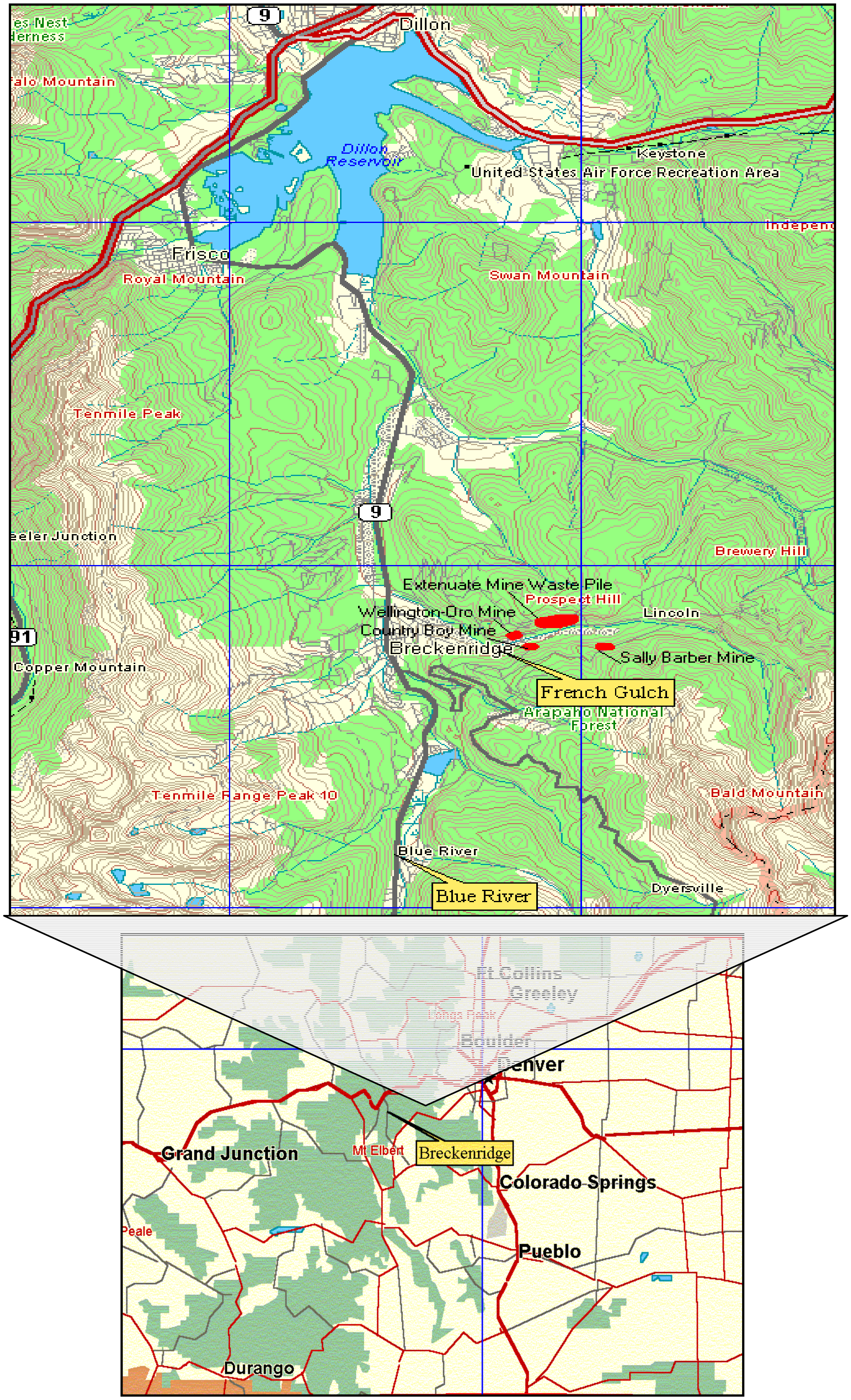


Figure 1-1 Location of the French Gulch/Wellington-Oro Mine Site	***Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site Breckenridge, Colorado***

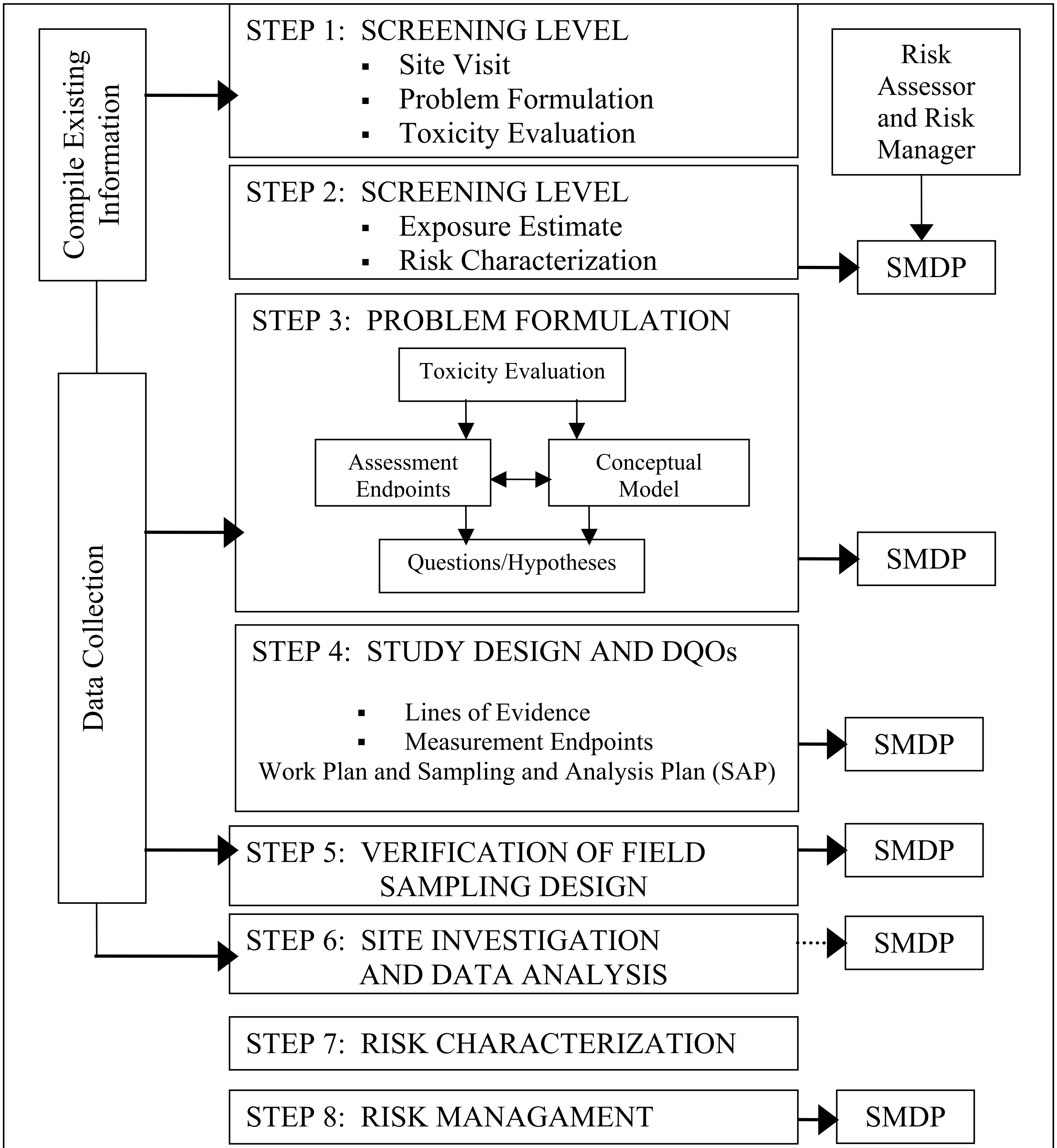


Figure 1-2 Eight Step Process Recommended in Ecological Risk Assessment Guidance for Superfund (ERAGs) (USEPA, 1997)

SMDP = Scientific Management Decision Point

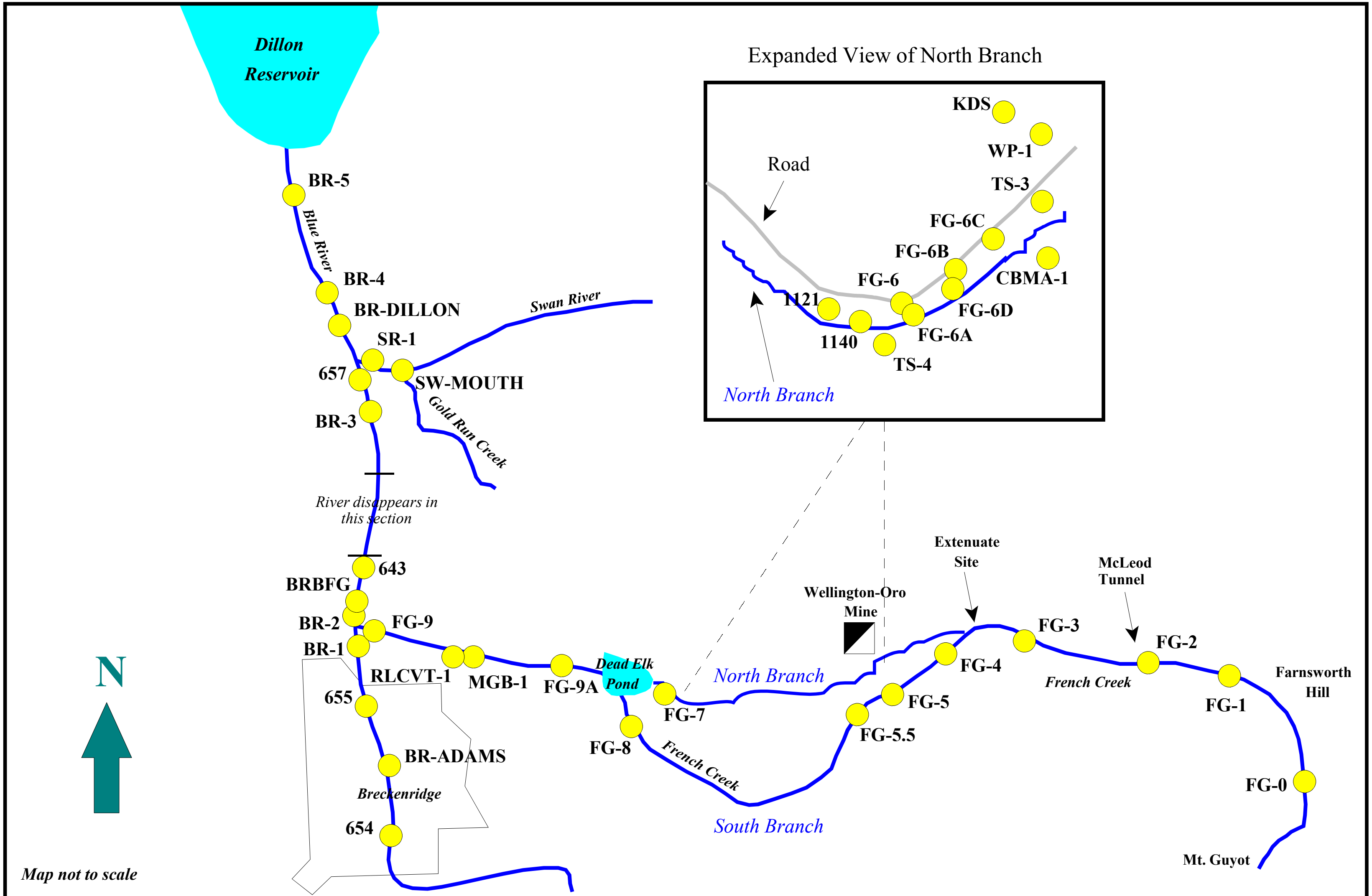


Figure 2-1
Sampling Location Map

Ecological Risk Assessment
French Gulch Wellington-Oro Mine Site,
Breckenridge, Colorado

Wellington-Oro Mine Complex

Union Mine and Mill

Figure 2-2 Abandoned Mine Sites	*Ecological Risk Assessment for the French Gulch/ Wellington-Oro Mine Site* Breckenridge, Colorado

Floating Dredge Remains

Piles of Alluvial Valley Material

Figure 2-3 Floating Dredge Remains and Removed Material	*Ecological Risk Assessment for the French Gulch/ Wellington-Oro Mine Site* Breckenridge, Colorado

French Gulch Topography

Blue River Topography

Figure 2-4 Current Topography of French Gulch and the Blue River	*Ecological Risk Assessment for* *the French Gulch/ Wellington-Oro Mine Site* Breckenridge, Colorado

Figure 2-5 French Gulch	*Ecological Risk Assessment for* *the French Gulch/ Wellington-Oro Mine Site* Breckenridge, Colorado

Figure 2-6 The Blue River	*Ecological Risk Assessment for* *the French Gulch/ Wellington-Oro Mine Site* Breckenridge, Colorado

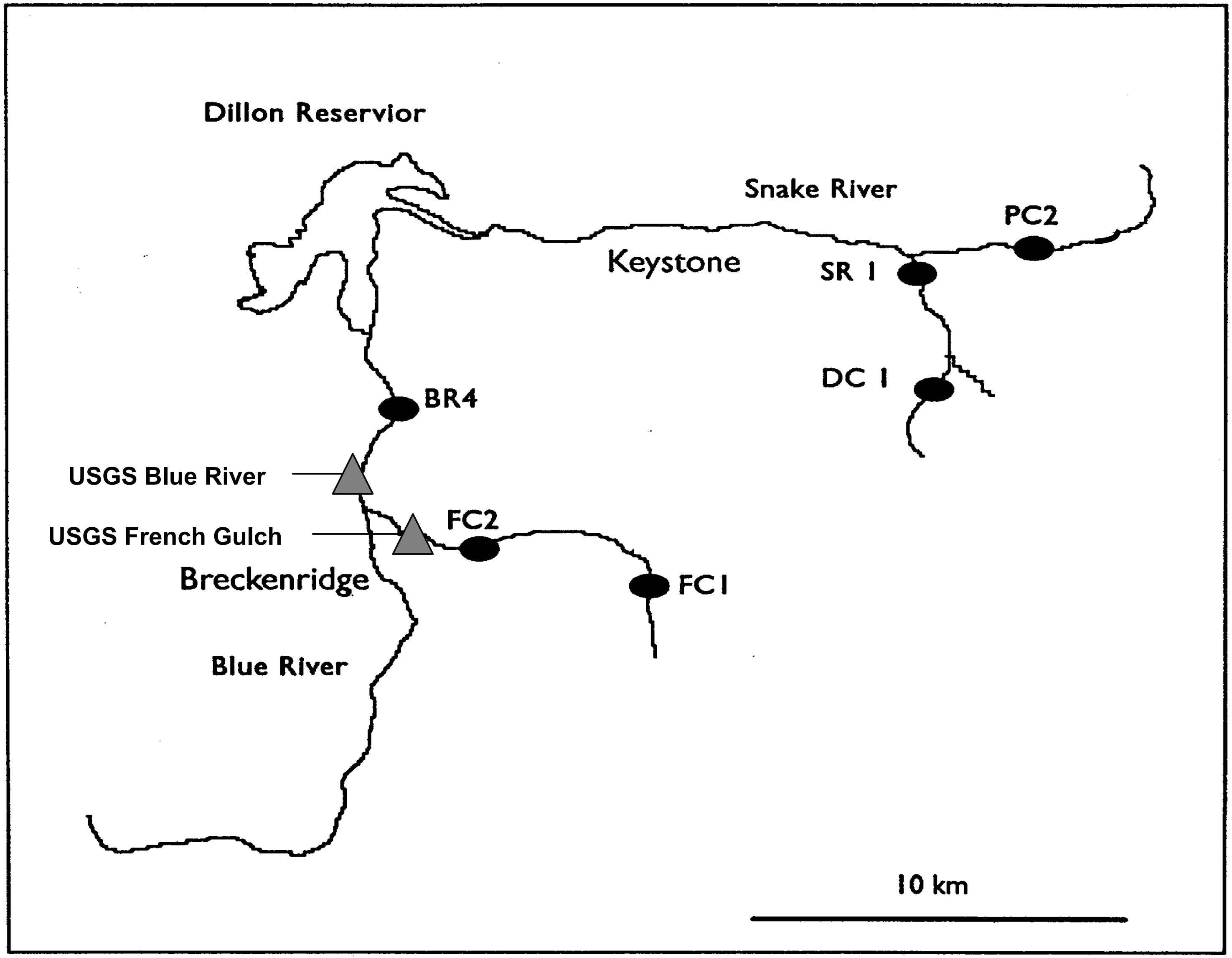


Figure 2-7 Benthic Macroinvertebrate Sampling Locations
(*modified from Clements, 1995*)

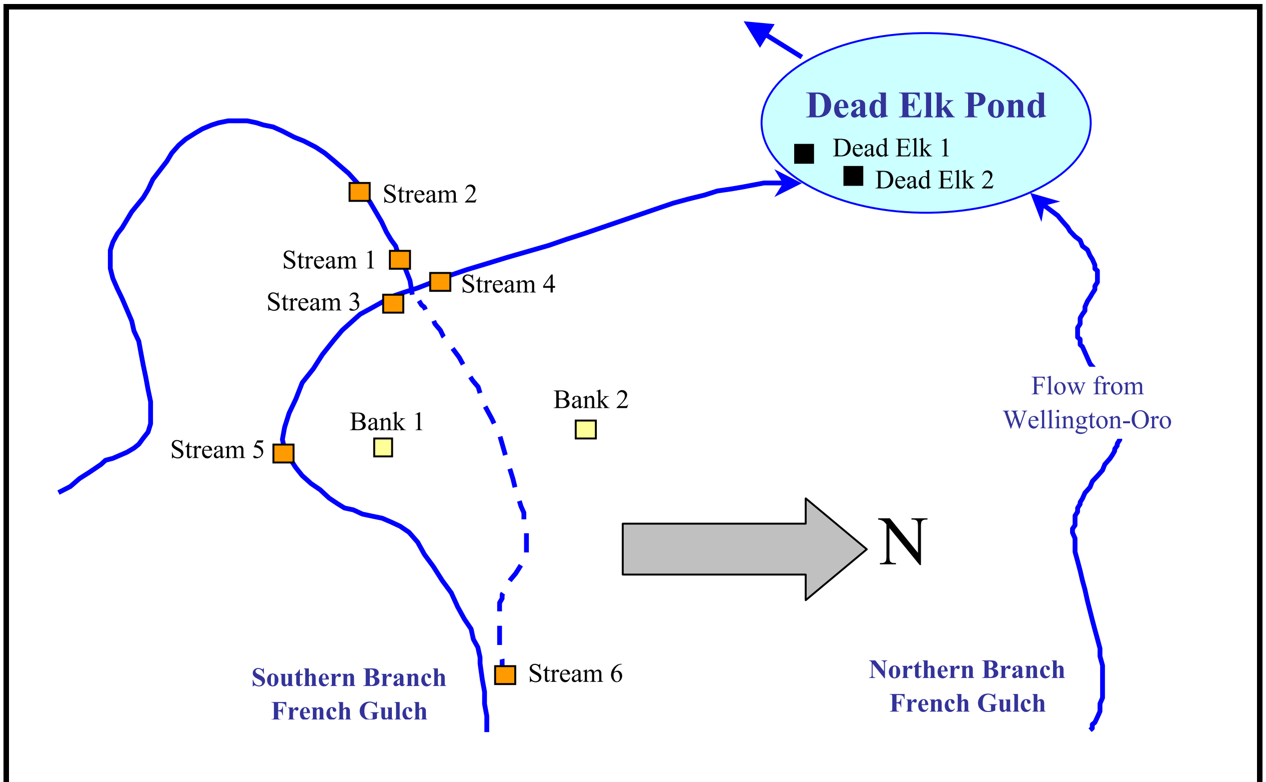


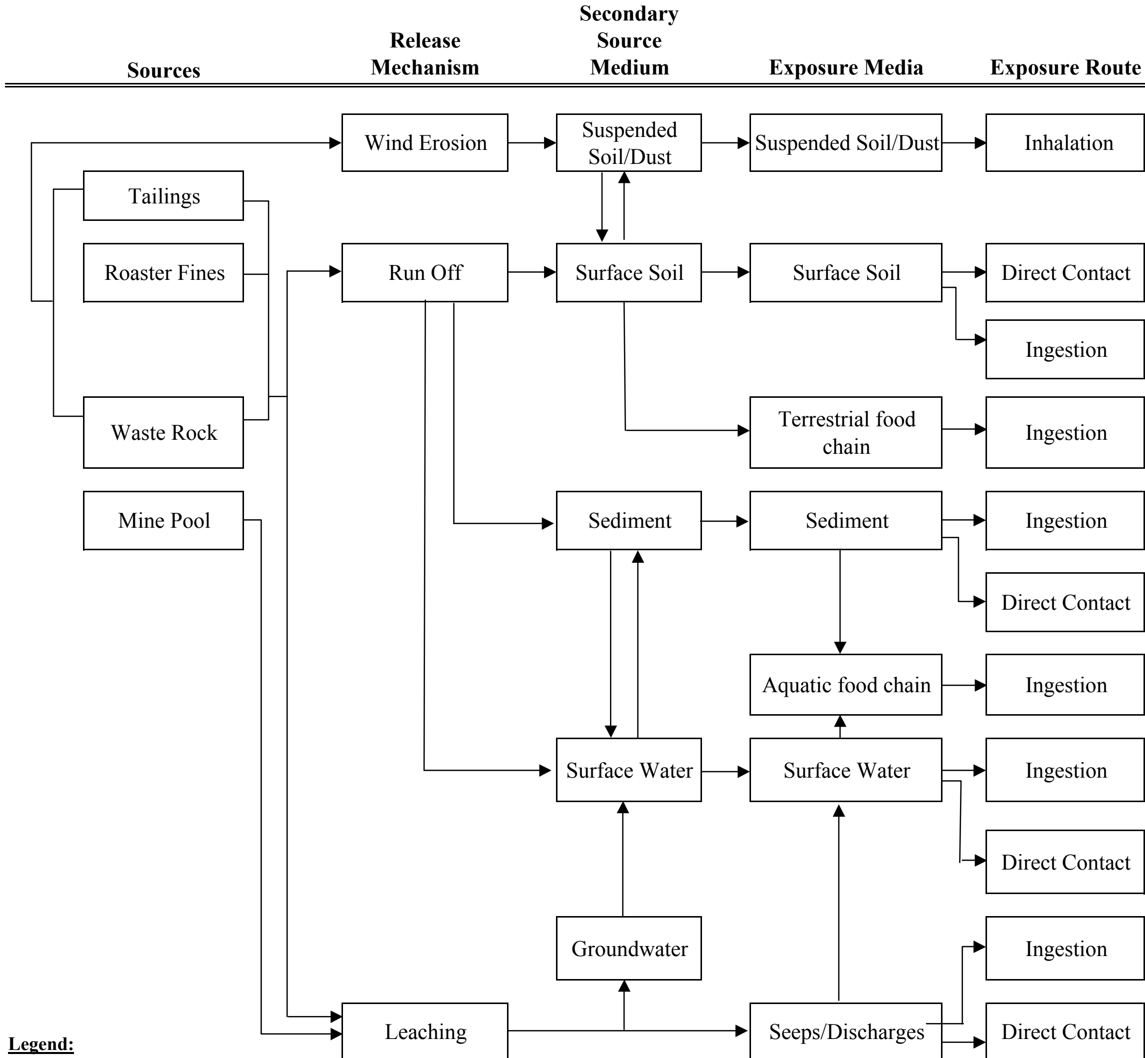
Figure 3-1 **Sediment Sampling Locations**	***Ecological Risk Assessment for the French Gulch/*** ***Wellington -Oro Mine Site*** ***Breckenridge, Colorado***

Source: Adrian Brown 1999b

Figure 3-1 Sediment Sampling Map: ABrown map, 5/7/2002

Figure 4-1. Ecological Site Conceptual Model

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado



Exposure Media	Exposure Route	Fish	BMI	Birds, Mammals	Reptiles/ Amphibians	Plants & Soil Inverts
Suspended Soil/Dust	Inhalation			X	X	
Surface Soil	Direct Contact			X	❍	❍
Surface Soil	Ingestion			❍	❍	
Terrestrial food chain	Ingestion			❍	❍	
Sediment	Ingestion	X	X	●	❍	
Sediment	Direct Contact		●	X	X	
Aquatic food chain	Ingestion	X	X	●	X	
Surface Water	Ingestion	X	X	●	❍	
Surface Water	Direct Contact	●	●	X	❍	
Seeps/Discharges	Ingestion			●	❍	
Seeps/Discharges	Direct Contact			X	❍	

Ecological Receptors

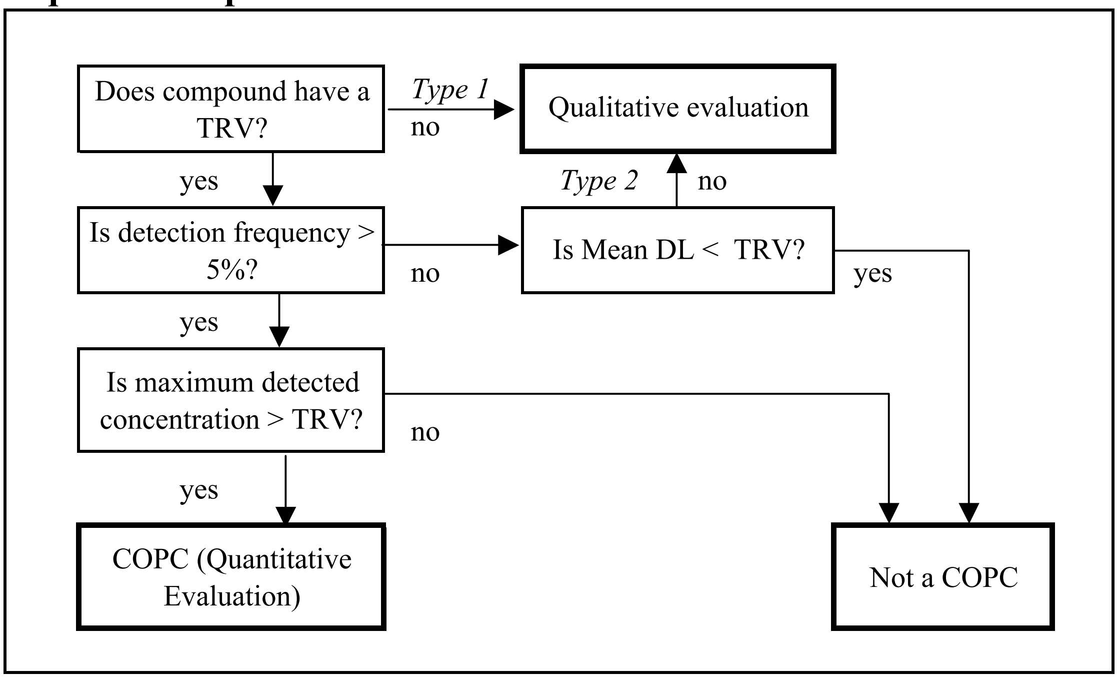
Legend:

Symbol	Meaning
	Pathway not complete; no evaluation
X	Pathway complete, but not selected for evaluation; considered to be minor in comparison with other pathways
●	Pathway complete and potentially significant; selected for quantitative evaluation
❍	Pathway complete and potentially significant; however, data are lacking to complete quantitative evaluation; qualitative evaluation only

Figure 4-2. COPC Selection Procedure

Ecological Risk Assessment for the French Gulch/Wellington-Oro Min Site
Breckenridge, Colorado

Aquatic Receptors



Wildlife Receptors

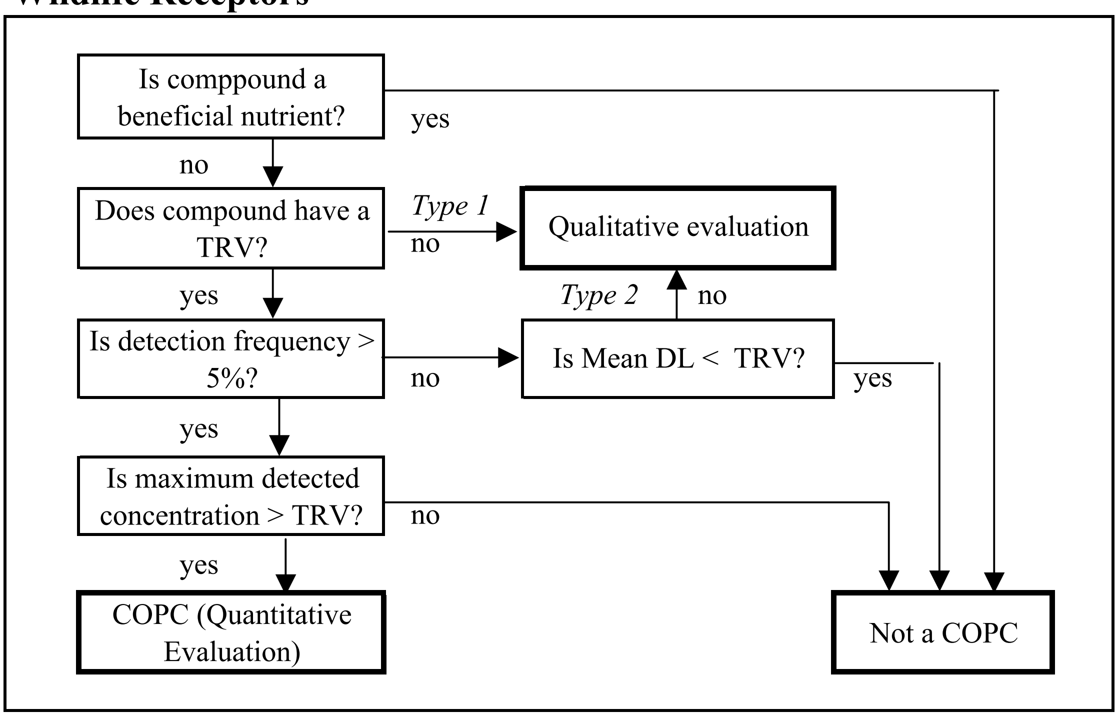
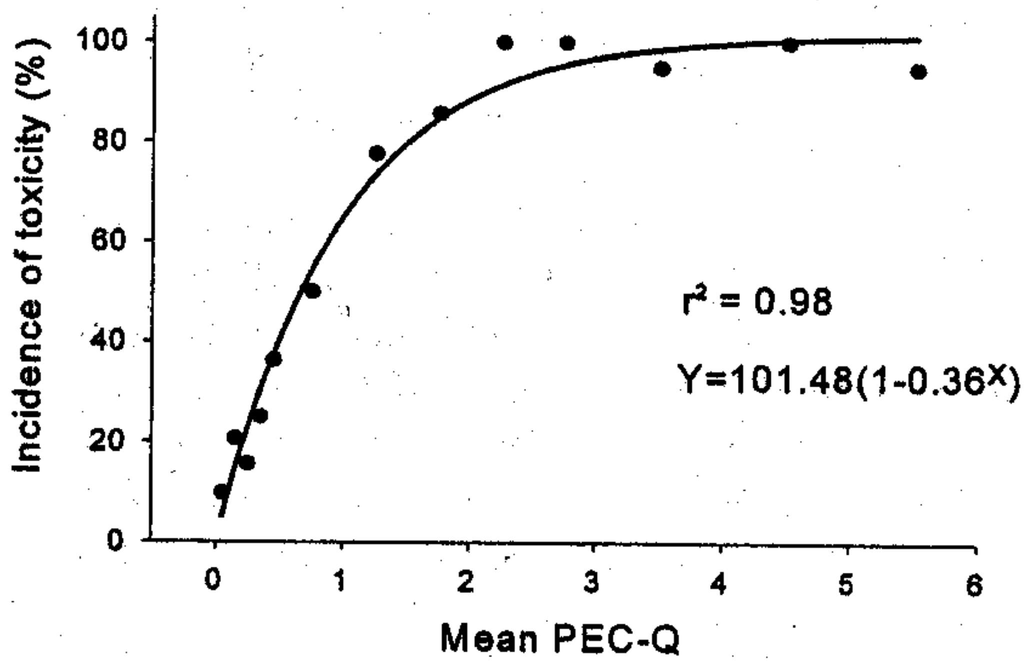


Figure 6-1

Relationship Between the Mean PEC Quotient and the Incidence of Toxicity in Freshwater Sediments

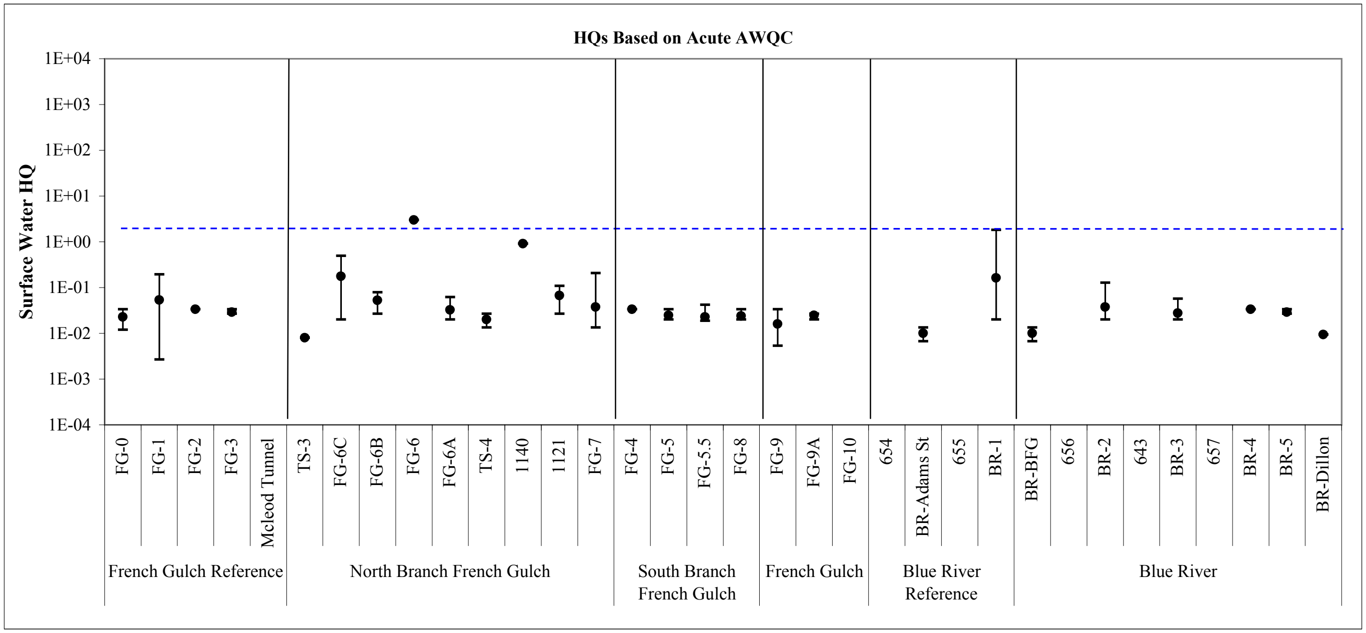
Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

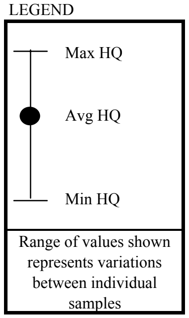


Source:
MacDonald et al., 2000

Figure 7-1a Summary of Surface Water Hazard Quotients for Aquatic Receptors

ALUMINUM





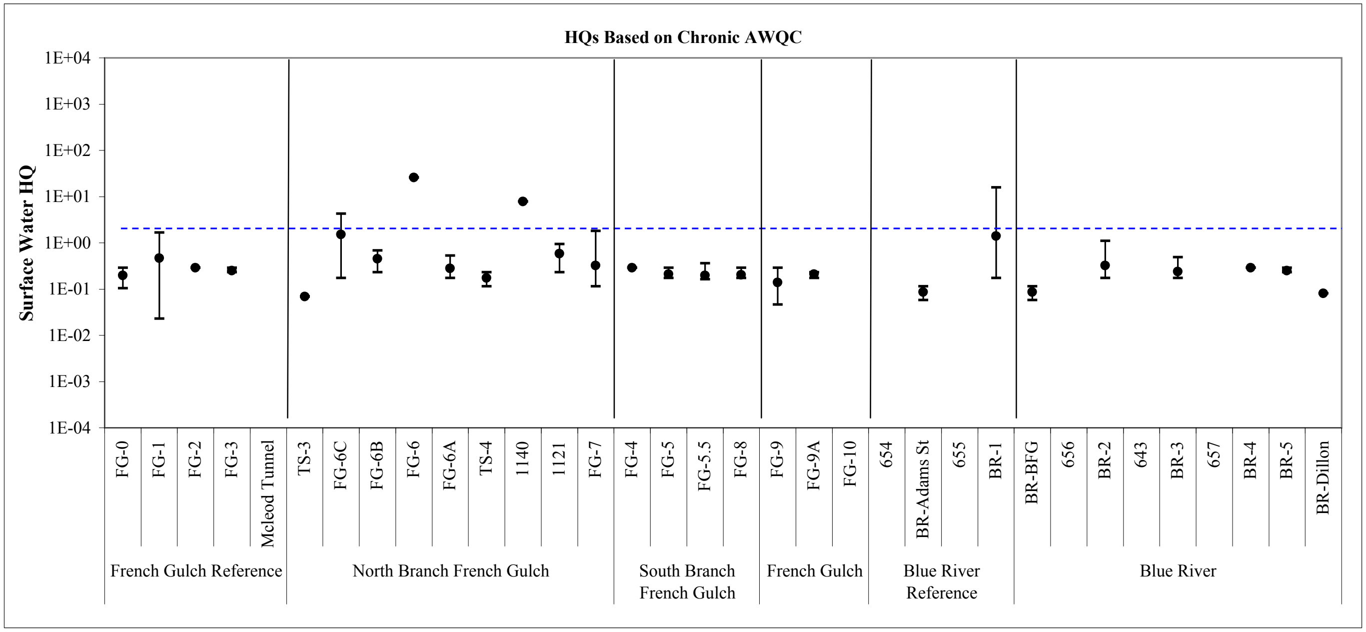
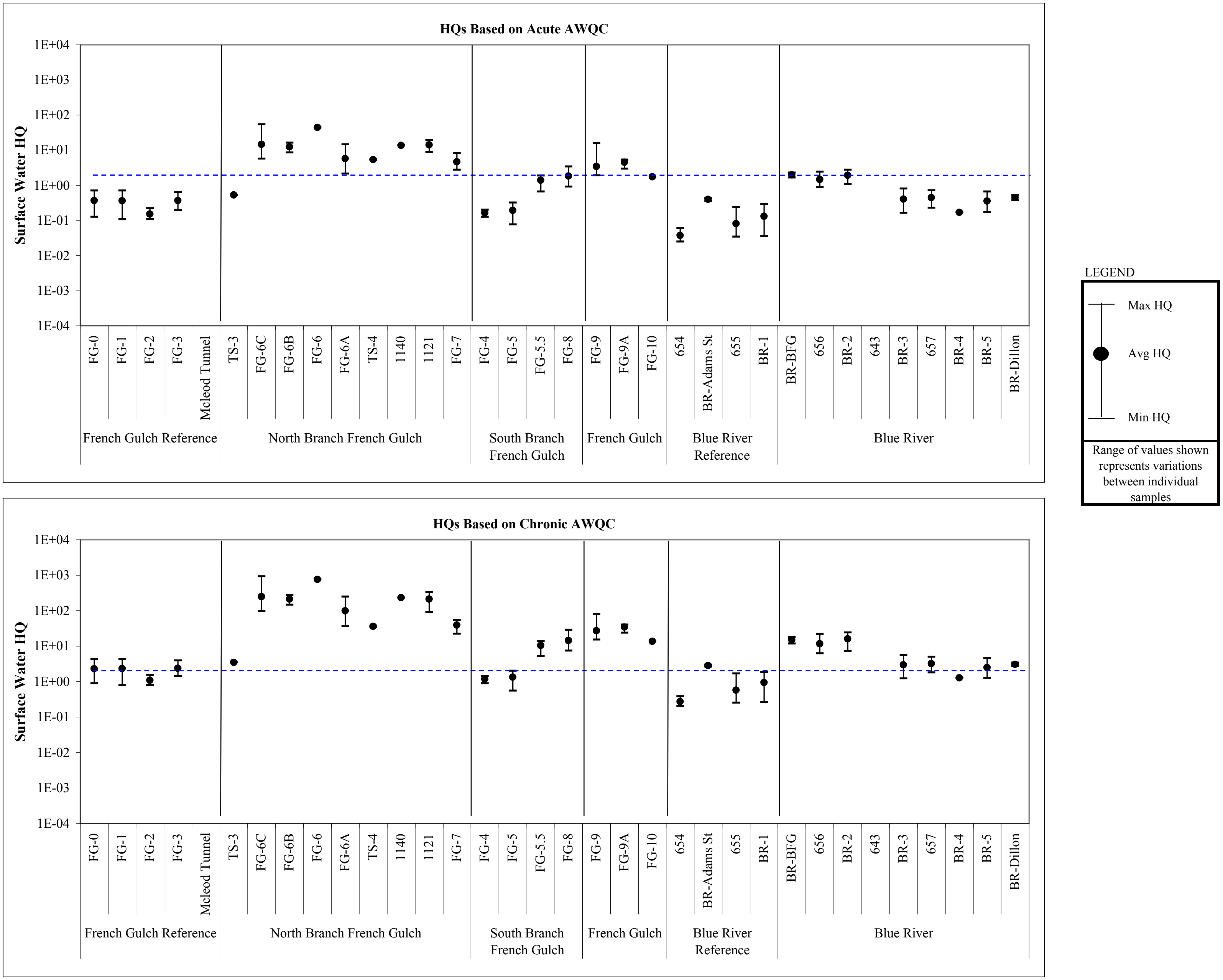


Figure 7-1b Summary of Surface Water Hazard Quotients for Aquatic Receptors

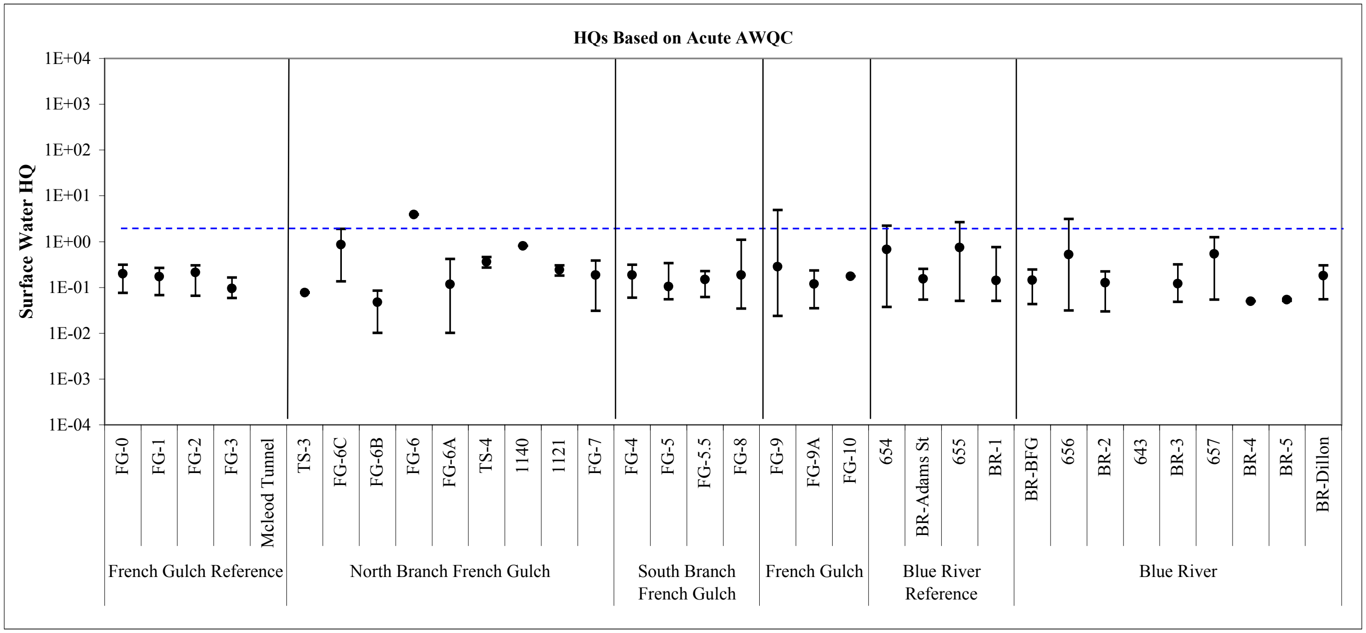
CADMIUM

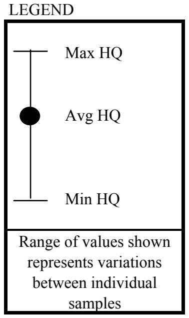


Revised Aquatic Risk_SW wo Discharge: Pivot Summary_Graph
5/7/2002

Figure 7-1c Summary of Surface Water Hazard Quotients for Aquatic Receptors

COPPER





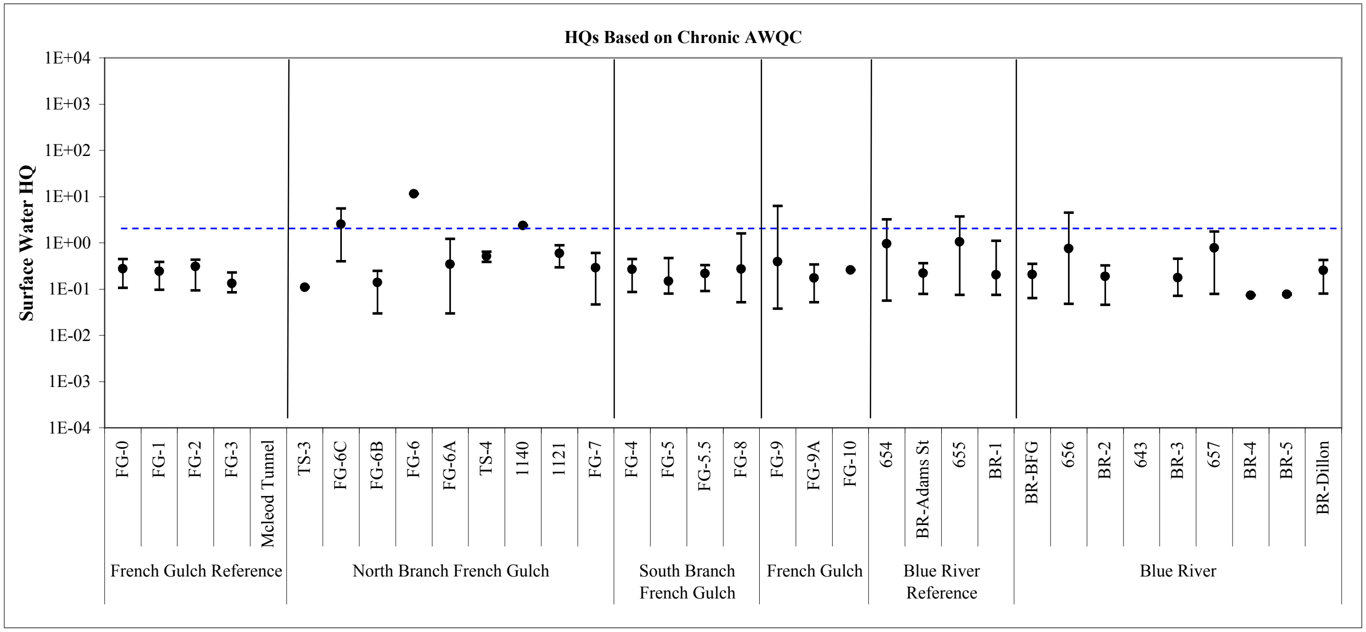
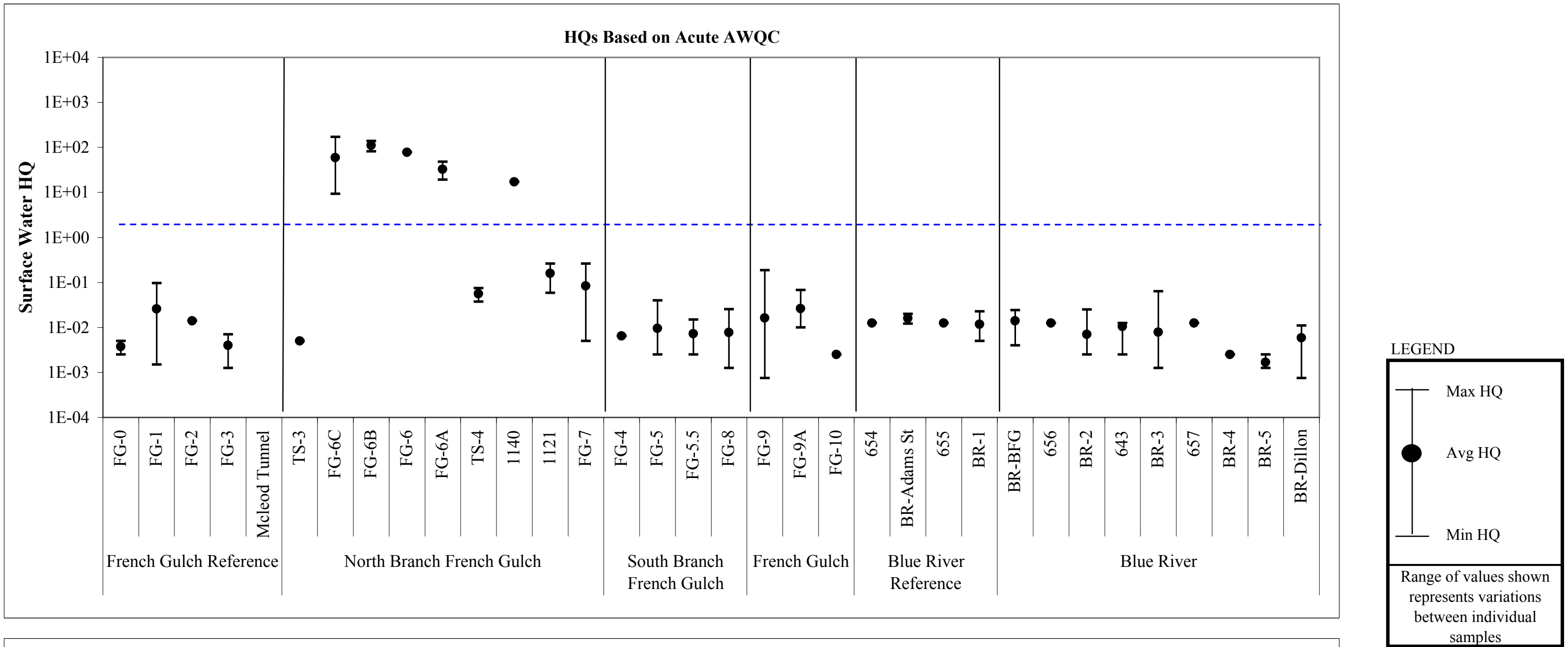


Figure 7-1d Summary of Surface Water Hazard Quotients for Aquatic Receptors

IRON



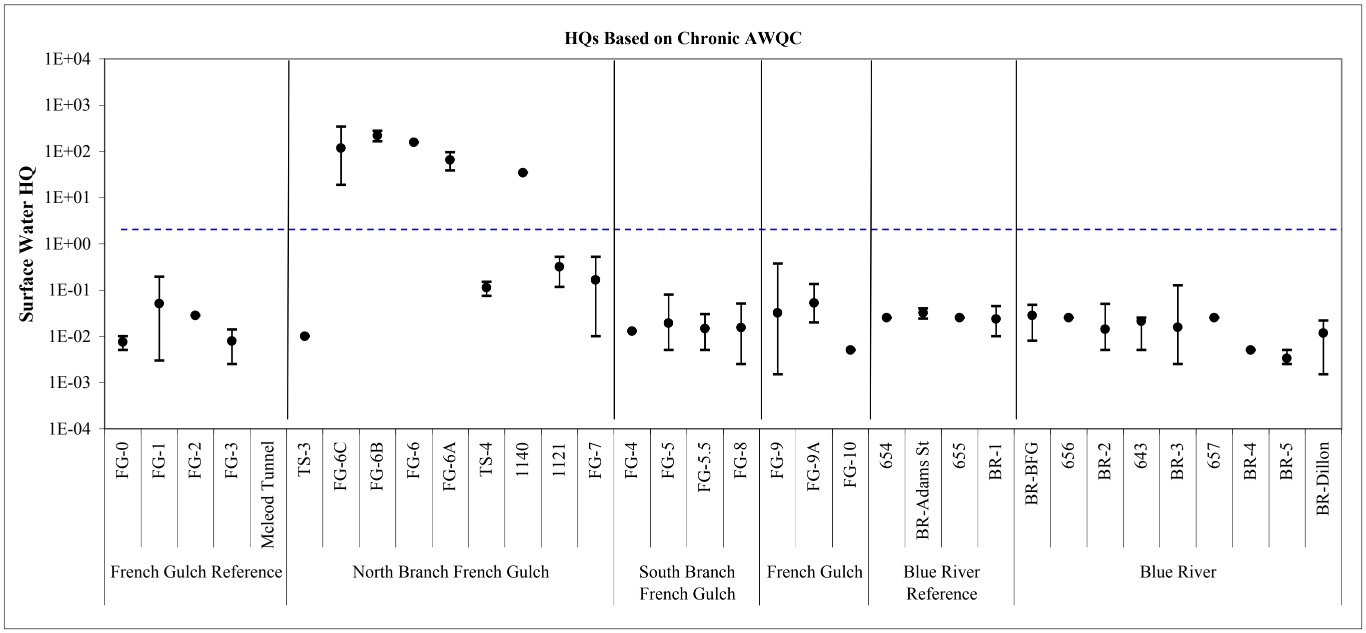
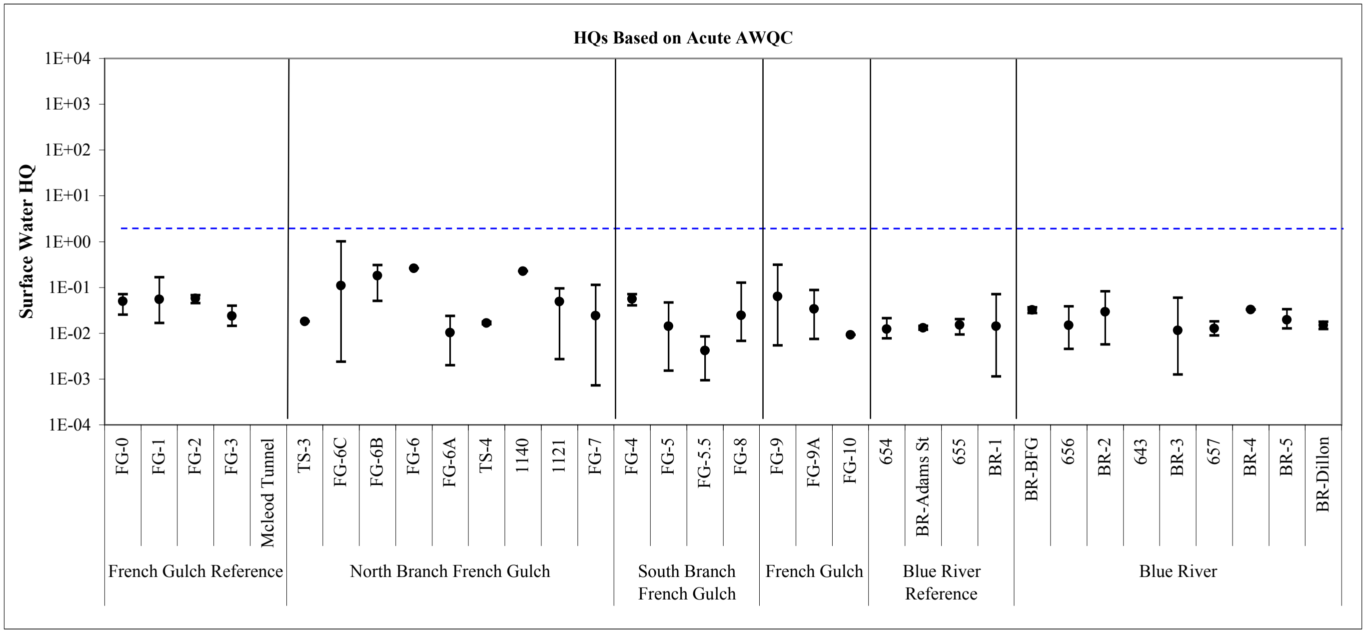
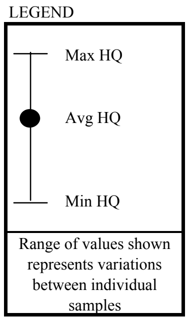


Figure 7-1e Summary of Surface Water Hazard Quotients for Aquatic Receptors

LEAD





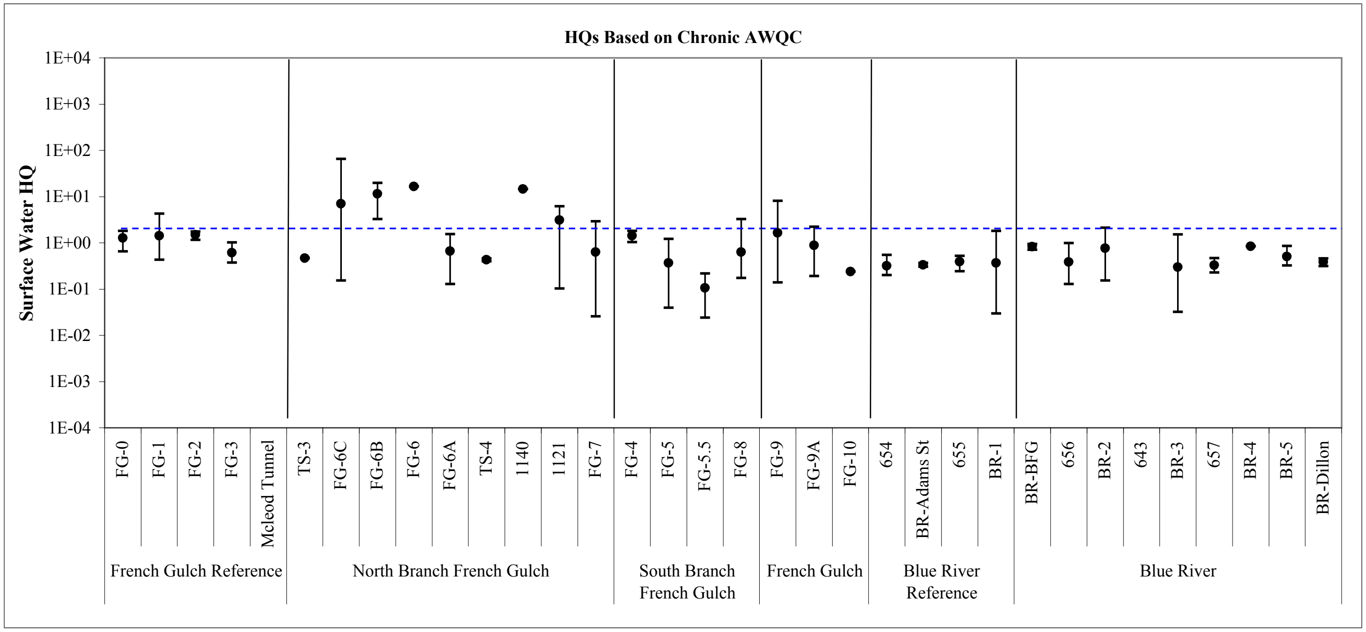
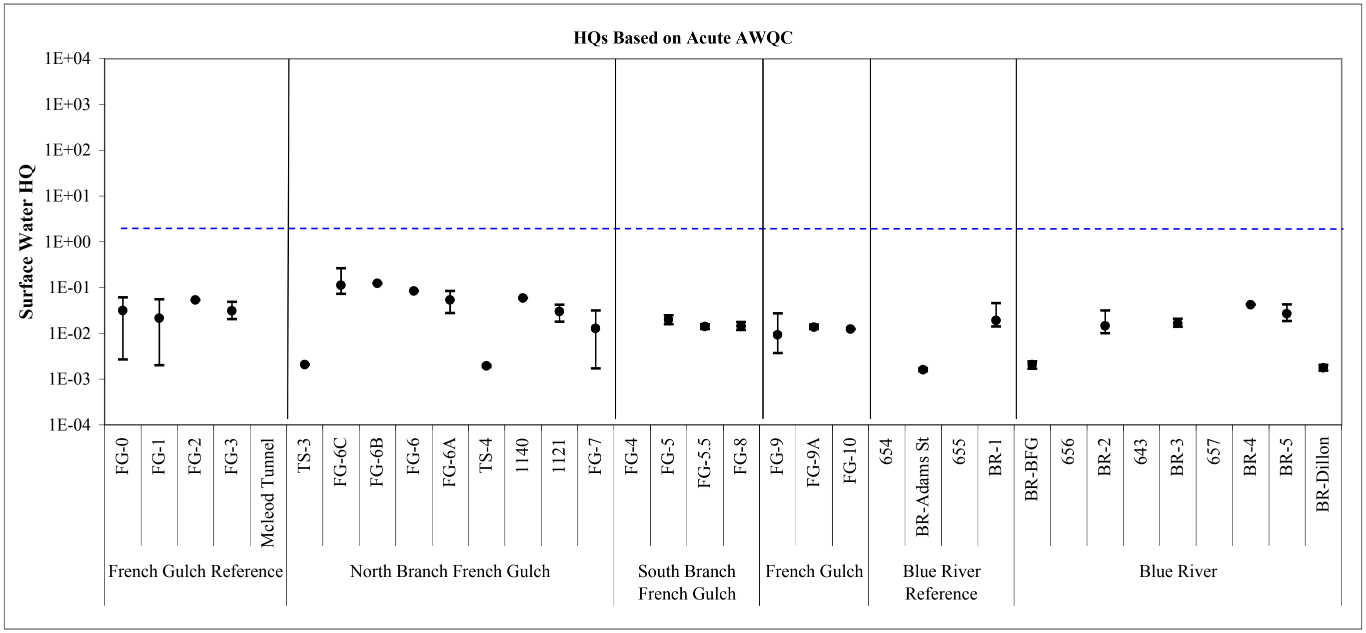
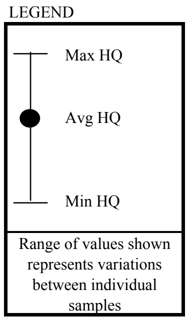


Figure 7-1f Summary of Surface Water Hazard Quotients for Aquatic Receptors

NICKEL





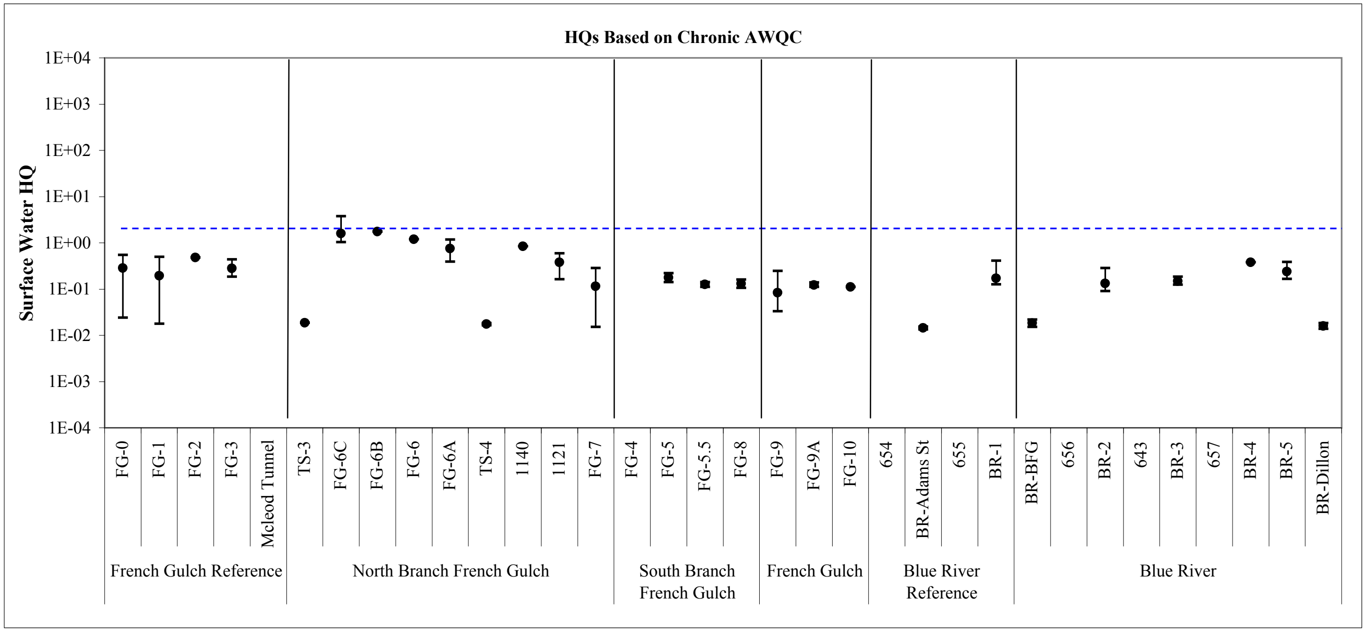
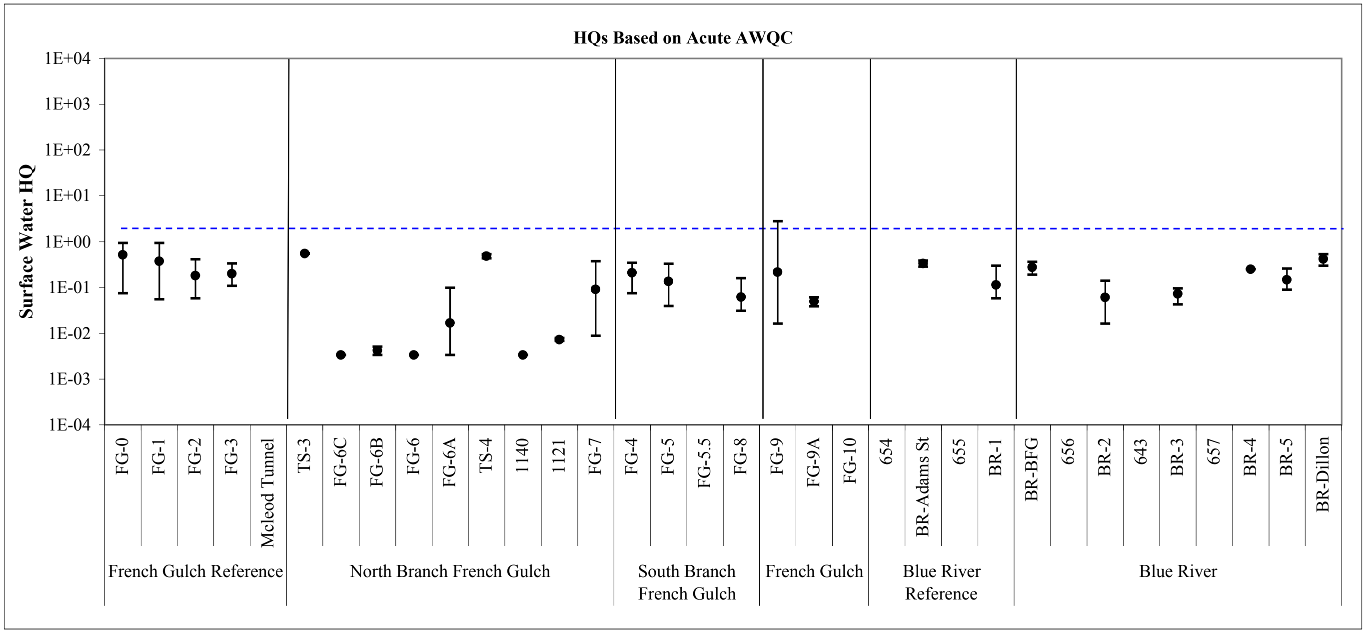
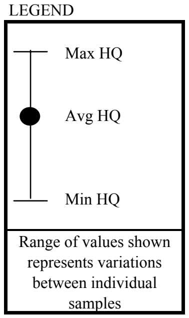


Figure 7-1g Summary of Surface Water Hazard Quotients for Aquatic Receptors

SILVER





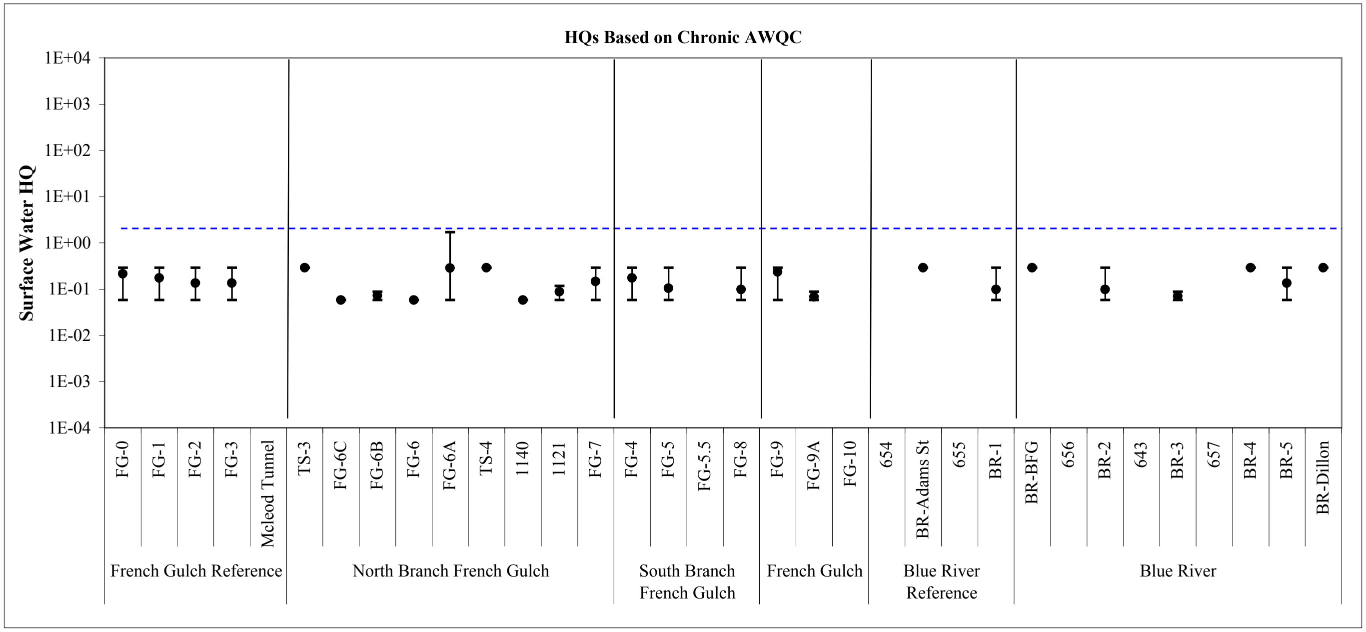


Figure 7-1h Summary of Surface Water Hazard Quotients for Aquatic Receptors

ZINC

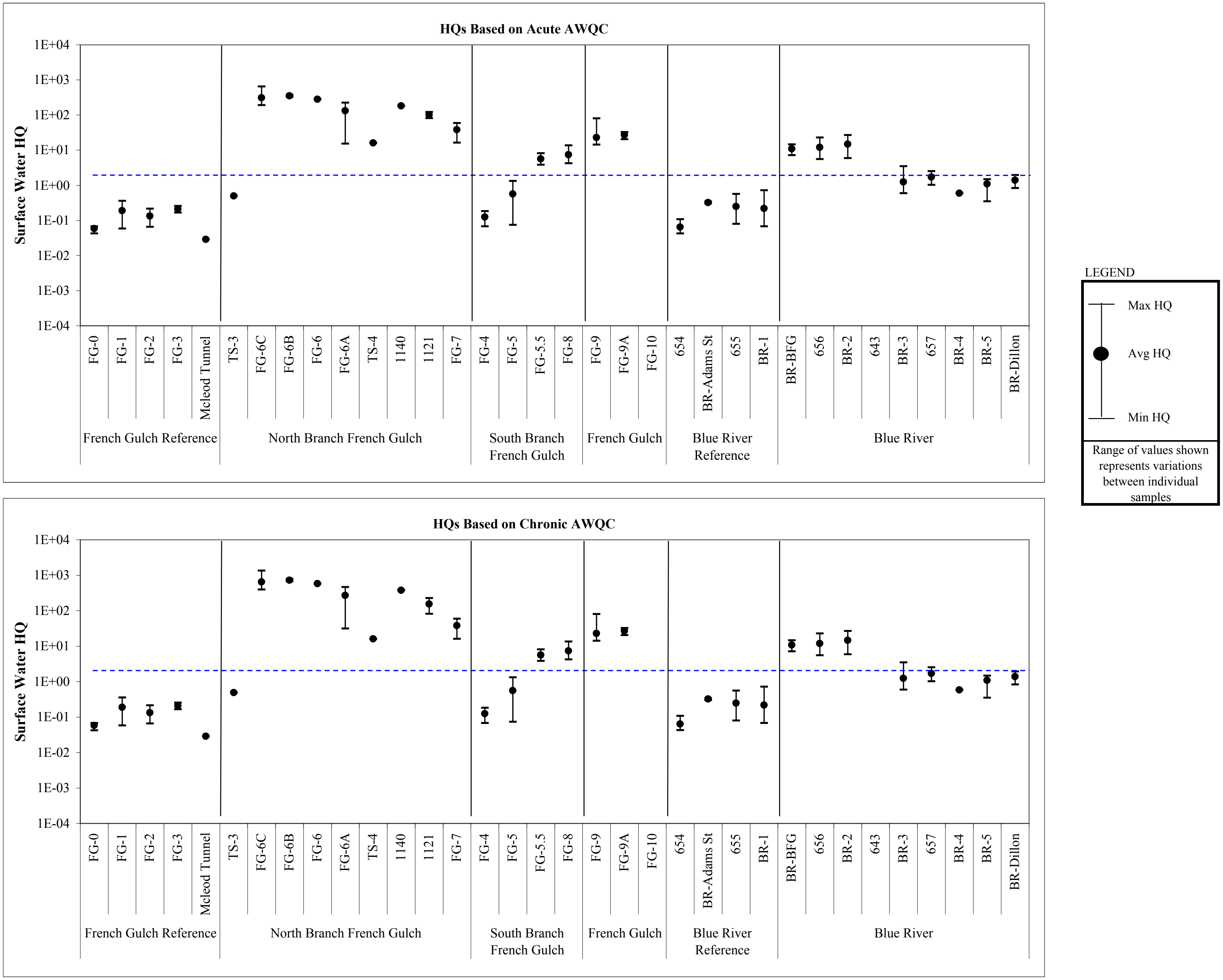
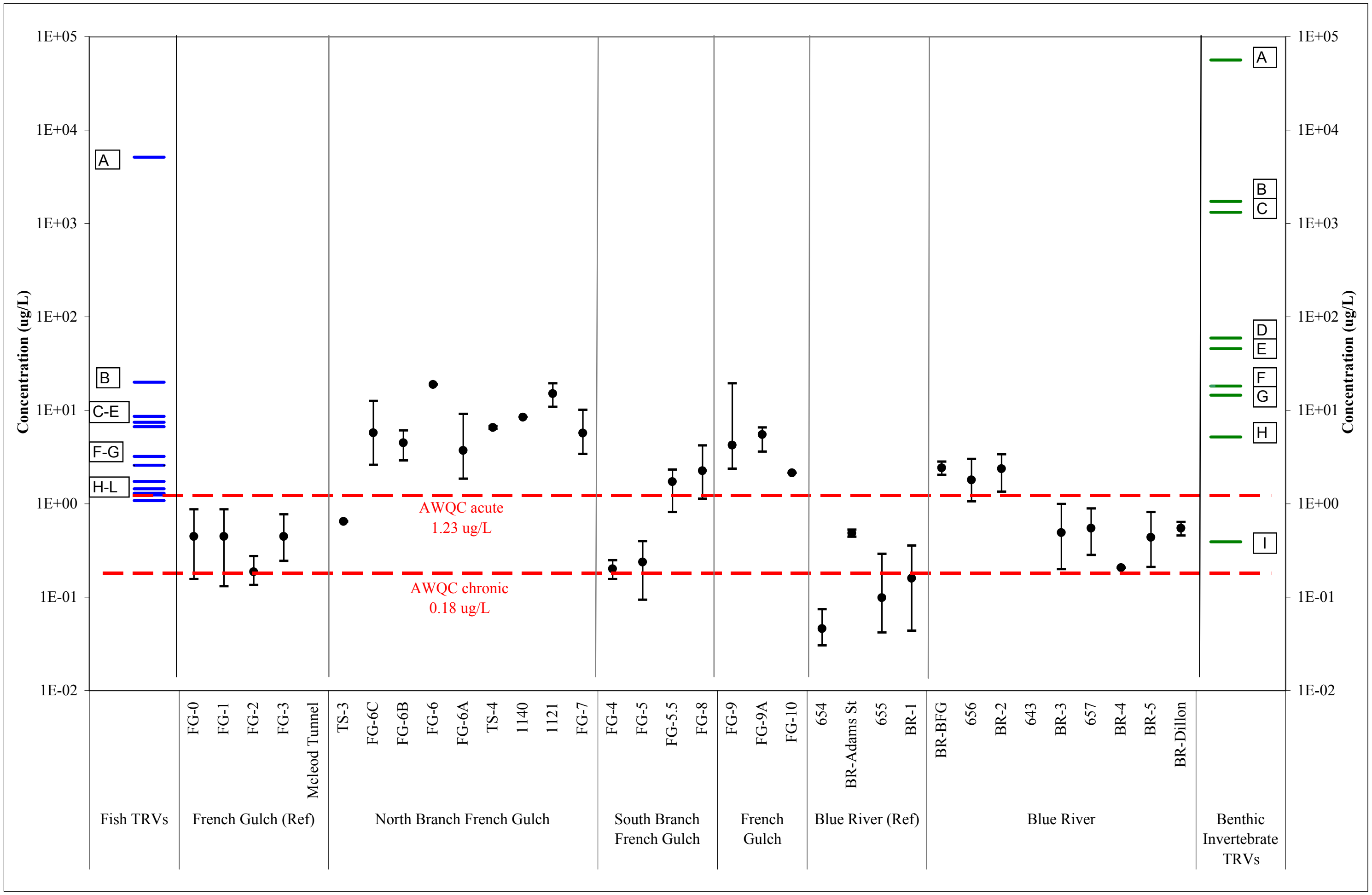


Figure 7-2a
Comparison of Cadmium Concentrations with Acute and Chronic Toxicity Values for Fish and Benthic Invertebrates



FISH TRVs (ug/L)

A	5,148	W. Sucker (NR), acute
B	20.02	Fathead Minnow (larvae), acute
C	8.62	W. sucker (NR), chronic
D	7.48	Rainbow (larvae), acute
E	6.69	Brown (NR), chronic
F	3.22	Colo. Squawfish (larva/juv), acute
G	2.59	Brook (NR), chronic
H	1.73	Bull (adult), acute
I	1.45	Rainbow (adult), chronic
J	1.30	Rainbow (adult), acute
K	1.24	Brook (NR), acute
L	1.08	Brown (NR), acute

LEGEND

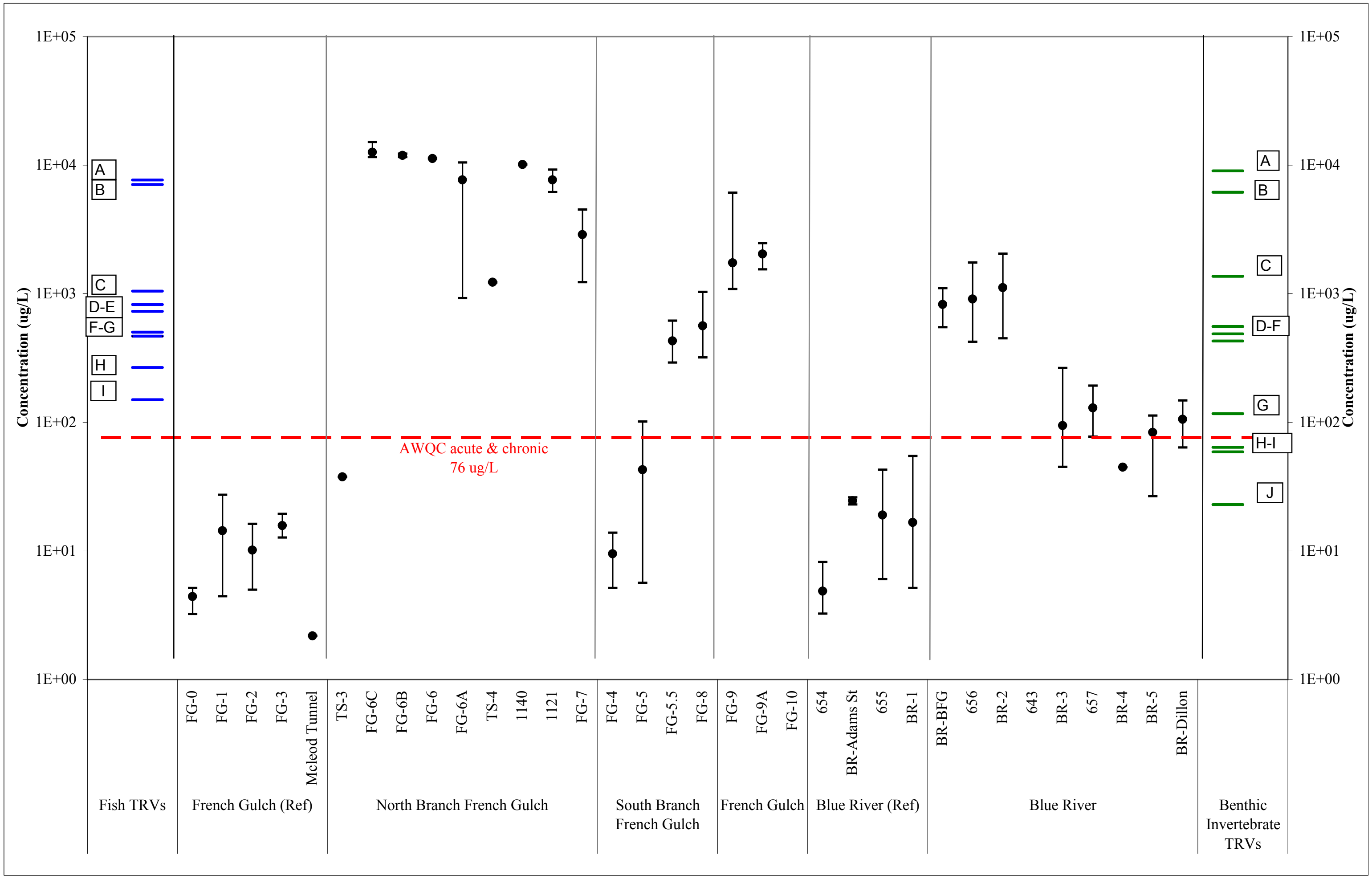
Maximum Concentration
Average Concentration
Minimum Concentration

All measured concentrations and TRVs normalized to a hardness of 60 mg/L.

BENTHIC TRVs (ug/L)

A	56,285	Midge, acute
B	1,732	Tubificid Worm, acute
C	1,323	Mayfly, acute
D	59	Snail, acute
E	46	Amphipod (Gammarus sp.), acute
F	18.2	Ceriodaphnia, acute
G	14.5	Daphnia, acute
H	5.18	Snail, chronic
I	0.39	Daphnia, chronic

Figure 7-2b
Comparison of Zinc Concentrations with Acute and Chronic Toxicity Values for Fish and Benthic Invertebrates



FISH TRVs (ug/L)

A	7,685	N. Squawfish, acute (juv)
B	7,091	W. Sucker, acute (adult)
C	1,049	Brook, chronic (life cycle)
D	825	Rainbow, chronic (larvae)
E	729	Brook, acute (juv)
F	502	Rainbow, acute (adult)
G	468	Rainbow, acute (larvae)
H	267	Rainbow, acute (juv)
I	150	Fathead minnow, acute (larvae)

LEGEND

Maximum Concentration

Average Concentration

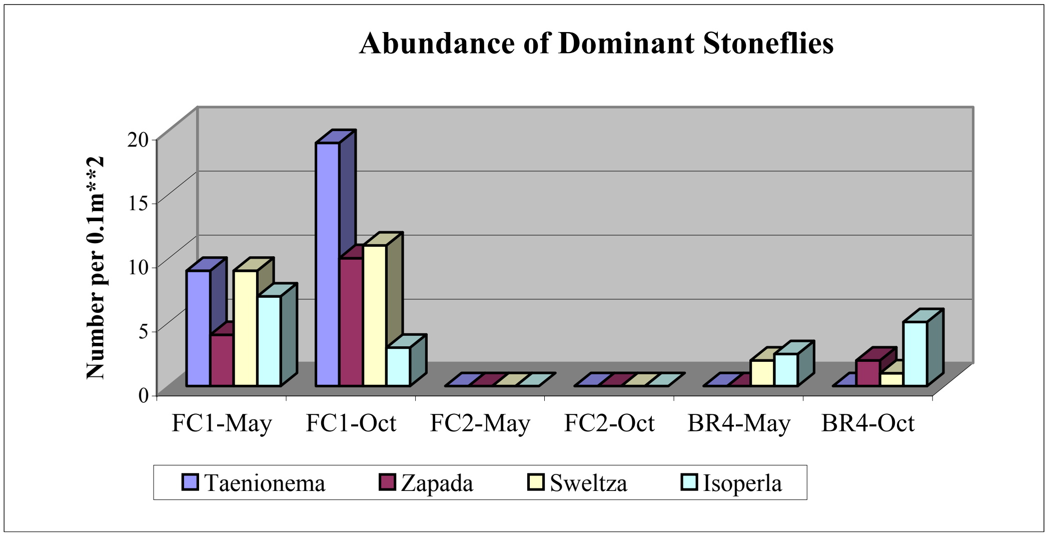
Minimum Concentration

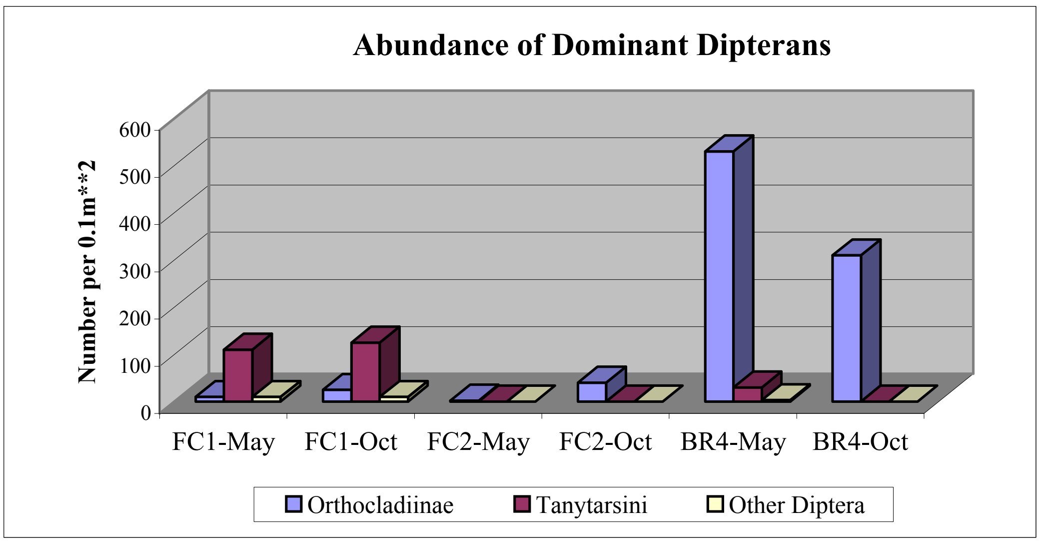
All measured concentrations and TRVs normalized to a hardness of 60 mg/L.

BENTHIC TRVs (ug/L)

A	9,046	Caddisfly, chronic
B	6,153	Midge, acute
C	1,368	Tubificid Worm, acute
D	558	Snail (Physa sp.), acute
E	489	Mayfly, acute
F	430	Amphipod (Gammarus sp.), acute
G	117	Amphipod (Hyalella sp.), acute
H	64	Daphnia, acute
I	59	Daphnia, chronic
J	23	Ceriodaphnia, acute

Figure 7-3a
Relative Abundance of Dominant Taxa (Clements, 1995)





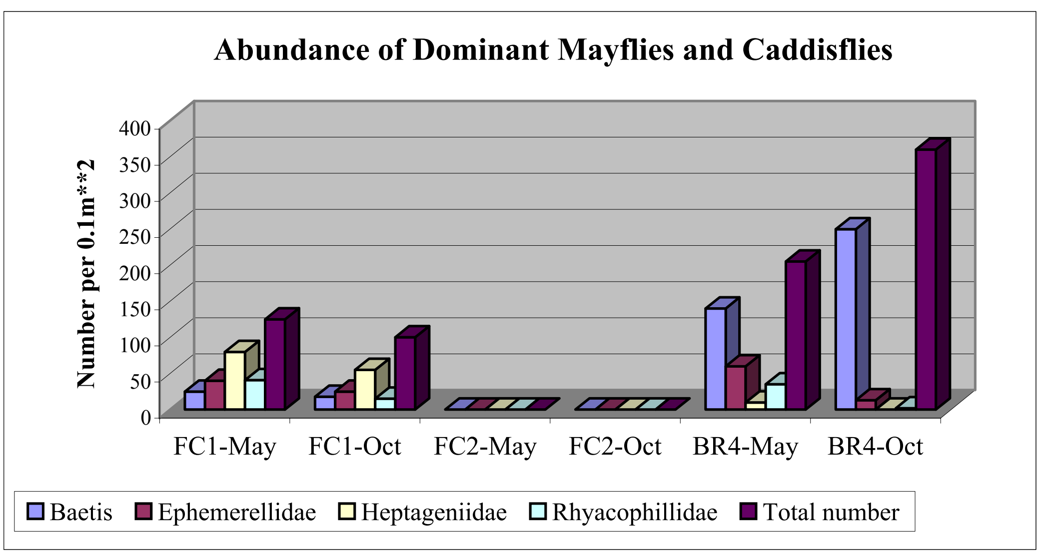
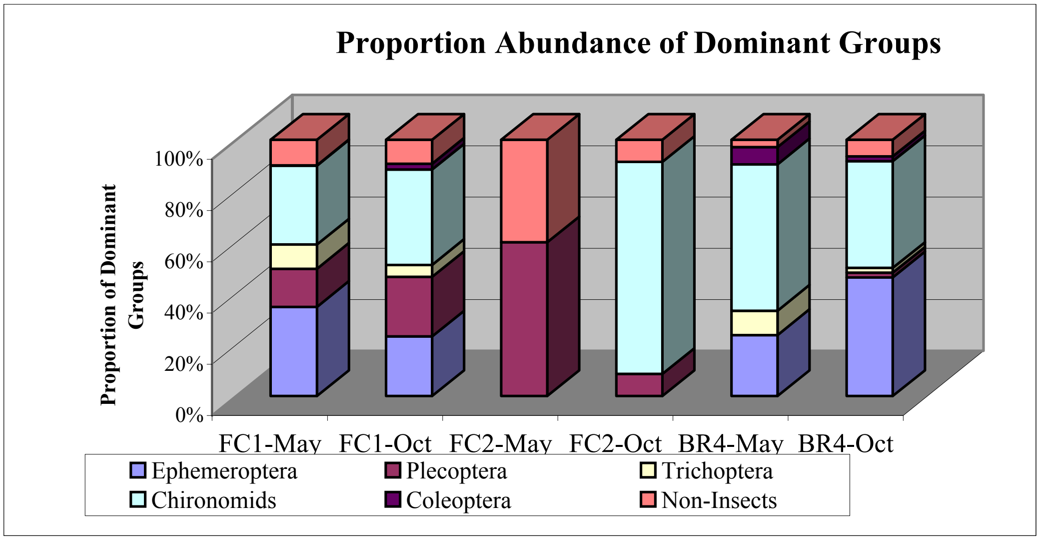


Figure 7-3b
Composition of Benthic Invertebrate Community (Clements, 1995)



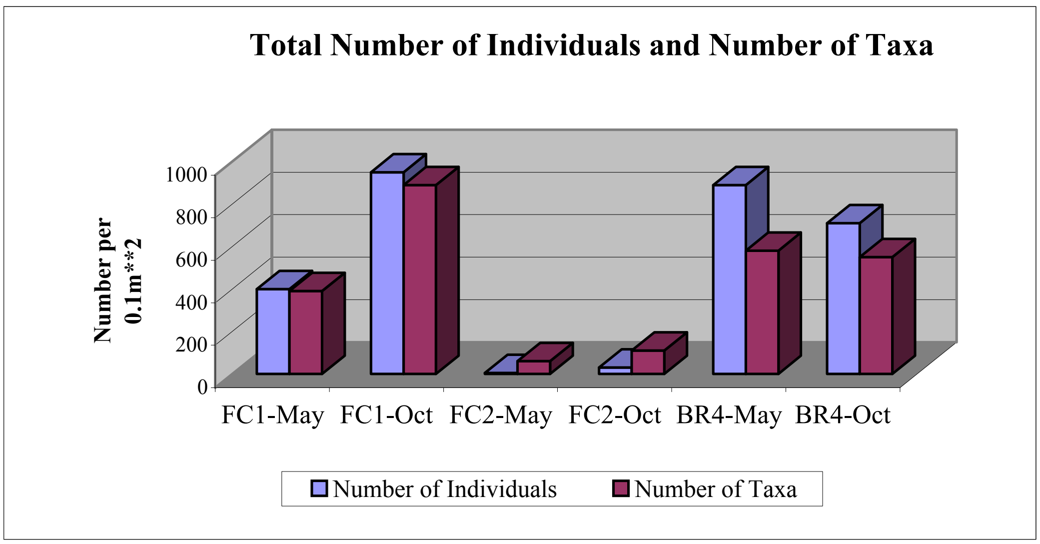
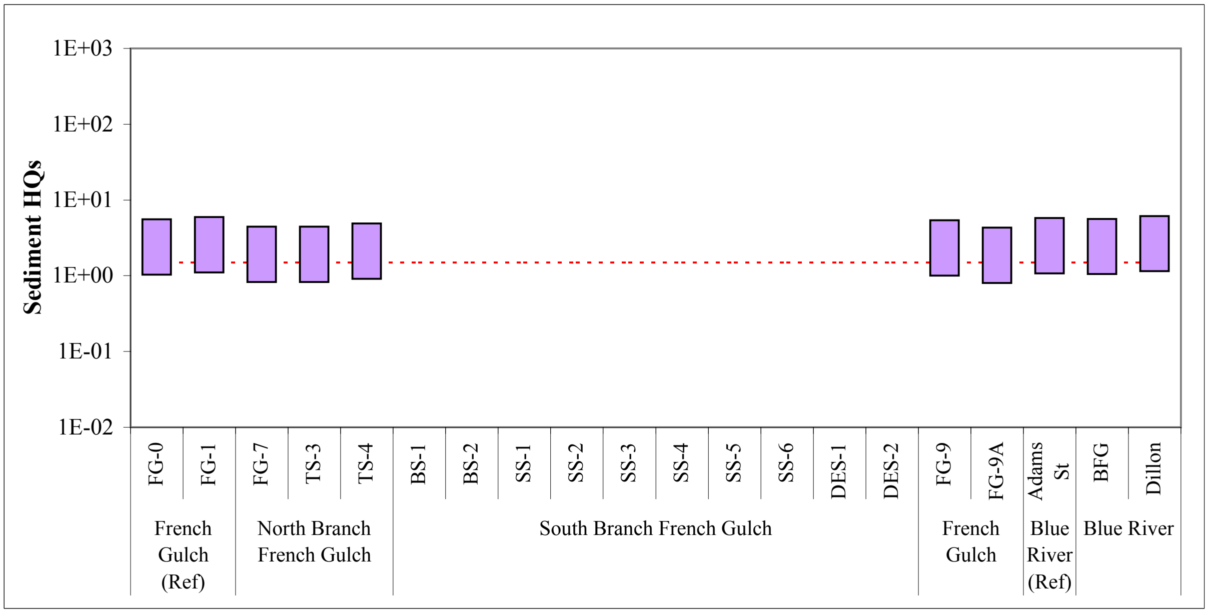


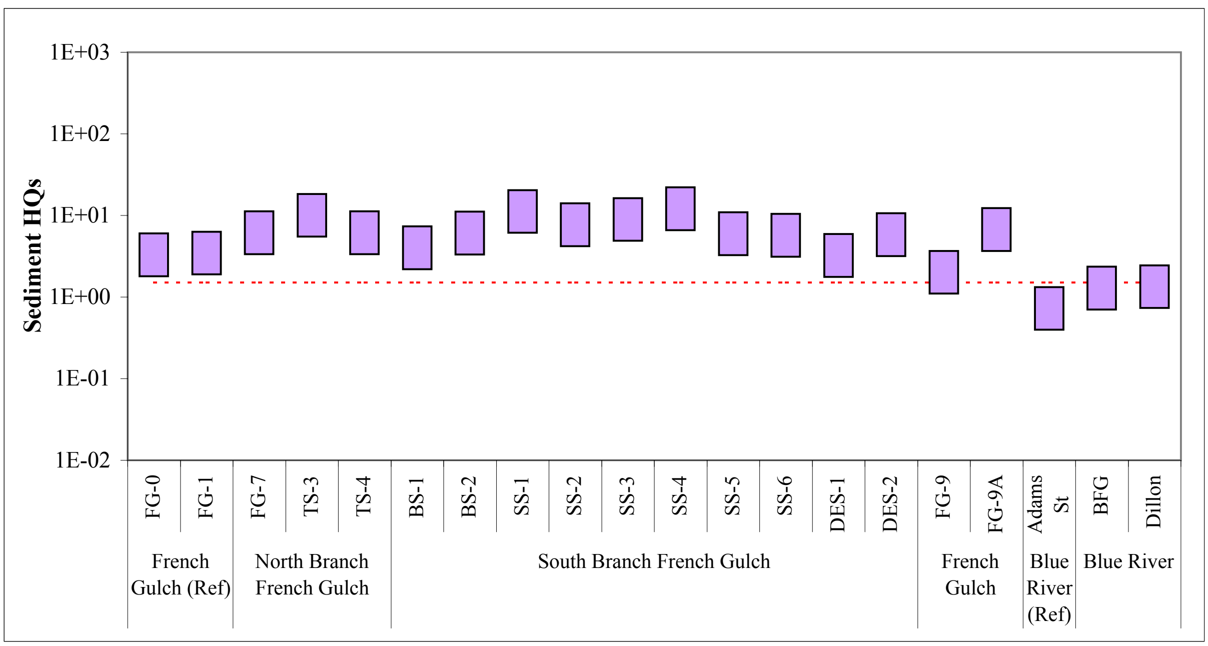
Figure 7-4
Summary of Sediment Hazard Quotients for Benthic Invertebrates

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

PANEL A: ALUMINUM



PANEL B: ARSENIC



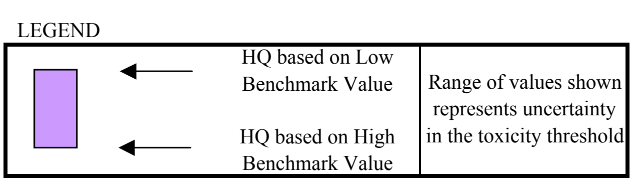
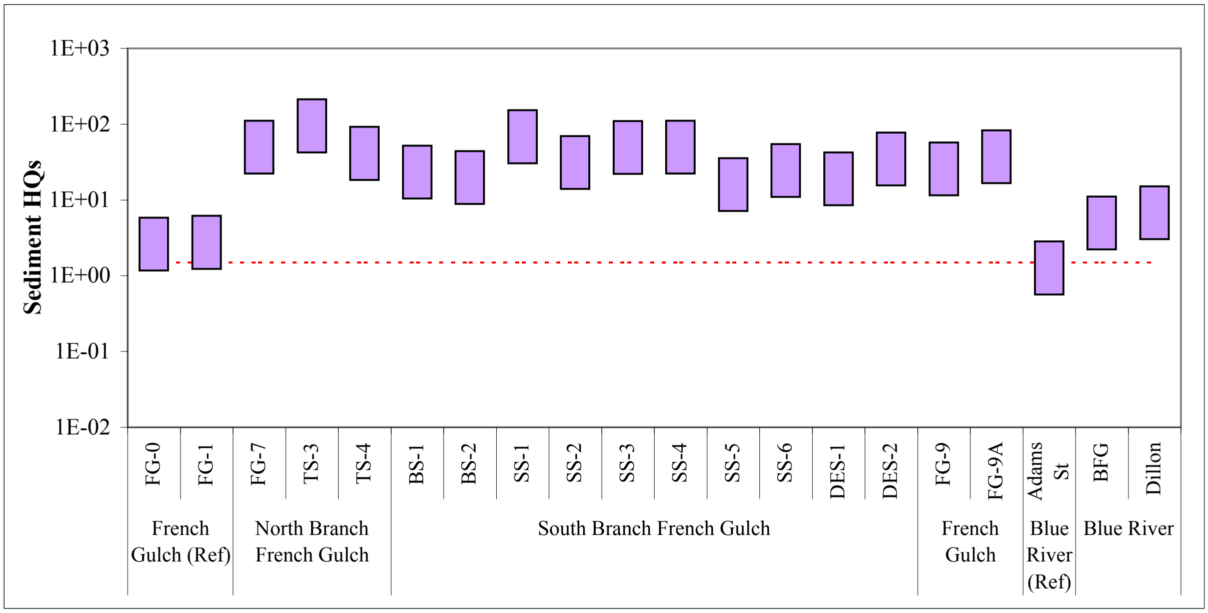


Figure 7-4
Summary of Sediment Hazard Quotients for Benthic Invertebrates

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

PANEL C: CADMIUM



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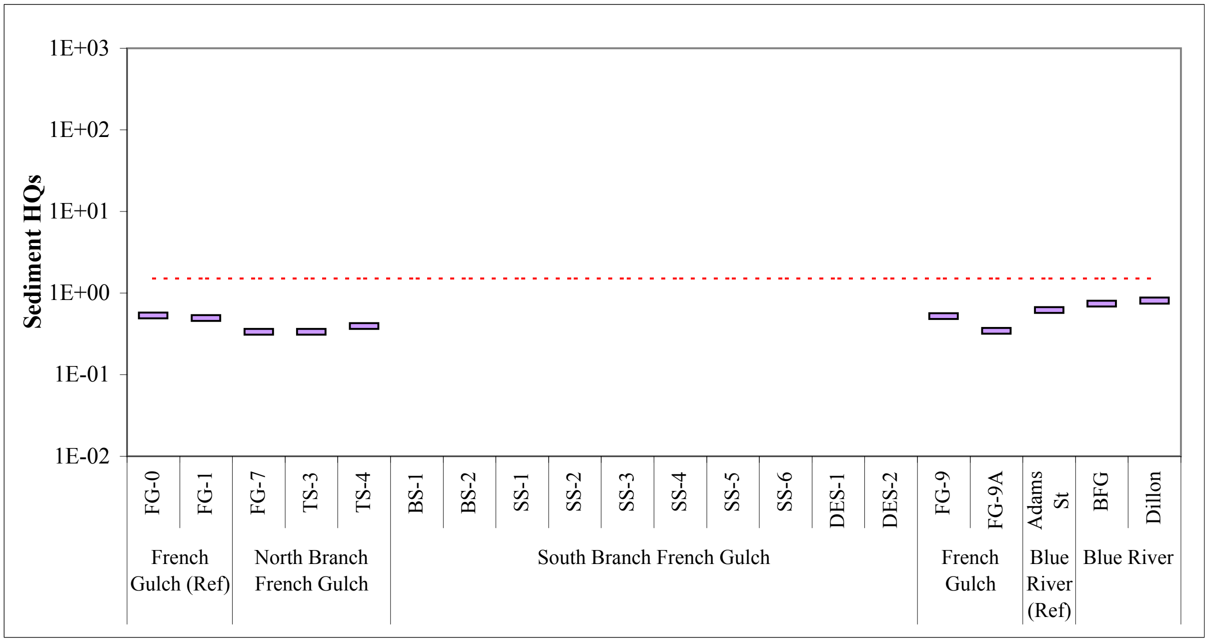


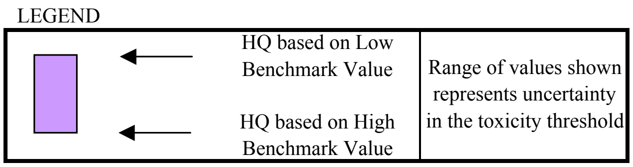
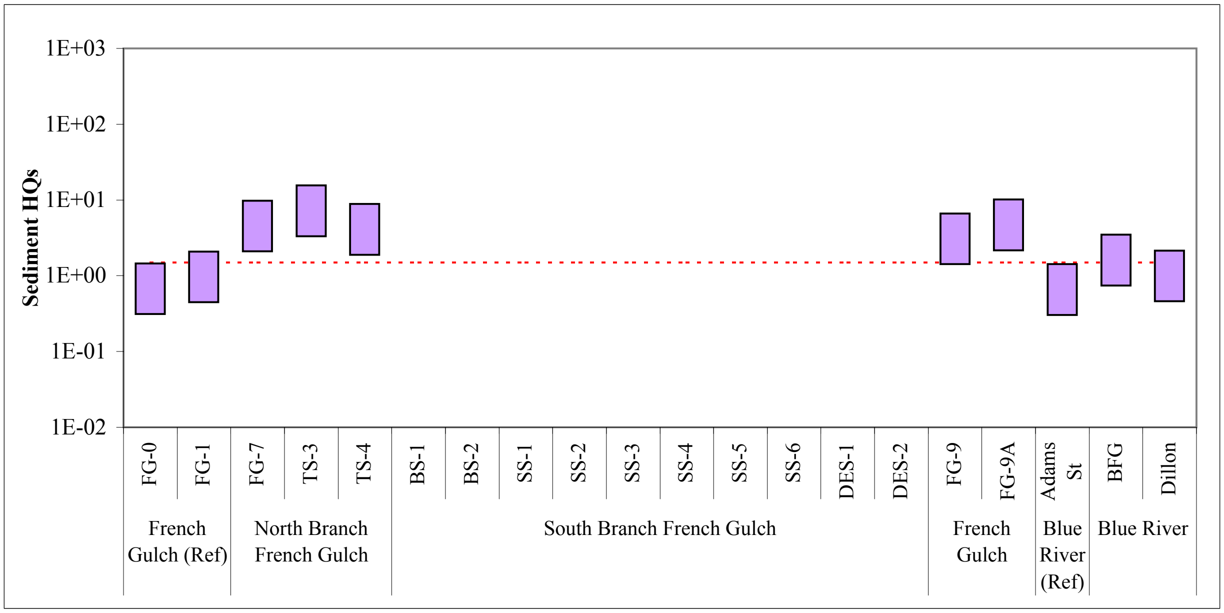


Figure 7-4
Summary of Sediment Hazard Quotients for Benthic Invertebrates

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

PANEL E: COPPER



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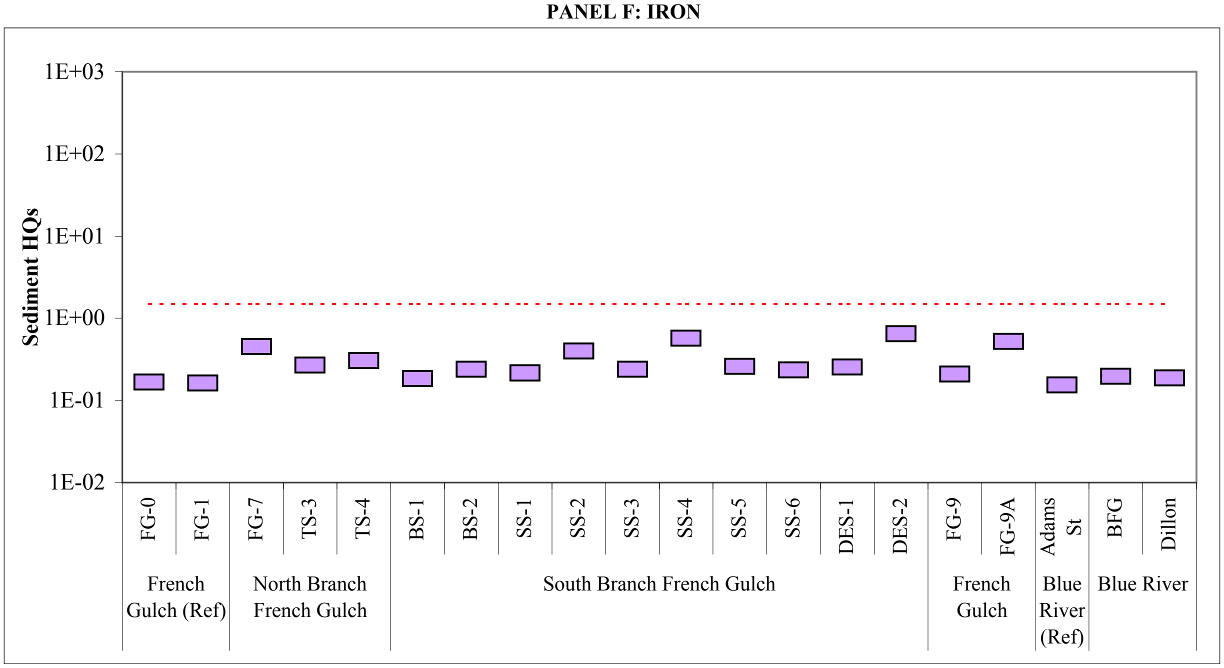

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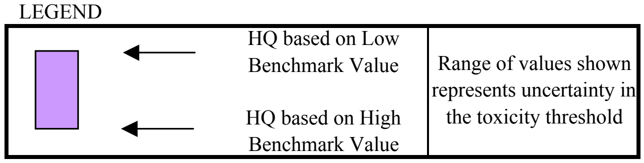
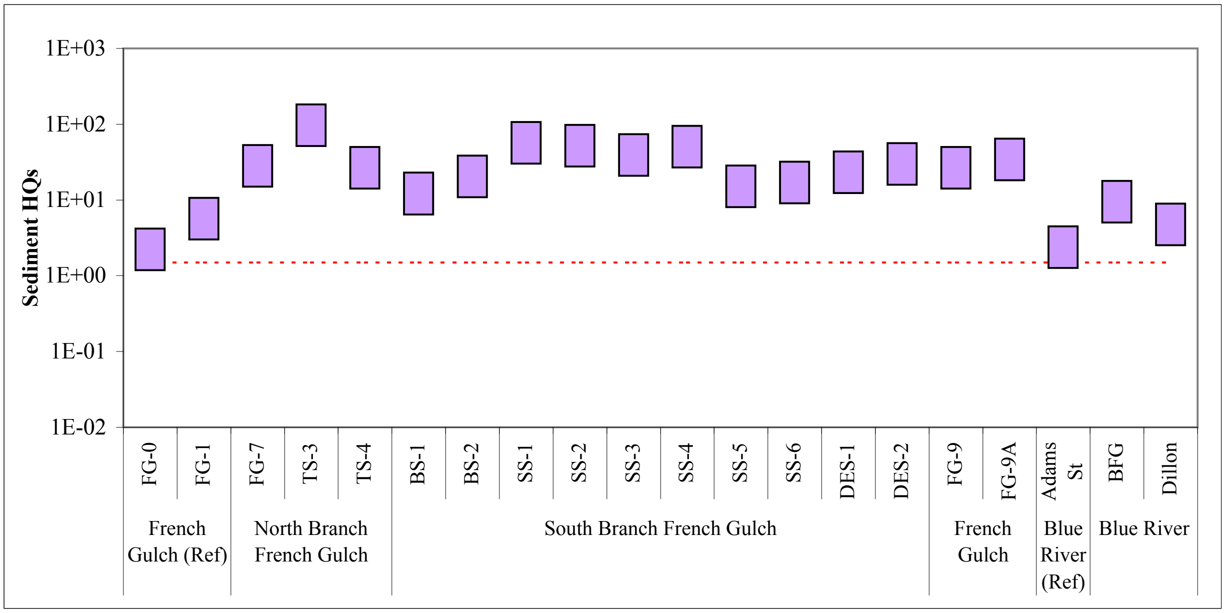


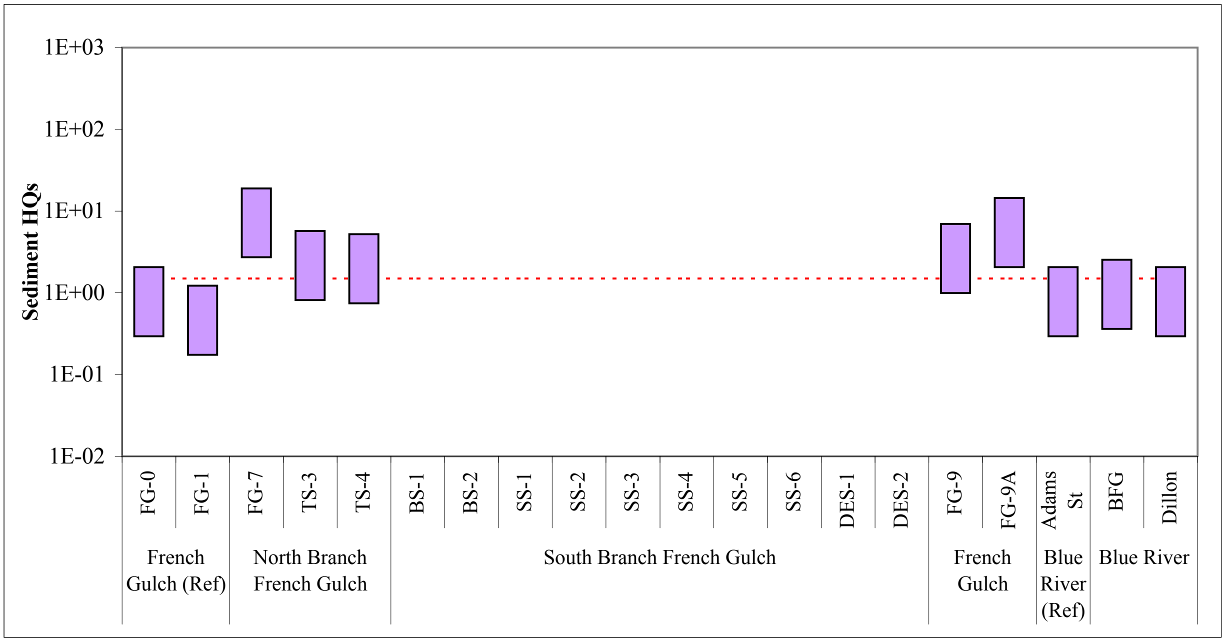
Figure 7-4
Summary of Sediment Hazard Quotients for Benthic Invertebrates

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

PANEL G: LEAD



PANEL H: MANGANESE



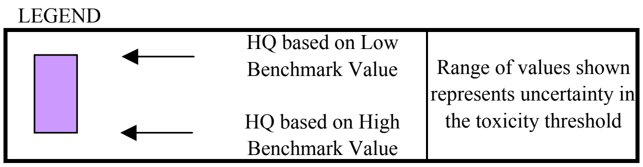
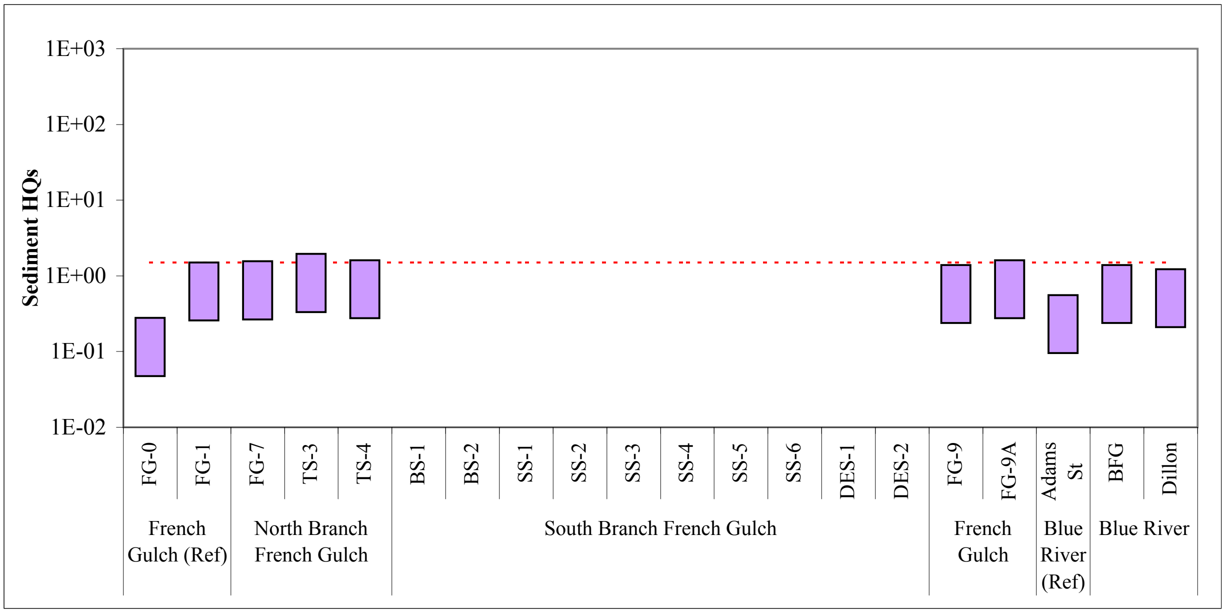


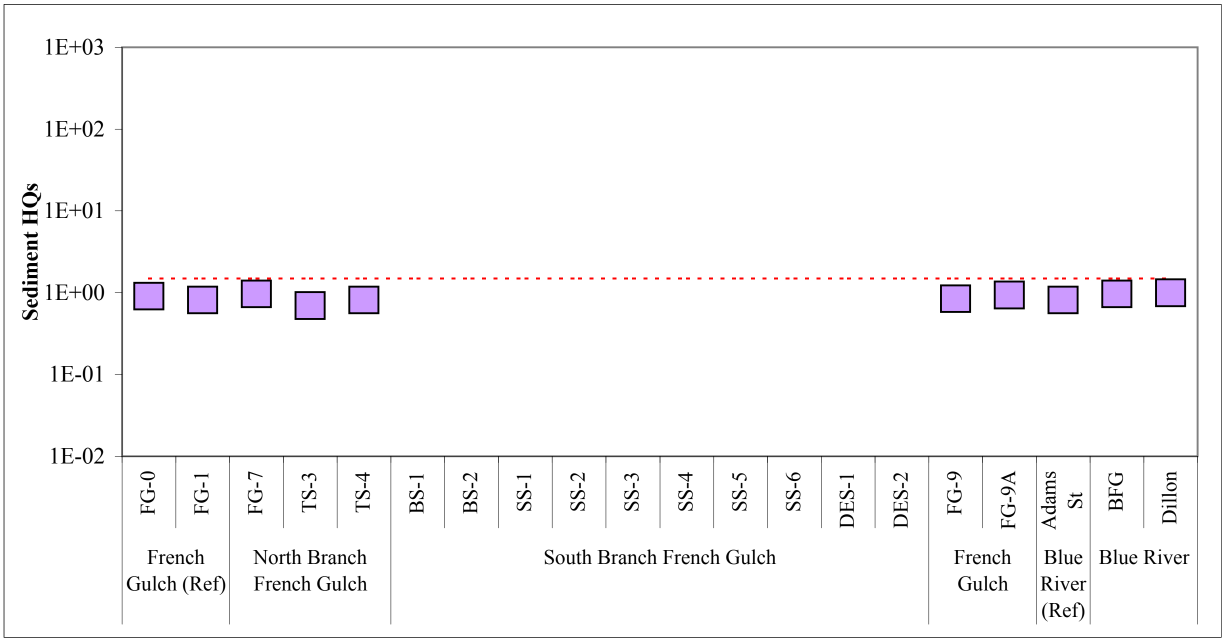
Figure 7-4
Summary of Sediment Hazard Quotients for Benthic Invertebrates

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

PANEL I: MERCURY



PANEL J: NICKEL



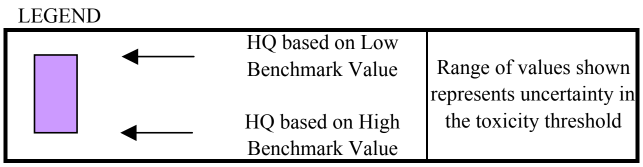
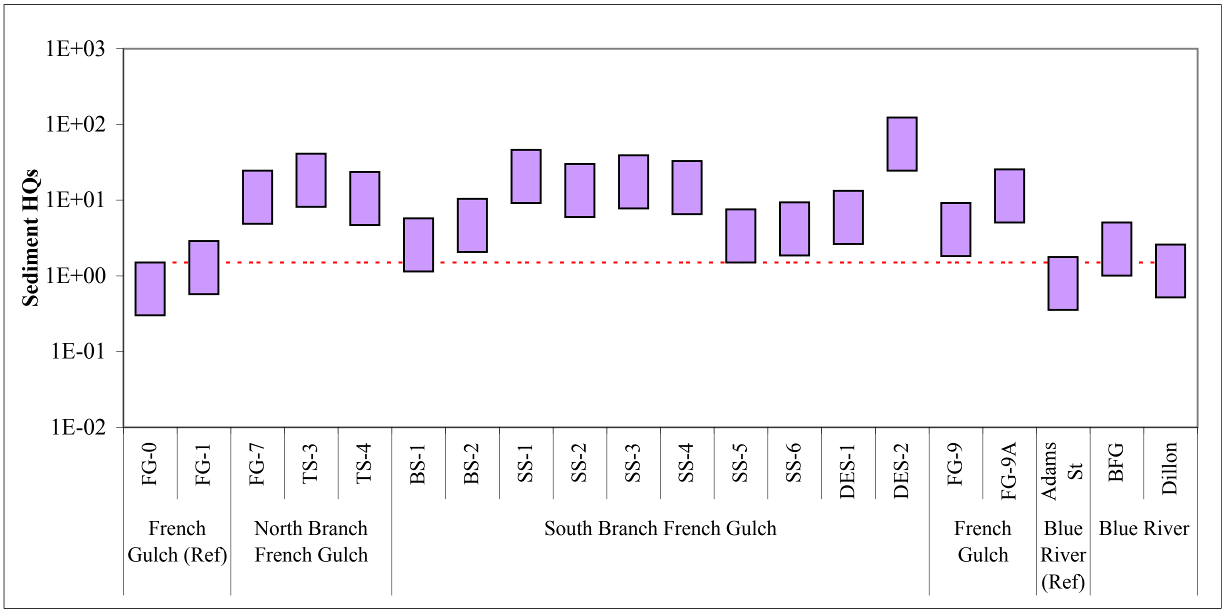


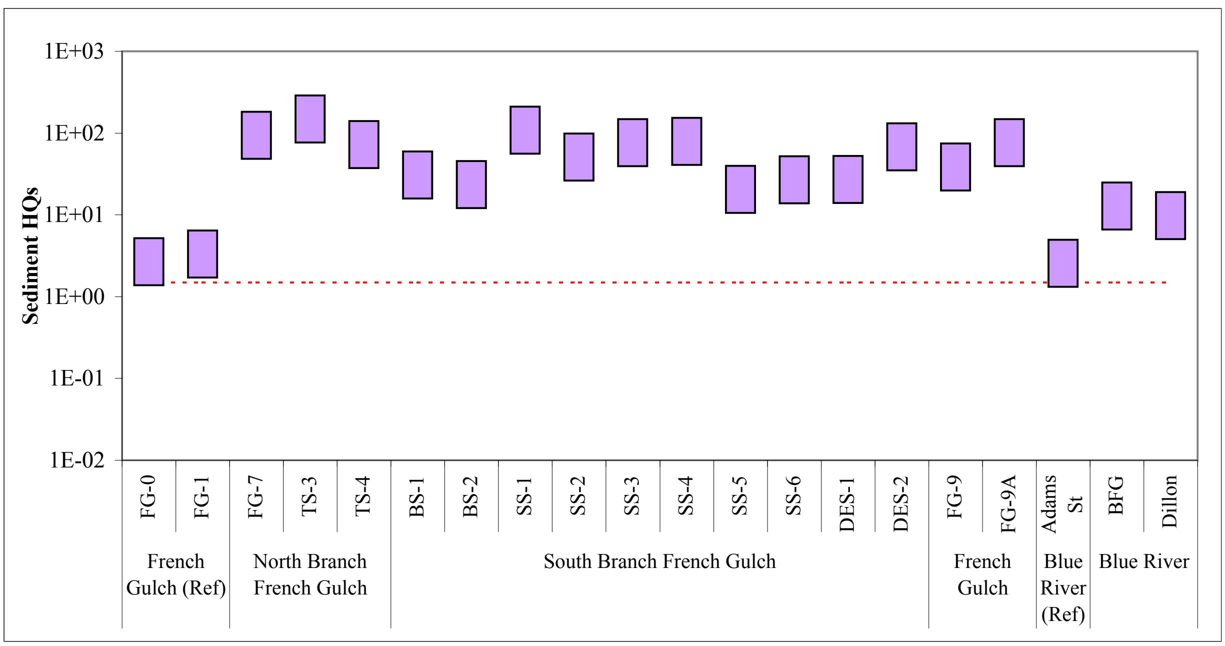
Figure 7-4
Summary of Sediment Hazard Quotients for Benthic Invertebrates

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

PANEL K: SILVER



PANEL L: ZINC



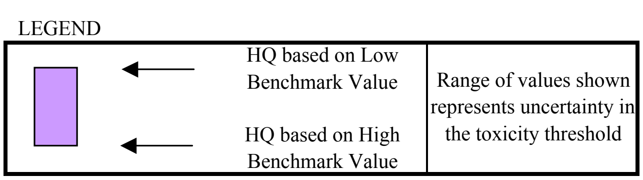
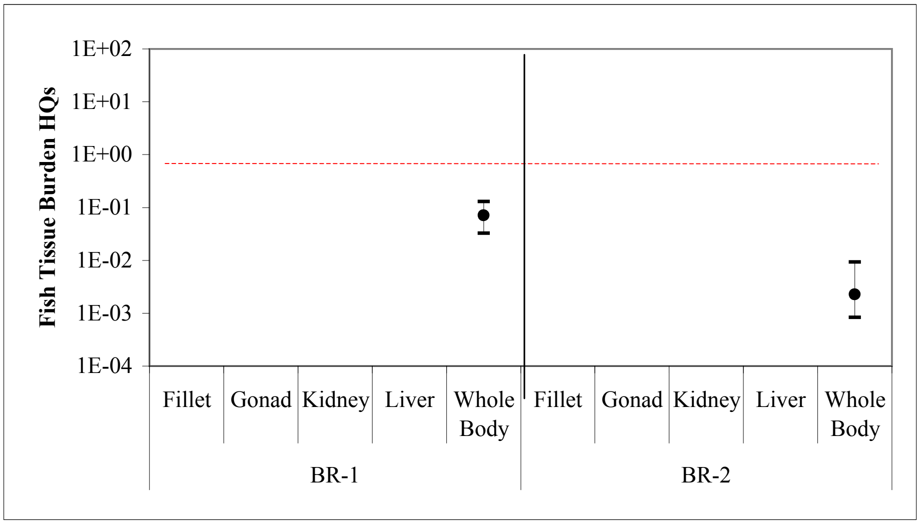


Figure 7-5
HQ Values Based on COPC Levels in Fish Tissues

ARSENIC



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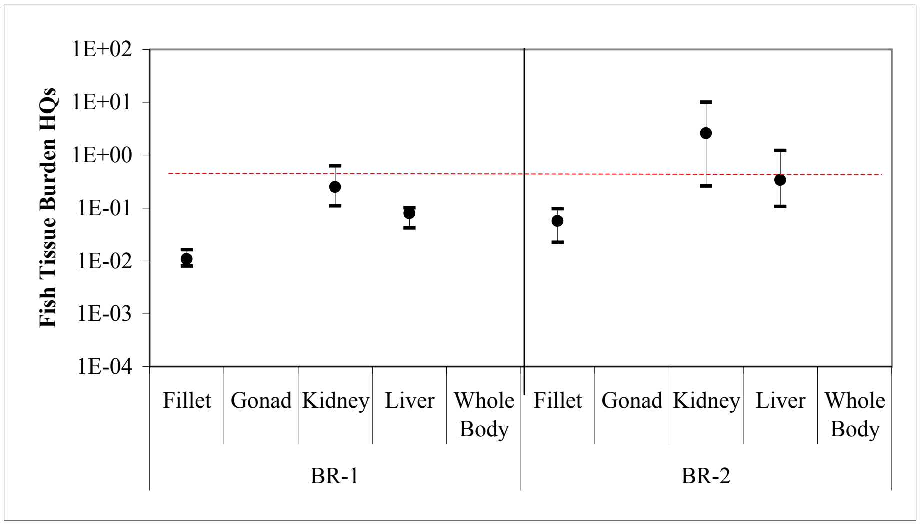


COPPER

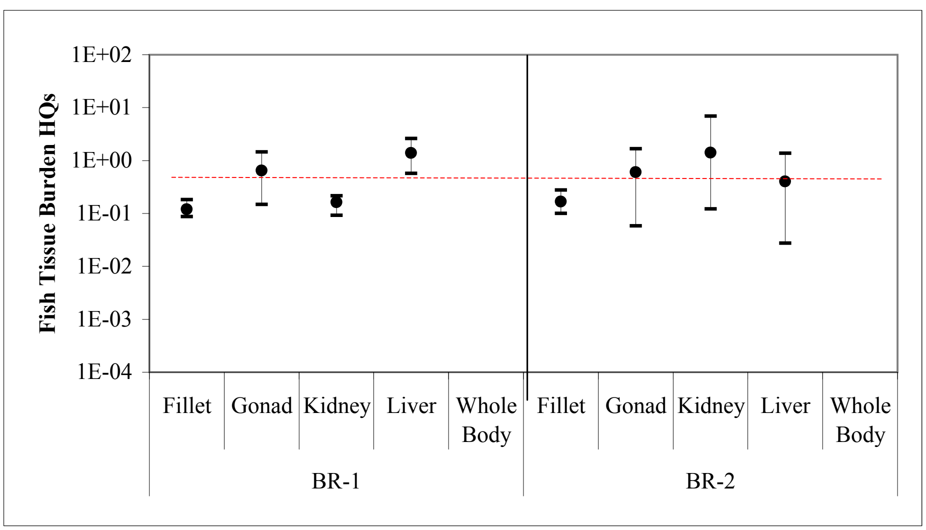
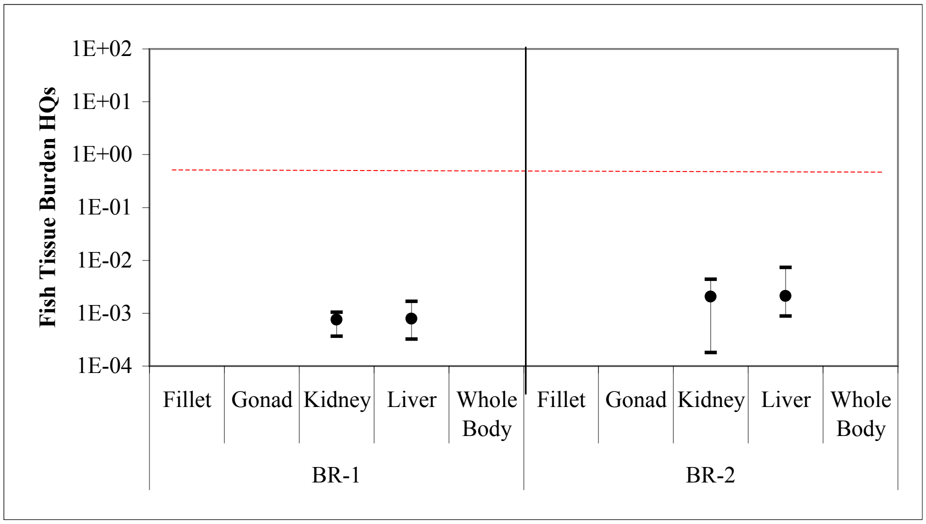


Figure 7-5
HQ Values Based on COPC Levels in Fish Tissues

LEAD



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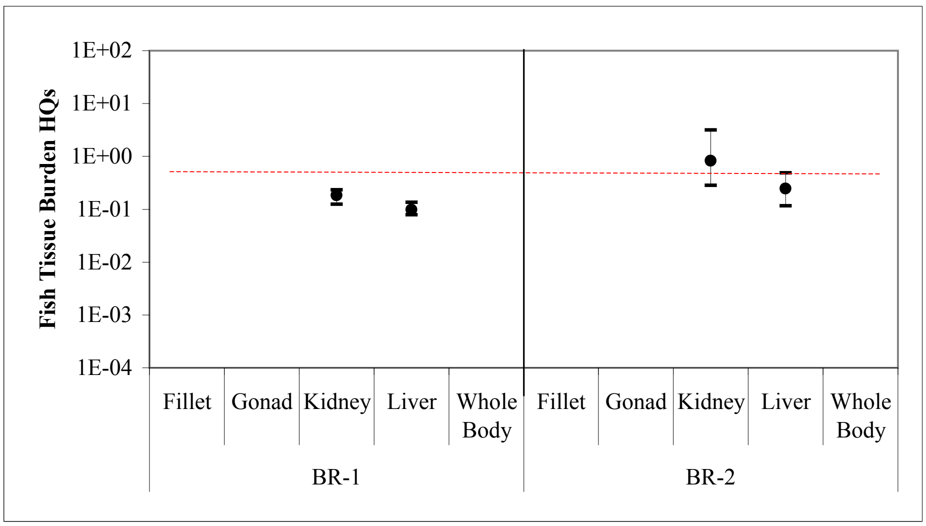


Figure 7-6
Summary of Wildlife Hazard Quotients

PANEL A: ALUMINUM

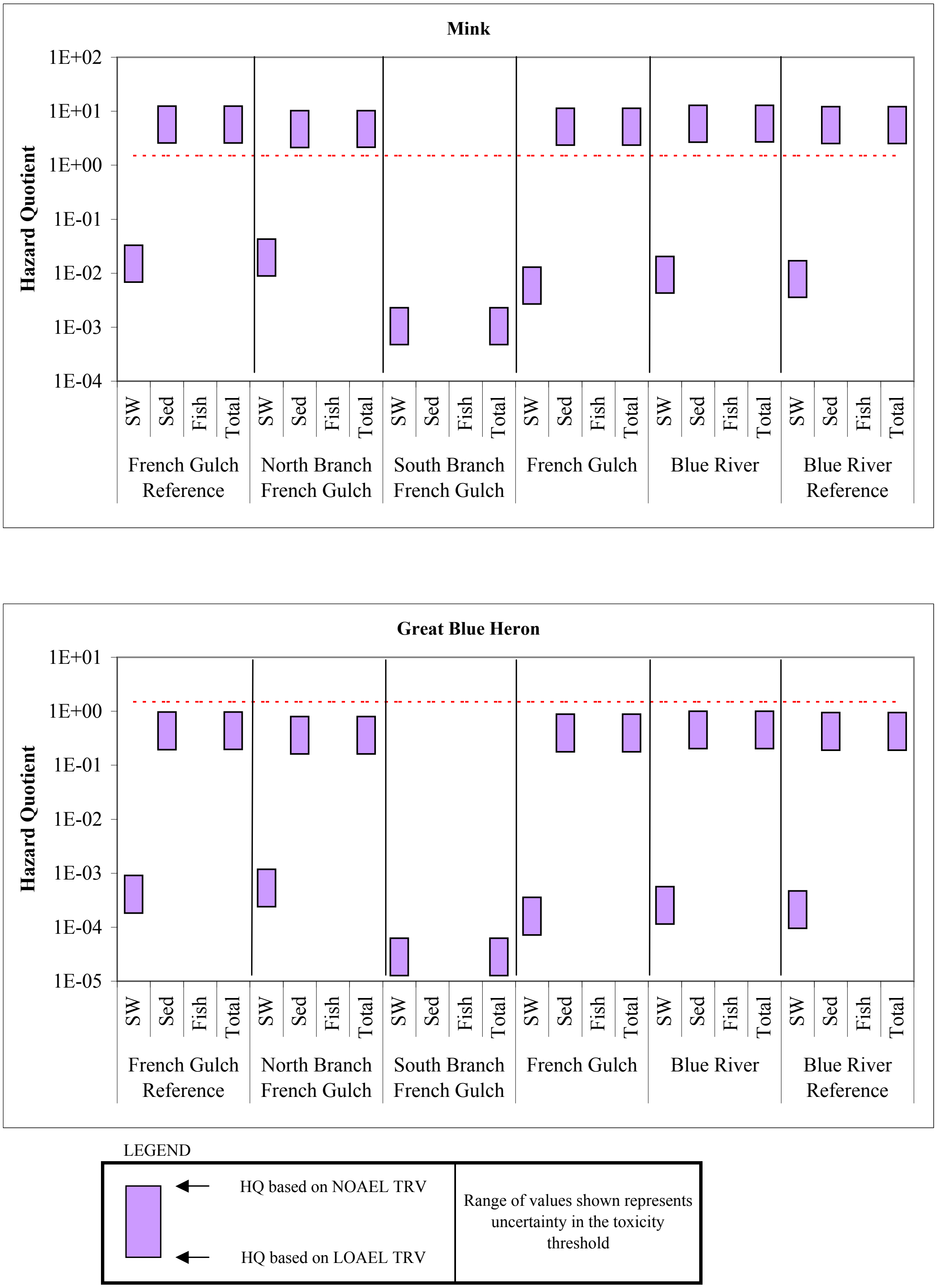
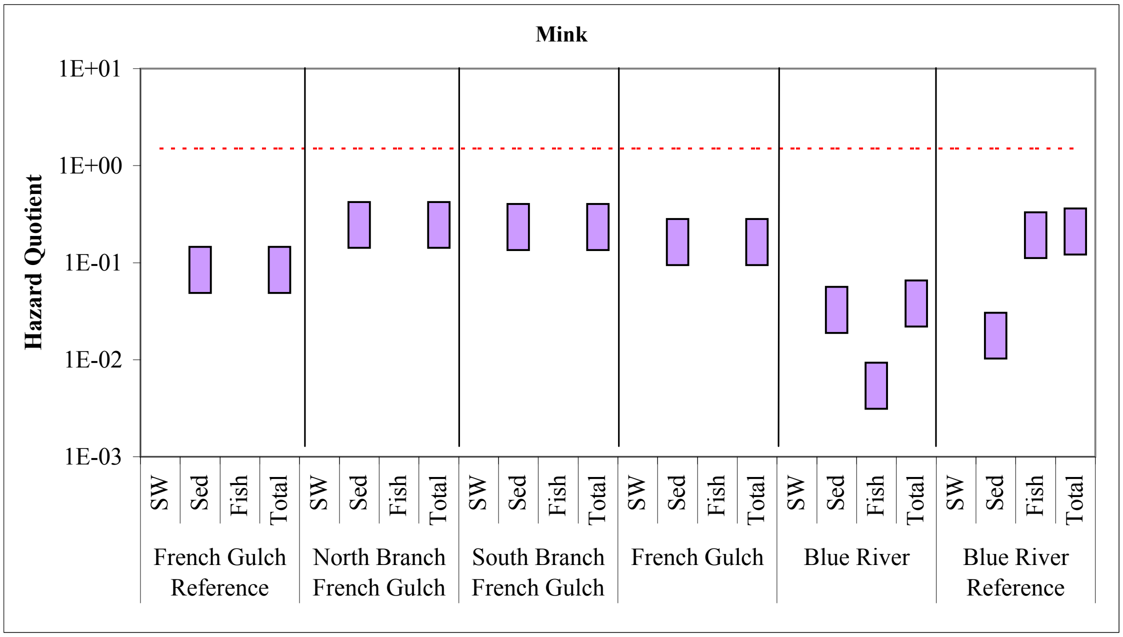
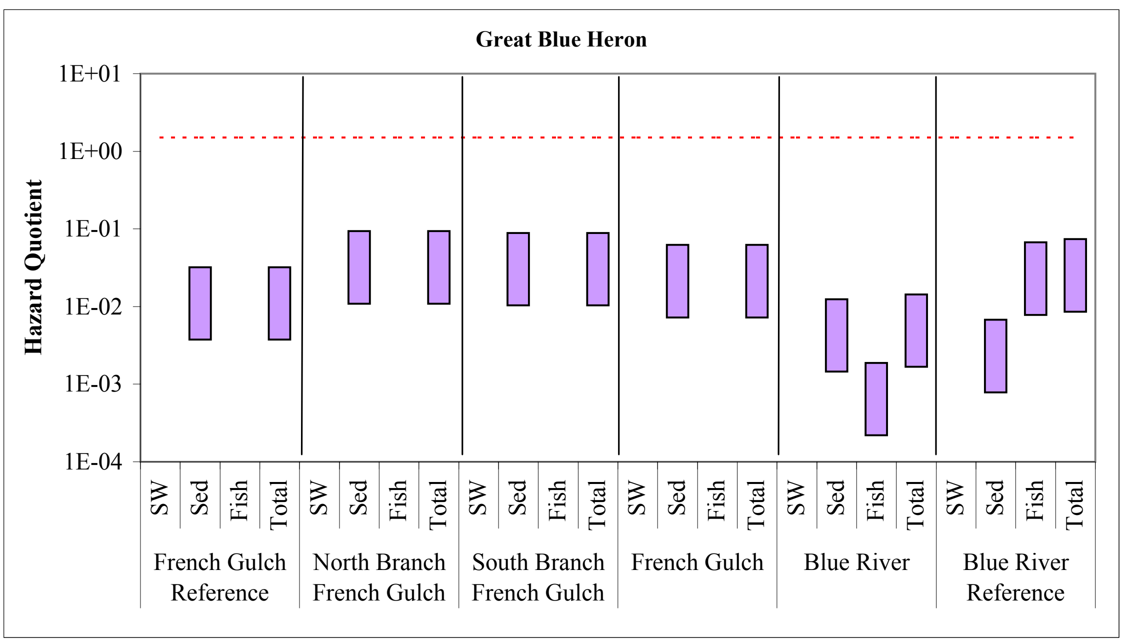


Figure 7-6
Summary of Wildlife Hazard Quotients

PANEL B: ARSENIC





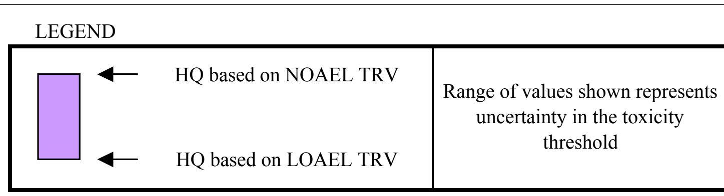
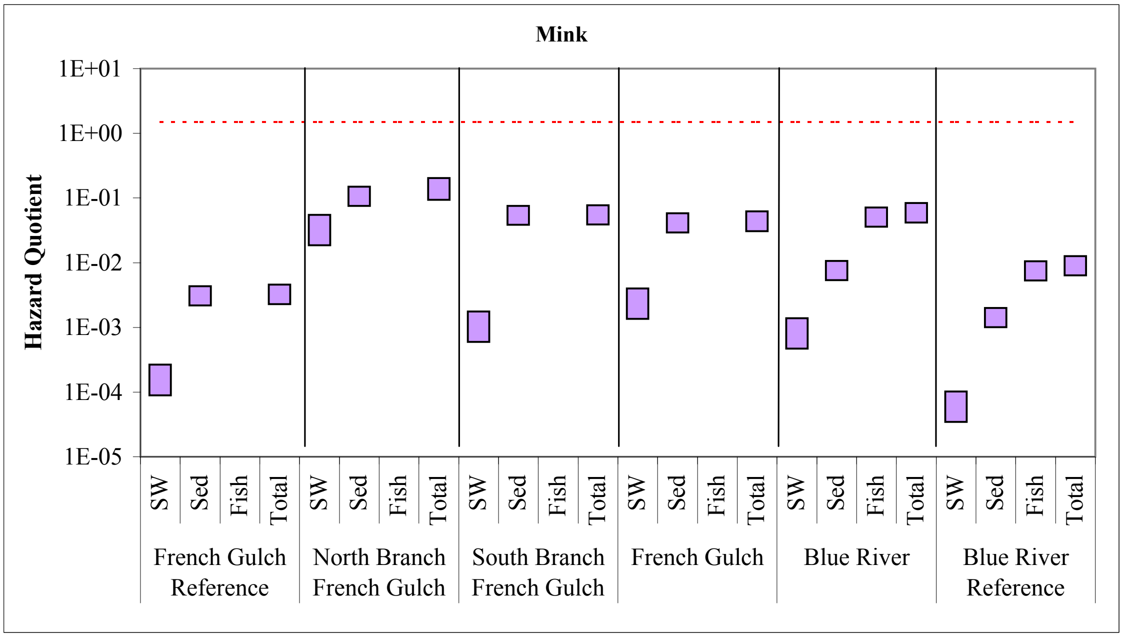
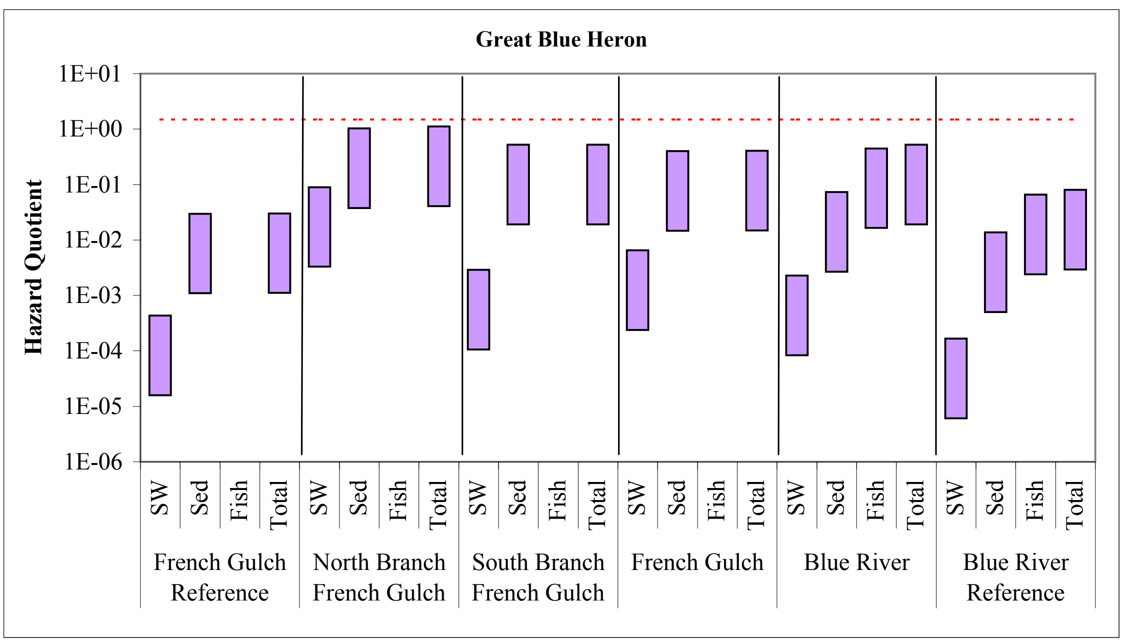


Figure 7-6
Summary of Wildlife Hazard Quotients

PANEL C: CADMIUM





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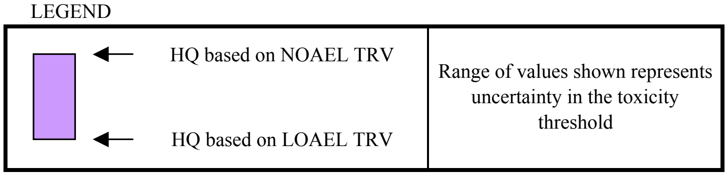
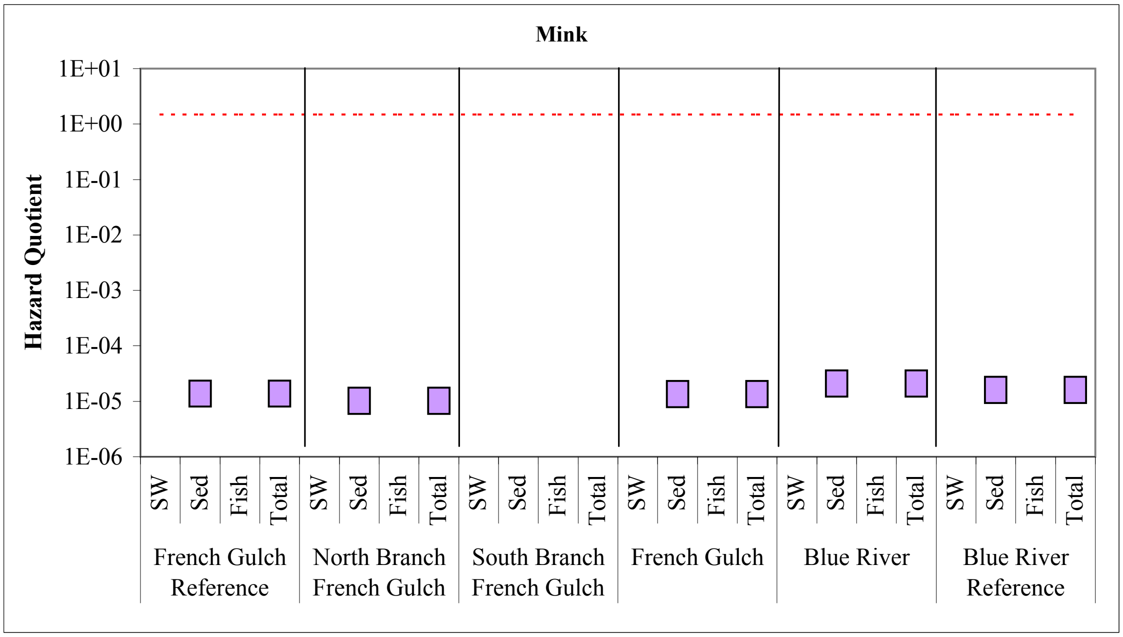
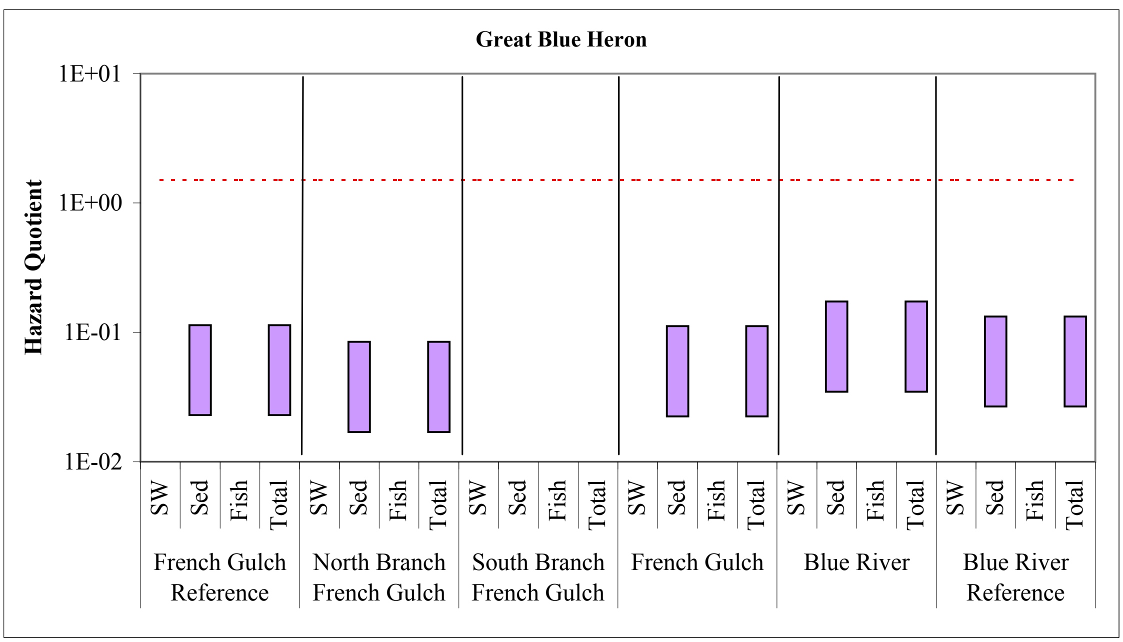


Figure 7-6
Summary of Wildlife Hazard Quotients

PANEL D: CHROMIUM





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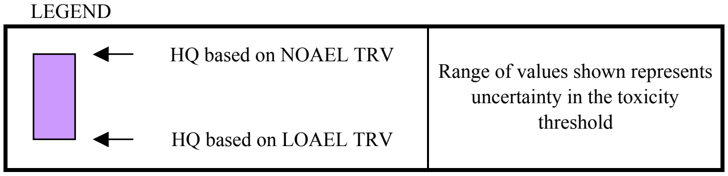
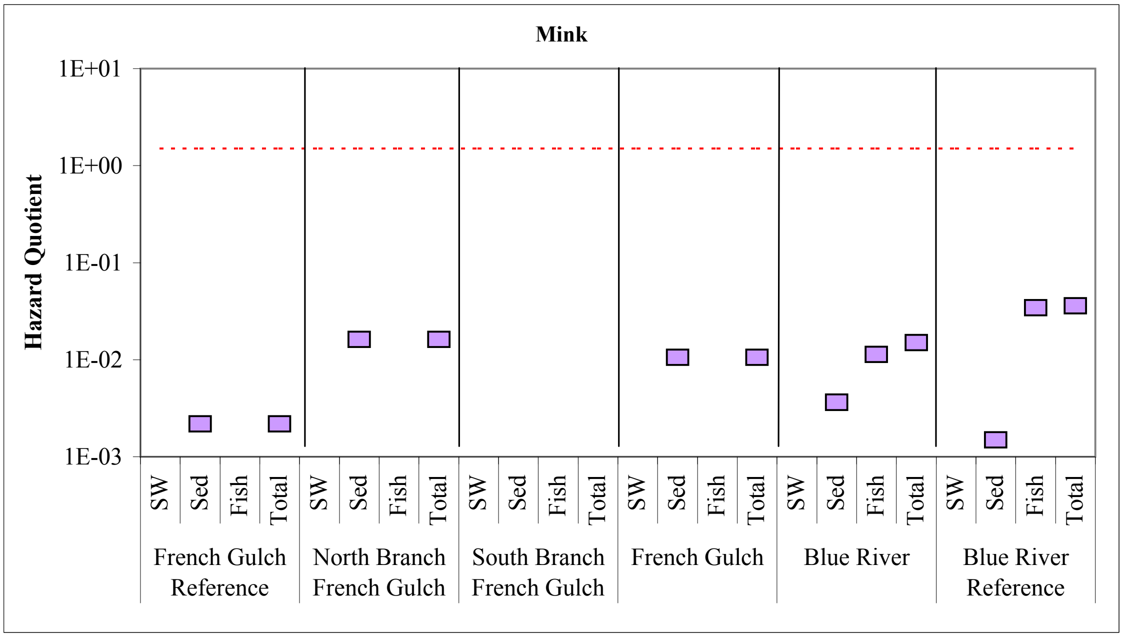
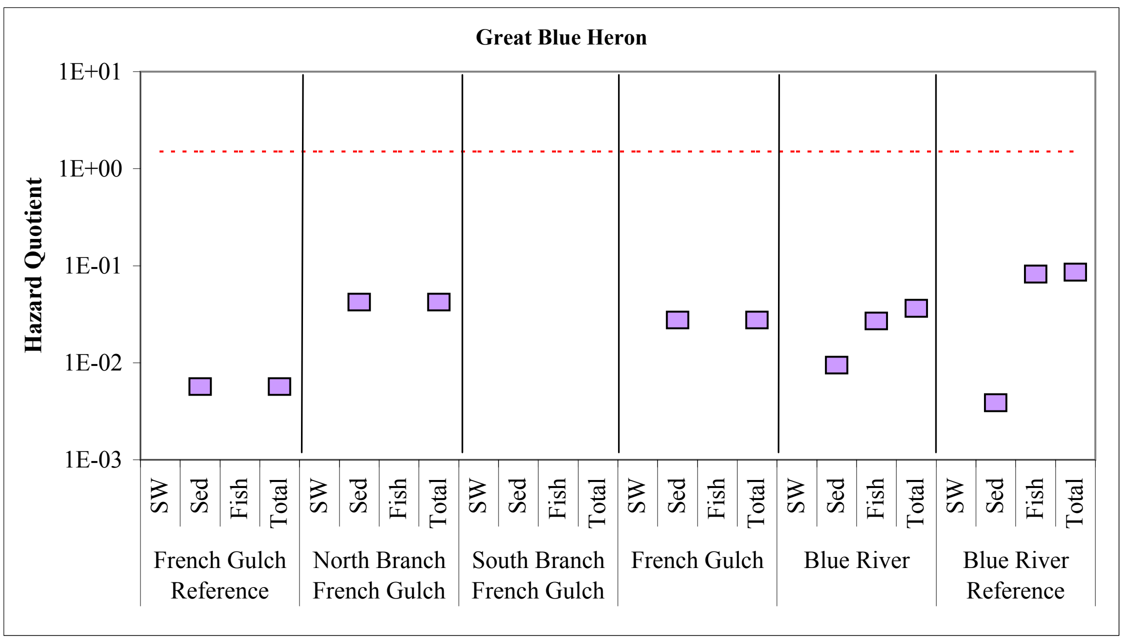


Figure 7-6
Summary of Wildlife Hazard Quotients

PANEL E: COPPER





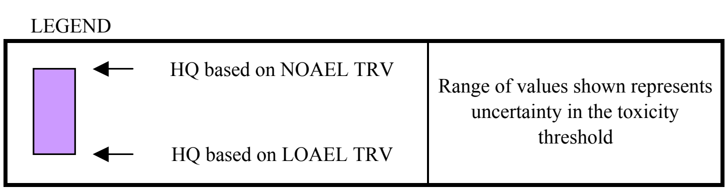
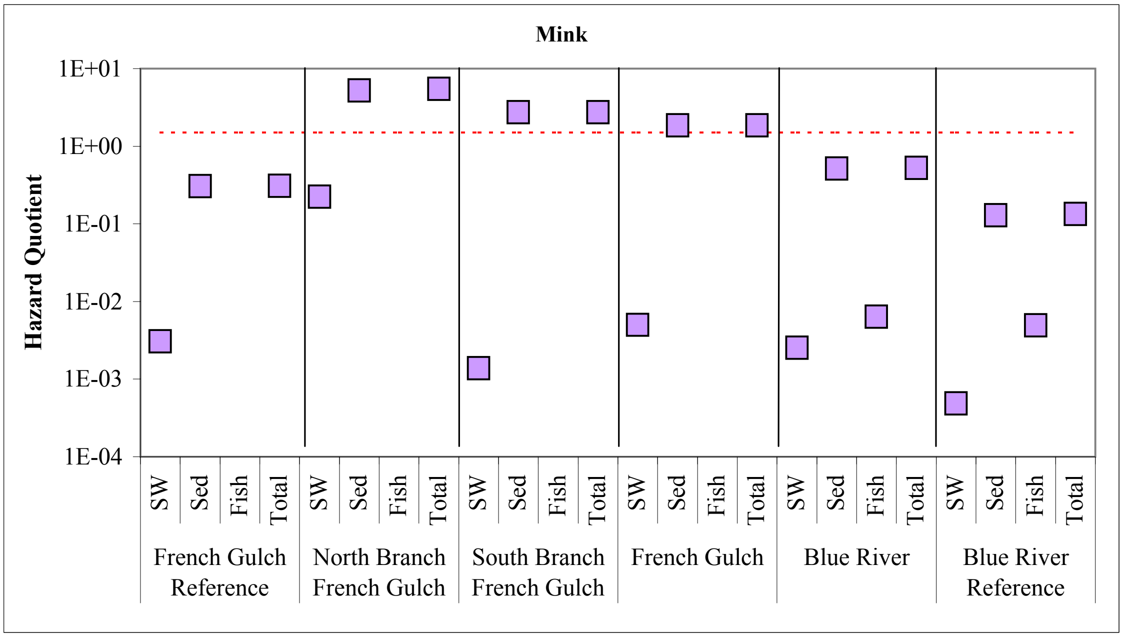
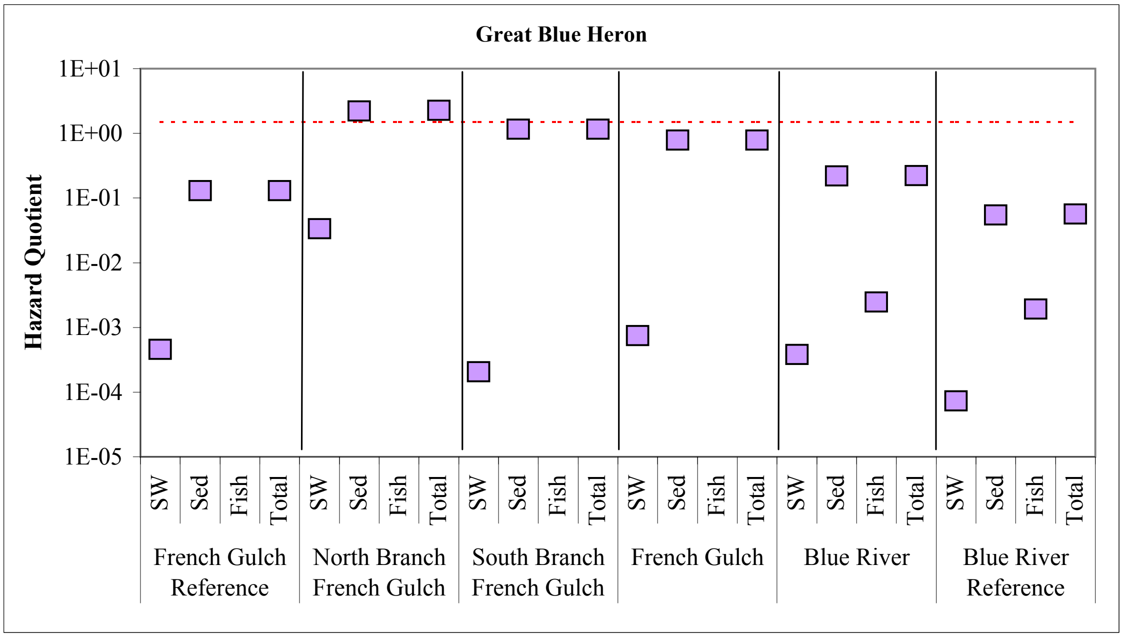


Figure 7-6
Summary of Wildlife Hazard Quotients

PANEL F: LEAD





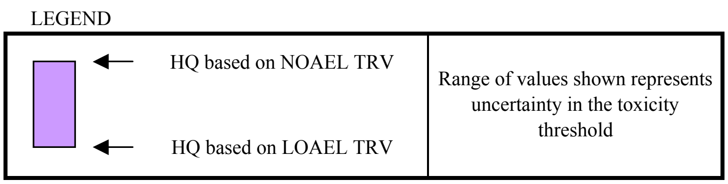
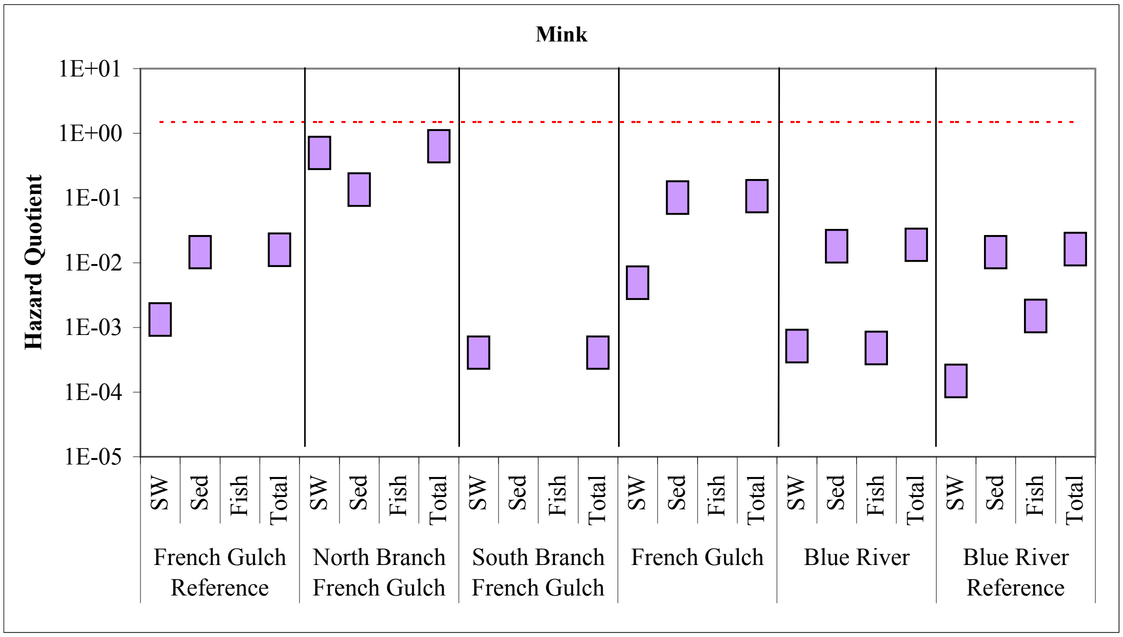
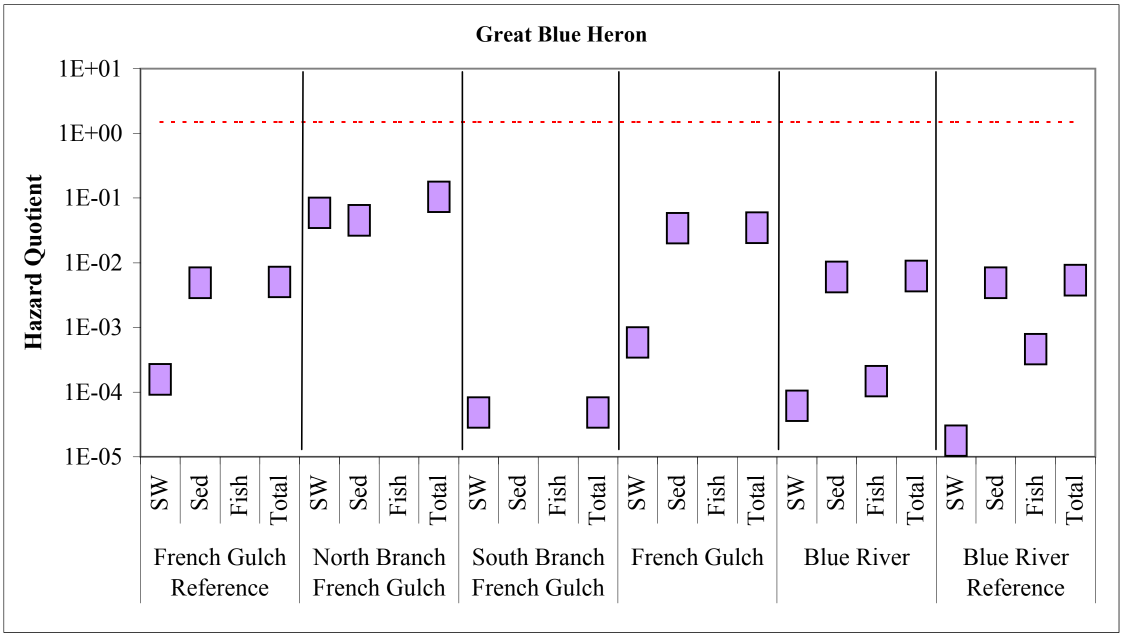


Figure 7-6
Summary of Wildlife Hazard Quotients

PANEL G: MANGANESE





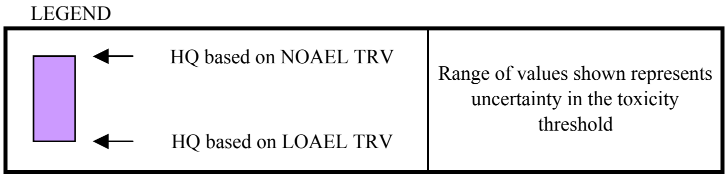
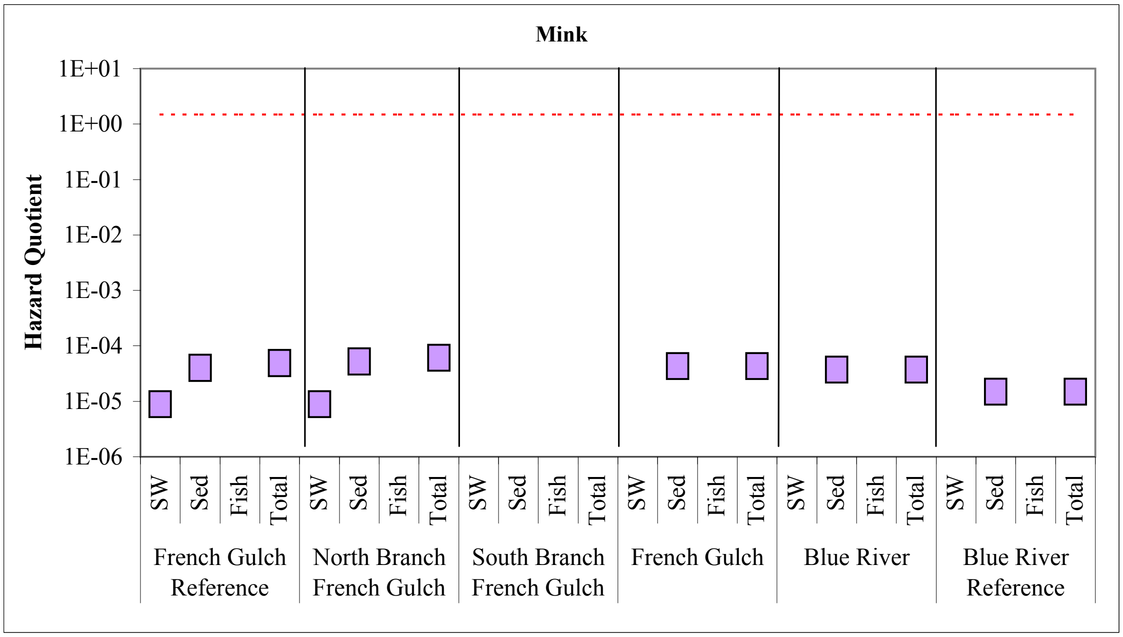
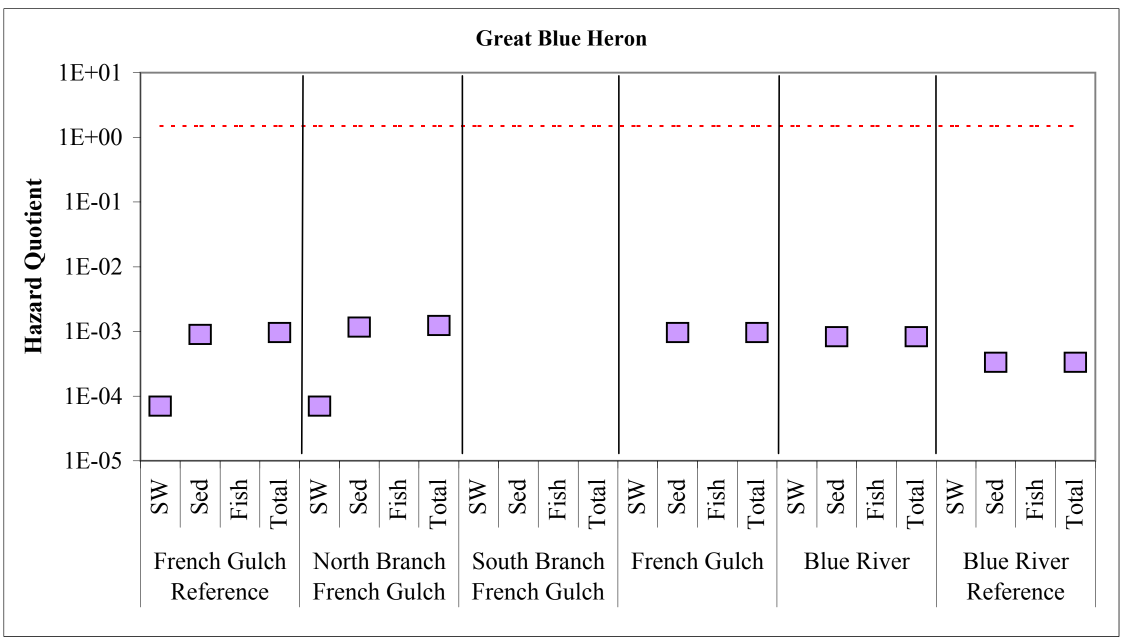


Figure 7-6
Summary of Wildlife Hazard Quotients

PANEL H: MERCURY





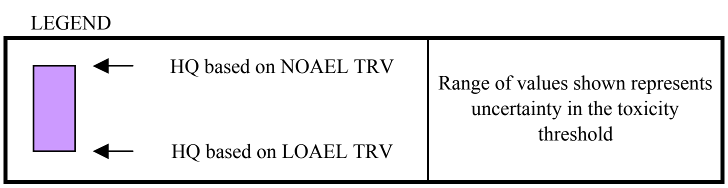
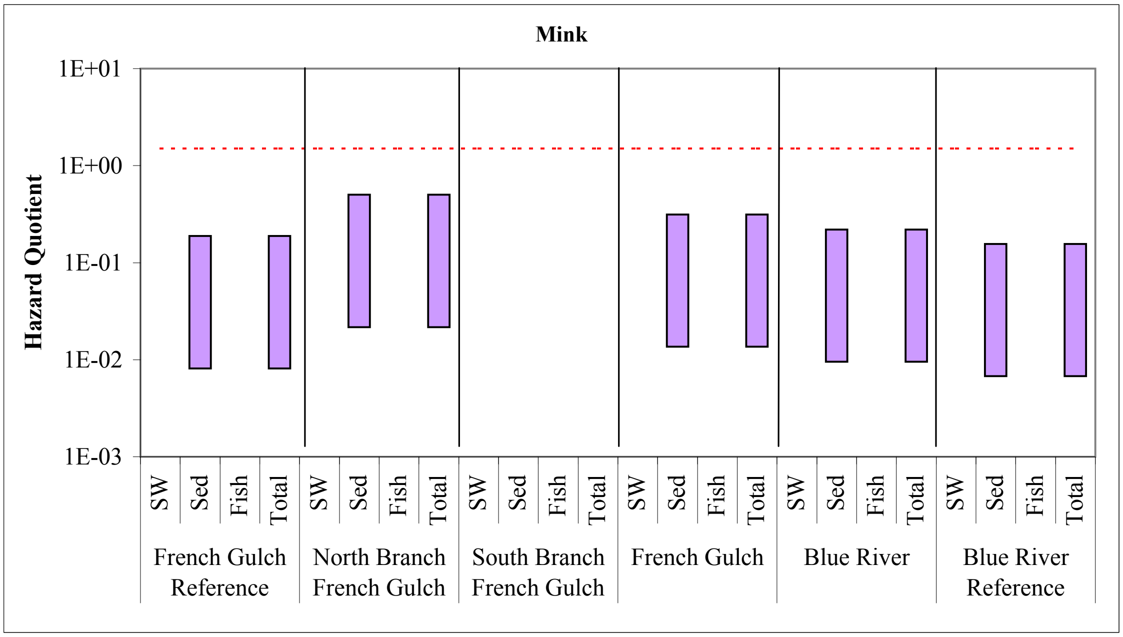
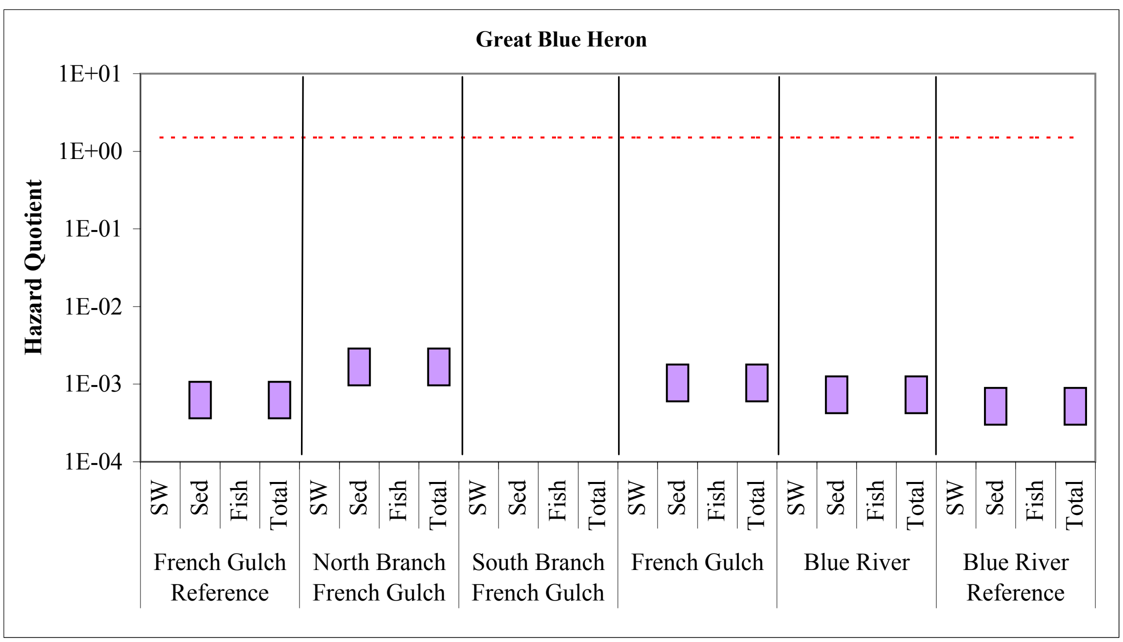


Figure 7-6
Summary of Wildlife Hazard Quotients

PANEL I: MOLYBDENUM





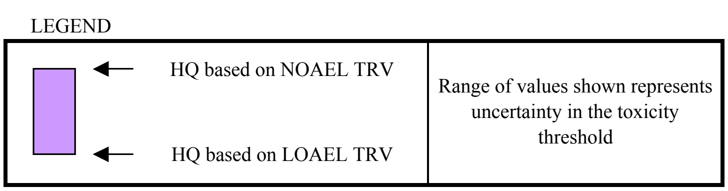
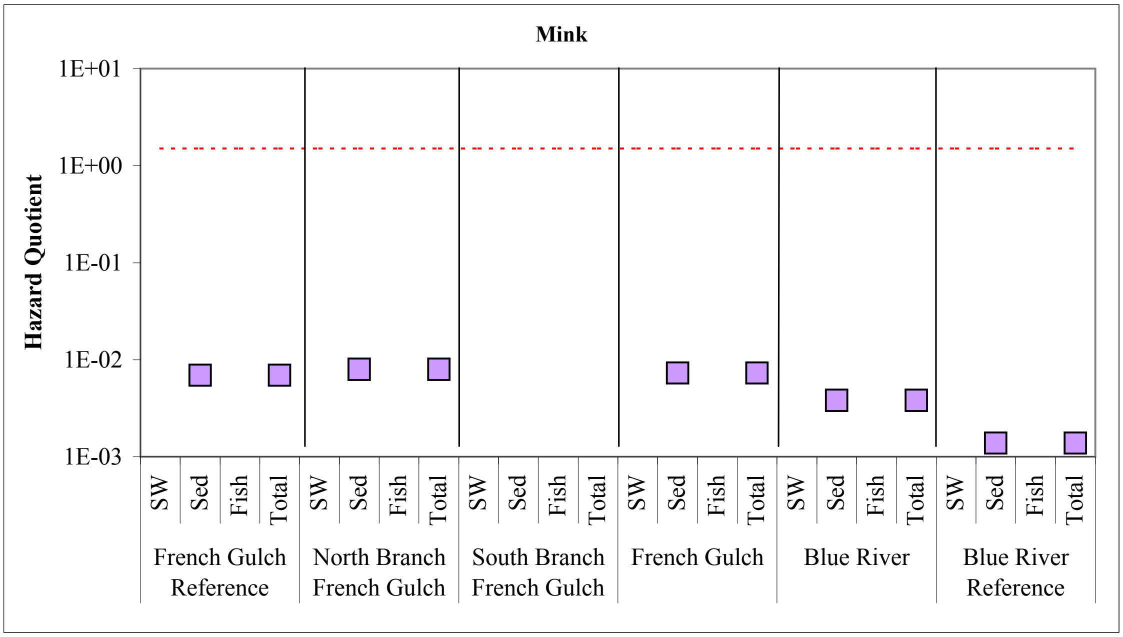
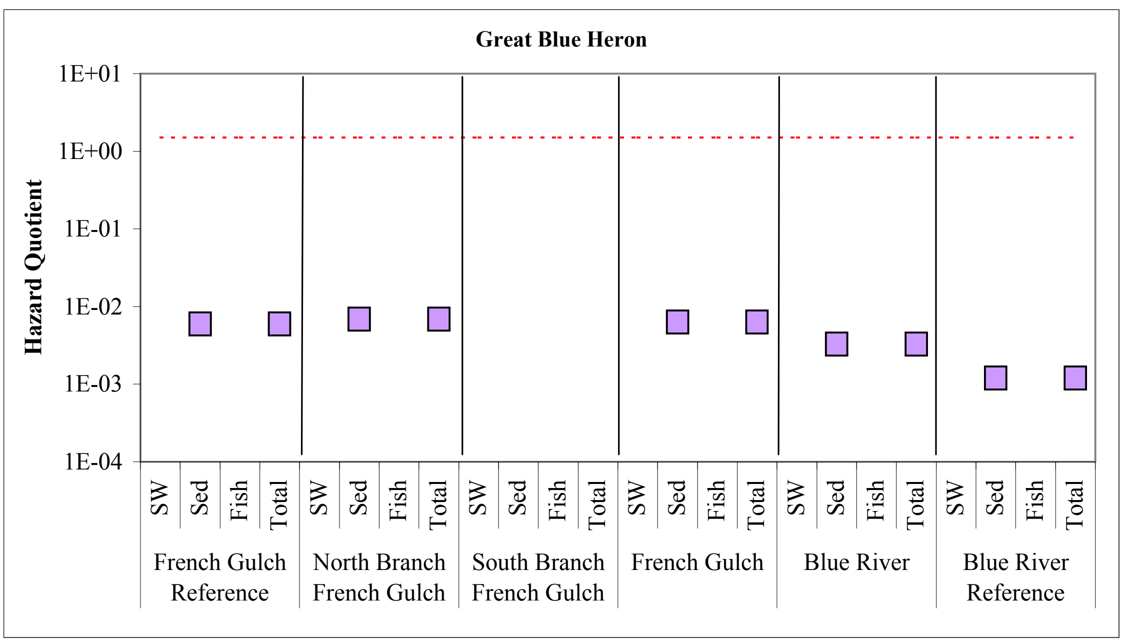


Figure 7-6
Summary of Wildlife Hazard Quotients

PANEL J: SELENIUM





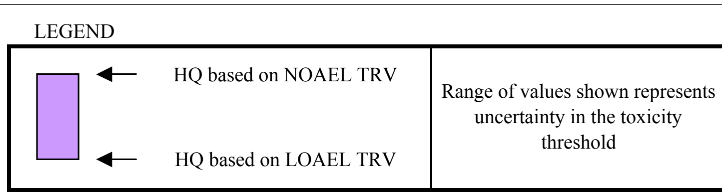
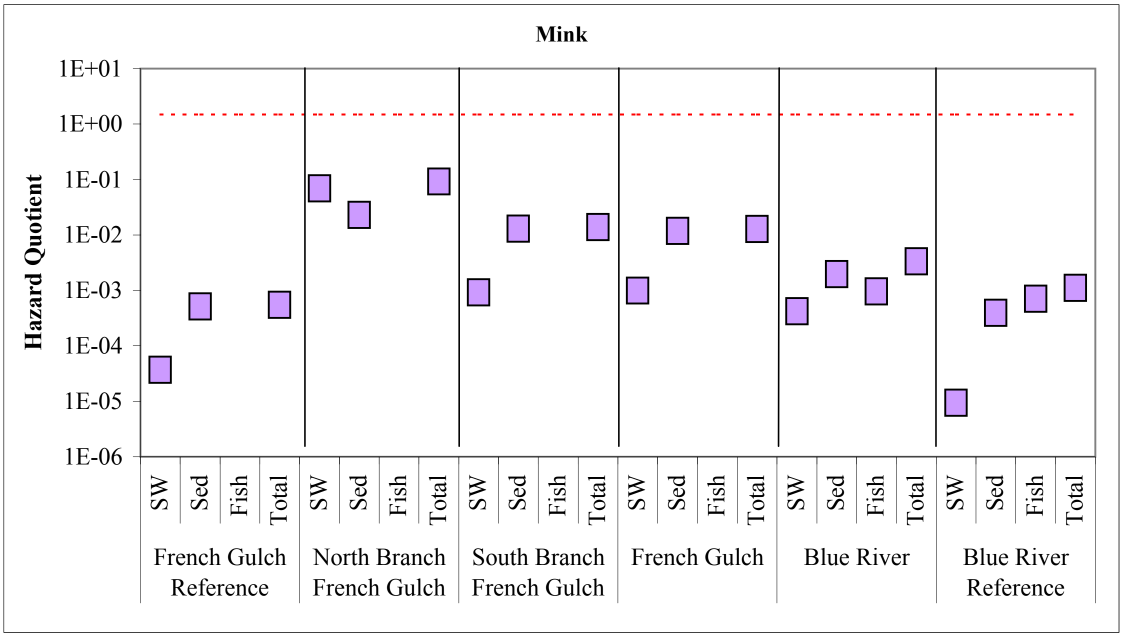
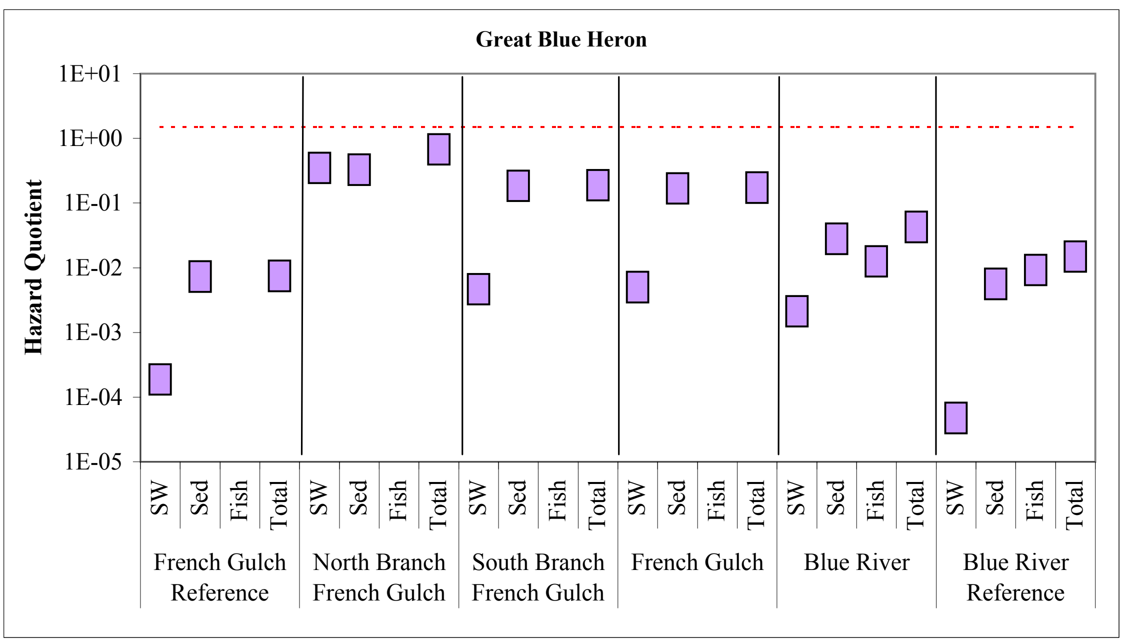
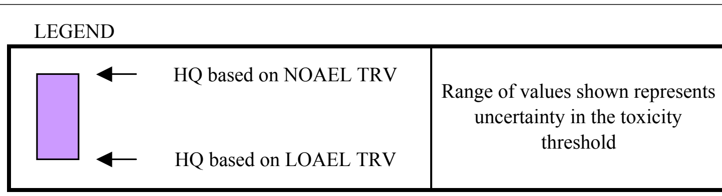


Figure 7-6
Summary of Wildlife Hazard Quotients

PANEL K: ZINC







Tables

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Table 2-1 Timeline of Mining Activities in the French Gulch Area *Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site* *Breckenridge, Colorado*	
Date	**Summary of Activity**
1859	Placer Mining in French Creek begins including small gravity separation operations, hydraulic mining and booming.
1880's – 1930's	Wellington mine and Oro mine operations (W-O complex) at peak production of lead, zinc, copper, silver, and gold
1889	Country Boy mine begins mining zinc, lead, silver, and gold.
1890	Detroit Mine upstream from W-O complex begins lode mining of gold, lead, and silver.
1900's –1940's	Dredging operations in French Creek at its peak with a total of 9 dredges were in operation.
1907	Wellington and Oro mines consolidated.
1908	A 100-ton gravity mill constructed at the W-O complex to produce lead, zinc, and pyrite concentrates.
1912	A 50-ton roaster and magnetic separation plant constructed to remove iron and sulfur from zinc byproducts. Roaster fines and mill tailings discarded on site.
1920's	Over 12 miles of tunnels, adits, drifts, stopes, and crosscuts compose the W-O complex.
1919-1921	300-350 gallons/minute pumped from mines to maintain water levels below mining activities.
1927	The 50-ton roaster and magnetic separation plant replaced with more economical flotation mill.
1928	The 8^{th} level of the Oro Shaft, the deepest level of the W-O complex, developed.
1929	Production of lead, zinc and pyrite concentrates ceased from the gravity mill.
1930's-1940's	Minimal mining activity at W-O complex.
1940's	B&B Mines and several affiliated companies acquire the W-O properties.
Late 1940's-early 1950's	W-O complex leased and mined at depths requiring the removal of 250 feet of water from the mine.
1940's-early 1970's	Sporadic mining and mill operations at W-O complex by lessees of B&B Mines.
Mid 1950's-early 1960's	Former partners of Mr. Davenport, Horn and Burger, acquire the W-O lease and mine the site.
1950's-1960's	Gravity and flotation mill tailings and roaster fines buried by waste rock and tailings from mining operations. Some tailings discarded into French Creek.
Early 1960's	Consolidated Parnett/Wellington Mine Association extensively mine the W-O complex.
1961	The Oro Shaft dewatered to decrease water levels by 200 feet (350 gallons/minute), in order to develop and maintain a new 230 foot level.
1962	The old 4^{th} level of Wellington workings intersected causing a mine blowout and flood.
1962	Fire destroyed the W-O mill.
Early 1963	Consolidated Parnett/Wellington Mine Association rebuilt the mill handling up to 150 tons of ore/day. North and south mill tailing ponds and a significant portion of the waste rock pile develop.
1968-early 1970's	Gilmore/Wellington Mining Company lease and mine the W-O complex producing 500 tons of ore/month.
1970	Ore production ceases.
Early 1970's	Gilmore develops drifts and crosscuts from Oro's 5^{th} level requiring dewatering of 600-1000 gallons/minute to lower the water level to the 6^{th} Oro level and 500-600 gallons/minute to maintain water levels.
Early 1970's	Gilmore is bankrupt.
1980's	The only mining related activities involve B&B issuing exploration leases for W-O complex.
Mid-1980's	The City of Breckenridge reclaim a section of the Blue River.
1989	Colorado Department of Public Health and Environment (CDPHE) and Colorado Division of Minerals and Geology (CDMG) observe trout fingerling kills in the Blue River below French Creek and propose a Non-Point Source (NPS) 319 project in French Gulch.
1991	CDMG installs groundwater monitoring wells near the #3 Mine shaft and mill tailings in the W-O Mine Complex area.
March, 1992	CDMG grout seals #3 Mine shaft under the hypothesis that the #3 Mine shaft was the point source of contamination into French Creek. A relief well was installed to characterize water quality and subsurface flows. Metal concentrations in French Creek did not significantly decrease indicating other sources and groundwater pathways.
May, 1993	CDMG diverted French Creek around the mill tailings south of French Gulch Road attempting to reroute spring runoffs around the tailings and reduce ponding and the level of the groundwater table in the south mill tailings area. Ponding was eliminated, however, groundwater levels were not significantly lowered. No noticeable improvements in surface water quality were observed.
Fall 1993	CDMG drills additional ground-water monitoring wells including the 11-10 Fault well (MW-14).
Fall 1994	More groundwater wells were installed to determine that mine water with elevated concentrations of metals was seeping into the bedrock and alluvium through fractures, subsidence zones above mine stopes, and possibly faults.
Fall, 1998	Roaster fines moved to nearby repository and capped.

Source: AGS (1999)

Table 2-2
Benthic Invertebrate Species Identified from French Gulch and the Blue River

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

Order	Family	Genus/Species	USGS (1996)		Clements (1995)			Clements (1995)		
			August		May			October		
			FG	BR	FC-1	FC-2	BR-4	FC-1	FC-2	BR-4
Ephemeroptera (mayflies)	Baetidae	Unspecified	8	457						
		Baetis sp.		16	X		X	X		X
		Baetis bicaudatus	85	1650						
		Baetis tricaudatus		1						
		Acentrella turbida		25						
	Ephemerellidae	Unspecified		32	X		X	X		X
		Drunella doddsi		97						
		Serratella tibialis		18						
	Heptageniidae	Unspecified			X		X	X		
		Cinygmula sp.	1							
		Epeorus albertae		57						
		Epeorus longimanus		5						
	Siphlonuridae	*Siphlonurus* sp.	4	1						
Plecoptera (stoneflies)	Chloroperlidae	Unspecified	1							
		Suwallia sp.	1							
		Suwallia sp. (Adult)	1							
		Sweltsa sp.	1		X		X	X		X
	Leuctridae	*Paraleuctra* sp.			X		X	X		
	Nemouridae	Unspecified		2						
		Zapada sp.		1	X			X	X	X
	Perlodidae	Unspecified		103						
		Cultus sp.		2						
		Isoperla sp.			X		X	X		X
		Skwala sp.		16						
	Pteronarcyidae	Unspecified		1						
		Pteronarcella sp.		5						
	Taeniopterygidae	*Taenionema* sp.			X			X		X
Trichoptera (caddisflies)	Glossosomatidae	*Glossosoma* sp.	4							
	Rhyacophilidae	Unspecified			X		X	X		X
		Rhyacophilia acropedes	2							
		Rhyacophilia alberta	1							
		Rhyacophilia angelita	2	18						
Coleoptera (beetles)	Elmidae	*Heterlimnius corpulentus* (Adult)	1							
		Heterlimnius sp.	1							
	Dytiscidae	Unspecified		1						
Diptera (flies)	Chironomidae	Unspecified			X		X	X		
		Unspecified - larval	511	4568						
		Unspecified - pupae	43	19						
		Unspecified - adult	29	2						
	Chironomidae Orthocladiinae	Unspecified			X	X	X	X	X	X
	Chironomidae Tanytarsini	Unspecified			X		X	X		
	Empididae	*Clinocera* sp.	37	6						
	Muscidae	Unspecified	4	1						
	Simuliidae	Unspecified	1	129						
Oligochaeta	Unspecified	Unspecified		19						
Turbellaria	Unspecified	Unspecified	28	1						
Nematoda	Unspecified	Unspecified	2							
Hydrachnidia	Unspecified	Unspecified	16	1						

Table 2-3

Fish Species Identified from French Gulch and the Blue River
Number of Individuals Collected by Station

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

Common Name	**Sampling Location**									
	FG0	**FG1**	**FG2**	**FG4**	**FG6A**	**FG8**	**FG9**	**BR1**	**BR2**	**BR3**
Colorado Cutthroat Trout (*Oncorhynchus clarki pleuriticus)*	4 [b]	2 [b] 12[d]	5 [b]	0 [b]	0 [b]	0 [b]	0 [a,d]	0 [a]	0 [b]	0 [b]
Brown trout (*Salmo trutta*)	0 [b]	0 [b]	0 [b]	0 [b]	0 [b]	0 [b]	0 [a,d]	2[a] 1 [b] 6 [c] 2[d]	0 [b] 6 [c] 3[d]	118 [b]
Brook trout (*Salvelinus fontinalis*)	0 [b]	0 [b]	0 [b]	0 [b]	0 [b]	0 [b]	0 [a,d]	36[a] 1 [b] 1[d]	0 [b] 6 [c] 2[d]	26 [b]
Sculpin (*Cottus bairdi*)	0 [b]	0 [b]	0 [b]	0 [b]	0 [b]	0 [b]	0 [a,d]	0 [a]	0 [b]	1 [b]
Rainbow trout (*Onchorhychus mykiss*)	0 [b]	0 [b]	0 [b]	0 [b]	0 [b]	0 [b]	0 [a,d]	0 [a]	1 [b]	0 [b]

[a] Deacon and Mize (1997); Table 2
[b] CDPHE & USEPA (1989); Table 6
[c] USGS & USEPA (1997)
[d] CDOW (2001)

Table 2-4 Birds Found in Summit County, Colorado *Ecological Risk Assessment of the French Gulch/Wellington-Oro Mine Site Breckenridge, Colorado*	
Common Name	**Genus/Species**
American Coot	*Fulica americana*
American Crow	*Corvus brachyrhynchos*
American Dipper	*Cinclus mexicanus*
American Kestrel	*Falco sparverius*
American Pipit	*Anthus rubescens*
American Redstart[7]	*Setophaga ruticilla*
American Robin	*Turdus migratorius*
American Tree Sparrow	*Spizella arborea*
American Wigeon	*Anas americana*
Bald Eagle[2,3,6,7]	*Haliaeetus leucocephalus*
Band-tailed Pigeon	*Columba fasciata*
Barn Swallow	*Hirundo rustica*
Barrow's Goldeneye[1,6,7]	*Bucephala islandica*
Belted Kingfisher	*Ceryle alcyon*
Black-and-white Warbler	*Mniotilta varia*
Black-billed Magpie	*Pica pica*
Black-capped Chickadee	*Parus atricapillus*
Black-crowned Night-heron[7]	*Nycticorax nycticorax*
Black-headed Grosbeak	*Pheucticus melanocephalus*
Blue Grouse	*Dendragapus obscurus*
Blue Jay	*Cyanocitta cristata*
Blue-winged Teal	*Anas discors*
Bohemian Waxwing	*Bombycilla garrulus*
Boreal Owl[7]	*Aegolius funereus*
Brewer's Blackbird	*Euphagus cyanocephalus*
Broad-tailed Hummingbird	*Selasphorus platycercus*
Brown Creeper	*Certhia americana*
Brown-headed Cowbird	*Molothrus ater*
California Gull	*Larus californicus*
Calliope Hummingbird	*Stellula calliope*
Cassin's Finch	*Carpodacus cassinii*
Chipping Sparrow	*Spizella passerina*
Cinnamon Teal	*Anas cyanoptera*
Clark's Nutcracker	*Nucifraga columbiana*
Cliff Swallow	*Hirundo pyrrhonota*
Common Goldeneye	*Bucephala clangula*
Common Grackle	*Quiscalus quisicula*
Common Merganser	*Mergus merganser*
Common Nighthawk	*Chordeiles minor*
Common Raven	*Corvus corax*
Common Redpoll	*Carduelis flammea*
Common Snipe	*Gallinago gallinago*
Cooper's Hawk	*Accipiter cooperii*
Cordilleran Flycatcher	*Empidonax occidentalis*
Curve-billed Thrasher	*Toxostoma curvirostre*
Dark-eyed Junco	*Junco hyemalis*
Dusky Flycatcher	*Empidonax oberholseri*
Eared Grebe[7]	*Podiceps nigricollis*
European Starling	*Sturnus vulgaris*

Table 2-4 (continued) Birds Found in Summit County, Colorado *Ecological Risk Assessment of the French Gulch/Wellington-Oro Mine Site* *Breckenridge, Colorado*	
Common Name	**Genus/Species**
Evening Grosbeak	*Coccothraustes vespertinus*
Flammulated Owl[6,8]	*Otus flammeolus*
Fox Sparrow	*Passerella iliaca schistacea*
Franklin's Gull[8]	*Larus pipixcan*
Gadwall	*Anas strepera*
Golden-crowned Kinglet	*Regulus satrapa*
Golden-crowned Sparrow	*Zonotrichia atricapilla*
Golden Eagle	*Aquila chrysaetos*
Gray Jay	*Perisoreus canadensis*
Great Blue Heron[7]	*Ardea herodias*
Great Horned Owl	*Bubo virginianus*
Greater Yellowlegs	*Tringa melanoleuca*
Green-tailed Towhee	*Pipilo chlorurus*
Green-winged Teal	*Anas crecca*
Hairy Woodpecker	*Picoides villosus*
Hammond's Flycatcher	*Empidonax hammondii*
Hermit Thrush	*Catharus guttatus*
Horned Lark[6]	*Eremophila alpestris*
House Finch	*Carpodacus mexicanus*
House Sparrow	*Passer domesticus*
House Wren	*Troglodytes aedon*
Killdeer	*Charadrius vociferus*
Lapland Longspur	*Calcarius lapponicus*
Lark Bunting[6,8]	*Calamospiza melanocorys*
Lazuli Bunting	*Passerina amoena*
Lesser Sandhill Crane	*Grus canadensis canadensis*
Lesser Scaup	*Aythya affinis*
Lewis' Woodpecker	*Melanerpes lewis*
Lincoln's Sparrow	*Melospiza lincolnii*
Loggerhead Shrike[1,7]	*Lanius ludovicianus*
MacGillivray's Warbler	*Oporornis tolmiei*
Mallard	*Anas platyrhynchos*
Merlin[7]	*Falco columbarius*
Mountain Bluebird	*Sialia currucoides*
Mountain Chickadee	*Parus gambeli*
Mourning Dove	*Zenaida macroura*
Nashville Warbler	*Vermivora ruficapilla*
Northern Flicker	*Colaptes auratus*
Northern Goshawk[7]	*Accipiter gentilis*
Northern Harrier[7]	*Circus cyaneus*
Northern Pintail	*Anas acuta*
Northern Pygmy-owl	*Glaucidium gnoma*
Northern Saw-whet Owl	*Aegolius acadicus*
Northern Shoveler	*Anas clypeata*
Northern Shrike	*Lanius excubitor*
Olive-sided Flycatcher	*Contopus borealis*
Orange-crowned Warbler	*Vermivora celata*
Osprey[7]	*Pandion haliaetus*
Palm Warbler	*Dendroica palmarum*

Table 2-4 (continued) Birds Found in Summit County, Colorado *Ecological Risk Assessment of the French Gulch/Wellington-Oro Mine Site Breckenridge, Colorado*	
Common Name	**Genus/Species**
Pied-billed Grebe	*Podilymbus podiceps*
Peregrine Falcon[1,6]	*Falco peregrinus*
Pine Grosbeak	*Pinicola enucleator*
Pine Siskin	*Carduelis pinus*
Pinyon Jay	*Gymnorhinus cyanocephalus*
Prairie Falcon[8]	*Falco mexicanus*
Pygmy Nuthatch	*Sitta pygmaea*
Red-breasted Nuthatch	*Sitta canadensis*
Red Crossbill	*Loxia curvirostra*
Redhead	*Aythya americana*
Red-headed Woodpecker[6,7]	*Melanerpes erythrocephalus*
Red-naped Sapsucker	*Sphyrapicus nuchalis*
Red-tailed Hawk	*Buteo jamaicensis*
Red-winged Blackbird	*Agelaius phoeniceus*
Ring-billed Gull[7]	*Larus delawrensis*
Ring-necked Duck	*Aythya collaris*
Rock Dove	*Columba livia*
Rock Wren	*Salpinctes obsoletus*
Rose-breasted Grosbeak	*Pheucticus ludovicianus*
Rosy Finch	*Leucosticte arctoa*
Rough-legged Hawk	*Buteo lagopus*
Ruby-crowned Kinglet	*Regulus calendula*
Ruddy Duck	*Oxyura jamaicensis*
Rufous Hummingbird[6]	*Selasphorous rufus*
Sage Grouse[1,6]	*Centrocercus urophasianus*
Sage Thrasher	*Oreoscoptes montanus*
Savannah Sparrow	*Passerculus sandwichensis*
Sharp-shinned Hawk	*Accipiter striatus*
Snowy Owl	*Nyctea scandiaca*
Solitary Sandpiper	*Tringa solitaria*
Song Sparrow	*Melospiza melodia*
Sora	*Porzana carolina*
Spotted Owl[2,3,6,7]	*Strix occidentalis*
Spotted Sandpiper	*Actitis macularia*
Steller’s Jay	*Cyanocitta stelleri*
Swainson’s Hawk[6,8]	*Buteo swainsoni*
Swainson’s Thrush	*Catharus ustulatus*
Tennessee Warbler	*Vermivora peregrina*
Three-toed Woodpecker[6]	*Picoides tridactylus*
Townsend’s Solitaire	*Myadestes townsendi*
Townsend’s Warbler	*Dendroica townsendi*
Tree Swallow	*Tachycineta bicolor*
Varied Thrush	*Ixoreus naevius*
Veery	*Catharus fuscescens*
Vesper Sparrow	*Pooecetes gramineus*
Violet-green Swallow	*Tachycineta thalassina*
Warbling Vireo	*Vireo gilvus*
Western Kingbird	*Tyrannus verticalis*
Western Meadowlark	*Sturnella neglecta*

Table 2-4 (continued) Birds Found in Summit County, Colorado *Ecological Risk Assessment of the French Gulch/Wellington-Oro Mine Site* *Breckenridge, Colorado*	
Common Name	**Genus/Species**
Western Tanager	*Piranga ludoviciana*
Western Wood-pewee	*Contopus sordidulus*
White-breasted Nuthatch	*Sitta carolinensis*
White-crowned Sparrow	*Zonotrichia leucophrys*
Whooping Crane[4,5,6,7]	*Grus americana*
Willet[7]	*Catoptrophorus semipalmatus*
Willow Flycatcher	*Empidonax traillii*
Wilson's Warbler	*Wilsonia pusilla*
Wood Duck	*Aix sponsa*
Yellow-rumped Warbler	*Dendroica coronata*
Yellow Warbler	*Dendroica petechia*

[1] *Listed as a Species of State Special Concern*
[2] *Listed as a State Threatened Species*
[3] *Listed as Federally Threatened*
[4] *Listed as a State Endangered Species*
[5] *Listed as Federally Endangered*
[6] *Listed as a Declining Species by the CDOW*
[7] *Listed as an Imperiled Species by the Colorado Natural Heritage Program*
[8] *Listed on the National Audubon Society's State Watchlist*
Source: Andrews and Righter (1992), CDOW (1999), Audubon Society (2000), NDIS (1999)

Table 2-5 **Mammals Found in Summit County, Colorado** ***Ecological Risk Assessment for the French Gulch/Wellington-Oro Site*** ***Breckenridge, Colorado***	
Common Name	**Genus/Species**
Abert's Squirrel	*Sciurus aberti*
American Badger	*Taxidea taxus*
American Beaver	*Castor canadensis*
American Elk	*Cervus elaphus*
American Marten	*Martes americana*
American Pika	*Ochotona princeps*
Big Brown Bat	*Eptesicus fuscus*
Bighorn Sheep	*Ovis canadensis*
Black Bear	*Ursus americanus*
Bobcat	*Lynx rufus*
Bushy-tailed Woodrat[3]	*Neotoma cinerea rupicola*
Common Muskrat	*Ondatra zibethicus*
Common Porcupine	*Erethizon dorsatum*
Coyote	*Canis latrans*
Deer Mouse	*Peromyscus maniculatus*
Dwarf Shrew[3]	*Sorex nanus*
Golden-mantled Ground Squirrel[3]	*Spermophilus lateralis*
Heather Vole	*Phenacomys intermedius*
Hoary Bat	*Lasiurus cinereus*
House Mouse	*Mus musculus*
Least Chipmunk[3]	*Tamias minimus*
Little Brown Myotis	*Myotis lucifugus*
Long-legged Myotis	*Myotis volans*
Long-tailed Vole	*Microtus longicaudus*
Long-tailed Weasel	*Mustela frenata*
Lynx[2,3,4]	*Lynx lynx canadensis*
Masked Shrew	*Sorex cinereus*
Meadow Vole[3]	*Microtus pennsylvanicus*
Mink	*Mustela vison*
Montane Shrew	*Sorex monticolus*
Montane Vole	*Microtus montanus*
Moose	*Alces alces shirasi*
Mountain Cottontail	*Sylvilagus nuttallii*
Mountain Goat	*Oreamnos americanus*
Mountain Lion	*Felis concolor*
Mule Deer	*Odocoileus hemionus*
Northern Pocket Gopher[3]	*Thomomys talpoides*
Northern River Otter[1,2]	*Lutra canadensis*
Pine Squirrel	*Tamiasciurus hudsonicus*
Pronghorn	*Antilocapra americana*
Pygmy Shrew	*Sorex hoyi*
Raccoon	*Procyon lotor*
Red Fox	*Vulpes vulpes*
Ringtail	*Bassariscus astutus*
Short-tailed Weasel	*Mustela erminea*
Silver-haired Bat	*Lasionycteris noctivagans*

Table 2-5 (continued) Mammals Found in Summit County, Colorado *Ecological Risk Assessment for the French Gulch/Wellington-Oro Site* *Breckenridge, Colorado*	
Common Name	**Genus/Species**
Snowshoe Hare	*Lepus americanus*
Southern Red-backed Vole	*Clethrionomys gapperi*
Striped Skunk	*Mephitus mephitus*
Townsend's Big-eared Bat[1,3]	*Plecotus townsendii pallescens*
Uinta Chipmunk	*Tamias umbrinus*
Water Shrew	*Sorex palustris*
Western Jumping Mouse	*Zapus princeps*
White-tailed Jackrabbit	*Lepus townsendii*
Wyoming Ground Squirrel	*Spermophilus elegans*
Yellow-bellied Marmot	*Marmota flaviventris*

[1] Listed as a Declining Species by the CDOW
[2] Listed as a State Endangered Species
[3] Listed as an Imperiled Species by the Colorado Natural Heritage Program Service
[4] Listed as a Federal Threatened Species
Source: Fitzgerald et al. (1994), NDIS (1999), CDOW (1999)

Table 2-6 Timeline of Sampling Activities in the French Gulch Area Baseline Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site Breckenridge, Colorado		
Date	**Reference**	**Summary of Activity**
1934	Lovering (1934)	Details the geology and mineralogy of the Breckenridge mining district including the W-O Mining Complex
1972	Moran and Wentz (1974)	Provides results of surface water samples from French Gulch and the Blue River analyzed for zinc, iron, manganese, lead, and other metal concentrations.
1975	Woodward-Clyde Consultants (1975)	Evaluates the relationship between groundwater in abandoned mine workings and the surface water of the Blue River catchment evaluated.
1986-1994	Breckenridge Sanitation District (BSD) (BSD, 1997)	Provides the results of ground water and Blue River surface water samples near the confluence with French Gulch.
1989	USBOR (Stover, 1989)	Identifies and evaluates acid mine drainage issued from collapsed and intact portals from the W-O Mine flowing adjacent to French Gulch Road.
1989-1990	CDPHE and USEPA (CDPHE, unpublished)	Provides results of the analyses of surface water samples and acute toxicity tests. The results identify the W-O Mine Complex as the source of metal concentrations in French Gulch and Blue River surface water
1991	USBOR (Stover, 1991)	Maps mine waste areas and provides results of samples from monitoring wells in the W-O Mine Complex area
1992-1996	CDPHE and USEPA (CDPHE, unpublished)	Provides results of analyses of surface water samples from French Gulch and the Blue River.
1993	USBOM (AGS, 1999)	Provides results of geophysical surveys searching for subsurface locations of the 11-10 fault zone
1995	Morrissey (Morrissey, 1995).	Characterizes groundwater chemistry and flow in the W-O Mine area
1995	Clements (Clements, 1995)	Provides results of sampling of aquatic macroinvertebrate communities from French Gulch and the Blue River. Conduct aquatic toxicity tests from the same sampling sites during high and low flow conditions.
1995	Ecology and Environment Inc. (E&E, 1995)	Preliminary assessment to identify potentially hazardous waste at the W-O Mine and to assess threats to human health and the environment
1996-1997	Radon Abatement Services (RAS, 1996; RAS, 1997)	Provides baseline isotope studies to characterize groundwater, surface water, and snow in the W-O Mine area
1996-1997	CDPHE (CDPHE, 1996 and 1997)	Provides results of analyses of samples from domestic water wells in the lower French Gulch area.
1997	USGS	Provides data on water quality in 15 streams in the Upper Colorado system including waters in French Gulch and the Blue River as part of the National Water-Quality Assessment (NAWQA) program.
1997	NWCCG	The Northwest Colorado Council of Governments (NWCCG) collect water quality data for the Blue River
1997	USGS (Kimball, 1997).	Evaluates colloidial properties of metals in water samples collected during snowmelt
1997	USGS (Kimball et al., 1997; Kimball et al. 1999)).	Provides lithium chloride, sodium bromide, and sodium chloride tracer studies in the W-O Mine area and French Gulch
1997	Radon Abatement Services (RAS, 1997).	Provides results of geophysical logging, water quality, and stable isotope studies of the Oro Shaft and monitoring wells in the W-O Mine area
1997	USBOR (USBOR, 1997)	Provides the results of analyses of samples of mine tailings, roaster fines, and mine waste areas in the W-O Mine Complex
1998	American Geological Services (AGS, 1998)	Provides the results of analyses of mine pool water samples, soil borings, and snow.
1998	URS (USEPA, 1996a).	Provides the results of analyses of soil samples and air along French Gulch road for arsenic, cadmium, and lead
1999	AdrianBrown (Adrian Brown, 1999)	Provides results of samples of groundwater from the W-O Mine Complex and French Gulch and the Blue River surface water. Sampling completed monthly.

Table 3-1
Historic and Current Sampling Stations and Descriptions

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

Historic and Current Sampling Stations and Descriptions			
Location	**Sampling ID**	**Study**	**Description**
French Gulch Reference	FG-0	CDPHE & EPA USGS 392838105572900	French Gulch upstream of Farncomb Hill
	FG-1	CDPHE & EPA USGS 39208105583600	French Gulch near Wire Patch Mine; upstream of McLeod Tunnel
	FG-2	CDPHE & EPA USGS	French Gulch downstream of McLeod Tunnel
	FG-3	CDPHE & EPA USGS	French Gulch downstream of Mineral Hill Mine, upstream of Extenuate Pile
South Branch French Gulch	FG-4	CDPHE & EPA USGS	French Gulch downstream from Extenuate Pile
	FG-5	CDPHE & EPA USGS AdrianBrown	French Gulch
	FG-5.5	AdrianBrown	Located on southern branch of French Gulch, directly south of FG-6C
	FG-8	CDPHE & EPA USGS	French Gulch upstream of Dead Elk Pond within the South Branch
	FG-9A	USGS	French Gulch 450 ft. downstream of Dead Elk Pond
	FG-9	CDPHE & EPA USGS 9046530 AdrianBrown	French Gulch 50 m upstream of confluence with Blue River
North Branch French Gulch **(includes groundwater seeps)**	TS-3	USGS 392855106005200	French Gulch at Country Boy Mine just below road to Country Boy
	FG-6B	CDPHE & EPA USGS	Seep at culvert downstream of MW-7 and MW-20 well road

Table 3-1 (continued)
Historic and Current Sampling Stations and Descriptions

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

Historic and Current Sampling Stations and Descriptions			
Location	**Sampling ID**	**Study**	**Description**
North Branch French Gulch (includes groundwater seeps)	FG-6C	USGS AdrianBrown	Seep near French Gulch Road upstream at Dead Man's Curve
	FG-6	CDPHE & EPA USGS	Seep on south side of French Gulch Road; Culvert draining Wellington Mine tailings
	FG-6A	CDPHE & EPA USGS	Seep on south side of French Gulch Road;
	TS-4	USGS 392849106011500	French Gulch below Ford Gulch approx. 0.25 miles downstream of W-O mine site
	1140	USGS	Seep at base of placer tailings piles that flows directly to French Gulch (USGS NAWQA)
	1121	USGS	Seep at base of placer tailings piles that flows into French Gulch (USGS NAWQA sample) (AGS, 1999)
	FG-7	CDPHE & EPA USGS 392907106013900	North Branch of French Gulch, upstream of Dead Elk Pond; NAWQA site is approx. 100 m upstream of EPA site.
Discharges to French Gulch	CBMA-1	USGS	Country Boy Mine Adit discharge at tour area
	WP-1	USGS	Seep at the base of mine waste pile on north side of French Gulch Road
	KDS	CDPHE & EPA USGS	Kenny Dog Spring
	MGB-1	USGS	Seep originating in the middle of Magnum Brown Drive
	RLCVT-1	USGS	Culvert drainage under Reliance Dr. upstream of French Gulch

Table 3-1 (continued)
Historic and Current Sampling Stations and Descriptions

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

Historic and Current Sampling Stations and Descriptions			
Location	**Sampling ID**	**Study**	**Description**
Blue River Reference	BR-Adams	USGS	Blue River at Adams St.
	654	NWCCOG	Blue River south of Breckenridge below Goose pasture Tarn
Blue River Reference	BR-1	CDPHE & EPA USGS AdrianBrown	Blue River 15 meters upstream from confluence with French Gulch
	655	NWCCOG	Blue River at Park Avenue Bridge and south of BR-1.
Blue River	BR-2	CDPHE & EPA USGS AdrianBrown	Blue River 50 meters downstream of confluence with French Gulch
	BR-BFG	USGS	Blue River below French Gulch
	BR-3	CDPHE & EPA USGS AdrianBrown	Blue River 3.25 miles downstream of confluence with French Gulch at Tiger Run Resort at parking lot entry
	BR-4	USGS	Blue River approx. 65 feet upstream of the confluence with the Swan River
	656	NWCCOG	Blue River immediately north of the confluence with French Gulch
	643	NWCCOG	Blue River located between BR-2 and BR-3
	657	NWCCOG	Blue River located between BR-3 and BR-4, just south of the confluence with the Swan River
	BR-5	USGS	Blue River at gauging station downstream of confluence with the Swan River
	BR-Dillon	USGS 9046600	Blue River near Swan Mountain Road before it flows into Dillon reservoir

Table 4-1
Summary of Surface Water COPCs

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

Parameters	Aquatic Receptors				Wildlife Receptors			
	Qual Type 1	Qual Type 2	Quant COPC	Not a COPC	Qual Type 1	Qual Type 2	Quant COPC	Not a COPC
Aluminum			X				X	
Antimony	X				X			
Arsenic				X				X
Barium	X					X		
Beryllium	X				X			
Cadmium			X				X	
Calcium	X							X
Chromium				X				X
Cobalt	X					X		
Copper			X					X
Iron			X		X			
Lead			X				X	
Magnesium	X							X
Manganese	X						X	
Mercury			X				X	
Molybdenum	X					X		
Nickel			X					X
Phosphorus	X				X			
Potassium	X							X
Selenium				X				X
Silicone	X				X			
Silver			X		X			
Sodium	X							X
Thallium	X							X
Uranium	X					X		
Zinc			X				X	
Total	**14**	**0**	**9**	**3**	**6**	**4**	**6**	**10**

Table 4-2

Summary of Sediment COPCs

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site

Breckenridge, Colorado

Parameters	**Aquatic Receptors**				**Wildlife Receptors**			
	Qual Type 1	Qual Type 2	Quant COPC	Not a COPC	Qual Type 1	Qual Type 2	Quant COPC	Not a COPC
Aluminum			X				X	
Arsenic			X				X	
Cadmium			X				X	
Chromium			X				X	
Copper			X				X	
Gold	X				X			
Iron			X		X			
Lead			X				X	
Manganese			X				X	
Mercury			X				X	
Molybdenum	X						X	
Nickel			X					X
Selenium	X						X	
Silver			X		X			
Zinc			X				X	
Total	**3**	**0**	**12**	**0**	**3**	**0**	**11**	**1**

Table 5-1a
Summary Statistics for Surface Water
ALUMINUM

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

General Location	Station ID	Total				Dissolved			
		Detection Frequency	Min (ug/L)	Mean (ug/L)	Max (ug/L)	Detection Frequency	Min (ug/L)	Mean (ug/L)	Max (ug/L)
Discharge	CBMA-1	0/1	na	na	na	0/1	na	na	na
	KDS	2/2	2.2E+02	3.4E+02	4.5E+02	2/2	4.2E+01	1.0E+02	1.6E+02
	MGB-1	1/1	1.9E+02	1.9E+02	1.9E+02	0/1	na	na	na
	RLCVT-1	0/1	na	na	na	0/1	na	na	na
	WP-1	1/1	1.1E+05	1.1E+05	1.1E+05	1/1	9.6E+04	9.6E+04	9.6E+04
French Gulch Reference	FG-0	0/1	na	na	na	1/2	9.0E+00	9.0E+00	9.0E+00
	FG-1	1/3	3.6E+02	3.6E+02	3.6E+02	3/5	2.0E+00	5.2E+01	1.5E+02
	FG-2	0/1	na	na	na	0/1	na	na	na
	FG-2 spring	na	na	na	na	na	na	na	na
	FG-3	2/3	4.3E+01	1.5E+02	2.5E+02	0/3	na	na	na
	Mcleod Tunnel	na	na	na	na	na	na	na	na
North Branch French Gulch	1121	2/2	5.9E+01	7.7E+01	9.4E+01	1/2	8.1E+01	8.1E+01	8.1E+01
	1140	1/1	7.2E+02	7.2E+02	7.2E+02	1/1	6.8E+02	6.8E+02	6.8E+02
	FG-6	1/1	3.0E+03	3.0E+03	3.0E+03	1/1	2.2E+03	2.2E+03	2.2E+03
	FG-6A	5/5	7.1E+01	3.0E+02	7.1E+02	1/6	4.6E+01	4.6E+01	4.6E+01
	FG-6B	3/3	5.1E+01	2.2E+02	3.2E+02	1/2	5.9E+01	5.9E+01	5.9E+01
	FG-6C	5/8	1.1E+02	2.5E+02	5.9E+02	6/13	8.1E+01	2.3E+02	3.7E+02
	FG-6D	0/2	na	na	na	na	na	na	na
	FG-7	2/12	3.0E+01	1.5E+02	2.7E+02	4/13	1.0E+01	5.2E+01	1.6E+02
	TS-3	na	na	na	na	1/1	6.0E+00	6.0E+00	6.0E+00
	TS-4	na	na	na	na	2/2	1.0E+01	1.5E+01	2.0E+01
South Branch French Gulch	FG-4	0/1	na	na	na	0/1	na	na	na
	FG-5	1/9	3.0E+01	3.0E+01	3.0E+01	0/9	na	na	na
	FG-5.5	2/6	3.0E+01	3.0E+01	3.0E+01	4/10	1.4E+01	2.0E+01	3.1E+01
	FG-8	2/8	3.0E+01	4.3E+01	5.5E+01	0/9	na	na	na
French Gulch	FG-10	na	na	na	na	na	na	na	na
	FG-9	6/12	3.0E+01	8.0E+01	1.8E+02	20/29	4.0E+00	9.5E+00	2.0E+01
	FG-9A	2/4	2.4E+02	2.4E+02	2.5E+02	0/3	na	na	na
Blue River	643	na	na	na	na	na	na	na	na
	656	na	na	na	na	na	na	na	na
	657	na	na	na	na	na	na	na	na
	BR-2	4/10	4.0E+01	1.0E+02	2.3E+02	5/15	1.7E+01	4.9E+01	9.6E+01
	BR-3	7/9	3.0E+01	2.8E+02	1.3E+03	4/13	1.6E+01	2.9E+01	4.3E+01
	BR-4	0/1	na	na	na	0/1	na	na	na
	BR-5	1/2	1.2E+02	1.2E+02	1.2E+02	0/3	na	na	na
	BR-BFG	na	na	na	na	2/2	5.0E+00	7.5E+00	1.0E+01
	BR-Dillon	na	na	na	na	1/1	7.0E+00	7.0E+00	7.0E+00
Blue River Reference	654	na	na	na	na	na	na	na	na
	655	na	na	na	na	na	na	na	na
	BR-1	6/12	4.0E+01	1.3E+02	4.0E+02	4/16	7.6E+01	4.3E+02	1.4E+03
	BR-Adams St	na	na	na	na	2/2	5.0E+00	7.5E+00	1.0E+01

na = not analyzed
Non-detects were evaluated at 1/2 the detection limit.

Table 5-1b
Summary Statistics for Surface Water
CADMIUM

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

General Location	Station ID	Total				Dissolved			
		Detection Frequency	Min (ug/L)	Mean (ug/L)	Max (ug/L)	Detection Frequency	Min (ug/L)	Mean (ug/L)	Max (ug/L)
Discharge	CBMA-1	1/1	3.0E+00	3.0E+00	3.0E+00	1/1	2.0E+00	2.0E+00	2.0E+00
	KDS	2/2	6.1E+00	1.2E+01	1.7E+01	1/2	1.8E+01	1.8E+01	1.8E+01
	MGB-1	1/1	6.0E+00	6.0E+00	6.0E+00	1/1	5.0E+00	5.0E+00	5.0E+00
	RLCVT-1	1/1	6.0E+00	6.0E+00	6.0E+00	1/1	6.0E+00	6.0E+00	6.0E+00
	WP-1	1/1	2.3E+04	2.3E+04	2.3E+04	1/1	2.0E+04	2.0E+04	2.0E+04
French Gulch Reference	FG-0	1/2	6.0E-01	6.0E-01	6.0E-01	0/3	na	na	na
	FG-1	0/4	na	na	na	0/6	na	na	na
	FG-2	0/3	na	na	na	0/3	na	na	na
	FG-2 spring	0/1	na	na	na	na	na	na	na
	FG-3	0/4	na	na	na	1/3	5.0E-01	5.0E-01	5.0E-01
	Mcleod Tunnel	1/1	1.2E+00	1.2E+00	1.2E+00	na	na	na	na
North Branch French Gulch	1121	2/2	3.6E+01	8.6E+01	1.4E+02	2/2	3.8E+01	8.7E+01	1.4E+02
	1140	1/1	9.0E+01	9.0E+01	9.0E+01	1/1	9.5E+01	9.5E+01	9.5E+01
	FG-6	2/2	6.1E+01	1.8E+02	3.1E+02	1/1	3.1E+02	3.1E+02	3.1E+02
	FG-6A	8/8	1.5E+01	4.0E+01	1.0E+02	8/8	1.5E+01	4.0E+01	1.0E+02
	FG-6B	3/3	6.1E+01	9.0E+01	1.1E+02	2/2	6.0E+01	8.7E+01	1.1E+02
	FG-6C	12/12	5.4E+01	1.1E+02	3.7E+02	22/22	1.6E+01	7.9E+01	3.8E+02
	FG-6D	2/2	7.8E+00	9.1E+00	1.0E+01	na	na	na	na
	FG-7	16/16	5.3E+00	1.1E+01	1.8E+01	22/22	5.0E+00	1.2E+01	2.0E+01
	TS-3	na	na	na	na	0/1	na	na	na
	TS-4	na	na	na	na	2/2	5.0E+00	5.5E+00	6.0E+00
South Branch French Gulch	FG-4	1/2	5.0E-01	5.0E-01	5.0E-01	0/2	na	na	na
	FG-5	5/13	3.0E-01	3.8E-01	6.0E-01	5/16	1.0E-01	2.4E-01	3.0E-01
	FG-5.5	11/11	1.1E+00	1.7E+00	2.0E+00	11/11	1.1E+00	2.0E+00	2.5E+00
	FG-8	15/15	1.6E+00	2.8E+00	4.9E+00	17/17	1.2E+00	2.9E+00	7.5E+00
French Gulch	FG-10	1/1	2.6E+00	2.6E+00	2.6E+00	1/1	3.0E+00	3.0E+00	3.0E+00
	FG-9	18/18	2.6E+00	5.3E+00	8.4E+00	48/48	2.8E+00	6.1E+00	1.1E+01
	FG-9A	4/4	6.1E+00	6.7E+00	7.6E+00	4/4	4.2E+00	6.5E+00	8.9E+00
Blue River	643	5/5	6.6E-01	7.8E-01	9.4E-01	4/5	6.4E-01	6.8E-01	7.5E-01
	656	21/21	8.9E-01	2.8E+00	8.6E+00	23/23	7.7E-01	2.6E+00	6.7E+00
	657	20/20	4.2E-01	6.1E-01	1.1E+00	21/21	3.9E-01	5.7E-01	8.0E-01
	BR-2	16/16	1.3E+00	3.8E+00	7.2E+00	26/26	6.0E-01	4.3E+00	8.2E+00
	BR-3	14/15	4.0E-01	6.6E-01	9.0E-01	20/24	4.0E-01	5.9E-01	9.0E-01
	BR-4	1/1	8.0E-01	8.0E-01	8.0E-01	0/1	na	na	na
	BR-5	1/2	1.0E+00	1.0E+00	1.0E+00	1/3	7.0E-01	7.0E-01	7.0E-01
	BR-BFG	na	na	na	na	2/2	2.0E+00	3.0E+00	4.0E+00
	BR-Dillon	na	na	na	na	0/2	na	na	na
Blue River Reference	654	1/22	1.3E-01	1.3E-01	1.3E-01	1/23	5.0E-02	5.0E-02	5.0E-02
	655	9/20	1.2E-01	2.4E-01	5.7E-01	5/21	1.1E-01	2.2E-01	3.0E-01
	BR-1	4/17	2.0E-01	4.6E-01	6.0E-01	4/23	1.0E-01	1.5E-01	3.0E-01
	BR-Adams St	na	na	na	na	0/2	na	na	na

na = not analyzed
Non-detects were evaluated at 1/2 the detection limit.

Table 5-1c

Summary Statistics for Surface Water

COPPER

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

General Location	Station ID	Total				Dissolved			
		Detection Frequency	Min (ug/L)	Mean (ug/L)	Max (ug/L)	Detection Frequency	Min (ug/L)	Mean (ug/L)	Max (ug/L)
Discharge	CBMA-1	0/1	na	na	na	0/1	na	na	na
	KDS	2/2	5.7E+00	8.6E+00	1.1E+01	1/2	6.7E+00	6.7E+00	6.7E+00
	MGB-1	1/1	1.0E+00	1.0E+00	1.0E+00	0/1	na	na	na
	RLCVT-1	0/1	na	na	na	0/1	na	na	na
	WP-1	1/1	9.6E+03	9.6E+03	9.6E+03	1/1	8.4E+03	8.4E+03	8.4E+03
French Gulch Reference	FG-0	0/2	na	na	na	1/3	1.0E+00	1.0E+00	1.0E+00
	FG-1	1/4	1.4E+00	1.4E+00	1.4E+00	2/6	1.4E+00	1.5E+00	1.5E+00
	FG-2	0/3	na	na	na	0/3	na	na	na
	FG-2 spring	0/1	na	na	na	na	na	na	na
	FG-3	0/4	na	na	na	1/3	9.0E-01	9.0E-01	9.0E-01
	Mcleod Tunnel	0/1	na	na	na	na	na	na	na
North Branch French Gulch	1121	2/2	8.5E+00	1.3E+01	1.7E+01	2/2	5.0E+00	1.0E+01	1.5E+01
	1140	1/1	4.7E+01	4.7E+01	4.7E+01	1/1	4.0E+01	4.0E+01	4.0E+01
	FG-6	1/2	2.2E+02	2.2E+02	2.2E+02	1/1	1.9E+02	1.9E+02	1.9E+02
	FG-6A	5/8	4.2E+00	1.7E+01	4.9E+01	4/8	2.3E+00	1.0E+01	2.1E+01
	FG-6B	2/3	1.1E+01	1.4E+01	1.6E+01	1/2	4.2E+00	4.2E+00	4.2E+00
	FG-6C	11/12	8.9E+00	4.5E+01	9.4E+01	11/12	6.7E+00	4.3E+01	9.3E+01
	FG-6D	2/2	1.3E+00	1.9E+00	2.5E+00	na	na	na	na
	FG-7	11/16	1.0E+00	5.2E+00	1.1E+01	11/17	2.0E+00	5.1E+00	9.0E+00
	TS-3	na	na	na	na	0/1	na	na	na
	TS-4	na	na	na	na	2/2	2.0E+00	2.5E+00	3.0E+00
South Branch French Gulch	FG-4	1/2	1.1E+00	1.1E+00	1.1E+00	0/2	na	na	na
	FG-5	5/13	1.0E+00	2.4E+00	6.0E+00	2/12	1.1E+00	1.5E+00	1.8E+00
	FG-5.5	9/11	1.0E+00	1.1E+00	2.0E+00	11/11	7.0E-01	1.4E+00	2.0E+00
	FG-8	8/15	1.0E+00	2.3E+00	5.0E+00	7/15	1.1E+00	2.9E+00	1.0E+01
French Gulch	FG-10	0/1	na	na	na	1/1	2.0E+00	2.0E+00	2.0E+00
	FG-9	12/18	1.0E+00	2.4E+00	5.9E+00	23/35	1.0E+00	2.8E+00	1.3E+01
	FG-9A	4/4	1.3E+00	2.4E+00	3.3E+00	2/3	1.1E+00	1.6E+00	2.1E+00
Blue River	643	5/5	1.1E+00	1.5E+00	2.4E+00	4/5	1.0E+00	1.5E+00	2.3E+00
	656	18/21	1.0E+00	1.4E+01	6.9E+01	14/19	1.0E+00	5.3E+00	2.7E+01
	657	18/19	1.1E+00	9.4E+00	6.8E+01	16/20	1.2E+00	4.2E+00	9.5E+00
	BR-2	10/16	1.0E+00	2.1E+00	5.1E+00	10/16	1.0E+00	1.8E+00	3.0E+00
	BR-3	6/15	1.0E+00	2.0E+00	4.6E+00	7/15	1.0E+00	1.3E+00	2.4E+00
	BR-4	1/1	1.7E+00	1.7E+00	1.7E+00	0/1	na	na	na
	BR-5	0/2	na	na	na	0/3	na	na	na
	BR-BFG	na	na	na	na	1/2	2.0E+00	2.0E+00	2.0E+00
	BR-Dillon	na	na	na	na	1/2	2.0E+00	2.0E+00	2.0E+00
Blue River Reference	654	12/21	1.0E+00	8.3E+00	2.3E+01	11/21	1.2E+00	7.1E+00	1.9E+01
	655	17/20	1.0E+00	7.3E+00	2.9E+01	14/18	1.1E+00	5.9E+00	1.7E+01
	BR-1	8/17	1.0E+00	2.5E+00	6.0E+00	6/17	6.0E-01	2.3E+00	7.0E+00
	BR-Adams St	na	na	na	na	1/2	2.0E+00	2.0E+00	2.0E+00

na = not analyzed
Non-detects were evaluated at 1/2 the detection limit.

Table 5-1d
Summary Statistics for Surface Water
IRON

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

General Location	Station ID	Total				Dissolved			
		Detection Frequency	Min (ug/L)	Mean (ug/L)	Max (ug/L)	Detection Frequency	Min (ug/L)	Mean (ug/L)	Max (ug/L)
Discharge	CBMA-1	1/1	1.1E+03	1.1E+03	1.1E+03	1/1	5.3E+02	5.3E+02	5.3E+02
	KDS	2/2	1.8E+03	2.9E+03	3.9E+03	2/2	1.9E+02	8.5E+02	1.5E+03
	MGB-1	1/1	3.0E+02	3.0E+02	3.0E+02	0/1	na	na	na
	RLCVT-1	1/1	4.7E+01	4.7E+01	4.7E+01	0/1	na	na	na
	WP-1	1/1	8.4E+05	8.4E+05	8.4E+05	1/1	6.9E+05	6.9E+05	6.9E+05
French Gulch Reference	FG-0	1/2	2.2E+01	2.2E+01	2.2E+01	1/2	1.0E+01	1.0E+01	1.0E+01
	FG-1	3/4	4.1E+01	1.8E+02	4.5E+02	5/5	3.0E+00	5.1E+01	1.9E+02
	FG-2	1/3	8.1E+01	8.1E+01	8.1E+01	1/1	2.8E+01	2.8E+01	2.8E+01
	FG-2 spring	0/1	na	na	na	na	na	na	na
	FG-3	3/4	3.3E+01	1.1E+02	2.6E+02	2/3	7.3E+00	1.1E+01	1.4E+01
	Mcleod Tunnel	1/1	2.7E+03	2.7E+03	2.7E+03	na	na	na	na
North Branch French Gulch	1121	2/2	4.2E+02	7.5E+02	1.1E+03	2/2	1.2E+02	3.2E+02	5.2E+02
	1140	1/1	3.6E+04	3.6E+04	3.6E+04	1/1	3.4E+04	3.4E+04	3.4E+04
	FG-6	2/2	3.7E+03	8.8E+04	1.7E+05	1/1	1.6E+05	1.6E+05	1.6E+05
	FG-6A	8/8	2.8E+04	6.4E+04	1.1E+05	6/6	3.9E+04	6.5E+04	9.5E+04
	FG-6B	3/3	1.1E+05	1.7E+05	2.4E+05	2/2	1.6E+05	2.2E+05	2.8E+05
	FG-6C	13/13	7.0E+04	1.5E+05	3.6E+05	23/23	1.9E+04	1.2E+05	3.4E+05
	FG-6D	2/2	2.7E+03	5.5E+03	8.3E+03	na	na	na	na
	FG-7	16/16	1.2E+02	4.2E+02	1.2E+03	21/21	1.0E+01	1.7E+02	5.2E+02
	TS-3	na	na	na	na	1/1	1.0E+01	1.0E+01	1.0E+01
	TS-4	na	na	na	na	2/2	7.4E+01	1.1E+02	1.5E+02
South Branch French Gulch	FG-4	1/2	7.8E+01	7.8E+01	7.8E+01	1/1	1.3E+01	1.3E+01	1.3E+01
	FG-5	10/12	1.0E+01	5.7E+01	1.5E+02	11/15	1.0E+01	2.4E+01	8.0E+01
	FG-5.5	11/11	1.0E+01	2.9E+01	5.0E+01	5/11	2.0E+01	2.6E+01	3.0E+01
	FG-8	13/15	1.0E+01	8.6E+01	2.8E+02	9/15	5.6E+00	2.3E+01	5.1E+01
French Gulch	FG-10	1/1	6.0E+01	6.0E+01	6.0E+01	0/1	na	na	na
	FG-9	19/19	3.0E+01	1.5E+02	4.7E+02	33/43	4.0E+00	4.0E+01	3.7E+02
	FG-9A	4/4	7.5E+01	3.7E+02	6.7E+02	4/4	2.0E+01	5.2E+01	1.4E+02
Blue River	643	2/5	1.7E+02	1.8E+02	1.8E+02	0/5	na	na	na
	656	11/22	1.1E+02	3.8E+02	1.8E+03	0/23	na	na	na
	657	10/20	1.0E+02	2.5E+02	5.8E+02	0/21	na	na	na
	BR-2	16/16	2.0E+01	1.2E+02	2.8E+02	14/24	1.0E+01	2.1E+01	5.0E+01
	BR-3	13/15	2.0E+01	1.7E+02	1.3E+03	7/22	6.8E+00	3.9E+01	1.3E+02
	BR-4	1/1	4.5E+01	4.5E+01	4.5E+01	0/1	na	na	na
	BR-5	2/2	4.6E+01	8.1E+01	1.2E+02	0/3	na	na	na
	BR-BFG	na	na	na	na	2/2	8.0E+00	2.8E+01	4.8E+01
	BR-Dillon	na	na	na	na	1/2	2.2E+01	2.2E+01	2.2E+01
Blue River Reference	654	16/22	5.1E+01	1.5E+02	2.8E+02	0/23	na	na	na
	655	15/20	1.1E+02	2.7E+02	6.9E+02	0/20	na	na	na
	BR-1	16/17	4.0E+01	1.8E+02	7.7E+02	21/21	1.0E+01	2.4E+01	4.5E+01
	BR-Adams St	na	na	na	na	2/2	2.4E+01	3.2E+01	4.0E+01

na = not analyzed
Non-detects were evaluated at 1/2 the detection limit.

Table 5-1e
Summary Statistics for Surface Water
LEAD

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

General Location	Station ID	Total				Dissolved			
		Detection Frequency	Min (ug/L)	Mean (ug/L)	Max (ug/L)	Detection Frequency	Min (ug/L)	Mean (ug/L)	Max (ug/L)
Discharge	CBMA-1	1/1	2.0E+00	2.0E+00	2.0E+00	0/1	na	na	na
	KDS	2/2	2.2E+00	1.3E+01	2.5E+01	0/2	na	na	na
	MGB-1	1/1	5.0E+00	5.0E+00	5.0E+00	0/1	na	na	na
	RLCVT-1	1/1	1.0E+00	1.0E+00	1.0E+00	0/1	na	na	na
	WP-1	1/1	5.5E+03	5.5E+03	5.5E+03	1/1	7.4E+02	7.4E+02	7.4E+02
French Gulch Reference	FG-0	0/2	na	na	na	0/3	na	na	na
	FG-1	1/4	4.2E+00	4.2E+00	4.2E+00	1/6	3.6E+00	3.6E+00	3.6E+00
	FG-2	0/3	na	na	na	0/3	na	na	na
	FG-2 spring	0/1	na	na	na	na	na	na	na
	FG-3	2/4	3.7E+00	3.9E+00	4.0E+00	0/3	na	na	na
	Mcleod Tunnel	1/1	1.8E+01	1.8E+01	1.8E+01	na	na	na	na
North Branch French Gulch	1121	2/2	9.9E+00	2.8E+01	4.6E+01	1/2	2.4E+01	2.4E+01	2.4E+01
	1140	1/1	8.2E+01	8.2E+01	8.2E+01	1/1	5.7E+01	5.7E+01	5.7E+01
	FG-6	2/2	1.9E+02	2.3E+02	2.7E+02	1/1	6.5E+01	6.5E+01	6.5E+01
	FG-6A	8/8	3.3E+01	8.1E+01	1.4E+02	5/8	1.1E+00	3.1E+00	6.0E+00
	FG-6B	3/3	1.8E+02	2.1E+02	2.3E+02	2/2	1.3E+01	4.5E+01	7.8E+01
	FG-6C	11/11	1.1E+02	1.9E+02	4.6E+02	27/29	5.0E-01	5.4E+01	2.6E+02
	FG-6D	0/2	na	na	na	na	na	na	na
	FG-7	15/16	1.7E+00	5.2E+00	2.0E+01	14/22	1.0E-01	1.2E+00	4.1E+00
	TS-3	na	na	na	na	0/1	na	na	na
	TS-4	na	na	na	na	0/2	na	na	na
South Branch French Gulch	FG-4	1/2	3.3E+00	3.3E+00	3.3E+00	0/2	na	na	na
	FG-5	8/13	3.0E-01	3.4E+00	1.7E+01	2/16	3.0E-01	3.0E-01	3.0E-01
	FG-5.5	11/11	4.0E-01	5.9E-01	7.0E-01	15/19	1.0E-01	6.4E-01	1.7E+00
	FG-8	10/15	8.0E-01	3.3E+00	8.4E+00	11/17	3.0E-01	1.4E+00	9.0E+00
French Gulch	FG-10	1/1	3.2E+00	3.2E+00	3.2E+00	1/1	5.0E-01	5.0E-01	5.0E-01
	FG-9	16/17	4.1E+00	8.3E+00	2.6E+01	46/51	1.3E+00	5.5E+00	5.1E+01
	FG-9A	4/4	2.7E+00	9.3E+00	1.6E+01	1/4	3.5E+00	3.5E+00	3.5E+00
Blue River	643	2/5	2.5E+00	3.6E+00	4.6E+00	1/5	1.8E+00	1.8E+00	1.8E+00
	656	20/22	1.6E+00	7.6E+00	6.2E+01	6/23	1.0E+00	1.6E+00	2.6E+00
	657	6/20	1.0E+00	2.5E+00	6.5E+00	0/21	na	na	na
	BR-2	15/16	1.1E+00	6.4E+00	2.6E+01	27/33	3.0E-01	2.6E+00	9.4E+00
	BR-3	12/15	2.0E-01	1.2E+00	4.5E+00	10/32	3.0E-01	7.4E-01	1.8E+00
	BR-4	1/1	3.6E+00	3.6E+00	3.6E+00	0/1	na	na	na
	BR-5	1/2	3.8E+00	3.8E+00	3.8E+00	0/3	na	na	na
	BR-BFG	na	na	na	na	2/2	1.0E+00	1.5E+00	2.0E+00
	BR-Dillon	na	na	na	na	0/2	na	na	na
Blue River Reference	654	1/22	1.2E+00	1.2E+00	1.2E+00	0/23	na	na	na
	655	5/20	1.4E+00	2.4E+00	5.1E+00	0/21	na	na	na
	BR-1	13/16	2.0E-01	1.0E+00	3.7E+00	7/27	2.0E-01	1.2E+00	4.7E+00
	BR-Adams St	na	na	na	na	0/2	na	na	na

na = not analyzed
Non-detects were evaluated at 1/2 the detection limit.

Table 5-1f
Summary Statistics for Surface Water
MERCURY

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

General Location	Station ID	Total				Dissolved			
		Detection Frequency	Min (ug/L)	Mean (ug/L)	Max (ug/L)	Detection Frequency	Min (ug/L)	Mean (ug/L)	Max (ug/L)
Discharge	CBMA-1	na	na	na	na	na	na	na	na
	KDS	na	na	na	na	na	na	na	na
	MGB-1	na	na	na	na	na	na	na	na
	RLCVT-1	na	na	na	na	na	na	na	na
	WP-1	1/1	4.0E+02	4.0E+02	4.0E+02	na	na	na	na
French Gulch Reference	FG-0	na	na	na	na	na	na	na	na
	FG-1	0/1	na	na	na	na	na	na	na
	FG-2	na	na	na	na	na	na	na	na
	FG-2 spring	na	na	na	na	na	na	na	na
	FG-3	na	na	na	na	na	na	na	na
	Mcleod Tunnel	na	na	na	na	na	na	na	na
North Branch French Gulch	1121	na	na	na	na	na	na	na	na
	1140	na	na	na	na	na	na	na	na
	FG-6	0/1	na	na	na	na	na	na	na
	FG-6A	0/1	na	na	na	na	na	na	na
	FG-6B	na	na	na	na	na	na	na	na
	FG-6C	0/1	na	na	na	na	na	na	na
	FG-6D	na	na	na	na	na	na	na	na
	FG-7	0/1	na	na	na	na	na	na	na
	TS-3	na	na	na	na	na	na	na	na
	TS-4	na	na	na	na	na	na	na	na
South Branch French Gulch	FG-4	na	na	na	na	na	na	na	na
	FG-5	na	na	na	na	na	na	na	na
	FG-5.5	na	na	na	na	na	na	na	na
	FG-8	na	na	na	na	na	na	na	na
French Gulch	FG-10	na	na	na	na	na	na	na	na
	FG-9	na	na	na	na	na	na	na	na
	FG-9A	na	na	na	na	na	na	na	na
Blue River	643	na	na	na	na	na	na	na	na
	656	na	na	na	na	na	na	na	na
	657	na	na	na	na	na	na	na	na
	BR-2	na	na	na	na	na	na	na	na
	BR-3	na	na	na	na	na	na	na	na
	BR-4	na	na	na	na	na	na	na	na
	BR-5	na	na	na	na	na	na	na	na
	BR-BFG	na	na	na	na	na	na	na	na
	BR-Dillon	na	na	na	na	na	na	na	na
Blue River Reference	654	na	na	na	na	na	na	na	na
	655	na	na	na	na	na	na	na	na
	BR-1	na	na	na	na	na	na	na	na
	BR-Adams St	na	na	na	na	na	na	na	na

na = not analyzed
Non-detects were evaluated at 1/2 the detection limit.

Table 5-1g
Summary Statistics for Surface Water
NICKEL
Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

General Location	Station ID	Total				Dissolved			
		Detection Frequency	Min (ug/L)	Mean (ug/L)	Max (ug/L)	Detection Frequency	Min (ug/L)	Mean (ug/L)	Max (ug/L)
Discharge	CBMA-1	0/1	na	na	na	0/1	na	na	na
	KDS	2/2	2.1E+01	3.0E+01	3.8E+01	1/2	4.1E+01	4.1E+01	4.1E+01
	MGB-1	0/1	na	na	na	0/1	na	na	na
	RLCVT-1	0/1	na	na	na	0/1	na	na	na
	WP-1	1/1	1.7E+03	1.7E+03	1.7E+03	1/1	1.4E+03	1.4E+03	1.4E+03
French Gulch Reference	FG-0	0/1	na	na	na	0/2	na	na	na
	FG-1	0/3	na	na	na	0/5	na	na	na
	FG-2	0/1	na	na	na	0/1	na	na	na
	FG-2 spring	na	na	na	na	na	na	na	na
	FG-3	0/3	na	na	na	0/3	na	na	na
	Mcleod Tunnel	na	na	na	na	na	na	na	na
North Branch French Gulch	1121	2/2	1.4E+01	2.8E+01	4.3E+01	2/2	1.6E+01	3.7E+01	5.8E+01
	1140	1/1	8.0E+01	8.0E+01	8.0E+01	1/1	8.1E+01	8.1E+01	8.1E+01
	FG-6	1/1	1.2E+02	1.2E+02	1.2E+02	1/1	1.2E+02	1.2E+02	1.2E+02
	FG-6A	5/5	6.1E+01	8.0E+01	1.1E+02	6/6	3.8E+01	7.4E+01	1.2E+02
	FG-6B	3/3	1.2E+02	1.5E+02	1.8E+02	2/2	1.7E+02	1.7E+02	1.7E+02
	FG-6C	11/11	9.0E+01	1.6E+02	3.7E+02	11/11	1.0E+02	1.5E+02	3.6E+02
	FG-6D	1/2	1.8E+01	1.8E+01	1.8E+01	na	na	na	na
	FG-7	6/15	1.0E+01	1.2E+01	2.0E+01	8/16	2.0E+00	9.3E+00	2.0E+01
	TS-3	na	na	na	na	0/1	na	na	na
	TS-4	na	na	na	na	0/2	na	na	na
South Branch French Gulch	FG-4	na	na	na	na	na	na	na	na
	FG-5	0/11	na	na	na	0/10	na	na	na
	FG-5.5	0/11	na	na	na	0/11	na	na	na
	FG-8	0/12	na	na	na	0/12	na	na	na
French Gulch	FG-10	0/1	na	na	na	0/1	na	na	na
	FG-9	0/15	na	na	na	17/29	2.0E+00	3.3E+00	5.0E+00
	FG-9A	0/4	na	na	na	0/3	na	na	na
Blue River	643	na	na	na	na	na	na	na	na
	656	na	na	na	na	na	na	na	na
	657	na	na	na	na	na	na	na	na
	BR-2	0/14	na	na	na	0/14	na	na	na
	BR-3	0/13	na	na	na	0/13	na	na	na
	BR-4	0/1	na	na	na	0/1	na	na	na
	BR-5	0/2	na	na	na	0/3	na	na	na
	BR-BFG	na	na	na	na	1/2	1.0E+00	1.0E+00	1.0E+00
	BR-Dillon	na	na	na	na	0/2	na	na	na
Blue River Reference	654	na	na	na	na	na	na	na	na
	655	na	na	na	na	na	na	na	na
	BR-1	0/15	na	na	na	0/15	na	na	na
	BR-Adams St	na	na	na	na	0/2	na	na	na

na = not analyzed
Non-detects were evaluated at 1/2 the detection limit.

Table 5-1g
Summary Statistics for Surface Water
NICKEL
Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

General Location	Station ID	Total				Dissolved			
		Detection Frequency	Min (ug/L)	Mean (ug/L)	Max (ug/L)	Detection Frequency	Min (ug/L)	Mean (ug/L)	Max (ug/L)
Discharge	CBMA-1	0/1	na	na	na	0/1	na	na	na
	KDS	2/2	2.1E+01	3.0E+01	3.8E+01	1/2	4.1E+01	4.1E+01	4.1E+01
	MGB-1	0/1	na	na	na	0/1	na	na	na
	RLCVT-1	0/1	na	na	na	0/1	na	na	na
	WP-1	1/1	1.7E+03	1.7E+03	1.7E+03	1/1	1.4E+03	1.4E+03	1.4E+03
French Gulch Reference	FG-0	0/1	na	na	na	0/2	na	na	na
	FG-1	0/3	na	na	na	0/5	na	na	na
	FG-2	0/1	na	na	na	0/1	na	na	na
	FG-2 spring	na	na	na	na	na	na	na	na
	FG-3	0/3	na	na	na	0/3	na	na	na
	Mcleod Tunnel	na	na	na	na	na	na	na	na
North Branch French Gulch	1121	2/2	1.4E+01	2.8E+01	4.3E+01	2/2	1.6E+01	3.7E+01	5.8E+01
	1140	1/1	8.0E+01	8.0E+01	8.0E+01	1/1	8.1E+01	8.1E+01	8.1E+01
	FG-6	1/1	1.2E+02	1.2E+02	1.2E+02	1/1	1.2E+02	1.2E+02	1.2E+02
	FG-6A	5/5	6.1E+01	8.0E+01	1.1E+02	6/6	3.8E+01	7.4E+01	1.2E+02
	FG-6B	3/3	1.2E+02	1.5E+02	1.8E+02	2/2	1.7E+02	1.7E+02	1.7E+02
	FG-6C	11/11	9.0E+01	1.6E+02	3.7E+02	11/11	1.0E+02	1.5E+02	3.6E+02
	FG-6D	1/2	1.8E+01	1.8E+01	1.8E+01	na	na	na	na
	FG-7	6/15	1.0E+01	1.2E+01	2.0E+01	8/16	2.0E+00	9.3E+00	2.0E+01
	TS-3	na	na	na	na	0/1	na	na	na
	TS-4	na	na	na	na	0/2	na	na	na
South Branch French Gulch	FG-4	na	na	na	na	na	na	na	na
	FG-5	0/11	na	na	na	0/10	na	na	na
	FG-5.5	0/11	na	na	na	0/11	na	na	na
	FG-8	0/12	na	na	na	0/12	na	na	na
French Gulch	FG-10	0/1	na	na	na	0/1	na	na	na
	FG-9	0/15	na	na	na	17/29	2.0E+00	3.3E+00	5.0E+00
	FG-9A	0/4	na	na	na	0/3	na	na	na
Blue River	643	na	na	na	na	na	na	na	na
	656	na	na	na	na	na	na	na	na
	657	na	na	na	na	na	na	na	na
	BR-2	0/14	na	na	na	0/14	na	na	na
	BR-3	0/13	na	na	na	0/13	na	na	na
	BR-4	0/1	na	na	na	0/1	na	na	na
	BR-5	0/2	na	na	na	0/3	na	na	na
	BR-BFG	na	na	na	na	1/2	1.0E+00	1.0E+00	1.0E+00
	BR-Dillon	na	na	na	na	0/2	na	na	na
Blue River Reference	654	na	na	na	na	na	na	na	na
	655	na	na	na	na	na	na	na	na
	BR-1	0/15	na	na	na	0/15	na	na	na
	BR-Adams St	na	na	na	na	0/2	na	na	na

na = not analyzed
Non-detects were evaluated at 1/2 the detection limit.

Table 5-1h

Summary Statistics for Surface Water

SILVER

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

		Total				Dissolved			
General Location	**Station ID**	**Detection Frequency**	**Min (ug/L)**	**Mean (ug/L)**	**Max (ug/L)**	**Detection Frequency**	**Min (ug/L)**	**Mean (ug/L)**	**Max (ug/L)**
Discharge	CBMA-1	0/1	na	na	na	0/1	na	na	na
	KDS	0/2	na	na	na	0/2	na	na	na
	MGB-1	0/1	na	na	na	0/1	na	na	na
	RLCVT-1	0/1	na	na	na	0/1	na	na	na
	WP-1	1/1	2.5E+01	2.5E+01	2.5E+01	1/1	1.0E+00	1.0E+00	1.0E+00
French Gulch Reference	FG-0	0/2	na	na	na	0/3	na	na	na
	FG-1	0/4	na	na	na	0/6	na	na	na
	FG-2	0/3	na	na	na	0/3	na	na	na
	FG-2 spring	na	na	na	na	na	na	na	na
	FG-3	0/4	na	na	na	0/3	na	na	na
	Mcleod Tunnel	0/1	na	na	na	na	na	na	na
North Branch French Gulch	1121	1/2	2.0E-01	2.0E-01	2.0E-01	0/2	na	na	na
	1140	0/1	na	na	na	0/1	na	na	na
	FG-6	1/2	3.4E-01	3.4E-01	3.4E-01	0/1	na	na	na
	FG-6A	2/8	3.3E-01	1.0E+00	1.7E+00	2/8	3.0E-01	1.6E+00	2.9E+00
	FG-6B	0/3	na	na	na	0/2	na	na	na
	FG-6C	0/2	na	na	na	0/2	na	na	na
	FG-6D	0/2	na	na	na	na	na	na	na
	FG-7	1/9	3.0E-01	3.0E-01	3.0E-01	0/9	na	na	na
	TS-3	na	na	na	na	0/1	na	na	na
	TS-4	na	na	na	na	0/2	na	na	na
South Branch French Gulch	FG-4	0/3	na	na	na	0/2	na	na	na
	FG-5	0/8	na	na	na	0/7	na	na	na
	FG-5.5	na	na	na	na	na	na	na	na
	FG-8	0/8	na	na	na	0/8	na	na	na
French Gulch	FG-10	na	na	na	na	na	na	na	na
	FG-9	0/10	na	na	na	0/27	na	na	na
	FG-9A	0/4	na	na	na	0/3	na	na	na
Blue River	643	na	na	na	na	na	na	na	na
	656	na	na	na	na	na	na	na	na
	657	na	na	na	na	na	na	na	na
	BR-2	0/8	na	na	na	0/8	na	na	na
	BR-3	0/7	na	na	na	0/7	na	na	na
	BR-4	0/1	na	na	na	0/1	na	na	na
	BR-5	0/2	na	na	na	0/3	na	na	na
	BR-BFG	na	na	na	na	0/2	na	na	na
	BR-Dillon	na	na	na	na	0/2	na	na	na
Blue River Reference	654	na	na	na	na	na	na	na	na
	655	na	na	na	na	na	na	na	na
	BR-1	0/8	na	na	na	0/8	na	na	na
	BR-Adams St	na	na	na	na	0/2	na	na	na

na = not analyzed
Non-detects were evaluated at 1/2 the detection limit.

Table 5-1i
Summary Statistics for Surface Water
ZINC
Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

General Location	Station ID	Total				Dissolved			
		Detection Frequency	Min (ug/L)	Mean (ug/L)	Max (ug/L)	Detection Frequency	Min (ug/L)	Mean (ug/L)	Max (ug/L)
Discharge	CBMA-1	1/1	3.0E+03	3.0E+03	3.0E+03	1/1	2.8E+03	2.8E+03	2.8E+03
	KDS	2/2	5.4E+03	7.6E+03	9.8E+03	2/2	4.1E+03	7.3E+03	1.0E+04
	MGB-1	1/1	1.6E+03	1.6E+03	1.6E+03	1/1	1.5E+03	1.5E+03	1.5E+03
	RLCVT-1	1/1	2.1E+03	2.1E+03	2.1E+03	1/1	2.0E+03	2.0E+03	2.0E+03
	WP-1	1/1	3.5E+06	3.5E+06	3.5E+06	1/1	3.1E+06	3.1E+06	3.1E+06
French Gulch Reference	FG-0	1/2	1.2E+01	1.2E+01	1.2E+01	1/3	2.0E+00	2.0E+00	2.0E+00
	FG-1	3/4	7.0E+00	1.4E+01	1.9E+01	5/6	7.0E+00	1.2E+01	2.0E+01
	FG-2	2/3	1.0E+01	1.9E+01	2.8E+01	2/3	1.0E+01	1.3E+01	1.5E+01
	FG-2 spring	1/2	1.0E+01	1.0E+01	1.0E+01	na	na	na	na
	FG-3	4/4	8.4E+00	1.7E+01	2.6E+01	3/3	1.0E+01	1.3E+01	1.6E+01
	Mcleod Tunnel	1/1	4.9E+02	4.9E+02	4.9E+02	0/1	na	na	na
North Branch French Gulch	1121	2/2	1.8E+04	3.4E+04	5.1E+04	2/2	1.8E+04	3.4E+04	5.0E+04
	1140	1/1	7.9E+04	7.9E+04	7.9E+04	1/1	8.4E+04	8.4E+04	8.4E+04
	FG-6	2/2	1.7E+04	7.4E+04	1.3E+05	1/1	1.3E+05	1.3E+05	1.3E+05
	FG-6A	8/8	4.3E+04	6.8E+04	1.1E+05	8/8	7.0E+03	6.0E+04	1.0E+05
	FG-6B	3/3	1.2E+05	1.4E+05	1.5E+05	2/2	1.5E+05	1.6E+05	1.7E+05
	FG-6C	15/15	8.5E+04	1.4E+05	3.1E+05	24/24	2.8E+04	1.3E+05	3.0E+05
	FG-6D	2/2	6.5E+03	1.3E+04	1.9E+04	na	na	na	na
	FG-7	16/16	2.3E+03	7.5E+03	1.4E+04	22/22	1.0E+03	7.3E+03	1.6E+04
	TS-3	na	na	na	na	1/1	3.0E+01	3.0E+01	3.0E+01
	TS-4	na	na	na	na	2/2	1.0E+03	1.1E+03	1.1E+03
South Branch French Gulch	FG-4	2/3	3.4E+01	4.8E+03	9.6E+03	1/2	1.4E+01	1.4E+01	1.4E+01
	FG-5	12/13	1.5E+01	4.4E+01	1.2E+02	15/16	1.0E+01	4.0E+01	1.1E+02
	FG-5.5	12/12	3.5E+02	5.0E+02	6.7E+02	11/11	3.8E+02	5.0E+02	6.6E+02
	FG-8	15/15	4.5E+02	7.5E+02	1.5E+03	17/17	3.0E+02	7.1E+02	1.5E+03
French Gulch	FG-10	1/1	7.1E+02	7.1E+02	7.1E+02	na	na	na	na
	FG-9	20/20	9.2E+02	2.2E+03	4.4E+03	45/45	1.1E+03	2.6E+03	4.5E+03
	FG-9A	4/4	2.3E+03	2.6E+03	3.4E+03	3/3	2.2E+03	2.6E+03	3.3E+03
Blue River	643	5/5	1.9E+02	2.2E+02	2.7E+02	4/4	1.9E+02	2.1E+02	2.5E+02
	656	22/22	3.2E+02	1.3E+03	3.6E+03	22/22	3.1E+02	1.3E+03	3.8E+03
	657	20/20	8.0E+01	1.3E+02	2.1E+02	21/21	7.9E+01	1.2E+02	2.0E+02
	BR-2	17/17	4.2E+02	1.6E+03	4.3E+03	26/26	3.3E+02	2.0E+03	4.2E+03
	BR-3	15/15	7.0E+01	1.1E+02	2.7E+02	24/24	5.0E+01	1.0E+02	2.4E+02
	BR-4	1/1	7.4E+01	7.4E+01	7.4E+01	1/1	5.3E+01	5.3E+01	5.3E+01
	BR-5	2/2	4.4E+01	7.9E+01	1.1E+02	3/3	3.1E+01	7.6E+01	9.9E+01
	BR-BFG	na	na	na	na	2/2	5.4E+02	1.0E+03	1.5E+03
	BR-Dillon	na	na	na	na	2/2	6.9E+01	9.5E+01	1.2E+02
Blue River Reference	654	0/21	na	na	na	1/23	1.0E+01	1.0E+01	1.0E+01
	655	16/20	1.0E+01	2.8E+01	1.0E+02	14/19	1.0E+01	2.2E+01	5.1E+01
	BR-1	17/17	8.8E+00	3.1E+01	1.1E+02	23/24	7.0E+00	1.8E+01	6.0E+01
	BR-Adams St	na	na	na	na	2/2	2.2E+01	2.6E+01	2.9E+01

na = not analyzed
Non-detects were evaluated at 1/2 the detection limit.

Table 5-2
Summary of Sediment Data

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

General Location	Station ID	Concentration (mg/kg)											
		Aluminum	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
Blue River	BR-BFG	7.6E+04	2.3E+01	1.1E+01	7.5E+01	1.1E+02	4.6E+04	6.4E+02	1.6E+03	2.5E-01	3.2E+01	3.7E+00	3.0E+03
	BR-Dillon	8.3E+04	2.4E+01	1.5E+01	8.2E+01	6.8E+01	4.4E+04	3.2E+02	1.3E+03	2.2E-01	3.3E+01	1.9E+00	2.3E+03
Blue River Reference	BR-Adams St	7.8E+04	1.3E+01	2.8E+00	6.3E+01	4.5E+01	3.6E+04	1.6E+02	1.3E+03	1.0E-01	2.7E+01	1.3E+00	6.0E+02
French Gulch	FG-9	7.3E+04	3.6E+01	5.7E+01	5.3E+01	2.1E+02	4.9E+04	1.8E+03	4.4E+03	2.5E-01	2.8E+01	6.7E+00	9.0E+03
	FG-9A	5.8E+04	1.2E+02	8.2E+01	3.5E+01	3.2E+02	1.2E+05	2.3E+03	9.1E+03	2.9E-01	3.1E+01	1.9E+01	1.8E+04
French Gulch Reference	FG-0	7.5E+04	5.9E+01	5.8E+00	5.4E+01	4.6E+01	3.9E+04	1.5E+02	1.3E+03	5.0E-02	3.0E+01	1.1E+00	6.3E+02
	FG-1	8.0E+04	6.2E+01	6.1E+00	5.0E+01	6.6E+01	3.8E+04	3.8E+02	7.7E+02	2.7E-01	2.7E+01	2.1E+00	7.8E+02
North Branch French Gulch	FG-7	6.0E+04	1.1E+02	1.1E+02	3.4E+01	3.1E+02	1.1E+05	1.9E+03	1.2E+04	2.8E-01	3.2E+01	1.8E+01	2.2E+04
	TS-3	6.0E+04	1.8E+02	2.1E+02	3.4E+01	4.9E+02	6.3E+04	6.5E+03	3.6E+03	3.5E-01	2.3E+01	3.0E+01	3.5E+04
	TS-4	6.6E+04	1.1E+02	9.1E+01	4.0E+01	2.8E+02	7.1E+04	1.8E+03	3.3E+03	2.9E-01	2.7E+01	1.7E+01	1.7E+04
South Branch French Gulch	Bank Sed. 1	na	7.2E+01	5.2E+01	na	na	4.3E+04	8.2E+02	na	na	na	4.2E+00	7.2E+03
	Bank Sed. 2	na	1.1E+02	4.4E+01	na	na	5.6E+04	1.4E+03	na	na	na	7.6E+00	5.5E+03
	Dead Elk Sed. 1	na	5.8E+01	4.2E+01	na	na	6.0E+04	1.6E+03	na	na	na	9.7E+00	6.4E+03
	Dead Elk Sed. 2	na	1.0E+02	7.7E+01	na	na	1.5E+05	2.0E+03	na	na	na	9.0E+01	1.6E+04
	Stream Sed. 1	na	2.0E+02	1.5E+02	na	na	5.0E+04	3.8E+03	na	na	na	3.4E+01	2.5E+04
	Stream Sed. 2	na	1.4E+02	6.9E+01	na	na	9.3E+04	3.5E+03	na	na	na	2.2E+01	1.2E+04
	Stream Sed. 3	na	1.6E+02	1.1E+02	na	na	5.6E+04	2.6E+03	na	na	na	2.9E+01	1.8E+04
	Stream Sed. 4	na	2.2E+02	1.1E+02	na	na	1.3E+05	3.4E+03	na	na	na	2.4E+01	1.9E+04
	Stream Sed. 5	na	1.1E+02	3.5E+01	na	na	6.0E+04	1.0E+03	na	na	na	5.5E+00	4.8E+03
	Stream Sed. 6	na	1.0E+02	5.4E+01	na	na	5.5E+04	1.2E+03	na	na	na	6.8E+00	6.3E+03

na = not analyzed
Values presented are the measured concentration at a station; non-detects were evaluated at 1/2 the detection limit.

Table 5-3
Summary of Fish Tissue Data

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

Parameter	Station ID	Species	Sample ID	Concentration (mg/kg dw)			
				Fillet	Gonad	Kidney	Liver
Arsenic	BR-1	Brown Trout	BR-1-1	6.5E-01	3.1E-02	1.3E-02	1.0E-02
		Brown Trout	BR-1-2	1.4E+00	2.1E-01	2.2E-02	1.0E-02
		Brown Trout	BR-1-3	5.6E-01	1.0E-02	2.6E-02	1.1E-02
		Brown Trout	BR-1-4	4.6E-01	8.9E-03	1.9E-02	1.1E-02
		Brown Trout	BR-1-5	1.1E+00	1.4E-01	1.6E-02	1.8E-02
		Brown Trout	BR-1-6	3.4E-01	9.3E-03	3.2E-02	3.2E-02
	BR-2	Brook Trout	BR-2-1	1.0E-02	8.6E-03	1.1E-02	2.3E-02
		Brook Trout	BR-2-2	1.2E-02	8.9E-03	7.2E-02	1.8E-02
		Brook Trout	BR-2-3	1.2E-02	1.5E-02	6.2E-02	3.5E-02
		Brook Trout	BR-2-4	7.9E-03	9.8E-03	1.5E-02	3.1E-02
		Brook Trout	BR-2-5	9.8E-03	1.4E-01	2.1E-01	7.9E-02
		Brook Trout	BR-2-6	1.0E-02	2.1E-01	4.2E-01	8.9E-02
		Brown Trout	BR-2-1	9.2E-03	1.2E-02	1.1E-02	1.2E-02
		Brown Trout	BR-2-2	1.1E-02	3.2E-02	1.8E-02	2.4E-02
		Brown Trout	BR-2-3	1.1E-02	1.1E-02	2.8E-02	1.2E-02
		Brown Trout	BR-2-4	1.1E-02	3.2E-02	5.9E-02	3.2E-02
		Brown Trout	BR-2-5	5.6E-02	6.9E-02	1.2E-02	1.1E-02
		Brown Trout	BR-2-6	9.7E-02	1.1E-02	1.6E-02	1.3E-02
Cadmium	BR-1	Brown Trout	BR-1-1	7.3E-03	1.3E-01	1.9E+00	1.4E+00
		Brown Trout	BR-1-2	4.5E-03	1.1E+00	1.0E+01	1.9E+00
		Brown Trout	BR-1-3	4.7E-03	2.9E-02	3.5E+00	1.2E+00
		Brown Trout	BR-1-4	4.9E-03	1.9E-02	1.7E+00	7.8E-01
		Brown Trout	BR-1-5	4.3E-03	3.7E-01	3.8E+00	1.9E+00
		Brown Trout	BR-1-6	3.6E-03	2.9E-02	2.8E+00	1.7E+00
	BR-2	Brook Trout	BR-2-1	2.3E-02	1.6E-01	1.1E+01	5.8E+00
		Brook Trout	BR-2-2	1.2E-02	9.0E-02	5.1E+01	2.0E+00
		Brook Trout	BR-2-3	1.0E-02	3.4E-01	2.1E+01	2.4E+00
		Brook Trout	BR-2-4	2.0E-02	6.7E-02	4.1E+00	2.3E+01
		Brook Trout	BR-2-5	4.3E-02	2.1E-01	2.4E+01	4.6E+00
		Brook Trout	BR-2-6	1.8E-02	2.8E-01	1.6E+02	3.2E+00
		Brown Trout	BR-2-1	3.2E-02	1.8E+00	3.0E+01	8.5E+00
		Brown Trout	BR-2-2	3.9E-02	2.3E+00	5.8E+01	9.3E+00
		Brown Trout	BR-2-3	4.3E-02	1.9E-01	6.4E+01	6.7E+00
		Brown Trout	BR-2-4	2.4E-02	2.7E-01	4.1E+01	4.3E+00
		Brown Trout	BR-2-5	1.6E-02	4.1E-01	1.4E+01	2.4E+00
		Brown Trout	BR-2-6	2.8E-02	2.4E-01	1.9E+01	3.5E+00
Copper	BR-1	Brown Trout	BR-1-1	2.7E-01	1.0E+00	1.5E+00	2.8E+02
		Brown Trout	BR-1-2	2.7E-01	2.7E+00	3.4E+00	3.0E+02
		Brown Trout	BR-1-3	3.1E-01	7.1E+00	3.6E+00	1.5E+02
		Brown Trout	BR-1-4	2.9E-01	4.2E+00	2.1E+00	1.4E+02
		Brown Trout	BR-1-5	2.2E-01	1.9E+00	2.3E+00	5.2E+02
		Brown Trout	BR-1-6	4.6E-01	1.0E+01	3.3E+00	6.2E+02
	BR-2	Brook Trout	BR-2-1	3.1E-01	4.1E-01	2.0E+00	4.4E+01
		Brook Trout	BR-2-2	3.4E-01	8.8E+00	3.2E+01	2.2E+01
		Brook Trout	BR-2-3	3.1E-01	1.1E+00	1.9E+01	8.5E+01
		Brook Trout	BR-2-4	6.7E-01	7.4E+00	4.2E+01	6.5E+00
		Brook Trout	BR-2-5	4.2E-01	1.2E+01	8.2E+00	4.2E+01
		Brook Trout	BR-2-6	3.9E-01	2.6E+00	1.1E+02	1.0E+02
		Brown Trout	BR-2-1	7.0E-01	1.0E+00	8.3E+00	6.8E+01
		Brown Trout	BR-2-2	3.1E-01	1.2E+00	1.0E+01	3.3E+02
		Brown Trout	BR-2-3	5.1E-01	4.8E+00	1.3E+01	8.8E+01
		Brown Trout	BR-2-4	4.5E-01	4.3E+00	1.3E+01	7.5E+01
		Brown Trout	BR-2-5	2.5E-01	2.2E+00	9.5E+00	2.7E+02
		Brown Trout	BR-2-6	3.6E-01	5.3E+00	7.5E+00	2.1E+01

Table 5-3 (continued)
Summary of Fish Tissue Data

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

Parameter	Station ID	Species	Sample ID	Concentration (mg/kg dw)			
				Fillet	Gonad	Kidney	Liver
Lead	BR-1	Brown Trout	BR-1-1	2.3E-02	6.7E-02	7.3E-01	9.8E-02
		Brown Trout	BR-1-2	1.1E-02	2.1E-01	7.3E-01	5.2E-02
		Brown Trout	BR-1-3	1.2E-02	4.8E-02	4.9E-01	4.6E-02
		Brown Trout	BR-1-4	6.1E-02	2.6E-02	7.1E-01	1.7E-01
		Brown Trout	BR-1-5	1.1E-02	1.4E-01	2.6E-01	7.7E-02
		Brown Trout	BR-1-6	2.6E-02	9.3E-03	2.8E-01	3.2E-02
	BR-2	Brook Trout	BR-2-1	2.3E-02	2.9E-02	1.2E+00	3.2E-01
		Brook Trout	BR-2-2	1.2E-02	2.6E-02	1.2E+00	1.4E-01
		Brook Trout	BR-2-3	1.2E-02	1.5E-02	4.7E-01	1.4E-01
		Brook Trout	BR-2-4	6.8E-02	4.8E-02	1.3E-01	7.3E-01
		Brook Trout	BR-2-5	2.5E-02	1.4E-01	6.2E-01	4.1E-01
		Brook Trout	BR-2-6	1.0E-02	2.1E-01	3.1E+00	8.9E-02
		Brown Trout	BR-2-1	9.2E-03	2.7E-02	1.8E+00	1.2E-01
		Brown Trout	BR-2-2	7.7E-02	3.2E-02	2.8E+00	1.8E-01
		Brown Trout	BR-2-3	2.7E-02	3.0E-02	1.7E+00	1.0E-01
		Brown Trout	BR-2-4	4.2E-02	3.2E-02	1.9E+00	1.0E-01
		Brown Trout	BR-2-5	2.6E-02	1.7E-01	1.7E+00	9.8E-02
		Brown Trout	BR-2-6	6.4E-02	4.1E-02	7.0E-01	9.8E-02
Manganese	BR-1	Brown Trout	BR-1-1	2.1E-01	5.6E-01	1.0E+00	1.8E+00
		Brown Trout	BR-1-2	1.5E-01	1.6E+00	2.9E+00	2.0E+00
		Brown Trout	BR-1-3	9.8E-02	1.2E+01	1.6E+00	2.7E+00
		Brown Trout	BR-1-4	1.0E+00	8.9E+00	1.5E+00	3.2E+00
		Brown Trout	BR-1-5	9.3E-01	1.1E+00	1.6E+00	2.4E+00
		Brown Trout	BR-1-6	2.6E-01	1.4E+01	1.8E+00	3.7E+00
	BR-2	Brook Trout	BR-2-1	1.6E-01	3.3E-01	9.0E-01	2.2E+00
		Brook Trout	BR-2-2	1.4E-01	1.5E+00	1.8E+00	3.1E+00
		Brook Trout	BR-2-3	1.4E-01	2.7E-01	1.5E+00	2.3E+00
		Brook Trout	BR-2-4	4.6E-01	1.9E+00	2.8E+00	2.0E+00
		Brook Trout	BR-2-5	2.7E-01	4.0E+00	2.3E+00	3.3E+00
		Brook Trout	BR-2-6	9.2E-02	7.6E-01	8.6E+00	3.9E+00
		Brown Trout	BR-2-1	1.0E-01	3.8E-01	9.2E-01	1.8E+00
		Brown Trout	BR-2-2	4.9E-01	4.7E-01	1.3E+00	2.9E+00
		Brown Trout	BR-2-3	2.0E-01	2.0E+00	1.2E+00	1.9E+00
		Brown Trout	BR-2-4	2.0E-01	4.8E-01	2.0E+00	2.5E+00
		Brown Trout	BR-2-5	1.4E-01	1.1E+00	1.6E+00	1.4E+00
		Brown Trout	BR-2-6	3.3E-01	2.4E+00	1.2E+00	2.2E+00
Zinc	BR-1	Brown Trout	BR-1-1	5.1E+00	3.2E+01	2.3E+01	2.3E+01
		Brown Trout	BR-1-2	4.9E+00	2.4E+02	4.3E+01	2.5E+01
		Brown Trout	BR-1-3	3.6E+00	8.7E+01	3.9E+01	2.5E+01
		Brown Trout	BR-1-4	7.9E+00	5.9E+01	2.9E+01	2.4E+01
		Brown Trout	BR-1-5	5.2E+00	1.7E+02	2.9E+01	3.7E+01
		Brown Trout	BR-1-6	6.3E+00	6.0E+01	4.0E+01	4.0E+01
	BR-2	Brook Trout	BR-2-1	6.7E+00	1.9E+01	6.8E+01	8.6E+01
		Brook Trout	BR-2-2	8.5E+00	7.0E+01	1.7E+02	1.1E+02
		Brook Trout	BR-2-3	6.0E+00	2.3E+01	7.9E+01	8.2E+01
		Brook Trout	BR-2-4	8.3E+00	7.8E+01	9.6E+01	7.5E+01
		Brook Trout	BR-2-5	9.9E+00	1.0E+02	2.7E+02	1.5E+02
		Brook Trout	BR-2-6	7.6E+00	5.5E+01	5.9E+02	1.5E+02
		Brown Trout	BR-2-1	5.0E+00	1.3E+02	1.1E+02	3.8E+01
		Brown Trout	BR-2-2	7.3E+00	1.2E+02	1.2E+02	5.3E+01
		Brown Trout	BR-2-3	5.4E+00	7.3E+01	1.1E+02	3.5E+01
		Brown Trout	BR-2-4	9.0E+00	3.3E+01	1.1E+02	4.2E+01
		Brown Trout	BR-2-5	9.4E+00	1.9E+02	6.3E+01	3.5E+01
		Brown Trout	BR-2-6	7.8E+00	9.7E+01	5.2E+01	4.1E+01

Non-detects were evaluated at 1/2 the detection limit.
All values shown to two significant figures.

Table 5-4
Surface Water Exposures for Wildlife

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

Panel A: Exposure Point Concentrations

	Exposure Point Concentration (EPC) in Surface Water (ug/L)						
COPCs	**French Gulch Reference**	**Discharge**	**North Branch French Gulch**	**South Branch French Gulch**	**French Gulch**	**Blue River Reference**	**Blue River**
Aluminum	356	114,510	463	25	140	184	222
Cadmium	0.42	22,500	87	2.8	6.3	0.16	2.2
Lead	6.4	5,490	463	2.9	10	1.0	5.3
Manganese	198	1,276,690	74,510	61	736	22	77
Mercury	0.10	400	0.10	na	na	na	na
Zinc	95	3,538,000	177,294	2,359	2,539	24	1,075

na = not analyzed
Non-detects were evaluated at 1/2 the detection limit.

Panel B: Dose to Mink

	Dose (mg/kg BW/day)						
COPCs	**French Gulch Reference**	**Discharge**	**North Branch French Gulch**	**South Branch French Gulch**	**French Gulch**	**Blue River Reference**	**Blue River**
Aluminum	3.7E-02	1.2E+01	4.9E-02	2.6E-03	1.5E-02	1.9E-02	2.3E-02
Cadmium	4.4E-05	2.4E+00	9.2E-03	2.9E-04	6.7E-04	1.7E-05	2.3E-04
Lead	6.7E-04	5.8E-01	4.9E-02	3.0E-04	1.1E-03	1.1E-04	5.5E-04
Manganese	2.1E-02	1.3E+02	7.8E+00	6.4E-03	7.7E-02	2.3E-03	8.1E-03
Mercury	1.0E-05	4.2E-02	1.0E-05	na	na	na	na
Zinc	1.0E-02	3.7E+02	1.9E+01	2.5E-01	2.7E-01	2.5E-03	1.1E-01

Panel C: Dose to Great Blue Heron

	Dose (mg/kg BW/day)						
COPCs	**French Gulch Reference**	**Discharge**	**North Branch French Gulch**	**South Branch French Gulch**	**French Gulch**	**Blue River Reference**	**Blue River**
Aluminum	1.6E-02	5.1E+00	2.1E-02	1.1E-03	6.2E-03	8.2E-03	9.9E-03
Cadmium	1.9E-05	1.0E+00	3.9E-03	1.3E-04	2.8E-04	7.2E-06	9.9E-05
Lead	2.8E-04	2.4E-01	2.1E-02	1.3E-04	4.6E-04	4.5E-05	2.3E-04
Manganese	8.8E-03	5.7E+01	3.3E+00	2.7E-03	3.3E-02	9.9E-04	3.4E-03
Mercury	4.5E-06	1.8E-02	4.5E-06	na	na	na	na
Zinc	4.2E-03	1.6E+02	7.9E+00	1.1E-01	1.1E-01	1.1E-03	4.8E-02

Dose = EPC * Intake Rate / Body Weight

Table 5-5
Sediment Exposures for Wildlife

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

Panel A: Exposure Point Concentrations

	Exposure Point Concentration (EPC) in Sediment (mg/kg)					
COPCs	**French Gulch Reference**	**North Branch French Gulch**	**South Branch French Gulch**	**French Gulch**	**Blue River Reference**	**Blue River**
Aluminum	80,000	66,000	na	73,000	78,000	83,000
Arsenic	62	180	171	120	13	24
Cadmium	6.1	210	107	82	2.8	15
Chromium	54	40	na	53	63	82
Copper	66	490	na	320	45	110
Lead	380	6,500	3,389	2,300	160	640
Manganese	1,300	12,000	na	9,100	1,300	1,600
Mercury	0.27	0.35	na	0.29	0.10	0.25
Molybdenum	6.0	16	na	10	5.0	7.0
Selenium	2.0	2.3	na	2.1	0.40	1.1
Zinc	780	35,000	19,704	18,000	600	3,000

na = not analyzed
Non-detects were evaluated at 1/2 the detection limit.

Panel B: Dose to Mink

	Dose (mg/kg BW/day)					
COPCs	**French Gulch Reference**	**North Branch French Gulch**	**South Branch French Gulch**	**French Gulch**	**Blue River Reference**	**Blue River**
Aluminum	2.8E+01	2.3E+01	na	2.6E+01	2.7E+01	2.9E+01
Arsenic	2.2E-02	6.3E-02	6.0E-02	4.2E-02	4.6E-03	8.5E-03
Cadmium	2.1E-03	7.4E-02	3.8E-02	2.9E-02	9.9E-04	5.3E-03
Chromium	1.9E-02	1.4E-02	na	1.9E-02	2.2E-02	2.9E-02
Copper	2.3E-02	1.7E-01	na	1.1E-01	1.6E-02	3.9E-02
Lead	1.3E-01	2.3E+00	1.2E+00	8.1E-01	5.6E-02	2.3E-01
Manganese	4.6E-01	4.2E+00	na	3.2E+00	4.6E-01	5.6E-01
Mercury	9.5E-05	1.2E-04	na	1.0E-04	3.5E-05	8.8E-05
Molybdenum	2.1E-03	5.6E-03	na	3.5E-03	1.8E-03	2.5E-03
Selenium	7.0E-04	8.1E-04	na	7.4E-04	1.4E-04	3.9E-04
Zinc	2.7E-01	1.2E+01	6.9E+00	6.3E+00	2.1E-01	1.1E+00

Panel C: Dose to Great Blue Heron

	Dose (mg/kg BW/day)					
COPCs	**French Gulch Reference**	**North Branch French Gulch**	**South Branch French Gulch**	**French Gulch**	**Blue River Reference**	**Blue River**
Aluminum	3.4E+01	2.8E+01	na	3.1E+01	3.3E+01	3.5E+01
Arsenic	2.6E-02	7.6E-02	7.2E-02	5.1E-02	5.5E-03	1.0E-02
Cadmium	2.6E-03	8.9E-02	4.5E-02	3.5E-02	1.2E-03	6.3E-03
Chromium	2.3E-02	1.7E-02	na	2.2E-02	2.7E-02	3.5E-02
Copper	2.8E-02	2.1E-01	na	1.4E-01	1.9E-02	4.6E-02
Lead	1.6E-01	2.7E+00	1.4E+00	9.7E-01	6.8E-02	2.7E-01
Manganese	5.5E-01	5.1E+00	na	3.8E+00	5.5E-01	6.8E-01
Mercury	1.1E-04	1.5E-04	na	1.2E-04	4.2E-05	1.1E-04
Molybdenum	2.5E-03	6.8E-03	na	4.2E-03	2.1E-03	3.0E-03
Selenium	8.4E-04	9.7E-04	na	8.9E-04	1.7E-04	4.6E-04
Zinc	3.3E-01	1.5E+01	8.3E+00	7.6E+00	2.5E-01	1.3E+00

Dose = EPC * Intake Rate / Body Weight

Table 5-6
Fish Tissue Exposures for Wildlife

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

Panel A: Exposure Point Concentrations

COPCs	Exposure Point Concentration (EPC) in Fish Tissue (mg/kg ww)	
	Blue River Reference (BR-1)	Blue River (BR-2)
Arsenic	0.311	0.009
Cadmium	0.032	0.221
Copper	2.28	0.75
Lead	0.013	0.017
Manganese	0.29	0.09
Zinc	2.37	3.22

Non-detects were evaluated at 1/2 the detection limit.
Based on estimated whole body concentrations.

Panel B: Dose to Mink

COPCs	Dose (mg/kg BW/day)	
	Blue River Reference (BR-1)	Blue River (BR-2)
Arsenic	5.0E-02	1.4E-03
Cadmium	5.2E-03	3.5E-02
Copper	3.7E-01	1.2E-01
Lead	2.2E-03	2.8E-03
Manganese	4.7E-02	1.5E-02
Zinc	3.8E-01	5.2E-01

Panel C: Dose to Great Blue Heron

COPCs	Dose (mg/kg BW/day)	
	Blue River Reference (BR-1)	Blue River (BR-2)
Arsenic	5.5E-02	1.5E-03
Cadmium	5.7E-03	3.9E-02
Copper	4.0E-01	1.3E-01
Lead	2.4E-03	3.0E-03
Manganese	5.2E-02	1.7E-02
Zinc	4.2E-01	5.7E-01

Dose = EPC * Intake Rate / Body Weight

Table 6-1
Ambient Water Quality Criteria (AWQC) for Aquatic Receptors

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

Basic Equation for Hardness-Dependant COPCs:
AWQC Dissolved = exp[a*ln(Hardness)+b] * [m-n*ln(Hardness)]

COPC	Acute				Chronic				AWQC Upper Hardness Limits (mg/L as CaCO3)		AWQC Dissolved (ug/L) at Hardness = 100	
	a	b	m	n	a	b	m	n	Acute	Chronic	Acute	Chronic
Aluminum	na	na	1.0	0	na	na	1.0	0	na	na	750	87
Cadmium	1.0166	-3.924	1.137	0.0418	0.7409	-4.719	1.102	0.0418	360	209	2.01	0.26
Copper	0.9422	-1.700	0.960	0	0.8545	-1.702	0.960	0	400	211	13	9
Iron	na	na	1.0	0	na	na	1.0	0	na	na	2000	1000
Lead	1.273	-1.460	1.462	0.1457	1.273	-4.705	1.462	0.1457	360	151	64.6	2.5
Mercury	na	na	0.850	0	na	na	0.850	0	na	na	1.19	0.6545
Nickel	0.8460	2.255	0.998	0	0.8460	0.0584	0.997	0	360	210	468	52
Silver	1.72	-6.52	0.850	0	na	na	0.850	0	350	350	3.4	1.7
Zinc	0.8473	0.8840	0.978	0	0.8473	0.8840	0.986	0	500	211	117	117

na = not hardness dependant

AWQC Source: EPA (1999)
Cadmium AWQC Source: EPA (2001)

Iron AWQC is not available for acute toxicity; assumed to be chronic * 2.
Silver AWQC is not available for chronic toxicity; assumed to be acute / 2.
Silver conversion factors (m,n) for total to dissolved and an upper hardness limit are not available for chronic toxicity; assumed to be equal to acute.

If measured station hardness is above the specified upper hardness limit, the applicable upper hardness limit is used to calculate the AWQC.

Table 6-2
Reliability of Individual Consensus-Based Sediment Quality Guidelines

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

COPC	% of Samples Correctly Predicted to Be Non-Toxic based on TEC	TEC Reliable?	% of Samples Correctly Predicted to Be Toxic based on PEC	PEC Reliable?
Arsenic	74%	No	77%	Yes
Cadmium	80%	Yes	94%	Yes
Chromium	72%	No	92%	Yes
Copper	82%	Yes	92%	Yes
Lead	82%	Yes	90%	Yes
Mercury	34%	No	100%	Yes
Nickel	72%	No	91%	Yes
Zinc	82%	Yes	90%	Yes

Source: MacDonald et al. (2000)

Table 6-3
Sediment Toxicity Benchmarks for Benthic Invertebrates

Baseline Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

COPC	Selected Sediment Toxicity Benchmark (mg/kg)		Source
	Low	High	
Aluminum	13,500	73,160	Ingersoll et al., 1996
Arsenic	9.79	33	MacDonald et al., 2000
Cadmium	0.99	4.98	MacDonald et al., 2000
Chromium	93.4	111	MacDonald et al., 2000
Copper	31.6	149	MacDonald et al., 2000
Iron	188,400	289,900	Ingersoll et al., 1996
Lead	35.8	128	MacDonald et al., 2000
Manganese	631	4,460	Ingersoll et al., 1996
Mercury	0.18	1.06	MacDonald et al., 2000
Nickel	22.7	48.6	MacDonald et al., 2000
Silver	0.73	3.7	MES, 1994 (Low); Long and Morgan, 1995 (High)
Zinc	121	459	MacDonald et al., 2000

MacDonald et al. (2000) -- based on consensus-based TEC and PEC values.

Ingersoll et al. (1996) -- based on the minimum and maximum reported values for 28 day *Hyalella azteca.*

Long and Morgan (1995) -- based on NOAA ERM values.

MacDonald Environmental Sciences (MES) (1994) -- based on Florida TEL value.

Table 6-4
Summary of Selected Fish Tissue Burden TRVs

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

COPC	Test Species	Tissue Type	No-Effect Level (mg/kg dw)
Arsenic	Rainbow Trout	Whole Body	10
Cadmium	Brook Trout	Kidney	16
	Rainbow Trout	Liver	18.75
		Muscle	0.45
Copper	Brook Trout	Egg	7
		Kidney	16.5
		Liver	239
	Rainbow Trout	Muscle	2.5
Lead	Brook Trout	Kidney	700
		Liver	100
Zinc	Brook Trout	Kidney	184.5
		Liver	300

Source: Jarvinen and Ankley (1999).
See Appendix E for further details

Table 6-5
Uncertainty Factors Used in Deriving Wildlife TRVs

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

Category	Basis for Uncertainty	Description	Uncertainty Factor
A	Inter-taxon Extrapolation	Same species	1
		Same genus, different species	2
		Same family, different genus	3
		Same order, different family	4
		Same class, different order	5
		Same phylum, different class	Do not use
B	Exposure Duration	Chronic study, approximately steady-state	1
		Subchronic studies, steady state not achieved	3
		Subacute studies (7-29 days for terrestrial)	5
		Acute studies (1-3 days for aquatic)	10
		Peracute studies (less than 1 day, single dose)	15
C	Toxicological Endpoint	NOEL for non-lethal sensitive endpoint	0.75 to 1
		NOEL for lethality or severe endpoint	2
		NOAEL for non-lethal sensitive endpoint	1 to 2
		NOAEL for lethality or severe endpoint	3
		LOEL for non-lethal sensitive endpoint	2 to 3
		LOEL for lethality or severe endpoint	5
		LOAEL for non-lethal sensitive endpoint	3 to 5
		LOAEL for lethality or severe endpoint	10
		FEL for non-lethal sensitive endpoint	5 to 10
		FEL for lethality or severe endpoint	15
D	Modifying Factors	Endangered species Threatened species Listed species	2 1.5 1.25
		Relevance of toxicological endpoint to assessment endpoints	1 to 2
		Extrapolation from test conditions to site conditions	0.5 to 2
		Relevance of exposure medium and co-contaminants	0.5 to 2
		Relevance of mechanism to receptor of concern	1 to 2
		Sensitivity of test species compared to receptor of concern	0.5 to 2
		Reliability of methods used to estimate tissue levels	1 to 2
		Differences in age, gender, development	1 to 2
		Other factors	0.5 to 2

TRV = Study Dose / Total UCF

Total UCF = $A \cdot B \cdot C \cdot D$, where $A = a_1 \cdot a_2 \cdot a_3 \cdot \text{.........} \cdot a_n$

Table 6-6
Summary of TRVs for Wildlife Receptors

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site Breckenridge, Colorado

Chemical	TRV	Mink		Great Blue Heron	
		Diet	Water	Diet	Water
Aluminum	NOAEL	2.3	1.1	35	18
	LOAEL	11.0	5.5	175	88
Arsenic	NOAEL	0.2	0.3	0.8	0.41
	LOAEL	0.5	0.8	7.1	3.5
Cadmium	NOAEL	0.5	0.2	0.09	0.04
	LOAEL	1.0	0.5	2.4	1.2
Chromium	NOAEL	800	400	0.2	0.1
	LOAEL	2400	1200	1.0	0.5
Copper	NOAEL	9	18	4.0	2.0
	LOAEL	13	26	6.0	3.0
Lead	NOAEL	0.31	0.16	0.9	0.4
	LOAEL	0.61	0.31	1.8	0.9
Manganese	NOAEL	18	8.8	65	33
	LOAEL	57	28	195	98
Mercury	NOAEL	1.4	0.7	0.09	0.05
	LOAEL	4.1	2.1	0.18	0.09
Molybdenum	NOAEL	0.01	0.02	2.4	1.2
	LOAEL	0.26	0.52	7.1	3.5
Selenium	NOAEL	0.08	0.04	0.10	0.05
	LOAEL	0.13	0.07	0.20	0.10
Zinc	NOAEL	311	156	26	13
	LOAEL	933	467	79	39

All units in mg/kg BW/day

Appendix A
Electronic Database – electronic files available on request

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Appendix B
Evaluation of Surface Water Data for Outliers

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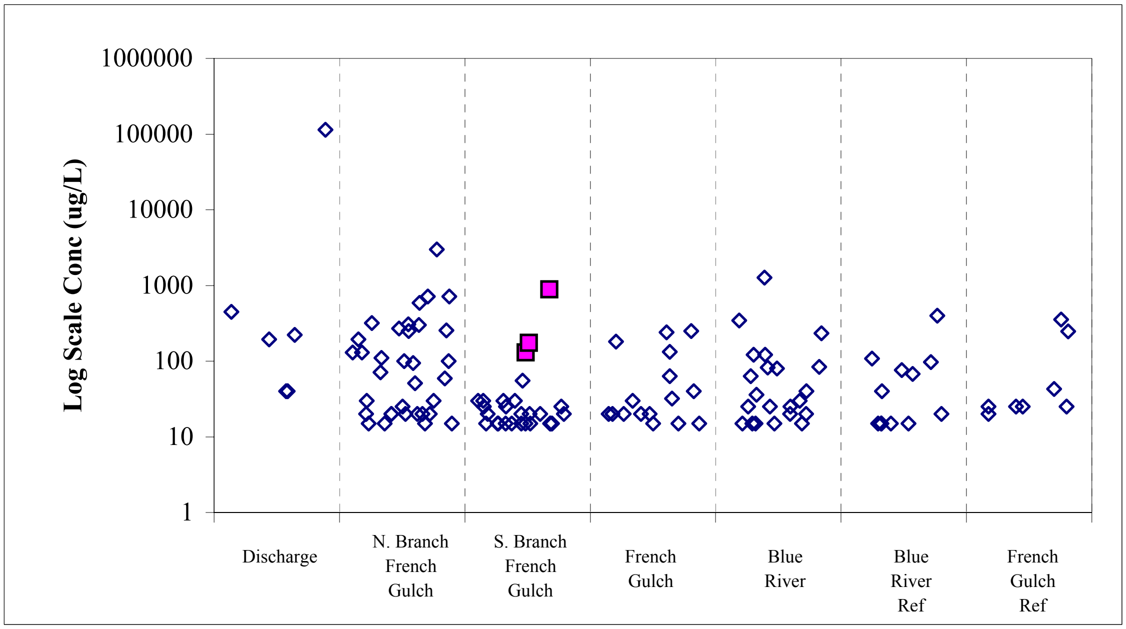
47 Confirmed Outliers via Rosner Outlier Test*

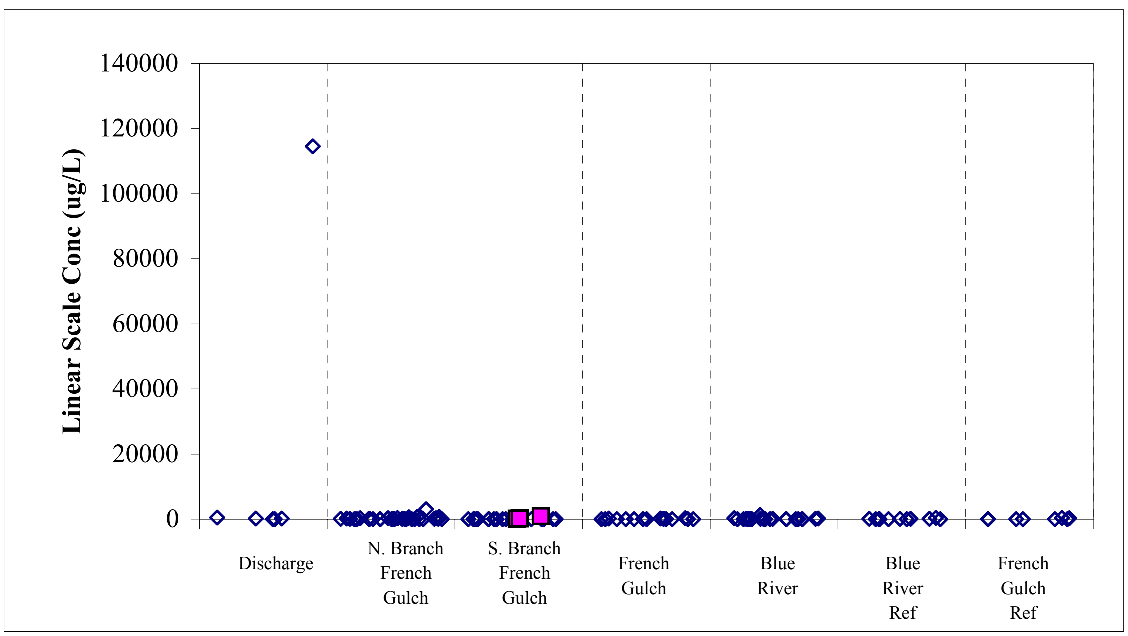
General Location	Station ID	Analysis Type	Parameter	Concentration (ug/L)	Outlier Type
Blue River Reference	BR-1	Dissolved	Cadmium	1.5	High
Blue River Reference	BR-1	Dissolved	Iron	5	Low
Blue River Reference	655	Dissolved	Iron	70	High
Blue River Reference	BR-1	Dissolved	Lead	7.98	High
Blue River Reference	BR-1	Dissolved	Lead	15.4	High
Blue River Reference	BR-1	Dissolved	Lead	20	High
Blue River Reference	BR-1	Total	Lead	8	High
Blue River Reference	654	Total	Zinc	605	High
Blue River	BR-Dillon	Dissolved	Aluminum	1	Low
Blue River	BR-2	Dissolved	Arsenic	1.1	High
Blue River	BR-3	Dissolved	Chromium	143	High
Blue River	BR-2	Total	Manganese	15000	High
French Gulch	FG-9	Dissolved	Aluminum	80	High
French Gulch	FG-9	Dissolved	Aluminum	111	High
French Gulch	FG-9	Dissolved	Aluminum	634	High
French Gulch	FG-9	Dissolved	Arsenic	0.25	Low
French Gulch	FG-9	Dissolved	Arsenic	0.25	Low
French Gulch	FG-9	Dissolved	Arsenic	0.4	Low
French Gulch	FG-9A	Dissolved	Arsenic	0.4	Low
French Gulch	FG-9	Dissolved	Chromium	30	High
French Gulch	FG-9	Dissolved	Chromium	90	High
French Gulch	FG-9	Dissolved	Nickel	15	High
French Gulch	FG-9	Dissolved	Nickel	21	High
French Gulch	FG-9	Dissolved	Nickel	85	High
French Gulch	FG-9	Dissolved	Sodium	4200	High
French Gulch	FG-9A	Dissolved	Zinc	30	Low
French Gulch	FG-10	Dissolved	Zinc	670	Low
South Branch French Gulch	FG-5.5	Dissolved	Aluminum	0.1	Low
South Branch French Gulch	FG-8	Dissolved	Aluminum	55	High
South Branch French Gulch	FG-8	Total	Aluminum	130	High
South Branch French Gulch	FG-8	Total	Aluminum	174	High
South Branch French Gulch	FG-5	Total	Aluminum	888	High
South Branch French Gulch	FG-8	Total	Arsenic	0.4	Low
South Branch French Gulch	FG-5	Total	Arsenic	1.2	High
South Branch French Gulch	FG-5	Total	Arsenic	1.9	High
South Branch French Gulch	FG-4	Total	Cadmium	72	High
South Branch French Gulch	FG-4	Total	Copper	70	High
South Branch French Gulch	FG-5	Total	Iron	953.1	High
South Branch French Gulch	FG-4	Total	Iron	16000	High
South Branch French Gulch	FG-4	Total	Lead	360	High
South Branch French Gulch	FG-4	Total	Manganese	1400	High
South Branch French Gulch	FG-4	Dissolved	Nickel	15	High
South Branch French Gulch	FG-5	Dissolved	Nickel	15	High
South Branch French Gulch	FG-8	Dissolved	Nickel	15	High
South Branch French Gulch	FG-4	Total	Nickel	15	High
South Branch French Gulch	FG-5	Total	Nickel	15	High
South Branch French Gulch	FG-8	Total	Nickel	15	High

*Discharge and North Branch French Gulch measurements were retained due to high variability in source materials.

Total Outliers	**47**
High Outliers	**37**
Low Outliers	**10**

Measured Aluminum Concentrations (Total) in Surface Water



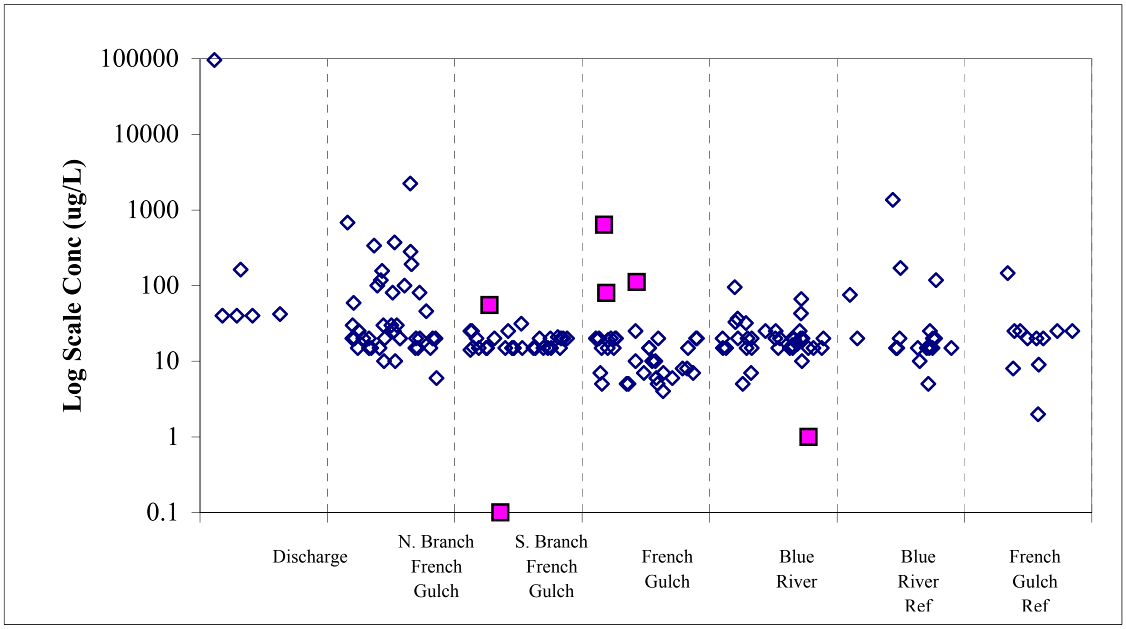


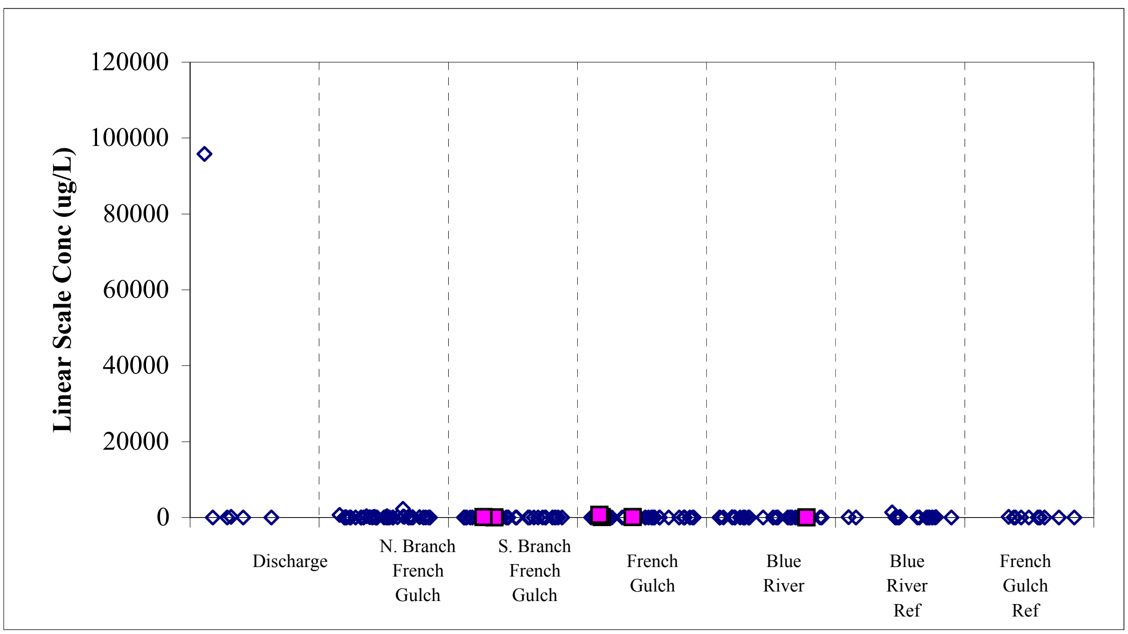
◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

outlier graphs_table.xls: Figure
5/8/2002

Measured Aluminum Concentrations (Dissolved) in Surface Water





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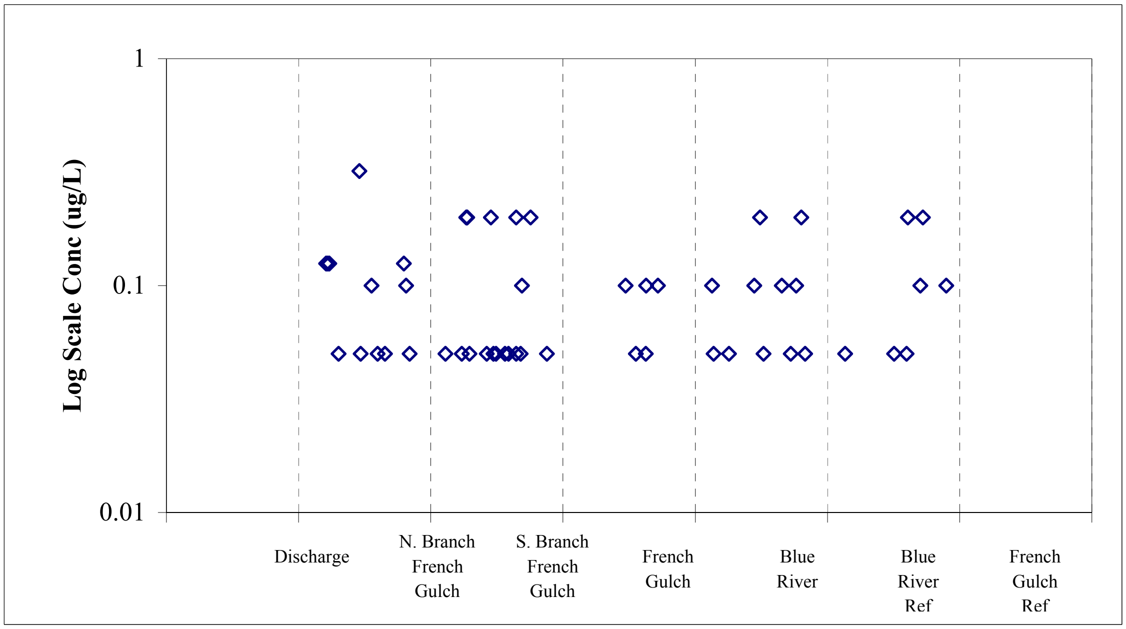
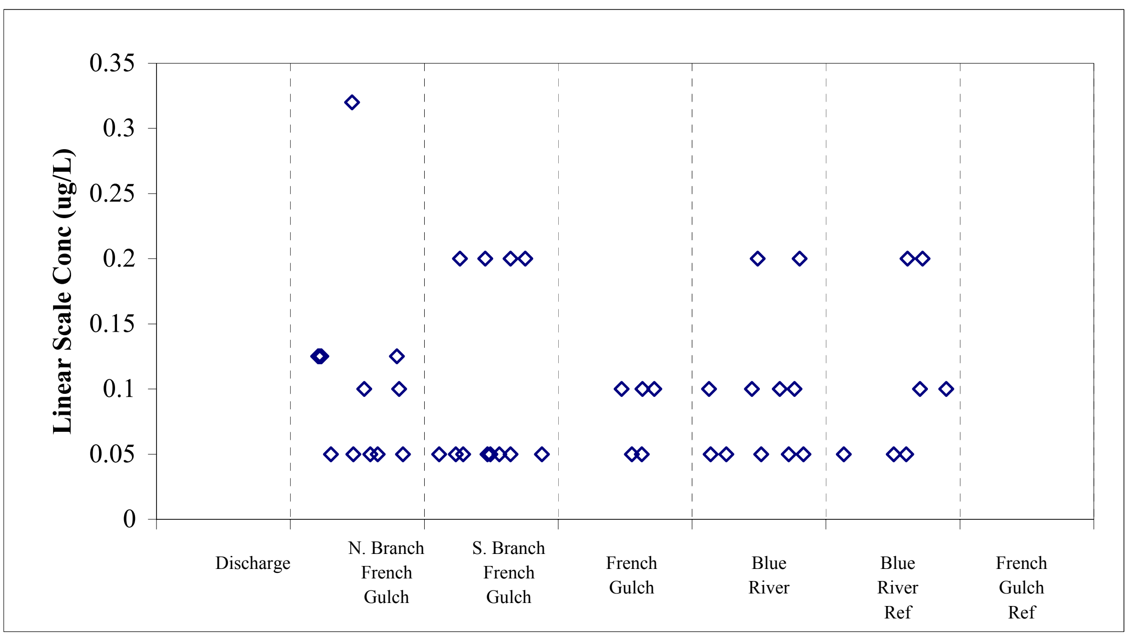
■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

Measured Antimony Concentrations (Total) in Surface Water

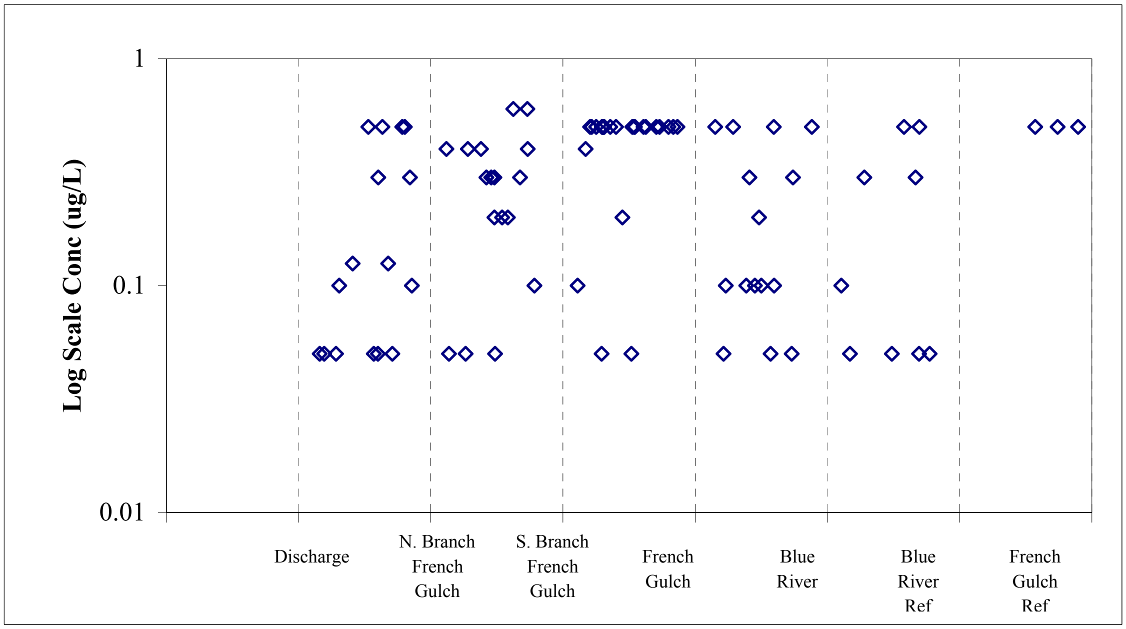


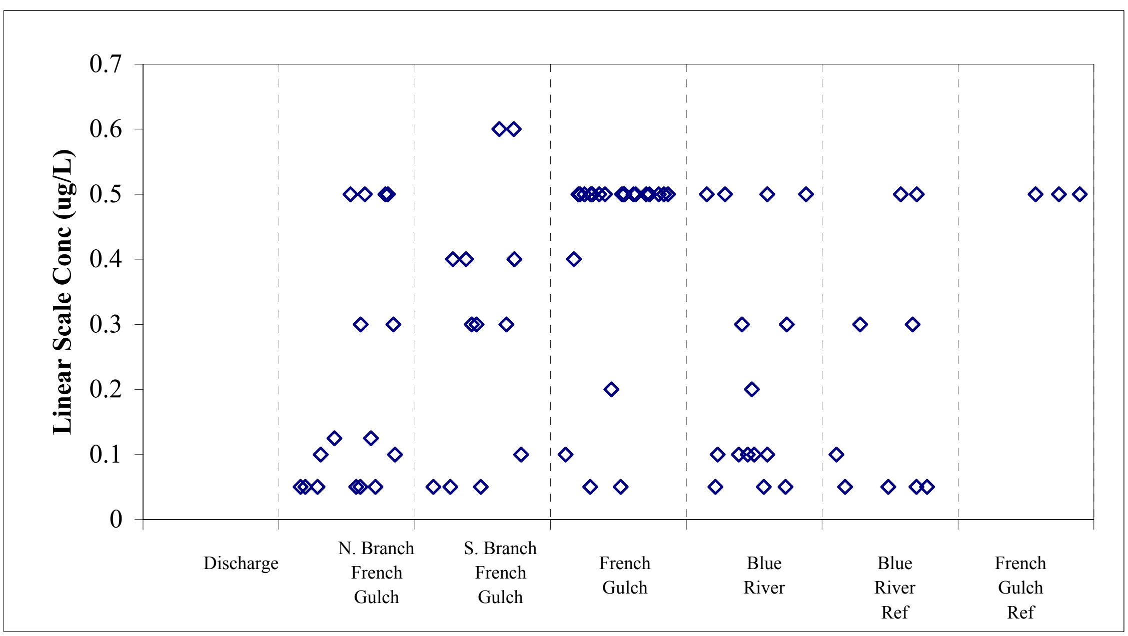


◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

Measured Antimony Concentrations (Dissolved) in Surface Water





◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

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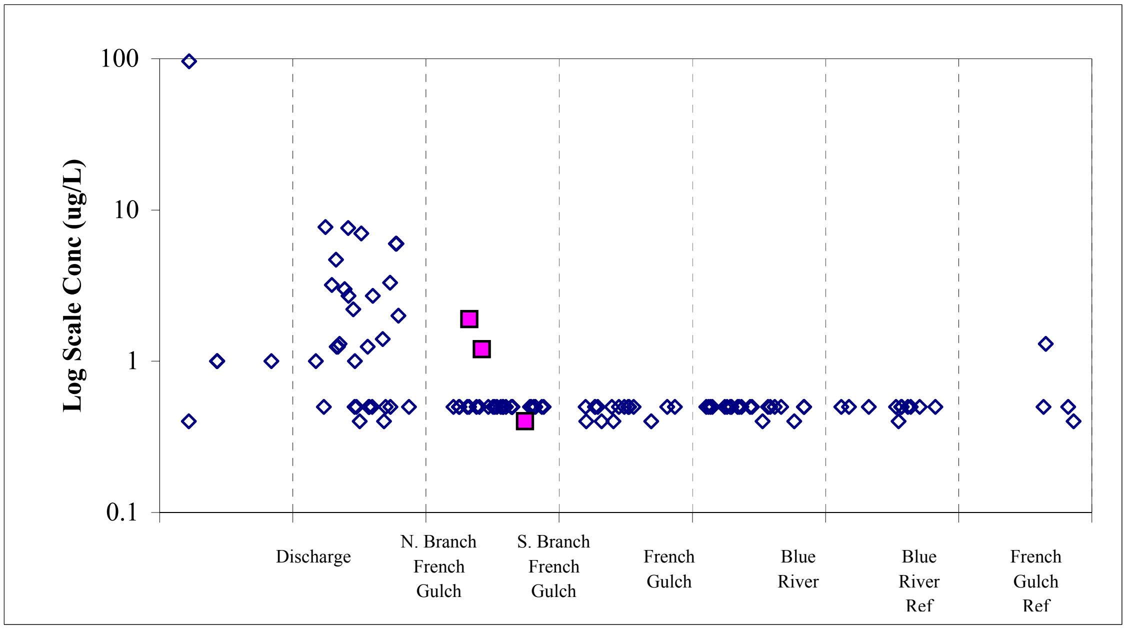
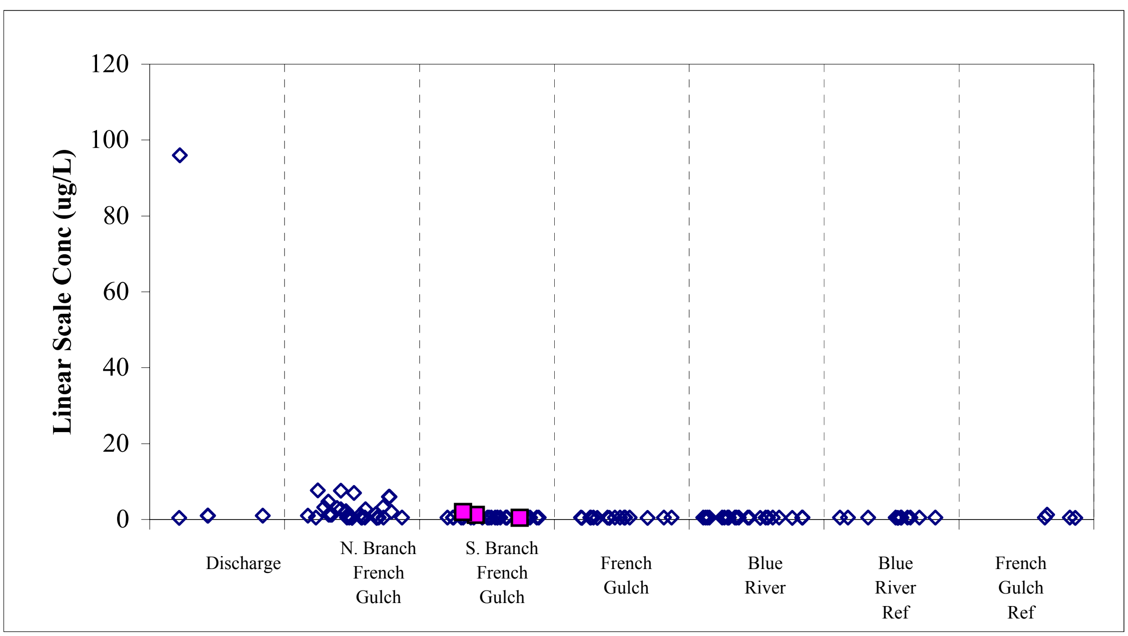
Measured Arsenic Concentrations (Total) in Surface Water

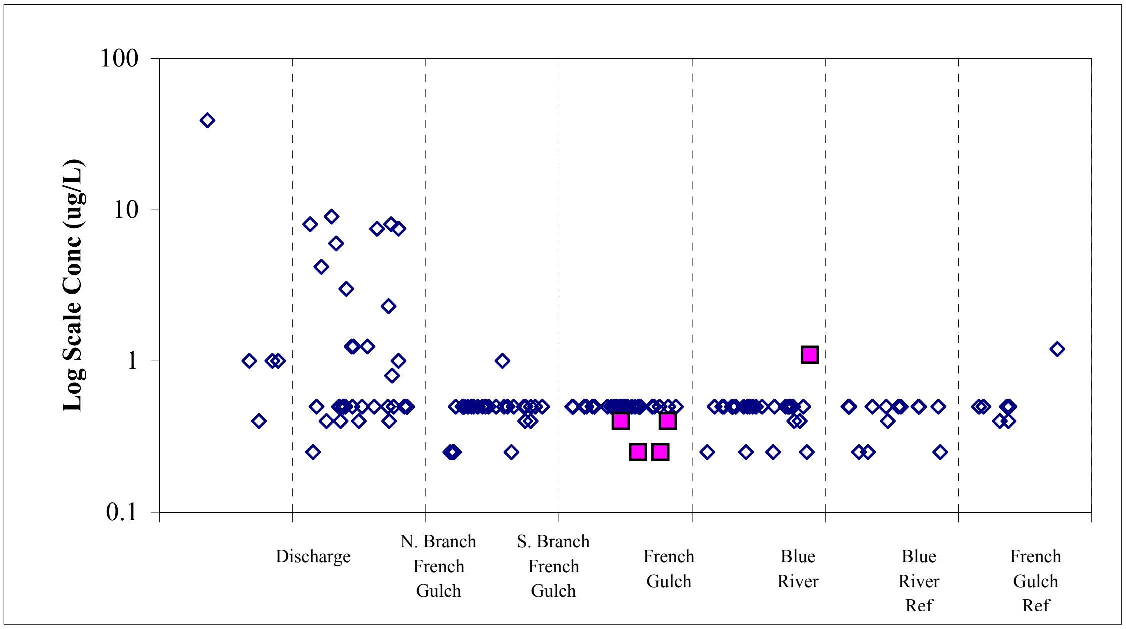


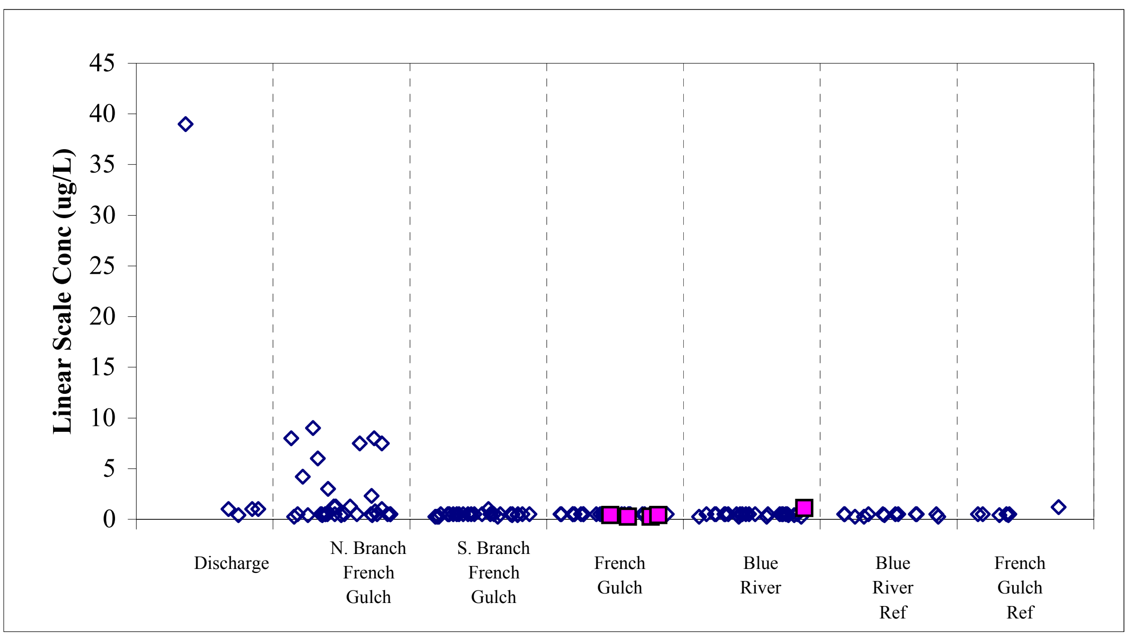


◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

Measured Arsenic Concentrations (Dissolved) in Surface Water



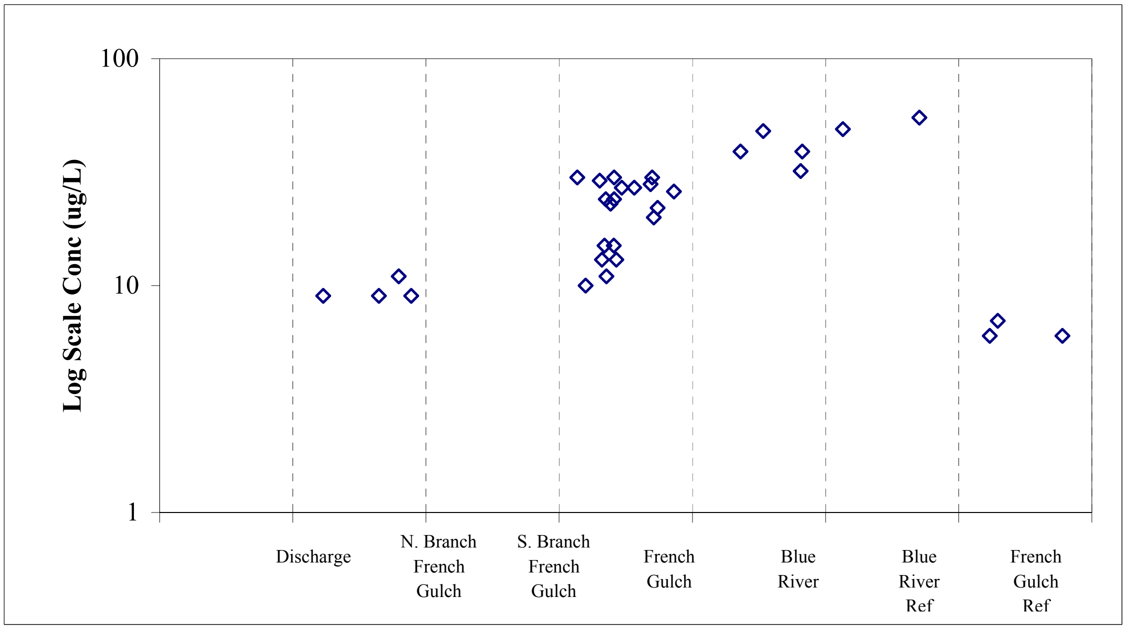


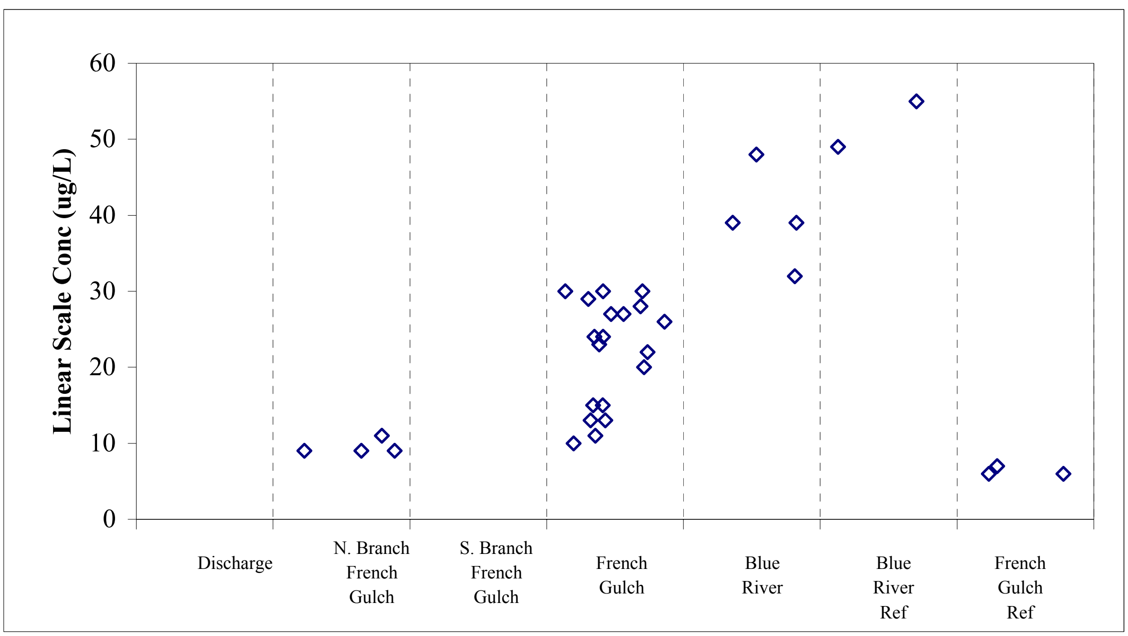
◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

outlier graphs_table.xls: Figure
5/8/2002

Measured Barium Concentrations (Dissolved) in Surface Water



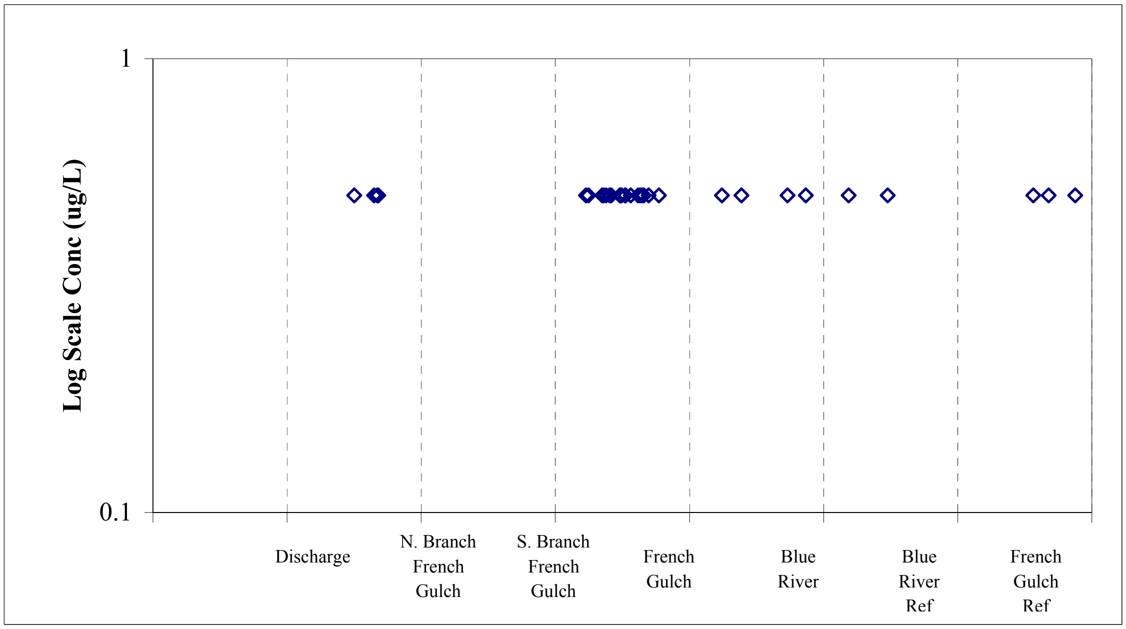


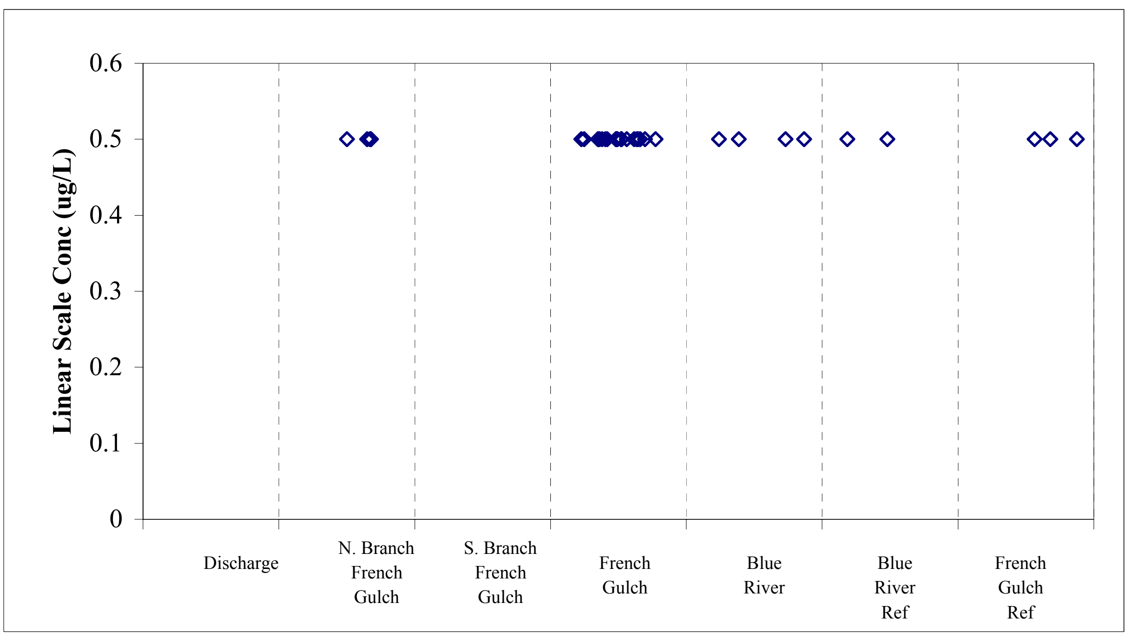
◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

outlier graphs_table.xls: Figure
5/8/2002

Measured Beryllium Concentrations (Dissolved) in Surface Water



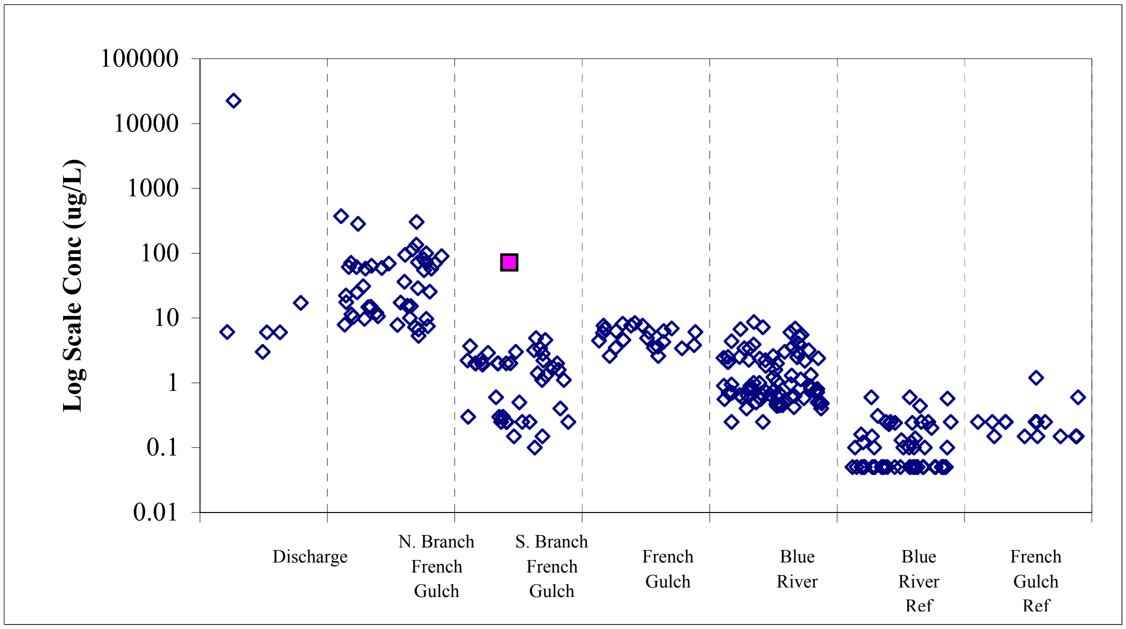


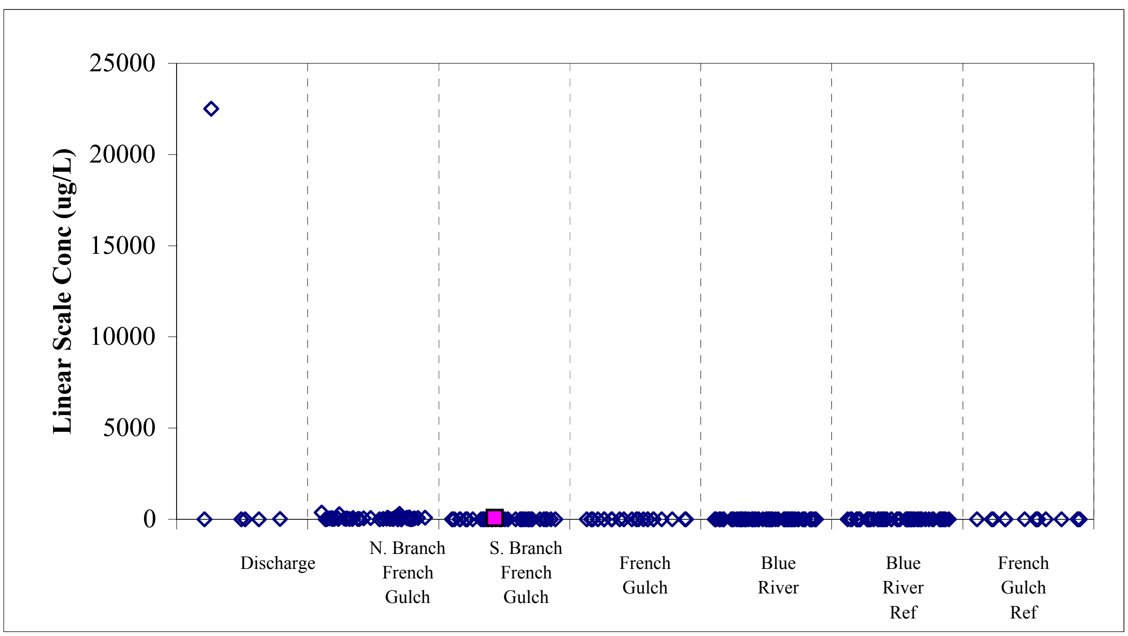
◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

outlier graphs_table.xls: Figure
5/8/2002

Measured Cadmium Concentrations (Total) in Surface Water



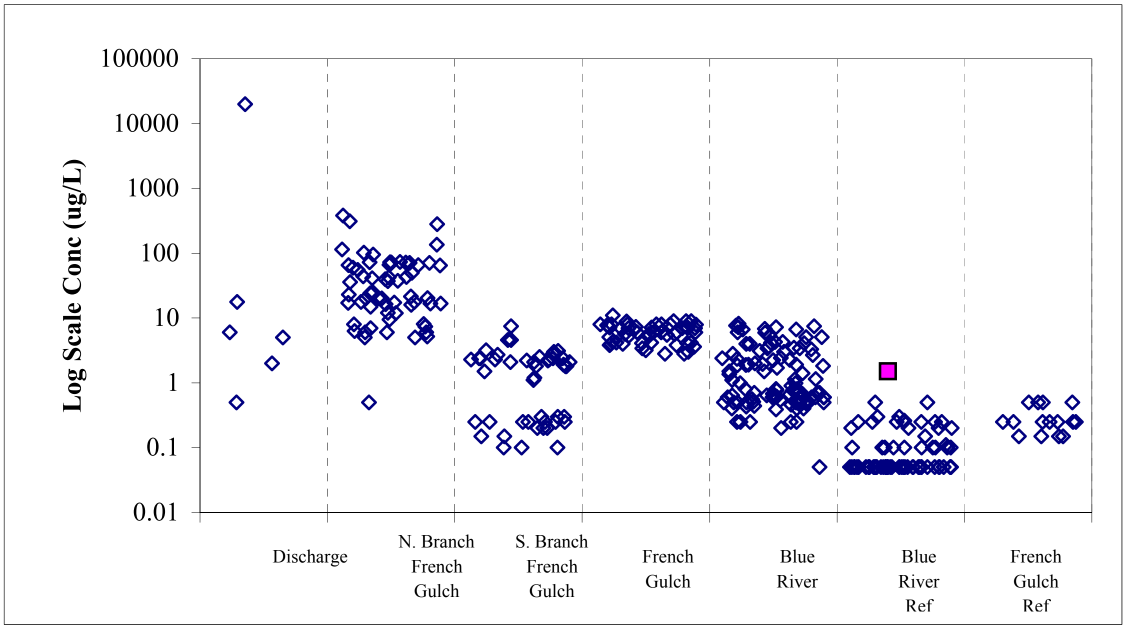


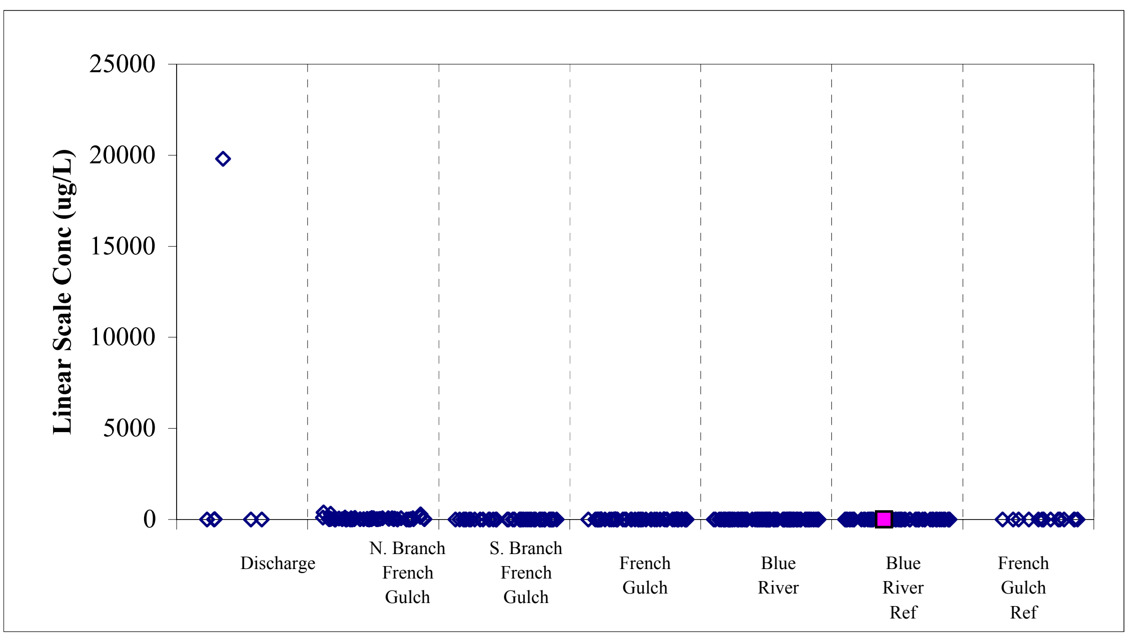
◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

outlier graphs_table.xls: Figure
5/8/2002

Measured Cadmium Concentrations (Dissolved) in Surface Water

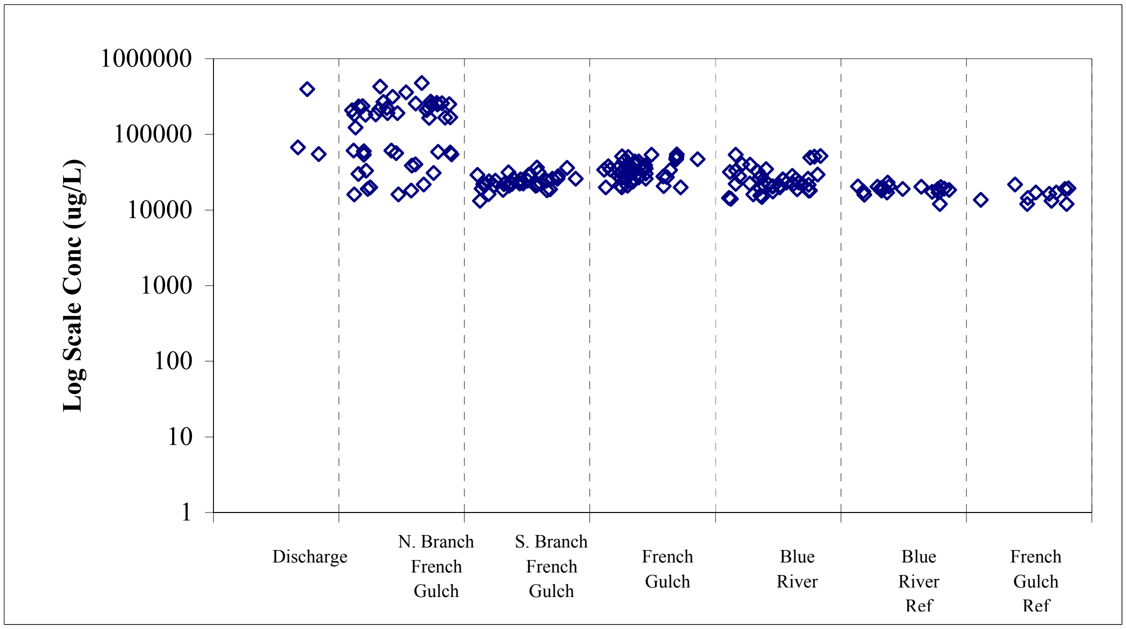


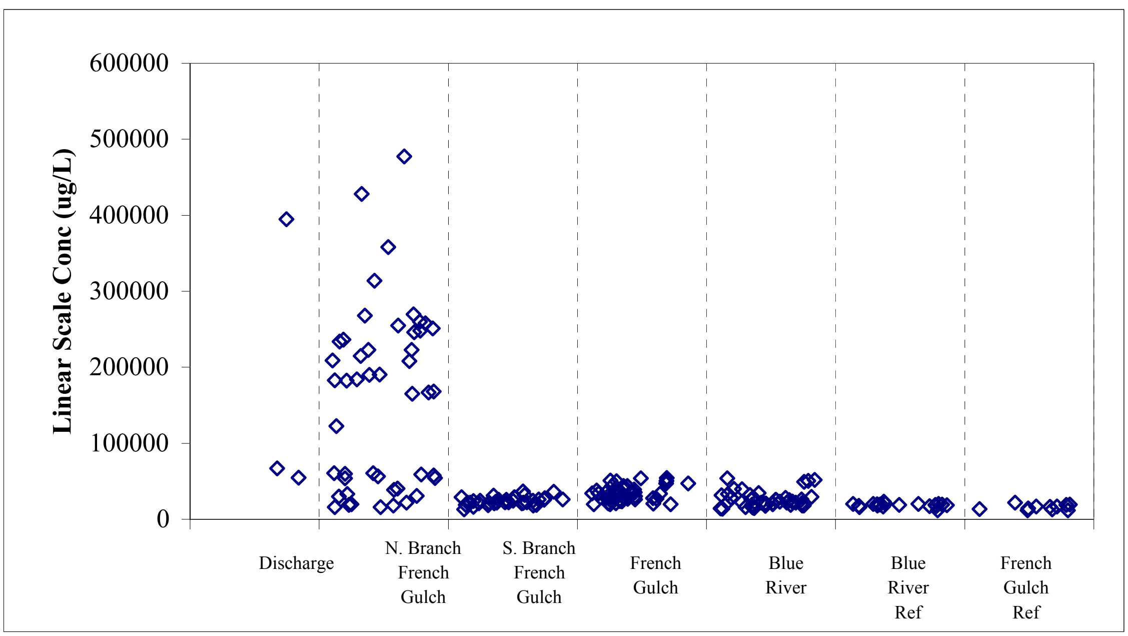


◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

Measured Calcium Concentrations (Dissolved) in Surface Water

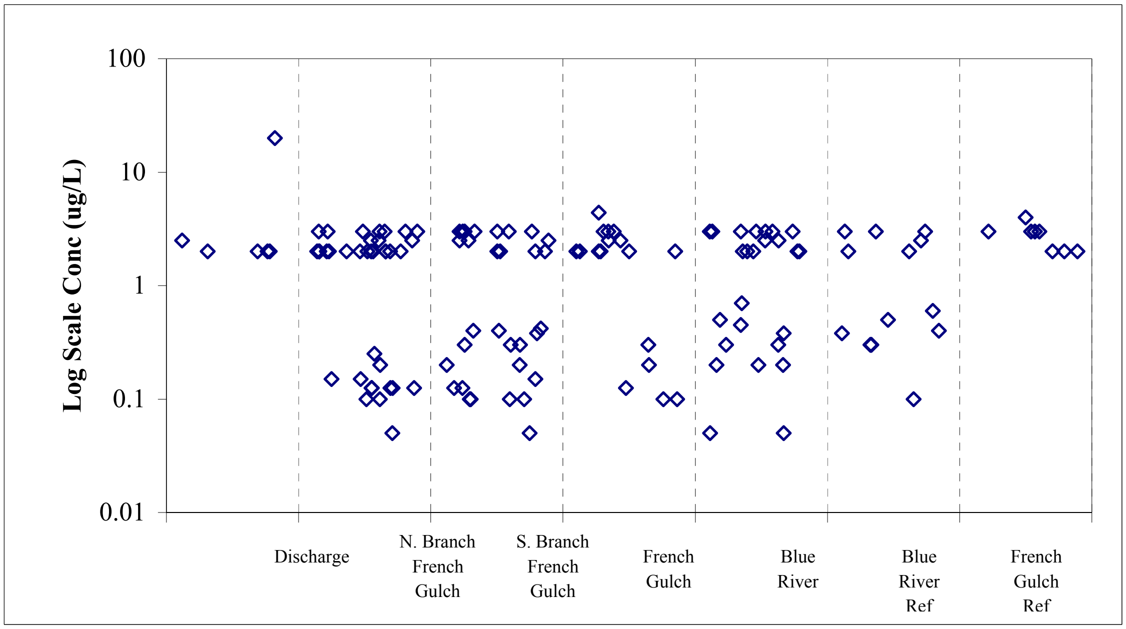


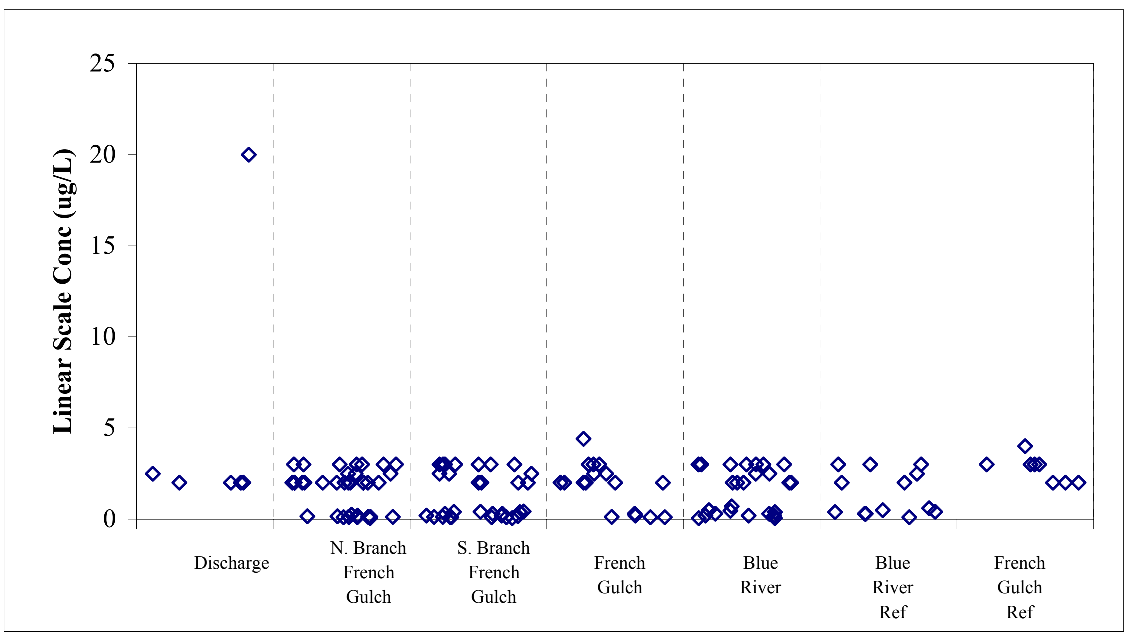


Sampling measurement (not detects are presented as 1/2 the detection limit)

Confirmed as an outlier via Rosner outlier test and excluded from dataset

Measured Chromium Concentrations (Total) in Surface Water

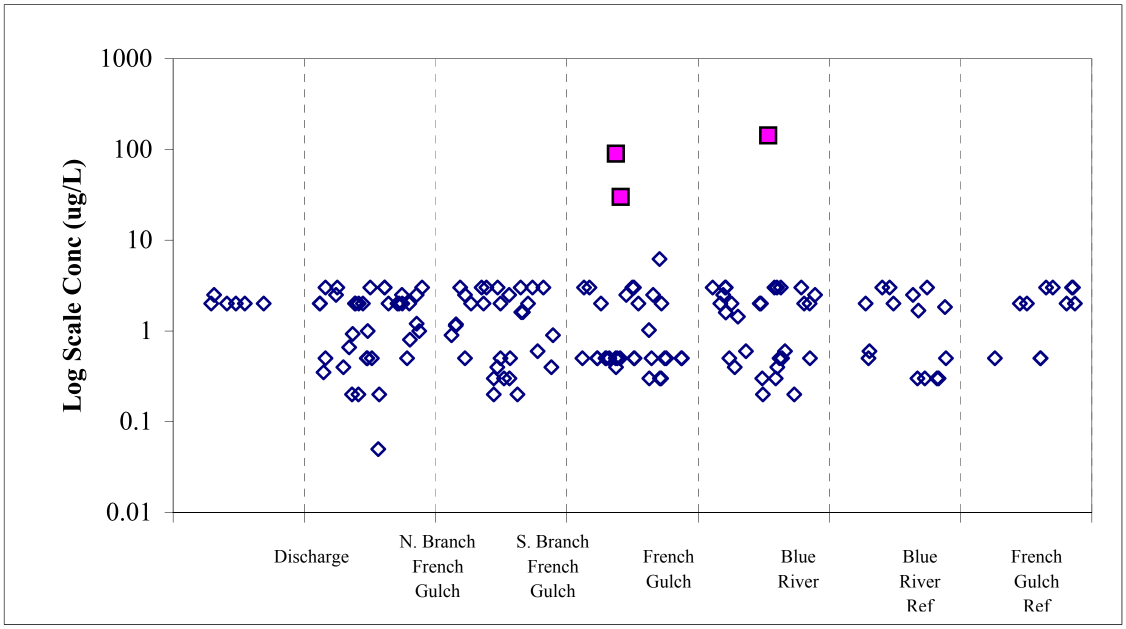


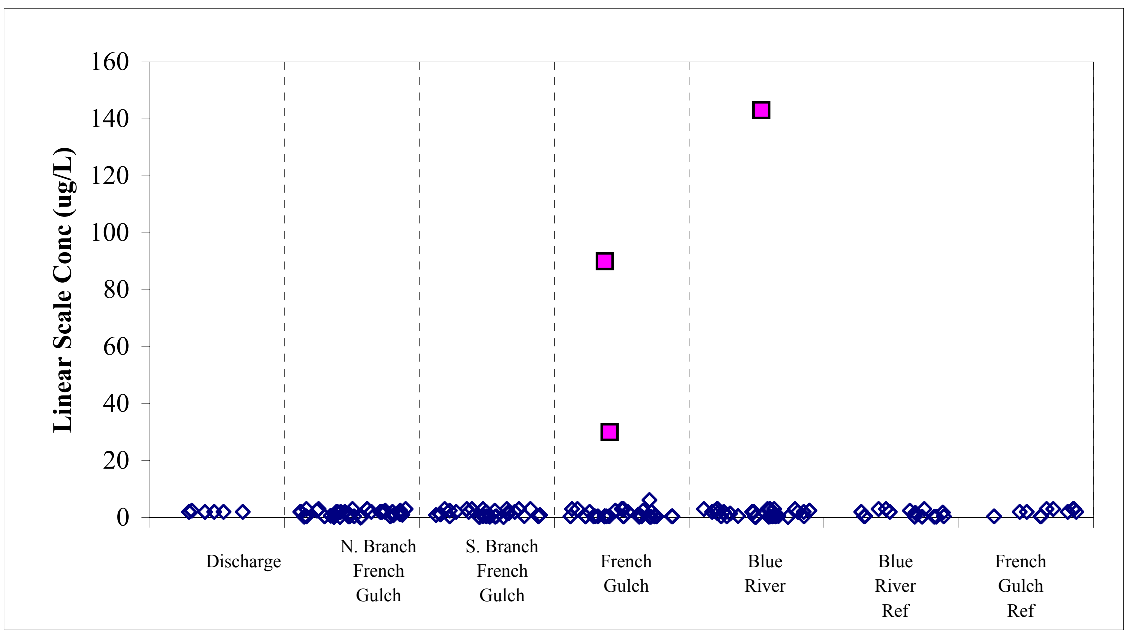


◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

Measured Chromium Concentrations (Dissolved) in Surface Water

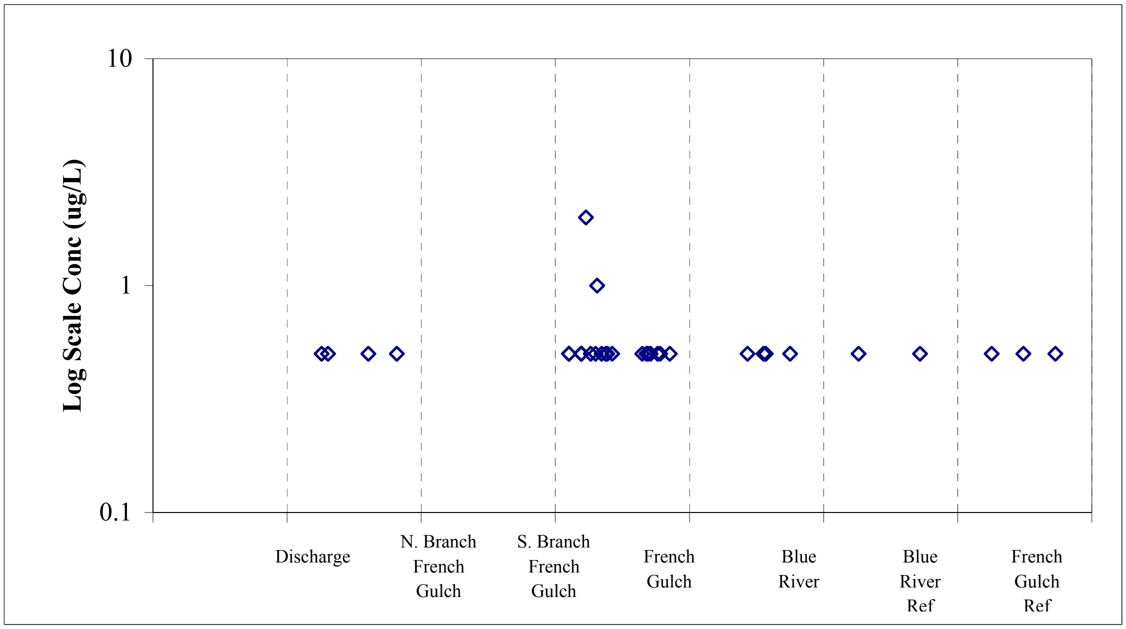


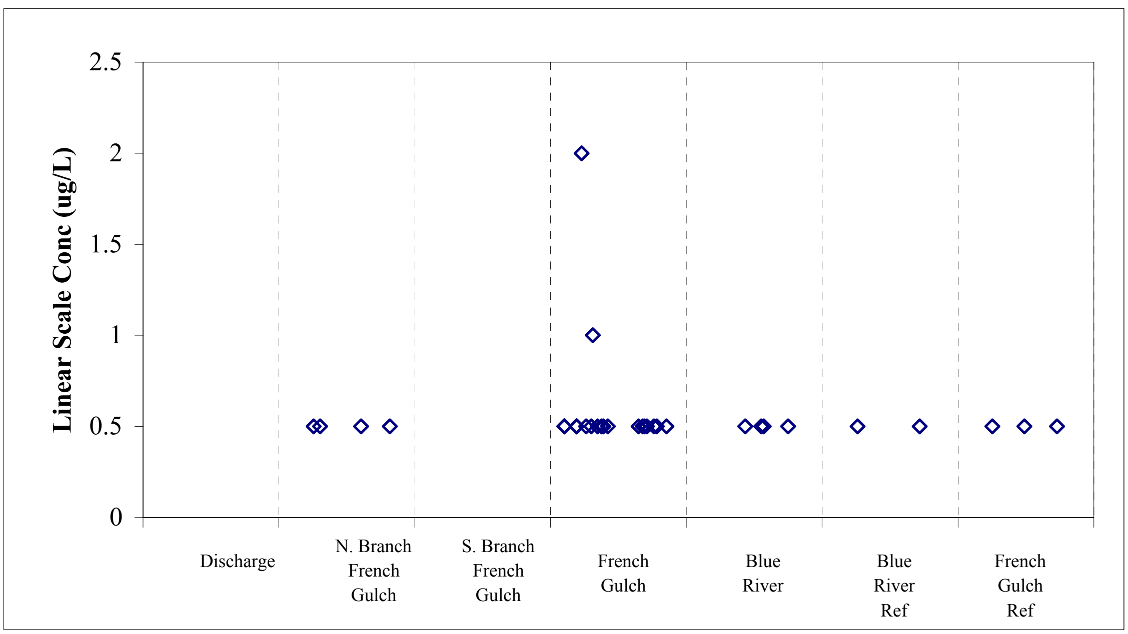


Sampling measurement (not detects are presented as 1/2 the detection limit)

Confirmed as an outlier via Rosner outlier test and excluded from dataset

Measured Cobalt Concentrations (Dissolved) in Surface Water





◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

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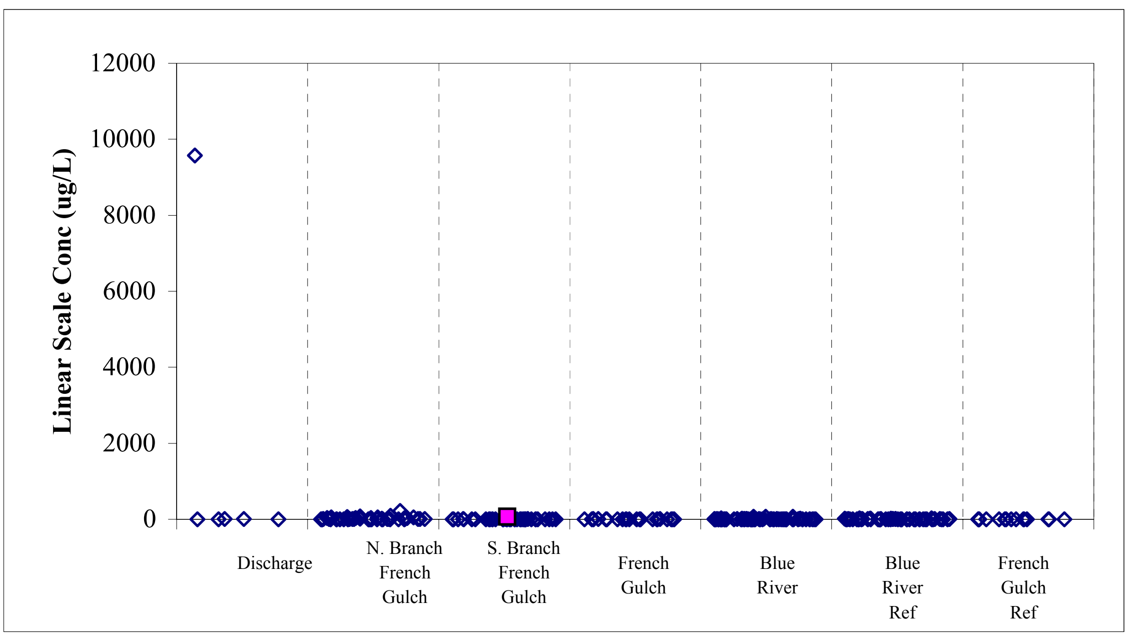
5/8/2002

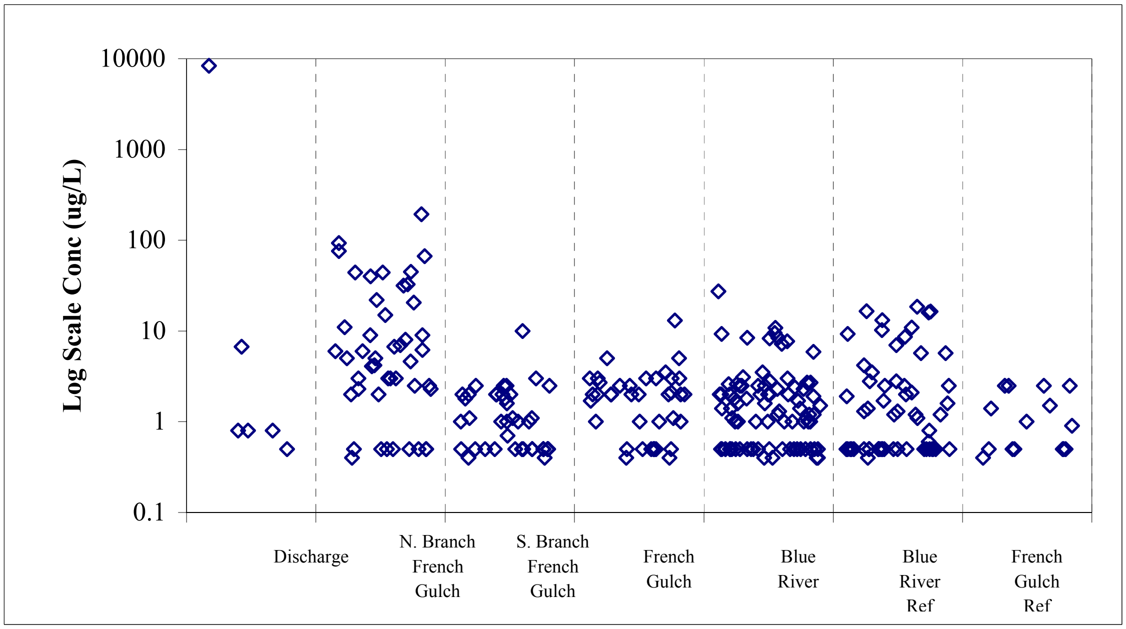
Measured Copper Concentrations (Total) in Surface Water

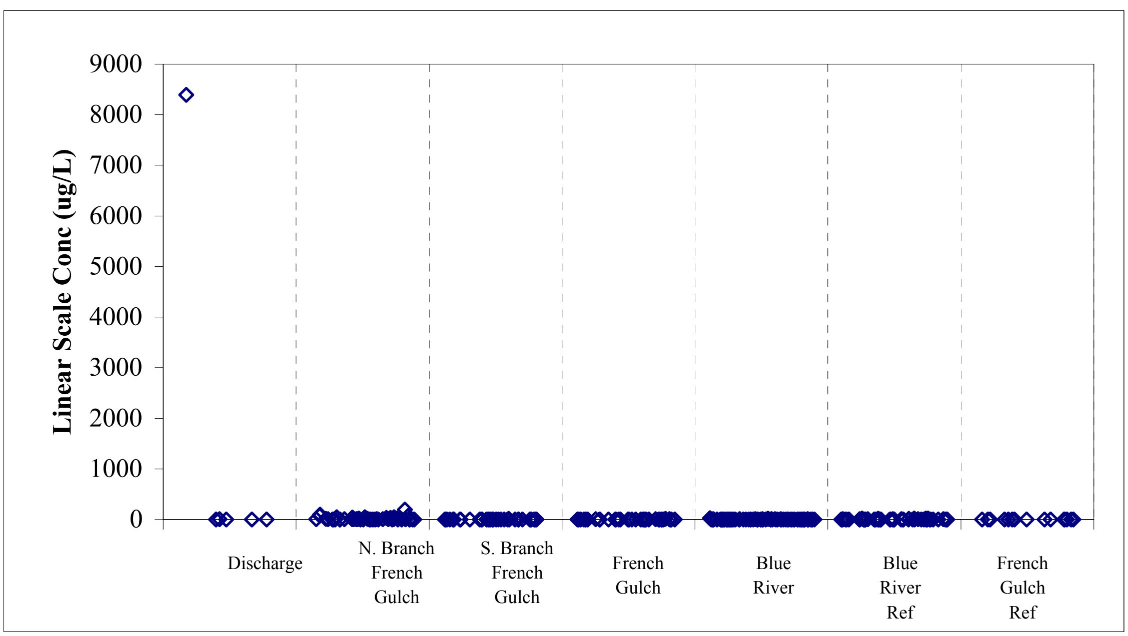


◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

Measured Copper Concentrations (Dissolved) in Surface Water

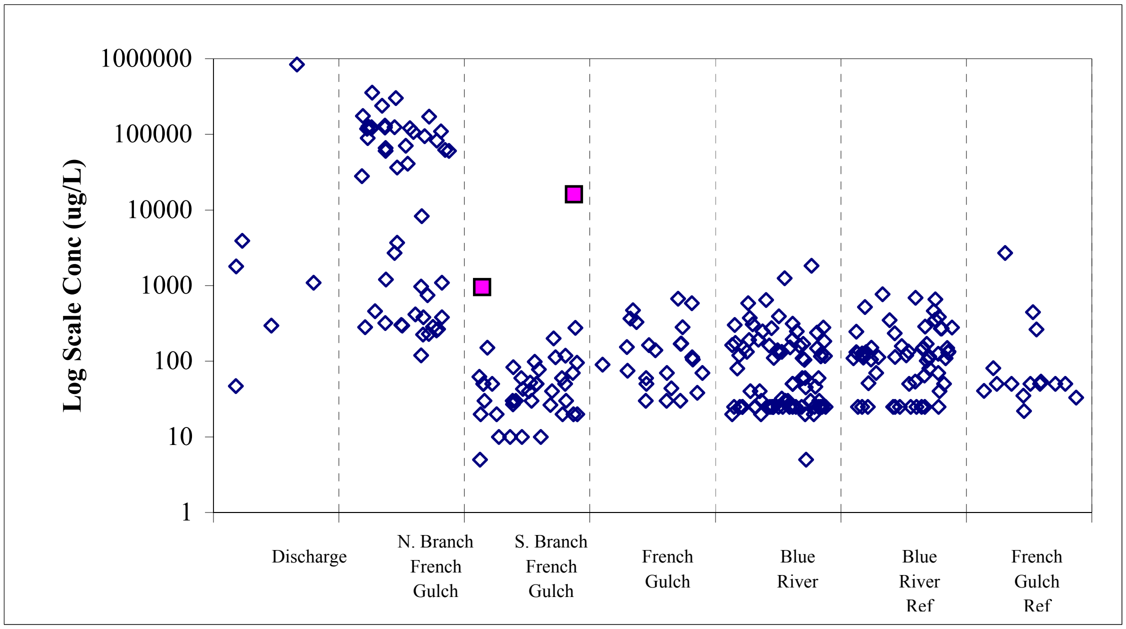


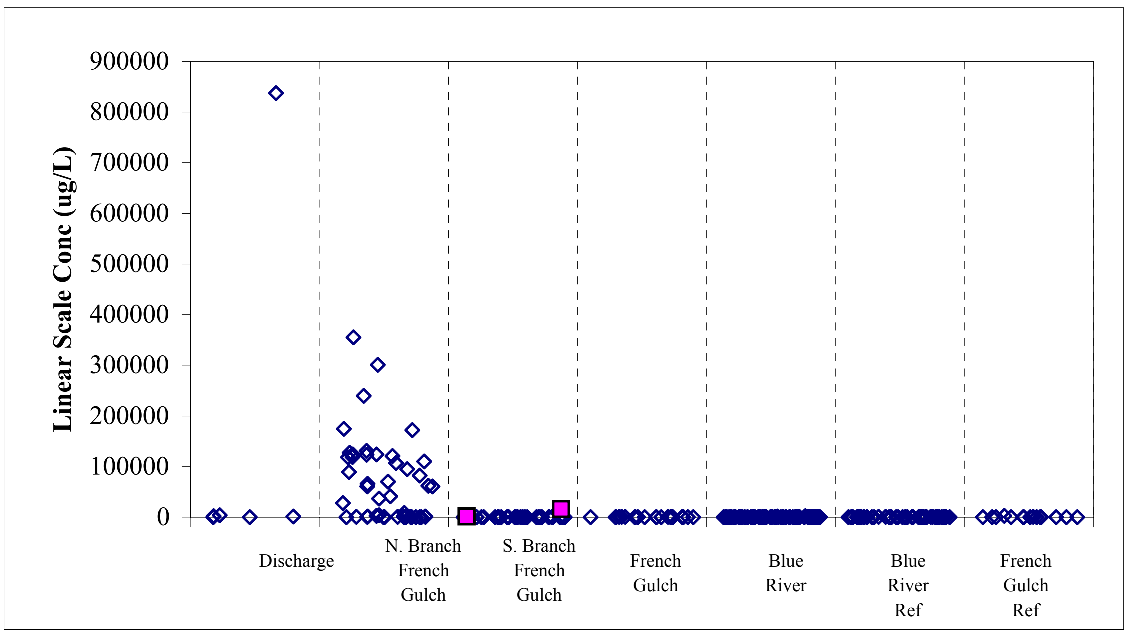


◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

Measured Iron Concentrations (Total) in Surface Water

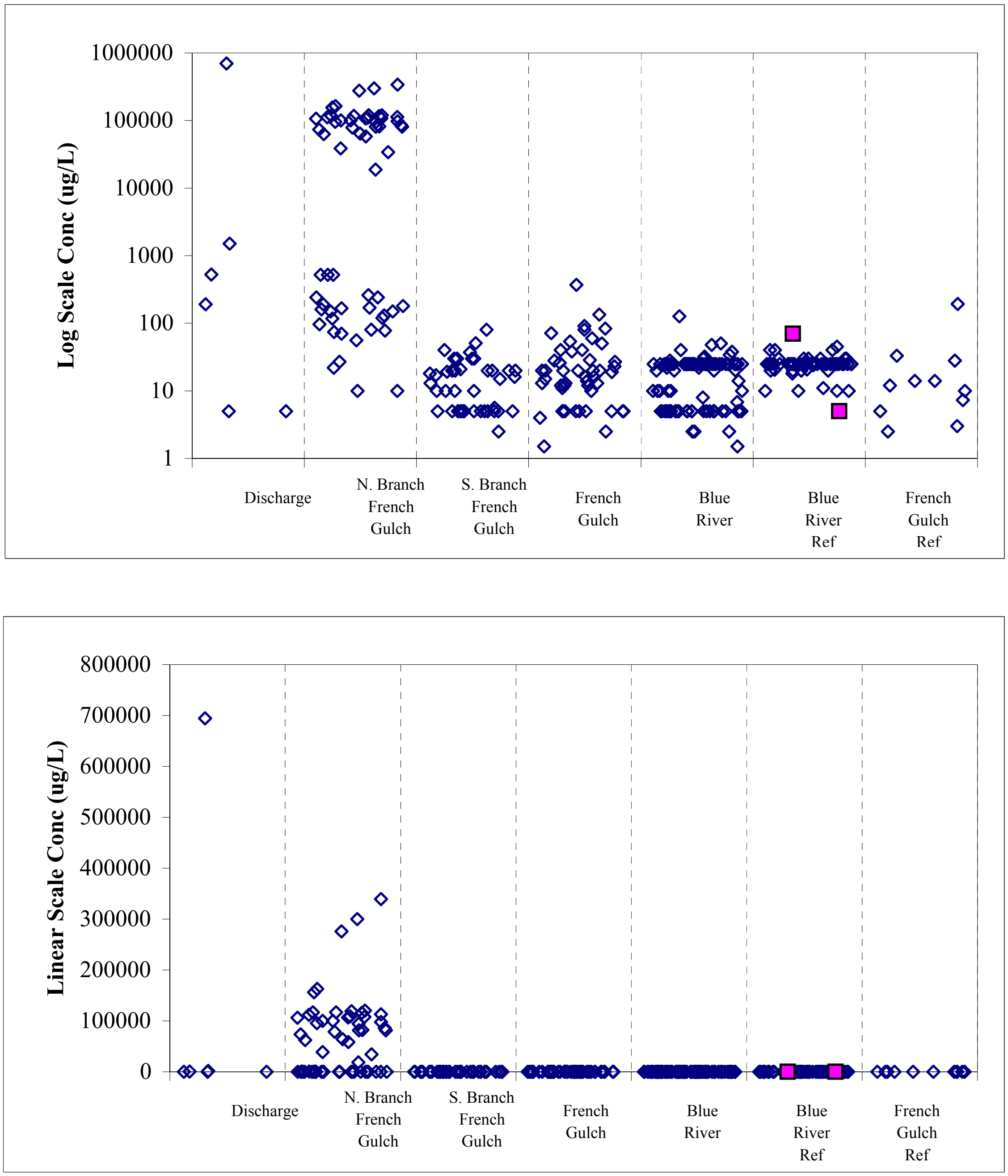




◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

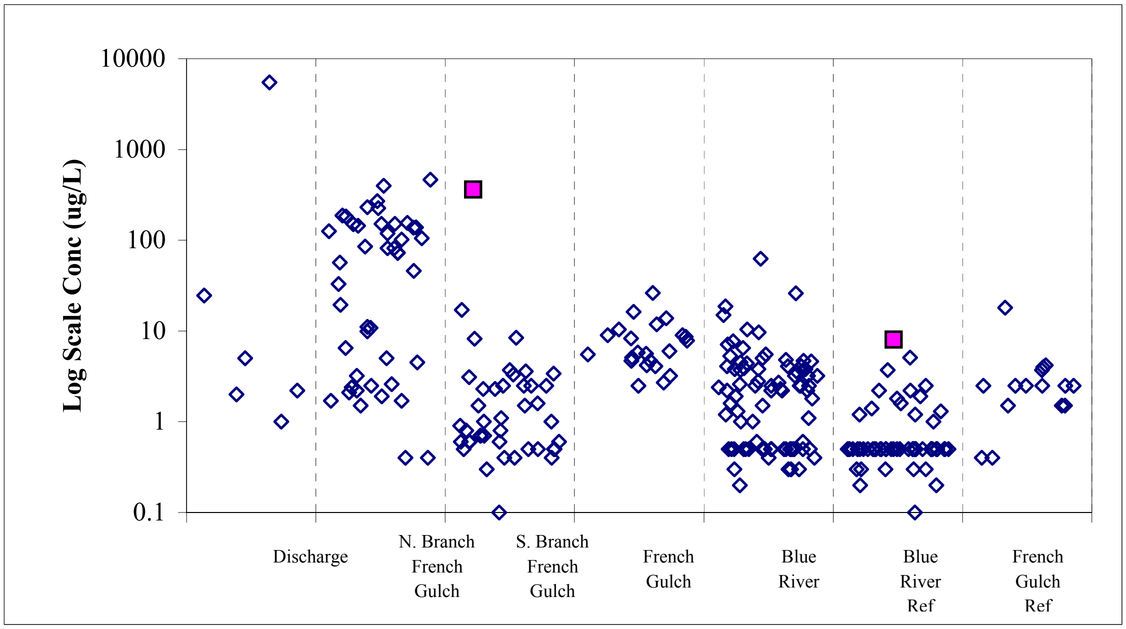
Measured Iron Concentrations (Dissolved) in Surface Water

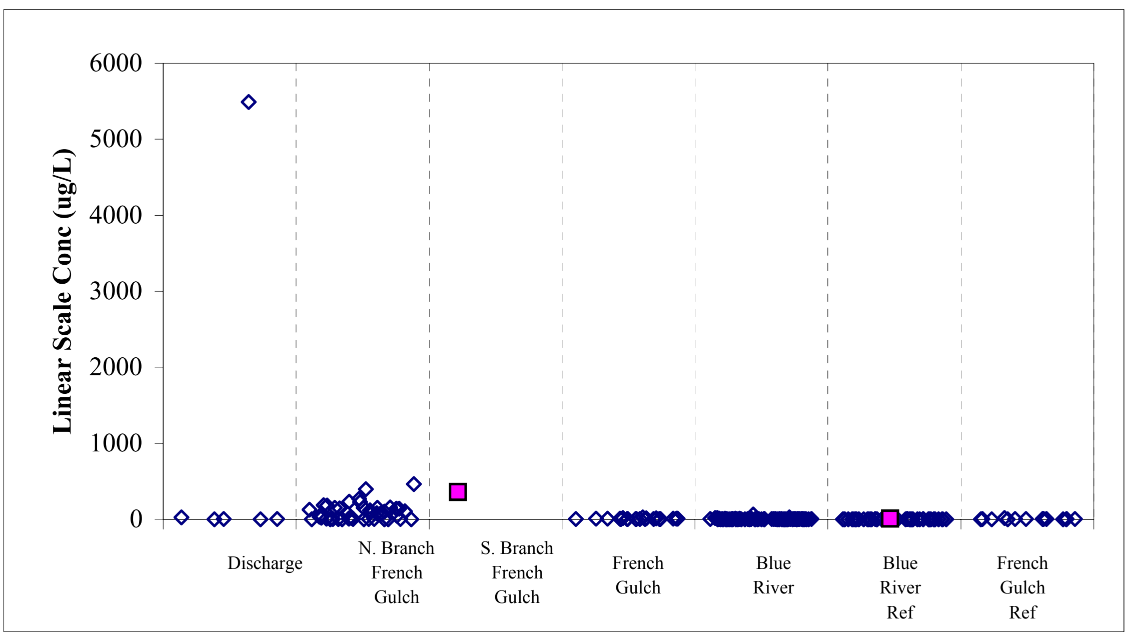


◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

Measured Lead Concentrations (Total) in Surface Water



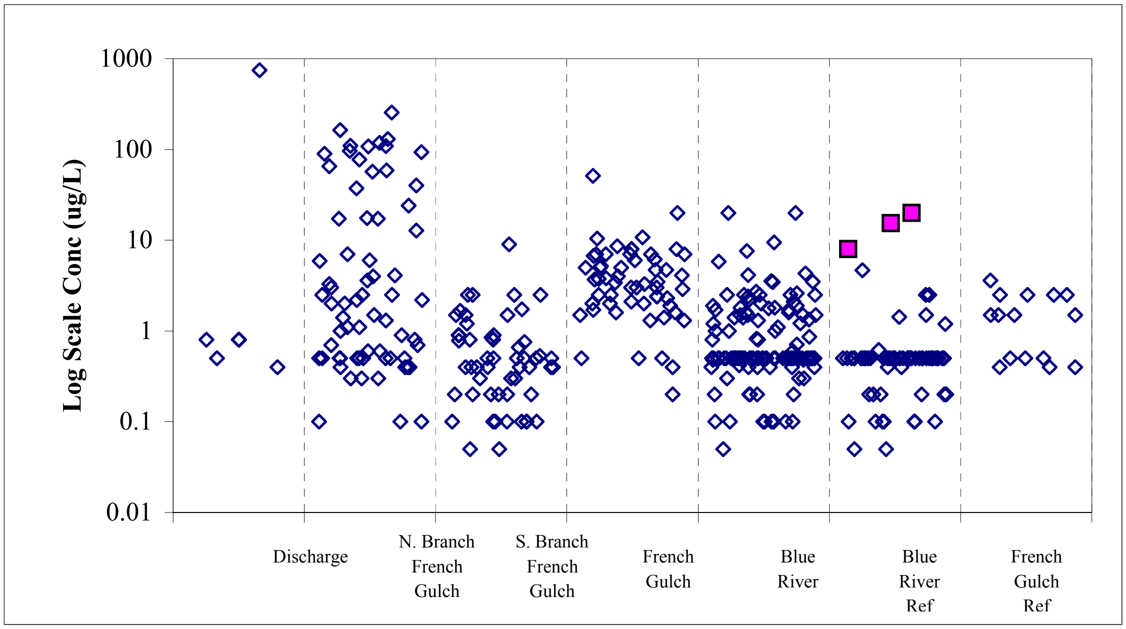


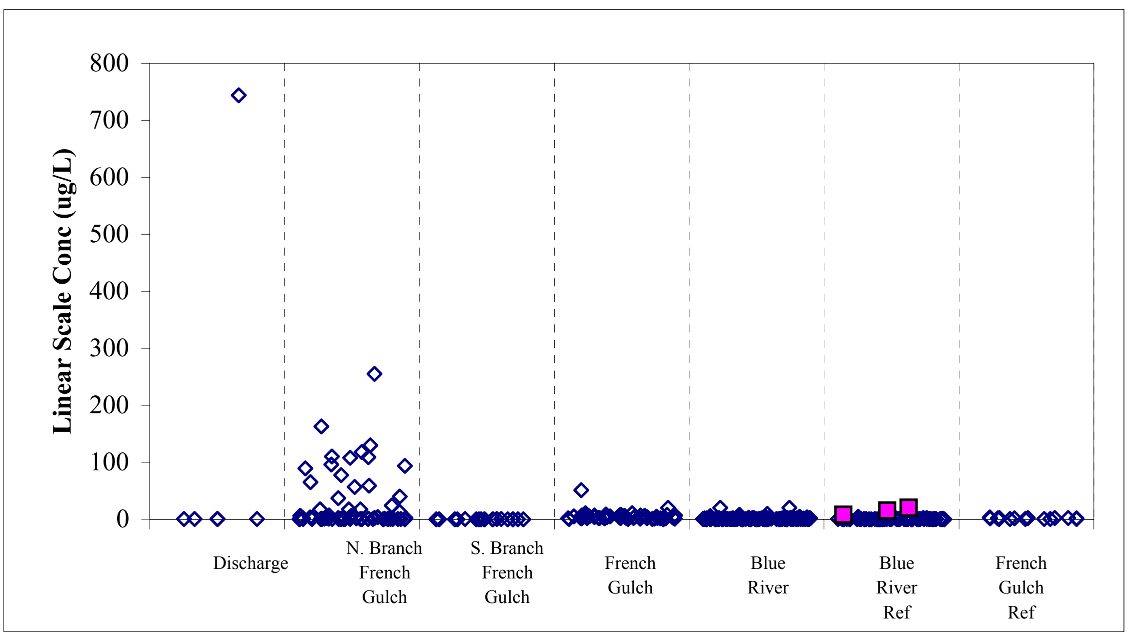
◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

outlier graphs_table.xls: Figure
5/8/2002

Measured Lead Concentrations (Dissolved) in Surface Water

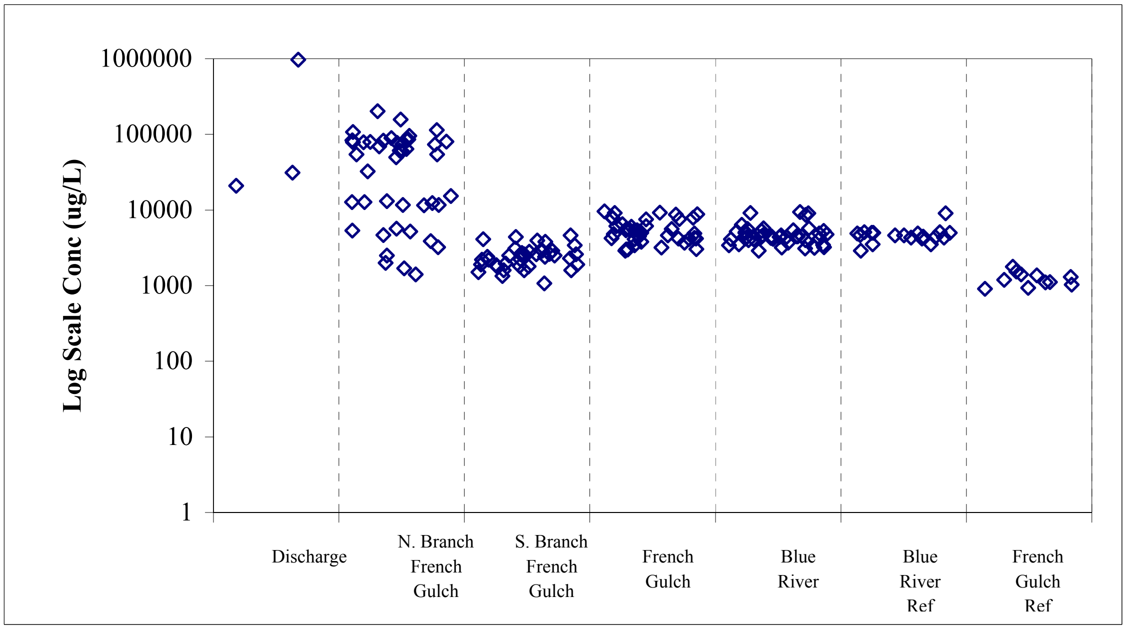


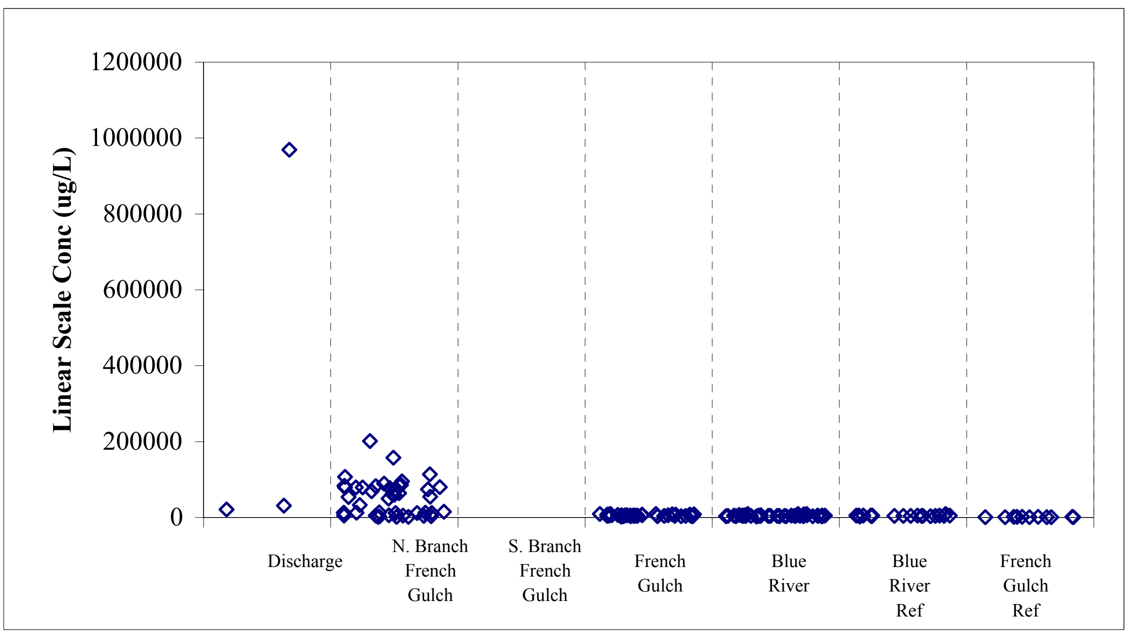


◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

Measured Magnesium Concentrations (Dissolved) in Surface Water



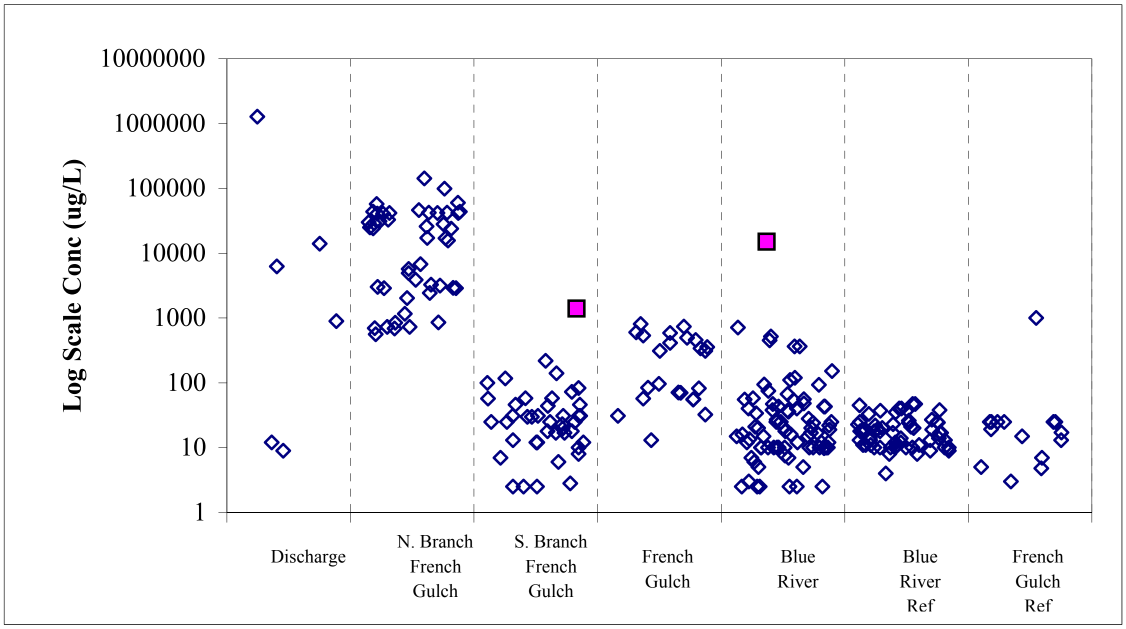


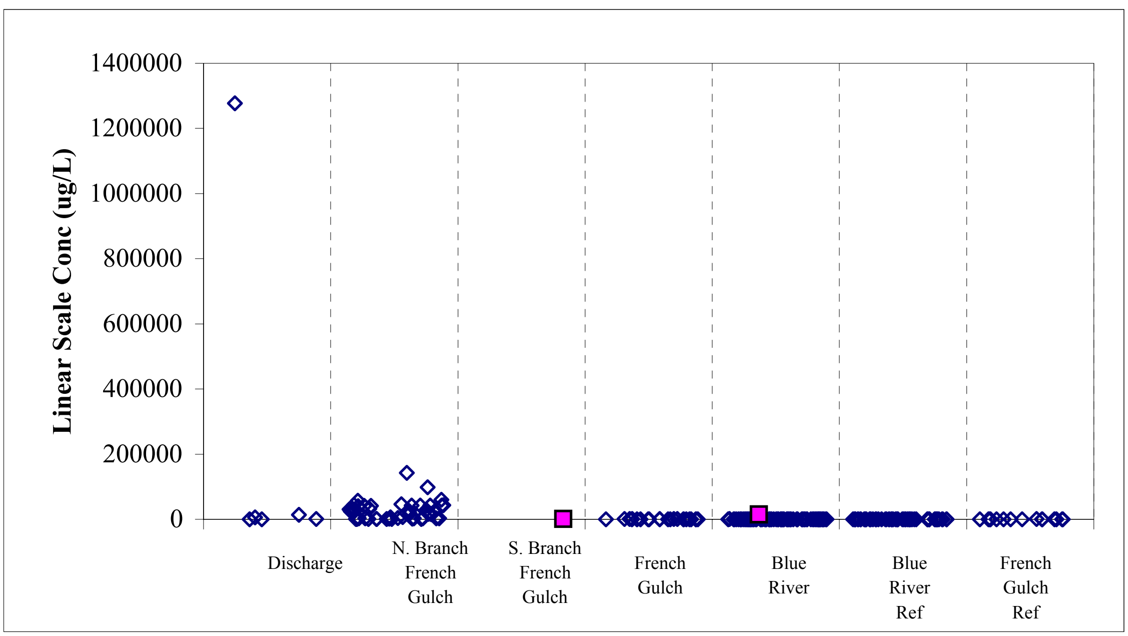
◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

outlier graphs_table.xls: Figure
5/8/2002

Measured Manganese Concentrations (Total) in Surface Water

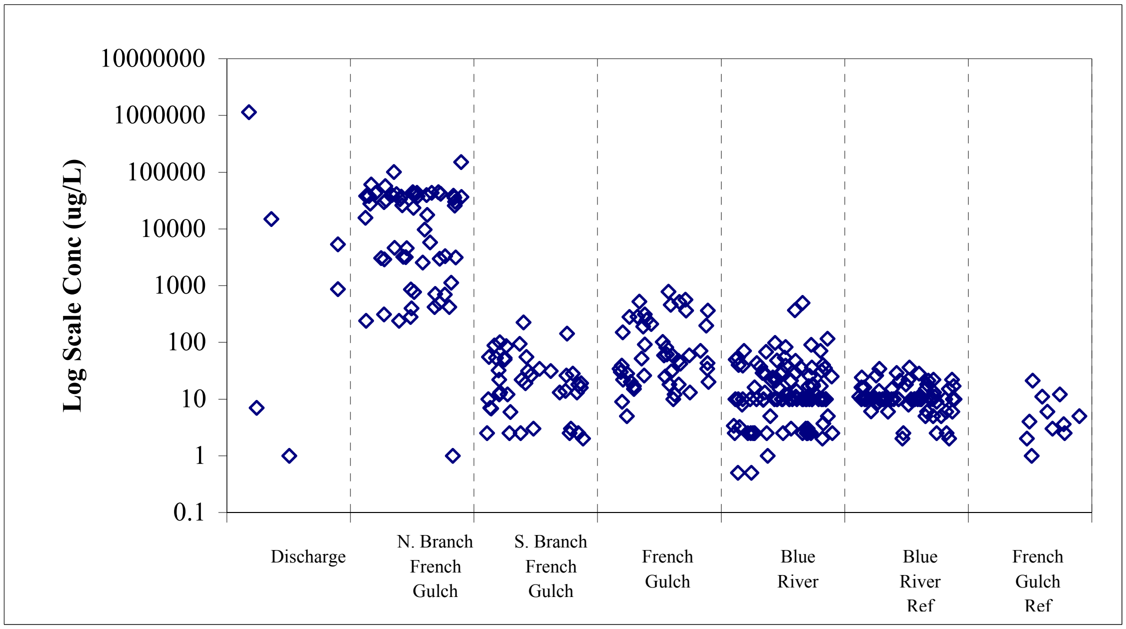


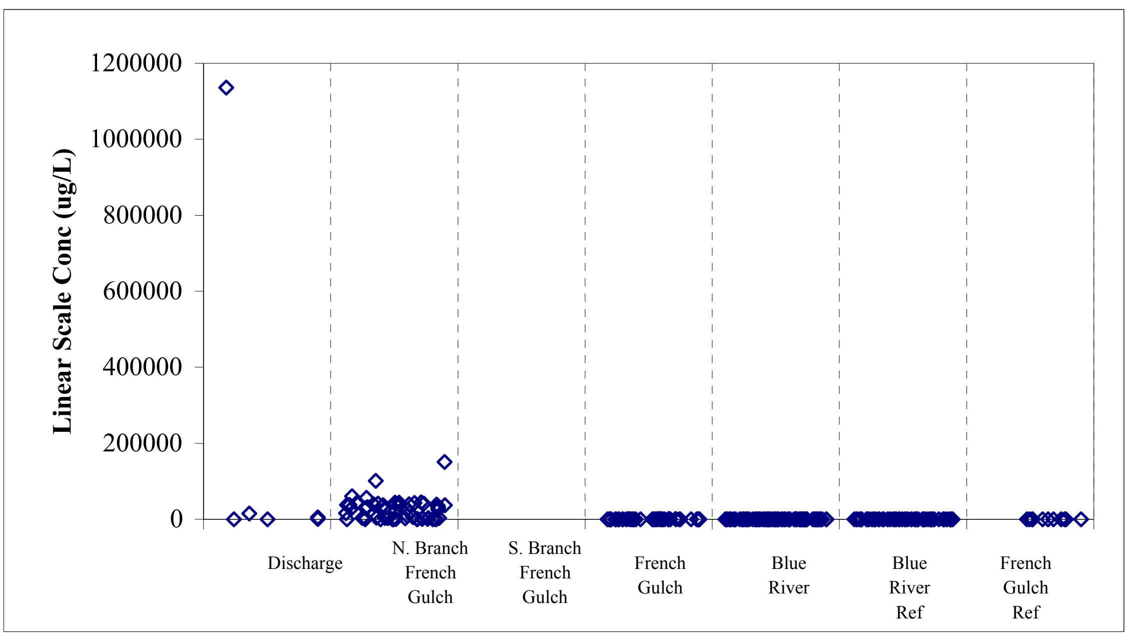


◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

Measured Manganese Concentrations (Dissolved) in Surface Water

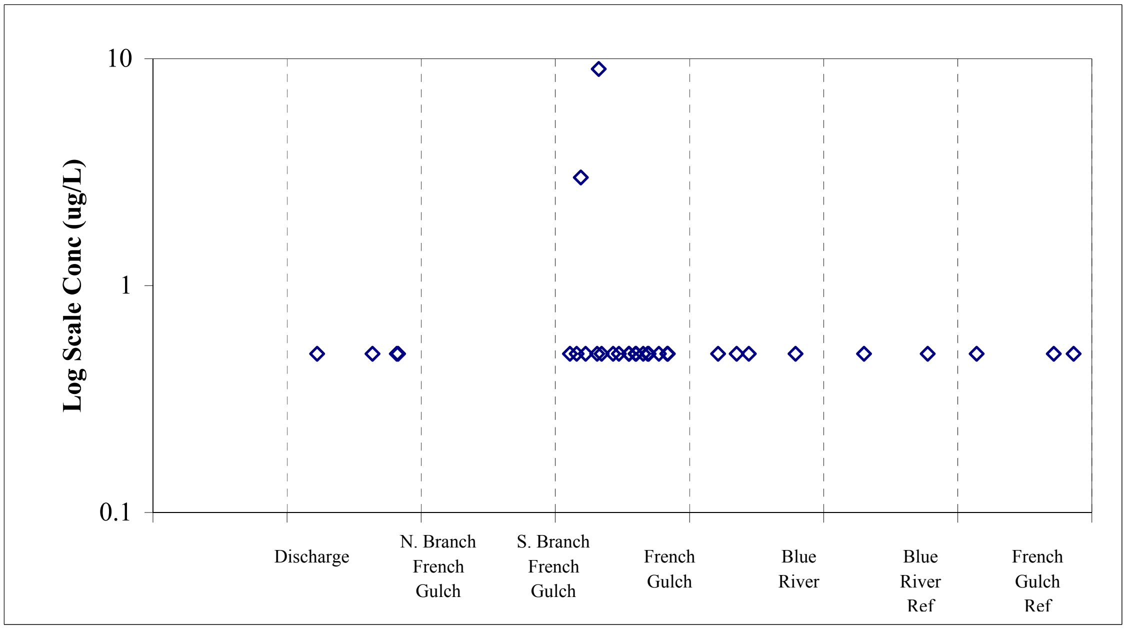


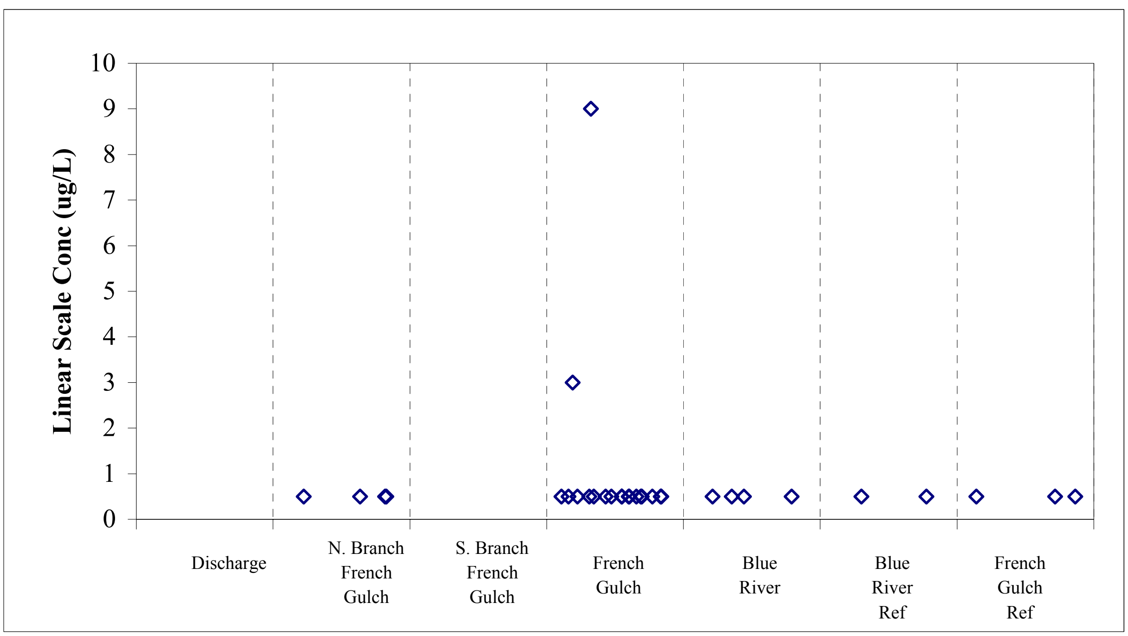


◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

Measured Molybdenum Concentrations (Dissolved) in Surface Water



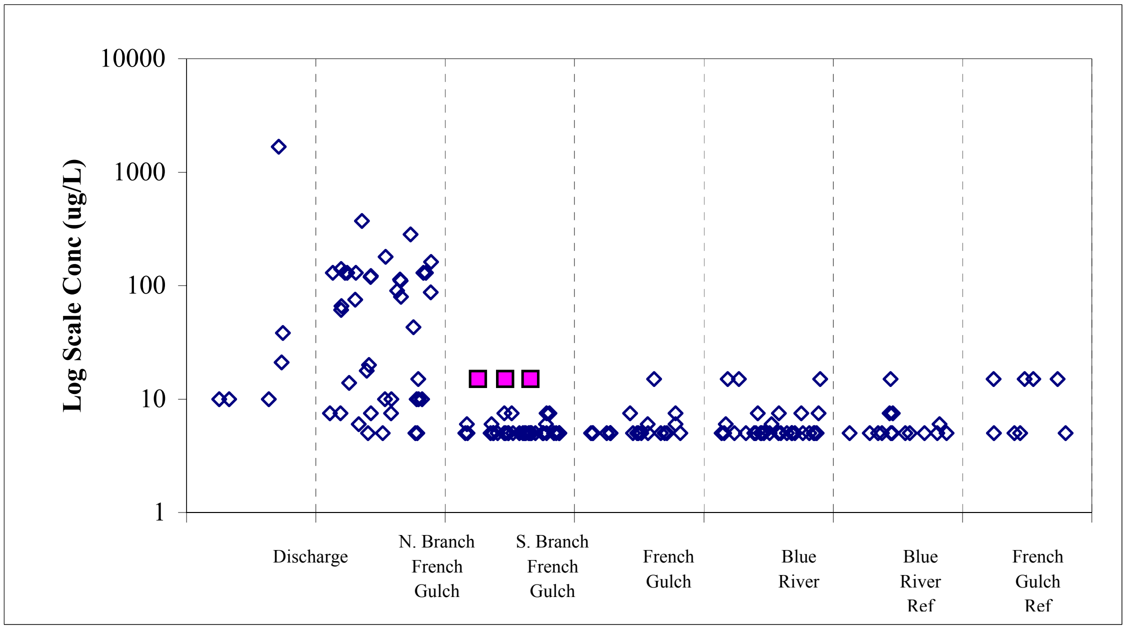


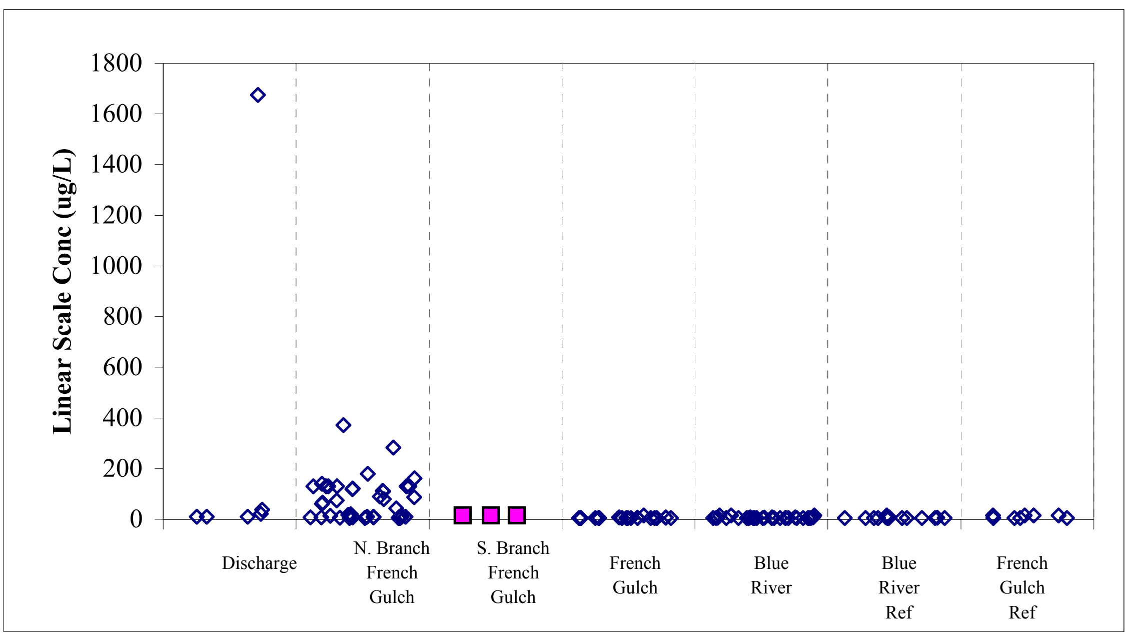
◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

outlier graphs_table.xls: Figure
5/8/2002

Measured Nickel Concentrations (Total) in Surface Water

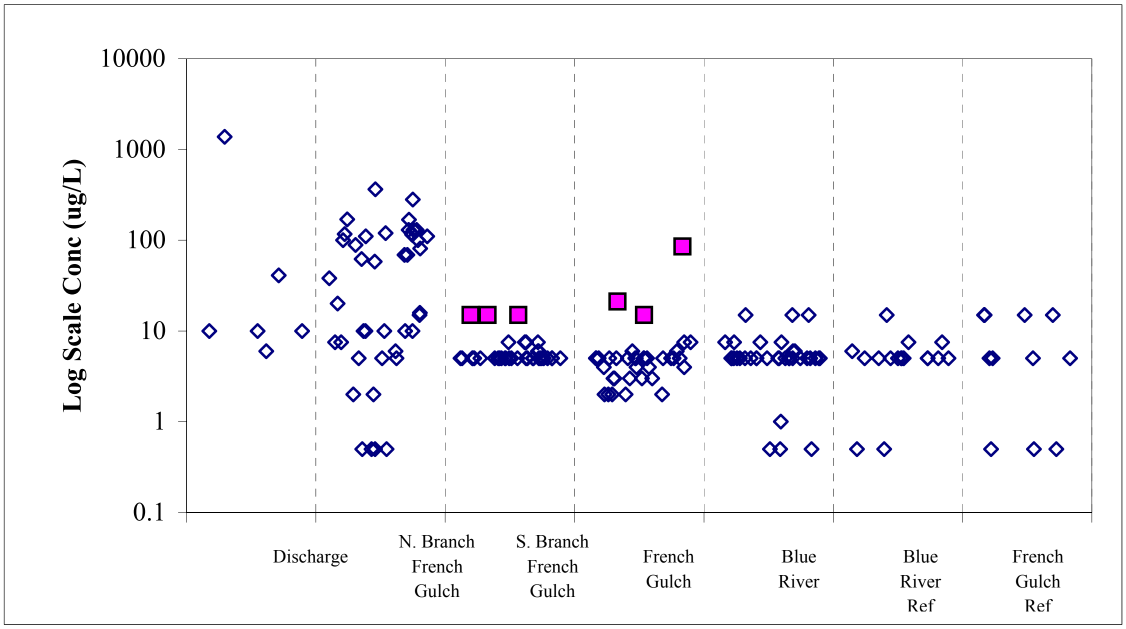


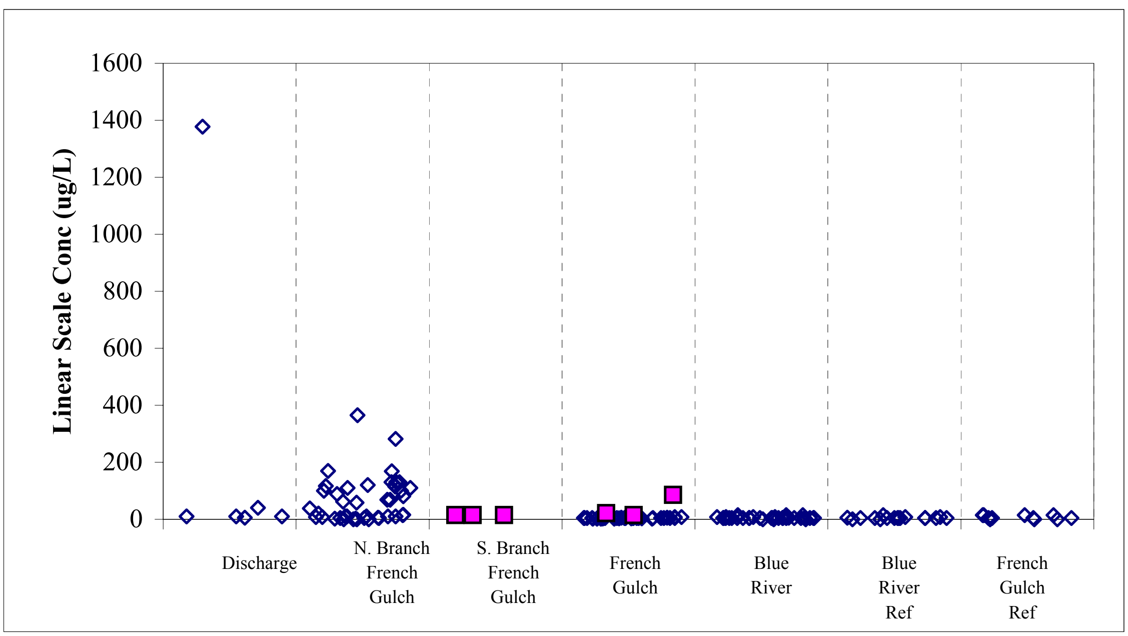


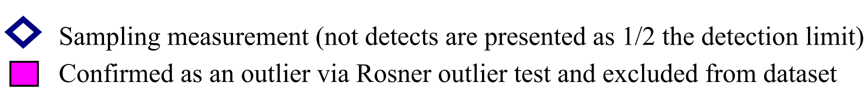
◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

Measured Nickel Concentrations (Dissolved) in Surface Water

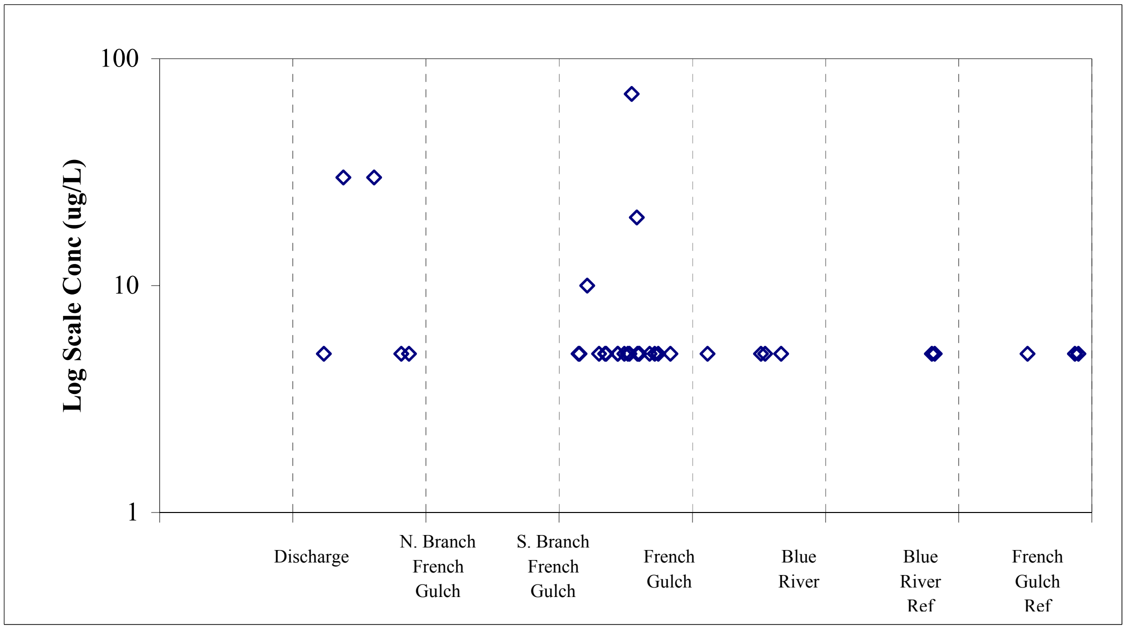


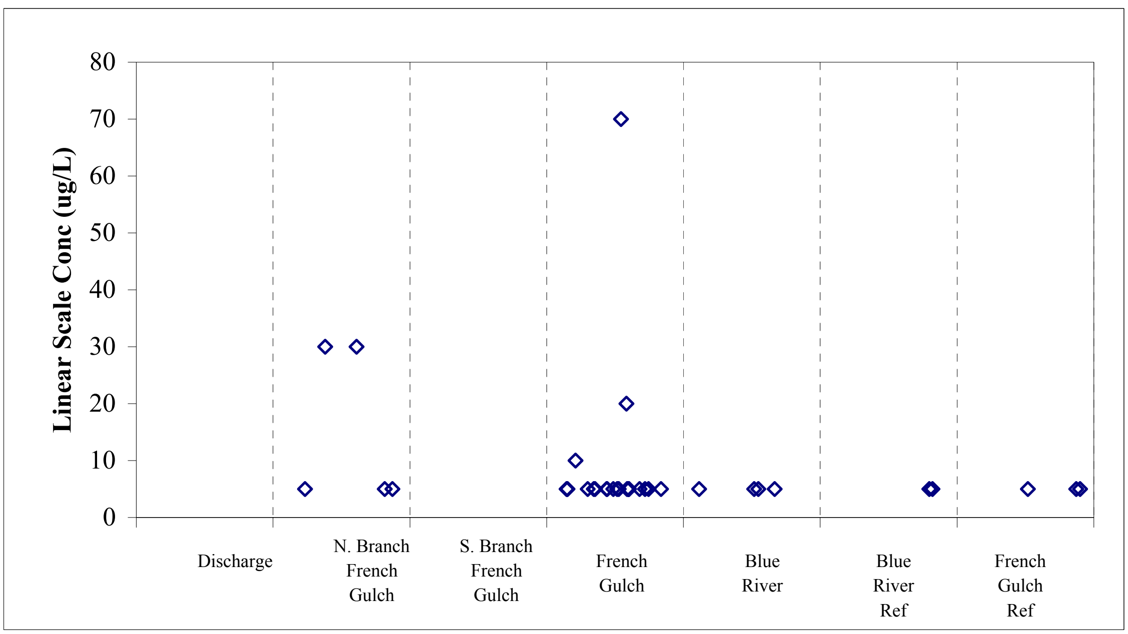


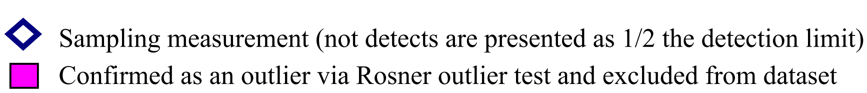


outlier graphs_table.xls: Figure
5/8/2002

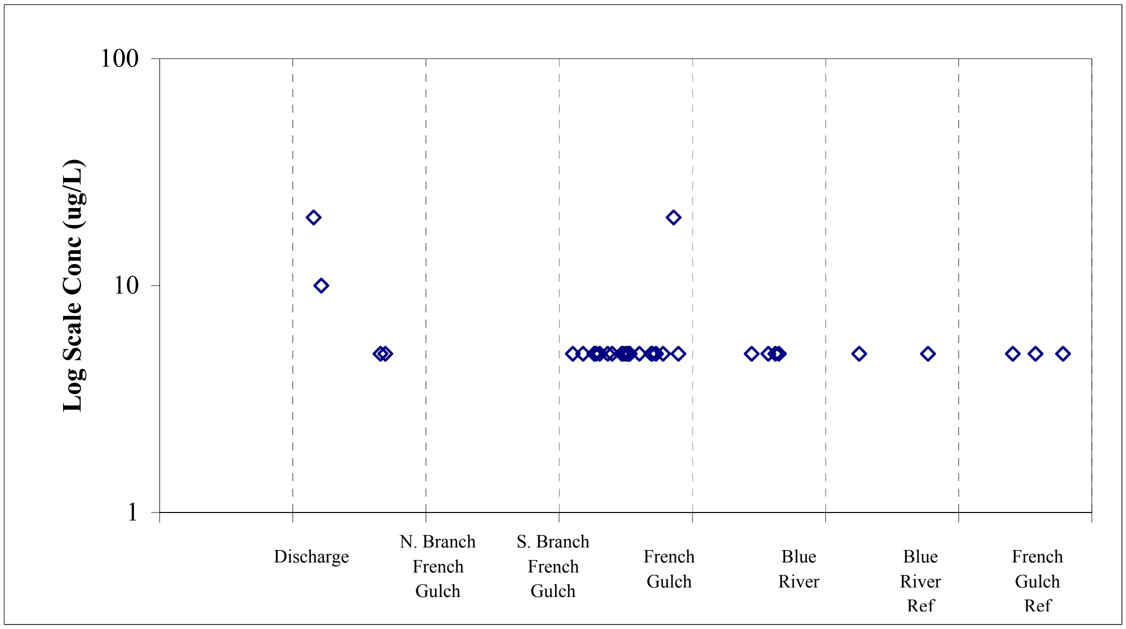
Measured Phosphorus Concentrations (Total) in Surface Water

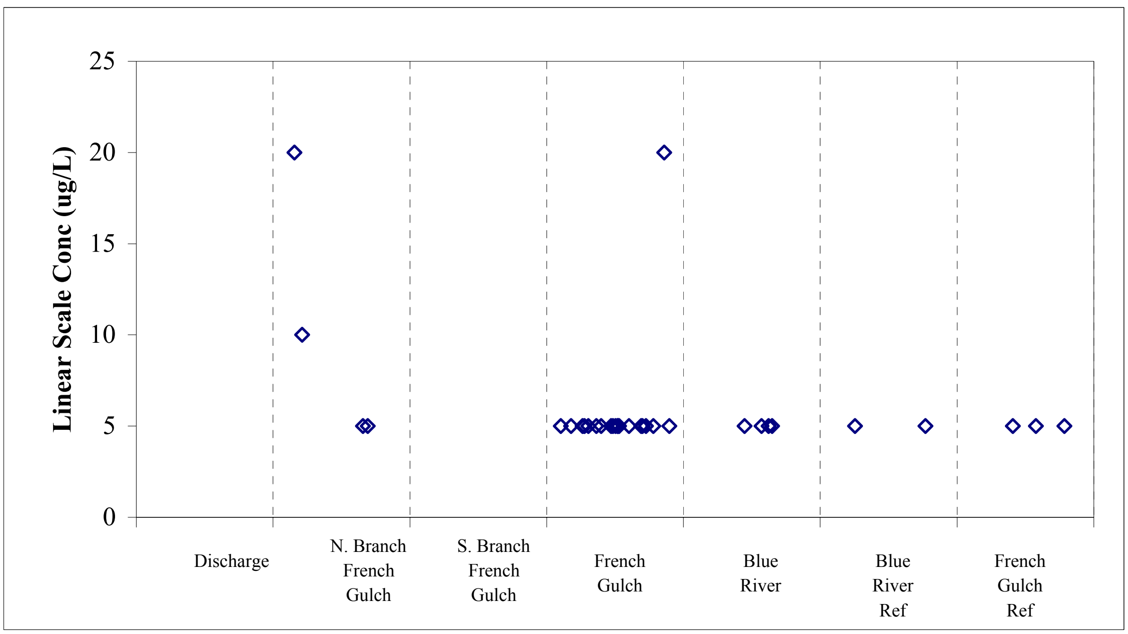






Measured Phosphorus Concentrations (Dissolved) in Surface Water

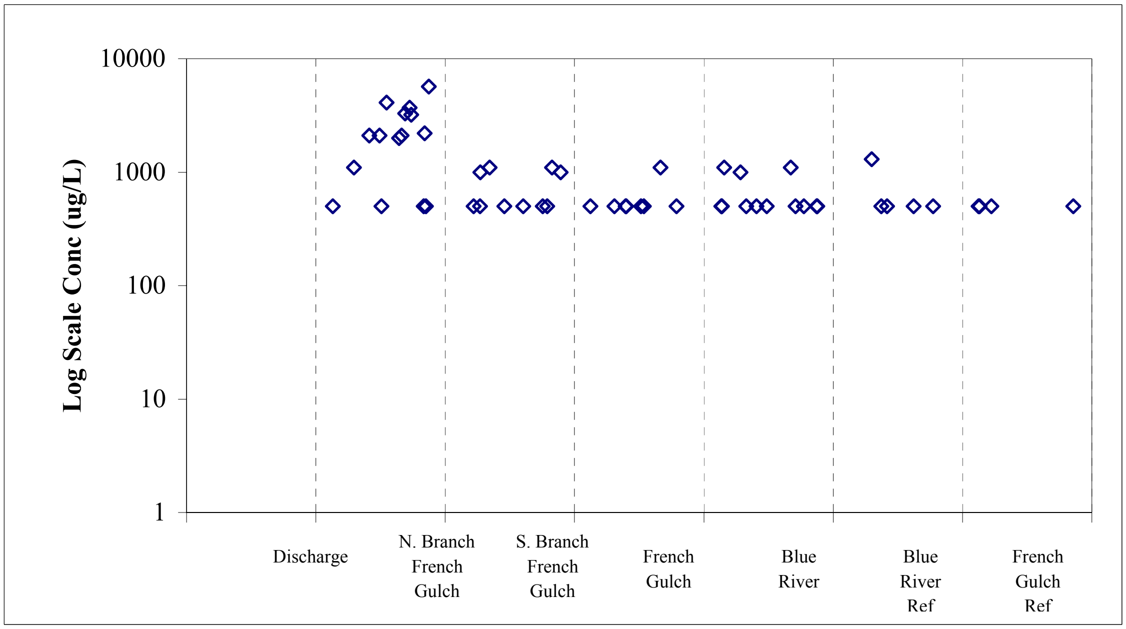


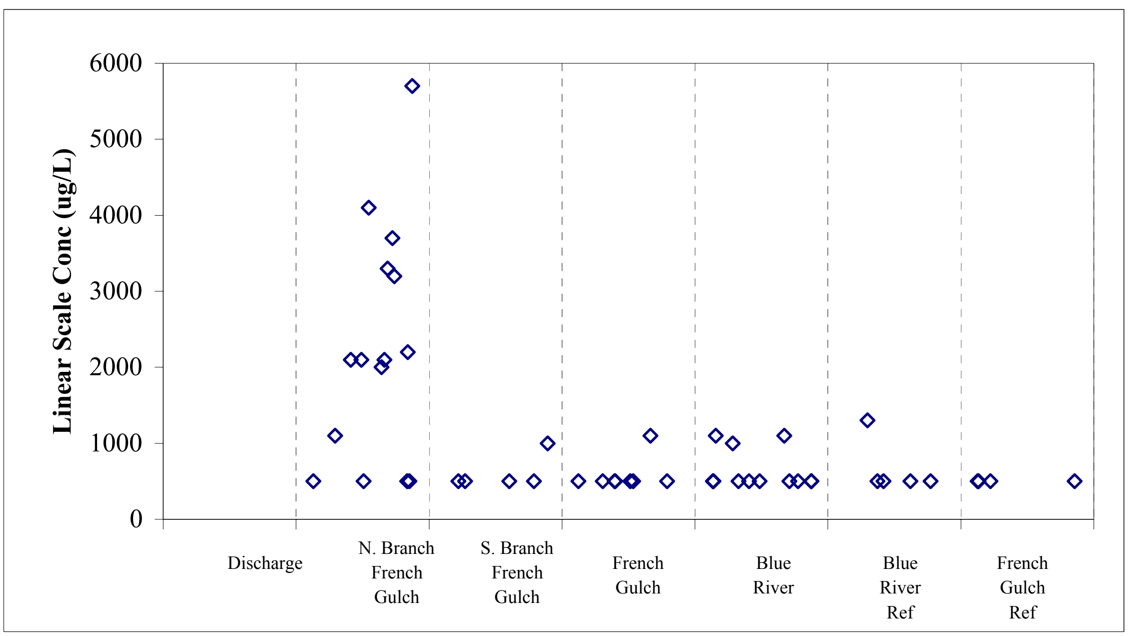


Sampling measurement (not detects are presented as 1/2 the detection limit)

Confirmed as an outlier via Rosner outlier test and excluded from dataset

Measured Potassium Concentrations (Total) in Surface Water

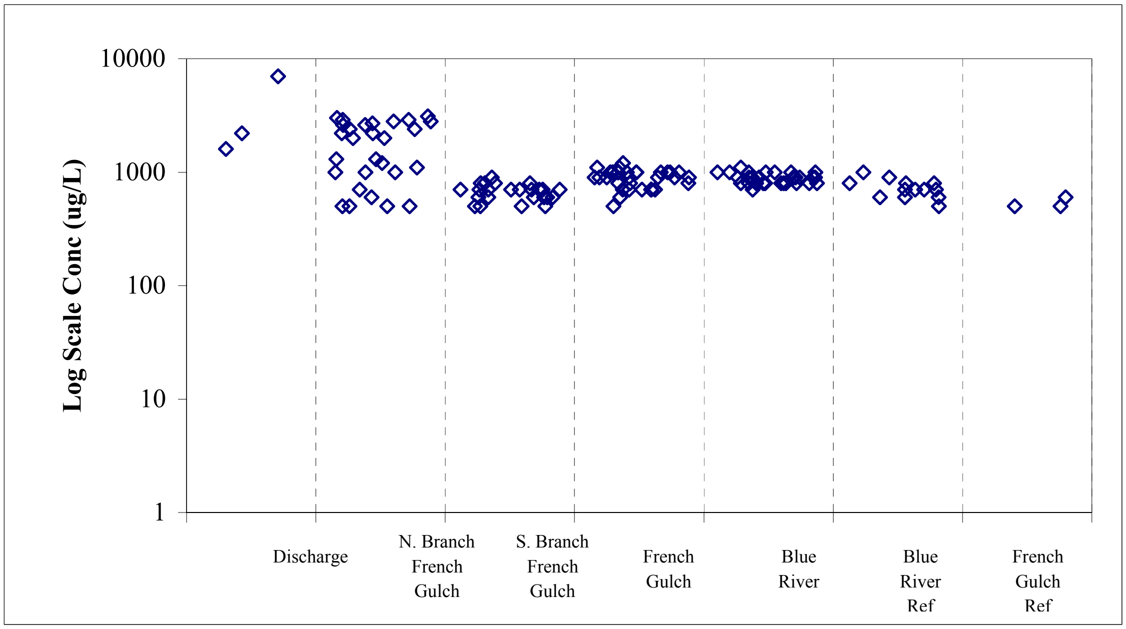


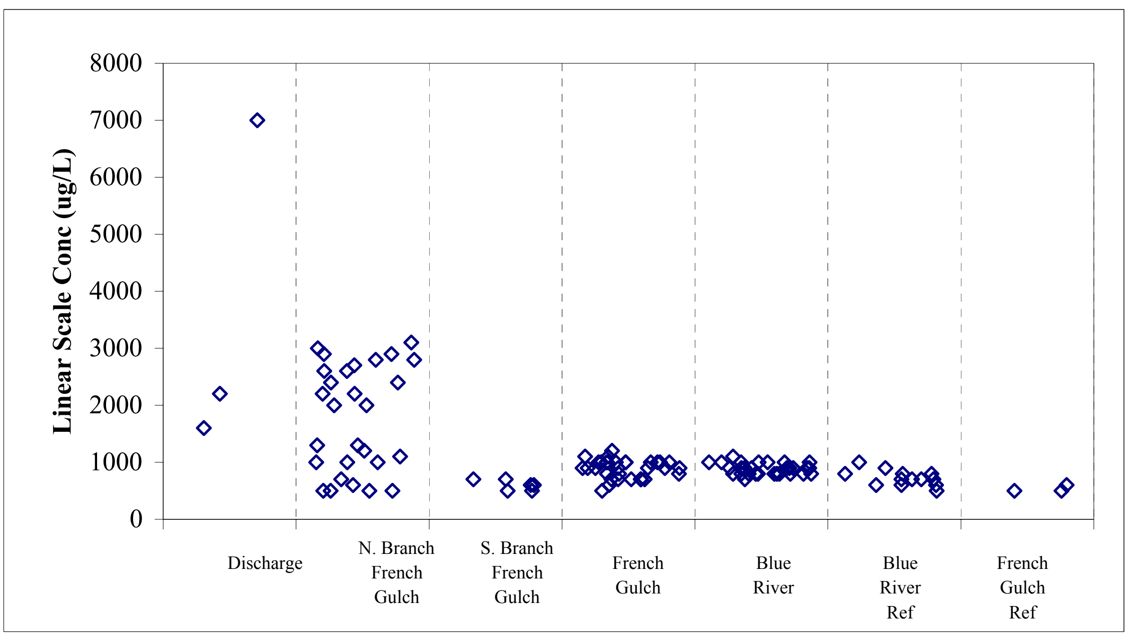


◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

Measured Potassium Concentrations (Dissolved) in Surface Water

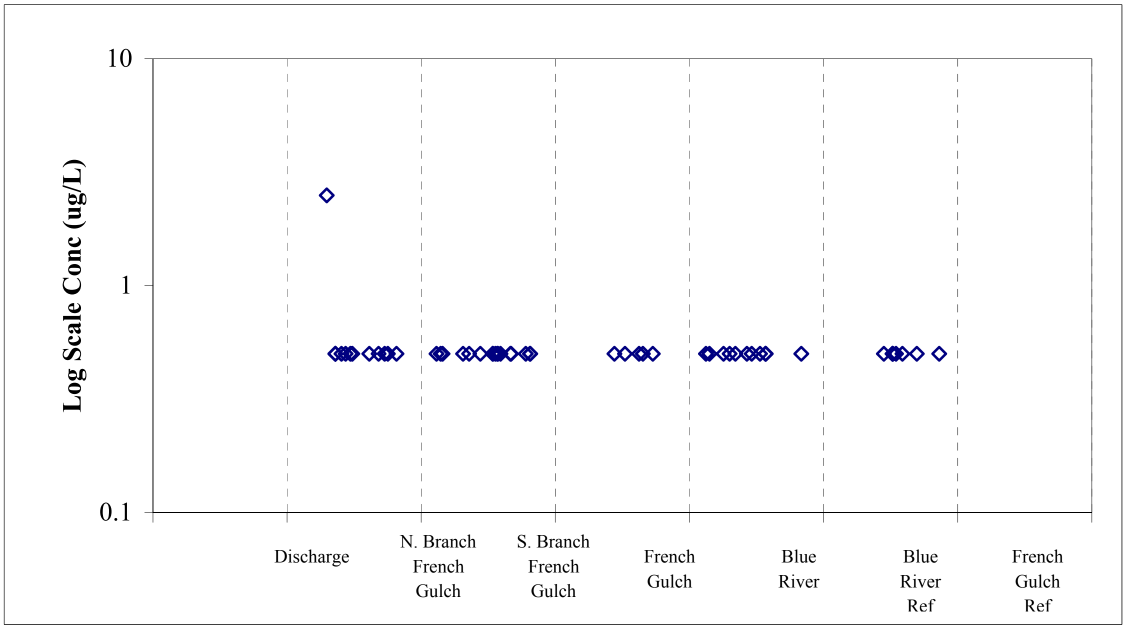


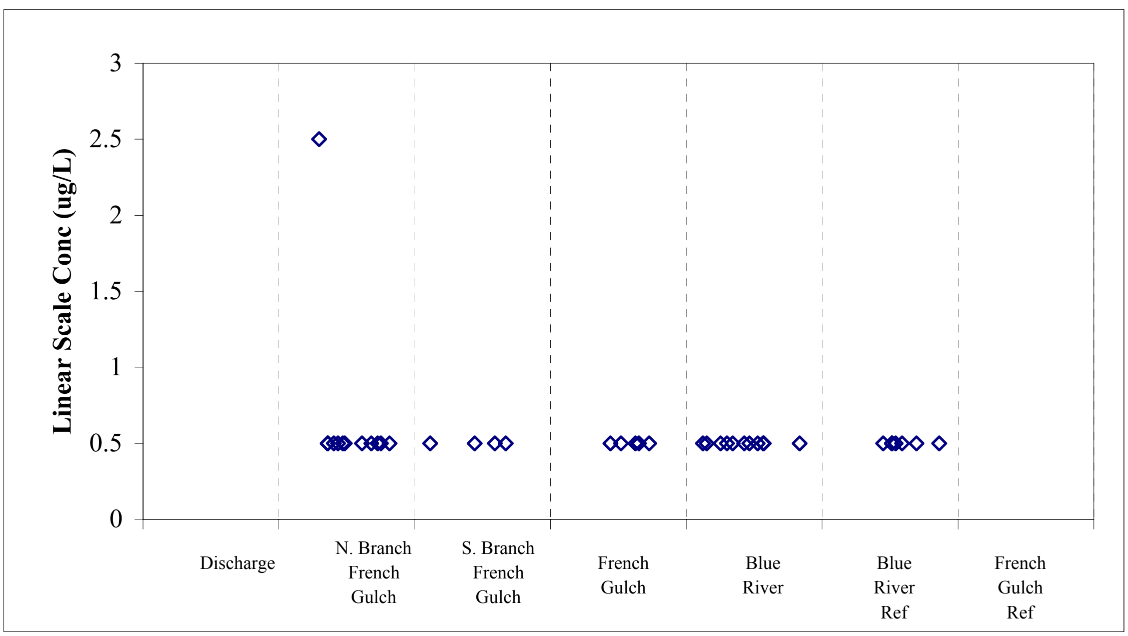


◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

Measured Selenium Concentrations (Total) in Surface Water

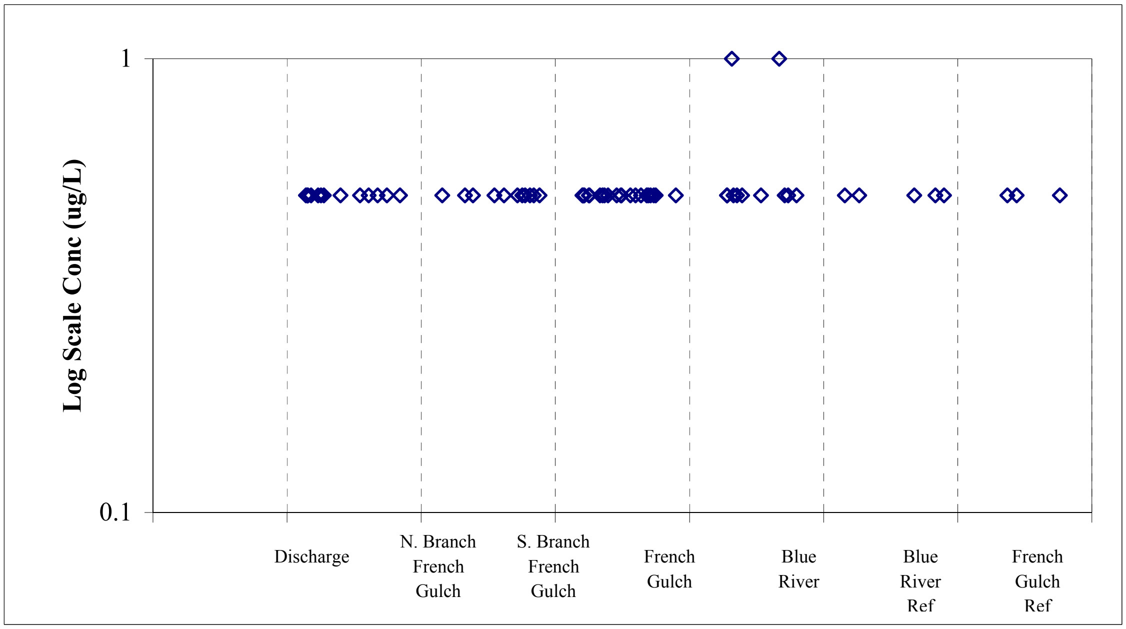


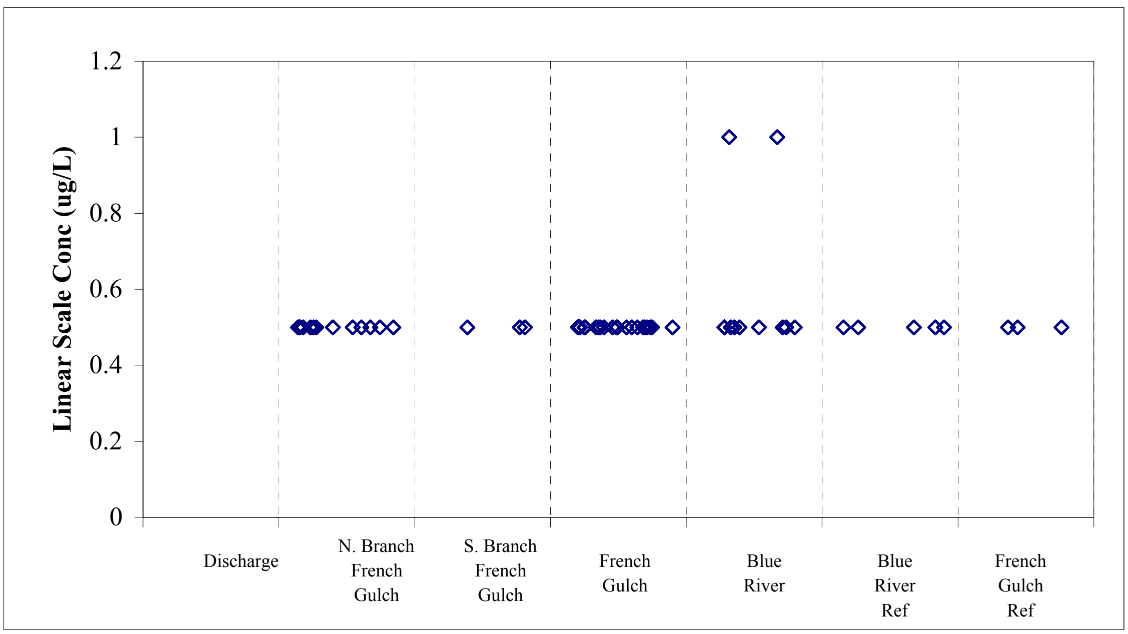


◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

Measured Selenium Concentrations (Dissolved) in Surface Water



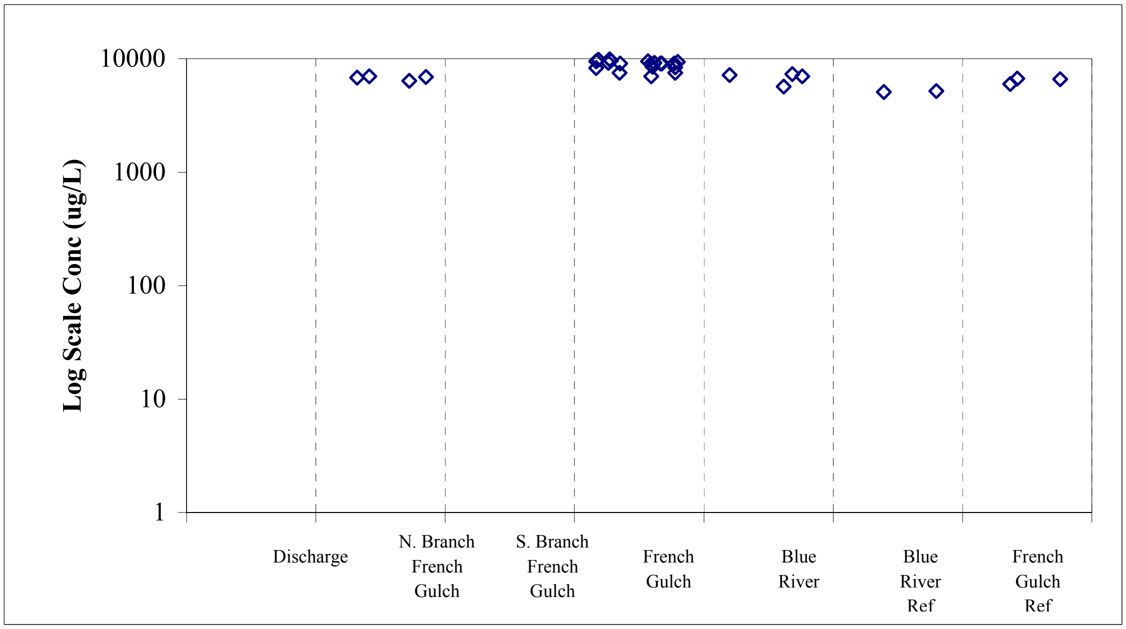


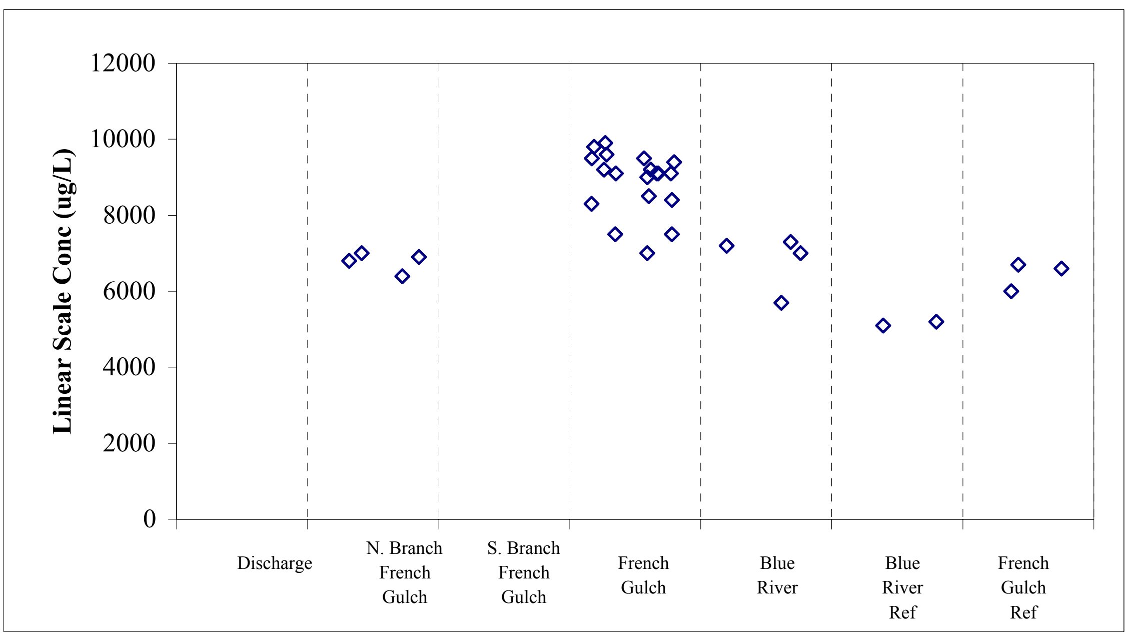
Sampling measurement (not detects are presented as 1/2 the detection limit)

Confirmed as an outlier via Rosner outlier test and excluded from dataset

outlier graphs_table.xls: Figure
5/8/2002

Measured Silicone Concentrations (Dissolved) in Surface Water



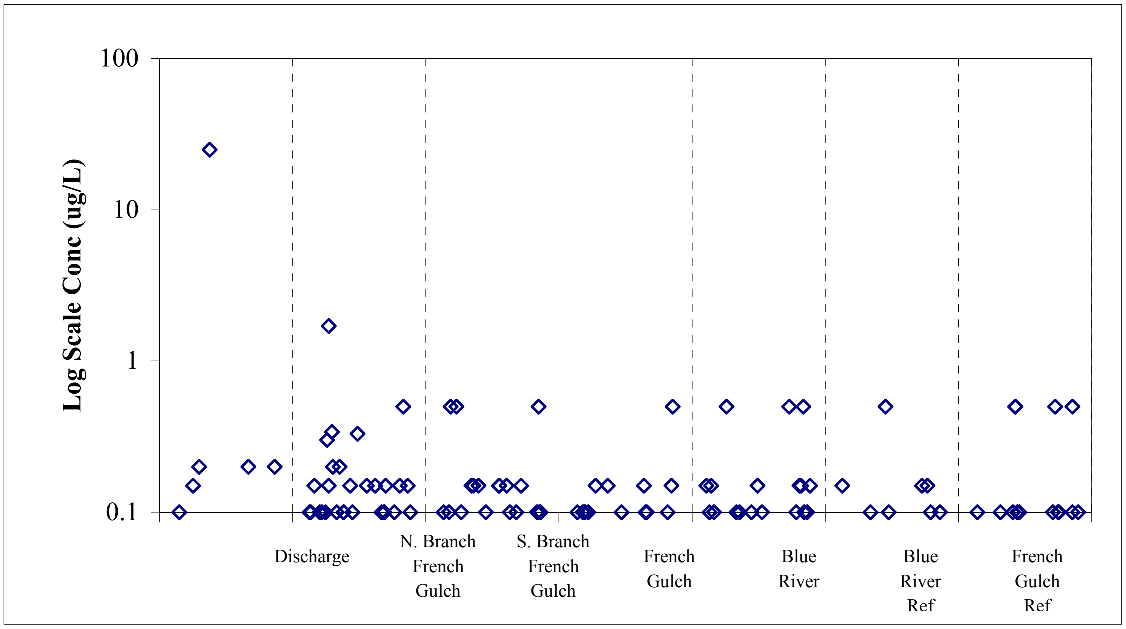


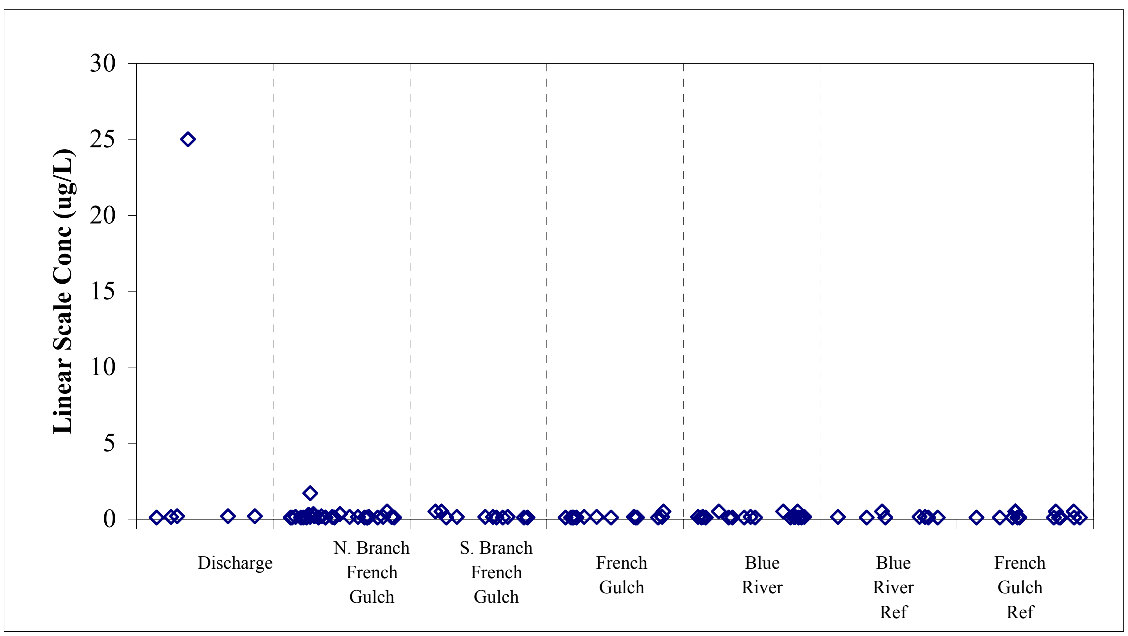
◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

outlier graphs_table.xls: Figure
5/8/2002

Measured Silver Concentrations (Total) in Surface Water

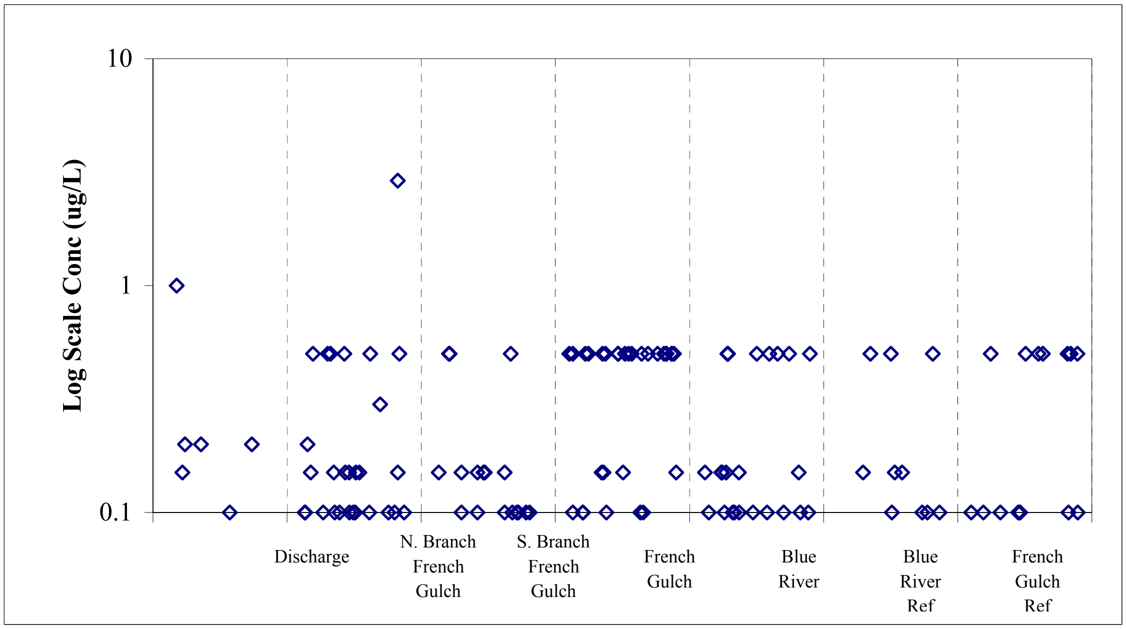


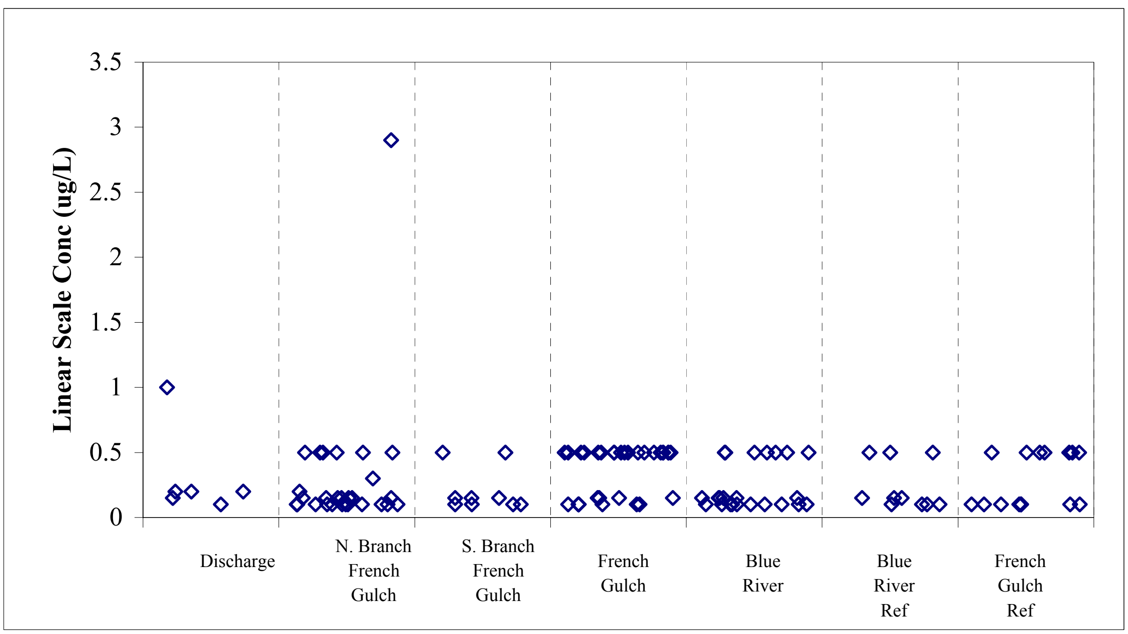


◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

Measured Silver Concentrations (Dissolved) in Surface Water

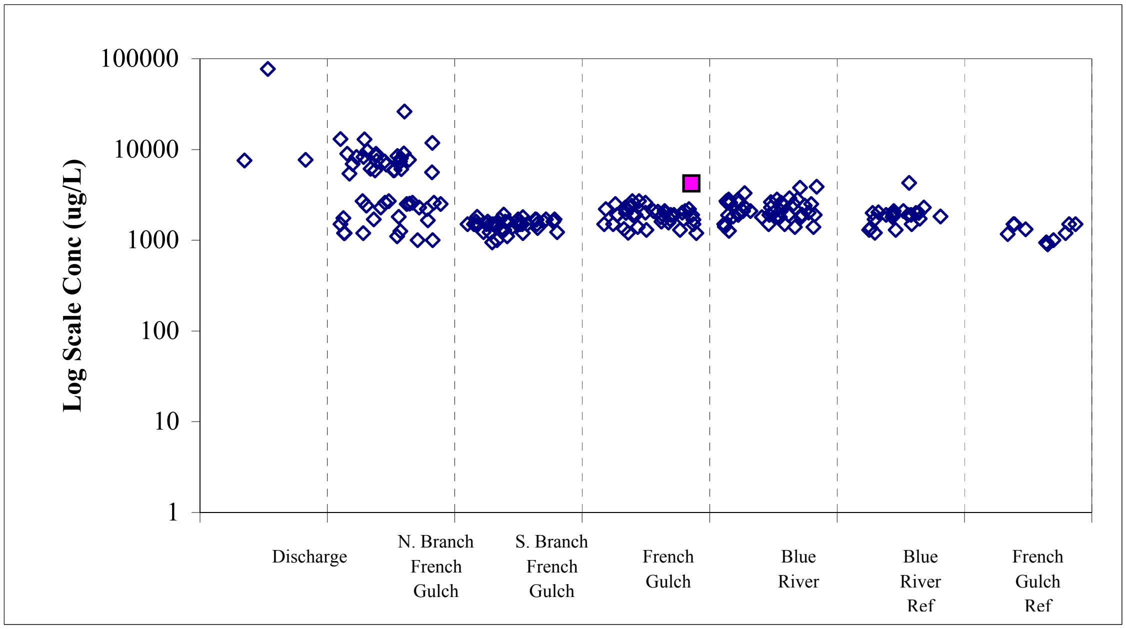


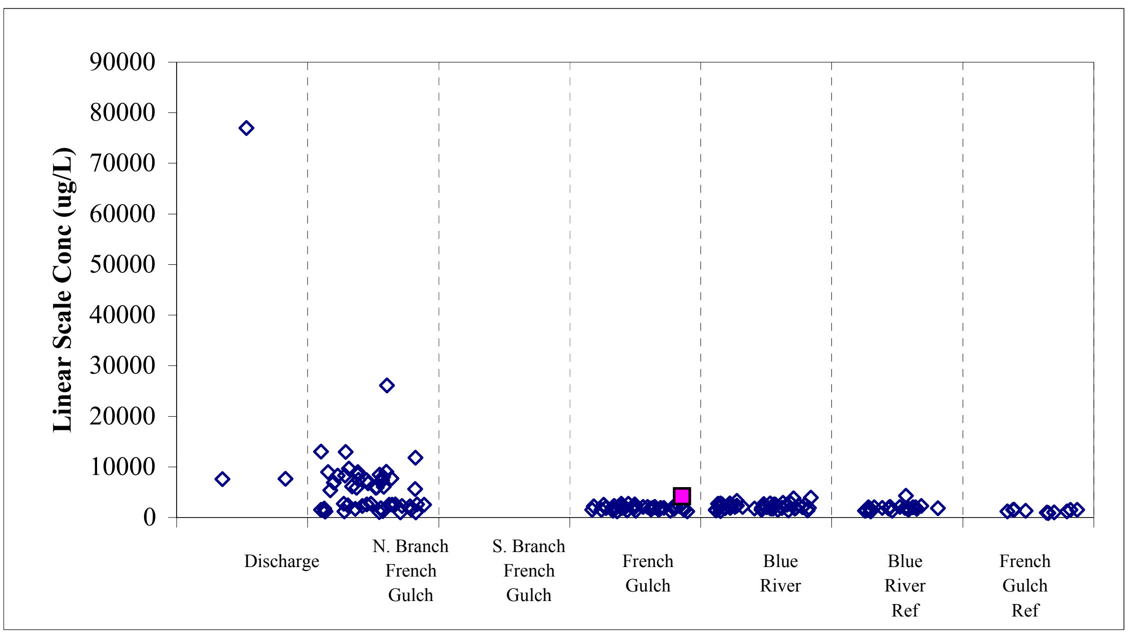


◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

Measured Sodium Concentrations (Dissolved) in Surface Water

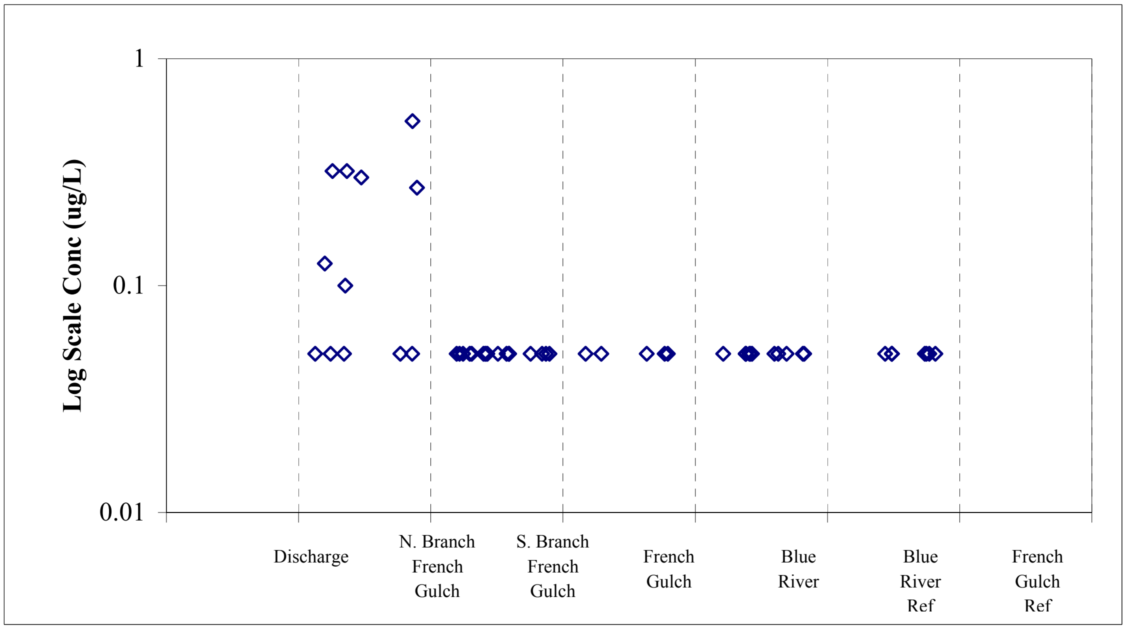


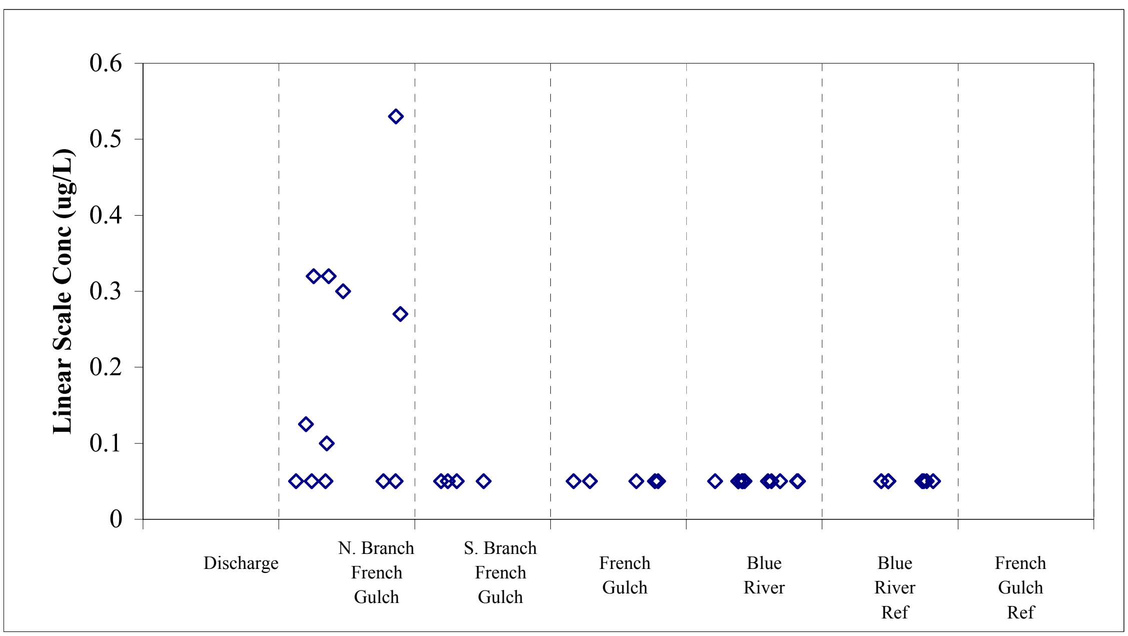


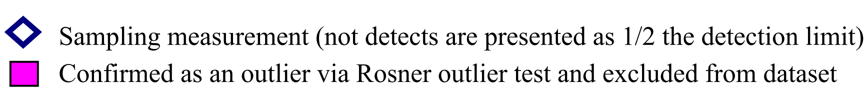
◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

Measured Thallium Concentrations (Total) in Surface Water

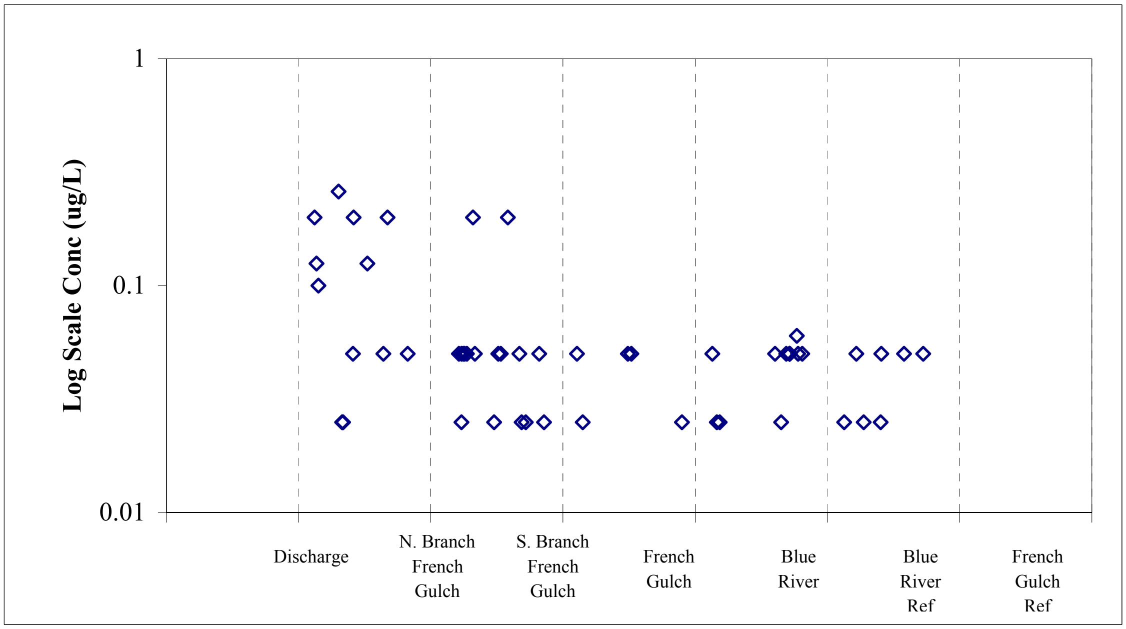


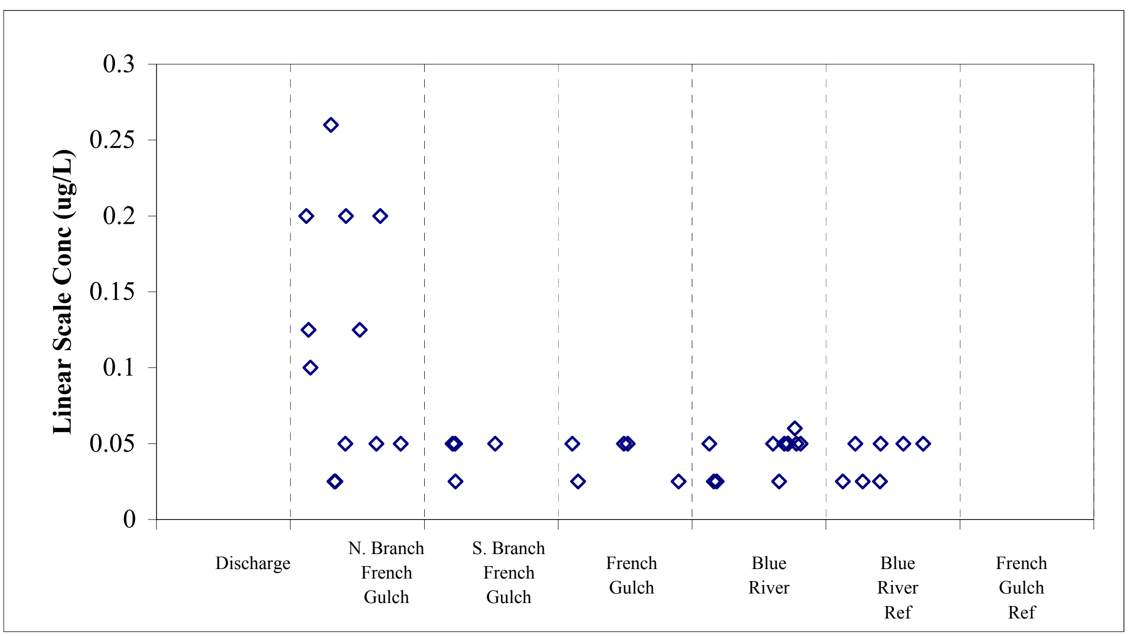




outlier graphs_table.xls: Figure
5/8/2002

Measured Thallium Concentrations (Dissolved) in Surface Water



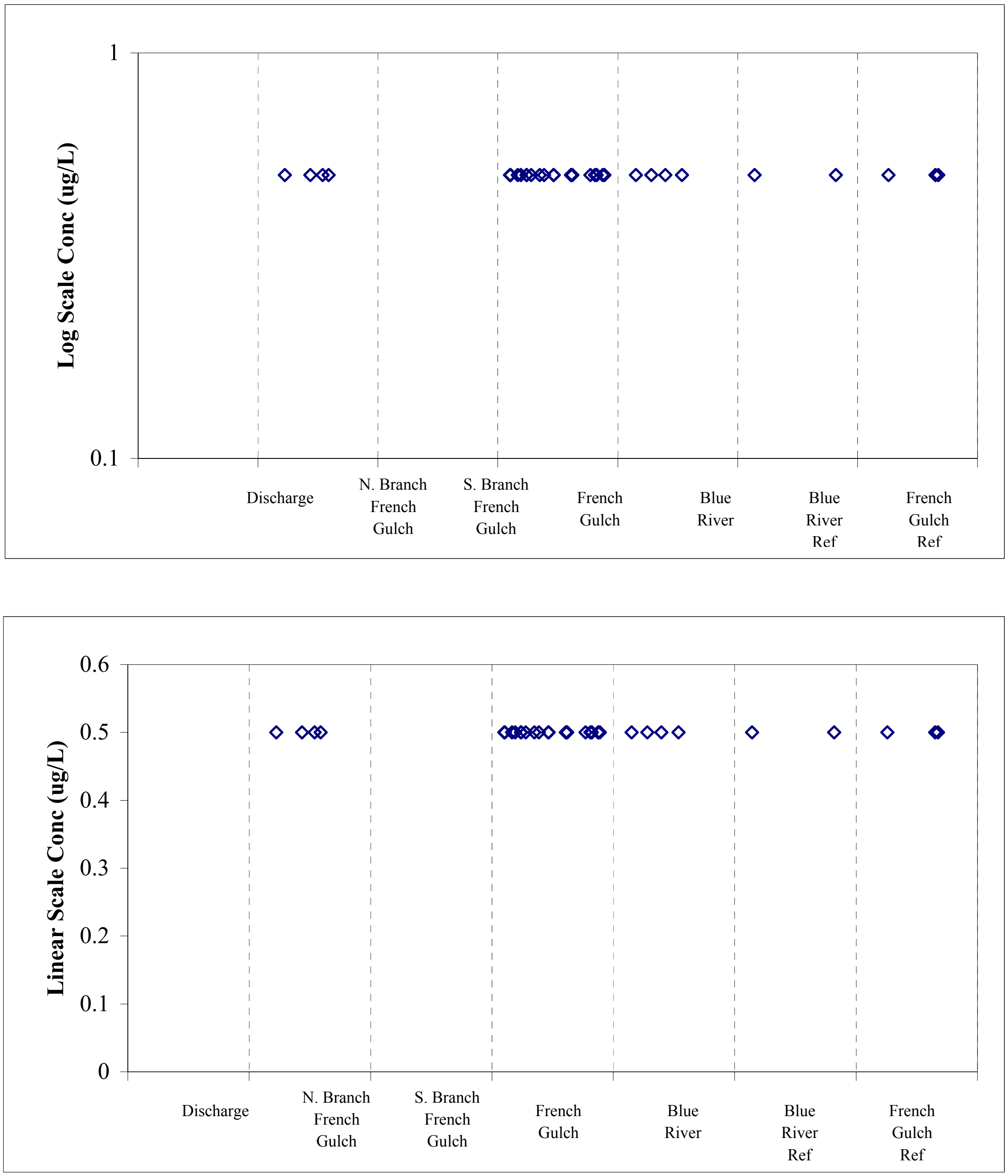


◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

outlier graphs_table.xls: Figure
5/8/2002

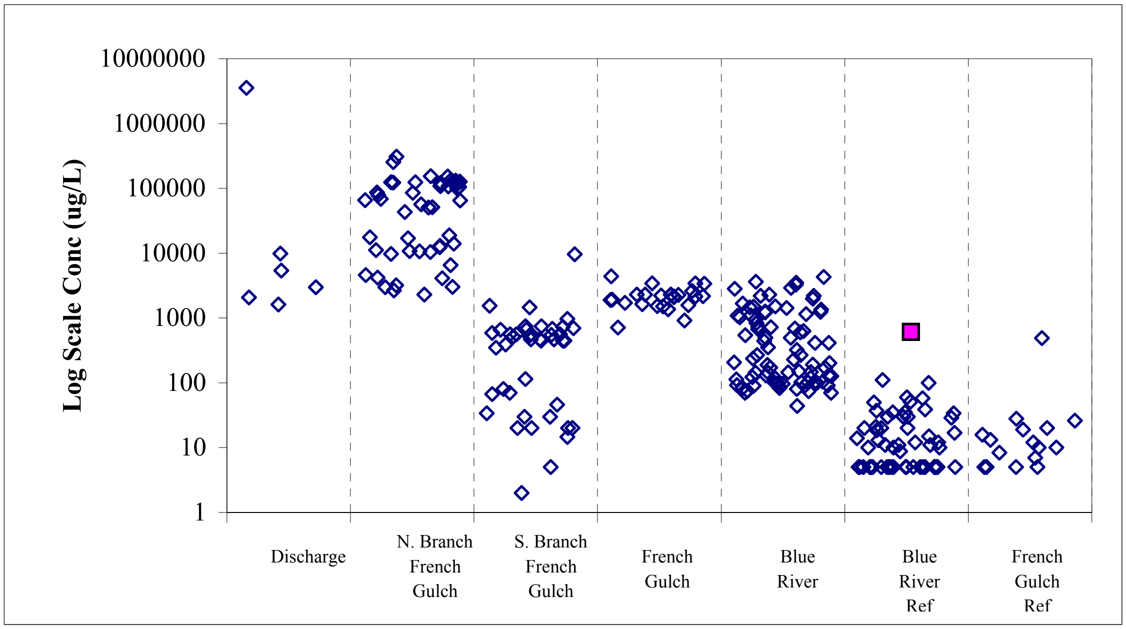
Measured Uranium Concentrations (Dissolved) in Surface Water

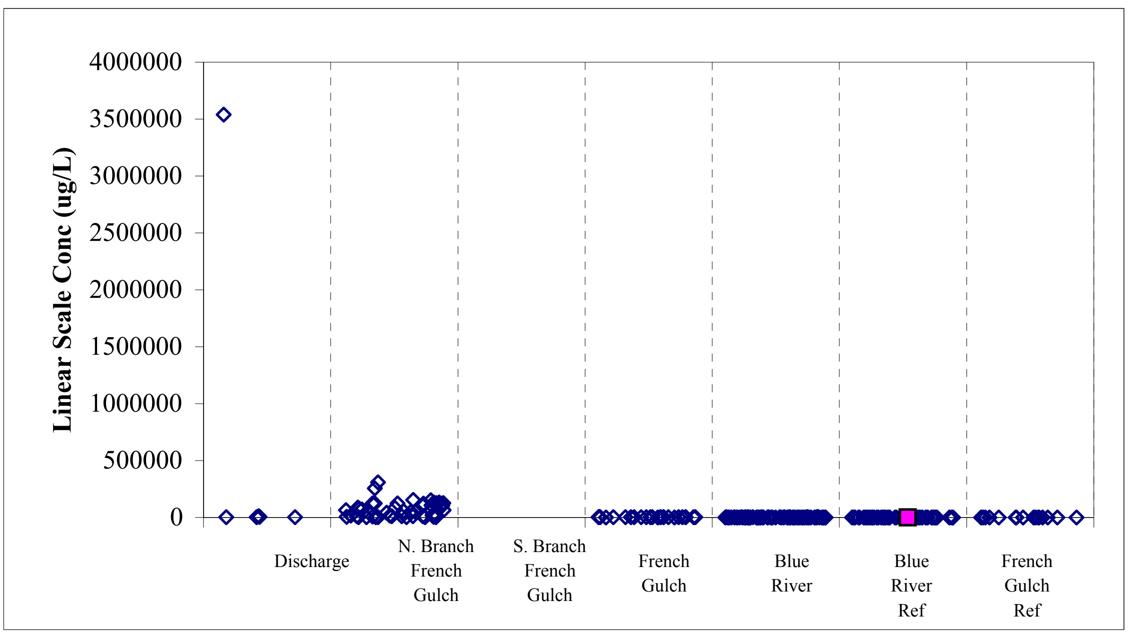


Sampling measurement (not detects are presented as 1/2 the detection limit)

Confirmed as an outlier via Rosner outlier test and excluded from dataset

Measured Zinc Concentrations (Total) in Surface Water



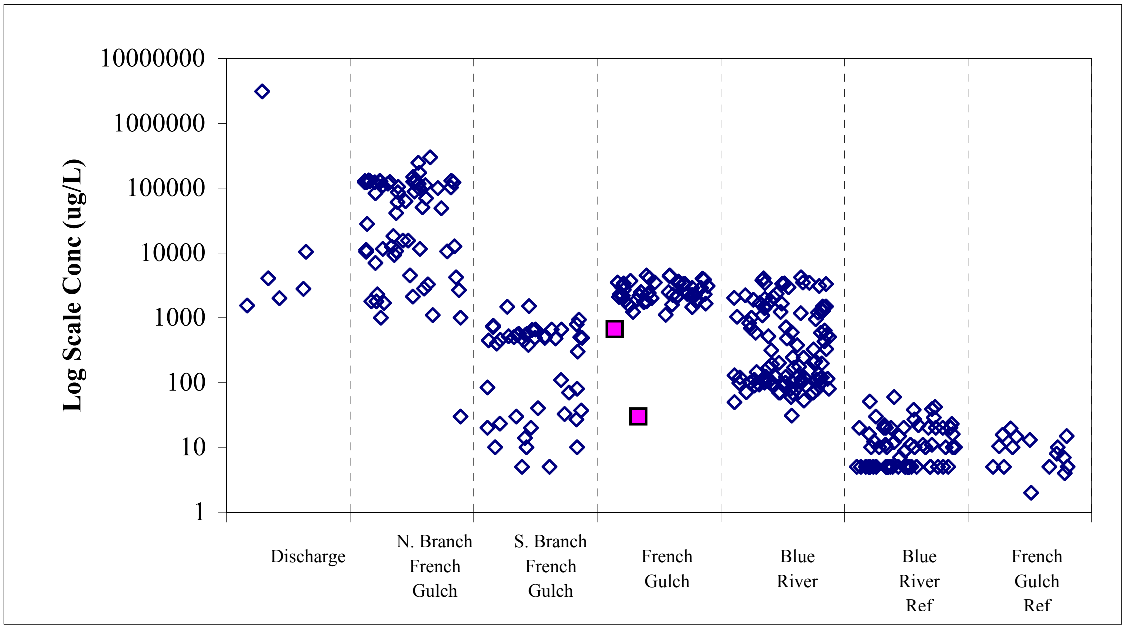


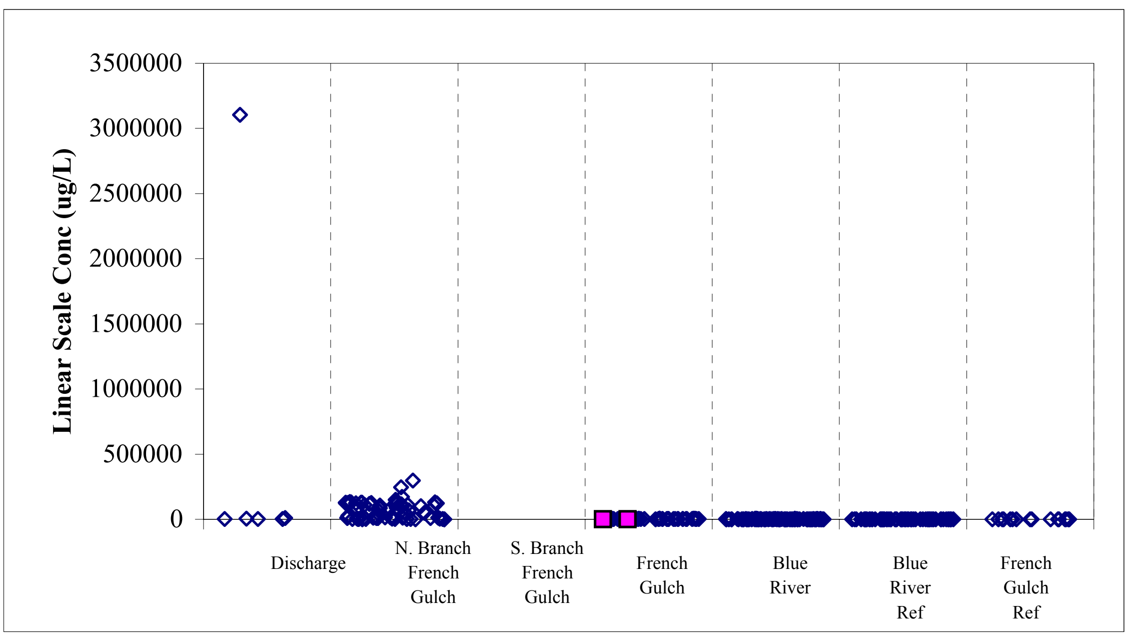
◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

outlier graphs_table.xls: Figure
5/8/2002

Measured Zinc Concentrations (Dissolved) in Surface Water





◇ Sampling measurement (not detects are presented as 1/2 the detection limit)

■ Confirmed as an outlier via Rosner outlier test and excluded from dataset

Appendix C
Selection of Chemicals of Potential Concern

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Appendix C1
Selection of Surface Water COPCs for Aquatic Receptors

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

Parameter	Analysis Type	Number of Detections	Number of Samples	Detection Frequency (DF)	Mean Detected Conc (ug/L)	Maximum Detected Conc (ug/L)	Mean Non-Detected Conc (ug/L)	Maximum Non-Detected Conc (ug/L)	AWQC Chronic Benchmark (ug/L)	Does cmpd have an TRV?	Is DF > 5%?	Is Mean DL < Benchmark?	Is Max Detect > Benchmark?	Qual Type 1	Qual Type 2	Quant COPC	Not a COPC
Aluminum	Total	57	122	47%	2,246	114,510	22	100	87	yes	yes	yes	yes	0	0	1	0
	Dissolved	67	172	39%	1,542	95,854	21	100	87	yes	yes	yes	yes				
Antimony	Total	15	52	29%	0.2	0.3	0.1	0.1	na	no	yes	yes	no	1	0	0	0
	Dissolved	32	84	38%	0.3	0.6	0.3	0.5	na	no	yes	yes	no				
Arsenic	Total	18	112	16%	9	96	1	1	150	yes	yes	yes	no	0	0	0	1
	Dissolved	16	138	12%	6.3	39	0.5	1	150	yes	yes	yes	no				
Barium	Total	0	0	na	na	na	na	na	na	no	no	no	no	1	0	0	0
	Dissolved	32	32	100%	23	55	na	na	na	no	yes	no	no				
Beryllium	Total	0	0	na	na	na	na	na	na	no	no	no	no	1	0	0	0
	Dissolved	0	32	0%	na	na	1	1	na	no	no	yes	no				
Cadmium	Total	201	270	74%	127.4	22,500.0	0.1	0.3	0.2	yes	yes	yes	yes	0	0	1	0
	Dissolved	259	357	73%	91	19,800	0	2	0.2	yes	yes	no	yes				
Calcium	Total	0	0	na	na	na	na	na	na	no	no	no	no	1	0	0	0
	Dissolved	204	204	100%	58,953	477,400	na	na	na	no	yes	no	no				
Chromium	Total	33	136	24%	0.5	4.4	2.1	20.0	49	yes	yes	yes	no	0	0	0	1
	Dissolved	52	159	33%	0.8	6.2	1.9	3.0	42	yes	yes	yes	no				
Cobalt	Total	0	0	na	na	na	na	na	na	no	no	no	no	1	0	0	0
	Dissolved	2	32	6%	2	2	1	1	na	no	yes	yes	no				
Copper	Total	174	268	65%	65.2	9,575.0	1.0	5.0	5	yes	yes	yes	yes	0	0	1	0
	Dissolved	170	287	59%	57.0	8,393.0	0.9	5.0	5	yes	yes	yes	yes				
Iron	Total	223	272	82%	18,098	837,588	31	50	1000	yes	yes	yes	yes	0	0	1	0
	Dissolved	182	335	54%	24,333	694,200	17	25	1000	yes	yes	yes	yes				
Lead	Total	179	268	67%	57	5,490	1	3	1	yes	yes	yes	yes	0	0	1	0
	Dissolved	182	394	46%	16	744	1	40	1	yes	yes	yes	yes				
Magnesium	Total	0	0	na	na	na	na	na	na	no	no	no	no	1	0	0	0
	Dissolved	199	199	100%	19,922	968,900	na	na	na	no	yes	no	no				
Manganese	Total	228	271	84%	10,729	1,276,690	13	25	na	no	yes	yes	no	1	0	0	0
	Dissolved	264	335	79%	9,768	1,136,130	7	10	na	no	yes	yes	no				
Mercury	Total	1	6	17%	400	400	0	0	1	yes	yes	yes	yes	0	0	1	0
	Dissolved	0	0	na	na	na	na	na	1	yes	no	no	yes				
Molybdenum	Total	0	0	na	na	na	na	na	na	no	no	no	no	1	0	0	0
	Dissolved	2	32	6%	6.0	9.0	0.5	0.5	na	no	yes	yes	no				
Nickel	Total	33	153	22%	142.9	1,675.0	6.4	15.0	29	yes	yes	yes	yes	0	0	1	0
	Dissolved	51	177	29%	84.3	1,377.0	5.8	15.0	29	yes	yes	yes	yes				
Phosphorus	Total	5	34	15%	32.00	70.00	5.00	5.00	na	no	yes	yes	no	1	0	0	0
	Dissolved	3	33	9%	16.67	20.00	5.00	5.00	na	no	yes	yes	no				
Potassium	Total	20	54	37%	2,070.0	5,700.0	500.0	500.0	na	no	yes	yes	no	1	0	0	0
	Dissolved	131	132	99%	1,078	7,000	500	500	na	no	yes	yes	no				
Selenium	Total	0	52	0%	na	na	1	3	5	yes	no	yes	yes	0	0	0	1
	Dissolved	2	65	3%	1	1	1	1	5	yes	no	yes	no				
Silicone	Total	0	0	na	na	na	na	na	na	no	no	no	no	1	0	0	0
	Dissolved	32	32	100%	7,894	9,900	na	na	na	no	yes	no	no				
Silver	Total	6	108	6%	5	25	0	1	1	yes	yes	yes	yes	0	0	1	0
	Dissolved	3	129	2%	1	3	0	1	1	yes	no	yes	yes				
Sodium	Total	0	0	na	na	na	na	na	na	no	no	no	no	1	0	0	0
	Dissolved	205	218	94%	3,200.7	77,000.0	1,500.0	1,500.0	na	no	yes	yes	no				
Thallium	Total	6	52	12%	0.3	0.5	0.1	0.1	na	no	yes	yes	no	1	0	0	0
	Dissolved	8	52	15%	0	0	0	0	na	no	yes	yes	no				
Uranium	Total	0	0	na	na	na	na	na	na	no	no	no	no	1	0	0	0
	Dissolved	0	32	0%	na	na	0.5	0.5	na	no	no	yes	no				
Zinc	Total	248	279	89%	28,985	3,538,000	5	5	67	yes	yes	yes	yes	0	0	1	0
	Dissolved	317	352	90%	24,180	3,105,000	5	5	66	yes	yes	yes	yes				
													Total	**14**	**0**	**9**	**3**

Appendix C1
Selection of Surface Water COPCs for Wildlife Receptors

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

Parameter	Analysis Type	Number of Detections	Number of Samples	Detection Frequency (DF)	Mean Detected Conc (ug/L)	Maximum Detected Conc (ug/L)	Mean Non-Detected Conc (ug/L)	Maximum Non-Detected Conc (ug/L)	Wildlife Ingestion Benchmark (ug/L)	Is cmpd essential nutrient? [a]	Does cmpd have an TRV?	Is DF > 5%?	Is Mean DL < Benchmark?	Is Max Detect > Benchmark?	Qual Type 1	Qual Type 2	Quant COPC	Not a COPC
Aluminum	Total	57	122	47%	2,246	114,510	22	100	4474	no	yes	yes	yes	yes	0	0	1	0
	Dissolved	67	172	39%	1,542	95,854	21	100	4474	no	yes	yes	yes	yes				
Antimony	Total	15	52	29%	0.2	0.3	0.1	0.1	na	no	no	yes	yes	no	1	0	0	0
	Dissolved	32	84	38%	0.3	0.6	0.3	0.5	na	no	no	yes	yes	no				
Arsenic	Total	18	112	16%	9	96	1	1	292	no	yes	yes	yes	no	0	0	0	1
	Dissolved	16	138	12%	6.3	39	0.5	1	292	no	yes	yes	yes	no				
Barium	Total	0	0	na	na	na	na	na	23100	no	yes	no	no	yes	0	1	0	0
	Dissolved	32	32	100%	23	55	na	na	23100	no	yes	yes	no	no				
Beryllium	Total	0	0	na	na	na	na	na	na	no	no	no	no	no	1	0	0	0
	Dissolved	0	32	0%	na	na	1	1	na	no	no	no	yes	no				
Cadmium	Total	201	270	74%	127.4	22,500.0	0.1	0.3	4132.0	no	yes	yes	yes	yes	0	0	1	0
	Dissolved	259	357	73%	91	19,800	0	2	4132.0	no	yes	yes	yes	yes				
Calcium	Total	0	0	na	na	na	na	na	na	yes	no	no	no	no	0	0	0	1
	Dissolved	204	204	100%	58,953	477,400	na	na	na	yes	no	yes	no	no				
Chromium	Total	33	136	24%	0.5	4.4	2.1	20.0	4300	no	yes	yes	yes	no	0	0	0	1
	Dissolved	52	159	33%	0.8	6.2	1.9	3.0	4300	no	yes	yes	yes	no				
Cobalt	Total	0	0	na	na	na	na	na	7670.00	no	yes	no	no	yes	0	1	0	0
	Dissolved	2	32	6%	2	2	1	1	7670.00	no	yes	yes	yes	no				
Copper	Total	174	268	65%	65.2	9,575.0	1.0	5.0	65200	no	yes	yes	yes	no	0	0	0	1
	Dissolved	170	287	59%	57.0	8,393.0	0.9	5.0	65200	no	yes	yes	yes	no				
Iron	Total	223	272	82%	18,098	837,588	31	50	na	no	no	yes	yes	no	1	0	0	0
	Dissolved	182	335	54%	24,333	694,200	17	25	na	no	no	yes	yes	no				
Lead	Total	179	268	67%	57	5,490	1	3	4860	no	yes	yes	yes	yes	0	0	1	0
	Dissolved	182	394	46%	16	744	1	40	4860	no	yes	yes	yes	no				
Magnesium	Total	0	0	na	na	na	na	na	na	yes	no	no	no	no	0	0	0	1
	Dissolved	199	199	100%	19,922	968,900	na	na	na	yes	no	yes	no	no				
Manganese	Total	228	271	84%	10,729	1,276,690	13	25	377000	no	yes	yes	yes	yes	0	0	1	0
	Dissolved	264	335	79%	9,768	1,136,130	7	10	377000	no	yes	yes	yes	yes				
Mercury	Total	1	6	17%	400	400	0	0	28	no	yes	yes	yes	yes	0	0	1	0
	Dissolved	0	0	na	na	na	na	na	28	no	yes	no	no	yes				
Molybdenum	Total	0	0	na	na	na	na	na	600.0	no	yes	no	no	yes	0	1	0	0
	Dissolved	2	32	6%	6.0	9.0	0.5	0.5	600.0	no	yes	yes	yes	no				
Nickel	Total	33	153	22%	142.9	1,675.0	6.4	15.0	171360	no	yes	yes	yes	no	0	0	0	1
	Dissolved	51	177	29%	84.3	1,377.0	5.8	15.0	171360	no	yes	yes	yes	no				
Phosphorus	Total	5	34	15%	32.00	70.00	5.00	5.00	na	no	no	yes	yes	no	1	0	0	0
	Dissolved	3	33	9%	16.67	20.00	5.00	5.00	na	no	no	yes	yes	no				
Potassium	Total	20	54	37%	2,070.0	5,700.0	500.0	500.0	na	yes	no	yes	yes	no	0	0	0	1
	Dissolved	131	132	99%	1,078	7,000	500	500	na	yes	no	yes	yes	no				
Selenium	Total	0	52	0%	na	na	1	3	857	no	yes	no	yes	yes	0	0	0	1
	Dissolved	2	65	3%	1	1	1	1	857	no	yes	no	yes	no				
Silicone	Total	0	0	na	na	na	na	na	na	no	no	no	no	no	1	0	0	0
	Dissolved	32	32	100%	7,894	9,900	na	na	na	no	no	yes	no	no				
Silver	Total	6	108	6%	5	25	0	1	na	no	no	yes	yes	no	1	0	0	0
	Dissolved	3	129	2%	1	3	0	1	na	no	no	no	yes	no				
Sodium	Total	0	0	na	na	na	na	na	na	yes	no	no	no	no	0	0	0	1
	Dissolved	205	218	94%	3,200.7	77,000.0	1,500.0	1,500.0	na	yes	no	yes	yes	no				
Thallium	Total	6	52	12%	0.3	0.5	0.1	0.1	32	no	yes	yes	yes	no	0	0	0	1
	Dissolved	8	52	15%	0	0	0	0	32	no	yes	yes	yes	no				
Uranium	Total	0	0	na	na	na	na	na	6995.0	no	yes	no	no	yes	0	1	0	0
	Dissolved	0	32	0%	na	na	0.5	0.5	6995.0	no	yes	no	yes	yes				
Zinc	Total	248	279	89%	28,985	3,538,000	5	5	62300	no	yes	yes	yes	yes	0	0	1	0
	Dissolved	317	352	90%	24,180	3,105,000	5	5	62300	no	yes	yes	yes	yes				
														Total	6	4	6	10

a Essential nutrients are defined as: calcium, magnesium, potassium, and sodium (including dissolved state).

Appendix C2
Selection of Sediment COPCs for Aquatic Receptors

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

Parameter	Number of Detections	Number of Samples	Detection Frequency (DF)	Mean Detected Conc (mg/kg)	Maximum Detected Conc (mg/kg)	Mean Non-Detected Conc (mg/kg)	Maximum Non-Detected Conc (mg/kg)	Aquatic Benchmark (mg/kg)	Does cmpd have an TRV?	Is DF > 5%?	Is Mean DL < Benchmark?	Is Max Detect > Benchmark?	Qual Type 1	Qual Type 2	Quant COPC	Not a COPC
Aluminum	10	10	100%	70,900	83,000	na	na	14000	yes	yes	no	yes	0	0	1	0
Arsenic	20	20	100%	100.2	216.0	na	na	10	yes	yes	no	yes	0	0	1	0
Cadmium	20	20	100%	67	210	na	na	1.0	yes	yes	no	yes	0	0	1	0
Chromium	10	10	100%	52.0	82.0	na	na	43	yes	yes	no	yes	0	0	1	0
Copper	10	10	100%	195	490	na	na	32	yes	yes	no	yes	0	0	1	0
Gold	7	10	70%	1.1	4.4	0.04	0.05	na	no	yes	yes	no	1	0	0	0
Iron	20	20	100%	68,560	151,000	na	na	19000	yes	yes	no	yes	0	0	1	0
Lead	20	20	100%	1,865.5	6,500.0	na	na	36	yes	yes	no	yes	0	0	1	0
Manganese	10	10	100%	3,867	12,000	na	na	630	yes	yes	no	yes	0	0	1	0
Mercury	10	10	100%	0.2	0.4	na	na	0.18	yes	yes	no	yes	0	0	1	0
Molybdenum	10	10	100%	8	16	na	na	na	no	yes	no	no	1	0	0	0
Nickel	10	10	100%	29	33	na	na	23	yes	yes	no	yes	0	0	1	0
Selenium	10	10	100%	2	2	na	na	na	no	yes	no	no	1	0	0	0
Silver	20	20	100%	17	90	na	na	0.73	yes	yes	no	yes	0	0	1	0
Zinc	20	20	100%	11,420	35,000	na	na	121	yes	yes	no	yes	0	0	1	0
												Total	**3**	**0**	**12**	**0**

Appendix C2
Selection of Sediment COPCs for Wildlife Receptors

Ecological Risk Assessment for the French Gulch/Wellington-Oro Mine Site
Breckenridge, Colorado

Parameter	Number of Detections	Number of Samples	Detection Frequency (DF)	Mean Detected Conc (mg/kg)	Maximum Detected Conc (mg/kg)	Mean Non-Detected Conc (mg/kg)	Maximum Non-Detected Conc (mg/kg)	Wildlife Benchmark (mg/kg)	Is cmpd essential nutrient? [a]	Does cmpd have an TRV?	Is DF > 5%?	Is Mean DL < Benchmark?	Is Max Detect > Benchmark?	Qual Type 1	Qual Type 2	Quant COPC	Not a COPC
Aluminum	10	10	100%	70,900	83,000	na	na	3.8	no	yes	yes	no	yes	0	0	1	0
Arsenic	20	20	100%	100.2	216.0	na	na	0.3	no	yes	yes	no	yes	0	0	1	0
Cadmium	20	20	100%	67	210	na	na	1.2	no	yes	yes	no	yes	0	0	1	0
Chromium	10	10	100%	52.0	82.0	na	na	0.8	no	yes	yes	no	yes	0	0	1	0
Copper	10	10	100%	195	490	na	na	38.9	no	yes	yes	no	yes	0	0	1	0
Gold	7	10	70%	1.1	4.4	0.04	0.05	na	no	no	yes	yes	no	1	0	0	0
Iron	20	20	100%	68,560	151,000	na	na	na	no	no	yes	no	no	1	0	0	0
Lead	20	20	100%	1,865.5	6,500.0	na	na	0.9	no	yes	yes	no	yes	0	0	1	0
Manganese	10	10	100%	3,867	12,000	na	na	322	no	yes	yes	no	yes	0	0	1	0
Mercury	10	10	100%	0.2	0.4	na	na	0.01	no	yes	yes	no	yes	0	0	1	0
Molybdenum	10	10	100%	8	16	na	na	0.5	no	yes	yes	no	yes	0	0	1	0
Nickel	10	10	100%	29	33	na	na	64.1	no	yes	yes	no	no	0	0	0	1
Selenium	10	10	100%	2	2	na	na	0.3	no	yes	yes	no	yes	0	0	1	0
Silver	20	20	100%	17	90	na	na	na	no	no	yes	no	no	1	0	0	0
Zinc	20	20	100%	11,420	35,000	na	na	12.0	no	yes	yes	no	yes	0	0	1	0
													Total	**3**	**0**	**11**	**1**

a Essential nutrients are defined as: calcium, magnesium, potassium, and sodium (including dissolved state).

Appendix D
Wildlife Exposure Parameters

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EXPOSURE FACTORS FOR WILDLIFE RECEPTORS OF CONCERN

	Receptor	***Genus species***	**Body Weight** (kg wet weight)	**Food Ingestion Rate** (kg wet weight/day)	**Water Ingestion Rate** (L/day)	**Sediment Ingestion Rate** (kg dry weight/day)	**Home Range Size** (ha)
Mammalian Semi-aquatic	Mink	*Mustela vison*	0.556	0.089	0.058	0.0002	14.1
Avian Aquatic	Great Blue Heron	*Ardea herodias*	2.34	0.411	0.10	0.0010	3.1

Great Blue Heron
Ardea herodias

Parameter	Symbol	Reported Values	References	Values Identified for SERA
Habitat		Freshwater lakes, rivers, wetlands, brackish marshes and mangroves where small fish are plentiful in shallow areas. Forage in shallow shores of ponds, lakes, streams, wet meadows, wooded swamps, bays and marshes. Uses trees for rookery sites. In absence of trees will use rock ledges, cliffs and artificial structures.	USEPA, 1993 Sample & Suter, 1994	
Body Weight (kg wet weight)	BW	2.229 - Mean - both sexes 2.204 - Mean - adult females 2.576 - Mean - adult males	USEPA, 1993	Mean of reported means: 2.34
Food Ingestion Rate (kg wet weight/day)	IR_{food}	Species specific values are not available. Can be estimated based on following equation: $\log IR_{food} = (0.966*(\log BW) - 0.640) / 1000$ Where: BW is in grams	Kushlan, 1978	Estimated from equation: 0.411
Water Ingestion Rate (L/day)	IR_{water}	Values not reported. Estimated based on following equation: $IR_{water} = 0.059*BW^{0.67}$	USEPA, 1993	Estimated from equation: 0.10
Sediment Ingestion Rate (kg dry weight/day)	IR_{sed}	Ingestion of sediment (I_{sed}) as percentage of food intake (kg sediment dry weight/kg food dry weight) is not available. Assumed to be equal to 1%.	Assumption	$IR_{sed} = IR_{food}*0.24*I_{sed}$ Where 0.24 (kg food dry weight /kg food wet weight) = wet weight to dry weight conversion factor for food assuming 24% dry matter in food: 0.0010
Dietary Composition (fraction wet volume)	df	Diet is predominantly fish but may include crustaceans, insects, snails, amphibians, reptiles, birds and mammals. Approximately 73% of fish eaten were smaller than 1/3 of beak length, 19% about ½ beak length, 7% longer than beak.	USEPA, 1993; Sample & Suter, 1994	Fraction fish = $df_{fish} = 1$
Home Range Size (ha)	HR	0.6 - Mean feeding territory - both sexes - fal 8.4 - Mean feeding territory - both sexes - winte	USEPA, 1993	Mean value for fall 0.6
Foraging Distance (km)		3.1 - Mean - both sexes - South Dakota - summe 7 to 8 - Mean - both sexes - North Carolina - summe	USEPA, 1993	Mean value for South Dakota 3.1
Seasonal Use		Migratory in northern portion of range. Leave breeding grounds by late October returning in mid-February.	USEPA, 1993	

Mink *Mustela vison*				
Parameter	**Symbol**	**Reported Values**	**References**	**Values Identified for SERA**
Habitat		Mink are associated with aquatic habitats including rivers, streams, lakes, ditches, swamps, marshes and backwater areas. They prefer irregular shorelines and brushy or wooded cover adjacent to the water.	USEPA, 1993	
Body Weight (kg wet weight)	BW	1.04 - Mean - adult male - summer - Montana 1.233 - Mean - adult male - fall - Montana 0.550 - Mean - adult female- summer - Montana 0.586 - Mean - adult female - fall - Montana 0.777 - Mean - juvenile male - summer - Montana 0.533 - Mean - juvenile female - summer - Montana	USEPA, 1993	Mean of means for females: 0.556
Food Ingestion Rate (kg wet weight/day)	IR_{food}	0.13 g/g-day - Mean - captive males = 0.15 kg/day (using 1.14 kg BW) 0.12 g/g-day - Mean - farm raised males = 0.14 kg/day 0.16 g/g-day - Mean - farm raised females = 0.089 kg/day (0.556 BW)	USEPA, 1993	Mean of means for females: 0.089
Water Ingestion Rate (L/day)	IR_{water}	0.028 g/g-day = 0.022 L/day - Mean for farm raised mink.	USEPA, 1993	Reported mean selected: 0.058
Sediment or Soil Ingestion Rate (kg dry weight/day)	$IR_{sediment}$	Ingestion of sediment (I_{sed}) or soil (I_{soil}) as percentage of food intake (kg dry weight/kg food dry weight) is not available. Assumed to be equal to 1%.		IR_{sed} (or IR_{soil}) = IR_{food}*0.22*$I_{sed/soil}$ Where 0.22 (kg food dry weight /kg food wet weight) = wet weight to dry weight conversion factor for food assuming 22% dry matter in food: 0.00020
Dietary Composition (fraction wet volume)	df	Mink are opportunistic feeders taking whatever prey is abundant. In many parts of its range mammals are the most important prey but mink hunt aquatic prey as well depending on the season. In mink stomachs the frequency of occurrence was: 11.5% fish, and 7.2% mammals.	USEPA, 1993	Fraction fish= df_{fish} = 1.0
Home Range Size (ha)	HR	Range size and shape depends on habitat. Shape is linear along streams and circular in marshes. Montana /riverine: 7.8 - Female mink in heavy vegetation 20.4 - Female mink in sparse vegetation	USEPA, 1993	Mean of reported values for females: 14.1
Seasonal Use		Mink are nocturnal and active year round.	USEPA, 1993	

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Appendix E
Derivation of Tissue-based TRVs for Fish

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Appendix E
Tissue Residues of Arsenic associated with Adverse Effects to Survival and Growth of Rainbow Trout

Arsenic *Note TRV indicated by bold and shading*

Test Species	Tissue Type	Exposure Form	Exposure Conc (mg/L)	Exposure Duration (days)	Age, Weight*	Residue (mg/kg dw)	Effect	Source Citation
Rainbow Trout	Whole Body	Sodium arsenate	120	7	FG, 1.5g	5	No Effect Survival	1
		Sodium arsenate	120	7	FG, 1.5g	5	No Effect Growth	1
		Sodium arsenate	240	7	FG, 1.5g	**10**	No Effect Survival	1
		Sodium arsenate	60	7	FG, 1.5g	15	Reduced Survival by 50%	1
		Arsenic trioxide	2.95	21	JV	15	Reduced Growth	1
		Sodium arsenate	36	77	FG, 5.7g	17	No Effect Survival	1
		Sodium arsenate	36	77	FG, 5.7g	23.5	No Effect Survival/Growth	2
		Sodium arsenate	18	77	FG, 5.7g	27	Reduced Survival/Death	1
		Sodium arsenate	36	77	FG, 5.7g	40.5	Reduced Survival by 50%	3
		Sodium arsenate	18	77	FG, 5.7g	43	Reduced Survival by 50%	3
		Sodium arsenate	36	77	FG, 5.7g	43	Reduced Survival by 50%	3
		Sodium arsenate	18	77	FG, 5.7g	67.5	Reduced Survival by 50%	3

* FG = Fingerling; JV = Juvenile
1 - McGeachy and Dixon, 1990
2 - Dixon and Sprague, 1981
3 - McGeachy and Dixon, 1992

Source: *Jarvinen and Ankley (1999). Linkages of Effects to Tissue Residues: Development of a Comprehensive Database for Aquatic Organisms Exposed to Inorganic and Organic Chemicals.*

Cadmium

Note TRV indicated by bold and shading

Test Species	Tissue Type	Exposure Form	Exposure Conc (mg/L)	Exposure Duration (days)	Age, Weight*	Residue (mg/kg dw)	Effect	Source Citation
Brook Trout	Kidney	Cadmium chloride	0.0005	266	YR	2.5	No Effect Survival	1
		Cadmium chloride	0.0005	266	YR	4	No Effect Survival	1
		Cadmium chloride	0.0034	266	YR	4.7	Reduced Survival	1
		Cadmium chloride	0.0034	266	YR	8	Reduced Survival	1
		Cadmium chloride	0.0005	266	YR	**16**	No Effect Survival	1
		Cadmium chloride	0.0034	266	YR	50	Reduced Survival	1
		Cadmium chloride	0.0034	735	EMB	65	No Effect Survival/Growth	1
	Liver	Cadmium chloride	0.0034	735	EMB	9	No Effect Survival/Growth	1
Brown Trout	Kidney	Cadmium sulfate	0.027	90	YR	5.3	No Effect Growth	2
		Cadmium sulfate	0.0093	630	AD	277	No Effect Survival/Growth	3
	Liver	Cadmium sulfate	0.027	90	YR	5.7	No Effect Growth	2
		Cadmium sulfate	0.0093	630	AD	91	No Effect Survival/Growth	3
Rainbow Trout	Kidney	Cadmium chloride	0.01	180 (90)	150-200g	1.9	No Effect Survival	4
		Cadmium sulfate	0.01	90	YR	7.5	No Effect Growth	2
		Cadmium sulfate	0.00047	455	AD	8	No Effect Reproduction	3
		Cadmium	0.001	210	3.1	25.5	No Effect Growth	5
		Cadmium chloride	0.2	120	JV	36.5	No Effect Growth	7
		Cadmium sulfate	0.0018	455	AD	82	Reduced Reproduction	3
		Cadmium	0.0048	210	3.1	100	Reduced Growth	5
		Cadmium chloride	0.01	180 (90)	150-200g	331.5	No Effect Survival/Growth	4
	Liver	Cadmium chloride	0.01	180 (90)	150-200g	1.9	No Effect Survival	4
		Cadmium sulfate	0.01	90	YR	5.2	No Effect Growth	2
		Cadmium sulfate	0.00047	455	AD	5.5	No Effect Reproduction	3
		Cadmium	0.001	210	3.1	8	No Effect Growth	5
		Cadmium sulfate	2.3	0.33 (2.67)	138 g	15	No Effect Survival	6
		Cadmium chloride	0.002	30	AD	15	No Effect Growth	8
		Cadmium chloride	0.2	120	JV	**18.75**	No Effect Growth	7
		Cadmium sulfate	0.0018	455	AD	29	Reduced Reproduction	3
		Cadmium	0.0048	210	3.1	36.5	Reduced Growth	5
		Cadmium sulfate	0.0055	455	AD	56.5	No Effect Survival/Growth	3
	Mucus	Cadmium sulfate	2.3	0.33 (2.67)	138 g	**4**	No Effect Survival	6
	Muscle	Cadmium chloride	0.01	180 (90)	150-200g	0.1	No Effect Survival	4
		Cadmium sulfate	2.3	0.33 (2.67)	138 g	0.4	No Effect Survival	6
		Cadmium	0.001	210	3.1	**0.45**	No Effect Growth	5
		Cadmium	0.0048	210	3.1	0.6	Reduced Growth	5
		Cadmium sulfate	0.00047	455	AD	2	No Effect Reproduction	3
		Cadmium sulfate	0.0018	455	AD	3	Reduced Reproduction	3
		Cadmium sulfate	0.0055	455	AD	14	No Effect Survival/Growth	3

* YR = Yearling; EMB = Embryo; AD = Adult; JV = Juvenile
1 - Benoit et al., 1976
2 - Roberts et al., 1979
3 - Brown et al., 1994
4 - Calamari et al., 1982
5 - Kumada et al., 1973
6 - Handy, 1992
7 - Olsson et al., 1989
8 - Zelikoff et al., 1995

Source: *Jarvinen and Ankley (1999). Linkages of Effects to Tissue Residues: Development of a Comprehensive Database for Aquatic Organisms Exposed to Inorganic and Organic Chemicals.*

Appendix E

Tissue Residues of Copper associated with Adverse Effects to Survival and Growth of Rainbow Trout

Note TRV indicated by bold and shading

Copper

Test Species	Tissue Type	Exposure Form	Exposure Conc (mg/L)	Exposure Duration (days)	Age, Weight*	Residue (mg/kg dw)	Effect	Source Citation
Brook Trout	Egg	Copper sulfate	0.0094	720	EMB, JV, AD	**7**	No Effect Survival/ Growth/Reproduction	1
	Kidney	Copper sulfate	0.0094	720	EMB, JV, AD	**16.5**	No Effect Survival/ Growth/Reproduction	1
	Liver	Copper sulfate	0.0094	720	EMB, JV, AD	**239**	No Effect Survival/ Growth/Reproduction	1
	Muscle	Copper sulfate	0.0094	720	EMB, JV, AD	17	No Effect Survival/ Growth/Reproduction	1
Rainbow Trout	Liver	Copper sulfate	0.6	0.33 (6.67)	138 g	360	Reduced Survival by 63%	2
		Copper	NA	360	2 y	500	No Effect Survival	2
		Copper sulfate	0.1	0.33 (6.67)	138 g	865	No Effect Survival	3
		Copper	NA	360	2 y	1155	No Effect Survival	3
	Muscle	Copper sulfate	0.6	0.33 (6.67)	138 g	2.5	Reduced Survival by 63%	2
		Copper sulfate	0.1	0.33 (6.67)	138 g	**2.5**	No Effect Survival	2

* EMB = Embryo; JV = Juvenile; AD = Adult

1 - McKim and Benoit, 1971; 1974

2 - Handy, 1992

3 - Ollson et al., 1987

<u>Source:</u> Jarvinen and Ankley (1999). Linkages of Effects to Tissue Residues: Development of a Comprehensive Database for Aquatic Organisms Exposed to Inorganic and Organic Chemicals.

Appendix E

Tissue Residues of Lead associated with Adverse Effects to Survival and Growth of Rainbow Trout

Note TRV indicated by bold and shading

Lead

Test Species	Tissue Type	Exposure Form	Exposure Conc (mg/L)	Exposure Duration (days)	Age, Weight*	Residue (mg/kg dw)	Effect	Source Citation
Brook Trout	Kidney	Lead nitrate	0.119	735	EMB, AD	175	No Effect Survival/ Growth/Reproduction	1
		Lead nitrate	0.235	735	EMB, AD	326	Reduced Survival/ Growth/Reproduction	1
		Lead nitrate	0.47	266	YR, AD	**700**	No Effect Survival/ Growth/Reproduction	1
	Liver	Lead nitrate	0.119	735	EMB, AD	49	No Effect Survival/ Growth/Reproduction	1
		Lead nitrate	0.235	735	EMB, AD	**100**	No Effect Survival/ Growth/Reproduction	1
		Lead nitrate	0.47	266	YR, AD	134	Reduced Survival/ Growth/Reproduction	1
Rainbow Trout	Kidney	Lead nitrate	0.06	224	UYR, 6.5g	40	No Effect Survival	2
	Liver	Lead nitrate	0.06	224	UYR, 6.5g	10	No Effect Survival	2

* EMB = Embryo; YR = Yearling; UYR = Under-yearling; AD = Adult

1 - Holcombe et al., 1976

2 - Hodson et al., 1978

<u>Source:</u> *Jarvinen and Ankley (1999). Linkages of Effects to Tissue Residues: Development of a Comprehensive Database for Aquatic Organisms Exposed to*

Appendix E
Tissue Residues of Zinc associated with Adverse Effects to Survival and Growth of Rainbow Trout

Note TRV indicated by bold and shading

Zinc

Test Species	Tissue Type	Exposure Form	Exposure Conc (mg/L)	Exposure Duration (days)	Age, Weight*	Residue (mg/kg dw)	Effect	Source Citation
Brook Trout	Kidney	Zinc sulfate	1.36	140	YR, AD	**184.5**	No Effect Survival/Growth	1
		Zinc sulfate	1.36	140	YR, AD	184.5	Reduced Reproduction	1
		Zinc sulfate	0.534	168	YR, AD	195	No Effect Survival/ Growth/Reproduction	1
	Liver	Zinc sulfate	0.534	168	YR, AD	**300**	No Effect Survival/ Growth/Reproduction	1
		Zinc sulfate	1.36	140	YR, AD	331.5	No Effect Survival/Growth	1
		Zinc sulfate	1.36	140	YR, AD	331.5	Reduced Reproduction	1
Rainbow Trout	Liver	Zinc sulfate	0.15	60	JV	75	No Effect Survival	2
		Zinc	NA	360	2 y	134	No Effect Survival	3

* YR = Yearling; JV = Juvenile; AD = Adult
1 - Holcombe et al., 1979
2 - Hogstrand et al., 1994
3 - Ollson et al., 1987

Source: *Jarvinen and Ankley (1999). Linkages of Effects to Tissue Residues: Development of a Comprehensive Database for Aquatic Organisms Exposed to*

Appendix F
Derivation of Oral TRVs for Wildlife

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NOAEL & LOAEL TRVs - **ALUMINUM**

					Study Factors						Conversion Factor (kg food/ kg BW/day)			Uncertainty Factors (UF)								
Receptor	**Study**	**Chemical**	**Route**	**Study Test Species**	**Duration**	**N**	**Doses**	**Endpoint**	**NOAEL study conc (ppm)**	**LOAEL study conc (ppm)**	**Source**	**NOAEL dose (mg/kg-day)**	**LOAEL dose (mg/kg-day)** [1]	**Inter-species**	**Duration**	**Endpoint NOAEL**	**Endpoint LOAEL**	**Other**	**Total UF[5] NOAEL**	**Total UF[5] LOAEL**	**NOAEL TRV (mg/kg-day)**	**LOAEL TRV (mg/kg-day)**
Mink (water)	**No Reliable TRV Establishing Studies Found** Derive from Dietary TRV[4]																				**1.13**	**5.5**
Mink (diet)	Golub et al., 1987	Aluminum lactate	Oral Diet	Rat	Chronic			Reproduction, Growth	85	413	0.08 ORNL 1996	6.8	33.04	3	1	1	1	1	3	3	**2.27**	**11.01**
Great Blue Heron (water)	**No Reliable TRV Establishing Studies Found** Derive from Dietary TRV[4]																				**17.50**	**87.5**
Great Blue Heron (diet)	Sparling, 1990	Aluminum sulphate	Oral Diet	Mallard	Chronic; 10 weeks			Reproduction, Growth	200.0	1,000	0.175 Camardese et al., 1990	35.00	175.0	1	1	1	1	1	1	1	**35.00**	**175.0**

[1] If no study is available to establish a LOAEL TRV, the LOAEL is set to equal 3 x NOAEL

[2] TRV(food) = TRV(water) / 0.50

[3] Test species uncertainty factor equals 1 since both Old World and New World mice are physiologically similar; and laboratory rodents are often more sensitive than wild species due to genetic heterogeneity of natural populations.

[4] TRV(water or capsule) = TRV(food) * 0.50

[5] TRV = Study Dose / UF

SMF = Study Modifying Factor
NA = Not Available
UF = Uncertainty Factor
NOAEL = No observed adverse effect level
LOAEL = Lowest observed adverse effect level
BW = body weight
TRV = Toxicity Reference Value

NOAEL & LOAEL TRVs - ARSENIC

Receptor	Study	Chemical	Route	Study Test Species	Study Factors: Duration	N	Doses	Endpoint	NOAEL study conc (ppm)	LOAEL study conc (ppm)	Conversion Factor (kg food/ kg BW/day): Source	NOAEL dose (mg/kg-day)	LOAEL dose (mg/kg-day) [1]	Uncertainty Factors (UF): Inter-species	Duration	Endpoint: NOAEL	Endpoint: LOAEL	Other	Total UF[5]: NOAEL	Total UF[5]: LOAEL	NOAEL TRV (mg/kg-day)	LOAEL TRV (mg/kg-day)
Mink (water)	Schroeder & Mitchener, 1971	Arsenite salt	Oral Water	Charles River CD Mice[3]	Chronic; 3 generations	10 animals in each generation	1 dose of 5.06 ppm (5 ppm water + 0.06 ppm diet)	Reproduction, Growth, Longevity	5.06		0.25 ORNL 1996	1.27	NA	5	1	1	1	1	5	5	**2.5E-01**	**7.6E-01**
Mink (diet)	Byron et al., 1967	Sodium arsenite	Oral Diet	Beagle	2 years	6 animals per dose group	4 doses each of arsenate or arsenite 5, 25, 50, 125 ppm	Growth, Mortality	50		0.024 ORNL 1996	1.2	NA	4	1	1	1	2 Unknown Effect Level	8	8	**1.5E-01**	**4.5E-01**
Great Blue Heron (water)	**No Reliable TRV Establishing Studies Found** Derive from Dietary TRV[4]																				**4.1E-01**	**3.5E+00**
Great Blue Heron (diet)	Stanley et al., 1994	Sodium arsenate	Oral Diet	Mallard	Chronic; 8 weeks	12 pairs (24 ducks) per diet	4 doses of 0, 25, 100, 400 ppm (Mean at 100 & 400 = 93 & 403 ppm)	Reproduction, Growth	93	403	0.175 Camardese et al., 1990	16	71	5	1	2	1	2 SMF	20	10	**8.1E-01**	**7.1E+00**

[1] If no study is available to establish a LOAEL TRV, the LOAEL is set to equal 3 x NOAEL

[2] TRV(food) = TRV(water) / 0.50

[3] Test species uncertainty factor equals 1 since both Old World and New World mice are physiologically similar; and laboratory rodents are often more sensitive than wild species due to genetic heterogeneity of natural populations.

[4] TRV(water or capsule) = TRV(food) * 0.50

[5] TRV = Study Dose / UF

SMF = Study Modifying Factor
NA = Not Available
UF = Uncertainty Factor
NOAEL = No observed adverse effect level
LOAEL = Lowest observed adverse effect level
BW = body weight
TRV = Toxicity Reference Value

NOAEL & LOAEL TRVs - CADMIUM

Receptor	Study	Chemical	Route	Study Test Species	Study Factors: Duration	Study Factors: N	Study Factors: Doses	Study Factors: Endpoint	NOAEL study conc (ppm)	LOAEL study conc (ppm)	Conversion Factor (kg food/ kg BW/day) Source	NOAEL dose (mg/kg-day)	LOAEL dose (mg/kg-day) [1]	Uncertainty Factors (UF): Inter-species	Uncertainty Factors (UF): Duration	Uncertainty Factors (UF): Endpoint		Other	Total UF[5]		NOAEL TRV (mg/kg-day)	LOAEL TRV (mg/kg-day)
																NOAEL	LOAEL		NOAEL	LOAEL		
Mink (water)	Schroeder & Mitchener, 1971	Soluble cadmium salts	Oral Water	Charles River CD Mice	Chronic; 3 generations	10 animals per dose group	1 expsoure of 10 mg/L (0.1 ppm in diet)	Reproduction		10	0.25 ORNL 1996	NA	2.5	5	1	1	1	1	5	5	**0.17**	**0.50**
Mink (diet)	Wilson et al., 1941	Cadmium chloride	Oral Diet	Albino rats	Chronic; 100 days	4 to 6 animals per dose group	6 exposures (0 control, 31, 62, 125, 250, 500 ppm)	Growth	31	62	0.08 ORNL 1996	2.48	4.96	5	1	1	1	1	5	5	**0.50**	**0.99**
Great Blue Heron (water)	**No Reliable TRV Establishing Studies Found** Derive from Dietary TRV[4]																				**0.04**	**1.2**
Great Blue Heron (diet)	White & Finley, 1978	Cadmium chloride	Oral Diet	Mallard	Chronic; 90 days	20 animals per dose group	4 exposure groups (0 control, 20, 200, 2000 ppm wet weight)	Reproduction	17.3	239	0.1 Measured in study	1.73	23.9	5	1	2	1	2 SMF	20	10	**0.09**	**2.4**

[1] If no study is available to establish a LOAEL TRV, the LOAEL is set to equal 3 x NOAEL

[2] TRV(food) = TRV(water) / 0.50

[3] Test species uncertainty factor equals 1 since both Old World and New World mice are physiologically similar; and laboratory rodents are often more sensitive than wild species due to genetic heterogeneity of natural populations.

[4] TRV(water or capsule) = TRV(food) * 0.50

[5] TRV = Study Dose / UF

SMF = Study Modifying Factor
NA = Not Available
UF = Uncertainty Factor
NOAEL = No observed adverse effect level
LOAEL = Lowest observed adverse effect level
BW = body weight
TRV = Toxicity Reference Value

NOAEL & LOAEL TRVs - CHROMIUM

Receptor	Study	Chemical	Route	Study Test Species	Study Factors: Duration	Study Factors: N	Study Factors: Doses	Study Factors: Endpoint	NOAEL study conc (ppm)	LOAEL study conc (ppm)	Conversion Factor (kg food/ kg BW/day): Source	NOAEL dose (mg/kg-day)	LOAEL dose (mg/kg-day) [1]	Uncertainty Factors (UF): Inter-species	Uncertainty Factors (UF): Duration	Uncertainty Factors (UF): Endpoint NOAEL	Uncertainty Factors (UF): Endpoint LOAEL	Other	Total UF[5] NOAEL	Total UF[5] LOAEL	NOAEL TRV (mg/kg-day)	LOAEL TRV (mg/kg-day)
Mink (water)	**No Reliable TRV Establishing Study** Derive from dietary TRV																				**4.0E+02**	**1.2E+03**
Mink (diet)	Ivankovic and Preussmann 1975	Chromium oxide Cr^{+3}	Oral Diet	Rat	90 days & 2 years Chronic		3 exposures 1%, 2%, 5%	Reproduction; Longevity	50000		0.08 BW & FCNS - EPA 1988a	4000	NA	5	1	1	1	1	5	5	**8.0E+02**	**2.4E+03**
Great Blue Heron (water)	**No Reliable TRV Establishing Study** Derive from dietary TRV																				**1.0E-01**	**5.0E-01**
Great Blue Heron (diet)	Haseltine et al. 1985	Chromium potassium sulfate Cr^{+3}	Oral Diet	Black duck	10 months Critical lifestage		2 exposures 10 & 50 ppm	Reproduction	10	50	0.1 BW - Dunning 1984; FCNS - Heinz et al 1989	1.0	5.0	5	1	1	1	1	5	5	**2.0E-01**	**1.0E+00**

[1] If no study is available to establish a LOAEL TRV, the LOAEL is set to equal 3 x NOAEL

[2] TRV(food) = TRV(water) / 0.50

[3] Test species uncertainty factor equals 1 since both Old World and New World mice are physiologically similar; and laboratory rodents are often more sensitive than wild species due to genetic heterogeneity of natural populations.

[4] TRV(water or capsule) = TRV(food) * 0.50

[5] TRV = Study Dose / UF

SMF = Study Modifying Factor
NA = Not Available
UF = Uncertainty Factor
NOAEL = No observed adverse effect level
LOAEL = Lowest observed adverse effect level
BW = body weight
TRV = Toxicity Reference Value

NOAEL & LOAEL TRVs - **COPPER**

Receptor	Study	Chemical	Route	Study Test Species	Study Factors: Duration	Study Factors: N	Study Factors: Doses	Study Factors: Endpoint	NOAEL study conc (ppm)	LOAEL study conc (ppm)	Conversion Factor (kg food/ kg BW/day) Source	NOAEL dose (mg/kg-day)	LOAEL dose (mg/kg-day) [1]	UF: Inter-species	UF: Duration	UF: Endpoint NOAEL	UF: Endpoint LOAEL	UF: Other	Total UF[5] NOAEL	Total UF[5] LOAEL	NOAEL TRV (mg/kg-day)	LOAEL TRV (mg/kg-day)
Mink (water)	Aulerich et al., 1982	Copper sulfate	Oral Water	Mink	Chronic; 357 days	24 animals per dose group	5 exposures (60.5 control, 25, 50, 100, 200 mg/kg)	Reproduction (Reproductive success)	110.5	160.5	0.16 USEPA, 1993	17.7	25.7	1	1	1	1	1	1	1	**1.8E+01**	**2.6E+01**
Mink (diet)	**No Reliable TRV Establishing Studies Found** Derive from Water TRV[2]																				**8.8E+00**	**1.3E+01**
Great Blue Heron (water)	**No Reliable TRV Establishing Studies Found** Derive from Dietary TRV[4]																				**2.0E+00**	**3.0E+00**
Great Blue Heron (diet)	Jackson & Stevenson, 1981	Copper oxide	Oral Diet	Chicken	Chronic; 40 weeks	22 animals per dose group	6 exposures (0 control, 150, 300, 450, 600, 750 ppm)	Reproduction	300	450	0.067 Measured in study	20.1	30.2	5	1	1	1	1	5	5	**4.0E+00**	**6.0E+00**

[1] If no study is available to establish a LOAEL TRV, the LOAEL is set to equal 3 x NOAEL

[2] TRV(food) = TRV(water) / 0.50

[3] Test species uncertainty factor equals 1 since both Old World and New World mice are physiologically similar; and laboratory rodents are often more sensitive than wild species due to genetic heterogeneity of natural populations.

[4] TRV(water or capsule) = TRV(food) * 0.50

[5] TRV = Study Dose / UF

SMF = Study Modifying Factor
NA = Not Available
UF = Uncertainty Factor
NOAEL = No observed adverse effect level
LOAEL = Lowest observed adverse effect level
BW = body weight
TRV = Toxicity Reference Value

NOAEL & LOAEL TRVs - **LEAD**

					Study Factors						Conversion Factor (kg food/ kg BW/day)			Uncertainty Factors (UF)								
Receptor	**Study**	**Chemical**	**Route**	**Study Test Species**	**Duration**	**N**	**Doses**	**Endpoint**	**NOAEL study conc (ppm)**	**LOAEL study conc (ppm)**	**Source**	**NOAEL dose (mg/kg-day)**	**LOAEL dose (mg/kg-day) [1]**	**Inter-species**	**Duration**	**Endpoint**		**Other**	**Total UF[5]**		**NOAEL TRV (mg/kg-day)**	**LOAEL TRV (mg/kg-day)**
																NOAEL	**LOAEL**		**NOAEL**	**LOAEL**		
Mink (water)	**No Reliable TRV Establishing Studies Found** Derive from Dietary TRV[4]																				**1.6E-01**	**3.1E-01**
Mink (diet)	Horwitt & Cowgill, 1938	Lead acetate	Oral Diet	Dogs	Chronic; prenatal + 7 months	2 to 4 animals per dose group	4 exposures (2 control, 25, 50, 100 ppm)	Reproduction, Growth	52	102	0.024 ORNL, 1996	1.25	2.45	4	1	1	1	1	4	4	**3.1E-01**	**6.1E-01**
Great Blue Heron (water)	**No Reliable TRV Establishing Studies Found** Derive from Dietary TRV[4]																				**4.4E-01**	**8.8E-01**
Great Blue Heron (diet)	Edens & Garlich, 1983	Lead acetate	Oral Diet	Leghorn hens	Chronic; 10 weeks (during repro-duction)	20 or 40 animals per dose group	3 or 5 exposures Exp 1- 0, 25, 50 ppm; Exp 2 - 0, 50, 100, 200, 400 ppm	Reproduction (Egg production)	25	50	0.175 Sax & Lewis, 1989	4.38	8.75	5	1	1	1	1	5	5	**8.8E-01**	**1.8E+00**

[1] If no study is available to establish a LOAEL TRV, the LOAEL is set to equal 3 x NOAEL

[2] TRV(food) = TRV(water) / 0.50

[3] Test species uncertainty factor equals 1 since both Old World and New World mice are physiologically similar; and laboratory rodents are often more sensitive than wild species due to genetic heterogeneity of natural populations.

[4] TRV(water or capsule) = TRV(food) * 0.50

[5] TRV = Study Dose / UF

SMF = Study Modifying Factor
NA = Not Available
UF = Uncertainty Factor
NOAEL = No observed adverse effect level
LOAEL = Lowest observed adverse effect level
BW = body weight
TRV = Toxicity Reference Value

NOAEL & LOAEL TRVs - **MANGANESE**

Receptor	Study	Chemical	Route	Study Test Species	Study Factors: Duration	Study Factors: N	Study Factors: Doses	Study Factors: Endpoint	NOAEL study conc (ppm)	LOAEL study conc (ppm)	Conversion Factor (kg food/ kg BW/day) Source	NOAEL dose (mg/kg-day)	LOAEL dose (mg/kg-day) [1]	Uncertainty Factors (UF): Inter-species	Uncertainty Factors (UF): Duration	Uncertainty Factors (UF): Endpoint NOAEL	Uncertainty Factors (UF): Endpoint LOAEL	Other	Total UF[5] NOAEL	Total UF[5] LOAEL	NOAEL TRV (mg/kg-day)	LOAEL TRV (mg/kg-day)
Mink (water)	**No Reliable TRV Establishing Study** Derive from dietary TRV																				**8.8E+00**	**2.8E+01**
Mink (diet)	Laskey et al 1982	Manganese oxide	Oral Diet	Rat	224 days (through gestation) Critical lifestage		3 exposures 350, 1050, 3500 ppm (+ 50 ppm basal diet)	Reproduction	1100	3550	0.08 BW & FCNS - EPA 1988a	88	284	5	1	1	1	1	5	5	**1.8E+01**	**5.7E+01**
Great Blue Heron (water)	**No Reliable TRV Establishing Study** Derive from dietary TRV																				**3.3E+01**	**9.8E+01**
Great Blue Heron (diet)	Laskey and Edens 1985	Manganese oxide	Oral Diet	Japanese quail	75 days Chronic exposure		1 exposure 5000 ppm (+56 ppm basal diet)	Growth; Aggressive behavior			1 None required	NA	977 Reported in study	5	1	1	1	1	5	5	**6.5E+01**	**2.0E+02**

[1] If no study is available to establish a LOAEL TRV, the LOAEL is set to equal 3 x NOAEL

[2] TRV(food) = TRV(water) / 0.50

[3] Test species uncertainty factor equals 1 since both Old World and New World mice are physiologically similar; and laboratory rodents are often more sensitive than wild species due to genetic heterogeneity of natural populations.

[4] TRV(water or capsule) = TRV(food) * 0.50

[5] TRV = Study Dose / UF

SMF = Study Modifying Factor
NA = Not Available
UF = Uncertainty Factor
NOAEL = No observed adverse effect level
LOAEL = Lowest observed adverse effect level
BW = body weight
TRV = Toxicity Reference Value

NOAEL & LOAEL TRVs - INORGANIC MERCURY

Receptor	Study	Chemical	Route	Study Test Species	Study Factors: Duration	Study Factors: N	Study Factors: Doses	Study Factors: Endpoint	NOAEL study conc (ppm)	LOAEL study conc (ppm)	Conversion Factor (kg food/ kg BW/day) Source	NOAEL dose (mg/kg-day)	LOAEL dose (mg/kg-day) [1]	Uncertainty Factors (UF): Inter-species	Uncertainty Factors (UF): Duration	Uncertainty Factors (UF): Endpoint NOAEL	Uncertainty Factors (UF): Endpoint LOAEL	Uncertainty Factors (UF): Other	Total UF[5] NOAEL	Total UF[5] LOAEL	NOAEL TRV (mg/kg-day)	LOAEL TRV (mg/kg-day)
Mink (water)	**No Reliable TRV Establishing Studies Found** Derive from Dietary TRV[4]																				**0.69**	**2.1**
Mink (diet)	Aulerich et al., 1974	Mercuric chloride	Oral Diet	Mink	Subchronic; 6 month Critical life stage (kit develop.)	15 animals per dose group	1 exposure (10 ppm)	Reproduction, Developmental	10		0.137 Bleavins & Aulerich, 1981	1.4	NA	1	1	1	1	1	1	1	**1.4**	**4.1**
Great Blue Heron (water)	**No Reliable TRV Establishing Studies Found** Derive from Dietary TRV[4]																				**0.05**	**0.1**
Great Blue Heron (diet)	Hill & Schaffner, 1976	Mercuric chloride	Oral Diet	Japanese quail	Chronic; 1 year Critical life stage (hatchling)		5 exposures (2, 4, 8, 16, 32 ppm)	Reproduction, Developmental	4	8	0.113 ORNL, 1996	0.45	0.90	5	1	1	1	1	5	5	**0.09**	**0.18**

[1] If no study is available to establish a LOAEL TRV, the LOAEL is set to equal 3 x NOAEL

[2] TRV(food) = TRV(water) / 0.50

[3] Test species uncertainty factor equals 1 since both Old World and New World mice are physiologically similar; and laboratory rodents are often more sensitive than wild species due to genetic heterogeneity of natural populations.

[4] TRV(water or capsule) = TRV(food) * 0.50

[5] TRV = Study Dose / UF

SMF = Study Modifying Factor
NA = Not Available

NOAEL & LOAEL TRVs **- MOLYBDENUM**

Receptor	Study	Chemical	Route	Study Test Species	Study Factors: Duration	Study Factors: N	Study Factors: Doses	Study Factors: Endpoint	NOAEL study conc (ppm)	LOAEL study conc (ppm)	Conversion Factor (kg food/ kg BW/day): Source	NOAEL dose (mg/kg-day)	LOAEL dose (mg/kg-day) [1]	Uncertainty Factors (UF): Inter-species	Uncertainty Factors (UF): Duration	Uncertainty Factors (UF): Endpoint NOAEL	Uncertainty Factors (UF): Endpoint LOAEL	Other	Total UF[5] NOAEL	Total UF[5] LOAEL	NOAEL TRV (mg/kg-day)	LOAEL TRV (mg/kg-day)
Mink (water)	Schroeder & Mitchener, 1971	Molybdate (MoO_4)	Oral Water	Mouse	Chronic; 3 generations	10 animals per dose group	1 expsoure of 10 mg/L (0.45 ppm in diet)	Reproduction	0.45	10.45	0.25 BW & WCNS - EPA 1988a	0.1125	2.6	5	1	1	1	1	5	5	**0.02**	**0.52**
Mink (diet)	**No Reliable TRV Establishing Studies Found** Derive from Water TRV[2]																				**0.01**	**0.26**
Great Blue Heron (water)	**No Reliable TRV Establishing Studies Found** Derive from Dietary TRV[4]																				**1.18**	**3.53**
Great Blue Heron (diet)	Lepore & Miller, 1965	Sodium Molybdate	Oral Diet	Chicken	21 days thru reproduction Critical life stage		3 exposures (500, 1000, 2000 ppm in diet)	Reproduction		500	0.071 BW & FCNS - EPA 1988a	NA	35.33	5	1	1	1	1	5	5	**2.36**	**7.07**

[1] If no study is available to establish a LOAEL TRV, the LOAEL is set to equal 3 x NOAEL

[2] TRV(food) = TRV(water) / 0.50

[3] Test species uncertainty factor equals 1 since both Old World and New World mice are physiologically similar; and laboratory rodents are often more sensitive than wild species due to genetic heterogeneity of natural populations.

[4] TRV(water or capsule) = TRV(food) * 0.50

[5] TRV = Study Dose / UF

SMF = Study Modifying Factor
NA = Not Available

NOAEL & LOAEL TRVs - SELENIUM

Receptor	Study	Chemical	Route	Study Test Species	Study Factors: Duration	Study Factors: N	Study Factors: Doses	Study Factors: Endpoint	NOAEL study conc (ppm)	LOAEL study conc (ppm)	Conversion Factor (kg food/ kg BW/day): Source	NOAEL dose (mg/kg-day)	LOAEL dose (mg/kg-day) [1]	Uncertainty Factors (UF): Inter-species	Uncertainty Factors (UF): Duration	Uncertainty Factors (UF): Endpoint NOAEL	Uncertainty Factors (UF): Endpoint LOAEL	Other	Total UF[5] NOAEL	Total UF[5] LOAEL	NOAEL TRV (mg/kg-day)	LOAEL TRV (mg/kg-day)
Mink (water)	Rosenfeld & Beath 1954	Potassium selenate	Oral Water	Rat	1 year (2 generations) Critical lifestage		3 exposures 1.5, 2.5, 7.5 mg/L	Reproduction	1.5	2.5	0.13 BW & WCNS - EPA 1988a	0.20	0.33	5	1	1	1	1	5	5	**3.9E-02**	**6.6E-02**
Mink (diet)	**No Reliable TRV Establishing Study** Derive from water TRV																				**7.9E-02**	**1.3E-01**
Great Blue Heron (water)	**No Reliable TRV Establishing Study** Derive from dietary TRV																				**5.0E-02**	**1.0E-01**
Great Blue Heron (diet)	Heinz et al 1987	Sodium selenite	Oral Diet	Mallard	78 days Critical lifestage		5 exposures 1, 5, 10, 25, 100 ppm	Reproduction	5	10	0.10 Measured in study	0.5	1.0	5	1	1	1	1	5	5	**1.0E-01**	**2.0E-01**

[1] If no study is available to establish a LOAEL TRV, the LOAEL is set to equal 3 x NOAEL

[2] TRV(food) = TRV(water) / 0.50

[3] Test species uncertainty factor equals 1 since both Old World and New World mice are physiologically similar; and laboratory rodents are often more sensitive than wild species due to genetic heterogeneity of natural populations.

[4] TRV(water or capsule) = TRV(food) * 0.50

[5] TRV = Study Dose / UF

SMF = Study Modifying Factor
NA = Not Available
UF = Uncertainty Factor
NOAEL = No observed adverse effect level
LOAEL = Lowest observed adverse effect level
BW = body weight
TRV = Toxicity Reference Value

NOAEL & LOAEL TRVs - ZINC

Receptor	Study	Chemical	Route	Study Test Species	Study Factors				NOAEL study conc (ppm)	LOAEL study conc (ppm)	Conversion Factor (kg food/ kg BW/day)	NOAEL dose (mg/kg-day)	LOAEL dose (mg/kg-day) [1]	Uncertainty Factors (UF)					Total UF[5]		NOAEL TRV (mg/kg-day)	LOAEL TRV (mg/kg-day)
					Duration	N	Doses	Endpoint			Source			Inter-species	Duration	Endpoint NOAEL	Endpoint LOAEL	Other	NOAEL	LOAEL		
Mink (water)	**No Reliable TRV Establishing Studies Found** Derive from Dietary TRV[4]																				**155.5**	**466.5**
Mink (diet)	Aulerich et al., 1991	Zinc sulfate	Oral Diet	Mink	Chronic	12 animals per dose group	4 exposures (0, 500, 1000, 1500 ppm)	Survivability, Growth			1 None required	311 ave. of male & female kits	NA	1	1	1	1	1	1	1	**311**	**933**
Great Blue Heron (water)	**No Reliable TRV Establishing Studies Found** Derive from Dietary TRV[4]																				**13**	**39**
Great Blue Heron (diet)	Stahl et al., 1989	Zinc sulfate	Oral Diet	White leghorn hen	Chronic; 44 weeks Critical life stage		3 exposures (28 control, 20, 200, 2000 ppm)	Reproduction	2,028		0.0646 Measured in study (NOAEL group)	131	NA	5	1	1	1	1	5	5	**26**	**79**

[1] If no study is available to establish a LOAEL TRV, the LOAEL is set to equal 3 x NOAEL

[2] TRV(food) = TRV(water) / 0.50

[3] Test species uncertainty factor equals 1 since both Old World and New World mice are physiologically similar; and laboratory rodents are often more sensitive than wild species due to genetic heterogeneity of natural populations.

[4] TRV(water or capsule) = TRV(food) * 0.50

[5] TRV = Study Dose / UF

SMF = Study Modifying Factor
NA = Not Available

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Appendix G
Detailed Calculations of HQ Values

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Appendix G
Risk Calculations to Fish Based on Tissue Burdens

			K values	0.67	0.013	0.008	0.01	WB = sum(Ki * Ci) / sum(Ki)	Hazard Quotients				
Parameter	**Station ID**	**Species**	**Sample ID**	**Fillet (mg/kg dw)**	**Gonad (mg/kg dw)**	**Kidney (mg/kg dw)**	**Liver (mg/kg dw)**	**Estimated Whole Body (mg/kg dw)**	**Fillet**	**Gonad**	**Kidney**	**Liver**	**Whole Body**
Arsenic	Blue River (BR-2)	Brook Trout	BR-2-1	1.0E-02	8.6E-03	1.1E-02	2.3E-02	1.1E-02	NC	NC	NC	NC	1.1E-03
Arsenic	Blue River (BR-2)	Brook Trout	BR-2-2	1.2E-02	8.9E-03	7.2E-02	1.8E-02	1.2E-02	NC	NC	NC	NC	1.2E-03
Arsenic	Blue River (BR-2)	Brook Trout	BR-2-3	1.2E-02	1.5E-02	6.2E-02	3.5E-02	1.3E-02	NC	NC	NC	NC	1.3E-03
Arsenic	Blue River (BR-2)	Brook Trout	BR-2-4	7.9E-03	9.8E-03	1.5E-02	3.1E-02	8.3E-03	NC	NC	NC	NC	8.3E-04
Arsenic	Blue River (BR-2)	Brook Trout	BR-2-5	9.8E-03	1.4E-01	2.1E-01	7.9E-02	1.5E-02	NC	NC	NC	NC	1.5E-03
Arsenic	Blue River (BR-2)	Brook Trout	BR-2-6	1.0E-02	2.1E-01	4.2E-01	8.9E-02	2.0E-02	NC	NC	NC	NC	2.0E-03
Arsenic	Blue River (BR-2)	Brown Trout	BR-2-1	9.2E-03	1.2E-02	1.1E-02	1.2E-02	9.3E-03	NC	NC	NC	NC	9.3E-04
Arsenic	Blue River (BR-2)	Brown Trout	BR-2-2	1.1E-02	3.2E-02	1.8E-02	2.4E-02	1.1E-02	NC	NC	NC	NC	1.1E-03
Arsenic	Blue River (BR-2)	Brown Trout	BR-2-3	1.1E-02	1.1E-02	2.8E-02	1.2E-02	1.1E-02	NC	NC	NC	NC	1.1E-03
Arsenic	Blue River (BR-2)	Brown Trout	BR-2-4	1.1E-02	3.2E-02	5.9E-02	3.2E-02	1.2E-02	NC	NC	NC	NC	1.2E-03
Arsenic	Blue River (BR-2)	Brown Trout	BR-2-5	5.6E-02	6.9E-02	1.2E-02	1.1E-02	5.5E-02	NC	NC	NC	NC	5.5E-03
Arsenic	Blue River (BR-2)	Brown Trout	BR-2-6	9.7E-02	1.1E-02	1.6E-02	1.3E-02	9.3E-02	NC	NC	NC	NC	9.3E-03
Arsenic	Blue River Reference (BR-1)	Brown Trout	BR-1-1	6.5E-01	3.1E-02	1.3E-02	1.0E-02	6.2E-01	NC	NC	NC	NC	6.2E-02
Arsenic	Blue River Reference (BR-1)	Brown Trout	BR-1-2	1.4E+00	2.1E-01	2.2E-02	1.0E-02	1.3E+00	NC	NC	NC	NC	1.3E-01
Arsenic	Blue River Reference (BR-1)	Brown Trout	BR-1-3	5.6E-01	1.0E-02	2.6E-02	1.1E-02	5.3E-01	NC	NC	NC	NC	5.3E-02
Arsenic	Blue River Reference (BR-1)	Brown Trout	BR-1-4	4.6E-01	8.9E-03	1.9E-02	1.1E-02	4.4E-01	NC	NC	NC	NC	4.4E-02
Arsenic	Blue River Reference (BR-1)	Brown Trout	BR-1-5	1.1E+00	1.4E-01	1.6E-02	1.8E-02	1.1E+00	NC	NC	NC	NC	1.1E-01
Arsenic	Blue River Reference (BR-1)	Brown Trout	BR-1-6	3.4E-01	9.3E-03	3.2E-02	3.2E-02	3.3E-01	NC	NC	NC	NC	3.3E-02
Cadmium	Blue River (BR-2)	Brook Trout	BR-2-1	2.3E-02	1.6E-01	1.1E+01	5.8E+00	2.3E-01	5.0E-02	NC	6.6E-01	3.1E-01	NC
Cadmium	Blue River (BR-2)	Brook Trout	BR-2-2	1.2E-02	9.0E-02	5.1E+01	2.0E+00	6.2E-01	2.6E-02	NC	3.2E+00	1.1E-01	NC
Cadmium	Blue River (BR-2)	Brook Trout	BR-2-3	1.0E-02	3.4E-01	2.1E+01	2.4E+00	2.9E-01	2.2E-02	NC	1.3E+00	1.3E-01	NC
Cadmium	Blue River (BR-2)	Brook Trout	BR-2-4	2.0E-02	6.7E-02	4.1E+00	2.3E+01	3.9E-01	4.5E-02	NC	2.6E-01	1.2E+00	NC
Cadmium	Blue River (BR-2)	Brook Trout	BR-2-5	4.3E-02	2.1E-01	2.4E+01	4.6E+00	3.8E-01	9.4E-02	NC	1.5E+00	2.5E-01	NC
Cadmium	Blue River (BR-2)	Brook Trout	BR-2-6	1.8E-02	2.8E-01	1.6E+02	3.2E+00	1.9E+00	4.0E-02	NC	1.0E+01	1.7E-01	NC
Cadmium	Blue River (BR-2)	Brown Trout	BR-2-1	3.2E-02	1.8E+00	3.0E+01	8.5E+00	5.3E-01	7.1E-02	NC	1.9E+00	4.5E-01	NC
Cadmium	Blue River (BR-2)	Brown Trout	BR-2-2	3.9E-02	2.3E+00	5.8E+01	9.3E+00	8.8E-01	8.7E-02	NC	3.6E+00	5.0E-01	NC
Cadmium	Blue River (BR-2)	Brown Trout	BR-2-3	4.3E-02	1.9E-01	6.4E+01	6.7E+00	8.7E-01	9.6E-02	NC	4.0E+00	3.6E-01	NC
Cadmium	Blue River (BR-2)	Brown Trout	BR-2-4	2.4E-02	2.7E-01	4.1E+01	4.3E+00	5.6E-01	5.3E-02	NC	2.6E+00	2.3E-01	NC
Cadmium	Blue River (BR-2)	Brown Trout	BR-2-5	1.6E-02	4.1E-01	1.4E+01	2.4E+00	2.1E-01	3.6E-02	NC	8.5E-01	1.3E-01	NC
Cadmium	Blue River (BR-2)	Brown Trout	BR-2-6	2.8E-02	2.4E-01	1.9E+01	3.5E+00	3.0E-01	6.2E-02	NC	1.2E+00	1.9E-01	NC
Cadmium	Blue River Reference (BR-1)	Brown Trout	BR-1-1	7.3E-03	1.3E-01	1.9E+00	1.4E+00	5.1E-02	1.6E-02	NC	1.2E-01	7.6E-02	NC
Cadmium	Blue River Reference (BR-1)	Brown Trout	BR-1-2	4.5E-03	1.1E+00	1.0E+01	1.9E+00	1.6E-01	9.9E-03	NC	6.2E-01	1.0E-01	NC
Cadmium	Blue River Reference (BR-1)	Brown Trout	BR-1-3	4.7E-03	2.9E-02	3.5E+00	1.2E+00	6.2E-02	1.0E-02	NC	2.2E-01	6.3E-02	NC
Cadmium	Blue River Reference (BR-1)	Brown Trout	BR-1-4	4.9E-03	1.9E-02	1.7E+00	7.8E-01	3.6E-02	1.1E-02	NC	1.1E-01	4.2E-02	NC
Cadmium	Blue River Reference (BR-1)	Brown Trout	BR-1-5	4.3E-03	3.7E-01	3.8E+00	1.9E+00	8.1E-02	9.4E-03	NC	2.4E-01	1.0E-01	NC
Cadmium	Blue River Reference (BR-1)	Brown Trout	BR-1-6	3.6E-03	2.9E-02	2.8E+00	1.7E+00	6.1E-02	8.0E-03	NC	1.7E-01	9.3E-02	NC
Copper	Blue River (BR-2)	Brook Trout	BR-2-1	3.1E-01	4.1E-01	2.0E+00	4.4E+01	9.6E-01	1.2E-01	5.8E-02	1.2E-01	1.8E-01	NC
Copper	Blue River (BR-2)	Brook Trout	BR-2-2	3.4E-01	8.8E+00	3.2E+01	2.2E+01	1.2E+00	1.4E-01	1.3E+00	1.9E+00	9.4E-02	NC
Copper	Blue River (BR-2)	Brook Trout	BR-2-3	3.1E-01	1.1E+00	1.9E+01	8.5E+01	1.7E+00	1.2E-01	1.6E-01	1.1E+00	3.5E-01	NC
Copper	Blue River (BR-2)	Brook Trout	BR-2-4	6.7E-01	7.4E+00	4.2E+01	6.5E+00	1.4E+00	2.7E-01	1.1E+00	2.6E+00	2.7E-02	NC
Copper	Blue River (BR-2)	Brook Trout	BR-2-5	4.2E-01	1.2E+01	8.2E+00	4.2E+01	1.3E+00	1.7E-01	1.7E+00	5.0E-01	1.8E-01	NC
Copper	Blue River (BR-2)	Brook Trout	BR-2-6	3.9E-01	2.6E+00	1.1E+02	1.0E+02	3.2E+00	1.6E-01	3.8E-01	6.9E+00	4.3E-01	NC
Copper	Blue River (BR-2)	Brown Trout	BR-2-1	7.0E-01	1.0E+00	8.3E+00	6.8E+01	1.7E+00	2.8E-01	1.4E-01	5.0E-01	2.8E-01	NC
Copper	Blue River (BR-2)	Brown Trout	BR-2-2	3.1E-01	1.2E+00	1.0E+01	3.3E+02	5.1E+00	1.3E-01	1.8E-01	6.2E-01	1.4E+00	NC
Copper	Blue River (BR-2)	Brown Trout	BR-2-3	5.1E-01	4.8E+00	1.3E+01	8.8E+01	2.0E+00	2.0E-01	6.9E-01	7.7E-01	3.7E-01	NC
Copper	Blue River (BR-2)	Brown Trout	BR-2-4	4.5E-01	4.3E+00	1.3E+01	7.5E+01	1.7E+00	1.8E-01	6.2E-01	7.9E-01	3.2E-01	NC
Copper	Blue River (BR-2)	Brown Trout	BR-2-5	2.5E-01	2.2E+00	9.5E+00	2.7E+02	4.3E+00	1.0E-01	3.1E-01	5.8E-01	1.1E+00	NC
Copper	Blue River (BR-2)	Brown Trout	BR-2-6	3.6E-01	5.3E+00	7.5E+00	2.1E+01	8.3E-01	1.5E-01	7.6E-01	4.6E-01	8.6E-02	NC
Copper	Blue River Reference (BR-1)	Brown Trout	BR-1-1	2.7E-01	1.0E+00	1.5E+00	2.8E+02	4.3E+00	1.1E-01	1.5E-01	9.2E-02	1.2E+00	NC
Copper	Blue River Reference (BR-1)	Brown Trout	BR-1-2	2.7E-01	2.7E+00	3.4E+00	3.0E+02	4.6E+00	1.1E-01	3.8E-01	2.0E-01	1.2E+00	NC

Appendix G
Risk Calculations to Fish Based on Tissue Burdens

			K values	0.67	0.013	0.008	0.01	WB = sum(Ki * Ci) / sum(Ki)	Hazard Quotients				
Parameter	**Station ID**	**Species**	**Sample ID**	**Fillet (mg/kg dw)**	**Gonad (mg/kg dw)**	**Kidney (mg/kg dw)**	**Liver (mg/kg dw)**	**Estimated Whole Body (mg/kg dw)**	**Fillet**	**Gonad**	**Kidney**	**Liver**	**Whole Body**
Copper	Blue River Reference (BR-1)	Brown Trout	BR-1-3	3.1E-01	7.1E+00	3.6E+00	1.5E+02	2.6E+00	1.2E-01	1.0E+00	2.2E-01	6.2E-01	NC
Copper	Blue River Reference (BR-1)	Brown Trout	BR-1-4	2.9E-01	4.2E+00	2.1E+00	1.4E+02	2.3E+00	1.1E-01	6.0E-01	1.2E-01	5.7E-01	NC
Copper	Blue River Reference (BR-1)	Brown Trout	BR-1-5	2.2E-01	1.9E+00	2.3E+00	5.2E+02	7.6E+00	8.6E-02	2.8E-01	1.4E-01	2.2E+00	NC
Copper	Blue River Reference (BR-1)	Brown Trout	BR-1-6	4.6E-01	1.0E+01	3.3E+00	6.2E+02	9.5E+00	1.8E-01	1.4E+00	2.0E-01	2.6E+00	NC
Lead	Blue River (BR-2)	Brook Trout	BR-2-1	2.3E-02	2.9E-02	1.2E+00	3.2E-01	4.1E-02	NC	NC	1.8E-03	3.2E-03	NC
Lead	Blue River (BR-2)	Brook Trout	BR-2-2	1.2E-02	2.6E-02	1.2E+00	1.4E-01	2.7E-02	NC	NC	1.7E-03	1.4E-03	NC
Lead	Blue River (BR-2)	Brook Trout	BR-2-3	1.2E-02	1.5E-02	4.7E-01	1.4E-01	1.9E-02	NC	NC	6.6E-04	1.4E-03	NC
Lead	Blue River (BR-2)	Brook Trout	BR-2-4	6.8E-02	4.8E-02	1.3E-01	7.3E-01	7.8E-02	NC	NC	1.8E-04	7.3E-03	NC
Lead	Blue River (BR-2)	Brook Trout	BR-2-5	2.5E-02	1.4E-01	6.2E-01	4.1E-01	3.9E-02	NC	NC	8.9E-04	4.1E-03	NC
Lead	Blue River (BR-2)	Brook Trout	BR-2-6	1.0E-02	2.1E-01	3.1E+00	8.9E-02	5.0E-02	NC	NC	4.4E-03	8.9E-04	NC
Lead	Blue River (BR-2)	Brown Trout	BR-2-1	9.2E-03	2.7E-02	1.8E+00	1.2E-01	3.2E-02	NC	NC	2.6E-03	1.2E-03	NC
Lead	Blue River (BR-2)	Brown Trout	BR-2-2	7.7E-02	3.2E-02	2.8E+00	1.8E-01	1.1E-01	NC	NC	4.0E-03	1.8E-03	NC
Lead	Blue River (BR-2)	Brown Trout	BR-2-3	2.7E-02	3.0E-02	1.7E+00	1.0E-01	4.7E-02	NC	NC	2.4E-03	1.0E-03	NC
Lead	Blue River (BR-2)	Brown Trout	BR-2-4	4.2E-02	3.2E-02	1.9E+00	1.0E-01	6.3E-02	NC	NC	2.6E-03	1.0E-03	NC
Lead	Blue River (BR-2)	Brown Trout	BR-2-5	2.6E-02	1.7E-01	1.7E+00	9.8E-02	4.9E-02	NC	NC	2.5E-03	9.8E-04	NC
Lead	Blue River (BR-2)	Brown Trout	BR-2-6	6.4E-02	4.1E-02	7.0E-01	9.8E-02	7.2E-02	NC	NC	9.9E-04	9.8E-04	NC
Lead	Blue River Reference (BR-1)	Brown Trout	BR-1-1	2.3E-02	6.7E-02	7.3E-01	9.8E-02	3.3E-02	NC	NC	1.0E-03	9.8E-04	NC
Lead	Blue River Reference (BR-1)	Brown Trout	BR-1-2	1.1E-02	2.1E-01	7.3E-01	5.2E-02	2.4E-02	NC	NC	1.0E-03	5.2E-04	NC
Lead	Blue River Reference (BR-1)	Brown Trout	BR-1-3	1.2E-02	4.8E-02	4.9E-01	4.6E-02	1.8E-02	NC	NC	7.1E-04	4.6E-04	NC
Lead	Blue River Reference (BR-1)	Brown Trout	BR-1-4	6.1E-02	2.6E-02	7.1E-01	1.7E-01	6.9E-02	NC	NC	1.0E-03	1.7E-03	NC
Lead	Blue River Reference (BR-1)	Brown Trout	BR-1-5	1.1E-02	1.4E-01	2.6E-01	7.7E-02	1.7E-02	NC	NC	3.6E-04	7.7E-04	NC
Lead	Blue River Reference (BR-1)	Brown Trout	BR-1-6	2.6E-02	9.3E-03	2.8E-01	3.2E-02	2.9E-02	NC	NC	3.9E-04	3.2E-04	NC
Manganese	Blue River (BR-2)	Brook Trout	BR-2-1	1.6E-01	3.3E-01	9.0E-01	2.2E+00	2.0E-01	NC	NC	NC	NC	NC
Manganese	Blue River (BR-2)	Brook Trout	BR-2-2	1.4E-01	1.5E+00	1.8E+00	3.1E+00	2.2E-01	NC	NC	NC	NC	NC
Manganese	Blue River (BR-2)	Brook Trout	BR-2-3	1.4E-01	2.7E-01	1.5E+00	2.3E+00	1.8E-01	NC	NC	NC	NC	NC
Manganese	Blue River (BR-2)	Brook Trout	BR-2-4	4.6E-01	1.9E+00	2.8E+00	2.0E+00	5.4E-01	NC	NC	NC	NC	NC
Manganese	Blue River (BR-2)	Brook Trout	BR-2-5	2.7E-01	4.0E+00	2.3E+00	3.3E+00	4.0E-01	NC	NC	NC	NC	NC
Manganese	Blue River (BR-2)	Brook Trout	BR-2-6	9.2E-02	7.6E-01	8.6E+00	3.9E+00	2.6E-01	NC	NC	NC	NC	NC
Manganese	Blue River (BR-2)	Brown Trout	BR-2-1	1.0E-01	3.8E-01	9.2E-01	1.8E+00	1.4E-01	NC	NC	NC	NC	NC
Manganese	Blue River (BR-2)	Brown Trout	BR-2-2	4.9E-01	4.7E-01	1.3E+00	2.9E+00	5.3E-01	NC	NC	NC	NC	NC
Manganese	Blue River (BR-2)	Brown Trout	BR-2-3	2.0E-01	2.0E+00	1.2E+00	1.9E+00	2.7E-01	NC	NC	NC	NC	NC
Manganese	Blue River (BR-2)	Brown Trout	BR-2-4	2.0E-01	4.8E-01	2.0E+00	2.5E+00	2.6E-01	NC	NC	NC	NC	NC
Manganese	Blue River (BR-2)	Brown Trout	BR-2-5	1.4E-01	1.1E+00	1.6E+00	1.4E+00	1.9E-01	NC	NC	NC	NC	NC
Manganese	Blue River (BR-2)	Brown Trout	BR-2-6	3.3E-01	2.4E+00	1.2E+00	2.2E+00	4.1E-01	NC	NC	NC	NC	NC
Manganese	Blue River Reference (BR-1)	Brown Trout	BR-1-1	2.1E-01	5.6E-01	1.0E+00	1.8E+00	2.5E-01	NC	NC	NC	NC	NC
Manganese	Blue River Reference (BR-1)	Brown Trout	BR-1-2	1.5E-01	1.6E+00	2.9E+00	2.0E+00	2.4E-01	NC	NC	NC	NC	NC
Manganese	Blue River Reference (BR-1)	Brown Trout	BR-1-3	9.8E-02	1.2E+01	1.6E+00	2.7E+00	3.7E-01	NC	NC	NC	NC	NC
Manganese	Blue River Reference (BR-1)	Brown Trout	BR-1-4	1.0E+00	8.9E+00	1.5E+00	3.2E+00	1.2E+00	NC	NC	NC	NC	NC
Manganese	Blue River Reference (BR-1)	Brown Trout	BR-1-5	9.3E-01	1.1E+00	1.6E+00	2.4E+00	9.7E-01	NC	NC	NC	NC	NC
Manganese	Blue River Reference (BR-1)	Brown Trout	BR-1-6	2.6E-01	1.4E+01	1.8E+00	3.7E+00	5.9E-01	NC	NC	NC	NC	NC
Zinc	Blue River (BR-2)	Brook Trout	BR-2-1	6.7E+00	1.9E+01	6.8E+01	8.6E+01	8.8E+00	NC	NC	3.7E-01	2.9E-01	NC
Zinc	Blue River (BR-2)	Brook Trout	BR-2-2	8.5E+00	7.0E+01	1.7E+02	1.1E+02	1.3E+01	NC	NC	9.4E-01	3.7E-01	NC
Zinc	Blue River (BR-2)	Brook Trout	BR-2-3	6.0E+00	2.3E+01	7.9E+01	8.2E+01	8.3E+00	NC	NC	4.3E-01	2.7E-01	NC
Zinc	Blue River (BR-2)	Brook Trout	BR-2-4	8.3E+00	7.8E+01	9.6E+01	7.5E+01	1.2E+01	NC	NC	5.2E-01	2.5E-01	NC
Zinc	Blue River (BR-2)	Brook Trout	BR-2-5	9.9E+00	1.0E+02	2.7E+02	1.5E+02	1.7E+01	NC	NC	1.5E+00	4.9E-01	NC
Zinc	Blue River (BR-2)	Brook Trout	BR-2-6	7.6E+00	5.5E+01	5.9E+02	1.5E+02	1.7E+01	NC	NC	3.2E+00	4.9E-01	NC
Zinc	Blue River (BR-2)	Brown Trout	BR-2-1	5.0E+00	1.3E+02	1.1E+02	3.8E+01	9.0E+00	NC	NC	5.7E-01	1.3E-01	NC
Zinc	Blue River (BR-2)	Brown Trout	BR-2-2	7.3E+00	1.2E+02	1.2E+02	5.3E+01	1.1E+01	NC	NC	6.7E-01	1.8E-01	NC
Zinc	Blue River (BR-2)	Brown Trout	BR-2-3	5.4E+00	7.3E+01	1.1E+02	3.5E+01	8.3E+00	NC	NC	6.1E-01	1.2E-01	NC
Zinc	Blue River (BR-2)	Brown Trout	BR-2-4	9.0E+00	3.3E+01	1.1E+02	4.2E+01	1.1E+01	NC	NC	5.7E-01	1.4E-01	NC

Appendix G
Risk Calculations to Fish Based on Tissue Burdens

			K values	0.67	0.013	0.008	0.01	WB = sum(Ki * Ci) / sum(Ki)	Hazard Quotients				
Parameter	Station ID	Species	Sample ID	Fillet (mg/kg dw)	Gonad (mg/kg dw)	Kidney (mg/kg dw)	Liver (mg/kg dw)	Estimated Whole Body (mg/kg dw)	Fillet	Gonad	Kidney	Liver	Whole Body
Zinc	Blue River (BR-2)	Brown Trout	BR-2-5	9.4E+00	1.9E+02	6.3E+01	3.5E+01	1.4E+01	NC	NC	3.4E-01	1.2E-01	NC
Zinc	Blue River (BR-2)	Brown Trout	BR-2-6	7.8E+00	9.7E+01	5.2E+01	4.1E+01	1.0E+01	NC	NC	2.8E-01	1.4E-01	NC
Zinc	Blue River Reference (BR-1)	Brown Trout	BR-1-1	5.1E+00	3.2E+01	2.3E+01	2.3E+01	6.1E+00	NC	NC	1.2E-01	7.8E-02	NC
Zinc	Blue River Reference (BR-1)	Brown Trout	BR-1-2	4.9E+00	2.4E+02	4.3E+01	2.5E+01	1.0E+01	NC	NC	2.3E-01	8.4E-02	NC
Zinc	Blue River Reference (BR-1)	Brown Trout	BR-1-3	3.6E+00	8.7E+01	3.9E+01	2.5E+01	5.8E+00	NC	NC	2.1E-01	8.4E-02	NC
Zinc	Blue River Reference (BR-1)	Brown Trout	BR-1-4	7.9E+00	5.9E+01	2.9E+01	2.4E+01	9.3E+00	NC	NC	1.6E-01	8.0E-02	NC
Zinc	Blue River Reference (BR-1)	Brown Trout	BR-1-5	5.2E+00	1.7E+02	2.9E+01	3.7E+01	8.9E+00	NC	NC	1.6E-01	1.2E-01	NC
Zinc	Blue River Reference (BR-1)	Brown Trout	BR-1-6	6.3E+00	6.0E+01	4.0E+01	4.0E+01	8.1E+00	NC	NC	2.2E-01	1.3E-01	NC

Non-detects are evaluated at 1/2 the detection limit.

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Sediment

COPCs	General Location	Station ID	Analysis Type	Adj Units	ND Adj Conc	Low Benchmark	High Benchmark	HQ low	HQ high
Aluminum	Blue River	BR-Dillon	Total	mg/kg	83000	13500	73160	**6E+00**	1E+00
Aluminum	Blue River	BR-BFG	Total	mg/kg	76000	13500	73160	**6E+00**	1E+00
Aluminum	Blue River Reference	BR-Adams St	Total	mg/kg	78000	13500	73160	**6E+00**	1E+00
Aluminum	French Gulch	FG-9	Total	mg/kg	73000	13500	73160	**5E+00**	1E+00
Aluminum	French Gulch	FG-9A	Total	mg/kg	58000	13500	73160	**4E+00**	8E-01
Aluminum	French Gulch Reference	FG-1	Total	mg/kg	80000	13500	73160	**6E+00**	1E+00
Aluminum	French Gulch Reference	FG-0	Total	mg/kg	75000	13500	73160	**6E+00**	1E+00
Aluminum	North Branch French Gulch	TS-4	Total	mg/kg	66000	13500	73160	**5E+00**	9E-01
Aluminum	North Branch French Gulch	FG-7	Total	mg/kg	60000	13500	73160	**4E+00**	8E-01
Aluminum	North Branch French Gulch	TS-3	Total	mg/kg	60000	13500	73160	**4E+00**	8E-01
Arsenic	Blue River	BR-BFG	Total	mg/kg	23	9.79	33	**2E+00**	7E-01
Arsenic	Blue River	BR-Dillon	Total	mg/kg	24	9.79	33	**2E+00**	7E-01
Arsenic	Blue River Reference	BR-Adams St	Total	mg/kg	13	9.79	33	1E+00	4E-01
Arsenic	French Gulch	FG-9A	Total	mg/kg	120	9.79	33	**1E+01**	**4E+00**
Arsenic	French Gulch	FG-9	Total	mg/kg	36	9.79	33	**4E+00**	1E+00
Arsenic	French Gulch Reference	FG-1	Total	mg/kg	62	9.79	33	**6E+00**	**2E+00**
Arsenic	French Gulch Reference	FG-0	Total	mg/kg	59	9.79	33	**6E+00**	**2E+00**
Arsenic	North Branch French Gulch	TS-3	Total	mg/kg	180	9.79	33	**2E+01**	**5E+00**
Arsenic	North Branch French Gulch	FG-7	Total	mg/kg	110	9.79	33	**1E+01**	**3E+00**
Arsenic	North Branch French Gulch	TS-4	Total	mg/kg	110	9.79	33	**1E+01**	**3E+00**
Arsenic	South Branch French Gulch - AB	Stream Sed. 3	Total	mg/kg	160	9.79	33	**2E+01**	**5E+00**
Arsenic	South Branch French Gulch - AB	Stream Sed. 5	Total	mg/kg	107	9.79	33	**1E+01**	**3E+00**
Arsenic	South Branch French Gulch - AB	Stream Sed. 4	Total	mg/kg	216	9.79	33	**2E+01**	**7E+00**
Arsenic	South Branch French Gulch - AB	Stream Sed. 2	Total	mg/kg	138	9.79	33	**1E+01**	**4E+00**
Arsenic	South Branch French Gulch - AB	Bank Sed. 2	Total	mg/kg	109	9.79	33	**1E+01**	**3E+00**
Arsenic	South Branch French Gulch - AB	Stream Sed. 6	Total	mg/kg	102	9.79	33	**1E+01**	**3E+00**
Arsenic	South Branch French Gulch - AB	Bank Sed. 1	Total	mg/kg	72	9.79	33	**7E+00**	**2E+00**
Arsenic	South Branch French Gulch - AB	Dead Elk Sed. 1	Total	mg/kg	58	9.79	33	**6E+00**	**2E+00**
Arsenic	South Branch French Gulch - AB	Stream Sed. 1	Total	mg/kg	200	9.79	33	**2E+01**	**6E+00**
Arsenic	South Branch French Gulch - AB	Dead Elk Sed. 2	Total	mg/kg	104	9.79	33	**1E+01**	**3E+00**
Cadmium	Blue River	BR-Dillon	Total	mg/kg	15	0.99	4.98	**2E+01**	**3E+00**
Cadmium	Blue River	BR-BFG	Total	mg/kg	11	0.99	4.98	**1E+01**	**2E+00**
Cadmium	Blue River Reference	BR-Adams St	Total	mg/kg	2.8	0.99	4.98	**3E+00**	6E-01
Cadmium	French Gulch	FG-9A	Total	mg/kg	82	0.99	4.98	**8E+01**	**2E+01**
Cadmium	French Gulch	FG-9	Total	mg/kg	57	0.99	4.98	**6E+01**	**1E+01**
Cadmium	French Gulch Reference	FG-1	Total	mg/kg	6.1	0.99	4.98	**6E+00**	1E+00
Cadmium	French Gulch Reference	FG-0	Total	mg/kg	5.8	0.99	4.98	**6E+00**	1E+00
Cadmium	North Branch French Gulch	TS-4	Total	mg/kg	91	0.99	4.98	**9E+01**	**2E+01**
Cadmium	North Branch French Gulch	FG-7	Total	mg/kg	110	0.99	4.98	**1E+02**	**2E+01**
Cadmium	North Branch French Gulch	TS-3	Total	mg/kg	210	0.99	4.98	**2E+02**	**4E+01**
Cadmium	South Branch French Gulch - AB	Dead Elk Sed. 2	Total	mg/kg	76.5	0.99	4.98	**8E+01**	**2E+01**
Cadmium	South Branch French Gulch - AB	Stream Sed. 3	Total	mg/kg	109	0.99	4.98	**1E+02**	**2E+01**
Cadmium	South Branch French Gulch - AB	Stream Sed. 4	Total	mg/kg	110	0.99	4.98	**1E+02**	**2E+01**
Cadmium	South Branch French Gulch - AB	Stream Sed. 2	Total	mg/kg	69.1	0.99	4.98	**7E+01**	**1E+01**
Cadmium	South Branch French Gulch - AB	Stream Sed. 5	Total	mg/kg	35.3	0.99	4.98	**4E+01**	**7E+00**
Cadmium	South Branch French Gulch - AB	Stream Sed. 1	Total	mg/kg	151	0.99	4.98	**2E+02**	**3E+01**
Cadmium	South Branch French Gulch - AB	Stream Sed. 6	Total	mg/kg	54.3	0.99	4.98	**5E+01**	**1E+01**
Cadmium	South Branch French Gulch - AB	Bank Sed. 1	Total	mg/kg	51.7	0.99	4.98	**5E+01**	**1E+01**

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Sediment

COPCs	General Location	Station ID	Analysis Type	Adj Units	ND Adj Conc	Low Benchmark	High Benchmark	HQ low	HQ high
Cadmium	South Branch French Gulch - AB	Dead Elk Sed. 1	Total	mg/kg	42.1	0.99	4.98	**4E+01**	**8E+00**
Cadmium	South Branch French Gulch - AB	Bank Sed. 2	Total	mg/kg	43.6	0.99	4.98	**4E+01**	**9E+00**
Chromium	Blue River	BR-Dillon	Total	mg/kg	82	93.4	111	9E-01	7E-01
Chromium	Blue River	BR-BFG	Total	mg/kg	75	93.4	111	8E-01	7E-01
Chromium	Blue River Reference	BR-Adams St	Total	mg/kg	63	93.4	111	7E-01	6E-01
Chromium	French Gulch	FG-9	Total	mg/kg	53	93.4	111	6E-01	5E-01
Chromium	French Gulch	FG-9A	Total	mg/kg	35	93.4	111	4E-01	3E-01
Chromium	French Gulch Reference	FG-0	Total	mg/kg	54	93.4	111	6E-01	5E-01
Chromium	French Gulch Reference	FG-1	Total	mg/kg	50	93.4	111	5E-01	5E-01
Chromium	North Branch French Gulch	TS-4	Total	mg/kg	40	93.4	111	4E-01	4E-01
Chromium	North Branch French Gulch	TS-3	Total	mg/kg	34	93.4	111	4E-01	3E-01
Chromium	North Branch French Gulch	FG-7	Total	mg/kg	34	93.4	111	4E-01	3E-01
Copper	Blue River	BR-Dillon	Total	mg/kg	68	31.6	149	**2E+00**	5E-01
Copper	Blue River	BR-BFG	Total	mg/kg	110	31.6	149	**3E+00**	7E-01
Copper	Blue River Reference	BR-Adams St	Total	mg/kg	45	31.6	149	1E+00	3E-01
Copper	French Gulch	FG-9A	Total	mg/kg	320	31.6	149	**1E+01**	**2E+00**
Copper	French Gulch	FG-9	Total	mg/kg	210	31.6	149	**7E+00**	1E+00
Copper	French Gulch Reference	FG-1	Total	mg/kg	66	31.6	149	**2E+00**	4E-01
Copper	French Gulch Reference	FG-0	Total	mg/kg	46	31.6	149	1E+00	3E-01
Copper	North Branch French Gulch	TS-3	Total	mg/kg	490	31.6	149	**2E+01**	**3E+00**
Copper	North Branch French Gulch	FG-7	Total	mg/kg	310	31.6	149	**1E+01**	**2E+00**
Copper	North Branch French Gulch	TS-4	Total	mg/kg	280	31.6	149	**9E+00**	**2E+00**
Iron	Blue River	BR-BFG	Total	mg/kg	46000	188400	289900	2E-01	2E-01
Iron	Blue River	BR-Dillon	Total	mg/kg	44000	188400	289900	2E-01	2E-01
Iron	Blue River Reference	BR-Adams St	Total	mg/kg	36000	188400	289900	2E-01	1E-01
Iron	French Gulch	FG-9A	Total	mg/kg	122000	188400	289900	6E-01	4E-01
Iron	French Gulch	FG-9	Total	mg/kg	49000	188400	289900	3E-01	2E-01
Iron	French Gulch Reference	FG-1	Total	mg/kg	38000	188400	289900	2E-01	1E-01
Iron	French Gulch Reference	FG-0	Total	mg/kg	39000	188400	289900	2E-01	1E-01
Iron	North Branch French Gulch	FG-7	Total	mg/kg	106000	188400	289900	6E-01	4E-01
Iron	North Branch French Gulch	TS-4	Total	mg/kg	71000	188400	289900	4E-01	2E-01
Iron	North Branch French Gulch	TS-3	Total	mg/kg	63000	188400	289900	3E-01	2E-01
Iron	South Branch French Gulch - AB	Dead Elk Sed. 1	Total	mg/kg	59500	188400	289900	3E-01	2E-01
Iron	South Branch French Gulch - AB	Bank Sed. 1	Total	mg/kg	43000	188400	289900	2E-01	1E-01
Iron	South Branch French Gulch - AB	Stream Sed. 4	Total	mg/kg	133000	188400	289900	7E-01	5E-01
Iron	South Branch French Gulch - AB	Stream Sed. 2	Total	mg/kg	93300	188400	289900	5E-01	3E-01
Iron	South Branch French Gulch - AB	Dead Elk Sed. 2	Total	mg/kg	151000	188400	289900	8E-01	5E-01
Iron	South Branch French Gulch - AB	Stream Sed. 5	Total	mg/kg	60400	188400	289900	3E-01	2E-01
Iron	South Branch French Gulch - AB	Bank Sed. 2	Total	mg/kg	56000	188400	289900	3E-01	2E-01
Iron	South Branch French Gulch - AB	Stream Sed. 1	Total	mg/kg	50400	188400	289900	3E-01	2E-01
Iron	South Branch French Gulch - AB	Stream Sed. 6	Total	mg/kg	54800	188400	289900	3E-01	2E-01
Iron	South Branch French Gulch - AB	Stream Sed. 3	Total	mg/kg	55800	188400	289900	3E-01	2E-01
Lead	Blue River	BR-BFG	Total	mg/kg	640	35.8	128	**2E+01**	**5E+00**
Lead	Blue River	BR-Dillon	Total	mg/kg	320	35.8	128	**9E+00**	**3E+00**
Lead	Blue River Reference	BR-Adams St	Total	mg/kg	160	35.8	128	**4E+00**	1E+00
Lead	French Gulch	FG-9	Total	mg/kg	1800	35.8	128	**5E+01**	**1E+01**
Lead	French Gulch	FG-9A	Total	mg/kg	2300	35.8	128	**6E+01**	**2E+01**
Lead	French Gulch Reference	FG-0	Total	mg/kg	150	35.8	128	**4E+00**	1E+00

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Sediment

COPCs	General Location	Station ID	Analysis Type	Adj Units	ND Adj Conc	Low Benchmark	High Benchmark	HQ low	HQ high
Lead	French Gulch Reference	FG-1	Total	mg/kg	380	35.8	128	**1E+01**	**3E+00**
Lead	North Branch French Gulch	FG-7	Total	mg/kg	1900	35.8	128	**5E+01**	**1E+01**
Lead	North Branch French Gulch	TS-4	Total	mg/kg	1800	35.8	128	**5E+01**	**1E+01**
Lead	North Branch French Gulch	TS-3	Total	mg/kg	6500	35.8	128	**2E+02**	**5E+01**
Lead	South Branch French Gulch - AB	Bank Sed. 2	Total	mg/kg	1380	35.8	128	**4E+01**	**1E+01**
Lead	South Branch French Gulch - AB	Dead Elk Sed. 1	Total	mg/kg	1570	35.8	128	**4E+01**	**1E+01**
Lead	South Branch French Gulch - AB	Stream Sed. 3	Total	mg/kg	2640	35.8	128	**7E+01**	**2E+01**
Lead	South Branch French Gulch - AB	Stream Sed. 6	Total	mg/kg	1150	35.8	128	**3E+01**	**9E+00**
Lead	South Branch French Gulch - AB	Stream Sed. 5	Total	mg/kg	1020	35.8	128	**3E+01**	**8E+00**
Lead	South Branch French Gulch - AB	Bank Sed. 1	Total	mg/kg	819	35.8	128	**2E+01**	**6E+00**
Lead	South Branch French Gulch - AB	Stream Sed. 4	Total	mg/kg	3410	35.8	128	**1E+02**	**3E+01**
Lead	South Branch French Gulch - AB	Stream Sed. 2	Total	mg/kg	3510	35.8	128	**1E+02**	**3E+01**
Lead	South Branch French Gulch - AB	Stream Sed. 1	Total	mg/kg	3840	35.8	128	**1E+02**	**3E+01**
Lead	South Branch French Gulch - AB	Dead Elk Sed. 2	Total	mg/kg	2020	35.8	128	**6E+01**	**2E+01**
Manganese	Blue River	BR-Dillon	Total	mg/kg	1300	631	4460	**2E+00**	3E-01
Manganese	Blue River	BR-BFG	Total	mg/kg	1600	631	4460	**3E+00**	4E-01
Manganese	Blue River Reference	BR-Adams St	Total	mg/kg	1300	631	4460	**2E+00**	3E-01
Manganese	French Gulch	FG-9A	Total	mg/kg	9100	631	4460	**1E+01**	**2E+00**
Manganese	French Gulch	FG-9	Total	mg/kg	4400	631	4460	**7E+00**	1E+00
Manganese	French Gulch Reference	FG-0	Total	mg/kg	1300	631	4460	**2E+00**	3E-01
Manganese	French Gulch Reference	FG-1	Total	mg/kg	770	631	4460	1E+00	2E-01
Manganese	North Branch French Gulch	FG-7	Total	mg/kg	12000	631	4460	**2E+01**	**3E+00**
Manganese	North Branch French Gulch	TS-3	Total	mg/kg	3600	631	4460	**6E+00**	8E-01
Manganese	North Branch French Gulch	TS-4	Total	mg/kg	3300	631	4460	**5E+00**	7E-01
Mercury	Blue River	BR-BFG	Total	mg/kg	0.25	0.18	1.06	1E+00	2E-01
Mercury	Blue River	BR-Dillon	Total	mg/kg	0.22	0.18	1.06	1E+00	2E-01
Mercury	Blue River Reference	BR-Adams St	Total	mg/kg	0.1	0.18	1.06	6E-01	9E-02
Mercury	French Gulch	FG-9	Total	mg/kg	0.25	0.18	1.06	1E+00	2E-01
Mercury	French Gulch	FG-9A	Total	mg/kg	0.29	0.18	1.06	**2E+00**	3E-01
Mercury	French Gulch Reference	FG-0	Total	mg/kg	0.05	0.18	1.06	3E-01	5E-02
Mercury	French Gulch Reference	FG-1	Total	mg/kg	0.27	0.18	1.06	**2E+00**	3E-01
Mercury	North Branch French Gulch	TS-3	Total	mg/kg	0.35	0.18	1.06	**2E+00**	3E-01
Mercury	North Branch French Gulch	TS-4	Total	mg/kg	0.29	0.18	1.06	**2E+00**	3E-01
Mercury	North Branch French Gulch	FG-7	Total	mg/kg	0.28	0.18	1.06	**2E+00**	3E-01
Nickel	Blue River	BR-Dillon	Total	mg/kg	33	22.7	48.6	1E+00	7E-01
Nickel	Blue River	BR-BFG	Total	mg/kg	32	22.7	48.6	1E+00	7E-01
Nickel	Blue River Reference	BR-Adams St	Total	mg/kg	27	22.7	48.6	1E+00	6E-01
Nickel	French Gulch	FG-9A	Total	mg/kg	31	22.7	48.6	1E+00	6E-01
Nickel	French Gulch	FG-9	Total	mg/kg	28	22.7	48.6	1E+00	6E-01
Nickel	French Gulch Reference	FG-1	Total	mg/kg	27	22.7	48.6	1E+00	6E-01
Nickel	French Gulch Reference	FG-0	Total	mg/kg	30	22.7	48.6	1E+00	6E-01
Nickel	North Branch French Gulch	TS-4	Total	mg/kg	27	22.7	48.6	1E+00	6E-01
Nickel	North Branch French Gulch	FG-7	Total	mg/kg	32	22.7	48.6	1E+00	7E-01
Nickel	North Branch French Gulch	TS-3	Total	mg/kg	23	22.7	48.6	1E+00	5E-01
Silver	Blue River	BR-BFG	Total	mg/kg	3.7	0.73	3.7	**5E+00**	1E+00
Silver	Blue River	BR-Dillon	Total	mg/kg	1.9	0.73	3.7	**3E+00**	5E-01
Silver	Blue River Reference	BR-Adams St	Total	mg/kg	1.3	0.73	3.7	**2E+00**	4E-01
Silver	French Gulch	FG-9A	Total	mg/kg	18.6	0.73	3.7	**3E+01**	**5E+00**

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Sediment

COPCs	General Location	Station ID	Analysis Type	Adj Units	ND Adj Conc	Low Benchmark	High Benchmark	HQ low	HQ high
Silver	French Gulch	FG-9	Total	mg/kg	6.7	0.73	3.7	**9E+00**	**2E+00**
Silver	French Gulch Reference	FG-1	Total	mg/kg	2.1	0.73	3.7	**3E+00**	6E-01
Silver	French Gulch Reference	FG-0	Total	mg/kg	1.1	0.73	3.7	**2E+00**	3E-01
Silver	North Branch French Gulch	TS-4	Total	mg/kg	17.2	0.73	3.7	**2E+01**	**5E+00**
Silver	North Branch French Gulch	TS-3	Total	mg/kg	30	0.73	3.7	**4E+01**	**8E+00**
Silver	North Branch French Gulch	FG-7	Total	mg/kg	17.9	0.73	3.7	**2E+01**	**5E+00**
Silver	South Branch French Gulch - AB	Dead Elk Sed. 2	Total	mg/kg	90	0.73	3.7	**1E+02**	**2E+01**
Silver	South Branch French Gulch - AB	Stream Sed. 1	Total	mg/kg	33.7	0.73	3.7	**5E+01**	**9E+00**
Silver	South Branch French Gulch - AB	Stream Sed. 3	Total	mg/kg	28.5	0.73	3.7	**4E+01**	**8E+00**
Silver	South Branch French Gulch - AB	Stream Sed. 4	Total	mg/kg	24	0.73	3.7	**3E+01**	**6E+00**
Silver	South Branch French Gulch - AB	Stream Sed. 2	Total	mg/kg	22	0.73	3.7	**3E+01**	**6E+00**
Silver	South Branch French Gulch - AB	Bank Sed. 2	Total	mg/kg	7.6	0.73	3.7	**1E+01**	**2E+00**
Silver	South Branch French Gulch - AB	Stream Sed. 6	Total	mg/kg	6.8	0.73	3.7	**9E+00**	**2E+00**
Silver	South Branch French Gulch - AB	Stream Sed. 5	Total	mg/kg	5.5	0.73	3.7	**8E+00**	1E+00
Silver	South Branch French Gulch - AB	Bank Sed. 1	Total	mg/kg	4.2	0.73	3.7	**6E+00**	1E+00
Silver	South Branch French Gulch - AB	Dead Elk Sed. 1	Total	mg/kg	9.7	0.73	3.7	**1E+01**	**3E+00**
Zinc	Blue River	BR-BFG	Total	mg/kg	3000	121	459	**2E+01**	**7E+00**
Zinc	Blue River	BR-Dillon	Total	mg/kg	2300	121	459	**2E+01**	**5E+00**
Zinc	Blue River Reference	BR-Adams St	Total	mg/kg	600	121	459	**5E+00**	1E+00
Zinc	French Gulch	FG-9A	Total	mg/kg	18000	121	459	**1E+02**	**4E+01**
Zinc	French Gulch	FG-9	Total	mg/kg	9000	121	459	**7E+01**	**2E+01**
Zinc	French Gulch Reference	FG-1	Total	mg/kg	780	121	459	**6E+00**	**2E+00**
Zinc	French Gulch Reference	FG-0	Total	mg/kg	630	121	459	**5E+00**	1E+00
Zinc	North Branch French Gulch	FG-7	Total	mg/kg	22000	121	459	**2E+02**	**5E+01**
Zinc	North Branch French Gulch	TS-4	Total	mg/kg	17000	121	459	**1E+02**	**4E+01**
Zinc	North Branch French Gulch	TS-3	Total	mg/kg	35000	121	459	**3E+02**	**8E+01**
Zinc	South Branch French Gulch - AB	Bank Sed. 2	Total	mg/kg	5500	121	459	**5E+01**	**1E+01**
Zinc	South Branch French Gulch - AB	Stream Sed. 1	Total	mg/kg	25400	121	459	**2E+02**	**6E+01**
Zinc	South Branch French Gulch - AB	Stream Sed. 4	Total	mg/kg	18600	121	459	**2E+02**	**4E+01**
Zinc	South Branch French Gulch - AB	Stream Sed. 3	Total	mg/kg	18000	121	459	**1E+02**	**4E+01**
Zinc	South Branch French Gulch - AB	Dead Elk Sed. 2	Total	mg/kg	15900	121	459	**1E+02**	**3E+01**
Zinc	South Branch French Gulch - AB	Stream Sed. 2	Total	mg/kg	12000	121	459	**1E+02**	**3E+01**
Zinc	South Branch French Gulch - AB	Bank Sed. 1	Total	mg/kg	7220	121	459	**6E+01**	**2E+01**
Zinc	South Branch French Gulch - AB	Stream Sed. 6	Total	mg/kg	6320	121	459	**5E+01**	**1E+01**
Zinc	South Branch French Gulch - AB	Stream Sed. 5	Total	mg/kg	4790	121	459	**4E+01**	**1E+01**
Zinc	South Branch French Gulch - AB	Dead Elk Sed. 1	Total	mg/kg	6360	121	459	**5E+01**	**1E+01**

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Aluminum	South Branch French Gulch	FG-4	22-Sep-92	Dissolved	ug/L	25	61	7.5E+02	8.7E+01	3E-02	3E-01
Aluminum	South Branch French Gulch	FG-5	23-Sep-99	Dissolved	ug/L	15	64	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	South Branch French Gulch	FG-5	22-Jul-96	Dissolved	ug/L	20	46	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	South Branch French Gulch	FG-5	11-Jun-96	Dissolved	ug/L	20	37	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	South Branch French Gulch	FG-5	23-Aug-94	Dissolved	ug/L	15	54	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	South Branch French Gulch	FG-5	19-Aug-99	Dissolved	ug/L	15	54	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	South Branch French Gulch	FG-5	05-Sep-99	Dissolved	ug/L	15	52	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	South Branch French Gulch	FG-5	16-Nov-93	Dissolved	ug/L	20	65	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	South Branch French Gulch	FG-5	21-Oct-93	Dissolved	ug/L	20	66	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	South Branch French Gulch	FG-5	22-Sep-92	Dissolved	ug/L	25	62	7.5E+02	8.7E+01	3E-02	3E-01
Aluminum	South Branch French Gulch	FG-5.5	17-Nov-99	Dissolved	ug/L	15	84	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	South Branch French Gulch	FG-5.5	23-Sep-99	Dissolved	ug/L	15	75	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	South Branch French Gulch	FG-5.5	13-Apr-00	Dissolved	ug/L	20.9	--	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	South Branch French Gulch	FG-5.5	10-May-00	Dissolved	ug/L	15.2	--	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	South Branch French Gulch	FG-5.5	21-Jun-00	Dissolved	ug/L	31.4	--	7.5E+02	8.7E+01	4E-02	4E-01
Aluminum	South Branch French Gulch	FG-5.5	13-Sep-00	Dissolved	ug/L	14.1	--	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	South Branch French Gulch	FG-5.5	05-Sep-99	Dissolved	ug/L	15	64	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	South Branch French Gulch	FG-5.5	19-Aug-99	Dissolved	ug/L	15	65	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	South Branch French Gulch	FG-5.5	23-Sep-99	Dissolved	ug/L	15	75	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	South Branch French Gulch	FG-5.5	05-Sep-99	Dissolved	ug/L	15	64	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	South Branch French Gulch	FG-8	05-Sep-99	Dissolved	ug/L	15	66	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	South Branch French Gulch	FG-8	23-Sep-99	Dissolved	ug/L	15	76	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	South Branch French Gulch	FG-8	21-Oct-93	Dissolved	ug/L	20	109	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	South Branch French Gulch	FG-8	22-Sep-92	Dissolved	ug/L	25	95	7.5E+02	8.7E+01	3E-02	3E-01
Aluminum	South Branch French Gulch	FG-8	19-Aug-99	Dissolved	ug/L	15	66	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	South Branch French Gulch	FG-8	23-Aug-94	Dissolved	ug/L	15	97	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	South Branch French Gulch	FG-8	11-Jun-96	Dissolved	ug/L	20	55	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	South Branch French Gulch	FG-8	16-Nov-93	Dissolved	ug/L	20	109	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	South Branch French Gulch	FG-8	17-Nov-99	Dissolved	ug/L	15	89	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	North Branch French Gulch	1121	13-Jun-96	Dissolved	ug/L	20	215	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	North Branch French Gulch	1121	23-Jul-96	Dissolved	ug/L	81	446	7.5E+02	8.7E+01	1E-01	9E-01
Aluminum	North Branch French Gulch	1140	13-Jun-96	Dissolved	ug/L	679	728	7.5E+02	8.7E+01	9E-01	**8E+00**
Aluminum	North Branch French Gulch	FG-6	11-Jun-96	Dissolved	ug/L	2241	1070	7.5E+02	8.7E+01	**3E+00**	**3E+01**
Aluminum	North Branch French Gulch	FG-6A	22-Sep-92	Dissolved	ug/L	25	440	7.5E+02	8.7E+01	3E-02	3E-01
Aluminum	North Branch French Gulch	FG-6A	16-Nov-93	Dissolved	ug/L	20	625	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	North Branch French Gulch	FG-6A	11-Jun-96	Dissolved	ug/L	20	722	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	North Branch French Gulch	FG-6A	21-Oct-93	Dissolved	ug/L	20	679	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	North Branch French Gulch	FG-6A	22-Jul-96	Dissolved	ug/L	46	908	7.5E+02	8.7E+01	6E-02	5E-01
Aluminum	North Branch French Gulch	FG-6A	23-Aug-94	Dissolved	ug/L	15	699	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	North Branch French Gulch	FG-6B	22-Jul-96	Dissolved	ug/L	20	1230	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	North Branch French Gulch	FG-6B	23-Aug-94	Dissolved	ug/L	59	1362	7.5E+02	8.7E+01	8E-02	7E-01
Aluminum	North Branch French Gulch	FG-6C	22-Jul-99	Dissolved	ug/L	15	742	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	North Branch French Gulch	FG-6C	05-Sep-99	Dissolved	ug/L	30	882	7.5E+02	8.7E+01	4E-02	3E-01
Aluminum	North Branch French Gulch	FG-6C	05-Sep-99	Dissolved	ug/L	100	882	7.5E+02	8.7E+01	1E-01	1E+00
Aluminum	North Branch French Gulch	FG-6C	11-Jun-96	Dissolved	ug/L	371	2020	7.5E+02	8.7E+01	5E-01	**4E+00**

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Aluminum	North Branch French Gulch	FG-6C	22-Jul-96	Dissolved	ug/L	118	1720	7.5E+02	8.7E+01	2E-01	1E+00
Aluminum	North Branch French Gulch	FG-6C	05-Sep-99	Dissolved	ug/L	100	882	7.5E+02	8.7E+01	1E-01	1E+00
Aluminum	North Branch French Gulch	FG-6C	19-Aug-99	Dissolved	ug/L	30	659	7.5E+02	8.7E+01	4E-02	3E-01
Aluminum	North Branch French Gulch	FG-6C	17-Nov-99	Dissolved	ug/L	30	972	7.5E+02	8.7E+01	4E-02	3E-01
Aluminum	North Branch French Gulch	FG-6C	23-Sep-99	Dissolved	ug/L	30	1010	7.5E+02	8.7E+01	4E-02	3E-01
Aluminum	North Branch French Gulch	FG-6C	13-Apr-00	Dissolved	ug/L	193	--	7.5E+02	8.7E+01	3E-01	**2E+00**
Aluminum	North Branch French Gulch	FG-6C	10-May-00	Dissolved	ug/L	81	--	7.5E+02	8.7E+01	1E-01	9E-01
Aluminum	North Branch French Gulch	FG-6C	21-Jun-00	Dissolved	ug/L	339	--	7.5E+02	8.7E+01	5E-01	**4E+00**
Aluminum	North Branch French Gulch	FG-6C	19-Jul-00	Dissolved	ug/L	281	--	7.5E+02	8.7E+01	4E-01	**3E+00**
Aluminum	North Branch French Gulch	FG-7	22-Jul-96	Dissolved	ug/L	156	96	7.5E+02	8.7E+01	2E-01	**2E+00**
Aluminum	North Branch French Gulch	FG-7	11-Jun-96	Dissolved	ug/L	20	68	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	North Branch French Gulch	FG-7	16-Nov-93	Dissolved	ug/L	20	120	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	North Branch French Gulch	FG-7	21-Oct-93	Dissolved	ug/L	20	123	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	North Branch French Gulch	FG-7	22-Sep-92	Dissolved	ug/L	25	102	7.5E+02	8.7E+01	3E-02	3E-01
Aluminum	North Branch French Gulch	FG-7	25-May-96	Dissolved	ug/L	20	--	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	North Branch French Gulch	FG-7	05-Jun-96	Dissolved	ug/L	10	58	7.5E+02	8.7E+01	1E-02	1E-01
Aluminum	North Branch French Gulch	FG-7	05-Jun-96	Dissolved	ug/L	20	58	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	North Branch French Gulch	FG-7	23-Aug-94	Dissolved	ug/L	15	93	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	North Branch French Gulch	FG-7	17-Nov-99	Dissolved	ug/L	15	201	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	North Branch French Gulch	FG-7	23-Sep-99	Dissolved	ug/L	15	201	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	North Branch French Gulch	FG-7	05-Sep-99	Dissolved	ug/L	15	184	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	North Branch French Gulch	FG-7	19-Aug-99	Dissolved	ug/L	15	196	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	North Branch French Gulch	TS-3	23-May-96	Dissolved	ug/L	6	46	7.5E+02	8.7E+01	8E-03	7E-02
Aluminum	North Branch French Gulch	TS-4	25-May-96	Dissolved	ug/L	20	47	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	North Branch French Gulch	TS-4	06-Jun-96	Dissolved	ug/L	10	53	7.5E+02	8.7E+01	1E-02	1E-01
Aluminum	French Gulch Reference	FG-0	22-Sep-92	Dissolved	ug/L	25	47	7.5E+02	8.7E+01	3E-02	3E-01
Aluminum	French Gulch Reference	FG-0	23-May-96	Dissolved	ug/L	9	34	7.5E+02	8.7E+01	1E-02	1E-01
Aluminum	French Gulch Reference	FG-1	22-Jul-96	Dissolved	ug/L	20	41	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	French Gulch Reference	FG-1	12-Jun-96	Dissolved	ug/L	146	37	7.5E+02	8.7E+01	2E-01	**2E+00**
Aluminum	French Gulch Reference	FG-1	22-Sep-92	Dissolved	ug/L	25	53	7.5E+02	8.7E+01	3E-02	3E-01
Aluminum	French Gulch Reference	FG-1	25-Oct-95	Dissolved	ug/L	2	48	7.5E+02	8.7E+01	3E-03	2E-02
Aluminum	French Gulch Reference	FG-1	23-May-96	Dissolved	ug/L	8	34	7.5E+02	8.7E+01	1E-02	9E-02
Aluminum	French Gulch Reference	FG-2	22-Sep-92	Dissolved	ug/L	25	55	7.5E+02	8.7E+01	3E-02	3E-01
Aluminum	French Gulch Reference	FG-3	12-Jun-96	Dissolved	ug/L	20	39	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	French Gulch Reference	FG-3	22-Sep-92	Dissolved	ug/L	25	62	7.5E+02	8.7E+01	3E-02	3E-01
Aluminum	French Gulch Reference	FG-3	22-Jul-96	Dissolved	ug/L	20	46	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	French Gulch	FG-9	16-May-96	Dissolved	ug/L	20	82	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	French Gulch	FG-9	26-May-96	Dissolved	ug/L	20	62	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	French Gulch	FG-9	17-Apr-96	Dissolved	ug/L	20	160	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	French Gulch	FG-9	22-Feb-96	Dissolved	ug/L	7	150	7.5E+02	8.7E+01	9E-03	8E-02
Aluminum	French Gulch	FG-9	21-Jun-96	Dissolved	ug/L	7	62	7.5E+02	8.7E+01	9E-03	8E-02
Aluminum	French Gulch	FG-9	25-Jun-96	Dissolved	ug/L	7	65	7.5E+02	8.7E+01	9E-03	8E-02
Aluminum	French Gulch	FG-9	13-Dec-96	Dissolved	ug/L	7	140	7.5E+02	8.7E+01	9E-03	8E-02
Aluminum	French Gulch	FG-9	21-Nov-95	Dissolved	ug/L	8	120	7.5E+02	8.7E+01	1E-02	9E-02
Aluminum	French Gulch	FG-9	16-Jan-97	Dissolved	ug/L	8	140	7.5E+02	8.7E+01	1E-02	9E-02

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Aluminum	French Gulch	FG-9	10-Jun-96	Dissolved	ug/L	20	65	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	French Gulch	FG-9	16-Nov-93	Dissolved	ug/L	20	125	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	French Gulch	FG-9	23-Oct-95	Dissolved	ug/L	10	110	7.5E+02	8.7E+01	1E-02	1E-01
Aluminum	French Gulch	FG-9	19-Jan-96	Dissolved	ug/L	10	150	7.5E+02	8.7E+01	1E-02	1E-01
Aluminum	French Gulch	FG-9	22-May-96	Dissolved	ug/L	10	75	7.5E+02	8.7E+01	1E-02	1E-01
Aluminum	French Gulch	FG-9	05-Sep-99	Dissolved	ug/L	15	85	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	French Gulch	FG-9	17-Nov-99	Dissolved	ug/L	15	113	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	French Gulch	FG-9	23-Sep-99	Dissolved	ug/L	15	102	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	French Gulch	FG-9	23-Aug-94	Dissolved	ug/L	15	102	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	French Gulch	FG-9	19-Aug-99	Dissolved	ug/L	15	87	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	French Gulch	FG-9	21-Feb-97	Dissolved	ug/L	6	160	7.5E+02	8.7E+01	8E-03	7E-02
Aluminum	French Gulch	FG-9	21-Mar-96	Dissolved	ug/L	4	140	7.5E+02	8.7E+01	5E-03	5E-02
Aluminum	French Gulch	FG-9	09-Sep-96	Dissolved	ug/L	5	110	7.5E+02	8.7E+01	7E-03	6E-02
Aluminum	French Gulch	FG-9	22-Sep-92	Dissolved	ug/L	25	103	7.5E+02	8.7E+01	3E-02	3E-01
Aluminum	French Gulch	FG-9	18-Jul-96	Dissolved	ug/L	5	18	7.5E+02	8.7E+01	7E-03	6E-02
Aluminum	French Gulch	FG-9	15-Aug-96	Dissolved	ug/L	5	99	7.5E+02	8.7E+01	7E-03	6E-02
Aluminum	French Gulch	FG-9	21-Oct-93	Dissolved	ug/L	20	121	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	French Gulch	FG-9	13-Nov-96	Dissolved	ug/L	6	120	7.5E+02	8.7E+01	8E-03	7E-02
Aluminum	French Gulch	FG-9	08-Oct-96	Dissolved	ug/L	5	110	7.5E+02	8.7E+01	7E-03	6E-02
Aluminum	French Gulch	FG-9	21-Jun-00	Dissolved	ug/L	19.1	--	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	French Gulch	FG-9A	23-Aug-94	Dissolved	ug/L	15	96	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	French Gulch	FG-9A	22-Jul-96	Dissolved	ug/L	20	85	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	French Gulch	FG-9A	11-Jun-96	Dissolved	ug/L	20	65	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	Discharge	CBMA-1	23-Jul-96	Dissolved	ug/L	40	224	7.5E+02	8.7E+01	5E-02	5E-01
Aluminum	Discharge	KDS	13-Jun-96	Dissolved	ug/L	163	296	7.5E+02	8.7E+01	2E-01	**2E+00**
Aluminum	Discharge	KDS	24-Aug-94	Dissolved	ug/L	42	222	7.5E+02	8.7E+01	6E-02	5E-01
Aluminum	Discharge	MGB-1	23-Jul-96	Dissolved	ug/L	40	82	7.5E+02	8.7E+01	5E-02	5E-01
Aluminum	Discharge	RLCVT-1	23-Jul-96	Dissolved	ug/L	40	86	7.5E+02	8.7E+01	5E-02	5E-01
Aluminum	Discharge	WP-1	12-Jun-96	Dissolved	ug/L	95854	4980	7.5E+02	8.7E+01	**1E+02**	**1E+03**
Aluminum	Blue River Reference	BR-1	16-Nov-93	Dissolved	ug/L	20	67	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	Blue River Reference	BR-1	21-Oct-93	Dissolved	ug/L	20	71	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	Blue River Reference	BR-1	10-Jun-96	Dissolved	ug/L	20	54	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	Blue River Reference	BR-1	13-Sep-00	Dissolved	ug/L	75.5	--	7.5E+02	8.7E+01	1E-01	9E-01
Aluminum	Blue River Reference	BR-1	21-Jun-00	Dissolved	ug/L	118	--	7.5E+02	8.7E+01	2E-01	1E+00
Aluminum	Blue River Reference	BR-1	13-Apr-00	Dissolved	ug/L	171	--	7.5E+02	8.7E+01	2E-01	**2E+00**
Aluminum	Blue River Reference	BR-1	10-May-00	Dissolved	ug/L	1360	--	7.5E+02	8.7E+01	**2E+00**	**2E+01**
Aluminum	Blue River Reference	BR-1	22-Sep-92	Dissolved	ug/L	25	66	7.5E+02	8.7E+01	3E-02	3E-01
Aluminum	Blue River Reference	BR-1	17-Nov-99	Dissolved	ug/L	15	69	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	Blue River Reference	BR-1	19-Aug-99	Dissolved	ug/L	15	61	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	Blue River Reference	BR-1	23-Sep-99	Dissolved	ug/L	15	71	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	Blue River Reference	BR-1	05-Sep-99	Dissolved	ug/L	15	60	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	Blue River Reference	BR-1	17-Nov-99	Dissolved	ug/L	15	70	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	Blue River Reference	BR-1	23-Sep-99	Dissolved	ug/L	15	72	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	Blue River Reference	BR-1	23-Jul-96	Dissolved	ug/L	20	42	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	Blue River Reference	BR-1	23-Aug-94	Dissolved	ug/L	15	61	7.5E+02	8.7E+01	2E-02	2E-01

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Aluminum	Blue River Reference	BR-Adams St	24-Oct-95	Dissolved	ug/L	5	68	7.5E+02	8.7E+01	7E-03	6E-02
Aluminum	Blue River Reference	BR-Adams St	21-May-96	Dissolved	ug/L	10	57	7.5E+02	8.7E+01	1E-02	1E-01
Aluminum	Blue River	BR-2	05-Sep-99	Dissolved	ug/L	15	81	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	Blue River	BR-2	16-Nov-93	Dissolved	ug/L	20	126	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	Blue River	BR-2	22-Aug-94	Dissolved	ug/L	15	76	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	Blue River	BR-2	23-Jul-96	Dissolved	ug/L	20	49	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	Blue River	BR-2	10-Jun-96	Dissolved	ug/L	20	58	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	Blue River	BR-2	19-Aug-99	Dissolved	ug/L	15	75	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	Blue River	BR-2	22-Sep-92	Dissolved	ug/L	25	102	7.5E+02	8.7E+01	3E-02	3E-01
Aluminum	Blue River	BR-2	21-Oct-93	Dissolved	ug/L	20	121	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	Blue River	BR-2	17-Nov-99	Dissolved	ug/L	15	103	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	Blue River	BR-2	13-Apr-00	Dissolved	ug/L	95.5	--	7.5E+02	8.7E+01	1E-01	1E+00
Aluminum	Blue River	BR-2	23-Sep-99	Dissolved	ug/L	15	93	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	Blue River	BR-2	10-May-00	Dissolved	ug/L	32.8	--	7.5E+02	8.7E+01	4E-02	4E-01
Aluminum	Blue River	BR-2	21-Jun-00	Dissolved	ug/L	66.2	--	7.5E+02	8.7E+01	9E-02	8E-01
Aluminum	Blue River	BR-2	19-Jul-00	Dissolved	ug/L	17	--	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	Blue River	BR-2	13-Sep-00	Dissolved	ug/L	31.9	--	7.5E+02	8.7E+01	4E-02	4E-01
Aluminum	Blue River	BR-3	17-Nov-99	Dissolved	ug/L	15	70	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	Blue River	BR-3	10-May-00	Dissolved	ug/L	42.7	--	7.5E+02	8.7E+01	6E-02	5E-01
Aluminum	Blue River	BR-3	13-Apr-00	Dissolved	ug/L	16.3	--	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	Blue River	BR-3	21-Oct-93	Dissolved	ug/L	20	76	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	Blue River	BR-3	10-Jun-96	Dissolved	ug/L	20	54	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	Blue River	BR-3	19-Aug-99	Dissolved	ug/L	15	65	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	Blue River	BR-3	16-Nov-93	Dissolved	ug/L	20	75	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	Blue River	BR-3	13-Sep-00	Dissolved	ug/L	19.6	--	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	Blue River	BR-3	23-Jul-96	Dissolved	ug/L	20	50	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	Blue River	BR-3	21-Jun-00	Dissolved	ug/L	36.7	--	7.5E+02	8.7E+01	5E-02	4E-01
Aluminum	Blue River	BR-3	22-Aug-94	Dissolved	ug/L	15	70	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	Blue River	BR-3	23-Sep-99	Dissolved	ug/L	15	72	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	Blue River	BR-3	05-Sep-99	Dissolved	ug/L	15	63	7.5E+02	8.7E+01	2E-02	2E-01
Aluminum	Blue River	BR-4	22-Sep-92	Dissolved	ug/L	25	73	7.5E+02	8.7E+01	3E-02	3E-01
Aluminum	Blue River	BR-5	23-Jul-96	Dissolved	ug/L	20	52	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	Blue River	BR-5	23-Jul-96	Dissolved	ug/L	20	52	7.5E+02	8.7E+01	3E-02	2E-01
Aluminum	Blue River	BR-5	22-Sep-92	Dissolved	ug/L	25	72	7.5E+02	8.7E+01	3E-02	3E-01
Aluminum	Blue River	BR-BFG	25-Oct-95	Dissolved	ug/L	5	86	7.5E+02	8.7E+01	7E-03	6E-02
Aluminum	Blue River	BR-BFG	22-May-96	Dissolved	ug/L	10	59	7.5E+02	8.7E+01	1E-02	1E-01
Aluminum	Blue River	BR-Dillon	24-May-96	Dissolved	ug/L	7	47	7.5E+02	8.7E+01	9E-03	8E-02
Cadmium	South Branch French Gulch	FG-4	22-Sep-92	Dissolved	ug/L	0.25	61	1.2E+00	1.7E-01	2E-01	1E+00
Cadmium	South Branch French Gulch	FG-4	21-Sep-89	Dissolved	ug/L	0.15	58	1.2E+00	1.7E-01	1E-01	9E-01
Cadmium	South Branch French Gulch	FG-5	03-Nov-98	Dissolved	ug/L	0.2	--	nc	nc	nc	nc
Cadmium	South Branch French Gulch	FG-5	22-Sep-98	Dissolved	ug/L	0.2	--	nc	nc	nc	nc
Cadmium	South Branch French Gulch	FG-5	22-Sep-92	Dissolved	ug/L	0.25	62	1.3E+00	1.8E-01	2E-01	1E+00
Cadmium	South Branch French Gulch	FG-5	21-Oct-93	Dissolved	ug/L	0.25	66	1.3E+00	1.8E-01	2E-01	1E+00
Cadmium	South Branch French Gulch	FG-5	16-Nov-93	Dissolved	ug/L	0.25	65	1.3E+00	1.8E-01	2E-01	1E+00
Cadmium	South Branch French Gulch	FG-5	11-Jun-96	Dissolved	ug/L	0.25	37	7.7E-01	1.2E-01	3E-01	**2E+00**

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Cadmium	South Branch French Gulch	FG-5	22-Jul-96	Dissolved	ug/L	0.25	46	9.5E-01	1.4E-01	3E-01	**2E+00**
Cadmium	South Branch French Gulch	FG-5	23-Aug-94	Dissolved	ug/L	0.25	54	1.1E+00	1.6E-01	2E-01	**2E+00**
Cadmium	South Branch French Gulch	FG-5	10-Jun-99	Dissolved	ug/L	0.3	--	nc	nc	nc	nc
Cadmium	South Branch French Gulch	FG-5	14-Jul-99	Dissolved	ug/L	0.1	--	nc	nc	nc	nc
Cadmium	South Branch French Gulch	FG-5	08-Oct-99	Dissolved	ug/L	0.2	63	1.3E+00	1.8E-01	2E-01	1E+00
Cadmium	South Branch French Gulch	FG-5	19-Aug-99	Dissolved	ug/L	0.1	54	1.1E+00	1.6E-01	9E-02	6E-01
Cadmium	South Branch French Gulch	FG-5	23-Sep-99	Dissolved	ug/L	0.1	64	1.3E+00	1.8E-01	8E-02	6E-01
Cadmium	South Branch French Gulch	FG-5	05-Sep-99	Dissolved	ug/L	0.3	52	1.1E+00	1.6E-01	3E-01	**2E+00**
Cadmium	South Branch French Gulch	FG-5	13-Sep-99	Dissolved	ug/L	0.3	60	1.2E+00	1.7E-01	2E-01	**2E+00**
Cadmium	South Branch French Gulch	FG-5	04-May-89	Dissolved	ug/L	0.15	84	1.7E+00	2.2E-01	9E-02	7E-01
Cadmium	South Branch French Gulch	FG-5.5	23-Sep-99	Dissolved	ug/L	2.1	75	1.5E+00	2.0E-01	1E+00	**1E+01**
Cadmium	South Branch French Gulch	FG-5.5	05-Sep-99	Dissolved	ug/L	2.4	64	1.3E+00	1.8E-01	**2E+00**	**1E+01**
Cadmium	South Branch French Gulch	FG-5.5	19-Aug-99	Dissolved	ug/L	2.5	65	1.3E+00	1.8E-01	**2E+00**	**1E+01**
Cadmium	South Branch French Gulch	FG-5.5	13-Sep-99	Dissolved	ug/L	2.3	71	1.4E+00	1.9E-01	**2E+00**	**1E+01**
Cadmium	South Branch French Gulch	FG-5.5	13-Sep-99	Dissolved	ug/L	2.3	71	1.4E+00	1.9E-01	**2E+00**	**1E+01**
Cadmium	South Branch French Gulch	FG-5.5	07-Oct-99	Dissolved	ug/L	1.8	76	1.5E+00	2.0E-01	1E+00	**9E+00**
Cadmium	South Branch French Gulch	FG-5.5	05-Sep-99	Dissolved	ug/L	2.4	64	1.3E+00	1.8E-01	**2E+00**	**1E+01**
Cadmium	South Branch French Gulch	FG-5.5	17-Nov-99	Dissolved	ug/L	1.5	84	1.7E+00	2.2E-01	9E-01	**7E+00**
Cadmium	South Branch French Gulch	FG-5.5	01-Nov-99	Dissolved	ug/L	1.1	82	1.7E+00	2.1E-01	7E-01	**5E+00**
Cadmium	South Branch French Gulch	FG-5.5	07-Oct-99	Dissolved	ug/L	1.8	76	1.5E+00	2.0E-01	1E+00	**9E+00**
Cadmium	South Branch French Gulch	FG-5.5	23-Sep-99	Dissolved	ug/L	2.1	75	1.5E+00	2.0E-01	1E+00	**1E+01**
Cadmium	South Branch French Gulch	FG-8	23-Sep-99	Dissolved	ug/L	2.2	76	1.5E+00	2.0E-01	1E+00	**1E+01**
Cadmium	South Branch French Gulch	FG-8	14-Sep-99	Dissolved	ug/L	2.3	71	1.4E+00	1.9E-01	**2E+00**	**1E+01**
Cadmium	South Branch French Gulch	FG-8	17-Nov-99	Dissolved	ug/L	3.1	89	1.8E+00	2.3E-01	**2E+00**	**1E+01**
Cadmium	South Branch French Gulch	FG-8	02-Nov-99	Dissolved	ug/L	2.7	86	1.7E+00	2.2E-01	**2E+00**	**1E+01**
Cadmium	South Branch French Gulch	FG-8	08-Oct-99	Dissolved	ug/L	2.4	73	1.5E+00	2.0E-01	**2E+00**	**1E+01**
Cadmium	South Branch French Gulch	FG-8	22-Sep-92	Dissolved	ug/L	4.6	95	1.9E+00	2.4E-01	**2E+00**	**2E+01**
Cadmium	South Branch French Gulch	FG-8	21-Sep-89	Dissolved	ug/L	1.9	92	1.9E+00	2.3E-01	1E+00	**8E+00**
Cadmium	South Branch French Gulch	FG-8	04-May-89	Dissolved	ug/L	1.8	97	2.0E+00	2.4E-01	9E-01	**7E+00**
Cadmium	South Branch French Gulch	FG-8	05-Sep-99	Dissolved	ug/L	2.1	66	1.3E+00	1.8E-01	**2E+00**	**1E+01**
Cadmium	South Branch French Gulch	FG-8	19-Aug-99	Dissolved	ug/L	2.4	66	1.3E+00	1.8E-01	**2E+00**	**1E+01**
Cadmium	South Branch French Gulch	FG-8	14-Jul-99	Dissolved	ug/L	2.2	--	nc	nc	nc	nc
Cadmium	South Branch French Gulch	FG-8	21-Oct-93	Dissolved	ug/L	7.5	109	2.2E+00	2.6E-01	**3E+00**	**3E+01**
Cadmium	South Branch French Gulch	FG-8	10-Jun-99	Dissolved	ug/L	1.2	--	nc	nc	nc	nc
Cadmium	South Branch French Gulch	FG-8	23-Aug-94	Dissolved	ug/L	3.2	97	1.9E+00	2.4E-01	**2E+00**	**1E+01**
Cadmium	South Branch French Gulch	FG-8	22-Jul-96	Dissolved	ug/L	3	64	1.3E+00	1.8E-01	**2E+00**	**2E+01**
Cadmium	South Branch French Gulch	FG-8	11-Jun-96	Dissolved	ug/L	2.8	55	1.1E+00	1.6E-01	**2E+00**	**2E+01**
Cadmium	South Branch French Gulch	FG-8	16-Nov-93	Dissolved	ug/L	4.6	109	2.2E+00	2.6E-01	**2E+00**	**2E+01**
Cadmium	North Branch French Gulch	1121	13-Jun-96	Dissolved	ug/L	37.6	215	4.2E+00	4.1E-01	**9E+00**	**9E+01**
Cadmium	North Branch French Gulch	1121	23-Jul-96	Dissolved	ug/L	136	446	7.0E+00	4.1E-01	**2E+01**	**3E+02**
Cadmium	North Branch French Gulch	1140	13-Jun-96	Dissolved	ug/L	95.3	728	7.0E+00	4.1E-01	**1E+01**	**2E+02**
Cadmium	North Branch French Gulch	FG-6	11-Jun-96	Dissolved	ug/L	309	1070	7.0E+00	4.1E-01	**4E+01**	**8E+02**
Cadmium	North Branch French Gulch	FG-6A	23-Aug-94	Dissolved	ug/L	20	699	7.0E+00	4.1E-01	**3E+00**	**5E+01**
Cadmium	North Branch French Gulch	FG-6A	21-Oct-93	Dissolved	ug/L	24	679	7.0E+00	4.1E-01	**3E+00**	**6E+01**
Cadmium	North Branch French Gulch	FG-6A	22-Jul-96	Dissolved	ug/L	71	908	7.0E+00	4.1E-01	**1E+01**	**2E+02**

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Cadmium	North Branch French Gulch	FG-6A	11-Jun-96	Dissolved	ug/L	102	722	7.0E+00	4.1E-01	**1E+01**	**2E+02**
Cadmium	North Branch French Gulch	FG-6A	16-Nov-93	Dissolved	ug/L	21.6	625	7.0E+00	4.1E-01	**3E+00**	**5E+01**
Cadmium	North Branch French Gulch	FG-6A	22-Sep-92	Dissolved	ug/L	14.9	440	7.0E+00	4.1E-01	**2E+00**	**4E+01**
Cadmium	North Branch French Gulch	FG-6A	21-Sep-89	Dissolved	ug/L	43	656	7.0E+00	4.1E-01	**6E+00**	**1E+02**
Cadmium	North Branch French Gulch	FG-6A	04-May-89	Dissolved	ug/L	25	580	7.0E+00	4.1E-01	**4E+00**	**6E+01**
Cadmium	North Branch French Gulch	FG-6B	23-Aug-94	Dissolved	ug/L	60.1	1362	7.0E+00	4.1E-01	**9E+00**	**1E+02**
Cadmium	North Branch French Gulch	FG-6B	22-Jul-96	Dissolved	ug/L	114	1230	7.0E+00	4.1E-01	**2E+01**	**3E+02**
Cadmium	North Branch French Gulch	FG-6C	21-Jun-00	Dissolved	ug/L	50	--	nc	nc	nc	nc
Cadmium	North Branch French Gulch	FG-6C	14-Jul-99	Dissolved	ug/L	66.3	--	nc	nc	nc	nc
Cadmium	North Branch French Gulch	FG-6C	22-Sep-98	Dissolved	ug/L	41	--	nc	nc	nc	nc
Cadmium	North Branch French Gulch	FG-6C	07-May-99	Dissolved	ug/L	44.2	956	7.0E+00	4.1E-01	**6E+00**	**1E+02**
Cadmium	North Branch French Gulch	FG-6C	22-Jul-96	Dissolved	ug/L	281	1720	7.0E+00	4.1E-01	**4E+01**	**7E+02**
Cadmium	North Branch French Gulch	FG-6C	11-Jun-96	Dissolved	ug/L	381	2020	7.0E+00	4.1E-01	**5E+01**	**9E+02**
Cadmium	North Branch French Gulch	FG-6C	07-Apr-99	Dissolved	ug/L	36	--	nc	nc	nc	nc
Cadmium	North Branch French Gulch	FG-6C	03-Nov-98	Dissolved	ug/L	42.3	--	nc	nc	nc	nc
Cadmium	North Branch French Gulch	FG-6C	02-Dec-98	Dissolved	ug/L	23	--	nc	nc	nc	nc
Cadmium	North Branch French Gulch	FG-6C	03-Mar-99	Dissolved	ug/L	37	--	nc	nc	nc	nc
Cadmium	North Branch French Gulch	FG-6C	04-Feb-99	Dissolved	ug/L	39.9	997	7.0E+00	4.1E-01	**6E+00**	**1E+02**
Cadmium	North Branch French Gulch	FG-6C	22-Jul-99	Dissolved	ug/L	71	742	7.0E+00	4.1E-01	**1E+01**	**2E+02**
Cadmium	North Branch French Gulch	FG-6C	10-Jun-99	Dissolved	ug/L	15.9	--	nc	nc	nc	nc
Cadmium	North Branch French Gulch	FG-6C	23-Sep-99	Dissolved	ug/L	65.1	1010	7.0E+00	4.1E-01	**9E+00**	**2E+02**
Cadmium	North Branch French Gulch	FG-6C	17-Nov-99	Dissolved	ug/L	55.3	972	7.0E+00	4.1E-01	**8E+00**	**1E+02**
Cadmium	North Branch French Gulch	FG-6C	07-Oct-99	Dissolved	ug/L	65.5	957	7.0E+00	4.1E-01	**9E+00**	**2E+02**
Cadmium	North Branch French Gulch	FG-6C	13-Sep-99	Dissolved	ug/L	71.9	839	7.0E+00	4.1E-01	**1E+01**	**2E+02**
Cadmium	North Branch French Gulch	FG-6C	05-Sep-99	Dissolved	ug/L	71.4	882	7.0E+00	4.1E-01	**1E+01**	**2E+02**
Cadmium	North Branch French Gulch	FG-6C	05-Sep-99	Dissolved	ug/L	72.9	882	7.0E+00	4.1E-01	**1E+01**	**2E+02**
Cadmium	North Branch French Gulch	FG-6C	05-Sep-99	Dissolved	ug/L	72.9	882	7.0E+00	4.1E-01	**1E+01**	**2E+02**
Cadmium	North Branch French Gulch	FG-6C	19-Aug-99	Dissolved	ug/L	73.5	659	7.0E+00	4.1E-01	**1E+01**	**2E+02**
Cadmium	North Branch French Gulch	FG-6C	02-Nov-99	Dissolved	ug/L	64.8	996	7.0E+00	4.1E-01	**9E+00**	**2E+02**
Cadmium	North Branch French Gulch	FG-7	17-Nov-99	Dissolved	ug/L	20.2	201	4.0E+00	4.0E-01	**5E+00**	**5E+01**
Cadmium	North Branch French Gulch	FG-7	01-Nov-99	Dissolved	ug/L	17.8	203	4.0E+00	4.0E-01	**4E+00**	**4E+01**
Cadmium	North Branch French Gulch	FG-7	07-Oct-99	Dissolved	ug/L	16.3	182	3.6E+00	3.7E-01	**5E+00**	**4E+01**
Cadmium	North Branch French Gulch	FG-7	22-Sep-92	Dissolved	ug/L	6.3	102	2.0E+00	2.5E-01	**3E+00**	**3E+01**
Cadmium	North Branch French Gulch	FG-7	04-May-89	Dissolved	ug/L	12	200	3.9E+00	4.0E-01	**3E+00**	**3E+01**
Cadmium	North Branch French Gulch	FG-7	05-Jun-96	Dissolved	ug/L	7	58	1.2E+00	1.7E-01	**6E+00**	**4E+01**
Cadmium	North Branch French Gulch	FG-7	05-Jun-96	Dissolved	ug/L	6	58	1.2E+00	1.7E-01	**5E+00**	**4E+01**
Cadmium	North Branch French Gulch	FG-7	23-Sep-99	Dissolved	ug/L	16.7	201	4.0E+00	4.0E-01	**4E+00**	**4E+01**
Cadmium	North Branch French Gulch	FG-7	10-Jun-99	Dissolved	ug/L	20.1	--	nc	nc	nc	nc
Cadmium	North Branch French Gulch	FG-7	14-Sep-99	Dissolved	ug/L	17.8	189	3.7E+00	3.8E-01	**5E+00**	**5E+01**
Cadmium	North Branch French Gulch	FG-7	05-Sep-99	Dissolved	ug/L	17.2	184	3.6E+00	3.8E-01	**5E+00**	**5E+01**
Cadmium	North Branch French Gulch	FG-7	19-Aug-99	Dissolved	ug/L	17.3	196	3.9E+00	3.9E-01	**4E+00**	**4E+01**
Cadmium	North Branch French Gulch	FG-7	14-Jul-99	Dissolved	ug/L	16.7	--	nc	nc	nc	nc
Cadmium	North Branch French Gulch	FG-7	21-Oct-93	Dissolved	ug/L	7.4	123	2.5E+00	2.8E-01	**3E+00**	**3E+01**
Cadmium	North Branch French Gulch	FG-7	10-Jun-99	Dissolved	ug/L	20.4	--	nc	nc	nc	nc
Cadmium	North Branch French Gulch	FG-7	16-Nov-93	Dissolved	ug/L	9.5	120	2.4E+00	2.8E-01	**4E+00**	**3E+01**

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Cadmium	North Branch French Gulch	FG-7	25-May-96	Dissolved	ug/L	8	47	9.7E-01	1.5E-01	**8E+00**	**5E+01**
Cadmium	North Branch French Gulch	FG-7	25-May-96	Dissolved	ug/L	6	62	1.3E+00	1.8E-01	**5E+00**	**3E+01**
Cadmium	North Branch French Gulch	FG-7	25-May-96	Dissolved	ug/L	5	58	1.2E+00	1.7E-01	**4E+00**	**3E+01**
Cadmium	North Branch French Gulch	FG-7	23-Aug-94	Dissolved	ug/L	5.2	93	1.9E+00	2.3E-01	**3E+00**	**2E+01**
Cadmium	North Branch French Gulch	FG-7	22-Jul-96	Dissolved	ug/L	11.9	96	1.9E+00	2.4E-01	**6E+00**	**5E+01**
Cadmium	North Branch French Gulch	FG-7	11-Jun-96	Dissolved	ug/L	8.1	68	1.4E+00	1.9E-01	**6E+00**	**4E+01**
Cadmium	North Branch French Gulch	TS-3	23-May-96	Dissolved	ug/L	0.5	46	9.5E-01	1.4E-01	5E-01	**3E+00**
Cadmium	North Branch French Gulch	TS-4	25-May-96	Dissolved	ug/L	5	47	9.7E-01	1.5E-01	**5E+00**	**3E+01**
Cadmium	North Branch French Gulch	TS-4	06-Jun-96	Dissolved	ug/L	6	53	1.1E+00	1.6E-01	**6E+00**	**4E+01**
Cadmium	French Gulch Reference	FG-0	21-Sep-89	Dissolved	ug/L	0.15	58	1.2E+00	1.7E-01	1E-01	9E-01
Cadmium	French Gulch Reference	FG-0	22-Sep-92	Dissolved	ug/L	0.25	47	9.7E-01	1.5E-01	3E-01	**2E+00**
Cadmium	French Gulch Reference	FG-0	23-May-96	Dissolved	ug/L	0.5	34	7.0E-01	1.2E-01	7E-01	**4E+00**
Cadmium	French Gulch Reference	FG-1	04-May-89	Dissolved	ug/L	0.15	69	1.4E+00	1.9E-01	1E-01	8E-01
Cadmium	French Gulch Reference	FG-1	25-Oct-95	Dissolved	ug/L	0.5	48	9.9E-01	1.5E-01	5E-01	**3E+00**
Cadmium	French Gulch Reference	FG-1	23-May-96	Dissolved	ug/L	0.5	34	7.0E-01	1.2E-01	7E-01	**4E+00**
Cadmium	French Gulch Reference	FG-1	22-Sep-92	Dissolved	ug/L	0.25	53	1.1E+00	1.6E-01	2E-01	**2E+00**
Cadmium	French Gulch Reference	FG-1	12-Jun-96	Dissolved	ug/L	0.25	37	7.7E-01	1.2E-01	3E-01	**2E+00**
Cadmium	French Gulch Reference	FG-1	22-Jul-96	Dissolved	ug/L	0.25	41	8.4E-01	1.3E-01	3E-01	**2E+00**
Cadmium	French Gulch Reference	FG-2	04-May-89	Dissolved	ug/L	0.15	67	1.4E+00	1.9E-01	1E-01	8E-01
Cadmium	French Gulch Reference	FG-2	22-Sep-92	Dissolved	ug/L	0.25	55	1.1E+00	1.6E-01	2E-01	**2E+00**
Cadmium	French Gulch Reference	FG-2	21-Sep-89	Dissolved	ug/L	0.15	60	1.2E+00	1.7E-01	1E-01	9E-01
Cadmium	French Gulch Reference	FG-3	22-Sep-92	Dissolved	ug/L	0.25	62	1.3E+00	1.8E-01	2E-01	1E+00
Cadmium	French Gulch Reference	FG-3	12-Jun-96	Dissolved	ug/L	0.5	39	8.0E-01	1.3E-01	6E-01	**4E+00**
Cadmium	French Gulch Reference	FG-3	22-Jul-96	Dissolved	ug/L	0.25	46	9.5E-01	1.4E-01	3E-01	**2E+00**
Cadmium	French Gulch	FG-10	02-Nov-99	Dissolved	ug/L	3	85	1.7E+00	2.2E-01	**2E+00**	**1E+01**
Cadmium	French Gulch	FG-9	19-Jan-96	Dissolved	ug/L	9	150	3.0E+00	3.3E-01	**3E+00**	**3E+01**
Cadmium	French Gulch	FG-9	16-May-96	Dissolved	ug/L	9	82	1.7E+00	2.1E-01	**5E+00**	**4E+01**
Cadmium	French Gulch	FG-9	21-Feb-97	Dissolved	ug/L	9	160	3.2E+00	3.4E-01	**3E+00**	**3E+01**
Cadmium	French Gulch	FG-9	08-Oct-96	Dissolved	ug/L	7	110	2.2E+00	2.6E-01	**3E+00**	**3E+01**
Cadmium	French Gulch	FG-9	21-Sep-89	Dissolved	ug/L	4.3	102	2.1E+00	2.5E-01	**2E+00**	**2E+01**
Cadmium	French Gulch	FG-9	21-Jun-96	Dissolved	ug/L	6	62	1.3E+00	1.8E-01	**5E+00**	**3E+01**
Cadmium	French Gulch	FG-9	21-Jun-00	Dissolved	ug/L	2.8	--	nc	nc	nc	nc
Cadmium	French Gulch	FG-9	25-Jun-96	Dissolved	ug/L	6	65	1.3E+00	1.8E-01	**5E+00**	**3E+01**
Cadmium	French Gulch	FG-9	08-Dec-00	Dissolved	ug/L	5.5	--	nc	nc	nc	nc
Cadmium	French Gulch	FG-9	13-Sep-00	Dissolved	ug/L	4.2	--	nc	nc	nc	nc
Cadmium	French Gulch	FG-9	23-Aug-00	Dissolved	ug/L	3.6	--	nc	nc	nc	nc
Cadmium	French Gulch	FG-9	18-Jul-96	Dissolved	ug/L	6	18	3.8E-01	7.4E-02	**2E+01**	**8E+01**
Cadmium	French Gulch	FG-9	19-Jul-00	Dissolved	ug/L	3.2	--	nc	nc	nc	nc
Cadmium	French Gulch	FG-9	15-Aug-96	Dissolved	ug/L	6	99	2.0E+00	2.4E-01	**3E+00**	**2E+01**
Cadmium	French Gulch	FG-9	23-Oct-95	Dissolved	ug/L	7	110	2.2E+00	2.6E-01	**3E+00**	**3E+01**
Cadmium	French Gulch	FG-9	09-Sep-96	Dissolved	ug/L	7	110	2.2E+00	2.6E-01	**3E+00**	**3E+01**
Cadmium	French Gulch	FG-9	13-Nov-96	Dissolved	ug/L	7	120	2.4E+00	2.8E-01	**3E+00**	**3E+01**
Cadmium	French Gulch	FG-9	04-May-89	Dissolved	ug/L	7.1	140	2.8E+00	3.1E-01	**3E+00**	**2E+01**
Cadmium	French Gulch	FG-9	21-Nov-95	Dissolved	ug/L	8	120	2.4E+00	2.8E-01	**3E+00**	**3E+01**
Cadmium	French Gulch	FG-9	22-Feb-96	Dissolved	ug/L	8	150	3.0E+00	3.3E-01	**3E+00**	**2E+01**

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Cadmium	French Gulch	FG-9	22-May-96	Dissolved	ug/L	8	75	1.5E+00	2.0E-01	**5E+00**	**4E+01**
Cadmium	French Gulch	FG-9	26-May-96	Dissolved	ug/L	8	62	1.3E+00	1.8E-01	**6E+00**	**5E+01**
Cadmium	French Gulch	FG-9	13-Dec-96	Dissolved	ug/L	8	140	2.8E+00	3.1E-01	**3E+00**	**3E+01**
Cadmium	French Gulch	FG-9	16-Jan-97	Dissolved	ug/L	8	140	2.8E+00	3.1E-01	**3E+00**	**3E+01**
Cadmium	French Gulch	FG-9	21-Mar-96	Dissolved	ug/L	7	140	2.8E+00	3.1E-01	**3E+00**	**2E+01**
Cadmium	French Gulch	FG-9	17-Apr-96	Dissolved	ug/L	11	160	3.2E+00	3.4E-01	**3E+00**	**3E+01**
Cadmium	French Gulch	FG-9	17-Nov-99	Dissolved	ug/L	5.3	113	2.3E+00	2.7E-01	**2E+00**	**2E+01**
Cadmium	French Gulch	FG-9	16-Nov-93	Dissolved	ug/L	7.4	125	2.5E+00	2.9E-01	**3E+00**	**3E+01**
Cadmium	French Gulch	FG-9	21-Oct-93	Dissolved	ug/L	6.6	121	2.4E+00	2.8E-01	**3E+00**	**2E+01**
Cadmium	French Gulch	FG-9	22-Sep-92	Dissolved	ug/L	6	103	2.1E+00	2.5E-01	**3E+00**	**2E+01**
Cadmium	French Gulch	FG-9	10-Jun-96	Dissolved	ug/L	5.7	65	1.3E+00	1.8E-01	**4E+00**	**3E+01**
Cadmium	French Gulch	FG-9	24-Sep-98	Dissolved	ug/L	4.2	--	nc	nc	nc	nc
Cadmium	French Gulch	FG-9	03-Nov-98	Dissolved	ug/L	5.1	--	nc	nc	nc	nc
Cadmium	French Gulch	FG-9	02-Dec-98	Dissolved	ug/L	4	--	nc	nc	nc	nc
Cadmium	French Gulch	FG-9	03-Mar-99	Dissolved	ug/L	7.3	--	nc	nc	nc	nc
Cadmium	French Gulch	FG-9	04-Feb-99	Dissolved	ug/L	7.7	175	3.5E+00	3.6E-01	**2E+00**	**2E+01**
Cadmium	French Gulch	FG-9	07-Apr-99	Dissolved	ug/L	7.3	--	nc	nc	nc	nc
Cadmium	French Gulch	FG-9	14-Jul-99	Dissolved	ug/L	2.8	--	nc	nc	nc	nc
Cadmium	French Gulch	FG-9	02-Nov-99	Dissolved	ug/L	5.5	108	2.2E+00	2.6E-01	**3E+00**	**2E+01**
Cadmium	French Gulch	FG-9	08-Oct-99	Dissolved	ug/L	4	95	1.9E+00	2.4E-01	**2E+00**	**2E+01**
Cadmium	French Gulch	FG-9	23-Sep-99	Dissolved	ug/L	4.1	102	2.1E+00	2.5E-01	**2E+00**	**2E+01**
Cadmium	French Gulch	FG-9	13-Sep-99	Dissolved	ug/L	3.8	92	1.9E+00	2.3E-01	**2E+00**	**2E+01**
Cadmium	French Gulch	FG-9	05-Sep-99	Dissolved	ug/L	3.8	85	1.7E+00	2.2E-01	**2E+00**	**2E+01**
Cadmium	French Gulch	FG-9	19-Aug-99	Dissolved	ug/L	3.4	87	1.8E+00	2.2E-01	**2E+00**	**2E+01**
Cadmium	French Gulch	FG-9	10-Jun-99	Dissolved	ug/L	4.1	--	nc	nc	nc	nc
Cadmium	French Gulch	FG-9	07-May-99	Dissolved	ug/L	7.9	172	3.4E+00	3.6E-01	**2E+00**	**2E+01**
Cadmium	French Gulch	FG-9	23-Aug-94	Dissolved	ug/L	5.4	102	2.0E+00	2.5E-01	**3E+00**	**2E+01**
Cadmium	French Gulch	FG-9	22-Jul-96	Dissolved	ug/L	5.6	84	1.7E+00	2.2E-01	**3E+00**	**3E+01**
Cadmium	French Gulch	FG-9A	22-Sep-98	Dissolved	ug/L	4.2	--	nc	nc	nc	nc
Cadmium	French Gulch	FG-9A	22-Jul-96	Dissolved	ug/L	8.9	85	1.7E+00	2.2E-01	**5E+00**	**4E+01**
Cadmium	French Gulch	FG-9A	11-Jun-96	Dissolved	ug/L	7.1	65	1.3E+00	1.8E-01	**5E+00**	**4E+01**
Cadmium	French Gulch	FG-9A	23-Aug-94	Dissolved	ug/L	5.7	96	1.9E+00	2.4E-01	**3E+00**	**2E+01**
Cadmium	Discharge	CBMA-1	23-Jul-96	Dissolved	ug/L	2	224	4.4E+00	4.1E-01	5E-01	**5E+00**
Cadmium	Discharge	KDS	13-Jun-96	Dissolved	ug/L	17.7	296	5.8E+00	4.1E-01	**3E+00**	**4E+01**
Cadmium	Discharge	KDS	24-Aug-94	Dissolved	ug/L	0.5	222	4.4E+00	4.1E-01	1E-01	1E+00
Cadmium	Discharge	MGB-1	23-Jul-96	Dissolved	ug/L	5	82	1.7E+00	2.1E-01	**3E+00**	**2E+01**
Cadmium	Discharge	RLCVT-1	23-Jul-96	Dissolved	ug/L	6	86	1.7E+00	2.2E-01	**3E+00**	**3E+01**
Cadmium	Discharge	WP-1	12-Jun-96	Dissolved	ug/L	19800	4980	7.0E+00	4.1E-01	**3E+03**	**5E+04**
Cadmium	Blue River Reference	654	22-Jul-98	Dissolved	ug/l	0.05	--	nc	nc	nc	nc
Cadmium	Blue River Reference	654	16-May-97	Dissolved	ug/l	0.05	72	1.5E+00	2.0E-01	3E-02	3E-01
Cadmium	Blue River Reference	654	07-Aug-98	Dissolved	ug/l	0.05	--	nc	nc	nc	nc
Cadmium	Blue River Reference	654	10-Sep-97	Dissolved	ug/l	0.05	60	1.2E+00	1.7E-01	4E-02	3E-01
Cadmium	Blue River Reference	654	08-May-97	Dissolved	ug/l	0.05	78	1.6E+00	2.1E-01	3E-02	2E-01
Cadmium	Blue River Reference	654	09-Sep-98	Dissolved	ug/l	0.05	--	nc	nc	nc	nc
Cadmium	Blue River Reference	654	21-May-97	Dissolved	ug/l	0.05	66	1.3E+00	1.8E-01	4E-02	3E-01

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Cadmium	Blue River Reference	654	04-Jun-97	Dissolved	ug/l	0.05	62	1.3E+00	1.8E-01	4E-02	3E-01
Cadmium	Blue River Reference	654	18-Jun-97	Dissolved	ug/l	0.05	60	1.2E+00	1.7E-01	4E-02	3E-01
Cadmium	Blue River Reference	654	10-Oct-97	Dissolved	ug/l	0.05	72	1.5E+00	2.0E-01	3E-02	3E-01
Cadmium	Blue River Reference	654	19-Nov-97	Dissolved	ug/l	0.05	96	1.9E+00	2.4E-01	3E-02	2E-01
Cadmium	Blue River Reference	654	07-Dec-97	Dissolved	ug/l	0.05	84	1.7E+00	2.2E-01	3E-02	2E-01
Cadmium	Blue River Reference	654	23-Sep-98	Dissolved	ug/l	0.05	--	nc	nc	nc	nc
Cadmium	Blue River Reference	654	01-Apr-98	Dissolved	ug/l	0.05	100	2.0E+00	2.5E-01	2E-02	2E-01
Cadmium	Blue River Reference	654	05-May-98	Dissolved	ug/l	0.05	76	1.5E+00	2.0E-01	3E-02	2E-01
Cadmium	Blue River Reference	654	24-Sep-97	Dissolved	ug/l	0.05	56	1.1E+00	1.6E-01	4E-02	3E-01
Cadmium	Blue River Reference	654	21-Aug-98	Dissolved	ug/l	0.05	--	nc	nc	nc	nc
Cadmium	Blue River Reference	654	01-Jul-98	Dissolved	ug/l	0.05	--	nc	nc	nc	nc
Cadmium	Blue River Reference	654	02-Jul-97	Dissolved	ug/l	0.05	40	8.3E-01	1.3E-01	6E-02	4E-01
Cadmium	Blue River Reference	654	16-Jul-97	Dissolved	ug/l	0.05	60	1.2E+00	1.7E-01	4E-02	3E-01
Cadmium	Blue River Reference	654	21-Aug-97	Dissolved	ug/l	0.05	52	1.1E+00	1.6E-01	5E-02	3E-01
Cadmium	Blue River Reference	654	02-Sep-97	Dissolved	ug/l	0.05	56	1.1E+00	1.6E-01	4E-02	3E-01
Cadmium	Blue River Reference	654	24-Apr-97	Dissolved	ug/l	0.05	86	1.7E+00	2.2E-01	3E-02	2E-01
Cadmium	Blue River Reference	655	18-Jun-97	Dissolved	ug/l	0.05	52	1.1E+00	1.6E-01	5E-02	3E-01
Cadmium	Blue River Reference	655	02-Jul-97	Dissolved	ug/l	0.05	42	8.7E-01	1.3E-01	6E-02	4E-01
Cadmium	Blue River Reference	655	16-Jul-97	Dissolved	ug/l	0.05	44	9.1E-01	1.4E-01	6E-02	4E-01
Cadmium	Blue River Reference	655	05-May-98	Dissolved	ug/l	0.05	72	1.5E+00	2.0E-01	3E-02	3E-01
Cadmium	Blue River Reference	655	21-May-97	Dissolved	ug/l	0.26	60	1.2E+00	1.7E-01	2E-01	**2E+00**
Cadmium	Blue River Reference	655	02-Sep-97	Dissolved	ug/l	0.05	52	1.1E+00	1.6E-01	5E-02	3E-01
Cadmium	Blue River Reference	655	24-Sep-97	Dissolved	ug/l	0.05	52	1.1E+00	1.6E-01	5E-02	3E-01
Cadmium	Blue River Reference	655	10-Oct-97	Dissolved	ug/l	0.05	60	1.2E+00	1.7E-01	4E-02	3E-01
Cadmium	Blue River Reference	655	07-Dec-97	Dissolved	ug/l	0.05	--	nc	nc	nc	nc
Cadmium	Blue River Reference	655	21-Aug-97	Dissolved	ug/l	0.05	44	9.1E-01	1.4E-01	6E-02	4E-01
Cadmium	Blue River Reference	655	09-Sep-98	Dissolved	ug/l	0.05	--	nc	nc	nc	nc
Cadmium	Blue River Reference	655	23-Sep-98	Dissolved	ug/l	0.11	60	1.2E+00	1.7E-01	9E-02	6E-01
Cadmium	Blue River Reference	655	07-Aug-98	Dissolved	ug/l	0.05	48	9.9E-01	1.5E-01	5E-02	3E-01
Cadmium	Blue River Reference	655	04-Jun-97	Dissolved	ug/l	0.05	54	1.1E+00	1.6E-01	5E-02	3E-01
Cadmium	Blue River Reference	655	24-Apr-97	Dissolved	ug/l	0.2	84	1.7E+00	2.2E-01	1E-01	9E-01
Cadmium	Blue River Reference	655	08-May-97	Dissolved	ug/l	0.25	74	1.5E+00	2.0E-01	2E-01	1E+00
Cadmium	Blue River Reference	655	01-Jul-98	Dissolved	ug/l	0.05	--	nc	nc	nc	nc
Cadmium	Blue River Reference	655	10-Sep-97	Dissolved	ug/l	0.05	44	9.1E-01	1.4E-01	6E-02	4E-01
Cadmium	Blue River Reference	655	16-May-97	Dissolved	ug/l	0.3	62	1.3E+00	1.8E-01	2E-01	**2E+00**
Cadmium	Blue River Reference	655	22-Jul-98	Dissolved	ug/l	0.05	58	1.2E+00	1.7E-01	4E-02	3E-01
Cadmium	Blue River Reference	655	21-Aug-98	Dissolved	ug/l	0.05	50	1.0E+00	1.5E-01	5E-02	3E-01
Cadmium	Blue River Reference	BR-1	23-Aug-94	Dissolved	ug/L	0.25	61	1.2E+00	1.7E-01	2E-01	1E+00
Cadmium	Blue River Reference	BR-1	05-Sep-99	Dissolved	ug/L	0.1	60	1.2E+00	1.7E-01	8E-02	6E-01
Cadmium	Blue River Reference	BR-1	10-Jun-96	Dissolved	ug/L	0.25	54	1.1E+00	1.6E-01	2E-01	**2E+00**
Cadmium	Blue River Reference	BR-1	23-Jul-96	Dissolved	ug/L	0.25	42	8.6E-01	1.3E-01	3E-01	**2E+00**
Cadmium	Blue River Reference	BR-1	14-Sep-99	Dissolved	ug/L	0.1	63	1.3E+00	1.8E-01	8E-02	6E-01
Cadmium	Blue River Reference	BR-1	05-May-99	Dissolved	ug/L	0.2	95	1.9E+00	2.4E-01	1E-01	8E-01
Cadmium	Blue River Reference	BR-1	10-Jun-99	Dissolved	ug/L	0.05	--	nc	nc	nc	nc
Cadmium	Blue River Reference	BR-1	10-Jun-99	Dissolved	ug/L	0.1	--	nc	nc	nc	nc

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Cadmium	Blue River Reference	BR-1	19-Aug-99	Dissolved	ug/L	0.1	61	1.2E+00	1.7E-01	8E-02	6E-01
Cadmium	Blue River Reference	BR-1	14-Jul-99	Dissolved	ug/L	0.1	--	nc	nc	nc	nc
Cadmium	Blue River Reference	BR-1	17-Nov-99	Dissolved	ug/L	0.05	69	1.4E+00	1.9E-01	4E-02	3E-01
Cadmium	Blue River Reference	BR-1	17-Nov-99	Dissolved	ug/L	0.1	70	1.4E+00	1.9E-01	7E-02	5E-01
Cadmium	Blue River Reference	BR-1	04-May-89	Dissolved	ug/L	0.3	67	1.4E+00	1.9E-01	2E-01	**2E+00**
Cadmium	Blue River Reference	BR-1	21-Sep-89	Dissolved	ug/L	0.15	58	1.2E+00	1.7E-01	1E-01	9E-01
Cadmium	Blue River Reference	BR-1	16-Nov-93	Dissolved	ug/L	0.25	67	1.4E+00	1.9E-01	2E-01	1E+00
Cadmium	Blue River Reference	BR-1	03-Nov-98	Dissolved	ug/L	0.2	--	nc	nc	nc	nc
Cadmium	Blue River Reference	BR-1	07-Oct-99	Dissolved	ug/L	0.1	71	1.4E+00	1.9E-01	7E-02	5E-01
Cadmium	Blue River Reference	BR-1	23-Sep-98	Dissolved	ug/L	0.2	--	nc	nc	nc	nc
Cadmium	Blue River Reference	BR-1	23-Sep-99	Dissolved	ug/L	0.1	72	1.5E+00	2.0E-01	7E-02	5E-01
Cadmium	Blue River Reference	BR-1	22-Sep-92	Dissolved	ug/L	0.25	66	1.3E+00	1.8E-01	2E-01	1E+00
Cadmium	Blue River Reference	BR-1	23-Sep-99	Dissolved	ug/L	0.1	71	1.4E+00	1.9E-01	7E-02	5E-01
Cadmium	Blue River Reference	BR-1	21-Oct-93	Dissolved	ug/L	0.25	71	1.4E+00	1.9E-01	2E-01	1E+00
Cadmium	Blue River Reference	BR-1	01-Nov-99	Dissolved	ug/L	0.1	71	1.4E+00	1.9E-01	7E-02	5E-01
Cadmium	Blue River Reference	BR-Adams St	24-Oct-95	Dissolved	ug/L	0.5	68	1.4E+00	1.9E-01	4E-01	**3E+00**
Cadmium	Blue River Reference	BR-Adams St	21-May-96	Dissolved	ug/L	0.5	57	1.2E+00	1.7E-01	4E-01	**3E+00**
Cadmium	Blue River	643	28-Dec-99	Dissolved	ug/l	0.66	--	nc	nc	nc	nc
Cadmium	Blue River	643	09-Sep-98	Dissolved	ug/l	0.67	--	nc	nc	nc	nc
Cadmium	Blue River	643	21-Aug-98	Dissolved	ug/l	0.64	--	nc	nc	nc	nc
Cadmium	Blue River	643	22-Jul-98	Dissolved	ug/l	0.75	--	nc	nc	nc	nc
Cadmium	Blue River	643	07-Aug-98	Dissolved	ug/l	0.05	--	nc	nc	nc	nc
Cadmium	Blue River	656	08-May-97	Dissolved	ug/l	2.35	106	2.1E+00	2.6E-01	1E+00	**9E+00**
Cadmium	Blue River	656	01-Jul-98	Dissolved	ug/l	1.91	--	nc	nc	nc	nc
Cadmium	Blue River	656	05-May-98	Dissolved	ug/l	3.65	120	2.4E+00	2.8E-01	**2E+00**	**1E+01**
Cadmium	Blue River	656	09-Sep-98	Dissolved	ug/l	2.43	90	1.8E+00	2.3E-01	1E+00	**1E+01**
Cadmium	Blue River	656	24-Apr-97	Dissolved	ug/l	4.12	124	2.5E+00	2.9E-01	**2E+00**	**1E+01**
Cadmium	Blue River	656	18-Jun-97	Dissolved	ug/l	1.36	58	1.2E+00	1.7E-01	1E+00	**8E+00**
Cadmium	Blue River	656	23-Sep-98	Dissolved	ug/l	3.41	94	1.9E+00	2.4E-01	**2E+00**	**1E+01**
Cadmium	Blue River	656	04-Jun-97	Dissolved	ug/l	1.89	60	1.2E+00	1.7E-01	**2E+00**	**1E+01**
Cadmium	Blue River	656	22-Jul-98	Dissolved	ug/l	2.39	78	1.6E+00	2.1E-01	**2E+00**	**1E+01**
Cadmium	Blue River	656	07-Aug-98	Dissolved	ug/l	1.15	--	nc	nc	nc	nc
Cadmium	Blue River	656	10-Sep-97	Dissolved	ug/l	2.25	76	1.5E+00	2.0E-01	1E+00	**1E+01**
Cadmium	Blue River	656	16-May-97	Dissolved	ug/l	1.83	80	1.6E+00	2.1E-01	1E+00	**9E+00**
Cadmium	Blue River	656	21-Aug-98	Dissolved	ug/l	1.95	--	nc	nc	nc	nc
Cadmium	Blue River	656	21-May-97	Dissolved	ug/l	1.87	68	1.4E+00	1.9E-01	1E+00	**1E+01**
Cadmium	Blue River	656	24-Sep-97	Dissolved	ug/l	2.27	76	1.5E+00	2.0E-01	1E+00	**1E+01**
Cadmium	Blue River	656	02-Sep-97	Dissolved	ug/l	1.13	64	1.3E+00	1.8E-01	9E-01	**6E+00**
Cadmium	Blue River	656	07-Dec-97	Dissolved	ug/l	6.66	136	2.7E+00	3.0E-01	**2E+00**	**2E+01**
Cadmium	Blue River	656	21-Aug-97	Dissolved	ug/l	0.99	42	8.7E-01	1.3E-01	1E+00	**7E+00**
Cadmium	Blue River	656	16-Jul-97	Dissolved	ug/l	0.77	--	nc	nc	nc	nc
Cadmium	Blue River	656	10-Oct-97	Dissolved	ug/l	2.68	100	2.0E+00	2.5E-01	1E+00	**1E+01**
Cadmium	Blue River	656	02-Jul-97	Dissolved	ug/l	0.99	44	9.1E-01	1.4E-01	1E+00	**7E+00**
Cadmium	Blue River	656	01-Apr-98	Dissolved	ug/l	5.29	164	3.3E+00	3.5E-01	**2E+00**	**2E+01**
Cadmium	Blue River	656	19-Nov-97	Dissolved	ug/l	5.94	128	2.6E+00	2.9E-01	**2E+00**	**2E+01**

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Cadmium	Blue River	657	04-Jun-97	Dissolved	ug/l	0.64	58	1.2E+00	1.7E-01	5E-01	**4E+00**
Cadmium	Blue River	657	22-Jul-98	Dissolved	ug/l	0.58	--	nc	nc	nc	nc
Cadmium	Blue River	657	07-Aug-98	Dissolved	ug/l	0.51	--	nc	nc	nc	nc
Cadmium	Blue River	657	24-Sep-97	Dissolved	ug/l	0.59	72	1.5E+00	2.0E-01	4E-01	**3E+00**
Cadmium	Blue River	657	05-May-98	Dissolved	ug/l	0.66	76	1.5E+00	2.0E-01	4E-01	**3E+00**
Cadmium	Blue River	657	21-Aug-98	Dissolved	ug/l	0.61	--	nc	nc	nc	nc
Cadmium	Blue River	657	02-Sep-97	Dissolved	ug/l	0.53	64	1.3E+00	1.8E-01	4E-01	**3E+00**
Cadmium	Blue River	657	21-Aug-97	Dissolved	ug/l	0.53	52	1.1E+00	1.6E-01	5E-01	**3E+00**
Cadmium	Blue River	657	16-Jul-97	Dissolved	ug/l	0.47	48	9.9E-01	1.5E-01	5E-01	**3E+00**
Cadmium	Blue River	657	18-Jun-97	Dissolved	ug/l	0.8	54	1.1E+00	1.6E-01	7E-01	**5E+00**
Cadmium	Blue River	657	21-May-97	Dissolved	ug/l	0.77	64	1.3E+00	1.8E-01	6E-01	**4E+00**
Cadmium	Blue River	657	16-May-97	Dissolved	ug/l	0.68	72	1.5E+00	2.0E-01	5E-01	**3E+00**
Cadmium	Blue River	657	08-May-97	Dissolved	ug/l	0.61	78	1.6E+00	2.1E-01	4E-01	**3E+00**
Cadmium	Blue River	657	09-Sep-98	Dissolved	ug/l	0.56	--	nc	nc	nc	nc
Cadmium	Blue River	657	01-Jul-98	Dissolved	ug/l	0.43	--	nc	nc	nc	nc
Cadmium	Blue River	657	19-Nov-97	Dissolved	ug/l	0.46	68	1.4E+00	1.9E-01	3E-01	**2E+00**
Cadmium	Blue River	657	07-Dec-97	Dissolved	ug/l	0.44	68	1.4E+00	1.9E-01	3E-01	**2E+00**
Cadmium	Blue River	657	01-Apr-98	Dissolved	ug/l	0.39	84	1.7E+00	2.2E-01	2E-01	**2E+00**
Cadmium	Blue River	657	02-Jul-97	Dissolved	ug/l	0.54	46	9.5E-01	1.4E-01	6E-01	**4E+00**
Cadmium	Blue River	657	24-Apr-97	Dissolved	ug/l	0.6	88	1.8E+00	2.3E-01	3E-01	**3E+00**
Cadmium	Blue River	657	23-Sep-98	Dissolved	ug/l	0.54	--	nc	nc	nc	nc
Cadmium	Blue River	BR-2	02-Nov-99	Dissolved	ug/L	5.1	108	2.2E+00	2.6E-01	**2E+00**	**2E+01**
Cadmium	Blue River	BR-2	17-Nov-99	Dissolved	ug/L	4.1	103	2.1E+00	2.5E-01	**2E+00**	**2E+01**
Cadmium	Blue River	BR-2	03-Nov-98	Dissolved	ug/L	4.3	--	nc	nc	nc	nc
Cadmium	Blue River	BR-2	02-Dec-98	Dissolved	ug/L	4	--	nc	nc	nc	nc
Cadmium	Blue River	BR-2	03-Mar-99	Dissolved	ug/L	7.2	--	nc	nc	nc	nc
Cadmium	Blue River	BR-2	04-Feb-99	Dissolved	ug/L	7.6	174	3.4E+00	3.6E-01	**2E+00**	**2E+01**
Cadmium	Blue River	BR-2	07-Apr-99	Dissolved	ug/L	7.2	--	nc	nc	nc	nc
Cadmium	Blue River	BR-2	23-Sep-99	Dissolved	ug/L	3.1	93	1.9E+00	2.3E-01	**2E+00**	**1E+01**
Cadmium	Blue River	BR-2	07-Apr-99	Dissolved	ug/L	7.5	--	nc	nc	nc	nc
Cadmium	Blue River	BR-2	04-May-89	Dissolved	ug/L	6	140	2.8E+00	3.1E-01	**2E+00**	**2E+01**
Cadmium	Blue River	BR-2	21-Sep-89	Dissolved	ug/L	4.3	108	2.2E+00	2.6E-01	**2E+00**	**2E+01**
Cadmium	Blue River	BR-2	22-Aug-94	Dissolved	ug/L	1.7	76	1.5E+00	2.0E-01	1E+00	**8E+00**
Cadmium	Blue River	BR-2	14-Sep-99	Dissolved	ug/L	3.5	89	1.8E+00	2.3E-01	**2E+00**	**2E+01**
Cadmium	Blue River	BR-2	14-Sep-99	Dissolved	ug/L	3.3	88	1.8E+00	2.3E-01	**2E+00**	**1E+01**
Cadmium	Blue River	BR-2	05-Sep-99	Dissolved	ug/L	2.8	81	1.6E+00	2.1E-01	**2E+00**	**1E+01**
Cadmium	Blue River	BR-2	19-Aug-99	Dissolved	ug/L	1.9	75	1.5E+00	2.0E-01	1E+00	**9E+00**
Cadmium	Blue River	BR-2	14-Jul-99	Dissolved	ug/L	0.6	--	nc	nc	nc	nc
Cadmium	Blue River	BR-2	10-Jun-99	Dissolved	ug/L	1.4	--	nc	nc	nc	nc
Cadmium	Blue River	BR-2	23-Sep-98	Dissolved	ug/L	3.4	--	nc	nc	nc	nc
Cadmium	Blue River	BR-2	05-May-99	Dissolved	ug/L	8.2	159	3.2E+00	3.4E-01	**3E+00**	**2E+01**
Cadmium	Blue River	BR-2	23-Jul-96	Dissolved	ug/L	1.1	49	1.0E+00	1.5E-01	1E+00	**7E+00**
Cadmium	Blue River	BR-2	10-Jun-96	Dissolved	ug/L	1.5	58	1.2E+00	1.7E-01	1E+00	**9E+00**
Cadmium	Blue River	BR-2	16-Nov-93	Dissolved	ug/L	6.8	126	2.5E+00	2.9E-01	**3E+00**	**2E+01**
Cadmium	Blue River	BR-2	21-Oct-93	Dissolved	ug/L	6.7	121	2.4E+00	2.8E-01	**3E+00**	**2E+01**

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Cadmium	Blue River	BR-2	22-Sep-92	Dissolved	ug/L	5.1	102	2.1E+00	2.5E-01	**2E+00**	**2E+01**
Cadmium	Blue River	BR-2	07-Oct-99	Dissolved	ug/L	3	91	1.8E+00	2.3E-01	**2E+00**	**1E+01**
Cadmium	Blue River	BR-3	04-Feb-99	Dissolved	ug/L	0.6	85	1.7E+00	2.2E-01	3E-01	**3E+00**
Cadmium	Blue River	BR-3	03-Mar-99	Dissolved	ug/L	0.2	--	nc	nc	nc	nc
Cadmium	Blue River	BR-3	07-Apr-99	Dissolved	ug/L	0.5	--	nc	nc	nc	nc
Cadmium	Blue River	BR-3	21-Sep-89	Dissolved	ug/L	0.4	68	1.4E+00	1.9E-01	3E-01	**2E+00**
Cadmium	Blue River	BR-3	04-May-89	Dissolved	ug/L	0.4	80	1.6E+00	2.1E-01	2E-01	**2E+00**
Cadmium	Blue River	BR-3	05-May-99	Dissolved	ug/L	0.6	89	1.8E+00	2.3E-01	3E-01	**3E+00**
Cadmium	Blue River	BR-3	10-Jun-99	Dissolved	ug/L	0.6	--	nc	nc	nc	nc
Cadmium	Blue River	BR-3	14-Jul-99	Dissolved	ug/L	0.5	--	nc	nc	nc	nc
Cadmium	Blue River	BR-3	19-Aug-99	Dissolved	ug/L	0.7	65	1.3E+00	1.8E-01	5E-01	**4E+00**
Cadmium	Blue River	BR-3	05-Sep-99	Dissolved	ug/L	0.6	63	1.3E+00	1.8E-01	5E-01	**3E+00**
Cadmium	Blue River	BR-3	14-Sep-99	Dissolved	ug/L	0.4	69	1.4E+00	1.9E-01	3E-01	**2E+00**
Cadmium	Blue River	BR-3	02-Dec-98	Dissolved	ug/L	1.5	--	nc	nc	nc	nc
Cadmium	Blue River	BR-3	03-Nov-98	Dissolved	ug/L	0.5	--	nc	nc	nc	nc
Cadmium	Blue River	BR-3	23-Sep-98	Dissolved	ug/L	0.7	--	nc	nc	nc	nc
Cadmium	Blue River	BR-3	22-Aug-94	Dissolved	ug/L	0.5	70	1.4E+00	1.9E-01	4E-01	**3E+00**
Cadmium	Blue River	BR-3	16-Nov-93	Dissolved	ug/L	0.25	75	1.5E+00	2.0E-01	2E-01	1E+00
Cadmium	Blue River	BR-3	10-Jun-96	Dissolved	ug/L	0.9	54	1.1E+00	1.6E-01	8E-01	**6E+00**
Cadmium	Blue River	BR-3	23-Jul-96	Dissolved	ug/L	0.5	50	1.0E+00	1.5E-01	5E-01	**3E+00**
Cadmium	Blue River	BR-3	21-Oct-93	Dissolved	ug/L	0.25	76	1.5E+00	2.0E-01	2E-01	1E+00
Cadmium	Blue River	BR-3	23-Sep-99	Dissolved	ug/L	0.8	72	1.5E+00	2.0E-01	5E-01	**4E+00**
Cadmium	Blue River	BR-3	07-Oct-99	Dissolved	ug/L	0.7	60	1.2E+00	1.7E-01	6E-01	**4E+00**
Cadmium	Blue River	BR-3	01-Nov-99	Dissolved	ug/L	0.5	74	1.5E+00	2.0E-01	3E-01	**3E+00**
Cadmium	Blue River	BR-3	17-Nov-99	Dissolved	ug/L	0.5	70	1.4E+00	1.9E-01	4E-01	**3E+00**
Cadmium	Blue River	BR-3	07-Oct-99	Dissolved	ug/L	0.8	73	1.5E+00	2.0E-01	5E-01	**4E+00**
Cadmium	Blue River	BR-4	22-Sep-92	Dissolved	ug/L	0.25	73	1.5E+00	2.0E-01	2E-01	1E+00
Cadmium	Blue River	BR-5	22-Sep-92	Dissolved	ug/L	0.25	72	1.5E+00	2.0E-01	2E-01	1E+00
Cadmium	Blue River	BR-5	23-Jul-96	Dissolved	ug/L	0.25	52	1.1E+00	1.6E-01	2E-01	**2E+00**
Cadmium	Blue River	BR-5	23-Jul-96	Dissolved	ug/L	0.7	52	1.1E+00	1.6E-01	7E-01	**5E+00**
Cadmium	Blue River	BR-BFG	22-May-96	Dissolved	ug/L	2	59	1.2E+00	1.7E-01	**2E+00**	**1E+01**
Cadmium	Blue River	BR-BFG	25-Oct-95	Dissolved	ug/L	4	86	1.7E+00	2.2E-01	**2E+00**	**2E+01**
Cadmium	Blue River	BR-Dillon	26-Oct-95	Dissolved	ug/L	0.5	66	1.3E+00	1.8E-01	4E-01	**3E+00**
Cadmium	Blue River	BR-Dillon	24-May-96	Dissolved	ug/L	0.5	47	9.7E-01	1.5E-01	5E-01	**3E+00**
Copper	South Branch French Gulch	FG-4	22-Sep-92	Dissolved	ug/L	0.5	61	8.4E+00	5.8E+00	6E-02	9E-02
Copper	South Branch French Gulch	FG-4	21-Sep-89	Dissolved	ug/L	2.5	58	8.0E+00	5.6E+00	3E-01	4E-01
Copper	South Branch French Gulch	FG-5	04-May-89	Dissolved	ug/L	2.5	84	1.1E+01	7.7E+00	2E-01	3E-01
Copper	South Branch French Gulch	FG-5	11-Jun-96	Dissolved	ug/L	1.8	37	5.3E+00	3.9E+00	3E-01	5E-01
Copper	South Branch French Gulch	FG-5	16-Nov-93	Dissolved	ug/L	0.5	65	9.0E+00	6.2E+00	6E-02	8E-02
Copper	South Branch French Gulch	FG-5	22-Sep-92	Dissolved	ug/L	0.5	62	8.6E+00	6.0E+00	6E-02	8E-02
Copper	South Branch French Gulch	FG-5	21-Oct-93	Dissolved	ug/L	0.5	66	9.1E+00	6.3E+00	6E-02	8E-02
Copper	South Branch French Gulch	FG-5	05-Sep-99	Dissolved	ug/L	0.5	52	7.3E+00	5.1E+00	7E-02	1E-01
Copper	South Branch French Gulch	FG-5	13-Sep-99	Dissolved	ug/L	0.5	60	8.3E+00	5.8E+00	6E-02	9E-02
Copper	South Branch French Gulch	FG-5	19-Aug-99	Dissolved	ug/L	1.1	54	7.5E+00	5.3E+00	1E-01	2E-01
Copper	South Branch French Gulch	FG-5	23-Sep-99	Dissolved	ug/L	0.5	64	8.8E+00	6.1E+00	6E-02	8E-02

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Copper	South Branch French Gulch	FG-5	08-Oct-99	Dissolved	ug/L	0.5	63	8.7E+00	6.0E+00	6E-02	8E-02
Copper	South Branch French Gulch	FG-5	23-Aug-94	Dissolved	ug/L	0.5	54	7.5E+00	5.3E+00	7E-02	9E-02
Copper	South Branch French Gulch	FG-5	22-Jul-96	Dissolved	ug/L	0.4	46	6.5E+00	4.6E+00	6E-02	9E-02
Copper	South Branch French Gulch	FG-5.5	23-Sep-99	Dissolved	ug/L	1	75	1.0E+01	7.0E+00	1E-01	1E-01
Copper	South Branch French Gulch	FG-5.5	07-Oct-99	Dissolved	ug/L	1	76	1.0E+01	7.1E+00	1E-01	1E-01
Copper	South Branch French Gulch	FG-5.5	19-Aug-99	Dissolved	ug/L	2	65	9.0E+00	6.2E+00	2E-01	3E-01
Copper	South Branch French Gulch	FG-5.5	05-Sep-99	Dissolved	ug/L	2	64	8.8E+00	6.1E+00	2E-01	3E-01
Copper	South Branch French Gulch	FG-5.5	13-Sep-99	Dissolved	ug/L	2	71	9.7E+00	6.7E+00	2E-01	3E-01
Copper	South Branch French Gulch	FG-5.5	05-Sep-99	Dissolved	ug/L	2	64	8.8E+00	6.1E+00	2E-01	3E-01
Copper	South Branch French Gulch	FG-5.5	13-Sep-99	Dissolved	ug/L	2	71	9.7E+00	6.7E+00	2E-01	3E-01
Copper	South Branch French Gulch	FG-5.5	23-Sep-99	Dissolved	ug/L	1	75	1.0E+01	7.0E+00	1E-01	1E-01
Copper	South Branch French Gulch	FG-5.5	07-Oct-99	Dissolved	ug/L	1	76	1.0E+01	7.1E+00	1E-01	1E-01
Copper	South Branch French Gulch	FG-5.5	01-Nov-99	Dissolved	ug/L	1	82	1.1E+01	7.6E+00	9E-02	1E-01
Copper	South Branch French Gulch	FG-5.5	17-Nov-99	Dissolved	ug/L	0.7	84	1.1E+01	7.7E+00	6E-02	9E-02
Copper	South Branch French Gulch	FG-8	17-Nov-99	Dissolved	ug/L	1.1	89	1.2E+01	8.1E+00	9E-02	1E-01
Copper	South Branch French Gulch	FG-8	23-Sep-99	Dissolved	ug/L	0.5	76	1.0E+01	7.1E+00	5E-02	7E-02
Copper	South Branch French Gulch	FG-8	08-Oct-99	Dissolved	ug/L	3	73	1.0E+01	6.8E+00	3E-01	4E-01
Copper	South Branch French Gulch	FG-8	14-Sep-99	Dissolved	ug/L	0.5	71	9.7E+00	6.7E+00	5E-02	7E-02
Copper	South Branch French Gulch	FG-8	02-Nov-99	Dissolved	ug/L	2	86	1.2E+01	7.9E+00	2E-01	3E-01
Copper	South Branch French Gulch	FG-8	21-Oct-93	Dissolved	ug/L	0.5	109	1.5E+01	9.7E+00	3E-02	5E-02
Copper	South Branch French Gulch	FG-8	19-Aug-99	Dissolved	ug/L	1.8	66	9.1E+00	6.3E+00	2E-01	3E-01
Copper	South Branch French Gulch	FG-8	22-Sep-92	Dissolved	ug/L	0.5	95	1.3E+01	8.5E+00	4E-02	6E-02
Copper	South Branch French Gulch	FG-8	23-Aug-94	Dissolved	ug/L	1.1	97	1.3E+01	8.7E+00	8E-02	1E-01
Copper	South Branch French Gulch	FG-8	22-Jul-96	Dissolved	ug/L	0.4	64	8.8E+00	6.1E+00	5E-02	7E-02
Copper	South Branch French Gulch	FG-8	16-Nov-93	Dissolved	ug/L	0.5	109	1.5E+01	9.7E+00	3E-02	5E-02
Copper	South Branch French Gulch	FG-8	11-Jun-96	Dissolved	ug/L	1.6	55	7.7E+00	5.4E+00	2E-01	3E-01
Copper	South Branch French Gulch	FG-8	21-Sep-89	Dissolved	ug/L	2.5	92	1.2E+01	8.3E+00	2E-01	3E-01
Copper	South Branch French Gulch	FG-8	04-May-89	Dissolved	ug/L	2.5	97	1.3E+01	8.7E+00	2E-01	3E-01
Copper	South Branch French Gulch	FG-8	05-Sep-99	Dissolved	ug/L	10	66	9.1E+00	6.3E+00	1E+00	**2E+00**
Copper	North Branch French Gulch	1121	13-Jun-96	Dissolved	ug/L	5	215	2.8E+01	1.7E+01	2E-01	3E-01
Copper	North Branch French Gulch	1121	23-Jul-96	Dissolved	ug/L	15	446	5.0E+01	1.7E+01	3E-01	9E-01
Copper	North Branch French Gulch	1140	13-Jun-96	Dissolved	ug/L	40.1	728	5.0E+01	1.7E+01	8E-01	**2E+00**
Copper	North Branch French Gulch	FG-6	11-Jun-96	Dissolved	ug/L	193	1070	5.0E+01	1.7E+01	**4E+00**	**1E+01**
Copper	North Branch French Gulch	FG-6A	22-Jul-96	Dissolved	ug/L	2.3	908	5.0E+01	1.7E+01	5E-02	1E-01
Copper	North Branch French Gulch	FG-6A	23-Aug-94	Dissolved	ug/L	0.5	699	5.0E+01	1.7E+01	1E-02	3E-02
Copper	North Branch French Gulch	FG-6A	22-Sep-92	Dissolved	ug/L	0.5	440	5.0E+01	1.7E+01	1E-02	3E-02
Copper	North Branch French Gulch	FG-6A	21-Sep-89	Dissolved	ug/L	2.5	656	5.0E+01	1.7E+01	5E-02	1E-01
Copper	North Branch French Gulch	FG-6A	04-May-89	Dissolved	ug/L	11	580	5.0E+01	1.7E+01	2E-01	6E-01
Copper	North Branch French Gulch	FG-6A	11-Jun-96	Dissolved	ug/L	20.5	722	5.0E+01	1.7E+01	4E-01	1E+00
Copper	North Branch French Gulch	FG-6A	21-Oct-93	Dissolved	ug/L	6	679	5.0E+01	1.7E+01	1E-01	4E-01
Copper	North Branch French Gulch	FG-6A	16-Nov-93	Dissolved	ug/L	3	625	5.0E+01	1.7E+01	6E-02	2E-01
Copper	North Branch French Gulch	FG-6B	22-Jul-96	Dissolved	ug/L	4.2	1230	5.0E+01	1.7E+01	8E-02	2E-01
Copper	North Branch French Gulch	FG-6B	23-Aug-94	Dissolved	ug/L	0.5	1362	5.0E+01	1.7E+01	1E-02	3E-02
Copper	North Branch French Gulch	FG-6C	21-Jun-00	Dissolved	ug/L	5	--	nc	nc	nc	nc
Copper	North Branch French Gulch	FG-6C	11-Jun-96	Dissolved	ug/L	6.7	2020	5.0E+01	1.7E+01	1E-01	4E-01

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Copper	North Branch French Gulch	FG-6C	05-Sep-99	Dissolved	ug/L	45	882	5.0E+01	1.7E+01	9E-01	**3E+00**
Copper	North Branch French Gulch	FG-6C	13-Sep-99	Dissolved	ug/L	66.8	839	5.0E+01	1.7E+01	1E+00	**4E+00**
Copper	North Branch French Gulch	FG-6C	23-Sep-99	Dissolved	ug/L	31.6	1010	5.0E+01	1.7E+01	6E-01	**2E+00**
Copper	North Branch French Gulch	FG-6C	07-Oct-99	Dissolved	ug/L	93.1	957	5.0E+01	1.7E+01	**2E+00**	**5E+00**
Copper	North Branch French Gulch	FG-6C	19-Aug-99	Dissolved	ug/L	32.6	659	5.0E+01	1.7E+01	7E-01	**2E+00**
Copper	North Branch French Gulch	FG-6C	05-Sep-99	Dissolved	ug/L	44	882	5.0E+01	1.7E+01	9E-01	**3E+00**
Copper	North Branch French Gulch	FG-6C	05-Sep-99	Dissolved	ug/L	44	882	5.0E+01	1.7E+01	9E-01	**3E+00**
Copper	North Branch French Gulch	FG-6C	22-Jul-96	Dissolved	ug/L	8	1720	5.0E+01	1.7E+01	2E-01	5E-01
Copper	North Branch French Gulch	FG-6C	17-Nov-99	Dissolved	ug/L	21.9	972	5.0E+01	1.7E+01	4E-01	1E+00
Copper	North Branch French Gulch	FG-6C	02-Nov-99	Dissolved	ug/L	76	996	5.0E+01	1.7E+01	**2E+00**	**4E+00**
Copper	North Branch French Gulch	FG-7	04-May-89	Dissolved	ug/L	2.5	200	2.6E+01	1.6E+01	1E-01	2E-01
Copper	North Branch French Gulch	FG-7	22-Sep-92	Dissolved	ug/L	0.5	102	1.4E+01	9.1E+00	4E-02	6E-02
Copper	North Branch French Gulch	FG-7	05-Sep-99	Dissolved	ug/L	6	184	2.4E+01	1.5E+01	3E-01	4E-01
Copper	North Branch French Gulch	FG-7	07-Oct-99	Dissolved	ug/L	9	182	2.4E+01	1.5E+01	4E-01	6E-01
Copper	North Branch French Gulch	FG-7	23-Sep-99	Dissolved	ug/L	6.2	201	2.6E+01	1.6E+01	2E-01	4E-01
Copper	North Branch French Gulch	FG-7	14-Sep-99	Dissolved	ug/L	7	189	2.4E+01	1.5E+01	3E-01	5E-01
Copper	North Branch French Gulch	FG-7	22-Jul-96	Dissolved	ug/L	0.4	96	1.3E+01	8.7E+00	3E-02	5E-02
Copper	North Branch French Gulch	FG-7	25-May-96	Dissolved	ug/L	3	--	nc	nc	nc	nc
Copper	North Branch French Gulch	FG-7	23-Aug-94	Dissolved	ug/L	0.5	93	1.3E+01	8.4E+00	4E-02	6E-02
Copper	North Branch French Gulch	FG-7	19-Aug-99	Dissolved	ug/L	4.1	196	2.5E+01	1.6E+01	2E-01	3E-01
Copper	North Branch French Gulch	FG-7	16-Nov-93	Dissolved	ug/L	0.5	120	1.6E+01	1.0E+01	3E-02	5E-02
Copper	North Branch French Gulch	FG-7	11-Jun-96	Dissolved	ug/L	2.3	68	9.3E+00	6.4E+00	2E-01	4E-01
Copper	North Branch French Gulch	FG-7	01-Nov-99	Dissolved	ug/L	9	203	2.6E+01	1.6E+01	3E-01	5E-01
Copper	North Branch French Gulch	FG-7	05-Jun-96	Dissolved	ug/L	3	58	8.0E+00	5.6E+00	4E-01	5E-01
Copper	North Branch French Gulch	FG-7	17-Nov-99	Dissolved	ug/L	4.6	201	2.6E+01	1.6E+01	2E-01	3E-01
Copper	North Branch French Gulch	FG-7	05-Jun-96	Dissolved	ug/L	2	58	8.0E+00	5.6E+00	2E-01	4E-01
Copper	North Branch French Gulch	FG-7	21-Oct-93	Dissolved	ug/L	0.5	123	1.6E+01	1.1E+01	3E-02	5E-02
Copper	North Branch French Gulch	TS-3	23-May-96	Dissolved	ug/L	0.5	46	6.5E+00	4.6E+00	8E-02	1E-01
Copper	North Branch French Gulch	TS-4	25-May-96	Dissolved	ug/L	3	47	6.6E+00	4.7E+00	5E-01	6E-01
Copper	North Branch French Gulch	TS-4	06-Jun-96	Dissolved	ug/L	2	53	7.4E+00	5.2E+00	3E-01	4E-01
Copper	French Gulch Reference	FG-0	22-Sep-92	Dissolved	ug/L	0.5	47	6.6E+00	4.7E+00	8E-02	1E-01
Copper	French Gulch Reference	FG-0	23-May-96	Dissolved	ug/L	1	34	4.9E+00	3.6E+00	2E-01	3E-01
Copper	French Gulch Reference	FG-0	21-Sep-89	Dissolved	ug/L	2.5	58	8.0E+00	5.6E+00	3E-01	4E-01
Copper	French Gulch Reference	FG-1	23-May-96	Dissolved	ug/L	0.5	34	4.9E+00	3.6E+00	1E-01	1E-01
Copper	French Gulch Reference	FG-1	25-Oct-95	Dissolved	ug/L	0.5	48	6.7E+00	4.8E+00	7E-02	1E-01
Copper	French Gulch Reference	FG-1	04-May-89	Dissolved	ug/L	2.5	69	9.5E+00	6.5E+00	3E-01	4E-01
Copper	French Gulch Reference	FG-1	22-Sep-92	Dissolved	ug/L	0.5	53	7.4E+00	5.2E+00	7E-02	1E-01
Copper	French Gulch Reference	FG-1	22-Jul-96	Dissolved	ug/L	1.5	41	5.7E+00	4.1E+00	3E-01	4E-01
Copper	French Gulch Reference	FG-1	12-Jun-96	Dissolved	ug/L	1.4	37	5.3E+00	3.8E+00	3E-01	4E-01
Copper	French Gulch Reference	FG-2	21-Sep-89	Dissolved	ug/L	2.5	60	8.3E+00	5.8E+00	3E-01	4E-01
Copper	French Gulch Reference	FG-2	04-May-89	Dissolved	ug/L	2.5	67	9.2E+00	6.4E+00	3E-01	4E-01
Copper	French Gulch Reference	FG-2	22-Sep-92	Dissolved	ug/L	0.5	55	7.6E+00	5.3E+00	7E-02	9E-02
Copper	French Gulch Reference	FG-3	22-Jul-96	Dissolved	ug/L	0.4	46	6.5E+00	4.6E+00	6E-02	9E-02
Copper	French Gulch Reference	FG-3	12-Jun-96	Dissolved	ug/L	0.9	39	5.5E+00	4.0E+00	2E-01	2E-01
Copper	French Gulch Reference	FG-3	22-Sep-92	Dissolved	ug/L	0.5	62	8.5E+00	5.9E+00	6E-02	8E-02

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Copper	French Gulch	FG-10	02-Nov-99	Dissolved	ug/L	2	85	1.2E+01	7.8E+00	2E-01	3E-01
Copper	French Gulch	FG-9	21-Jun-00	Dissolved	ug/L	5	--	nc	nc	nc	nc
Copper	French Gulch	FG-9	02-Nov-99	Dissolved	ug/L	3	108	1.4E+01	9.6E+00	2E-01	3E-01
Copper	French Gulch	FG-9	17-Nov-99	Dissolved	ug/L	1.7	113	1.5E+01	9.9E+00	1E-01	2E-01
Copper	French Gulch	FG-9	08-Oct-99	Dissolved	ug/L	2	95	1.3E+01	8.6E+00	2E-01	2E-01
Copper	French Gulch	FG-9	05-Sep-99	Dissolved	ug/L	2	85	1.2E+01	7.8E+00	2E-01	3E-01
Copper	French Gulch	FG-9	19-Aug-99	Dissolved	ug/L	3.5	87	1.2E+01	8.0E+00	3E-01	4E-01
Copper	French Gulch	FG-9	23-Sep-99	Dissolved	ug/L	2	102	1.4E+01	9.1E+00	1E-01	2E-01
Copper	French Gulch	FG-9	13-Sep-99	Dissolved	ug/L	2	92	1.2E+01	8.3E+00	2E-01	2E-01
Copper	French Gulch	FG-9	23-Oct-95	Dissolved	ug/L	1	110	1.5E+01	9.7E+00	7E-02	1E-01
Copper	French Gulch	FG-9	09-Sep-96	Dissolved	ug/L	1	110	1.5E+01	9.7E+00	7E-02	1E-01
Copper	French Gulch	FG-9	08-Oct-96	Dissolved	ug/L	0.5	110	1.5E+01	9.7E+00	3E-02	5E-02
Copper	French Gulch	FG-9	17-Apr-96	Dissolved	ug/L	3	160	2.1E+01	1.3E+01	1E-01	2E-01
Copper	French Gulch	FG-9	18-Jul-96	Dissolved	ug/L	13	18	2.7E+00	2.1E+00	**5E+00**	**6E+00**
Copper	French Gulch	FG-9	16-May-96	Dissolved	ug/L	5	82	1.1E+01	7.6E+00	4E-01	7E-01
Copper	French Gulch	FG-9	21-Sep-89	Dissolved	ug/L	2.5	102	1.4E+01	9.1E+00	2E-01	3E-01
Copper	French Gulch	FG-9	04-May-89	Dissolved	ug/L	2.5	140	1.8E+01	1.2E+01	1E-01	2E-01
Copper	French Gulch	FG-9	26-May-96	Dissolved	ug/L	3	62	8.6E+00	6.0E+00	4E-01	5E-01
Copper	French Gulch	FG-9	15-Aug-96	Dissolved	ug/L	1	99	1.3E+01	8.9E+00	8E-02	1E-01
Copper	French Gulch	FG-9	19-Jan-96	Dissolved	ug/L	3	150	2.0E+01	1.3E+01	2E-01	2E-01
Copper	French Gulch	FG-9	21-Nov-95	Dissolved	ug/L	3	120	1.6E+01	1.0E+01	2E-01	3E-01
Copper	French Gulch	FG-9	25-Jun-96	Dissolved	ug/L	2	65	9.0E+00	6.2E+00	2E-01	3E-01
Copper	French Gulch	FG-9	21-Jun-96	Dissolved	ug/L	2	62	8.6E+00	6.0E+00	2E-01	3E-01
Copper	French Gulch	FG-9	21-Mar-96	Dissolved	ug/L	2	140	1.8E+01	1.2E+01	1E-01	2E-01
Copper	French Gulch	FG-9	22-Feb-96	Dissolved	ug/L	2	150	2.0E+01	1.3E+01	1E-01	2E-01
Copper	French Gulch	FG-9	21-Feb-97	Dissolved	ug/L	0.5	160	2.1E+01	1.3E+01	2E-02	4E-02
Copper	French Gulch	FG-9	16-Jan-97	Dissolved	ug/L	0.5	140	1.8E+01	1.2E+01	3E-02	4E-02
Copper	French Gulch	FG-9	13-Dec-96	Dissolved	ug/L	0.5	140	1.8E+01	1.2E+01	3E-02	4E-02
Copper	French Gulch	FG-9	13-Nov-96	Dissolved	ug/L	0.5	120	1.6E+01	1.0E+01	3E-02	5E-02
Copper	French Gulch	FG-9	22-May-96	Dissolved	ug/L	3	75	1.0E+01	7.0E+00	3E-01	4E-01
Copper	French Gulch	FG-9	22-Jul-96	Dissolved	ug/L	0.4	84	1.1E+01	7.7E+00	4E-02	5E-02
Copper	French Gulch	FG-9	23-Aug-94	Dissolved	ug/L	1	102	1.4E+01	9.1E+00	7E-02	1E-01
Copper	French Gulch	FG-9	16-Nov-93	Dissolved	ug/L	0.5	125	1.7E+01	1.1E+01	3E-02	5E-02
Copper	French Gulch	FG-9	10-Jun-96	Dissolved	ug/L	2.7	65	9.0E+00	6.2E+00	3E-01	4E-01
Copper	French Gulch	FG-9	21-Oct-93	Dissolved	ug/L	0.5	121	1.6E+01	1.1E+01	3E-02	5E-02
Copper	French Gulch	FG-9	22-Sep-92	Dissolved	ug/L	0.5	103	1.4E+01	9.2E+00	4E-02	5E-02
Copper	French Gulch	FG-9A	22-Jul-96	Dissolved	ug/L	0.4	85	1.1E+01	7.8E+00	3E-02	5E-02
Copper	French Gulch	FG-9A	11-Jun-96	Dissolved	ug/L	2.1	65	9.0E+00	6.2E+00	2E-01	3E-01
Copper	French Gulch	FG-9A	23-Aug-94	Dissolved	ug/L	1.1	96	1.3E+01	8.6E+00	9E-02	1E-01
Copper	Discharge	CBMA-1	23-Jul-96	Dissolved	ug/L	0.8	224	2.9E+01	1.7E+01	3E-02	5E-02
Copper	Discharge	KDS	24-Aug-94	Dissolved	ug/L	0.5	222	2.8E+01	1.7E+01	2E-02	3E-02
Copper	Discharge	KDS	13-Jun-96	Dissolved	ug/L	6.7	296	3.7E+01	1.7E+01	2E-01	4E-01
Copper	Discharge	MGB-1	23-Jul-96	Dissolved	ug/L	0.8	82	1.1E+01	7.6E+00	7E-02	1E-01
Copper	Discharge	RLCVT-1	23-Jul-96	Dissolved	ug/L	0.8	86	1.2E+01	7.9E+00	7E-02	1E-01
Copper	Discharge	WP-1	12-Jun-96	Dissolved	ug/L	8393	4980	5.0E+01	1.7E+01	**2E+02**	**5E+02**

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Copper	Blue River Reference	654	24-Apr-97	Dissolved	ug/l	5.7	86	1.2E+01	7.9E+00	5E-01	7E-01
Copper	Blue River Reference	654	02-Sep-97	Dissolved	ug/l	16.4	56	7.8E+00	5.5E+00	**2E+00**	**3E+00**
Copper	Blue River Reference	654	09-Sep-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Copper	Blue River Reference	654	21-May-97	Dissolved	ug/l	1.2	66	9.1E+00	6.3E+00	1E-01	2E-01
Copper	Blue River Reference	654	16-May-97	Dissolved	ug/l	4.2	72	9.9E+00	6.8E+00	4E-01	6E-01
Copper	Blue River Reference	654	22-Jul-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Copper	Blue River Reference	654	23-Sep-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Copper	Blue River Reference	654	01-Jul-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Copper	Blue River Reference	654	21-Aug-98	Dissolved	ug/l	1.2	--	nc	nc	nc	nc
Copper	Blue River Reference	654	24-Sep-97	Dissolved	ug/l	0.5	56	7.8E+00	5.5E+00	6E-02	9E-02
Copper	Blue River Reference	654	21-Aug-97	Dissolved	ug/l	13.2	52	7.3E+00	5.1E+00	**2E+00**	**3E+00**
Copper	Blue River Reference	654	16-Jul-97	Dissolved	ug/l	3.5	60	8.3E+00	5.8E+00	4E-01	6E-01
Copper	Blue River Reference	654	02-Jul-97	Dissolved	ug/l	10.2	40	5.7E+00	4.1E+00	**2E+00**	**2E+00**
Copper	Blue River Reference	654	18-Jun-97	Dissolved	ug/l	18.5	60	8.3E+00	5.8E+00	**2E+00**	**3E+00**
Copper	Blue River Reference	654	08-May-97	Dissolved	ug/l	2.8	78	1.1E+01	7.2E+00	3E-01	4E-01
Copper	Blue River Reference	654	07-Aug-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Copper	Blue River Reference	654	05-May-98	Dissolved	ug/l	0.5	76	1.0E+01	7.1E+00	5E-02	7E-02
Copper	Blue River Reference	654	19-Nov-97	Dissolved	ug/l	0.5	96	1.3E+01	8.6E+00	4E-02	6E-02
Copper	Blue River Reference	654	10-Oct-97	Dissolved	ug/l	1.4	72	9.9E+00	6.8E+00	1E-01	2E-01
Copper	Blue River Reference	654	01-Apr-98	Dissolved	ug/l	0.5	100	1.3E+01	9.0E+00	4E-02	6E-02
Copper	Blue River Reference	654	07-Dec-97	Dissolved	ug/l	0.5	84	1.1E+01	7.7E+00	4E-02	6E-02
Copper	Blue River Reference	655	22-Jul-98	Dissolved	ug/l	1.6	58	8.0E+00	5.6E+00	2E-01	3E-01
Copper	Blue River Reference	655	16-May-97	Dissolved	ug/l	10.9	62	8.6E+00	6.0E+00	1E+00	**2E+00**
Copper	Blue River Reference	655	24-Sep-97	Dissolved	ug/l	0.5	52	7.3E+00	5.1E+00	7E-02	1E-01
Copper	Blue River Reference	655	16-Jul-97	Dissolved	ug/l	16.5	44	6.2E+00	4.4E+00	**3E+00**	**4E+00**
Copper	Blue River Reference	655	02-Jul-97	Dissolved	ug/l	5.7	42	5.9E+00	4.3E+00	1E+00	1E+00
Copper	Blue River Reference	655	18-Jun-97	Dissolved	ug/l	8.6	52	7.3E+00	5.1E+00	1E+00	**2E+00**
Copper	Blue River Reference	655	01-Jul-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Copper	Blue River Reference	655	05-May-98	Dissolved	ug/l	0.5	72	9.9E+00	6.8E+00	5E-02	7E-02
Copper	Blue River Reference	655	07-Dec-97	Dissolved	ug/l	1.1	--	nc	nc	nc	nc
Copper	Blue River Reference	655	10-Oct-97	Dissolved	ug/l	2.8	60	8.3E+00	5.8E+00	3E-01	5E-01
Copper	Blue River Reference	655	07-Aug-98	Dissolved	ug/l	1.9	48	6.7E+00	4.8E+00	3E-01	4E-01
Copper	Blue River Reference	655	21-May-97	Dissolved	ug/l	9.3	60	8.3E+00	5.8E+00	1E+00	**2E+00**
Copper	Blue River Reference	655	08-May-97	Dissolved	ug/l	2.5	74	1.0E+01	6.9E+00	2E-01	4E-01
Copper	Blue River Reference	655	09-Sep-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Copper	Blue River Reference	655	04-Jun-97	Dissolved	ug/l	16	54	7.5E+00	5.3E+00	**2E+00**	**3E+00**
Copper	Blue River Reference	655	24-Apr-97	Dissolved	ug/l	2.5	84	1.1E+01	7.7E+00	2E-01	3E-01
Copper	Blue River Reference	655	23-Sep-98	Dissolved	ug/l	1.3	60	8.3E+00	5.8E+00	2E-01	2E-01
Copper	Blue River Reference	655	21-Aug-98	Dissolved	ug/l	1.2	50	7.0E+00	5.0E+00	2E-01	2E-01
Copper	Blue River Reference	BR-1	21-Sep-89	Dissolved	ug/L	2.5	58	8.0E+00	5.6E+00	3E-01	4E-01
Copper	Blue River Reference	BR-1	01-Nov-99	Dissolved	ug/L	0.5	71	9.7E+00	6.7E+00	5E-02	7E-02
Copper	Blue River Reference	BR-1	04-May-89	Dissolved	ug/L	7	67	9.2E+00	6.4E+00	8E-01	1E+00
Copper	Blue River Reference	BR-1	17-Nov-99	Dissolved	ug/L	0.6	69	9.5E+00	6.5E+00	6E-02	9E-02
Copper	Blue River Reference	BR-1	17-Nov-99	Dissolved	ug/L	0.8	70	9.6E+00	6.6E+00	8E-02	1E-01
Copper	Blue River Reference	BR-1	23-Sep-99	Dissolved	ug/L	0.5	71	9.7E+00	6.7E+00	5E-02	7E-02

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Copper	Blue River Reference	BR-1	23-Jul-96	Dissolved	ug/L	0.4	42	5.9E+00	4.2E+00	7E-02	9E-02
Copper	Blue River Reference	BR-1	21-Oct-93	Dissolved	ug/L	0.5	71	9.7E+00	6.6E+00	5E-02	8E-02
Copper	Blue River Reference	BR-1	22-Sep-92	Dissolved	ug/L	0.5	66	9.0E+00	6.3E+00	6E-02	8E-02
Copper	Blue River Reference	BR-1	14-Sep-99	Dissolved	ug/L	0.5	63	8.7E+00	6.0E+00	6E-02	8E-02
Copper	Blue River Reference	BR-1	23-Aug-94	Dissolved	ug/L	2.1	61	8.5E+00	5.9E+00	2E-01	4E-01
Copper	Blue River Reference	BR-1	05-Sep-99	Dissolved	ug/L	0.5	60	8.3E+00	5.8E+00	6E-02	9E-02
Copper	Blue River Reference	BR-1	16-Nov-93	Dissolved	ug/L	0.5	67	9.2E+00	6.4E+00	5E-02	8E-02
Copper	Blue River Reference	BR-1	19-Aug-99	Dissolved	ug/L	1.7	61	8.4E+00	5.9E+00	2E-01	3E-01
Copper	Blue River Reference	BR-1	10-Jun-96	Dissolved	ug/L	1.3	54	7.5E+00	5.3E+00	2E-01	2E-01
Copper	Blue River Reference	BR-1	07-Oct-99	Dissolved	ug/L	0.5	71	9.7E+00	6.7E+00	5E-02	7E-02
Copper	Blue River Reference	BR-1	23-Sep-99	Dissolved	ug/L	0.5	72	9.9E+00	6.8E+00	5E-02	7E-02
Copper	Blue River Reference	BR-Adams St	24-Oct-95	Dissolved	ug/L	0.5	68	9.3E+00	6.4E+00	5E-02	8E-02
Copper	Blue River Reference	BR-Adams St	21-May-96	Dissolved	ug/L	2	57	7.9E+00	5.5E+00	3E-01	4E-01
Copper	Blue River	643	21-Aug-98	Dissolved	ug/l	1.2	--	nc	nc	nc	nc
Copper	Blue River	643	28-Dec-99	Dissolved	ug/l	1	--	nc	nc	nc	nc
Copper	Blue River	643	09-Sep-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Copper	Blue River	643	07-Aug-98	Dissolved	ug/l	1.6	--	nc	nc	nc	nc
Copper	Blue River	643	22-Jul-98	Dissolved	ug/l	2.3	--	nc	nc	nc	nc
Copper	Blue River	656	10-Oct-97	Dissolved	ug/l	0.5	100	1.3E+01	9.0E+00	4E-02	6E-02
Copper	Blue River	656	07-Dec-97	Dissolved	ug/l	1.1	136	1.8E+01	1.2E+01	6E-02	9E-02
Copper	Blue River	656	19-Nov-97	Dissolved	ug/l	2.3	128	1.7E+01	1.1E+01	1E-01	2E-01
Copper	Blue River	656	08-May-97	Dissolved	ug/l	2.6	106	1.4E+01	9.4E+00	2E-01	3E-01
Copper	Blue River	656	02-Sep-97	Dissolved	ug/l	27.4	64	8.8E+00	6.1E+00	**3E+00**	**4E+00**
Copper	Blue River	656	02-Jul-97	Dissolved	ug/l	8.4	44	6.2E+00	4.4E+00	1E+00	**2E+00**
Copper	Blue River	656	18-Jun-97	Dissolved	ug/l	8.3	58	8.0E+00	5.6E+00	1E+00	1E+00
Copper	Blue River	656	24-Sep-97	Dissolved	ug/l	0.5	76	1.0E+01	7.1E+00	5E-02	7E-02
Copper	Blue River	656	04-Jun-97	Dissolved	ug/l	10.8	60	8.3E+00	5.8E+00	1E+00	**2E+00**
Copper	Blue River	656	16-May-97	Dissolved	ug/l	2.7	80	1.1E+01	7.4E+00	2E-01	4E-01
Copper	Blue River	656	23-Sep-98	Dissolved	ug/l	1	94	1.3E+01	8.5E+00	8E-02	1E-01
Copper	Blue River	656	21-May-97	Dissolved	ug/l	2.6	68	9.3E+00	6.4E+00	3E-01	4E-01
Copper	Blue River	656	09-Sep-98	Dissolved	ug/l	0.5	90	1.2E+01	8.2E+00	4E-02	6E-02
Copper	Blue River	656	01-Apr-98	Dissolved	ug/l	1.5	164	2.1E+01	1.4E+01	7E-02	1E-01
Copper	Blue River	656	05-May-98	Dissolved	ug/l	0.5	120	1.6E+01	1.0E+01	3E-02	5E-02
Copper	Blue River	656	01-Jul-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Copper	Blue River	656	07-Aug-98	Dissolved	ug/l	1.1	--	nc	nc	nc	nc
Copper	Blue River	656	21-Aug-98	Dissolved	ug/l	1.8	--	nc	nc	nc	nc
Copper	Blue River	656	22-Jul-98	Dissolved	ug/l	3.1	78	1.1E+01	7.2E+00	3E-01	4E-01
Copper	Blue River	657	02-Jul-97	Dissolved	ug/l	7.2	46	6.5E+00	4.6E+00	1E+00	**2E+00**
Copper	Blue River	657	18-Jun-97	Dissolved	ug/l	9.3	54	7.5E+00	5.3E+00	1E+00	**2E+00**
Copper	Blue River	657	24-Sep-97	Dissolved	ug/l	1.2	72	9.9E+00	6.8E+00	1E-01	2E-01
Copper	Blue River	657	09-Sep-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Copper	Blue River	657	04-Jun-97	Dissolved	ug/l	8.4	58	8.0E+00	5.6E+00	1E+00	1E+00
Copper	Blue River	657	21-Aug-98	Dissolved	ug/l	1.2	--	nc	nc	nc	nc
Copper	Blue River	657	02-Sep-97	Dissolved	ug/l	7.7	64	8.8E+00	6.1E+00	9E-01	1E+00
Copper	Blue River	657	21-Aug-97	Dissolved	ug/l	5.9	52	7.3E+00	5.1E+00	8E-01	1E+00

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Copper	Blue River	657	07-Aug-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Copper	Blue River	657	21-May-97	Dissolved	ug/l	1.7	64	8.8E+00	6.1E+00	2E-01	3E-01
Copper	Blue River	657	16-May-97	Dissolved	ug/l	9.5	72	9.9E+00	6.8E+00	1E+00	1E+00
Copper	Blue River	657	08-May-97	Dissolved	ug/l	2.7	78	1.1E+01	7.2E+00	3E-01	4E-01
Copper	Blue River	657	24-Apr-97	Dissolved	ug/l	2.8	88	1.2E+01	8.0E+00	2E-01	3E-01
Copper	Blue River	657	23-Sep-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Copper	Blue River	657	19-Nov-97	Dissolved	ug/l	1.3	68	9.3E+00	6.4E+00	1E-01	2E-01
Copper	Blue River	657	07-Dec-97	Dissolved	ug/l	0.5	68	9.3E+00	6.4E+00	5E-02	8E-02
Copper	Blue River	657	01-Apr-98	Dissolved	ug/l	2	84	1.1E+01	7.7E+00	2E-01	3E-01
Copper	Blue River	657	05-May-98	Dissolved	ug/l	3.5	76	1.0E+01	7.1E+00	3E-01	5E-01
Copper	Blue River	657	01-Jul-98	Dissolved	ug/l	1.4	--	nc	nc	nc	nc
Copper	Blue River	657	22-Jul-98	Dissolved	ug/l	1.6	--	nc	nc	nc	nc
Copper	Blue River	BR-2	22-Sep-92	Dissolved	ug/L	0.5	102	1.4E+01	9.1E+00	4E-02	5E-02
Copper	Blue River	BR-2	07-Oct-99	Dissolved	ug/L	2	91	1.2E+01	8.3E+00	2E-01	2E-01
Copper	Blue River	BR-2	17-Nov-99	Dissolved	ug/L	1.4	103	1.4E+01	9.2E+00	1E-01	2E-01
Copper	Blue River	BR-2	02-Nov-99	Dissolved	ug/L	3	108	1.4E+01	9.6E+00	2E-01	3E-01
Copper	Blue River	BR-2	04-May-89	Dissolved	ug/L	2.5	140	1.8E+01	1.2E+01	1E-01	2E-01
Copper	Blue River	BR-2	21-Sep-89	Dissolved	ug/L	2.5	108	1.4E+01	9.6E+00	2E-01	3E-01
Copper	Blue River	BR-2	23-Sep-99	Dissolved	ug/L	2	93	1.3E+01	8.4E+00	2E-01	2E-01
Copper	Blue River	BR-2	22-Aug-94	Dissolved	ug/L	0.5	76	1.0E+01	7.1E+00	5E-02	7E-02
Copper	Blue River	BR-2	23-Jul-96	Dissolved	ug/L	0.4	49	6.8E+00	4.9E+00	6E-02	8E-02
Copper	Blue River	BR-2	10-Jun-96	Dissolved	ug/L	1.8	58	8.0E+00	5.6E+00	2E-01	3E-01
Copper	Blue River	BR-2	16-Nov-93	Dissolved	ug/L	0.5	126	1.7E+01	1.1E+01	3E-02	5E-02
Copper	Blue River	BR-2	21-Oct-93	Dissolved	ug/L	1	121	1.6E+01	1.1E+01	6E-02	9E-02
Copper	Blue River	BR-2	14-Sep-99	Dissolved	ug/L	2	89	1.2E+01	8.1E+00	2E-01	2E-01
Copper	Blue River	BR-2	14-Sep-99	Dissolved	ug/L	2	88	1.2E+01	8.0E+00	2E-01	2E-01
Copper	Blue River	BR-2	05-Sep-99	Dissolved	ug/L	1	81	1.1E+01	7.5E+00	9E-02	1E-01
Copper	Blue River	BR-2	19-Aug-99	Dissolved	ug/L	1.9	75	1.0E+01	7.0E+00	2E-01	3E-01
Copper	Blue River	BR-3	04-May-89	Dissolved	ug/L	2.5	80	1.1E+01	7.4E+00	2E-01	3E-01
Copper	Blue River	BR-3	21-Sep-89	Dissolved	ug/L	2.5	68	9.3E+00	6.4E+00	3E-01	4E-01
Copper	Blue River	BR-3	23-Sep-99	Dissolved	ug/L	0.5	72	9.9E+00	6.8E+00	5E-02	7E-02
Copper	Blue River	BR-3	22-Aug-94	Dissolved	ug/L	1.4	70	9.5E+00	6.6E+00	1E-01	2E-01
Copper	Blue River	BR-3	14-Sep-99	Dissolved	ug/L	0.5	69	9.5E+00	6.5E+00	5E-02	8E-02
Copper	Blue River	BR-3	01-Nov-99	Dissolved	ug/L	1	74	1.0E+01	6.9E+00	1E-01	1E-01
Copper	Blue River	BR-3	10-Jun-96	Dissolved	ug/L	2.4	54	7.5E+00	5.3E+00	3E-01	5E-01
Copper	Blue River	BR-3	23-Jul-96	Dissolved	ug/L	0.4	50	7.0E+00	5.0E+00	6E-02	8E-02
Copper	Blue River	BR-3	17-Nov-99	Dissolved	ug/L	1	70	9.6E+00	6.6E+00	1E-01	2E-01
Copper	Blue River	BR-3	16-Nov-93	Dissolved	ug/L	0.5	75	1.0E+01	7.0E+00	5E-02	7E-02
Copper	Blue River	BR-3	07-Oct-99	Dissolved	ug/L	1	60	8.3E+00	5.8E+00	1E-01	2E-01
Copper	Blue River	BR-3	21-Oct-93	Dissolved	ug/L	0.5	76	1.0E+01	7.1E+00	5E-02	7E-02
Copper	Blue River	BR-3	07-Oct-99	Dissolved	ug/L	0.5	73	1.0E+01	6.8E+00	5E-02	7E-02
Copper	Blue River	BR-3	19-Aug-99	Dissolved	ug/L	1	65	9.0E+00	6.2E+00	1E-01	2E-01
Copper	Blue River	BR-3	05-Sep-99	Dissolved	ug/L	1	63	8.7E+00	6.0E+00	1E-01	2E-01
Copper	Blue River	BR-4	22-Sep-92	Dissolved	ug/L	0.5	73	1.0E+01	6.8E+00	5E-02	7E-02
Copper	Blue River	BR-5	23-Jul-96	Dissolved	ug/L	0.4	52	7.3E+00	5.1E+00	5E-02	8E-02

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Copper	Blue River	BR-5	23-Jul-96	Dissolved	ug/L	0.4	52	7.2E+00	5.1E+00	6E-02	8E-02
Copper	Blue River	BR-5	22-Sep-92	Dissolved	ug/L	0.5	72	9.8E+00	6.7E+00	5E-02	7E-02
Copper	Blue River	BR-BFG	22-May-96	Dissolved	ug/L	2	59	8.2E+00	5.7E+00	2E-01	4E-01
Copper	Blue River	BR-BFG	25-Oct-95	Dissolved	ug/L	0.5	86	1.2E+01	7.9E+00	4E-02	6E-02
Copper	Blue River	BR-Dillon	26-Oct-95	Dissolved	ug/L	0.5	66	9.1E+00	6.3E+00	6E-02	8E-02
Copper	Blue River	BR-Dillon	24-May-96	Dissolved	ug/L	2	47	6.6E+00	4.7E+00	3E-01	4E-01
Iron	South Branch French Gulch	FG-4	22-Sep-92	Dissolved	ug/L	13	61	2.0E+03	1.0E+03	7E-03	1E-02
Iron	South Branch French Gulch	FG-5	19-Aug-99	Dissolved	ug/L	5	54	2.0E+03	1.0E+03	3E-03	5E-03
Iron	South Branch French Gulch	FG-5	05-Sep-99	Dissolved	ug/L	5	52	2.0E+03	1.0E+03	3E-03	5E-03
Iron	South Branch French Gulch	FG-5	13-Sep-99	Dissolved	ug/L	80	60	2.0E+03	1.0E+03	4E-02	8E-02
Iron	South Branch French Gulch	FG-5	16-Nov-93	Dissolved	ug/L	37	65	2.0E+03	1.0E+03	2E-02	4E-02
Iron	South Branch French Gulch	FG-5	22-Jul-96	Dissolved	ug/L	18.1	46	2.0E+03	1.0E+03	9E-03	2E-02
Iron	South Branch French Gulch	FG-5	11-Jun-96	Dissolved	ug/L	19.1	37	2.0E+03	1.0E+03	1E-02	2E-02
Iron	South Branch French Gulch	FG-5	21-Oct-93	Dissolved	ug/L	15	66	2.0E+03	1.0E+03	8E-03	2E-02
Iron	South Branch French Gulch	FG-5	22-Sep-92	Dissolved	ug/L	5	62	2.0E+03	1.0E+03	3E-03	5E-03
Iron	South Branch French Gulch	FG-5	23-Aug-94	Dissolved	ug/L	17	54	2.0E+03	1.0E+03	9E-03	2E-02
Iron	South Branch French Gulch	FG-5	22-Sep-98	Dissolved	ug/L	10	--	2.0E+03	1.0E+03	5E-03	1E-02
Iron	South Branch French Gulch	FG-5	03-Nov-98	Dissolved	ug/L	20	--	2.0E+03	1.0E+03	1E-02	2E-02
Iron	South Branch French Gulch	FG-5	10-Jun-99	Dissolved	ug/L	10	--	2.0E+03	1.0E+03	5E-03	1E-02
Iron	South Branch French Gulch	FG-5	23-Sep-99	Dissolved	ug/L	5	64	2.0E+03	1.0E+03	3E-03	5E-03
Iron	South Branch French Gulch	FG-5	08-Oct-99	Dissolved	ug/L	20	63	2.0E+03	1.0E+03	1E-02	2E-02
Iron	South Branch French Gulch	FG-5	14-Jul-99	Dissolved	ug/L	20	--	2.0E+03	1.0E+03	1E-02	2E-02
Iron	South Branch French Gulch	FG-5.5	01-Nov-99	Dissolved	ug/L	5	82	2.0E+03	1.0E+03	3E-03	5E-03
Iron	South Branch French Gulch	FG-5.5	17-Nov-99	Dissolved	ug/L	30	84	2.0E+03	1.0E+03	2E-02	3E-02
Iron	South Branch French Gulch	FG-5.5	19-Aug-99	Dissolved	ug/L	5	65	2.0E+03	1.0E+03	3E-03	5E-03
Iron	South Branch French Gulch	FG-5.5	05-Sep-99	Dissolved	ug/L	5	64	2.0E+03	1.0E+03	3E-03	5E-03
Iron	South Branch French Gulch	FG-5.5	23-Sep-99	Dissolved	ug/L	5	75	2.0E+03	1.0E+03	3E-03	5E-03
Iron	South Branch French Gulch	FG-5.5	07-Oct-99	Dissolved	ug/L	20	76	2.0E+03	1.0E+03	1E-02	2E-02
Iron	South Branch French Gulch	FG-5.5	13-Sep-99	Dissolved	ug/L	30	71	2.0E+03	1.0E+03	2E-02	3E-02
Iron	South Branch French Gulch	FG-5.5	23-Sep-99	Dissolved	ug/L	5	75	2.0E+03	1.0E+03	3E-03	5E-03
Iron	South Branch French Gulch	FG-5.5	07-Oct-99	Dissolved	ug/L	20	76	2.0E+03	1.0E+03	1E-02	2E-02
Iron	South Branch French Gulch	FG-5.5	05-Sep-99	Dissolved	ug/L	5	64	2.0E+03	1.0E+03	3E-03	5E-03
Iron	South Branch French Gulch	FG-5.5	13-Sep-99	Dissolved	ug/L	30	71	2.0E+03	1.0E+03	2E-02	3E-02
Iron	South Branch French Gulch	FG-8	11-Jun-96	Dissolved	ug/L	50.8	55	2.0E+03	1.0E+03	3E-02	5E-02
Iron	South Branch French Gulch	FG-8	22-Jul-96	Dissolved	ug/L	5.6	64	2.0E+03	1.0E+03	3E-03	6E-03
Iron	South Branch French Gulch	FG-8	21-Oct-93	Dissolved	ug/L	21	109	2.0E+03	1.0E+03	1E-02	2E-02
Iron	South Branch French Gulch	FG-8	22-Sep-92	Dissolved	ug/L	30	95	2.0E+03	1.0E+03	2E-02	3E-02
Iron	South Branch French Gulch	FG-8	16-Nov-93	Dissolved	ug/L	2.5	109	2.0E+03	1.0E+03	1E-03	3E-03
Iron	South Branch French Gulch	FG-8	10-Jun-99	Dissolved	ug/L	40	--	2.0E+03	1.0E+03	2E-02	4E-02
Iron	South Branch French Gulch	FG-8	19-Aug-99	Dissolved	ug/L	5	66	2.0E+03	1.0E+03	3E-03	5E-03
Iron	South Branch French Gulch	FG-8	14-Jul-99	Dissolved	ug/L	5	--	2.0E+03	1.0E+03	3E-03	5E-03
Iron	South Branch French Gulch	FG-8	17-Nov-99	Dissolved	ug/L	5	89	2.0E+03	1.0E+03	3E-03	5E-03
Iron	South Branch French Gulch	FG-8	02-Nov-99	Dissolved	ug/L	5	86	2.0E+03	1.0E+03	3E-03	5E-03
Iron	South Branch French Gulch	FG-8	23-Sep-99	Dissolved	ug/L	10	76	2.0E+03	1.0E+03	5E-03	1E-02
Iron	South Branch French Gulch	FG-8	14-Sep-99	Dissolved	ug/L	5	71	2.0E+03	1.0E+03	3E-03	5E-03

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Iron	South Branch French Gulch	FG-8	05-Sep-99	Dissolved	ug/L	20	66	2.0E+03	1.0E+03	1E-02	2E-02
Iron	South Branch French Gulch	FG-8	08-Oct-99	Dissolved	ug/L	10	73	2.0E+03	1.0E+03	5E-03	1E-02
Iron	South Branch French Gulch	FG-8	23-Aug-94	Dissolved	ug/L	16	97	2.0E+03	1.0E+03	8E-03	2E-02
Iron	North Branch French Gulch	1121	23-Jul-96	Dissolved	ug/L	117	446	2.0E+03	1.0E+03	6E-02	1E-01
Iron	North Branch French Gulch	1121	13-Jun-96	Dissolved	ug/L	519.5	215	2.0E+03	1.0E+03	3E-01	5E-01
Iron	North Branch French Gulch	1140	13-Jun-96	Dissolved	ug/L	34111.9	728	2.0E+03	1.0E+03	**2E+01**	**3E+01**
Iron	North Branch French Gulch	FG-6	11-Jun-96	Dissolved	ug/L	155972	1070	2.0E+03	1.0E+03	**8E+01**	**2E+02**
Iron	North Branch French Gulch	FG-6A	11-Jun-96	Dissolved	ug/L	73377.2	722	2.0E+03	1.0E+03	**4E+01**	**7E+01**
Iron	North Branch French Gulch	FG-6A	22-Jul-96	Dissolved	ug/L	95411	908	2.0E+03	1.0E+03	**5E+01**	**1E+02**
Iron	North Branch French Gulch	FG-6A	21-Oct-93	Dissolved	ug/L	62570	679	2.0E+03	1.0E+03	**3E+01**	**6E+01**
Iron	North Branch French Gulch	FG-6A	16-Nov-93	Dissolved	ug/L	58400	625	2.0E+03	1.0E+03	**3E+01**	**6E+01**
Iron	North Branch French Gulch	FG-6A	22-Sep-92	Dissolved	ug/L	38540	440	2.0E+03	1.0E+03	**2E+01**	**4E+01**
Iron	North Branch French Gulch	FG-6A	23-Aug-94	Dissolved	ug/L	63998	699	2.0E+03	1.0E+03	**3E+01**	**6E+01**
Iron	North Branch French Gulch	FG-6B	22-Jul-96	Dissolved	ug/L	163200	1230	2.0E+03	1.0E+03	**8E+01**	**2E+02**
Iron	North Branch French Gulch	FG-6B	23-Aug-94	Dissolved	ug/L	276000	1362	2.0E+03	1.0E+03	**1E+02**	**3E+02**
Iron	North Branch French Gulch	FG-6C	10-Jun-99	Dissolved	ug/L	18700	--	2.0E+03	1.0E+03	**9E+00**	**2E+01**
Iron	North Branch French Gulch	FG-6C	14-Jul-99	Dissolved	ug/L	81300	--	2.0E+03	1.0E+03	**4E+01**	**8E+01**
Iron	North Branch French Gulch	FG-6C	22-Jul-99	Dissolved	ug/L	85700	742	2.0E+03	1.0E+03	**4E+01**	**9E+01**
Iron	North Branch French Gulch	FG-6C	19-Aug-99	Dissolved	ug/L	81200	659	2.0E+03	1.0E+03	**4E+01**	**8E+01**
Iron	North Branch French Gulch	FG-6C	02-Dec-98	Dissolved	ug/L	119000	--	2.0E+03	1.0E+03	**6E+01**	**1E+02**
Iron	North Branch French Gulch	FG-6C	03-Nov-98	Dissolved	ug/L	107000	--	2.0E+03	1.0E+03	**5E+01**	**1E+02**
Iron	North Branch French Gulch	FG-6C	22-Sep-98	Dissolved	ug/L	100000	--	2.0E+03	1.0E+03	**5E+01**	**1E+02**
Iron	North Branch French Gulch	FG-6C	07-May-99	Dissolved	ug/L	106000	956	2.0E+03	1.0E+03	**5E+01**	**1E+02**
Iron	North Branch French Gulch	FG-6C	11-Jun-96	Dissolved	ug/L	299948	2020	2.0E+03	1.0E+03	**1E+02**	**3E+02**
Iron	North Branch French Gulch	FG-6C	22-Jul-96	Dissolved	ug/L	339140	1720	2.0E+03	1.0E+03	**2E+02**	**3E+02**
Iron	North Branch French Gulch	FG-6C	13-Sep-99	Dissolved	ug/L	100000	839	2.0E+03	1.0E+03	**5E+01**	**1E+02**
Iron	North Branch French Gulch	FG-6C	17-Nov-99	Dissolved	ug/L	113000	972	2.0E+03	1.0E+03	**6E+01**	**1E+02**
Iron	North Branch French Gulch	FG-6C	23-Sep-99	Dissolved	ug/L	107810	1010	2.0E+03	1.0E+03	**5E+01**	**1E+02**
Iron	North Branch French Gulch	FG-6C	07-Oct-99	Dissolved	ug/L	115690	957	2.0E+03	1.0E+03	**6E+01**	**1E+02**
Iron	North Branch French Gulch	FG-6C	02-Nov-99	Dissolved	ug/L	112000	996	2.0E+03	1.0E+03	**6E+01**	**1E+02**
Iron	North Branch French Gulch	FG-6C	05-Sep-99	Dissolved	ug/L	117000	882	2.0E+03	1.0E+03	**6E+01**	**1E+02**
Iron	North Branch French Gulch	FG-6C	05-Sep-99	Dissolved	ug/L	117000	882	2.0E+03	1.0E+03	**6E+01**	**1E+02**
Iron	North Branch French Gulch	FG-6C	05-Sep-99	Dissolved	ug/L	109000	882	2.0E+03	1.0E+03	**5E+01**	**1E+02**
Iron	North Branch French Gulch	FG-6C	07-Apr-99	Dissolved	ug/L	94300	--	2.0E+03	1.0E+03	**5E+01**	**9E+01**
Iron	North Branch French Gulch	FG-6C	04-Feb-99	Dissolved	ug/L	120000	997	2.0E+03	1.0E+03	**6E+01**	**1E+02**
Iron	North Branch French Gulch	FG-6C	13-Apr-00	Dissolved	ug/L	82000	--	2.0E+03	1.0E+03	**4E+01**	**8E+01**
Iron	North Branch French Gulch	FG-6C	21-Jun-00	Dissolved	ug/L	78900	--	2.0E+03	1.0E+03	**4E+01**	**8E+01**
Iron	North Branch French Gulch	FG-6C	03-Mar-99	Dissolved	ug/L	97800	--	2.0E+03	1.0E+03	**5E+01**	**1E+02**
Iron	North Branch French Gulch	FG-7	10-Jun-99	Dissolved	ug/L	520	--	2.0E+03	1.0E+03	3E-01	5E-01
Iron	North Branch French Gulch	FG-7	17-Nov-99	Dissolved	ug/L	70	201	2.0E+03	1.0E+03	4E-02	7E-02
Iron	North Branch French Gulch	FG-7	10-Jun-99	Dissolved	ug/L	520	--	2.0E+03	1.0E+03	3E-01	5E-01
Iron	North Branch French Gulch	FG-7	14-Jul-99	Dissolved	ug/L	160	--	2.0E+03	1.0E+03	8E-02	2E-01
Iron	North Branch French Gulch	FG-7	25-May-96	Dissolved	ug/L	120	58	2.0E+03	1.0E+03	6E-02	1E-01
Iron	North Branch French Gulch	FG-7	25-May-96	Dissolved	ug/L	240	47	2.0E+03	1.0E+03	1E-01	2E-01
Iron	North Branch French Gulch	FG-7	25-May-96	Dissolved	ug/L	150	62	2.0E+03	1.0E+03	8E-02	2E-01

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Iron	North Branch French Gulch	FG-7	14-Sep-99	Dissolved	ug/L	180	189	2.0E+03	1.0E+03	9E-02	2E-01
Iron	North Branch French Gulch	FG-7	07-Oct-99	Dissolved	ug/L	260	182	2.0E+03	1.0E+03	1E-01	3E-01
Iron	North Branch French Gulch	FG-7	23-Sep-99	Dissolved	ug/L	80	201	2.0E+03	1.0E+03	4E-02	8E-02
Iron	North Branch French Gulch	FG-7	19-Aug-99	Dissolved	ug/L	130	196	2.0E+03	1.0E+03	7E-02	1E-01
Iron	North Branch French Gulch	FG-7	01-Nov-99	Dissolved	ug/L	170	203	2.0E+03	1.0E+03	9E-02	2E-01
Iron	North Branch French Gulch	FG-7	05-Sep-99	Dissolved	ug/L	190	184	2.0E+03	1.0E+03	1E-01	2E-01
Iron	North Branch French Gulch	FG-7	22-Sep-92	Dissolved	ug/L	27	102	2.0E+03	1.0E+03	1E-02	3E-02
Iron	North Branch French Gulch	FG-7	16-Nov-93	Dissolved	ug/L	56	120	2.0E+03	1.0E+03	3E-02	6E-02
Iron	North Branch French Gulch	FG-7	21-Oct-93	Dissolved	ug/L	10	123	2.0E+03	1.0E+03	5E-03	1E-02
Iron	North Branch French Gulch	FG-7	05-Jun-96	Dissolved	ug/L	240	58	2.0E+03	1.0E+03	1E-01	2E-01
Iron	North Branch French Gulch	FG-7	05-Jun-96	Dissolved	ug/L	78	58	2.0E+03	1.0E+03	4E-02	8E-02
Iron	North Branch French Gulch	FG-7	22-Jul-96	Dissolved	ug/L	96.8	96	2.0E+03	1.0E+03	5E-02	1E-01
Iron	North Branch French Gulch	FG-7	11-Jun-96	Dissolved	ug/L	166	68	2.0E+03	1.0E+03	8E-02	2E-01
Iron	North Branch French Gulch	FG-7	23-Aug-94	Dissolved	ug/L	22	93	2.0E+03	1.0E+03	1E-02	2E-02
Iron	North Branch French Gulch	TS-3	23-May-96	Dissolved	ug/L	10	46	2.0E+03	1.0E+03	5E-03	1E-02
Iron	North Branch French Gulch	TS-4	25-May-96	Dissolved	ug/L	150	47	2.0E+03	1.0E+03	8E-02	2E-01
Iron	North Branch French Gulch	TS-4	06-Jun-96	Dissolved	ug/L	74	53	2.0E+03	1.0E+03	4E-02	7E-02
Iron	French Gulch Reference	FG-0	23-May-96	Dissolved	ug/L	10	34	2.0E+03	1.0E+03	5E-03	1E-02
Iron	French Gulch Reference	FG-0	22-Sep-92	Dissolved	ug/L	5	47	2.0E+03	1.0E+03	3E-03	5E-03
Iron	French Gulch Reference	FG-1	22-Jul-96	Dissolved	ug/L	14	41	2.0E+03	1.0E+03	7E-03	1E-02
Iron	French Gulch Reference	FG-1	12-Jun-96	Dissolved	ug/L	193.3	37	2.0E+03	1.0E+03	1E-01	2E-01
Iron	French Gulch Reference	FG-1	22-Sep-92	Dissolved	ug/L	33	53	2.0E+03	1.0E+03	2E-02	3E-02
Iron	French Gulch Reference	FG-1	23-May-96	Dissolved	ug/L	12	34	2.0E+03	1.0E+03	6E-03	1E-02
Iron	French Gulch Reference	FG-1	25-Oct-95	Dissolved	ug/L	3	48	2.0E+03	1.0E+03	2E-03	3E-03
Iron	French Gulch Reference	FG-2	22-Sep-92	Dissolved	ug/L	28	55	2.0E+03	1.0E+03	1E-02	3E-02
Iron	French Gulch Reference	FG-3	22-Sep-92	Dissolved	ug/L	14	62	2.0E+03	1.0E+03	7E-03	1E-02
Iron	French Gulch Reference	FG-3	12-Jun-96	Dissolved	ug/L	7.3	39	2.0E+03	1.0E+03	4E-03	7E-03
Iron	French Gulch Reference	FG-3	22-Jul-96	Dissolved	ug/L	2.5	46	2.0E+03	1.0E+03	1E-03	3E-03
Iron	French Gulch	FG-10	02-Nov-99	Dissolved	ug/L	5	85	2.0E+03	1.0E+03	3E-03	5E-03
Iron	French Gulch	FG-9	23-Oct-95	Dissolved	ug/L	13	110	2.0E+03	1.0E+03	7E-03	1E-02
Iron	French Gulch	FG-9	18-Jul-96	Dissolved	ug/L	13	18	2.0E+03	1.0E+03	7E-03	1E-02
Iron	French Gulch	FG-9	21-Oct-93	Dissolved	ug/L	14	121	2.0E+03	1.0E+03	7E-03	1E-02
Iron	French Gulch	FG-9	21-Jun-96	Dissolved	ug/L	28	62	2.0E+03	1.0E+03	1E-02	3E-02
Iron	French Gulch	FG-9	17-Apr-96	Dissolved	ug/L	54	160	2.0E+03	1.0E+03	3E-02	5E-02
Iron	French Gulch	FG-9	13-Dec-96	Dissolved	ug/L	71	140	2.0E+03	1.0E+03	4E-02	7E-02
Iron	French Gulch	FG-9	13-Nov-96	Dissolved	ug/L	12	120	2.0E+03	1.0E+03	6E-03	1E-02
Iron	French Gulch	FG-9	15-Aug-96	Dissolved	ug/L	13	99	2.0E+03	1.0E+03	7E-03	1E-02
Iron	French Gulch	FG-9	25-Jun-96	Dissolved	ug/L	27	65	2.0E+03	1.0E+03	1E-02	3E-02
Iron	French Gulch	FG-9	16-Jan-97	Dissolved	ug/L	15	140	2.0E+03	1.0E+03	8E-03	2E-02
Iron	French Gulch	FG-9	21-Nov-95	Dissolved	ug/L	16	120	2.0E+03	1.0E+03	8E-03	2E-02
Iron	French Gulch	FG-9	21-Feb-97	Dissolved	ug/L	16	160	2.0E+03	1.0E+03	8E-03	2E-02
Iron	French Gulch	FG-9	19-Jan-96	Dissolved	ug/L	19	150	2.0E+03	1.0E+03	1E-02	2E-02
Iron	French Gulch	FG-9	04-Feb-99	Dissolved	ug/L	20	175	2.0E+03	1.0E+03	1E-02	2E-02
Iron	French Gulch	FG-9	03-Mar-99	Dissolved	ug/L	40	--	2.0E+03	1.0E+03	2E-02	4E-02
Iron	French Gulch	FG-9	02-Dec-98	Dissolved	ug/L	20	--	2.0E+03	1.0E+03	1E-02	2E-02

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Iron	French Gulch	FG-9	03-Nov-98	Dissolved	ug/L	10	--	2.0E+03	1.0E+03	5E-03	1E-02
Iron	French Gulch	FG-9	09-Sep-96	Dissolved	ug/L	11	110	2.0E+03	1.0E+03	6E-03	1E-02
Iron	French Gulch	FG-9	16-May-96	Dissolved	ug/L	370	82	2.0E+03	1.0E+03	2E-01	4E-01
Iron	French Gulch	FG-9	21-Mar-96	Dissolved	ug/L	1.5	140	2.0E+03	1.0E+03	8E-04	2E-03
Iron	French Gulch	FG-9	26-May-96	Dissolved	ug/L	4	62	2.0E+03	1.0E+03	2E-03	4E-03
Iron	French Gulch	FG-9	22-Feb-96	Dissolved	ug/L	12	150	2.0E+03	1.0E+03	6E-03	1E-02
Iron	French Gulch	FG-9	22-Sep-92	Dissolved	ug/L	5	103	2.0E+03	1.0E+03	3E-03	5E-03
Iron	French Gulch	FG-9	07-Apr-99	Dissolved	ug/L	20	--	2.0E+03	1.0E+03	1E-02	2E-02
Iron	French Gulch	FG-9	08-Oct-96	Dissolved	ug/L	12	110	2.0E+03	1.0E+03	6E-03	1E-02
Iron	French Gulch	FG-9	24-Sep-98	Dissolved	ug/L	60	--	2.0E+03	1.0E+03	3E-02	6E-02
Iron	French Gulch	FG-9	22-May-96	Dissolved	ug/L	91	75	2.0E+03	1.0E+03	5E-02	9E-02
Iron	French Gulch	FG-9	23-Sep-99	Dissolved	ug/L	20	102	2.0E+03	1.0E+03	1E-02	2E-02
Iron	French Gulch	FG-9	22-Jul-96	Dissolved	ug/L	38.2	84	2.0E+03	1.0E+03	2E-02	4E-02
Iron	French Gulch	FG-9	02-Nov-99	Dissolved	ug/L	5	108	2.0E+03	1.0E+03	3E-03	5E-03
Iron	French Gulch	FG-9	08-Oct-99	Dissolved	ug/L	5	95	2.0E+03	1.0E+03	3E-03	5E-03
Iron	French Gulch	FG-9	10-Jun-99	Dissolved	ug/L	50	--	2.0E+03	1.0E+03	3E-02	5E-02
Iron	French Gulch	FG-9	19-Aug-99	Dissolved	ug/L	5	87	2.0E+03	1.0E+03	3E-03	5E-03
Iron	French Gulch	FG-9	07-May-99	Dissolved	ug/L	80	172	2.0E+03	1.0E+03	4E-02	8E-02
Iron	French Gulch	FG-9	14-Jul-99	Dissolved	ug/L	5	--	2.0E+03	1.0E+03	3E-03	5E-03
Iron	French Gulch	FG-9	23-Aug-94	Dissolved	ug/L	23	102	2.0E+03	1.0E+03	1E-02	2E-02
Iron	French Gulch	FG-9	13-Sep-99	Dissolved	ug/L	5	92	2.0E+03	1.0E+03	3E-03	5E-03
Iron	French Gulch	FG-9	05-Sep-99	Dissolved	ug/L	20	85	2.0E+03	1.0E+03	1E-02	2E-02
Iron	French Gulch	FG-9	17-Nov-99	Dissolved	ug/L	5	113	2.0E+03	1.0E+03	3E-03	5E-03
Iron	French Gulch	FG-9	21-Jun-00	Dissolved	ug/L	5	--	2.0E+03	1.0E+03	3E-03	5E-03
Iron	French Gulch	FG-9	16-Nov-93	Dissolved	ug/L	2.5	125	2.0E+03	1.0E+03	1E-03	3E-03
Iron	French Gulch	FG-9	13-Apr-00	Dissolved	ug/L	40	--	2.0E+03	1.0E+03	2E-02	4E-02
Iron	French Gulch	FG-9	10-Jun-96	Dissolved	ug/L	83.5	65	2.0E+03	1.0E+03	4E-02	8E-02
Iron	French Gulch	FG-9A	22-Jul-96	Dissolved	ug/L	28.6	85	2.0E+03	1.0E+03	1E-02	3E-02
Iron	French Gulch	FG-9A	23-Aug-94	Dissolved	ug/L	26	96	2.0E+03	1.0E+03	1E-02	3E-02
Iron	French Gulch	FG-9A	22-Sep-98	Dissolved	ug/L	20	--	2.0E+03	1.0E+03	1E-02	2E-02
Iron	French Gulch	FG-9A	11-Jun-96	Dissolved	ug/L	135	65	2.0E+03	1.0E+03	7E-02	1E-01
Iron	Discharge	CBMA-1	23-Jul-96	Dissolved	ug/L	527	224	2.0E+03	1.0E+03	3E-01	5E-01
Iron	Discharge	KDS	13-Jun-96	Dissolved	ug/L	1508	296	2.0E+03	1.0E+03	8E-01	**2E+00**
Iron	Discharge	KDS	24-Aug-94	Dissolved	ug/L	191	222	2.0E+03	1.0E+03	1E-01	2E-01
Iron	Discharge	MGB-1	23-Jul-96	Dissolved	ug/L	5	82	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Discharge	RLCVT-1	23-Jul-96	Dissolved	ug/L	5	86	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Discharge	WP-1	12-Jun-96	Dissolved	ug/L	694200	4980	2.0E+03	1.0E+03	**3E+02**	**7E+02**
Iron	Blue River Reference	654	16-May-97	Dissolved	ug/l	25	72	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	654	23-Sep-98	Dissolved	ug/l	25	--	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	654	22-Jul-98	Dissolved	ug/l	25	--	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	654	08-May-97	Dissolved	ug/l	25	78	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	654	21-May-97	Dissolved	ug/l	25	66	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	654	07-Aug-98	Dissolved	ug/l	25	--	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	654	10-Sep-97	Dissolved	ug/l	25	60	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	654	10-Oct-97	Dissolved	ug/l	25	72	2.0E+03	1.0E+03	1E-02	3E-02

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Iron	Blue River Reference	654	24-Sep-97	Dissolved	ug/l	25	56	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	654	21-Aug-98	Dissolved	ug/l	25	--	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	654	19-Nov-97	Dissolved	ug/l	25	96	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	654	07-Dec-97	Dissolved	ug/l	25	84	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	654	05-May-98	Dissolved	ug/l	25	76	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	654	01-Apr-98	Dissolved	ug/l	25	100	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	654	01-Jul-98	Dissolved	ug/l	25	--	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	654	09-Sep-98	Dissolved	ug/l	25	--	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	654	21-Aug-97	Dissolved	ug/l	25	52	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	654	02-Sep-97	Dissolved	ug/l	25	56	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	654	02-Jul-97	Dissolved	ug/l	25	40	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	654	16-Jul-97	Dissolved	ug/l	25	60	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	654	24-Apr-97	Dissolved	ug/l	25	86	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	654	04-Jun-97	Dissolved	ug/l	25	62	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	654	18-Jun-97	Dissolved	ug/l	25	60	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	655	10-Sep-97	Dissolved	ug/l	25	44	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	655	07-Dec-97	Dissolved	ug/l	25	--	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	655	01-Jul-98	Dissolved	ug/l	25	--	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	655	05-May-98	Dissolved	ug/l	25	72	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	655	02-Sep-97	Dissolved	ug/l	25	52	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	655	21-Aug-97	Dissolved	ug/l	25	44	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	655	16-Jul-97	Dissolved	ug/l	25	44	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	655	02-Jul-97	Dissolved	ug/l	25	42	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	655	18-Jun-97	Dissolved	ug/l	25	52	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	655	24-Sep-97	Dissolved	ug/l	25	52	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	655	10-Oct-97	Dissolved	ug/l	25	60	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	655	22-Jul-98	Dissolved	ug/l	25	58	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	655	16-May-97	Dissolved	ug/l	25	62	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	655	23-Sep-98	Dissolved	ug/l	25	60	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	655	04-Jun-97	Dissolved	ug/l	25	54	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	655	07-Aug-98	Dissolved	ug/l	25	48	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	655	21-May-97	Dissolved	ug/l	25	60	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	655	24-Apr-97	Dissolved	ug/l	25	84	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	655	09-Sep-98	Dissolved	ug/l	25	--	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	655	21-Aug-98	Dissolved	ug/l	25	50	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River Reference	BR-1	14-Jul-99	Dissolved	ug/L	40	--	2.0E+03	1.0E+03	2E-02	4E-02
Iron	Blue River Reference	BR-1	10-Jun-96	Dissolved	ug/L	20.5	54	2.0E+03	1.0E+03	1E-02	2E-02
Iron	Blue River Reference	BR-1	23-Aug-94	Dissolved	ug/L	45	61	2.0E+03	1.0E+03	2E-02	5E-02
Iron	Blue River Reference	BR-1	10-Jun-99	Dissolved	ug/L	30	--	2.0E+03	1.0E+03	2E-02	3E-02
Iron	Blue River Reference	BR-1	05-May-99	Dissolved	ug/L	10	95	2.0E+03	1.0E+03	5E-03	1E-02
Iron	Blue River Reference	BR-1	19-Aug-99	Dissolved	ug/L	30	61	2.0E+03	1.0E+03	2E-02	3E-02
Iron	Blue River Reference	BR-1	23-Jul-96	Dissolved	ug/L	20.6	42	2.0E+03	1.0E+03	1E-02	2E-02
Iron	Blue River Reference	BR-1	10-Jun-99	Dissolved	ug/L	40	--	2.0E+03	1.0E+03	2E-02	4E-02
Iron	Blue River Reference	BR-1	17-Nov-99	Dissolved	ug/L	10	69	2.0E+03	1.0E+03	5E-03	1E-02
Iron	Blue River Reference	BR-1	14-Sep-99	Dissolved	ug/L	20	63	2.0E+03	1.0E+03	1E-02	2E-02

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Iron	Blue River Reference	BR-1	21-Oct-93	Dissolved	ug/L	18	71	2.0E+03	1.0E+03	9E-03	2E-02
Iron	Blue River Reference	BR-1	01-Nov-99	Dissolved	ug/L	20	71	2.0E+03	1.0E+03	1E-02	2E-02
Iron	Blue River Reference	BR-1	23-Sep-98	Dissolved	ug/L	30	--	2.0E+03	1.0E+03	2E-02	3E-02
Iron	Blue River Reference	BR-1	02-Dec-98	Dissolved	ug/L	20	--	2.0E+03	1.0E+03	1E-02	2E-02
Iron	Blue River Reference	BR-1	07-Oct-99	Dissolved	ug/L	30	71	2.0E+03	1.0E+03	2E-02	3E-02
Iron	Blue River Reference	BR-1	03-Nov-98	Dissolved	ug/L	20	--	2.0E+03	1.0E+03	1E-02	2E-02
Iron	Blue River Reference	BR-1	22-Sep-92	Dissolved	ug/L	30	66	2.0E+03	1.0E+03	2E-02	3E-02
Iron	Blue River Reference	BR-1	23-Sep-99	Dissolved	ug/L	10	71	2.0E+03	1.0E+03	5E-03	1E-02
Iron	Blue River Reference	BR-1	17-Nov-99	Dissolved	ug/L	10	70	2.0E+03	1.0E+03	5E-03	1E-02
Iron	Blue River Reference	BR-1	16-Nov-93	Dissolved	ug/L	11	67	2.0E+03	1.0E+03	6E-03	1E-02
Iron	Blue River Reference	BR-1	05-Sep-99	Dissolved	ug/L	30	60	2.0E+03	1.0E+03	2E-02	3E-02
Iron	Blue River Reference	BR-Adams St	21-May-96	Dissolved	ug/L	40	57	2.0E+03	1.0E+03	2E-02	4E-02
Iron	Blue River Reference	BR-Adams St	24-Oct-95	Dissolved	ug/L	24	68	2.0E+03	1.0E+03	1E-02	2E-02
Iron	Blue River	643	07-Aug-98	Dissolved	ug/l	25	--	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	643	22-Jul-98	Dissolved	ug/l	25	--	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	643	28-Dec-99	Dissolved	ug/l	5	--	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Blue River	643	09-Sep-98	Dissolved	ug/l	25	--	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	643	21-Aug-98	Dissolved	ug/l	25	--	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	656	23-Sep-98	Dissolved	ug/l	25	94	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	656	05-May-98	Dissolved	ug/l	25	120	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	656	01-Jul-98	Dissolved	ug/l	25	--	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	656	10-Oct-97	Dissolved	ug/l	25	100	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	656	19-Nov-97	Dissolved	ug/l	25	128	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	656	24-Sep-97	Dissolved	ug/l	25	76	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	656	21-May-97	Dissolved	ug/l	25	68	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	656	01-Apr-98	Dissolved	ug/l	25	164	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	656	07-Dec-97	Dissolved	ug/l	25	136	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	656	09-Sep-98	Dissolved	ug/l	25	90	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	656	21-Aug-98	Dissolved	ug/l	25	--	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	656	16-May-97	Dissolved	ug/l	25	80	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	656	24-Apr-97	Dissolved	ug/l	25	124	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	656	21-Aug-97	Dissolved	ug/l	25	42	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	656	16-Jul-97	Dissolved	ug/l	25	--	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	656	02-Jul-97	Dissolved	ug/l	25	44	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	656	08-May-97	Dissolved	ug/l	25	106	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	656	02-Sep-97	Dissolved	ug/l	25	64	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	656	18-Jun-97	Dissolved	ug/l	25	58	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	656	04-Jun-97	Dissolved	ug/l	25	60	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	656	07-Aug-98	Dissolved	ug/l	25	--	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	656	22-Jul-98	Dissolved	ug/l	25	78	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	656	10-Sep-97	Dissolved	ug/l	25	76	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	657	24-Apr-97	Dissolved	ug/l	25	88	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	657	23-Sep-98	Dissolved	ug/l	25	--	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	657	02-Jul-97	Dissolved	ug/l	25	46	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	657	09-Sep-98	Dissolved	ug/l	25	--	2.0E+03	1.0E+03	1E-02	3E-02

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Iron	Blue River	657	04-Jun-97	Dissolved	ug/l	25	58	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	657	21-Aug-98	Dissolved	ug/l	25	--	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	657	02-Sep-97	Dissolved	ug/l	25	64	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	657	08-May-97	Dissolved	ug/l	25	78	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	657	21-Aug-97	Dissolved	ug/l	25	52	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	657	18-Jun-97	Dissolved	ug/l	25	54	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	657	16-Jul-97	Dissolved	ug/l	25	48	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	657	21-May-97	Dissolved	ug/l	25	64	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	657	16-May-97	Dissolved	ug/l	25	72	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	657	22-Jul-98	Dissolved	ug/l	25	--	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	657	01-Apr-98	Dissolved	ug/l	25	84	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	657	05-May-98	Dissolved	ug/l	25	76	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	657	07-Dec-97	Dissolved	ug/l	25	68	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	657	01-Jul-98	Dissolved	ug/l	25	--	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	657	07-Aug-98	Dissolved	ug/l	25	--	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	657	24-Sep-97	Dissolved	ug/l	25	72	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	657	19-Nov-97	Dissolved	ug/l	25	68	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	BR-2	14-Sep-99	Dissolved	ug/L	5	89	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Blue River	BR-2	14-Sep-99	Dissolved	ug/L	5	88	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Blue River	BR-2	05-May-99	Dissolved	ug/L	5	159	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Blue River	BR-2	22-Aug-94	Dissolved	ug/L	32	76	2.0E+03	1.0E+03	2E-02	3E-02
Iron	Blue River	BR-2	10-Jun-99	Dissolved	ug/L	50	--	2.0E+03	1.0E+03	3E-02	5E-02
Iron	Blue River	BR-2	05-Sep-99	Dissolved	ug/L	10	81	2.0E+03	1.0E+03	5E-03	1E-02
Iron	Blue River	BR-2	19-Aug-99	Dissolved	ug/L	20	75	2.0E+03	1.0E+03	1E-02	2E-02
Iron	Blue River	BR-2	14-Jul-99	Dissolved	ug/L	20	--	2.0E+03	1.0E+03	1E-02	2E-02
Iron	Blue River	BR-2	23-Sep-99	Dissolved	ug/L	5	93	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Blue River	BR-2	23-Jul-96	Dissolved	ug/L	20.2	49	2.0E+03	1.0E+03	1E-02	2E-02
Iron	Blue River	BR-2	17-Nov-99	Dissolved	ug/L	5	103	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Blue River	BR-2	02-Nov-99	Dissolved	ug/L	5	108	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Blue River	BR-2	10-Jun-96	Dissolved	ug/L	37.9	58	2.0E+03	1.0E+03	2E-02	4E-02
Iron	Blue River	BR-2	07-Apr-99	Dissolved	ug/L	5	--	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Blue River	BR-2	23-Sep-98	Dissolved	ug/L	10	--	2.0E+03	1.0E+03	5E-03	1E-02
Iron	Blue River	BR-2	04-Feb-99	Dissolved	ug/L	10	174	2.0E+03	1.0E+03	5E-03	1E-02
Iron	Blue River	BR-2	21-Oct-93	Dissolved	ug/L	14	121	2.0E+03	1.0E+03	7E-03	1E-02
Iron	Blue River	BR-2	03-Nov-98	Dissolved	ug/L	10	--	2.0E+03	1.0E+03	5E-03	1E-02
Iron	Blue River	BR-2	03-Mar-99	Dissolved	ug/L	10	--	2.0E+03	1.0E+03	5E-03	1E-02
Iron	Blue River	BR-2	16-Nov-93	Dissolved	ug/L	34	126	2.0E+03	1.0E+03	2E-02	3E-02
Iron	Blue River	BR-2	02-Dec-98	Dissolved	ug/L	5	--	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Blue River	BR-2	07-Oct-99	Dissolved	ug/L	10	91	2.0E+03	1.0E+03	5E-03	1E-02
Iron	Blue River	BR-2	22-Sep-92	Dissolved	ug/L	5	102	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Blue River	BR-2	07-Apr-99	Dissolved	ug/L	5	--	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Blue River	BR-3	07-Oct-99	Dissolved	ug/L	5	73	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Blue River	BR-3	07-Oct-99	Dissolved	ug/L	20	60	2.0E+03	1.0E+03	1E-02	2E-02
Iron	Blue River	BR-3	10-Jun-96	Dissolved	ug/L	27.9	54	2.0E+03	1.0E+03	1E-02	3E-02
Iron	Blue River	BR-3	01-Nov-99	Dissolved	ug/L	5	74	2.0E+03	1.0E+03	3E-03	5E-03

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Iron	Blue River	BR-3	14-Sep-99	Dissolved	ug/L	5	69	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Blue River	BR-3	10-Jun-99	Dissolved	ug/L	30	--	2.0E+03	1.0E+03	2E-02	3E-02
Iron	Blue River	BR-3	19-Aug-99	Dissolved	ug/L	5	65	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Blue River	BR-3	05-May-99	Dissolved	ug/L	5	89	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Blue River	BR-3	22-Aug-94	Dissolved	ug/L	2.5	70	2.0E+03	1.0E+03	1E-03	3E-03
Iron	Blue River	BR-3	05-Sep-99	Dissolved	ug/L	5	63	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Blue River	BR-3	14-Jul-99	Dissolved	ug/L	5	--	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Blue River	BR-3	23-Sep-99	Dissolved	ug/L	5	72	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Blue River	BR-3	23-Jul-96	Dissolved	ug/L	6.8	50	2.0E+03	1.0E+03	3E-03	7E-03
Iron	Blue River	BR-3	23-Sep-98	Dissolved	ug/L	5	--	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Blue River	BR-3	21-Oct-93	Dissolved	ug/L	22	76	2.0E+03	1.0E+03	1E-02	2E-02
Iron	Blue River	BR-3	07-Apr-99	Dissolved	ug/L	5	--	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Blue River	BR-3	03-Mar-99	Dissolved	ug/L	40	--	2.0E+03	1.0E+03	2E-02	4E-02
Iron	Blue River	BR-3	04-Feb-99	Dissolved	ug/L	5	85	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Blue River	BR-3	03-Nov-98	Dissolved	ug/L	5	--	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Blue River	BR-3	02-Dec-98	Dissolved	ug/L	5	--	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Blue River	BR-3	16-Nov-93	Dissolved	ug/L	127	75	2.0E+03	1.0E+03	6E-02	1E-01
Iron	Blue River	BR-3	17-Nov-99	Dissolved	ug/L	5	70	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Blue River	BR-4	22-Sep-92	Dissolved	ug/L	5	73	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Blue River	BR-5	23-Jul-96	Dissolved	ug/L	2.5	52	2.0E+03	1.0E+03	1E-03	3E-03
Iron	Blue River	BR-5	22-Sep-92	Dissolved	ug/L	5	72	2.0E+03	1.0E+03	3E-03	5E-03
Iron	Blue River	BR-5	23-Jul-96	Dissolved	ug/L	2.5	52	2.0E+03	1.0E+03	1E-03	3E-03
Iron	Blue River	BR-BFG	22-May-96	Dissolved	ug/L	48	59	2.0E+03	1.0E+03	2E-02	5E-02
Iron	Blue River	BR-BFG	25-Oct-95	Dissolved	ug/L	8	86	2.0E+03	1.0E+03	4E-03	8E-03
Iron	Blue River	BR-Dillon	24-May-96	Dissolved	ug/L	22	47	2.0E+03	1.0E+03	1E-02	2E-02
Iron	Blue River	BR-Dillon	26-Oct-95	Dissolved	ug/L	1.5	66	2.0E+03	1.0E+03	8E-04	2E-03
Lead	South Branch French Gulch	FG-4	21-Sep-89	Dissolved	ug/L	2.5	58	3.6E+01	1.4E+00	7E-02	**2E+00**
Lead	South Branch French Gulch	FG-4	22-Sep-92	Dissolved	ug/L	1.5	61	3.7E+01	1.5E+00	4E-02	1E+00
Lead	South Branch French Gulch	FG-5	05-Sep-99	Dissolved	ug/L	0.1	52	3.1E+01	1.2E+00	3E-03	8E-02
Lead	South Branch French Gulch	FG-5	19-Aug-99	Dissolved	ug/L	0.05	54	3.3E+01	1.3E+00	2E-03	4E-02
Lead	South Branch French Gulch	FG-5	14-Jul-99	Dissolved	ug/L	0.3	--	nc	nc	nc	nc
Lead	South Branch French Gulch	FG-5	22-Jul-96	Dissolved	ug/L	0.4	46	2.8E+01	1.1E+00	1E-02	4E-01
Lead	South Branch French Gulch	FG-5	11-Jun-96	Dissolved	ug/L	0.4	37	2.2E+01	8.5E-01	2E-02	5E-01
Lead	South Branch French Gulch	FG-5	21-Oct-93	Dissolved	ug/L	0.5	66	4.1E+01	1.6E+00	1E-02	3E-01
Lead	South Branch French Gulch	FG-5	23-Aug-94	Dissolved	ug/L	0.5	54	3.3E+01	1.3E+00	2E-02	4E-01
Lead	South Branch French Gulch	FG-5	10-Jun-99	Dissolved	ug/L	0.3	--	nc	nc	nc	nc
Lead	South Branch French Gulch	FG-5	22-Sep-98	Dissolved	ug/L	0.2	--	nc	nc	nc	nc
Lead	South Branch French Gulch	FG-5	22-Sep-92	Dissolved	ug/L	1.5	62	3.9E+01	1.5E+00	4E-02	1E+00
Lead	South Branch French Gulch	FG-5	16-Nov-93	Dissolved	ug/L	0.5	65	4.1E+01	1.6E+00	1E-02	3E-01
Lead	South Branch French Gulch	FG-5	04-May-89	Dissolved	ug/L	2.5	84	5.3E+01	2.1E+00	5E-02	1E+00
Lead	South Branch French Gulch	FG-5	03-Nov-98	Dissolved	ug/L	0.2	--	nc	nc	nc	nc
Lead	South Branch French Gulch	FG-5	23-Sep-99	Dissolved	ug/L	0.1	64	4.0E+01	1.5E+00	3E-03	6E-02
Lead	South Branch French Gulch	FG-5	08-Oct-99	Dissolved	ug/L	0.1	63	3.9E+01	1.5E+00	3E-03	7E-02
Lead	South Branch French Gulch	FG-5	13-Sep-99	Dissolved	ug/L	0.1	60	3.7E+01	1.4E+00	3E-03	7E-02
Lead	South Branch French Gulch	FG-5.5	23-Sep-99	Dissolved	ug/L	0.4	75	4.7E+01	1.8E+00	8E-03	2E-01

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Lead	South Branch French Gulch	FG-5.5	07-Oct-99	Dissolved	ug/L	0.1	76	4.8E+01	1.9E+00	2E-03	5E-02
Lead	South Branch French Gulch	FG-5.5	01-Nov-99	Dissolved	ug/L	0.1	82	5.2E+01	2.0E+00	2E-03	5E-02
Lead	South Branch French Gulch	FG-5.5	05-Sep-99	Dissolved	ug/L	0.2	64	4.0E+01	1.5E+00	5E-03	1E-01
Lead	South Branch French Gulch	FG-5.5	13-Sep-99	Dissolved	ug/L	0.2	71	4.4E+01	1.7E+00	5E-03	1E-01
Lead	South Branch French Gulch	FG-5.5	17-Nov-99	Dissolved	ug/L	0.05	84	5.3E+01	2.1E+00	9E-04	2E-02
Lead	South Branch French Gulch	FG-5.5	19-Aug-99	Dissolved	ug/L	0.1	65	4.0E+01	1.6E+00	2E-03	6E-02
Lead	South Branch French Gulch	FG-5.5	05-Sep-99	Dissolved	ug/L	0.2	64	4.0E+01	1.5E+00	5E-03	1E-01
Lead	South Branch French Gulch	FG-5.5	13-Sep-99	Dissolved	ug/L	0.2	71	4.4E+01	1.7E+00	5E-03	1E-01
Lead	South Branch French Gulch	FG-5.5	07-Oct-99	Dissolved	ug/L	0.1	76	4.8E+01	1.9E+00	2E-03	5E-02
Lead	South Branch French Gulch	FG-5.5	23-Aug-00	Dissolved	ug/L	0.78	--	nc	nc	nc	nc
Lead	South Branch French Gulch	FG-5.5	23-Sep-99	Dissolved	ug/L	0.4	75	4.7E+01	1.8E+00	8E-03	2E-01
Lead	South Branch French Gulch	FG-5.5	19-Jul-00	Dissolved	ug/L	0.53	--	nc	nc	nc	nc
Lead	South Branch French Gulch	FG-5.5	08-Dec-00	Dissolved	ug/L	0.66	--	nc	nc	nc	nc
Lead	South Branch French Gulch	FG-5.5	13-Sep-00	Dissolved	ug/L	0.85	--	nc	nc	nc	nc
Lead	South Branch French Gulch	FG-5.5	13-Apr-00	Dissolved	ug/L	0.76	--	nc	nc	nc	nc
Lead	South Branch French Gulch	FG-5.5	10-May-00	Dissolved	ug/L	1.73	--	nc	nc	nc	nc
Lead	South Branch French Gulch	FG-5.5	21-Jun-00	Dissolved	ug/L	1.66	--	nc	nc	nc	nc
Lead	South Branch French Gulch	FG-5.5	09-Jan-00	Dissolved	ug/L	0.9	--	nc	nc	nc	nc
Lead	South Branch French Gulch	FG-8	17-Nov-99	Dissolved	ug/L	0.4	89	5.7E+01	2.2E+00	7E-03	2E-01
Lead	South Branch French Gulch	FG-8	02-Nov-99	Dissolved	ug/L	0.4	86	5.5E+01	2.1E+00	7E-03	2E-01
Lead	South Branch French Gulch	FG-8	16-Nov-93	Dissolved	ug/L	0.5	109	7.1E+01	2.8E+00	7E-03	2E-01
Lead	South Branch French Gulch	FG-8	14-Jul-99	Dissolved	ug/L	1.2	--	nc	nc	nc	nc
Lead	South Branch French Gulch	FG-8	19-Aug-99	Dissolved	ug/L	0.9	66	4.1E+01	1.6E+00	2E-02	6E-01
Lead	South Branch French Gulch	FG-8	11-Jun-96	Dissolved	ug/L	0.9	55	3.4E+01	1.3E+00	3E-02	7E-01
Lead	South Branch French Gulch	FG-8	08-Oct-99	Dissolved	ug/L	0.4	73	4.6E+01	1.8E+00	9E-03	2E-01
Lead	South Branch French Gulch	FG-8	23-Aug-94	Dissolved	ug/L	0.5	97	6.2E+01	2.4E+00	8E-03	2E-01
Lead	South Branch French Gulch	FG-8	05-Sep-99	Dissolved	ug/L	0.8	66	4.1E+01	1.6E+00	2E-02	5E-01
Lead	South Branch French Gulch	FG-8	10-Jun-99	Dissolved	ug/L	0.8	--	nc	nc	nc	nc
Lead	South Branch French Gulch	FG-8	22-Jul-96	Dissolved	ug/L	0.4	64	3.9E+01	1.5E+00	1E-02	3E-01
Lead	South Branch French Gulch	FG-8	21-Sep-89	Dissolved	ug/L	2.5	92	5.9E+01	2.3E+00	4E-02	1E+00
Lead	South Branch French Gulch	FG-8	22-Sep-92	Dissolved	ug/L	1.5	95	6.1E+01	2.4E+00	2E-02	6E-01
Lead	South Branch French Gulch	FG-8	23-Sep-99	Dissolved	ug/L	0.5	76	4.8E+01	1.9E+00	1E-02	3E-01
Lead	South Branch French Gulch	FG-8	04-May-89	Dissolved	ug/L	2.5	97	6.2E+01	2.4E+00	4E-02	1E+00
Lead	South Branch French Gulch	FG-8	21-Oct-93	Dissolved	ug/L	9	109	7.1E+01	2.8E+00	1E-01	**3E+00**
Lead	South Branch French Gulch	FG-8	14-Sep-99	Dissolved	ug/L	0.3	71	4.4E+01	1.7E+00	7E-03	2E-01
Lead	North Branch French Gulch	1121	13-Jun-96	Dissolved	ug/L	0.4	215	1.5E+02	3.9E+00	3E-03	1E-01
Lead	North Branch French Gulch	1121	23-Jul-96	Dissolved	ug/L	24	446	2.5E+02	3.9E+00	1E-01	**6E+00**
Lead	North Branch French Gulch	1140	13-Jun-96	Dissolved	ug/L	56.7	728	2.5E+02	3.9E+00	2E-01	**1E+01**
Lead	North Branch French Gulch	FG-6	11-Jun-96	Dissolved	ug/L	65.4	1070	2.5E+02	3.9E+00	3E-01	**2E+01**
Lead	North Branch French Gulch	FG-6A	22-Jul-96	Dissolved	ug/L	1.1	908	2.5E+02	3.9E+00	4E-03	3E-01
Lead	North Branch French Gulch	FG-6A	23-Aug-94	Dissolved	ug/L	0.5	699	2.5E+02	3.9E+00	2E-03	1E-01
Lead	North Branch French Gulch	FG-6A	11-Jun-96	Dissolved	ug/L	1.3	722	2.5E+02	3.9E+00	5E-03	3E-01
Lead	North Branch French Gulch	FG-6A	04-May-89	Dissolved	ug/L	2.5	580	2.5E+02	3.9E+00	1E-02	6E-01
Lead	North Branch French Gulch	FG-6A	22-Sep-92	Dissolved	ug/L	3.6	440	2.5E+02	3.9E+00	1E-02	9E-01
Lead	North Branch French Gulch	FG-6A	21-Sep-89	Dissolved	ug/L	2.5	656	2.5E+02	3.9E+00	1E-02	6E-01

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Lead	North Branch French Gulch	FG-6A	16-Nov-93	Dissolved	ug/L	6	625	2.5E+02	3.9E+00	2E-02	**2E+00**
Lead	North Branch French Gulch	FG-6A	21-Oct-93	Dissolved	ug/L	3.3	679	2.5E+02	3.9E+00	1E-02	8E-01
Lead	North Branch French Gulch	FG-6B	22-Jul-96	Dissolved	ug/L	12.8	1230	2.5E+02	3.9E+00	5E-02	**3E+00**
Lead	North Branch French Gulch	FG-6B	23-Aug-94	Dissolved	ug/L	77.7	1362	2.5E+02	3.9E+00	3E-01	**2E+01**
Lead	North Branch French Gulch	FG-6C	05-Sep-99	Dissolved	ug/L	17.2	882	2.5E+02	3.9E+00	7E-02	**4E+00**
Lead	North Branch French Gulch	FG-6C	19-Aug-99	Dissolved	ug/L	2.2	659	2.5E+02	3.9E+00	9E-03	6E-01
Lead	North Branch French Gulch	FG-6C	05-Sep-99	Dissolved	ug/L	17.2	882	2.5E+02	3.9E+00	7E-02	**4E+00**
Lead	North Branch French Gulch	FG-6C	22-Jul-99	Dissolved	ug/L	3	742	2.5E+02	3.9E+00	1E-02	8E-01
Lead	North Branch French Gulch	FG-6C	05-Sep-99	Dissolved	ug/L	17.5	882	2.5E+02	3.9E+00	7E-02	**4E+00**
Lead	North Branch French Gulch	FG-6C	14-Jul-99	Dissolved	ug/L	37.3	--	nc	nc	nc	nc
Lead	North Branch French Gulch	FG-6C	04-Feb-99	Dissolved	ug/L	1.1	997	2.5E+02	3.9E+00	4E-03	3E-01
Lead	North Branch French Gulch	FG-6C	07-Apr-99	Dissolved	ug/L	0.8	--	nc	nc	nc	nc
Lead	North Branch French Gulch	FG-6C	03-Mar-99	Dissolved	ug/L	0.5	--	nc	nc	nc	nc
Lead	North Branch French Gulch	FG-6C	02-Dec-98	Dissolved	ug/L	40	--	nc	nc	nc	nc
Lead	North Branch French Gulch	FG-6C	21-Jun-00	Dissolved	ug/L	109	--	nc	nc	nc	nc
Lead	North Branch French Gulch	FG-6C	09-Jan-00	Dissolved	ug/L	93.6	--	nc	nc	nc	nc
Lead	North Branch French Gulch	FG-6C	10-May-00	Dissolved	ug/L	118	--	nc	nc	nc	nc
Lead	North Branch French Gulch	FG-6C	19-Jul-00	Dissolved	ug/L	110	--	nc	nc	nc	nc
Lead	North Branch French Gulch	FG-6C	23-Aug-00	Dissolved	ug/L	130	--	nc	nc	nc	nc
Lead	North Branch French Gulch	FG-6C	13-Sep-00	Dissolved	ug/L	108	--	nc	nc	nc	nc
Lead	North Branch French Gulch	FG-6C	08-Dec-00	Dissolved	ug/L	96.3	--	nc	nc	nc	nc
Lead	North Branch French Gulch	FG-6C	13-Apr-00	Dissolved	ug/L	163	--	nc	nc	nc	nc
Lead	North Branch French Gulch	FG-6C	10-Jun-99	Dissolved	ug/L	0.5	--	nc	nc	nc	nc
Lead	North Branch French Gulch	FG-6C	03-Nov-98	Dissolved	ug/L	89.6	--	nc	nc	nc	nc
Lead	North Branch French Gulch	FG-6C	22-Sep-98	Dissolved	ug/L	7	--	nc	nc	nc	nc
Lead	North Branch French Gulch	FG-6C	11-Jun-96	Dissolved	ug/L	255.3	2020	2.5E+02	3.9E+00	1E+00	**6E+01**
Lead	North Branch French Gulch	FG-6C	22-Jul-96	Dissolved	ug/L	59	1720	2.5E+02	3.9E+00	2E-01	**2E+01**
Lead	North Branch French Gulch	FG-6C	07-May-99	Dissolved	ug/L	5.9	956	2.5E+02	3.9E+00	2E-02	**2E+00**
Lead	North Branch French Gulch	FG-6C	02-Nov-99	Dissolved	ug/L	0.6	996	2.5E+02	3.9E+00	2E-03	2E-01
Lead	North Branch French Gulch	FG-6C	17-Nov-99	Dissolved	ug/L	0.7	972	2.5E+02	3.9E+00	3E-03	2E-01
Lead	North Branch French Gulch	FG-6C	13-Sep-99	Dissolved	ug/L	0.7	839	2.5E+02	3.9E+00	3E-03	2E-01
Lead	North Branch French Gulch	FG-6C	23-Sep-99	Dissolved	ug/L	1.4	1010	2.5E+02	3.9E+00	6E-03	4E-01
Lead	North Branch French Gulch	FG-6C	07-Oct-99	Dissolved	ug/L	2.2	957	2.5E+02	3.9E+00	9E-03	6E-01
Lead	North Branch French Gulch	FG-7	17-Nov-99	Dissolved	ug/L	0.4	201	1.4E+02	3.9E+00	3E-03	1E-01
Lead	North Branch French Gulch	FG-7	07-Oct-99	Dissolved	ug/L	0.6	182	1.2E+02	3.9E+00	5E-03	2E-01
Lead	North Branch French Gulch	FG-7	01-Nov-99	Dissolved	ug/L	0.1	203	1.4E+02	3.9E+00	7E-04	3E-02
Lead	North Branch French Gulch	FG-7	23-Sep-99	Dissolved	ug/L	0.1	201	1.4E+02	3.9E+00	7E-04	3E-02
Lead	North Branch French Gulch	FG-7	25-May-96	Dissolved	ug/L	4	58	3.6E+01	1.4E+00	1E-01	**3E+00**
Lead	North Branch French Gulch	FG-7	22-Sep-92	Dissolved	ug/L	1.5	102	6.6E+01	2.6E+00	2E-02	6E-01
Lead	North Branch French Gulch	FG-7	19-Aug-99	Dissolved	ug/L	0.1	196	1.3E+02	3.9E+00	8E-04	3E-02
Lead	North Branch French Gulch	FG-7	25-May-96	Dissolved	ug/L	0.5	47	2.8E+01	1.1E+00	2E-02	5E-01
Lead	North Branch French Gulch	FG-7	21-Oct-93	Dissolved	ug/L	0.5	123	8.1E+01	3.1E+00	6E-03	2E-01
Lead	North Branch French Gulch	FG-7	14-Jul-99	Dissolved	ug/L	0.4	--	nc	nc	nc	nc
Lead	North Branch French Gulch	FG-7	25-May-96	Dissolved	ug/L	2	62	3.8E+01	1.5E+00	5E-02	1E+00
Lead	North Branch French Gulch	FG-7	10-Jun-99	Dissolved	ug/L	0.4	--	nc	nc	nc	nc

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Lead	North Branch French Gulch	FG-7	04-May-89	Dissolved	ug/L	2.5	200	1.4E+02	3.9E+00	2E-02	6E-01
Lead	North Branch French Gulch	FG-7	05-Jun-96	Dissolved	ug/L	2	58	3.6E+01	1.4E+00	6E-02	1E+00
Lead	North Branch French Gulch	FG-7	05-Jun-96	Dissolved	ug/L	1	58	3.6E+01	1.4E+00	3E-02	7E-01
Lead	North Branch French Gulch	FG-7	10-Jun-99	Dissolved	ug/L	0.3	--	nc	nc	nc	nc
Lead	North Branch French Gulch	FG-7	23-Aug-94	Dissolved	ug/L	0.5	93	6.0E+01	2.3E+00	8E-03	2E-01
Lead	North Branch French Gulch	FG-7	11-Jun-96	Dissolved	ug/L	4.1	68	4.2E+01	1.6E+00	1E-01	**3E+00**
Lead	North Branch French Gulch	FG-7	14-Sep-99	Dissolved	ug/L	0.3	189	1.3E+02	3.9E+00	2E-03	8E-02
Lead	North Branch French Gulch	FG-7	22-Jul-96	Dissolved	ug/L	0.9	96	6.2E+01	2.4E+00	1E-02	4E-01
Lead	North Branch French Gulch	FG-7	16-Nov-93	Dissolved	ug/L	0.5	120	7.9E+01	3.1E+00	6E-03	2E-01
Lead	North Branch French Gulch	FG-7	05-Sep-99	Dissolved	ug/L	0.3	184	1.2E+02	3.9E+00	2E-03	8E-02
Lead	North Branch French Gulch	TS-3	23-May-96	Dissolved	ug/L	0.5	46	2.7E+01	1.1E+00	2E-02	5E-01
Lead	North Branch French Gulch	TS-4	06-Jun-96	Dissolved	ug/L	0.5	53	3.2E+01	1.3E+00	2E-02	4E-01
Lead	North Branch French Gulch	TS-4	25-May-96	Dissolved	ug/L	0.5	47	2.8E+01	1.1E+00	2E-02	5E-01
Lead	French Gulch Reference	FG-0	22-Sep-92	Dissolved	ug/L	1.5	47	2.8E+01	1.1E+00	5E-02	1E+00
Lead	French Gulch Reference	FG-0	21-Sep-89	Dissolved	ug/L	2.5	58	3.6E+01	1.4E+00	7E-02	**2E+00**
Lead	French Gulch Reference	FG-0	23-May-96	Dissolved	ug/L	0.5	34	2.0E+01	7.6E-01	3E-02	7E-01
Lead	French Gulch Reference	FG-1	25-Oct-95	Dissolved	ug/L	0.5	48	2.9E+01	1.1E+00	2E-02	4E-01
Lead	French Gulch Reference	FG-1	23-May-96	Dissolved	ug/L	0.5	34	2.0E+01	7.6E-01	3E-02	7E-01
Lead	French Gulch Reference	FG-1	04-May-89	Dissolved	ug/L	2.5	69	4.3E+01	1.7E+00	6E-02	1E+00
Lead	French Gulch Reference	FG-1	12-Jun-96	Dissolved	ug/L	3.6	37	2.2E+01	8.4E-01	2E-01	**4E+00**
Lead	French Gulch Reference	FG-1	22-Sep-92	Dissolved	ug/L	1.5	53	3.2E+01	1.3E+00	5E-02	1E+00
Lead	French Gulch Reference	FG-1	22-Jul-96	Dissolved	ug/L	0.4	41	2.4E+01	9.3E-01	2E-02	4E-01
Lead	French Gulch Reference	FG-2	04-May-89	Dissolved	ug/L	2.5	67	4.2E+01	1.6E+00	6E-02	**2E+00**
Lead	French Gulch Reference	FG-2	21-Sep-89	Dissolved	ug/L	2.5	60	3.7E+01	1.4E+00	7E-02	**2E+00**
Lead	French Gulch Reference	FG-2	22-Sep-92	Dissolved	ug/L	1.5	55	3.3E+01	1.3E+00	5E-02	1E+00
Lead	French Gulch Reference	FG-3	12-Jun-96	Dissolved	ug/L	0.4	39	2.3E+01	8.8E-01	2E-02	5E-01
Lead	French Gulch Reference	FG-3	22-Sep-92	Dissolved	ug/L	1.5	62	3.8E+01	1.5E+00	4E-02	1E+00
Lead	French Gulch Reference	FG-3	22-Jul-96	Dissolved	ug/L	0.4	46	2.8E+01	1.1E+00	1E-02	4E-01
Lead	French Gulch	FG-10	02-Nov-99	Dissolved	ug/L	0.5	85	5.4E+01	2.1E+00	9E-03	2E-01
Lead	French Gulch	FG-9	21-Jun-00	Dissolved	ug/L	4.72	--	nc	nc	nc	nc
Lead	French Gulch	FG-9	10-Jun-96	Dissolved	ug/L	4.1	65	4.0E+01	1.6E+00	1E-01	**3E+00**
Lead	French Gulch	FG-9	09-Jan-00	Dissolved	ug/L	10.4	--	nc	nc	nc	nc
Lead	French Gulch	FG-9	13-Apr-00	Dissolved	ug/L	10.8	--	nc	nc	nc	nc
Lead	French Gulch	FG-9	19-Jul-00	Dissolved	ug/L	3.74	--	nc	nc	nc	nc
Lead	French Gulch	FG-9	22-Jul-96	Dissolved	ug/L	3.4	84	5.3E+01	2.1E+00	6E-02	**2E+00**
Lead	French Gulch	FG-9	10-May-00	Dissolved	ug/L	51.2	--	nc	nc	nc	nc
Lead	French Gulch	FG-9	21-Jun-96	Dissolved	ug/L	2	62	3.8E+01	1.5E+00	5E-02	1E+00
Lead	French Gulch	FG-9	16-Nov-93	Dissolved	ug/L	1.6	125	8.2E+01	3.2E+00	2E-02	5E-01
Lead	French Gulch	FG-9	22-May-96	Dissolved	ug/L	3	75	4.7E+01	1.8E+00	6E-02	**2E+00**
Lead	French Gulch	FG-9	17-Apr-96	Dissolved	ug/L	2	160	1.1E+02	3.9E+00	2E-02	5E-01
Lead	French Gulch	FG-9	25-Jun-96	Dissolved	ug/L	3	65	4.0E+01	1.6E+00	7E-02	**2E+00**
Lead	French Gulch	FG-9	18-Jul-96	Dissolved	ug/L	3	18	9.6E+00	3.7E-01	3E-01	**8E+00**
Lead	French Gulch	FG-9	23-Aug-00	Dissolved	ug/L	6.13	--	nc	nc	nc	nc
Lead	French Gulch	FG-9	13-Sep-00	Dissolved	ug/L	6.74	--	nc	nc	nc	nc
Lead	French Gulch	FG-9	16-May-96	Dissolved	ug/L	2	82	5.2E+01	2.0E+00	4E-02	1E+00

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Lead	French Gulch	FG-9	08-Oct-99	Dissolved	ug/L	2.9	95	6.1E+01	2.4E+00	5E-02	1E+00
Lead	French Gulch	FG-9	08-Dec-00	Dissolved	ug/L	8.6	--	nc	nc	nc	nc
Lead	French Gulch	FG-9	21-Mar-96	Dissolved	ug/L	0.5	140	9.3E+01	3.6E+00	5E-03	1E-01
Lead	French Gulch	FG-9	02-Dec-98	Dissolved	ug/L	20	--	nc	nc	nc	nc
Lead	French Gulch	FG-9	13-Sep-99	Dissolved	ug/L	2.1	92	5.9E+01	2.3E+00	4E-02	9E-01
Lead	French Gulch	FG-9	02-Nov-99	Dissolved	ug/L	5.2	108	7.0E+01	2.7E+00	7E-02	**2E+00**
Lead	French Gulch	FG-9	05-Sep-99	Dissolved	ug/L	2.4	85	5.4E+01	2.1E+00	4E-02	1E+00
Lead	French Gulch	FG-9	23-Sep-99	Dissolved	ug/L	2.4	102	6.6E+01	2.6E+00	4E-02	9E-01
Lead	French Gulch	FG-9	07-Apr-99	Dissolved	ug/L	1.9	--	nc	nc	nc	nc
Lead	French Gulch	FG-9	07-May-99	Dissolved	ug/L	1.6	172	1.2E+02	3.9E+00	1E-02	4E-01
Lead	French Gulch	FG-9	23-Aug-94	Dissolved	ug/L	3.3	102	6.6E+01	2.6E+00	5E-02	1E+00
Lead	French Gulch	FG-9	17-Nov-99	Dissolved	ug/L	4.7	113	7.4E+01	2.9E+00	6E-02	**2E+00**
Lead	French Gulch	FG-9	19-Aug-99	Dissolved	ug/L	1.7	87	5.5E+01	2.2E+00	3E-02	8E-01
Lead	French Gulch	FG-9	14-Jul-99	Dissolved	ug/L	1.3	--	nc	nc	nc	nc
Lead	French Gulch	FG-9	10-Jun-99	Dissolved	ug/L	2.3	--	nc	nc	nc	nc
Lead	French Gulch	FG-9	24-Sep-98	Dissolved	ug/L	3.8	--	nc	nc	nc	nc
Lead	French Gulch	FG-9	03-Mar-99	Dissolved	ug/L	1.3	--	nc	nc	nc	nc
Lead	French Gulch	FG-9	03-Nov-98	Dissolved	ug/L	3.7	--	nc	nc	nc	nc
Lead	French Gulch	FG-9	21-Oct-93	Dissolved	ug/L	1.4	121	7.9E+01	3.1E+00	2E-02	5E-01
Lead	French Gulch	FG-9	21-Feb-97	Dissolved	ug/L	8	160	1.1E+02	3.9E+00	7E-02	**2E+00**
Lead	French Gulch	FG-9	16-Jan-97	Dissolved	ug/L	8	140	9.3E+01	3.6E+00	9E-02	**2E+00**
Lead	French Gulch	FG-9	19-Jan-96	Dissolved	ug/L	8	150	1.0E+02	3.9E+00	8E-02	**2E+00**
Lead	French Gulch	FG-9	13-Dec-96	Dissolved	ug/L	7	140	9.3E+01	3.6E+00	8E-02	**2E+00**
Lead	French Gulch	FG-9	21-Nov-95	Dissolved	ug/L	7	120	7.9E+01	3.1E+00	9E-02	**2E+00**
Lead	French Gulch	FG-9	23-Oct-95	Dissolved	ug/L	7	110	7.2E+01	2.8E+00	1E-01	**3E+00**
Lead	French Gulch	FG-9	13-Nov-96	Dissolved	ug/L	6	120	7.9E+01	3.1E+00	8E-02	**2E+00**
Lead	French Gulch	FG-9	08-Oct-96	Dissolved	ug/L	5	110	7.2E+01	2.8E+00	7E-02	**2E+00**
Lead	French Gulch	FG-9	09-Sep-96	Dissolved	ug/L	5	110	7.2E+01	2.8E+00	7E-02	**2E+00**
Lead	French Gulch	FG-9	15-Aug-96	Dissolved	ug/L	5	99	6.4E+01	2.5E+00	8E-02	**2E+00**
Lead	French Gulch	FG-9	21-Sep-89	Dissolved	ug/L	2.5	102	6.6E+01	2.6E+00	4E-02	1E+00
Lead	French Gulch	FG-9	04-May-89	Dissolved	ug/L	2.5	140	9.3E+01	3.6E+00	3E-02	7E-01
Lead	French Gulch	FG-9	26-May-96	Dissolved	ug/L	4	62	3.8E+01	1.5E+00	1E-01	**3E+00**
Lead	French Gulch	FG-9	22-Feb-96	Dissolved	ug/L	7	150	1.0E+02	3.9E+00	7E-02	**2E+00**
Lead	French Gulch	FG-9	04-Feb-99	Dissolved	ug/L	7	175	1.2E+02	3.9E+00	6E-02	**2E+00**
Lead	French Gulch	FG-9	22-Sep-92	Dissolved	ug/L	1.5	103	6.7E+01	2.6E+00	2E-02	6E-01
Lead	French Gulch	FG-9A	22-Jul-96	Dissolved	ug/L	0.4	85	5.4E+01	2.1E+00	7E-03	2E-01
Lead	French Gulch	FG-9A	23-Aug-94	Dissolved	ug/L	0.5	96	6.2E+01	2.4E+00	8E-03	2E-01
Lead	French Gulch	FG-9A	11-Jun-96	Dissolved	ug/L	3.5	65	4.0E+01	1.6E+00	9E-02	**2E+00**
Lead	French Gulch	FG-9A	22-Sep-98	Dissolved	ug/L	0.2	--	nc	nc	nc	nc
Lead	Discharge	CBMA-1	23-Jul-96	Dissolved	ug/L	0.8	224	1.5E+02	3.9E+00	5E-03	2E-01
Lead	Discharge	KDS	13-Jun-96	Dissolved	ug/L	0.4	296	2.1E+02	3.9E+00	2E-03	1E-01
Lead	Discharge	KDS	24-Aug-94	Dissolved	ug/L	0.5	222	1.5E+02	3.9E+00	3E-03	1E-01
Lead	Discharge	MGB-1	23-Jul-96	Dissolved	ug/L	0.8	82	5.2E+01	2.0E+00	2E-02	4E-01
Lead	Discharge	RLCVT-1	23-Jul-96	Dissolved	ug/L	0.8	86	5.5E+01	2.1E+00	1E-02	4E-01
Lead	Discharge	WP-1	12-Jun-96	Dissolved	ug/L	744	4980	2.5E+02	3.9E+00	**3E+00**	**2E+02**

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Lead	Blue River Reference	654	24-Apr-97	Dissolved	ug/l	0.5	86	5.5E+01	2.1E+00	9E-03	2E-01
Lead	Blue River Reference	654	02-Sep-97	Dissolved	ug/l	0.5	56	3.4E+01	1.3E+00	1E-02	4E-01
Lead	Blue River Reference	654	18-Jun-97	Dissolved	ug/l	0.5	60	3.7E+01	1.4E+00	1E-02	3E-01
Lead	Blue River Reference	654	02-Jul-97	Dissolved	ug/l	0.5	40	2.4E+01	9.2E-01	2E-02	5E-01
Lead	Blue River Reference	654	21-Aug-97	Dissolved	ug/l	0.5	52	3.1E+01	1.2E+00	2E-02	4E-01
Lead	Blue River Reference	654	04-Jun-97	Dissolved	ug/l	0.5	62	3.8E+01	1.5E+00	1E-02	3E-01
Lead	Blue River Reference	654	16-Jul-97	Dissolved	ug/l	0.5	60	3.7E+01	1.4E+00	1E-02	3E-01
Lead	Blue River Reference	654	21-Aug-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Lead	Blue River Reference	654	01-Apr-98	Dissolved	ug/l	0.5	100	6.5E+01	2.5E+00	8E-03	2E-01
Lead	Blue River Reference	654	01-Jul-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Lead	Blue River Reference	654	09-Sep-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Lead	Blue River Reference	654	10-Oct-97	Dissolved	ug/l	0.5	72	4.5E+01	1.8E+00	1E-02	3E-01
Lead	Blue River Reference	654	07-Dec-97	Dissolved	ug/l	0.5	84	5.3E+01	2.1E+00	9E-03	2E-01
Lead	Blue River Reference	654	19-Nov-97	Dissolved	ug/l	0.5	96	6.2E+01	2.4E+00	8E-03	2E-01
Lead	Blue River Reference	654	05-May-98	Dissolved	ug/l	0.5	76	4.8E+01	1.9E+00	1E-02	3E-01
Lead	Blue River Reference	654	24-Sep-97	Dissolved	ug/l	0.5	56	3.4E+01	1.3E+00	1E-02	4E-01
Lead	Blue River Reference	654	08-May-97	Dissolved	ug/l	0.5	78	4.9E+01	1.9E+00	1E-02	3E-01
Lead	Blue River Reference	654	21-May-97	Dissolved	ug/l	0.5	66	4.1E+01	1.6E+00	1E-02	3E-01
Lead	Blue River Reference	654	07-Aug-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Lead	Blue River Reference	654	22-Jul-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Lead	Blue River Reference	654	23-Sep-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Lead	Blue River Reference	654	10-Sep-97	Dissolved	ug/l	0.5	60	3.7E+01	1.4E+00	1E-02	3E-01
Lead	Blue River Reference	654	16-May-97	Dissolved	ug/l	0.5	72	4.5E+01	1.8E+00	1E-02	3E-01
Lead	Blue River Reference	655	07-Dec-97	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Lead	Blue River Reference	655	10-Oct-97	Dissolved	ug/l	0.5	60	3.7E+01	1.4E+00	1E-02	3E-01
Lead	Blue River Reference	655	24-Sep-97	Dissolved	ug/l	0.5	52	3.1E+01	1.2E+00	2E-02	4E-01
Lead	Blue River Reference	655	04-Jun-97	Dissolved	ug/l	0.5	54	3.3E+01	1.3E+00	2E-02	4E-01
Lead	Blue River Reference	655	16-May-97	Dissolved	ug/l	0.5	62	3.8E+01	1.5E+00	1E-02	3E-01
Lead	Blue River Reference	655	10-Sep-97	Dissolved	ug/l	0.5	44	2.6E+01	1.0E+00	2E-02	5E-01
Lead	Blue River Reference	655	05-May-98	Dissolved	ug/l	0.5	72	4.5E+01	1.8E+00	1E-02	3E-01
Lead	Blue River Reference	655	01-Jul-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Lead	Blue River Reference	655	18-Jun-97	Dissolved	ug/l	0.5	52	3.1E+01	1.2E+00	2E-02	4E-01
Lead	Blue River Reference	655	16-Jul-97	Dissolved	ug/l	0.5	44	2.6E+01	1.0E+00	2E-02	5E-01
Lead	Blue River Reference	655	21-May-97	Dissolved	ug/l	0.5	60	3.7E+01	1.4E+00	1E-02	3E-01
Lead	Blue River Reference	655	08-May-97	Dissolved	ug/l	0.5	74	4.6E+01	1.8E+00	1E-02	3E-01
Lead	Blue River Reference	655	24-Apr-97	Dissolved	ug/l	0.5	84	5.3E+01	2.1E+00	9E-03	2E-01
Lead	Blue River Reference	655	09-Sep-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Lead	Blue River Reference	655	02-Jul-97	Dissolved	ug/l	0.5	42	2.5E+01	9.7E-01	2E-02	5E-01
Lead	Blue River Reference	655	02-Sep-97	Dissolved	ug/l	0.5	52	3.1E+01	1.2E+00	2E-02	4E-01
Lead	Blue River Reference	655	22-Jul-98	Dissolved	ug/l	0.5	58	3.6E+01	1.4E+00	1E-02	4E-01
Lead	Blue River Reference	655	21-Aug-97	Dissolved	ug/l	0.5	44	2.6E+01	1.0E+00	2E-02	5E-01
Lead	Blue River Reference	655	21-Aug-98	Dissolved	ug/l	0.5	50	3.0E+01	1.2E+00	2E-02	4E-01
Lead	Blue River Reference	655	23-Sep-98	Dissolved	ug/l	0.5	60	3.7E+01	1.4E+00	1E-02	3E-01
Lead	Blue River Reference	655	07-Aug-98	Dissolved	ug/l	0.5	48	2.9E+01	1.1E+00	2E-02	4E-01
Lead	Blue River Reference	BR-1	23-Aug-94	Dissolved	ug/L	0.5	61	3.8E+01	1.5E+00	1E-02	3E-01

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Lead	Blue River Reference	BR-1	23-Sep-99	Dissolved	ug/L	0.1	71	4.4E+01	1.7E+00	2E-03	6E-02
Lead	Blue River Reference	BR-1	19-Jul-00	Dissolved	ug/L	0.62	--	nc	nc	nc	nc
Lead	Blue River Reference	BR-1	23-Aug-00	Dissolved	ug/L	1.19	--	nc	nc	nc	nc
Lead	Blue River Reference	BR-1	17-Nov-99	Dissolved	ug/L	0.05	70	4.4E+01	1.7E+00	1E-03	3E-02
Lead	Blue River Reference	BR-1	05-May-99	Dissolved	ug/L	0.2	95	6.1E+01	2.4E+00	3E-03	8E-02
Lead	Blue River Reference	BR-1	05-Sep-99	Dissolved	ug/L	0.1	60	3.7E+01	1.4E+00	3E-03	7E-02
Lead	Blue River Reference	BR-1	21-Jun-00	Dissolved	ug/L	4.66	--	nc	nc	nc	nc
Lead	Blue River Reference	BR-1	13-Sep-00	Dissolved	ug/L	1.43	--	nc	nc	nc	nc
Lead	Blue River Reference	BR-1	10-Jun-99	Dissolved	ug/L	0.2	--	nc	nc	nc	nc
Lead	Blue River Reference	BR-1	21-Sep-89	Dissolved	ug/L	2.5	58	3.6E+01	1.4E+00	7E-02	**2E+00**
Lead	Blue River Reference	BR-1	16-Nov-93	Dissolved	ug/L	0.5	67	4.2E+01	1.6E+00	1E-02	3E-01
Lead	Blue River Reference	BR-1	01-Nov-99	Dissolved	ug/L	0.1	71	4.4E+01	1.7E+00	2E-03	6E-02
Lead	Blue River Reference	BR-1	03-Nov-98	Dissolved	ug/L	0.2	--	nc	nc	nc	nc
Lead	Blue River Reference	BR-1	23-Sep-98	Dissolved	ug/L	0.2	--	nc	nc	nc	nc
Lead	Blue River Reference	BR-1	07-Oct-99	Dissolved	ug/L	0.1	71	4.4E+01	1.7E+00	2E-03	6E-02
Lead	Blue River Reference	BR-1	14-Jul-99	Dissolved	ug/L	0.1	--	nc	nc	nc	nc
Lead	Blue River Reference	BR-1	10-Jun-99	Dissolved	ug/L	0.2	--	nc	nc	nc	nc
Lead	Blue River Reference	BR-1	04-May-89	Dissolved	ug/L	2.5	67	4.2E+01	1.6E+00	6E-02	**2E+00**
Lead	Blue River Reference	BR-1	23-Sep-99	Dissolved	ug/L	0.1	72	4.5E+01	1.8E+00	2E-03	6E-02
Lead	Blue River Reference	BR-1	14-Sep-99	Dissolved	ug/L	0.1	63	3.9E+01	1.5E+00	3E-03	7E-02
Lead	Blue River Reference	BR-1	21-Oct-93	Dissolved	ug/L	0.5	71	4.4E+01	1.7E+00	1E-02	3E-01
Lead	Blue River Reference	BR-1	19-Aug-99	Dissolved	ug/L	0.2	61	3.8E+01	1.5E+00	5E-03	1E-01
Lead	Blue River Reference	BR-1	10-Jun-96	Dissolved	ug/L	0.4	54	3.3E+01	1.3E+00	1E-02	3E-01
Lead	Blue River Reference	BR-1	17-Nov-99	Dissolved	ug/L	0.05	69	4.3E+01	1.7E+00	1E-03	3E-02
Lead	Blue River Reference	BR-1	22-Sep-92	Dissolved	ug/L	1.5	66	4.1E+01	1.6E+00	4E-02	9E-01
Lead	Blue River Reference	BR-1	23-Jul-96	Dissolved	ug/L	0.4	42	2.5E+01	9.6E-01	2E-02	4E-01
Lead	Blue River Reference	BR-Adams St	21-May-96	Dissolved	ug/L	0.5	57	3.5E+01	1.4E+00	1E-02	4E-01
Lead	Blue River Reference	BR-Adams St	24-Oct-95	Dissolved	ug/L	0.5	68	4.2E+01	1.6E+00	1E-02	3E-01
Lead	Blue River	643	21-Aug-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Lead	Blue River	643	07-Aug-98	Dissolved	ug/l	1.8	--	nc	nc	nc	nc
Lead	Blue River	643	22-Jul-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Lead	Blue River	643	28-Dec-99	Dissolved	ug/l	1.5	--	nc	nc	nc	nc
Lead	Blue River	643	09-Sep-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Lead	Blue River	656	16-Jul-97	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Lead	Blue River	656	08-May-97	Dissolved	ug/l	0.5	106	6.9E+01	2.7E+00	7E-03	2E-01
Lead	Blue River	656	22-Jul-98	Dissolved	ug/l	0.5	78	4.9E+01	1.9E+00	1E-02	3E-01
Lead	Blue River	656	07-Aug-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Lead	Blue River	656	09-Sep-98	Dissolved	ug/l	2.2	90	5.8E+01	2.2E+00	4E-02	1E+00
Lead	Blue River	656	21-Aug-97	Dissolved	ug/l	0.5	42	2.5E+01	9.7E-01	2E-02	5E-01
Lead	Blue River	656	21-Aug-98	Dissolved	ug/l	1.3	--	nc	nc	nc	nc
Lead	Blue River	656	02-Sep-97	Dissolved	ug/l	0.5	64	4.0E+01	1.5E+00	1E-02	3E-01
Lead	Blue River	656	19-Nov-97	Dissolved	ug/l	1	128	8.4E+01	3.3E+00	1E-02	3E-01
Lead	Blue River	656	10-Oct-97	Dissolved	ug/l	0.5	100	6.5E+01	2.5E+00	8E-03	2E-01
Lead	Blue River	656	24-Sep-97	Dissolved	ug/l	0.5	76	4.8E+01	1.9E+00	1E-02	3E-01
Lead	Blue River	656	05-May-98	Dissolved	ug/l	0.5	120	7.9E+01	3.1E+00	6E-03	2E-01

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Lead	Blue River	656	16-May-97	Dissolved	ug/l	0.5	80	5.1E+01	2.0E+00	1E-02	3E-01
Lead	Blue River	656	10-Sep-97	Dissolved	ug/l	0.5	76	4.8E+01	1.9E+00	1E-02	3E-01
Lead	Blue River	656	23-Sep-98	Dissolved	ug/l	1.4	94	6.0E+01	2.4E+00	2E-02	6E-01
Lead	Blue River	656	01-Apr-98	Dissolved	ug/l	0.5	164	1.1E+02	3.9E+00	5E-03	1E-01
Lead	Blue River	656	21-May-97	Dissolved	ug/l	0.5	68	4.2E+01	1.6E+00	1E-02	3E-01
Lead	Blue River	656	07-Dec-97	Dissolved	ug/l	2.6	136	9.0E+01	3.5E+00	3E-02	7E-01
Lead	Blue River	656	01-Jul-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Lead	Blue River	656	04-Jun-97	Dissolved	ug/l	1.1	60	3.7E+01	1.4E+00	3E-02	8E-01
Lead	Blue River	656	02-Jul-97	Dissolved	ug/l	0.5	44	2.6E+01	1.0E+00	2E-02	5E-01
Lead	Blue River	656	24-Apr-97	Dissolved	ug/l	0.5	124	8.2E+01	3.2E+00	6E-03	2E-01
Lead	Blue River	656	18-Jun-97	Dissolved	ug/l	0.5	58	3.6E+01	1.4E+00	1E-02	4E-01
Lead	Blue River	657	07-Aug-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Lead	Blue River	657	22-Jul-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Lead	Blue River	657	01-Jul-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Lead	Blue River	657	05-May-98	Dissolved	ug/l	0.5	76	4.8E+01	1.9E+00	1E-02	3E-01
Lead	Blue River	657	01-Apr-98	Dissolved	ug/l	0.5	84	5.3E+01	2.1E+00	9E-03	2E-01
Lead	Blue River	657	07-Dec-97	Dissolved	ug/l	0.5	68	4.2E+01	1.6E+00	1E-02	3E-01
Lead	Blue River	657	19-Nov-97	Dissolved	ug/l	0.5	68	4.2E+01	1.6E+00	1E-02	3E-01
Lead	Blue River	657	02-Jul-97	Dissolved	ug/l	0.5	46	2.7E+01	1.1E+00	2E-02	5E-01
Lead	Blue River	657	23-Sep-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Lead	Blue River	657	21-Aug-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Lead	Blue River	657	04-Jun-97	Dissolved	ug/l	0.5	58	3.6E+01	1.4E+00	1E-02	4E-01
Lead	Blue River	657	09-Sep-98	Dissolved	ug/l	0.5	--	nc	nc	nc	nc
Lead	Blue River	657	02-Sep-97	Dissolved	ug/l	0.5	64	4.0E+01	1.5E+00	1E-02	3E-01
Lead	Blue River	657	24-Sep-97	Dissolved	ug/l	0.5	72	4.5E+01	1.8E+00	1E-02	3E-01
Lead	Blue River	657	08-May-97	Dissolved	ug/l	0.5	78	4.9E+01	1.9E+00	1E-02	3E-01
Lead	Blue River	657	24-Apr-97	Dissolved	ug/l	0.5	88	5.6E+01	2.2E+00	9E-03	2E-01
Lead	Blue River	657	16-May-97	Dissolved	ug/l	0.5	72	4.5E+01	1.8E+00	1E-02	3E-01
Lead	Blue River	657	21-May-97	Dissolved	ug/l	0.5	64	4.0E+01	1.5E+00	1E-02	3E-01
Lead	Blue River	657	18-Jun-97	Dissolved	ug/l	0.5	54	3.3E+01	1.3E+00	2E-02	4E-01
Lead	Blue River	657	16-Jul-97	Dissolved	ug/l	0.5	48	2.9E+01	1.1E+00	2E-02	4E-01
Lead	Blue River	657	21-Aug-97	Dissolved	ug/l	0.5	52	3.1E+01	1.2E+00	2E-02	4E-01
Lead	Blue River	BR-2	21-Oct-93	Dissolved	ug/L	1.8	121	8.0E+01	3.1E+00	2E-02	6E-01
Lead	Blue River	BR-2	22-Sep-92	Dissolved	ug/L	1.5	102	6.6E+01	2.6E+00	2E-02	6E-01
Lead	Blue River	BR-2	10-Jun-99	Dissolved	ug/L	0.8	--	nc	nc	nc	nc
Lead	Blue River	BR-2	10-Jun-96	Dissolved	ug/L	0.4	58	3.6E+01	1.4E+00	1E-02	3E-01
Lead	Blue River	BR-2	23-Jul-96	Dissolved	ug/L	0.4	49	2.9E+01	1.1E+00	1E-02	3E-01
Lead	Blue River	BR-2	16-Nov-93	Dissolved	ug/L	1.9	126	8.3E+01	3.2E+00	2E-02	6E-01
Lead	Blue River	BR-2	05-May-99	Dissolved	ug/L	0.6	159	1.1E+02	3.9E+00	6E-03	2E-01
Lead	Blue River	BR-2	10-May-00	Dissolved	ug/L	2.5	--	nc	nc	nc	nc
Lead	Blue River	BR-2	22-Aug-94	Dissolved	ug/L	1.4	76	4.8E+01	1.9E+00	3E-02	7E-01
Lead	Blue River	BR-2	19-Jul-00	Dissolved	ug/L	1.34	--	nc	nc	nc	nc
Lead	Blue River	BR-2	21-Jun-00	Dissolved	ug/L	3.55	--	nc	nc	nc	nc
Lead	Blue River	BR-2	23-Sep-99	Dissolved	ug/L	2.1	93	6.0E+01	2.3E+00	4E-02	9E-01
Lead	Blue River	BR-2	07-Apr-99	Dissolved	ug/L	1.7	--	nc	nc	nc	nc

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Lead	Blue River	BR-2	07-Apr-99	Dissolved	ug/L	1.6	--	nc	nc	nc	nc
Lead	Blue River	BR-2	13-Apr-00	Dissolved	ug/L	9.44	--	nc	nc	nc	nc
Lead	Blue River	BR-2	17-Nov-99	Dissolved	ug/L	3.5	103	6.7E+01	2.6E+00	5E-02	1E+00
Lead	Blue River	BR-2	14-Sep-99	Dissolved	ug/L	1.7	88	5.6E+01	2.2E+00	3E-02	8E-01
Lead	Blue River	BR-2	07-Oct-99	Dissolved	ug/L	1.2	91	5.8E+01	2.3E+00	2E-02	5E-01
Lead	Blue River	BR-2	21-Sep-89	Dissolved	ug/L	2.5	108	7.0E+01	2.7E+00	4E-02	9E-01
Lead	Blue River	BR-2	23-Aug-00	Dissolved	ug/L	3.45	--	nc	nc	nc	nc
Lead	Blue River	BR-2	04-May-89	Dissolved	ug/L	2.5	140	9.3E+01	3.6E+00	3E-02	7E-01
Lead	Blue River	BR-2	04-Feb-99	Dissolved	ug/L	4.3	174	1.2E+02	3.9E+00	4E-02	1E+00
Lead	Blue River	BR-2	08-Dec-00	Dissolved	ug/L	7.6	--	nc	nc	nc	nc
Lead	Blue River	BR-2	14-Sep-99	Dissolved	ug/L	1.9	89	5.7E+01	2.2E+00	3E-02	9E-01
Lead	Blue River	BR-2	02-Nov-99	Dissolved	ug/L	5.8	108	7.0E+01	2.7E+00	8E-02	**2E+00**
Lead	Blue River	BR-2	13-Sep-00	Dissolved	ug/L	4.12	--	nc	nc	nc	nc
Lead	Blue River	BR-2	19-Aug-99	Dissolved	ug/L	0.8	75	4.7E+01	1.8E+00	2E-02	4E-01
Lead	Blue River	BR-2	23-Sep-98	Dissolved	ug/L	2.4	--	nc	nc	nc	nc
Lead	Blue River	BR-2	14-Jul-99	Dissolved	ug/L	0.3	--	nc	nc	nc	nc
Lead	Blue River	BR-2	03-Mar-99	Dissolved	ug/L	1	--	nc	nc	nc	nc
Lead	Blue River	BR-2	05-Sep-99	Dissolved	ug/L	1.6	81	5.1E+01	2.0E+00	3E-02	8E-01
Lead	Blue River	BR-2	02-Dec-98	Dissolved	ug/L	20	--	nc	nc	nc	nc
Lead	Blue River	BR-2	03-Nov-98	Dissolved	ug/L	2.7	--	nc	nc	nc	nc
Lead	Blue River	BR-3	22-Aug-94	Dissolved	ug/L	0.5	70	4.3E+01	1.7E+00	1E-02	3E-01
Lead	Blue River	BR-3	01-Nov-99	Dissolved	ug/L	0.1	74	4.6E+01	1.8E+00	2E-03	6E-02
Lead	Blue River	BR-3	10-Jun-99	Dissolved	ug/L	0.3	--	nc	nc	nc	nc
Lead	Blue River	BR-3	23-Aug-00	Dissolved	ug/L	0.82	--	nc	nc	nc	nc
Lead	Blue River	BR-3	19-Jul-00	Dissolved	ug/L	0.71	--	nc	nc	nc	nc
Lead	Blue River	BR-3	21-Jun-00	Dissolved	ug/L	1.77	--	nc	nc	nc	nc
Lead	Blue River	BR-3	05-Sep-99	Dissolved	ug/L	0.1	63	3.9E+01	1.5E+00	3E-03	7E-02
Lead	Blue River	BR-3	04-Feb-99	Dissolved	ug/L	0.2	85	5.4E+01	2.1E+00	4E-03	9E-02
Lead	Blue River	BR-3	07-Apr-99	Dissolved	ug/L	0.1	--	nc	nc	nc	nc
Lead	Blue River	BR-3	05-May-99	Dissolved	ug/L	0.2	89	5.7E+01	2.2E+00	4E-03	9E-02
Lead	Blue River	BR-3	17-Nov-99	Dissolved	ug/L	0.3	70	4.4E+01	1.7E+00	7E-03	2E-01
Lead	Blue River	BR-3	08-Dec-00	Dissolved	ug/L	0.48	--	nc	nc	nc	nc
Lead	Blue River	BR-3	04-May-89	Dissolved	ug/L	2.5	80	5.1E+01	2.0E+00	5E-02	1E+00
Lead	Blue River	BR-3	21-Sep-89	Dissolved	ug/L	2.5	68	4.2E+01	1.6E+00	6E-02	**2E+00**
Lead	Blue River	BR-3	03-Mar-99	Dissolved	ug/L	0.2	--	nc	nc	nc	nc
Lead	Blue River	BR-3	16-Nov-93	Dissolved	ug/L	0.5	75	4.7E+01	1.8E+00	1E-02	3E-01
Lead	Blue River	BR-3	13-Sep-00	Dissolved	ug/L	0.42	--	nc	nc	nc	nc
Lead	Blue River	BR-3	19-Aug-99	Dissolved	ug/L	0.05	65	4.0E+01	1.6E+00	1E-03	3E-02
Lead	Blue River	BR-3	10-Jun-96	Dissolved	ug/L	0.4	54	3.3E+01	1.3E+00	1E-02	3E-01
Lead	Blue River	BR-3	23-Sep-99	Dissolved	ug/L	0.1	72	4.5E+01	1.8E+00	2E-03	6E-02
Lead	Blue River	BR-3	09-Jan-00	Dissolved	ug/L	0.48	--	nc	nc	nc	nc
Lead	Blue River	BR-3	14-Jul-99	Dissolved	ug/L	0.1	--	nc	nc	nc	nc
Lead	Blue River	BR-3	07-Oct-99	Dissolved	ug/L	0.1	60	3.7E+01	1.4E+00	3E-03	7E-02
Lead	Blue River	BR-3	21-Oct-93	Dissolved	ug/L	0.5	76	4.8E+01	1.9E+00	1E-02	3E-01
Lead	Blue River	BR-3	02-Dec-98	Dissolved	ug/L	20	--	nc	nc	nc	nc

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Lead	Blue River	BR-3	07-Oct-99	Dissolved	ug/L	0.1	73	4.6E+01	1.8E+00	2E-03	6E-02
Lead	Blue River	BR-3	14-Sep-99	Dissolved	ug/L	0.1	69	4.3E+01	1.7E+00	2E-03	6E-02
Lead	Blue River	BR-3	13-Apr-00	Dissolved	ug/L	0.86	--	nc	nc	nc	nc
Lead	Blue River	BR-3	10-May-00	Dissolved	ug/L	1.21	--	nc	nc	nc	nc
Lead	Blue River	BR-3	23-Sep-98	Dissolved	ug/L	0.2	--	nc	nc	nc	nc
Lead	Blue River	BR-3	23-Jul-96	Dissolved	ug/L	0.4	50	3.0E+01	1.2E+00	1E-02	3E-01
Lead	Blue River	BR-3	03-Nov-98	Dissolved	ug/L	0.2	--	nc	nc	nc	nc
Lead	Blue River	BR-4	22-Sep-92	Dissolved	ug/L	1.5	73	4.6E+01	1.8E+00	3E-02	8E-01
Lead	Blue River	BR-5	22-Sep-92	Dissolved	ug/L	1.5	72	4.5E+01	1.8E+00	3E-02	9E-01
Lead	Blue River	BR-5	23-Jul-96	Dissolved	ug/L	0.4	52	3.2E+01	1.2E+00	1E-02	3E-01
Lead	Blue River	BR-5	23-Jul-96	Dissolved	ug/L	0.4	52	3.1E+01	1.2E+00	1E-02	3E-01
Lead	Blue River	BR-BFG	25-Oct-95	Dissolved	ug/L	2	86	5.5E+01	2.1E+00	4E-02	9E-01
Lead	Blue River	BR-BFG	22-May-96	Dissolved	ug/L	1	59	3.6E+01	1.4E+00	3E-02	7E-01
Lead	Blue River	BR-Dillon	24-May-96	Dissolved	ug/L	0.5	47	2.8E+01	1.1E+00	2E-02	5E-01
Lead	Blue River	BR-Dillon	26-Oct-95	Dissolved	ug/L	0.5	66	4.1E+01	1.6E+00	1E-02	3E-01
Nickel	South Branch French Gulch	FG-5	05-Sep-99	Dissolved	ug/L	5	52	2.7E+02	3.0E+01	2E-02	2E-01
Nickel	South Branch French Gulch	FG-5	21-Oct-93	Dissolved	ug/L	7.5	66	3.3E+02	3.7E+01	2E-02	2E-01
Nickel	South Branch French Gulch	FG-5	11-Jun-96	Dissolved	ug/L	5	37	2.0E+02	2.3E+01	2E-02	2E-01
Nickel	South Branch French Gulch	FG-5	22-Jul-96	Dissolved	ug/L	5	46	2.4E+02	2.7E+01	2E-02	2E-01
Nickel	South Branch French Gulch	FG-5	23-Aug-94	Dissolved	ug/L	6	54	2.8E+02	3.1E+01	2E-02	2E-01
Nickel	South Branch French Gulch	FG-5	08-Oct-99	Dissolved	ug/L	5	63	3.2E+02	3.5E+01	2E-02	1E-01
Nickel	South Branch French Gulch	FG-5	16-Nov-93	Dissolved	ug/L	7.5	65	3.3E+02	3.6E+01	2E-02	2E-01
Nickel	South Branch French Gulch	FG-5	23-Sep-99	Dissolved	ug/L	5	64	3.2E+02	3.6E+01	2E-02	1E-01
Nickel	South Branch French Gulch	FG-5	19-Aug-99	Dissolved	ug/L	5	54	2.8E+02	3.1E+01	2E-02	2E-01
Nickel	South Branch French Gulch	FG-5	13-Sep-99	Dissolved	ug/L	5	60	3.0E+02	3.4E+01	2E-02	1E-01
Nickel	South Branch French Gulch	FG-5.5	23-Sep-99	Dissolved	ug/L	5	75	3.7E+02	4.1E+01	1E-02	1E-01
Nickel	South Branch French Gulch	FG-5.5	05-Sep-99	Dissolved	ug/L	5	64	3.2E+02	3.6E+01	2E-02	1E-01
Nickel	South Branch French Gulch	FG-5.5	13-Sep-99	Dissolved	ug/L	5	71	3.5E+02	3.9E+01	1E-02	1E-01
Nickel	South Branch French Gulch	FG-5.5	07-Oct-99	Dissolved	ug/L	5	76	3.7E+02	4.1E+01	1E-02	1E-01
Nickel	South Branch French Gulch	FG-5.5	23-Sep-99	Dissolved	ug/L	5	75	3.7E+02	4.1E+01	1E-02	1E-01
Nickel	South Branch French Gulch	FG-5.5	13-Sep-99	Dissolved	ug/L	5	71	3.5E+02	3.9E+01	1E-02	1E-01
Nickel	South Branch French Gulch	FG-5.5	05-Sep-99	Dissolved	ug/L	5	64	3.2E+02	3.6E+01	2E-02	1E-01
Nickel	South Branch French Gulch	FG-5.5	19-Aug-99	Dissolved	ug/L	5	65	3.3E+02	3.6E+01	2E-02	1E-01
Nickel	South Branch French Gulch	FG-5.5	07-Oct-99	Dissolved	ug/L	5	76	3.7E+02	4.1E+01	1E-02	1E-01
Nickel	South Branch French Gulch	FG-5.5	01-Nov-99	Dissolved	ug/L	5	82	4.0E+02	4.4E+01	1E-02	1E-01
Nickel	South Branch French Gulch	FG-5.5	17-Nov-99	Dissolved	ug/L	5	84	4.0E+02	4.5E+01	1E-02	1E-01
Nickel	South Branch French Gulch	FG-8	02-Nov-99	Dissolved	ug/L	5	86	4.1E+02	4.6E+01	1E-02	1E-01
Nickel	South Branch French Gulch	FG-8	17-Nov-99	Dissolved	ug/L	5	89	4.2E+02	4.7E+01	1E-02	1E-01
Nickel	South Branch French Gulch	FG-8	22-Jul-96	Dissolved	ug/L	5	64	3.2E+02	3.5E+01	2E-02	1E-01
Nickel	South Branch French Gulch	FG-8	23-Aug-94	Dissolved	ug/L	6	97	4.5E+02	5.0E+01	1E-02	1E-01
Nickel	South Branch French Gulch	FG-8	11-Jun-96	Dissolved	ug/L	5	55	2.8E+02	3.1E+01	2E-02	2E-01
Nickel	South Branch French Gulch	FG-8	16-Nov-93	Dissolved	ug/L	7.5	109	5.1E+02	5.6E+01	1E-02	1E-01
Nickel	South Branch French Gulch	FG-8	21-Oct-93	Dissolved	ug/L	7.5	109	5.0E+02	5.6E+01	1E-02	1E-01
Nickel	South Branch French Gulch	FG-8	23-Sep-99	Dissolved	ug/L	5	76	3.7E+02	4.1E+01	1E-02	1E-01
Nickel	South Branch French Gulch	FG-8	14-Sep-99	Dissolved	ug/L	5	71	3.5E+02	3.9E+01	1E-02	1E-01

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Nickel	South Branch French Gulch	FG-8	08-Oct-99	Dissolved	ug/L	5	73	3.6E+02	4.0E+01	1E-02	1E-01
Nickel	South Branch French Gulch	FG-8	05-Sep-99	Dissolved	ug/L	5	66	3.3E+02	3.7E+01	2E-02	1E-01
Nickel	South Branch French Gulch	FG-8	19-Aug-99	Dissolved	ug/L	5	66	3.3E+02	3.7E+01	2E-02	1E-01
Nickel	North Branch French Gulch	1121	23-Jul-96	Dissolved	ug/L	58	446	1.4E+03	9.7E+01	4E-02	6E-01
Nickel	North Branch French Gulch	1121	13-Jun-96	Dissolved	ug/L	15.9	215	8.9E+02	9.7E+01	2E-02	2E-01
Nickel	North Branch French Gulch	1140	13-Jun-96	Dissolved	ug/L	81.3	728	1.4E+03	9.7E+01	6E-02	8E-01
Nickel	North Branch French Gulch	FG-6	11-Jun-96	Dissolved	ug/L	116.6	1070	1.4E+03	9.7E+01	8E-02	1E+00
Nickel	North Branch French Gulch	FG-6A	22-Jul-96	Dissolved	ug/L	115.1	908	1.4E+03	9.7E+01	8E-02	1E+00
Nickel	North Branch French Gulch	FG-6A	21-Oct-93	Dissolved	ug/L	69	679	1.4E+03	9.7E+01	5E-02	7E-01
Nickel	North Branch French Gulch	FG-6A	23-Aug-94	Dissolved	ug/L	62	699	1.4E+03	9.7E+01	4E-02	6E-01
Nickel	North Branch French Gulch	FG-6A	22-Sep-92	Dissolved	ug/L	38	440	1.4E+03	9.7E+01	3E-02	4E-01
Nickel	North Branch French Gulch	FG-6A	16-Nov-93	Dissolved	ug/L	69	625	1.4E+03	9.7E+01	5E-02	7E-01
Nickel	North Branch French Gulch	FG-6A	11-Jun-96	Dissolved	ug/L	88.9	722	1.4E+03	9.7E+01	6E-02	9E-01
Nickel	North Branch French Gulch	FG-6B	23-Aug-94	Dissolved	ug/L	169	1362	1.4E+03	9.7E+01	1E-01	**2E+00**
Nickel	North Branch French Gulch	FG-6B	22-Jul-96	Dissolved	ug/L	170.2	1230	1.4E+03	9.7E+01	1E-01	**2E+00**
Nickel	North Branch French Gulch	FG-6C	23-Sep-99	Dissolved	ug/L	120	1010	1.4E+03	9.7E+01	9E-02	1E+00
Nickel	North Branch French Gulch	FG-6C	07-Oct-99	Dissolved	ug/L	130	957	1.4E+03	9.7E+01	9E-02	1E+00
Nickel	North Branch French Gulch	FG-6C	02-Nov-99	Dissolved	ug/L	120	996	1.4E+03	9.7E+01	9E-02	1E+00
Nickel	North Branch French Gulch	FG-6C	17-Nov-99	Dissolved	ug/L	130	972	1.4E+03	9.7E+01	9E-02	1E+00
Nickel	North Branch French Gulch	FG-6C	05-Sep-99	Dissolved	ug/L	110	882	1.4E+03	9.7E+01	8E-02	1E+00
Nickel	North Branch French Gulch	FG-6C	22-Jul-96	Dissolved	ug/L	281.7	1720	1.4E+03	9.7E+01	2E-01	**3E+00**
Nickel	North Branch French Gulch	FG-6C	05-Sep-99	Dissolved	ug/L	110	882	1.4E+03	9.7E+01	8E-02	1E+00
Nickel	North Branch French Gulch	FG-6C	11-Jun-96	Dissolved	ug/L	364.7	2020	1.4E+03	9.7E+01	3E-01	**4E+00**
Nickel	North Branch French Gulch	FG-6C	19-Aug-99	Dissolved	ug/L	100	659	1.4E+03	9.7E+01	7E-02	1E+00
Nickel	North Branch French Gulch	FG-6C	13-Sep-99	Dissolved	ug/L	130	839	1.4E+03	9.7E+01	9E-02	1E+00
Nickel	North Branch French Gulch	FG-6C	05-Sep-99	Dissolved	ug/L	100	882	1.4E+03	9.7E+01	7E-02	1E+00
Nickel	North Branch French Gulch	FG-7	05-Sep-99	Dissolved	ug/L	10	184	7.8E+02	8.7E+01	1E-02	1E-01
Nickel	North Branch French Gulch	FG-7	19-Aug-99	Dissolved	ug/L	10	196	8.3E+02	9.2E+01	1E-02	1E-01
Nickel	North Branch French Gulch	FG-7	16-Nov-93	Dissolved	ug/L	7.5	120	5.5E+02	6.1E+01	1E-02	1E-01
Nickel	North Branch French Gulch	FG-7	23-Aug-94	Dissolved	ug/L	6	93	4.4E+02	4.9E+01	1E-02	1E-01
Nickel	North Branch French Gulch	FG-7	21-Oct-93	Dissolved	ug/L	7.5	123	5.6E+02	6.2E+01	1E-02	1E-01
Nickel	North Branch French Gulch	FG-7	22-Jul-96	Dissolved	ug/L	5	96	4.5E+02	5.0E+01	1E-02	1E-01
Nickel	North Branch French Gulch	FG-7	05-Jun-96	Dissolved	ug/L	2	58	3.0E+02	3.3E+01	7E-03	6E-02
Nickel	North Branch French Gulch	FG-7	25-May-96	Dissolved	ug/L	2	62	3.1E+02	3.5E+01	6E-03	6E-02
Nickel	North Branch French Gulch	FG-7	22-Sep-92	Dissolved	ug/L	15	102	4.8E+02	5.3E+01	3E-02	3E-01
Nickel	North Branch French Gulch	FG-7	25-May-96	Dissolved	ug/L	0.5	58	3.0E+02	3.3E+01	2E-03	2E-02
Nickel	North Branch French Gulch	FG-7	07-Oct-99	Dissolved	ug/L	10	182	7.8E+02	8.6E+01	1E-02	1E-01
Nickel	North Branch French Gulch	FG-7	01-Nov-99	Dissolved	ug/L	10	203	8.5E+02	9.5E+01	1E-02	1E-01
Nickel	North Branch French Gulch	FG-7	17-Nov-99	Dissolved	ug/L	20	201	8.5E+02	9.4E+01	2E-02	2E-01
Nickel	North Branch French Gulch	FG-7	14-Sep-99	Dissolved	ug/L	5	189	8.0E+02	8.9E+01	6E-03	6E-02
Nickel	North Branch French Gulch	FG-7	23-Sep-99	Dissolved	ug/L	10	201	8.5E+02	9.4E+01	1E-02	1E-01
Nickel	North Branch French Gulch	FG-7	11-Jun-96	Dissolved	ug/L	5	68	3.4E+02	3.7E+01	1E-02	1E-01
Nickel	North Branch French Gulch	TS-3	23-May-96	Dissolved	ug/L	0.5	46	2.4E+02	2.7E+01	2E-03	2E-02
Nickel	North Branch French Gulch	TS-4	25-May-96	Dissolved	ug/L	0.5	47	2.5E+02	2.7E+01	2E-03	2E-02
Nickel	North Branch French Gulch	TS-4	06-Jun-96	Dissolved	ug/L	0.5	53	2.7E+02	3.0E+01	2E-03	2E-02

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Nickel	French Gulch Reference	FG-0	22-Sep-92	Dissolved	ug/L	15	47	2.5E+02	2.8E+01	6E-02	5E-01
Nickel	French Gulch Reference	FG-0	23-May-96	Dissolved	ug/L	0.5	34	1.9E+02	2.1E+01	3E-03	2E-02
Nickel	French Gulch Reference	FG-1	23-May-96	Dissolved	ug/L	0.5	34	1.9E+02	2.1E+01	3E-03	2E-02
Nickel	French Gulch Reference	FG-1	25-Oct-95	Dissolved	ug/L	0.5	48	2.5E+02	2.8E+01	2E-03	2E-02
Nickel	French Gulch Reference	FG-1	22-Jul-96	Dissolved	ug/L	5	41	2.2E+02	2.4E+01	2E-02	2E-01
Nickel	French Gulch Reference	FG-1	22-Sep-92	Dissolved	ug/L	15	53	2.7E+02	3.0E+01	5E-02	5E-01
Nickel	French Gulch Reference	FG-1	12-Jun-96	Dissolved	ug/L	5	37	2.0E+02	2.3E+01	2E-02	2E-01
Nickel	French Gulch Reference	FG-2	22-Sep-92	Dissolved	ug/L	15	55	2.8E+02	3.1E+01	5E-02	5E-01
Nickel	French Gulch Reference	FG-3	22-Sep-92	Dissolved	ug/L	15	62	3.1E+02	3.4E+01	5E-02	4E-01
Nickel	French Gulch Reference	FG-3	22-Jul-96	Dissolved	ug/L	5	46	2.4E+02	2.7E+01	2E-02	2E-01
Nickel	French Gulch Reference	FG-3	12-Jun-96	Dissolved	ug/L	5	39	2.1E+02	2.3E+01	2E-02	2E-01
Nickel	French Gulch	FG-10	02-Nov-99	Dissolved	ug/L	5	85	4.1E+02	4.5E+01	1E-02	1E-01
Nickel	French Gulch	FG-9	16-Nov-93	Dissolved	ug/L	7.5	125	5.6E+02	6.3E+01	1E-02	1E-01
Nickel	French Gulch	FG-9	13-Sep-99	Dissolved	ug/L	5	92	4.4E+02	4.8E+01	1E-02	1E-01
Nickel	French Gulch	FG-9	10-Jun-96	Dissolved	ug/L	5	65	3.3E+02	3.6E+01	2E-02	1E-01
Nickel	French Gulch	FG-9	16-Jan-97	Dissolved	ug/L	4	140	6.2E+02	6.9E+01	6E-03	6E-02
Nickel	French Gulch	FG-9	23-Sep-99	Dissolved	ug/L	5	102	4.8E+02	5.3E+01	1E-02	9E-02
Nickel	French Gulch	FG-9	15-Aug-96	Dissolved	ug/L	3	99	4.6E+02	5.2E+01	6E-03	6E-02
Nickel	French Gulch	FG-9	08-Oct-96	Dissolved	ug/L	3	110	5.1E+02	5.6E+01	6E-03	5E-02
Nickel	French Gulch	FG-9	13-Nov-96	Dissolved	ug/L	3	120	5.5E+02	6.1E+01	5E-03	5E-02
Nickel	French Gulch	FG-9	19-Jan-96	Dissolved	ug/L	4	150	6.6E+02	7.3E+01	6E-03	5E-02
Nickel	French Gulch	FG-9	21-Oct-93	Dissolved	ug/L	7.5	121	5.5E+02	6.1E+01	1E-02	1E-01
Nickel	French Gulch	FG-9	23-Aug-94	Dissolved	ug/L	6	102	4.7E+02	5.3E+01	1E-02	1E-01
Nickel	French Gulch	FG-9	17-Apr-96	Dissolved	ug/L	5	160	7.0E+02	7.7E+01	7E-03	6E-02
Nickel	French Gulch	FG-9	22-Feb-96	Dissolved	ug/L	5	150	6.6E+02	7.3E+01	8E-03	7E-02
Nickel	French Gulch	FG-9	13-Dec-96	Dissolved	ug/L	5	140	6.2E+02	6.9E+01	8E-03	7E-02
Nickel	French Gulch	FG-9	21-Feb-97	Dissolved	ug/L	4	160	7.0E+02	7.7E+01	6E-03	5E-02
Nickel	French Gulch	FG-9	05-Sep-99	Dissolved	ug/L	5	85	4.1E+02	4.5E+01	1E-02	1E-01
Nickel	French Gulch	FG-9	19-Aug-99	Dissolved	ug/L	5	87	4.2E+02	4.6E+01	1E-02	1E-01
Nickel	French Gulch	FG-9	22-Jul-96	Dissolved	ug/L	5	84	4.0E+02	4.5E+01	1E-02	1E-01
Nickel	French Gulch	FG-9	21-Mar-96	Dissolved	ug/L	4	140	6.2E+02	6.9E+01	6E-03	6E-02
Nickel	French Gulch	FG-9	21-Jun-96	Dissolved	ug/L	2	62	3.1E+02	3.5E+01	6E-03	6E-02
Nickel	French Gulch	FG-9	26-May-96	Dissolved	ug/L	2	62	3.1E+02	3.5E+01	6E-03	6E-02
Nickel	French Gulch	FG-9	08-Oct-99	Dissolved	ug/L	5	95	4.5E+02	5.0E+01	1E-02	1E-01
Nickel	French Gulch	FG-9	23-Oct-95	Dissolved	ug/L	2	110	5.1E+02	5.6E+01	4E-03	4E-02
Nickel	French Gulch	FG-9	21-Nov-95	Dissolved	ug/L	2	120	5.5E+02	6.1E+01	4E-03	3E-02
Nickel	French Gulch	FG-9	09-Sep-96	Dissolved	ug/L	2	110	5.1E+02	5.6E+01	4E-03	4E-02
Nickel	French Gulch	FG-9	18-Jul-96	Dissolved	ug/L	3	18	1.1E+02	1.2E+01	3E-02	2E-01
Nickel	French Gulch	FG-9	17-Nov-99	Dissolved	ug/L	5	113	5.2E+02	5.8E+01	1E-02	9E-02
Nickel	French Gulch	FG-9	02-Nov-99	Dissolved	ug/L	5	108	5.0E+02	5.6E+01	1E-02	9E-02
Nickel	French Gulch	FG-9	22-May-96	Dissolved	ug/L	3	75	3.7E+02	4.1E+01	8E-03	7E-02
Nickel	French Gulch	FG-9A	11-Jun-96	Dissolved	ug/L	5	65	3.3E+02	3.6E+01	2E-02	1E-01
Nickel	French Gulch	FG-9A	22-Jul-96	Dissolved	ug/L	5	85	4.1E+02	4.5E+01	1E-02	1E-01
Nickel	French Gulch	FG-9A	23-Aug-94	Dissolved	ug/L	6	96	4.5E+02	5.0E+01	1E-02	1E-01
Nickel	Discharge	CBMA-1	23-Jul-96	Dissolved	ug/L	10	224	9.3E+02	9.7E+01	1E-02	1E-01

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Nickel	Discharge	KDS	24-Aug-94	Dissolved	ug/L	6	222	9.2E+02	9.7E+01	7E-03	6E-02
Nickel	Discharge	KDS	13-Jun-96	Dissolved	ug/L	40.9	296	1.2E+03	9.7E+01	3E-02	4E-01
Nickel	Discharge	MGB-1	23-Jul-96	Dissolved	ug/L	10	82	4.0E+02	4.4E+01	3E-02	2E-01
Nickel	Discharge	RLCVT-1	23-Jul-96	Dissolved	ug/L	10	86	4.1E+02	4.6E+01	2E-02	2E-01
Nickel	Discharge	WP-1	12-Jun-96	Dissolved	ug/L	1377	4980	1.4E+03	9.7E+01	1E+00	**1E+01**
Nickel	Blue River Reference	BR-1	10-Jun-96	Dissolved	ug/L	5	54	2.8E+02	3.1E+01	2E-02	2E-01
Nickel	Blue River Reference	BR-1	23-Jul-96	Dissolved	ug/L	5	42	2.2E+02	2.5E+01	2E-02	2E-01
Nickel	Blue River Reference	BR-1	19-Aug-99	Dissolved	ug/L	5	61	3.1E+02	3.4E+01	2E-02	1E-01
Nickel	Blue River Reference	BR-1	17-Nov-99	Dissolved	ug/L	5	69	3.4E+02	3.8E+01	1E-02	1E-01
Nickel	Blue River Reference	BR-1	23-Sep-99	Dissolved	ug/L	5	71	3.5E+02	3.9E+01	1E-02	1E-01
Nickel	Blue River Reference	BR-1	21-Oct-93	Dissolved	ug/L	7.5	71	3.5E+02	3.9E+01	2E-02	2E-01
Nickel	Blue River Reference	BR-1	22-Sep-92	Dissolved	ug/L	15	66	3.3E+02	3.6E+01	5E-02	4E-01
Nickel	Blue River Reference	BR-1	07-Oct-99	Dissolved	ug/L	5	71	3.5E+02	3.9E+01	1E-02	1E-01
Nickel	Blue River Reference	BR-1	23-Sep-99	Dissolved	ug/L	5	72	3.5E+02	3.9E+01	1E-02	1E-01
Nickel	Blue River Reference	BR-1	01-Nov-99	Dissolved	ug/L	5	71	3.5E+02	3.9E+01	1E-02	1E-01
Nickel	Blue River Reference	BR-1	17-Nov-99	Dissolved	ug/L	5	70	3.5E+02	3.8E+01	1E-02	1E-01
Nickel	Blue River Reference	BR-1	16-Nov-93	Dissolved	ug/L	7.5	67	3.3E+02	3.7E+01	2E-02	2E-01
Nickel	Blue River Reference	BR-1	23-Aug-94	Dissolved	ug/L	6	61	3.1E+02	3.4E+01	2E-02	2E-01
Nickel	Blue River Reference	BR-1	05-Sep-99	Dissolved	ug/L	5	60	3.0E+02	3.4E+01	2E-02	1E-01
Nickel	Blue River Reference	BR-1	14-Sep-99	Dissolved	ug/L	5	63	3.2E+02	3.5E+01	2E-02	1E-01
Nickel	Blue River Reference	BR-Adams St	21-May-96	Dissolved	ug/L	0.5	57	2.9E+02	3.2E+01	2E-03	2E-02
Nickel	Blue River Reference	BR-Adams St	24-Oct-95	Dissolved	ug/L	0.5	68	3.4E+02	3.8E+01	1E-03	1E-02
Nickel	Blue River	BR-2	02-Nov-99	Dissolved	ug/L	5	108	5.0E+02	5.6E+01	1E-02	9E-02
Nickel	Blue River	BR-2	23-Jul-96	Dissolved	ug/L	5	49	2.6E+02	2.8E+01	2E-02	2E-01
Nickel	Blue River	BR-2	07-Oct-99	Dissolved	ug/L	5	91	4.3E+02	4.8E+01	1E-02	1E-01
Nickel	Blue River	BR-2	19-Aug-99	Dissolved	ug/L	5	75	3.7E+02	4.1E+01	1E-02	1E-01
Nickel	Blue River	BR-2	05-Sep-99	Dissolved	ug/L	5	81	3.9E+02	4.4E+01	1E-02	1E-01
Nickel	Blue River	BR-2	21-Oct-93	Dissolved	ug/L	7.5	121	5.5E+02	6.1E+01	1E-02	1E-01
Nickel	Blue River	BR-2	22-Sep-92	Dissolved	ug/L	15	102	4.8E+02	5.3E+01	3E-02	3E-01
Nickel	Blue River	BR-2	22-Aug-94	Dissolved	ug/L	6	76	3.7E+02	4.1E+01	2E-02	1E-01
Nickel	Blue River	BR-2	14-Sep-99	Dissolved	ug/L	5	89	4.2E+02	4.7E+01	1E-02	1E-01
Nickel	Blue River	BR-2	23-Sep-99	Dissolved	ug/L	5	93	4.4E+02	4.9E+01	1E-02	1E-01
Nickel	Blue River	BR-2	14-Sep-99	Dissolved	ug/L	5	88	4.2E+02	4.7E+01	1E-02	1E-01
Nickel	Blue River	BR-2	16-Nov-93	Dissolved	ug/L	7.5	126	5.7E+02	6.3E+01	1E-02	1E-01
Nickel	Blue River	BR-2	17-Nov-99	Dissolved	ug/L	5	103	4.8E+02	5.3E+01	1E-02	9E-02
Nickel	Blue River	BR-2	10-Jun-96	Dissolved	ug/L	5	58	3.0E+02	3.3E+01	2E-02	2E-01
Nickel	Blue River	BR-3	23-Sep-99	Dissolved	ug/L	5	72	3.5E+02	3.9E+01	1E-02	1E-01
Nickel	Blue River	BR-3	17-Nov-99	Dissolved	ug/L	5	70	3.5E+02	3.8E+01	1E-02	1E-01
Nickel	Blue River	BR-3	07-Oct-99	Dissolved	ug/L	5	60	3.0E+02	3.4E+01	2E-02	1E-01
Nickel	Blue River	BR-3	07-Oct-99	Dissolved	ug/L	5	73	3.6E+02	4.0E+01	1E-02	1E-01
Nickel	Blue River	BR-3	01-Nov-99	Dissolved	ug/L	5	74	3.6E+02	4.0E+01	1E-02	1E-01
Nickel	Blue River	BR-3	16-Nov-93	Dissolved	ug/L	7.5	75	3.7E+02	4.1E+01	2E-02	2E-01
Nickel	Blue River	BR-3	21-Oct-93	Dissolved	ug/L	7.5	76	3.7E+02	4.1E+01	2E-02	2E-01
Nickel	Blue River	BR-3	10-Jun-96	Dissolved	ug/L	5	54	2.8E+02	3.1E+01	2E-02	2E-01
Nickel	Blue River	BR-3	22-Aug-94	Dissolved	ug/L	6	70	3.4E+02	3.8E+01	2E-02	2E-01

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Nickel	Blue River	BR-3	19-Aug-99	Dissolved	ug/L	5	65	3.3E+02	3.6E+01	2E-02	1E-01
Nickel	Blue River	BR-3	23-Jul-96	Dissolved	ug/L	5	50	2.6E+02	2.9E+01	2E-02	2E-01
Nickel	Blue River	BR-3	05-Sep-99	Dissolved	ug/L	5	63	3.2E+02	3.5E+01	2E-02	1E-01
Nickel	Blue River	BR-3	14-Sep-99	Dissolved	ug/L	5	69	3.4E+02	3.8E+01	1E-02	1E-01
Nickel	Blue River	BR-4	22-Sep-92	Dissolved	ug/L	15	73	3.6E+02	4.0E+01	4E-02	4E-01
Nickel	Blue River	BR-5	22-Sep-92	Dissolved	ug/L	15	72	3.5E+02	3.9E+01	4E-02	4E-01
Nickel	Blue River	BR-5	23-Jul-96	Dissolved	ug/L	5	52	2.7E+02	3.0E+01	2E-02	2E-01
Nickel	Blue River	BR-5	23-Jul-96	Dissolved	ug/L	5	52	2.7E+02	3.0E+01	2E-02	2E-01
Nickel	Blue River	BR-BFG	22-May-96	Dissolved	ug/L	0.5	59	3.0E+02	3.3E+01	2E-03	2E-02
Nickel	Blue River	BR-BFG	25-Oct-95	Dissolved	ug/L	1	86	4.1E+02	4.6E+01	2E-03	2E-02
Nickel	Blue River	BR-Dillon	24-May-96	Dissolved	ug/L	0.5	47	2.5E+02	2.7E+01	2E-03	2E-02
Nickel	Blue River	BR-Dillon	26-Oct-95	Dissolved	ug/L	0.5	66	3.3E+02	3.7E+01	2E-03	1E-02
Silver	South Branch French Gulch	FG-4	22-Sep-92	Dissolved	ug/L	0.5	61	1.5E+00	1.7E+00	3E-01	3E-01
Silver	South Branch French Gulch	FG-4	21-Sep-89	Dissolved	ug/L	0.1	58	1.4E+00	1.7E+00	7E-02	6E-02
Silver	South Branch French Gulch	FG-5	22-Sep-92	Dissolved	ug/L	0.5	62	1.5E+00	1.7E+00	3E-01	3E-01
Silver	South Branch French Gulch	FG-5	23-Aug-94	Dissolved	ug/L	0.15	54	1.2E+00	1.7E+00	1E-01	9E-02
Silver	South Branch French Gulch	FG-5	04-May-89	Dissolved	ug/L	0.1	84	2.6E+00	1.7E+00	4E-02	6E-02
Silver	South Branch French Gulch	FG-5	21-Oct-93	Dissolved	ug/L	0.15	66	1.7E+00	1.7E+00	9E-02	9E-02
Silver	South Branch French Gulch	FG-5	16-Nov-93	Dissolved	ug/L	0.15	65	1.7E+00	1.7E+00	9E-02	9E-02
Silver	South Branch French Gulch	FG-5	22-Jul-96	Dissolved	ug/L	0.1	46	9.1E-01	1.7E+00	1E-01	6E-02
Silver	South Branch French Gulch	FG-5	11-Jun-96	Dissolved	ug/L	0.1	37	6.4E-01	1.7E+00	2E-01	6E-02
Silver	South Branch French Gulch	FG-8	23-Aug-94	Dissolved	ug/L	0.15	97	3.2E+00	1.7E+00	5E-02	9E-02
Silver	South Branch French Gulch	FG-8	21-Sep-89	Dissolved	ug/L	0.1	92	3.0E+00	1.7E+00	3E-02	6E-02
Silver	South Branch French Gulch	FG-8	22-Jul-96	Dissolved	ug/L	0.1	64	1.6E+00	1.7E+00	6E-02	6E-02
Silver	South Branch French Gulch	FG-8	16-Nov-93	Dissolved	ug/L	0.15	109	4.0E+00	1.7E+00	4E-02	9E-02
Silver	South Branch French Gulch	FG-8	11-Jun-96	Dissolved	ug/L	0.1	55	1.2E+00	1.7E+00	8E-02	6E-02
Silver	South Branch French Gulch	FG-8	04-May-89	Dissolved	ug/L	0.1	97	3.3E+00	1.7E+00	3E-02	6E-02
Silver	South Branch French Gulch	FG-8	21-Oct-93	Dissolved	ug/L	0.15	109	4.0E+00	1.7E+00	4E-02	9E-02
Silver	South Branch French Gulch	FG-8	22-Sep-92	Dissolved	ug/L	0.5	95	3.1E+00	1.7E+00	2E-01	3E-01
Silver	North Branch French Gulch	1121	13-Jun-96	Dissolved	ug/L	0.1	215	1.3E+01	1.7E+00	8E-03	6E-02
Silver	North Branch French Gulch	1121	23-Jul-96	Dissolved	ug/L	0.2	446	3.0E+01	1.7E+00	7E-03	1E-01
Silver	North Branch French Gulch	1140	13-Jun-96	Dissolved	ug/L	0.1	728	3.0E+01	1.7E+00	3E-03	6E-02
Silver	North Branch French Gulch	FG-6	11-Jun-96	Dissolved	ug/L	0.1	1070	3.0E+01	1.7E+00	3E-03	6E-02
Silver	North Branch French Gulch	FG-6A	21-Sep-89	Dissolved	ug/L	0.1	656	3.0E+01	1.7E+00	3E-03	6E-02
Silver	North Branch French Gulch	FG-6A	21-Oct-93	Dissolved	ug/L	0.15	679	3.0E+01	1.7E+00	5E-03	9E-02
Silver	North Branch French Gulch	FG-6A	22-Jul-96	Dissolved	ug/L	0.1	908	3.0E+01	1.7E+00	3E-03	6E-02
Silver	North Branch French Gulch	FG-6A	11-Jun-96	Dissolved	ug/L	0.1	722	3.0E+01	1.7E+00	3E-03	6E-02
Silver	North Branch French Gulch	FG-6A	04-May-89	Dissolved	ug/L	0.3	580	3.0E+01	1.7E+00	1E-02	2E-01
Silver	North Branch French Gulch	FG-6A	23-Aug-94	Dissolved	ug/L	0.15	699	3.0E+01	1.7E+00	5E-03	9E-02
Silver	North Branch French Gulch	FG-6A	22-Sep-92	Dissolved	ug/L	2.9	440	3.0E+01	1.7E+00	1E-01	**2E+00**
Silver	North Branch French Gulch	FG-6A	16-Nov-93	Dissolved	ug/L	0.15	625	3.0E+01	1.7E+00	5E-03	9E-02
Silver	North Branch French Gulch	FG-6B	23-Aug-94	Dissolved	ug/L	0.15	1362	3.0E+01	1.7E+00	5E-03	9E-02
Silver	North Branch French Gulch	FG-6B	22-Jul-96	Dissolved	ug/L	0.1	1230	3.0E+01	1.7E+00	3E-03	6E-02
Silver	North Branch French Gulch	FG-6C	11-Jun-96	Dissolved	ug/L	0.1	2020	3.0E+01	1.7E+00	3E-03	6E-02
Silver	North Branch French Gulch	FG-6C	22-Jul-96	Dissolved	ug/L	0.1	1720	3.0E+01	1.7E+00	3E-03	6E-02

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Silver	North Branch French Gulch	FG-7	21-Oct-93	Dissolved	ug/L	0.15	123	4.9E+00	1.7E+00	3E-02	9E-02
Silver	North Branch French Gulch	FG-7	22-Sep-92	Dissolved	ug/L	0.5	102	3.6E+00	1.7E+00	1E-01	3E-01
Silver	North Branch French Gulch	FG-7	04-May-89	Dissolved	ug/L	0.1	200	1.1E+01	1.7E+00	9E-03	6E-02
Silver	North Branch French Gulch	FG-7	05-Jun-96	Dissolved	ug/L	0.5	58	1.4E+00	1.7E+00	4E-01	3E-01
Silver	North Branch French Gulch	FG-7	16-Nov-93	Dissolved	ug/L	0.15	120	4.7E+00	1.7E+00	3E-02	9E-02
Silver	North Branch French Gulch	FG-7	23-Aug-94	Dissolved	ug/L	0.15	93	3.0E+00	1.7E+00	5E-02	9E-02
Silver	North Branch French Gulch	FG-7	22-Jul-96	Dissolved	ug/L	0.1	96	3.2E+00	1.7E+00	3E-02	6E-02
Silver	North Branch French Gulch	FG-7	25-May-96	Dissolved	ug/L	0.5	--	nc	1.7E+00	nc	3E-01
Silver	North Branch French Gulch	FG-7	11-Jun-96	Dissolved	ug/L	0.1	68	1.8E+00	1.7E+00	6E-02	6E-02
Silver	North Branch French Gulch	TS-3	23-May-96	Dissolved	ug/L	0.5	46	9.1E-01	1.7E+00	6E-01	3E-01
Silver	North Branch French Gulch	TS-4	25-May-96	Dissolved	ug/L	0.5	47	9.4E-01	1.7E+00	5E-01	3E-01
Silver	North Branch French Gulch	TS-4	06-Jun-96	Dissolved	ug/L	0.5	53	1.2E+00	1.7E+00	4E-01	3E-01
Silver	French Gulch Reference	FG-0	22-Sep-92	Dissolved	ug/L	0.5	47	9.5E-01	1.7E+00	5E-01	3E-01
Silver	French Gulch Reference	FG-0	23-May-96	Dissolved	ug/L	0.5	34	5.4E-01	1.7E+00	9E-01	3E-01
Silver	French Gulch Reference	FG-0	21-Sep-89	Dissolved	ug/L	0.1	58	1.4E+00	1.7E+00	7E-02	6E-02
Silver	French Gulch Reference	FG-1	04-May-89	Dissolved	ug/L	0.1	69	1.8E+00	1.7E+00	5E-02	6E-02
Silver	French Gulch Reference	FG-1	22-Sep-92	Dissolved	ug/L	0.5	53	1.2E+00	1.7E+00	4E-01	3E-01
Silver	French Gulch Reference	FG-1	22-Jul-96	Dissolved	ug/L	0.1	41	7.3E-01	1.7E+00	1E-01	6E-02
Silver	French Gulch Reference	FG-1	25-Oct-95	Dissolved	ug/L	0.5	48	9.8E-01	1.7E+00	5E-01	3E-01
Silver	French Gulch Reference	FG-1	12-Jun-96	Dissolved	ug/L	0.1	37	6.3E-01	1.7E+00	2E-01	6E-02
Silver	French Gulch Reference	FG-1	23-May-96	Dissolved	ug/L	0.5	34	5.4E-01	1.7E+00	9E-01	3E-01
Silver	French Gulch Reference	FG-2	21-Sep-89	Dissolved	ug/L	0.1	60	1.4E+00	1.7E+00	7E-02	6E-02
Silver	French Gulch Reference	FG-2	22-Sep-92	Dissolved	ug/L	0.5	55	1.2E+00	1.7E+00	4E-01	3E-01
Silver	French Gulch Reference	FG-2	04-May-89	Dissolved	ug/L	0.1	67	1.7E+00	1.7E+00	6E-02	6E-02
Silver	French Gulch Reference	FG-3	12-Jun-96	Dissolved	ug/L	0.1	39	6.7E-01	1.7E+00	1E-01	6E-02
Silver	French Gulch Reference	FG-3	22-Sep-92	Dissolved	ug/L	0.5	62	1.5E+00	1.7E+00	3E-01	3E-01
Silver	French Gulch Reference	FG-3	22-Jul-96	Dissolved	ug/L	0.1	46	9.2E-01	1.7E+00	1E-01	6E-02
Silver	French Gulch	FG-9	23-Aug-94	Dissolved	ug/L	0.15	102	3.5E+00	1.7E+00	4E-02	9E-02
Silver	French Gulch	FG-9	16-Nov-93	Dissolved	ug/L	0.15	125	5.0E+00	1.7E+00	3E-02	9E-02
Silver	French Gulch	FG-9	10-Jun-96	Dissolved	ug/L	0.1	65	1.6E+00	1.7E+00	6E-02	6E-02
Silver	French Gulch	FG-9	22-Sep-92	Dissolved	ug/L	0.5	103	3.7E+00	1.7E+00	1E-01	3E-01
Silver	French Gulch	FG-9	22-Jul-96	Dissolved	ug/L	0.1	84	2.5E+00	1.7E+00	4E-02	6E-02
Silver	French Gulch	FG-9	21-Oct-93	Dissolved	ug/L	0.15	121	4.8E+00	1.7E+00	3E-02	9E-02
Silver	French Gulch	FG-9	18-Jul-96	Dissolved	ug/L	0.5	18	1.8E-01	1.7E+00	**3E+00**	3E-01
Silver	French Gulch	FG-9	25-Jun-96	Dissolved	ug/L	0.5	65	1.6E+00	1.7E+00	3E-01	3E-01
Silver	French Gulch	FG-9	21-Jun-96	Dissolved	ug/L	0.5	62	1.5E+00	1.7E+00	3E-01	3E-01
Silver	French Gulch	FG-9	26-May-96	Dissolved	ug/L	0.5	62	1.5E+00	1.7E+00	3E-01	3E-01
Silver	French Gulch	FG-9	16-May-96	Dissolved	ug/L	0.5	82	2.5E+00	1.7E+00	2E-01	3E-01
Silver	French Gulch	FG-9	16-Jan-97	Dissolved	ug/L	0.5	140	6.2E+00	1.7E+00	8E-02	3E-01
Silver	French Gulch	FG-9	22-May-96	Dissolved	ug/L	0.5	75	2.1E+00	1.7E+00	2E-01	3E-01
Silver	French Gulch	FG-9	13-Dec-96	Dissolved	ug/L	0.5	140	6.2E+00	1.7E+00	8E-02	3E-01
Silver	French Gulch	FG-9	13-Nov-96	Dissolved	ug/L	0.5	120	4.7E+00	1.7E+00	1E-01	3E-01
Silver	French Gulch	FG-9	21-Feb-97	Dissolved	ug/L	0.5	160	7.7E+00	1.7E+00	6E-02	3E-01
Silver	French Gulch	FG-9	08-Oct-96	Dissolved	ug/L	0.5	110	4.1E+00	1.7E+00	1E-01	3E-01
Silver	French Gulch	FG-9	09-Sep-96	Dissolved	ug/L	0.5	110	4.1E+00	1.7E+00	1E-01	3E-01

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Silver	French Gulch	FG-9	15-Aug-96	Dissolved	ug/L	0.5	99	3.4E+00	1.7E+00	1E-01	3E-01
Silver	French Gulch	FG-9	19-Jan-96	Dissolved	ug/L	0.5	150	6.9E+00	1.7E+00	7E-02	3E-01
Silver	French Gulch	FG-9	23-Oct-95	Dissolved	ug/L	0.5	110	4.1E+00	1.7E+00	1E-01	3E-01
Silver	French Gulch	FG-9	21-Nov-95	Dissolved	ug/L	0.5	120	4.7E+00	1.7E+00	1E-01	3E-01
Silver	French Gulch	FG-9	21-Sep-89	Dissolved	ug/L	0.1	102	3.6E+00	1.7E+00	3E-02	6E-02
Silver	French Gulch	FG-9	04-May-89	Dissolved	ug/L	0.1	140	6.2E+00	1.7E+00	2E-02	6E-02
Silver	French Gulch	FG-9	17-Apr-96	Dissolved	ug/L	0.5	160	7.7E+00	1.7E+00	6E-02	3E-01
Silver	French Gulch	FG-9	21-Mar-96	Dissolved	ug/L	0.5	140	6.2E+00	1.7E+00	8E-02	3E-01
Silver	French Gulch	FG-9	22-Feb-96	Dissolved	ug/L	0.5	150	6.9E+00	1.7E+00	7E-02	3E-01
Silver	French Gulch	FG-9A	23-Aug-94	Dissolved	ug/L	0.15	96	3.2E+00	1.7E+00	5E-02	9E-02
Silver	French Gulch	FG-9A	22-Jul-96	Dissolved	ug/L	0.1	85	2.6E+00	1.7E+00	4E-02	6E-02
Silver	French Gulch	FG-9A	11-Jun-96	Dissolved	ug/L	0.1	65	1.6E+00	1.7E+00	6E-02	6E-02
Silver	Discharge	CBMA-1	23-Jul-96	Dissolved	ug/L	0.2	224	1.4E+01	1.7E+00	1E-02	1E-01
Silver	Discharge	KDS	24-Aug-94	Dissolved	ug/L	0.15	222	1.4E+01	1.7E+00	1E-02	9E-02
Silver	Discharge	KDS	13-Jun-96	Dissolved	ug/L	0.1	296	2.2E+01	1.7E+00	4E-03	6E-02
Silver	Discharge	MGB-1	23-Jul-96	Dissolved	ug/L	0.2	82	2.5E+00	1.7E+00	8E-02	1E-01
Silver	Discharge	RLCVT-1	23-Jul-96	Dissolved	ug/L	0.2	86	2.7E+00	1.7E+00	8E-02	1E-01
Silver	Discharge	WP-1	12-Jun-96	Dissolved	ug/L	1	4980	3.0E+01	1.7E+00	3E-02	6E-01
Silver	Blue River Reference	BR-1	23-Jul-96	Dissolved	ug/L	0.1	42	7.7E-01	1.7E+00	1E-01	6E-02
Silver	Blue River Reference	BR-1	16-Nov-93	Dissolved	ug/L	0.15	67	1.7E+00	1.7E+00	9E-02	9E-02
Silver	Blue River Reference	BR-1	04-May-89	Dissolved	ug/L	0.1	67	1.7E+00	1.7E+00	6E-02	6E-02
Silver	Blue River Reference	BR-1	21-Sep-89	Dissolved	ug/L	0.1	58	1.4E+00	1.7E+00	7E-02	6E-02
Silver	Blue River Reference	BR-1	21-Oct-93	Dissolved	ug/L	0.15	71	1.9E+00	1.7E+00	8E-02	9E-02
Silver	Blue River Reference	BR-1	22-Sep-92	Dissolved	ug/L	0.5	66	1.7E+00	1.7E+00	3E-01	3E-01
Silver	Blue River Reference	BR-1	10-Jun-96	Dissolved	ug/L	0.1	54	1.2E+00	1.7E+00	8E-02	6E-02
Silver	Blue River Reference	BR-1	23-Aug-94	Dissolved	ug/L	0.15	61	1.5E+00	1.7E+00	1E-01	9E-02
Silver	Blue River Reference	BR-Adams St	24-Oct-95	Dissolved	ug/L	0.5	68	1.8E+00	1.7E+00	3E-01	3E-01
Silver	Blue River Reference	BR-Adams St	21-May-96	Dissolved	ug/L	0.5	57	1.3E+00	1.7E+00	4E-01	3E-01
Silver	Blue River	BR-2	16-Nov-93	Dissolved	ug/L	0.15	126	5.1E+00	1.7E+00	3E-02	9E-02
Silver	Blue River	BR-2	21-Oct-93	Dissolved	ug/L	0.15	121	4.8E+00	1.7E+00	3E-02	9E-02
Silver	Blue River	BR-2	21-Sep-89	Dissolved	ug/L	0.1	108	3.9E+00	1.7E+00	3E-02	6E-02
Silver	Blue River	BR-2	04-May-89	Dissolved	ug/L	0.1	140	6.2E+00	1.7E+00	2E-02	6E-02
Silver	Blue River	BR-2	10-Jun-96	Dissolved	ug/L	0.1	58	1.4E+00	1.7E+00	7E-02	6E-02
Silver	Blue River	BR-2	23-Jul-96	Dissolved	ug/L	0.1	49	1.0E+00	1.7E+00	1E-01	6E-02
Silver	Blue River	BR-2	22-Aug-94	Dissolved	ug/L	0.15	76	2.2E+00	1.7E+00	7E-02	9E-02
Silver	Blue River	BR-2	22-Sep-92	Dissolved	ug/L	0.5	102	3.6E+00	1.7E+00	1E-01	3E-01
Silver	Blue River	BR-3	21-Oct-93	Dissolved	ug/L	0.15	76	2.1E+00	1.7E+00	7E-02	9E-02
Silver	Blue River	BR-3	16-Nov-93	Dissolved	ug/L	0.15	75	2.1E+00	1.7E+00	7E-02	9E-02
Silver	Blue River	BR-3	10-Jun-96	Dissolved	ug/L	0.1	54	1.2E+00	1.7E+00	8E-02	6E-02
Silver	Blue River	BR-3	22-Aug-94	Dissolved	ug/L	0.15	70	1.8E+00	1.7E+00	8E-02	9E-02
Silver	Blue River	BR-3	23-Jul-96	Dissolved	ug/L	0.1	50	1.1E+00	1.7E+00	1E-01	6E-02
Silver	Blue River	BR-3	21-Sep-89	Dissolved	ug/L	0.1	68	1.8E+00	1.7E+00	6E-02	6E-02
Silver	Blue River	BR-3	04-May-89	Dissolved	ug/L	0.1	80	2.4E+00	1.7E+00	4E-02	6E-02
Silver	Blue River	BR-4	22-Sep-92	Dissolved	ug/L	0.5	73	2.0E+00	1.7E+00	2E-01	3E-01
Silver	Blue River	BR-5	23-Jul-96	Dissolved	ug/L	0.1	52	1.1E+00	1.7E+00	9E-02	6E-02

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Silver	Blue River	BR-5	22-Sep-92	Dissolved	ug/L	0.5	72	2.0E+00	1.7E+00	3E-01	3E-01
Silver	Blue River	BR-5	23-Jul-96	Dissolved	ug/L	0.1	52	1.1E+00	1.7E+00	9E-02	6E-02
Silver	Blue River	BR-BFG	25-Oct-95	Dissolved	ug/L	0.5	86	2.7E+00	1.7E+00	2E-01	3E-01
Silver	Blue River	BR-BFG	22-May-96	Dissolved	ug/L	0.5	59	1.4E+00	1.7E+00	4E-01	3E-01
Silver	Blue River	BR-Dillon	26-Oct-95	Dissolved	ug/L	0.5	66	1.7E+00	1.7E+00	3E-01	3E-01
Silver	Blue River	BR-Dillon	24-May-96	Dissolved	ug/L	0.5	47	9.4E-01	1.7E+00	5E-01	3E-01
Zinc	South Branch French Gulch	FG-4	22-Sep-92	Dissolved	ug/L	14	61	7.7E+01	7.7E+01	2E-01	2E-01
Zinc	South Branch French Gulch	FG-4	21-Sep-89	Dissolved	ug/L	5	58	7.4E+01	7.4E+01	7E-02	7E-02
Zinc	South Branch French Gulch	FG-5	22-Jul-96	Dissolved	ug/L	32.6	46	6.1E+01	6.1E+01	5E-01	5E-01
Zinc	South Branch French Gulch	FG-5	11-Jun-96	Dissolved	ug/L	23.4	37	5.1E+01	5.1E+01	5E-01	5E-01
Zinc	South Branch French Gulch	FG-5	16-Nov-93	Dissolved	ug/L	109	65	8.2E+01	8.2E+01	1E+00	1E+00
Zinc	South Branch French Gulch	FG-5	21-Oct-93	Dissolved	ug/L	27	66	8.2E+01	8.3E+01	3E-01	3E-01
Zinc	South Branch French Gulch	FG-5	22-Sep-92	Dissolved	ug/L	84	62	7.9E+01	7.9E+01	1E+00	1E+00
Zinc	South Branch French Gulch	FG-5	22-Sep-98	Dissolved	ug/L	20	--	nc	nc	nc	nc
Zinc	South Branch French Gulch	FG-5	3-Nov-98	Dissolved	ug/L	40	--	nc	nc	nc	nc
Zinc	South Branch French Gulch	FG-5	4-May-89	Dissolved	ug/L	10	84	1.0E+02	1.0E+02	1E-01	1E-01
Zinc	South Branch French Gulch	FG-5	10-Jun-99	Dissolved	ug/L	10	--	nc	nc	nc	nc
Zinc	South Branch French Gulch	FG-5	14-Jul-99	Dissolved	ug/L	30	--	nc	nc	nc	nc
Zinc	South Branch French Gulch	FG-5	23-Aug-94	Dissolved	ug/L	37	54	6.9E+01	7.0E+01	5E-01	5E-01
Zinc	South Branch French Gulch	FG-5	5-Sep-99	Dissolved	ug/L	5	52	6.7E+01	6.8E+01	7E-02	7E-02
Zinc	South Branch French Gulch	FG-5	8-Oct-99	Dissolved	ug/L	80	63	7.9E+01	8.0E+01	1E+00	1E+00
Zinc	South Branch French Gulch	FG-5	23-Sep-99	Dissolved	ug/L	20	64	8.0E+01	8.1E+01	2E-01	2E-01
Zinc	South Branch French Gulch	FG-5	13-Sep-99	Dissolved	ug/L	70	60	7.6E+01	7.7E+01	9E-01	9E-01
Zinc	South Branch French Gulch	FG-5	19-Aug-99	Dissolved	ug/L	10	54	7.0E+01	7.0E+01	1E-01	1E-01
Zinc	South Branch French Gulch	FG-5.5	05-Sep-99	Dissolved	ug/L	520	64	8.0E+01	8.1E+01	**6E+00**	**6E+00**
Zinc	South Branch French Gulch	FG-5.5	19-Aug-99	Dissolved	ug/L	660	65	8.1E+01	8.2E+01	**8E+00**	**8E+00**
Zinc	South Branch French Gulch	FG-5.5	5-Sep-99	Dissolved	ug/L	520	64	8.0E+01	8.1E+01	**6E+00**	**6E+00**
Zinc	South Branch French Gulch	FG-5.5	17-Nov-99	Dissolved	ug/L	400	84	1.0E+02	1.0E+02	**4E+00**	**4E+00**
Zinc	South Branch French Gulch	FG-5.5	1-Nov-99	Dissolved	ug/L	380	82	9.9E+01	1.0E+02	**4E+00**	**4E+00**
Zinc	South Branch French Gulch	FG-5.5	7-Oct-99	Dissolved	ug/L	450	76	9.3E+01	9.4E+01	**5E+00**	**5E+00**
Zinc	South Branch French Gulch	FG-5.5	13-Sep-99	Dissolved	ug/L	570	71	8.8E+01	8.8E+01	**7E+00**	**6E+00**
Zinc	South Branch French Gulch	FG-5.5	13-Sep-99	Dissolved	ug/L	570	71	8.8E+01	8.8E+01	**7E+00**	**6E+00**
Zinc	South Branch French Gulch	FG-5.5	23-Sep-99	Dissolved	ug/L	490	75	9.2E+01	9.3E+01	**5E+00**	**5E+00**
Zinc	South Branch French Gulch	FG-5.5	7-Oct-99	Dissolved	ug/L	450	76	9.3E+01	9.4E+01	**5E+00**	**5E+00**
Zinc	South Branch French Gulch	FG-5.5	23-Sep-99	Dissolved	ug/L	490	75	9.2E+01	9.3E+01	**5E+00**	**5E+00**
Zinc	South Branch French Gulch	FG-8	10-Jun-99	Dissolved	ug/L	300	--	nc	nc	nc	nc
Zinc	South Branch French Gulch	FG-8	22-Jul-96	Dissolved	ug/L	658.7	64	8.0E+01	8.1E+01	**8E+00**	**8E+00**
Zinc	South Branch French Gulch	FG-8	14-Jul-99	Dissolved	ug/L	500	--	nc	nc	nc	nc
Zinc	South Branch French Gulch	FG-8	23-Aug-94	Dissolved	ug/L	941	97	1.1E+02	1.1E+02	**8E+00**	**8E+00**
Zinc	South Branch French Gulch	FG-8	11-Jun-96	Dissolved	ug/L	753.5	55	7.1E+01	7.1E+01	**1E+01**	**1E+01**
Zinc	South Branch French Gulch	FG-8	16-Nov-93	Dissolved	ug/L	1479	109	1.3E+02	1.3E+02	**1E+01**	**1E+01**
Zinc	South Branch French Gulch	FG-8	21-Oct-93	Dissolved	ug/L	792	109	1.3E+02	1.3E+02	**6E+00**	**6E+00**
Zinc	South Branch French Gulch	FG-8	22-Sep-92	Dissolved	ug/L	1516	95	1.1E+02	1.1E+02	**1E+01**	**1E+01**
Zinc	South Branch French Gulch	FG-8	04-May-89	Dissolved	ug/L	650	97	1.1E+02	1.2E+02	**6E+00**	**6E+00**
Zinc	South Branch French Gulch	FG-8	14-Sep-99	Dissolved	ug/L	540	71	8.8E+01	8.8E+01	**6E+00**	**6E+00**

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Zinc	South Branch French Gulch	FG-8	21-Sep-89	Dissolved	ug/L	460	92	1.1E+02	1.1E+02	**4E+00**	**4E+00**
Zinc	South Branch French Gulch	FG-8	19-Aug-99	Dissolved	ug/L	550	66	8.2E+01	8.3E+01	**7E+00**	**7E+00**
Zinc	South Branch French Gulch	FG-8	05-Sep-99	Dissolved	ug/L	500	66	8.2E+01	8.3E+01	**6E+00**	**6E+00**
Zinc	South Branch French Gulch	FG-8	17-Nov-99	Dissolved	ug/L	720	89	1.1E+02	1.1E+02	**7E+00**	**7E+00**
Zinc	South Branch French Gulch	FG-8	02-Nov-99	Dissolved	ug/L	660	86	1.0E+02	1.0E+02	**6E+00**	**6E+00**
Zinc	South Branch French Gulch	FG-8	08-Oct-99	Dissolved	ug/L	480	73	9.0E+01	9.0E+01	**5E+00**	**5E+00**
Zinc	South Branch French Gulch	FG-8	23-Sep-99	Dissolved	ug/L	490	76	9.3E+01	9.4E+01	**5E+00**	**5E+00**
Zinc	North Branch French Gulch	1121	23-Jul-96	Dissolved	ug/L	50447	446	4.2E+02	2.2E+02	**1E+02**	**2E+02**
Zinc	North Branch French Gulch	1121	13-Jun-96	Dissolved	ug/L	18183	215	2.2E+02	2.2E+02	**8E+01**	**8E+01**
Zinc	North Branch French Gulch	1140	13-Jun-96	Dissolved	ug/L	83845	728	4.6E+02	2.2E+02	**2E+02**	**4E+02**
Zinc	North Branch French Gulch	FG-6	11-Jun-96	Dissolved	ug/L	129150	1070	4.6E+02	2.2E+02	**3E+02**	**6E+02**
Zinc	North Branch French Gulch	FG-6A	23-Aug-94	Dissolved	ug/L	63029	699	4.6E+02	2.2E+02	**1E+02**	**3E+02**
Zinc	North Branch French Gulch	FG-6A	11-Jun-96	Dissolved	ug/L	86202	722	4.6E+02	2.2E+02	**2E+02**	**4E+02**
Zinc	North Branch French Gulch	FG-6A	21-Oct-93	Dissolved	ug/L	69550	679	4.6E+02	2.2E+02	**2E+02**	**3E+02**
Zinc	North Branch French Gulch	FG-6A	22-Jul-96	Dissolved	ug/L	102530	908	4.6E+02	2.2E+02	**2E+02**	**5E+02**
Zinc	North Branch French Gulch	FG-6A	21-Sep-89	Dissolved	ug/L	7000	656	4.6E+02	2.2E+02	**2E+01**	**3E+01**
Zinc	North Branch French Gulch	FG-6A	04-May-89	Dissolved	ug/L	49000	580	4.6E+02	2.2E+02	**1E+02**	**2E+02**
Zinc	North Branch French Gulch	FG-6A	16-Nov-93	Dissolved	ug/L	60400	625	4.6E+02	2.2E+02	**1E+02**	**3E+02**
Zinc	North Branch French Gulch	FG-6A	22-Sep-92	Dissolved	ug/L	41260	440	4.1E+02	2.2E+02	**1E+02**	**2E+02**
Zinc	North Branch French Gulch	FG-6B	22-Jul-96	Dissolved	ug/L	149000	1230	4.6E+02	2.2E+02	**3E+02**	**7E+02**
Zinc	North Branch French Gulch	FG-6B	23-Aug-94	Dissolved	ug/L	173000	1362	4.6E+02	2.2E+02	**4E+02**	**8E+02**
Zinc	North Branch French Gulch	FG-6C	21-Jun-00	Dissolved	ug/L	105000	--	nc	nc	nc	nc
Zinc	North Branch French Gulch	FG-6C	17-Nov-99	Dissolved	ug/L	129000	972	4.6E+02	2.2E+02	**3E+02**	**6E+02**
Zinc	North Branch French Gulch	FG-6C	21-Jun-00	Dissolved	ug/L	100000	--	nc	nc	nc	nc
Zinc	North Branch French Gulch	FG-6C	02-Nov-99	Dissolved	ug/L	125000	996	4.6E+02	2.2E+02	**3E+02**	**6E+02**
Zinc	North Branch French Gulch	FG-6C	13-Apr-00	Dissolved	ug/L	117000	--	nc	nc	nc	nc
Zinc	North Branch French Gulch	FG-6C	07-Apr-99	Dissolved	ug/L	111000	--	nc	nc	nc	nc
Zinc	North Branch French Gulch	FG-6C	07-Oct-99	Dissolved	ug/L	126680	957	4.6E+02	2.2E+02	**3E+02**	**6E+02**
Zinc	North Branch French Gulch	FG-6C	07-May-99	Dissolved	ug/L	123000	956	4.6E+02	2.2E+02	**3E+02**	**6E+02**
Zinc	North Branch French Gulch	FG-6C	05-Sep-99	Dissolved	ug/L	123000	882	4.6E+02	2.2E+02	**3E+02**	**6E+02**
Zinc	North Branch French Gulch	FG-6C	19-Aug-99	Dissolved	ug/L	88200	659	4.6E+02	2.2E+02	**2E+02**	**4E+02**
Zinc	North Branch French Gulch	FG-6C	22-Jul-99	Dissolved	ug/L	110000	742	4.6E+02	2.2E+02	**2E+02**	**5E+02**
Zinc	North Branch French Gulch	FG-6C	05-Sep-99	Dissolved	ug/L	123000	882	4.6E+02	2.2E+02	**3E+02**	**6E+02**
Zinc	North Branch French Gulch	FG-6C	14-Jul-99	Dissolved	ug/L	99500	--	nc	nc	nc	nc
Zinc	North Branch French Gulch	FG-6C	04-Feb-99	Dissolved	ug/L	126000	997	4.6E+02	2.2E+02	**3E+02**	**6E+02**
Zinc	North Branch French Gulch	FG-6C	22-Jul-96	Dissolved	ug/L	244820	1720	4.6E+02	2.2E+02	**5E+02**	**1E+03**
Zinc	North Branch French Gulch	FG-6C	11-Jun-96	Dissolved	ug/L	298190	2020	4.6E+02	2.2E+02	**7E+02**	**1E+03**
Zinc	North Branch French Gulch	FG-6C	05-Sep-99	Dissolved	ug/L	123000	882	4.6E+02	2.2E+02	**3E+02**	**6E+02**
Zinc	North Branch French Gulch	FG-6C	22-Sep-98	Dissolved	ug/L	125000	--	nc	nc	nc	nc
Zinc	North Branch French Gulch	FG-6C	03-Nov-98	Dissolved	ug/L	132000	--	nc	nc	nc	nc
Zinc	North Branch French Gulch	FG-6C	13-Sep-99	Dissolved	ug/L	129000	839	4.6E+02	2.2E+02	**3E+02**	**6E+02**
Zinc	North Branch French Gulch	FG-6C	02-Dec-98	Dissolved	ug/L	130000	--	nc	nc	nc	nc
Zinc	North Branch French Gulch	FG-6C	03-Mar-99	Dissolved	ug/L	116000	--	nc	nc	nc	nc
Zinc	North Branch French Gulch	FG-6C	23-Sep-99	Dissolved	ug/L	128160	1010	4.6E+02	2.2E+02	**3E+02**	**6E+02**
Zinc	North Branch French Gulch	FG-6C	10-Jun-99	Dissolved	ug/L	27900	--	nc	nc	nc	nc

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Zinc	North Branch French Gulch	FG-7	05-Jun-96	Dissolved	ug/L	1800	58	7.4E+01	7.4E+01	**2E+01**	**2E+01**
Zinc	North Branch French Gulch	FG-7	05-Jun-96	Dissolved	ug/L	1700	58	7.4E+01	7.4E+01	**2E+01**	**2E+01**
Zinc	North Branch French Gulch	FG-7	04-May-89	Dissolved	ug/L	9300	200	2.1E+02	2.1E+02	**4E+01**	**4E+01**
Zinc	North Branch French Gulch	FG-7	25-May-96	Dissolved	ug/L	1000	47	6.2E+01	6.2E+01	**2E+01**	**2E+01**
Zinc	North Branch French Gulch	FG-7	23-Aug-94	Dissolved	ug/L	2127	93	1.1E+02	1.1E+02	**2E+01**	**2E+01**
Zinc	North Branch French Gulch	FG-7	22-Sep-92	Dissolved	ug/L	2827	102	1.2E+02	1.2E+02	**2E+01**	**2E+01**
Zinc	North Branch French Gulch	FG-7	22-Jul-96	Dissolved	ug/L	4483.6	96	1.1E+02	1.1E+02	**4E+01**	**4E+01**
Zinc	North Branch French Gulch	FG-7	11-Jun-96	Dissolved	ug/L	2681.4	68	8.4E+01	8.5E+01	**3E+01**	**3E+01**
Zinc	North Branch French Gulch	FG-7	16-Nov-93	Dissolved	ug/L	4198	120	1.4E+02	1.4E+02	**3E+01**	**3E+01**
Zinc	North Branch French Gulch	FG-7	21-Oct-93	Dissolved	ug/L	3254	123	1.4E+02	1.4E+02	**2E+01**	**2E+01**
Zinc	North Branch French Gulch	FG-7	01-Nov-99	Dissolved	ug/L	12700	203	2.1E+02	2.2E+02	**6E+01**	**6E+01**
Zinc	North Branch French Gulch	FG-7	17-Nov-99	Dissolved	ug/L	12500	201	2.1E+02	2.1E+02	**6E+01**	**6E+01**
Zinc	North Branch French Gulch	FG-7	07-Oct-99	Dissolved	ug/L	10460	182	1.9E+02	2.0E+02	**5E+01**	**5E+01**
Zinc	North Branch French Gulch	FG-7	23-Sep-99	Dissolved	ug/L	11530	201	2.1E+02	2.1E+02	**5E+01**	**5E+01**
Zinc	North Branch French Gulch	FG-7	14-Sep-99	Dissolved	ug/L	11200	189	2.0E+02	2.0E+02	**6E+01**	**6E+01**
Zinc	North Branch French Gulch	FG-7	05-Sep-99	Dissolved	ug/L	10600	184	2.0E+02	2.0E+02	**5E+01**	**5E+01**
Zinc	North Branch French Gulch	FG-7	19-Aug-99	Dissolved	ug/L	11500	196	2.1E+02	2.1E+02	**6E+01**	**6E+01**
Zinc	North Branch French Gulch	FG-7	14-Jul-99	Dissolved	ug/L	10700	--	nc	nc	nc	nc
Zinc	North Branch French Gulch	FG-7	10-Jun-99	Dissolved	ug/L	15500	--	nc	nc	nc	nc
Zinc	North Branch French Gulch	FG-7	10-Jun-99	Dissolved	ug/L	15500	--	nc	nc	nc	nc
Zinc	North Branch French Gulch	FG-7	25-May-96	Dissolved	ug/L	2300	62	7.8E+01	7.9E+01	**3E+01**	**3E+01**
Zinc	North Branch French Gulch	FG-7	25-May-96	Dissolved	ug/L	1800	58	7.4E+01	7.4E+01	**2E+01**	**2E+01**
Zinc	North Branch French Gulch	TS-3	23-May-96	Dissolved	ug/L	30	46	6.1E+01	6.1E+01	5E-01	5E-01
Zinc	North Branch French Gulch	TS-4	06-Jun-96	Dissolved	ug/L	1100	53	6.8E+01	6.9E+01	**2E+01**	**2E+01**
Zinc	North Branch French Gulch	TS-4	25-May-96	Dissolved	ug/L	1000	47	6.2E+01	6.2E+01	**2E+01**	**2E+01**
Zinc	French Gulch Reference	FG-0	22-Sep-92	Dissolved	ug/L	4	47	6.2E+01	6.3E+01	6E-02	6E-02
Zinc	French Gulch Reference	FG-0	21-Sep-89	Dissolved	ug/L	5	58	7.4E+01	7.4E+01	7E-02	7E-02
Zinc	French Gulch Reference	FG-0	23-May-96	Dissolved	ug/L	2	34	4.7E+01	4.7E+01	4E-02	4E-02
Zinc	French Gulch Reference	FG-1	22-Jul-96	Dissolved	ug/L	19.6	41	5.5E+01	5.5E+01	4E-01	4E-01
Zinc	French Gulch Reference	FG-1	12-Jun-96	Dissolved	ug/L	14.6	37	5.1E+01	5.1E+01	3E-01	3E-01
Zinc	French Gulch Reference	FG-1	22-Sep-92	Dissolved	ug/L	10	53	6.8E+01	6.9E+01	1E-01	1E-01
Zinc	French Gulch Reference	FG-1	4-May-89	Dissolved	ug/L	5	69	8.6E+01	8.6E+01	6E-02	6E-02
Zinc	French Gulch Reference	FG-1	23-May-96	Dissolved	ug/L	8	34	4.7E+01	4.7E+01	2E-01	2E-01
Zinc	French Gulch Reference	FG-1	25-Oct-95	Dissolved	ug/L	7	48	6.3E+01	6.3E+01	1E-01	1E-01
Zinc	French Gulch Reference	FG-2	22-Sep-92	Dissolved	ug/L	15	55	7.0E+01	7.1E+01	2E-01	2E-01
Zinc	French Gulch Reference	FG-2	21-Sep-89	Dissolved	ug/L	5	60	7.6E+01	7.7E+01	7E-02	7E-02
Zinc	French Gulch Reference	FG-2	4-May-89	Dissolved	ug/L	10	67	8.3E+01	8.4E+01	1E-01	1E-01
Zinc	French Gulch Reference	FG-3	12-Jun-96	Dissolved	ug/L	10.4	39	5.2E+01	5.3E+01	2E-01	2E-01
Zinc	French Gulch Reference	FG-3	22-Jul-96	Dissolved	ug/L	15.6	46	6.1E+01	6.2E+01	3E-01	3E-01
Zinc	French Gulch Reference	FG-3	22-Sep-92	Dissolved	ug/L	13	62	7.8E+01	7.8E+01	2E-01	2E-01
Zinc	French Gulch Reference	Mcleod Tunnel	04-May-89	Dissolved	ug/L	5	160	1.7E+02	1.8E+02	3E-02	3E-02
Zinc	French Gulch	FG-9	22-Jul-96	Dissolved	ug/L	2216.4	84	1.0E+02	1.0E+02	**2E+01**	**2E+01**
Zinc	French Gulch	FG-9	10-Jun-96	Dissolved	ug/L	2072.8	65	8.1E+01	8.2E+01	**3E+01**	**3E+01**
Zinc	French Gulch	FG-9	16-Nov-93	Dissolved	ug/L	3337	125	1.4E+02	1.4E+02	**2E+01**	**2E+01**
Zinc	French Gulch	FG-9	21-Oct-93	Dissolved	ug/L	2872	121	1.4E+02	1.4E+02	**2E+01**	**2E+01**

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Zinc	French Gulch	FG-9	22-Sep-92	Dissolved	ug/L	1830	103	1.2E+02	1.2E+02	**2E+01**	**2E+01**
Zinc	French Gulch	FG-9	24-Sep-98	Dissolved	ug/L	2000	--	nc	nc	nc	nc
Zinc	French Gulch	FG-9	03-Nov-98	Dissolved	ug/L	2490	--	nc	nc	nc	nc
Zinc	French Gulch	FG-9	07-May-99	Dissolved	ug/L	3380	172	1.9E+02	1.9E+02	**2E+01**	**2E+01**
Zinc	French Gulch	FG-9	10-Jun-99	Dissolved	ug/L	1650	--	nc	nc	nc	nc
Zinc	French Gulch	FG-9	02-Dec-98	Dissolved	ug/L	2330	--	nc	nc	nc	nc
Zinc	French Gulch	FG-9	03-Mar-99	Dissolved	ug/L	3620	--	nc	nc	nc	nc
Zinc	French Gulch	FG-9	04-Feb-99	Dissolved	ug/L	4000	175	1.9E+02	1.9E+02	**2E+01**	**2E+01**
Zinc	French Gulch	FG-9	07-Apr-99	Dissolved	ug/L	3490	--	nc	nc	nc	nc
Zinc	French Gulch	FG-9	21-Feb-97	Dissolved	ug/L	4500	160	1.7E+02	1.8E+02	**3E+01**	**3E+01**
Zinc	French Gulch	FG-9	04-May-89	Dissolved	ug/L	4500	140	1.6E+02	1.6E+02	**3E+01**	**3E+01**
Zinc	French Gulch	FG-9	17-Apr-96	Dissolved	ug/L	4400	160	1.7E+02	1.8E+02	**3E+01**	**3E+01**
Zinc	French Gulch	FG-9	16-Jan-97	Dissolved	ug/L	4100	140	1.6E+02	1.6E+02	**3E+01**	**3E+01**
Zinc	French Gulch	FG-9	19-Jan-96	Dissolved	ug/L	3900	150	1.7E+02	1.7E+02	**2E+01**	**2E+01**
Zinc	French Gulch	FG-9	23-Aug-94	Dissolved	ug/L	2199	102	1.2E+02	1.2E+02	**2E+01**	**2E+01**
Zinc	French Gulch	FG-9	13-Nov-96	Dissolved	ug/L	3100	120	1.4E+02	1.4E+02	**2E+01**	**2E+01**
Zinc	French Gulch	FG-9	17-Nov-99	Dissolved	ug/L	2190	113	1.3E+02	1.3E+02	**2E+01**	**2E+01**
Zinc	French Gulch	FG-9	02-Nov-99	Dissolved	ug/L	2250	108	1.3E+02	1.3E+02	**2E+01**	**2E+01**
Zinc	French Gulch	FG-9	08-Oct-99	Dissolved	ug/L	1790	95	1.1E+02	1.1E+02	**2E+01**	**2E+01**
Zinc	French Gulch	FG-9	23-Sep-99	Dissolved	ug/L	1730	102	1.2E+02	1.2E+02	**1E+01**	**1E+01**
Zinc	French Gulch	FG-9	13-Sep-99	Dissolved	ug/L	1590	92	1.1E+02	1.1E+02	**1E+01**	**1E+01**
Zinc	French Gulch	FG-9	05-Sep-99	Dissolved	ug/L	1460	85	1.0E+02	1.0E+02	**1E+01**	**1E+01**
Zinc	French Gulch	FG-9	19-Aug-99	Dissolved	ug/L	1550	87	1.0E+02	1.0E+02	**1E+01**	**1E+01**
Zinc	French Gulch	FG-9	14-Jul-99	Dissolved	ug/L	1230	--	nc	nc	nc	nc
Zinc	French Gulch	FG-9	13-Dec-96	Dissolved	ug/L	3700	140	1.6E+02	1.6E+02	**2E+01**	**2E+01**
Zinc	French Gulch	FG-9	25-Jun-96	Dissolved	ug/L	2100	65	8.1E+01	8.2E+01	**3E+01**	**3E+01**
Zinc	French Gulch	FG-9	23-Oct-95	Dissolved	ug/L	3100	110	1.3E+02	1.3E+02	**2E+01**	**2E+01**
Zinc	French Gulch	FG-9	21-Nov-95	Dissolved	ug/L	3000	120	1.4E+02	1.4E+02	**2E+01**	**2E+01**
Zinc	French Gulch	FG-9	21-Mar-96	Dissolved	ug/L	2900	140	1.6E+02	1.6E+02	**2E+01**	**2E+01**
Zinc	French Gulch	FG-9	16-May-96	Dissolved	ug/L	2700	82	9.9E+01	1.0E+02	**3E+01**	**3E+01**
Zinc	French Gulch	FG-9	15-Aug-96	Dissolved	ug/L	2500	99	1.2E+02	1.2E+02	**2E+01**	**2E+01**
Zinc	French Gulch	FG-9	08-Oct-96	Dissolved	ug/L	2400	110	1.3E+02	1.3E+02	**2E+01**	**2E+01**
Zinc	French Gulch	FG-9	09-Sep-96	Dissolved	ug/L	2400	110	1.3E+02	1.3E+02	**2E+01**	**2E+01**
Zinc	French Gulch	FG-9	26-May-96	Dissolved	ug/L	2300	62	7.8E+01	7.9E+01	**3E+01**	**3E+01**
Zinc	French Gulch	FG-9	18-Jul-96	Dissolved	ug/L	2200	18	2.7E+01	2.8E+01	**8E+01**	**8E+01**
Zinc	French Gulch	FG-9	21-Sep-89	Dissolved	ug/L	1900	102	1.2E+02	1.2E+02	**2E+01**	**2E+01**
Zinc	French Gulch	FG-9	21-Jun-96	Dissolved	ug/L	1800	62	7.8E+01	7.9E+01	**2E+01**	**2E+01**
Zinc	French Gulch	FG-9	21-Jun-00	Dissolved	ug/L	1110	--	nc	nc	nc	nc
Zinc	French Gulch	FG-9	13-Apr-00	Dissolved	ug/L	3370	--	nc	nc	nc	nc
Zinc	French Gulch	FG-9	22-Feb-96	Dissolved	ug/L	3500	150	1.7E+02	1.7E+02	**2E+01**	**2E+01**
Zinc	French Gulch	FG-9	22-May-96	Dissolved	ug/L	2300	75	9.2E+01	9.3E+01	**3E+01**	**2E+01**
Zinc	French Gulch	FG-9A	11-Jun-96	Dissolved	ug/L	2239.1	65	8.1E+01	8.2E+01	**3E+01**	**3E+01**
Zinc	French Gulch	FG-9A	22-Jul-96	Dissolved	ug/L	3304.1	85	1.0E+02	1.0E+02	**3E+01**	**3E+01**
Zinc	French Gulch	FG-9A	23-Aug-94	Dissolved	ug/L	2304	96	1.1E+02	1.1E+02	**2E+01**	**2E+01**
Zinc	Discharge	CBMA-1	23-Jul-96	Dissolved	ug/L	2796	224	2.3E+02	2.2E+02	**1E+01**	**1E+01**

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Zinc	Discharge	KDS	13-Jun-96	Dissolved	ug/L	10460	296	2.9E+02	2.2E+02	**4E+01**	**5E+01**
Zinc	Discharge	KDS	24-Aug-94	Dissolved	ug/L	4051	222	2.3E+02	2.2E+02	**2E+01**	**2E+01**
Zinc	Discharge	MGB-1	23-Jul-96	Dissolved	ug/L	1537	82	9.9E+01	1.0E+02	**2E+01**	**2E+01**
Zinc	Discharge	RLCVT-1	23-Jul-96	Dissolved	ug/L	2012	86	1.0E+02	1.0E+02	**2E+01**	**2E+01**
Zinc	Discharge	WP-1	12-Jun-96	Dissolved	ug/L	3105000	4980	4.6E+02	2.2E+02	**7E+03**	**1E+04**
Zinc	Blue River Reference	654	09-Sep-98	Dissolved	ug/l	5	--	nc	nc	nc	nc
Zinc	Blue River Reference	654	23-Sep-98	Dissolved	ug/l	5	--	nc	nc	nc	nc
Zinc	Blue River Reference	654	01-Jul-98	Dissolved	ug/l	5	--	nc	nc	nc	nc
Zinc	Blue River Reference	654	16-May-97	Dissolved	ug/l	5	72	8.9E+01	8.9E+01	6E-02	6E-02
Zinc	Blue River Reference	654	10-Sep-97	Dissolved	ug/l	5	60	7.6E+01	7.7E+01	7E-02	7E-02
Zinc	Blue River Reference	654	07-Aug-98	Dissolved	ug/l	5	--	nc	nc	nc	nc
Zinc	Blue River Reference	654	22-Jul-98	Dissolved	ug/l	5	--	nc	nc	nc	nc
Zinc	Blue River Reference	654	10-Oct-97	Dissolved	ug/l	5	72	8.9E+01	8.9E+01	6E-02	6E-02
Zinc	Blue River Reference	654	19-Nov-97	Dissolved	ug/l	5	96	1.1E+02	1.1E+02	4E-02	4E-02
Zinc	Blue River Reference	654	21-Aug-98	Dissolved	ug/l	5	--	nc	nc	nc	nc
Zinc	Blue River Reference	654	07-Dec-97	Dissolved	ug/l	5	84	1.0E+02	1.0E+02	5E-02	5E-02
Zinc	Blue River Reference	654	01-Apr-98	Dissolved	ug/l	5	100	1.2E+02	1.2E+02	4E-02	4E-02
Zinc	Blue River Reference	654	05-May-98	Dissolved	ug/l	10	76	9.3E+01	9.4E+01	1E-01	1E-01
Zinc	Blue River Reference	654	24-Sep-97	Dissolved	ug/l	5	56	7.2E+01	7.2E+01	7E-02	7E-02
Zinc	Blue River Reference	654	08-May-97	Dissolved	ug/l	5	78	9.5E+01	9.6E+01	5E-02	5E-02
Zinc	Blue River Reference	654	4-Jun-97	Dissolved	ug/l	5	62	7.8E+01	7.9E+01	6E-02	6E-02
Zinc	Blue River Reference	654	18-Jun-97	Dissolved	ug/l	5	60	7.6E+01	7.7E+01	7E-02	7E-02
Zinc	Blue River Reference	654	2-Jul-97	Dissolved	ug/l	5	40	5.4E+01	5.4E+01	9E-02	9E-02
Zinc	Blue River Reference	654	16-Jul-97	Dissolved	ug/l	5	60	7.6E+01	7.7E+01	7E-02	7E-02
Zinc	Blue River Reference	654	21-Aug-97	Dissolved	ug/l	5	52	6.7E+01	6.8E+01	7E-02	7E-02
Zinc	Blue River Reference	654	2-Sep-97	Dissolved	ug/l	5	56	7.2E+01	7.2E+01	7E-02	7E-02
Zinc	Blue River Reference	654	24-Apr-97	Dissolved	ug/l	5	86	1.0E+02	1.0E+02	5E-02	5E-02
Zinc	Blue River Reference	654	21-May-97	Dissolved	ug/l	5	66	8.2E+01	8.3E+01	6E-02	6E-02
Zinc	Blue River Reference	655	21-Aug-98	Dissolved	ug/l	11	50	6.5E+01	6.6E+01	2E-01	2E-01
Zinc	Blue River Reference	655	9-Sep-98	Dissolved	ug/l	5	--	nc	nc	nc	nc
Zinc	Blue River Reference	655	7-Aug-98	Dissolved	ug/l	5	48	6.3E+01	6.3E+01	8E-02	8E-02
Zinc	Blue River Reference	655	10-Oct-97	Dissolved	ug/l	12	60	7.6E+01	7.7E+01	2E-01	2E-01
Zinc	Blue River Reference	655	22-Jul-98	Dissolved	ug/l	10	58	7.4E+01	7.4E+01	1E-01	1E-01
Zinc	Blue River Reference	655	16-May-97	Dissolved	ug/l	42	62	7.8E+01	7.9E+01	5E-01	5E-01
Zinc	Blue River Reference	655	10-Sep-97	Dissolved	ug/l	5	44	5.8E+01	5.9E+01	9E-02	8E-02
Zinc	Blue River Reference	655	7-Dec-97	Dissolved	ug/l	16	--	nc	nc	nc	nc
Zinc	Blue River Reference	655	24-Sep-97	Dissolved	ug/l	15	52	6.7E+01	6.8E+01	2E-01	2E-01
Zinc	Blue River Reference	655	2-Sep-97	Dissolved	ug/l	11	52	6.7E+01	6.8E+01	2E-01	2E-01
Zinc	Blue River Reference	655	21-Aug-97	Dissolved	ug/l	11	44	5.8E+01	5.9E+01	2E-01	2E-01
Zinc	Blue River Reference	655	16-Jul-97	Dissolved	ug/l	5	44	5.8E+01	5.9E+01	9E-02	8E-02
Zinc	Blue River Reference	655	2-Jul-97	Dissolved	ug/l	5	42	5.6E+01	5.7E+01	9E-02	9E-02
Zinc	Blue River Reference	655	18-Jun-97	Dissolved	ug/l	16	52	6.7E+01	6.8E+01	2E-01	2E-01
Zinc	Blue River Reference	655	21-May-97	Dissolved	ug/l	39	60	7.6E+01	7.7E+01	5E-01	5E-01
Zinc	Blue River Reference	655	8-May-97	Dissolved	ug/l	51	74	9.1E+01	9.2E+01	6E-01	6E-01
Zinc	Blue River Reference	655	24-Apr-97	Dissolved	ug/l	38	84	1.0E+02	1.0E+02	4E-01	4E-01

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Zinc	Blue River Reference	655	1-Jul-98	Dissolved	ug/l	10	--	nc	nc	nc	nc
Zinc	Blue River Reference	655	4-Jun-97	Dissolved	ug/l	27	54	7.0E+01	7.0E+01	4E-01	4E-01
Zinc	Blue River Reference	BR-1	23-Sep-99	Dissolved	ug/L	20	71	8.8E+01	8.8E+01	2E-01	2E-01
Zinc	Blue River Reference	BR-1	17-Nov-99	Dissolved	ug/L	20	69	8.6E+01	8.6E+01	2E-01	2E-01
Zinc	Blue River Reference	BR-1	17-Nov-99	Dissolved	ug/L	20	70	8.7E+01	8.7E+01	2E-01	2E-01
Zinc	Blue River Reference	BR-1	01-Nov-99	Dissolved	ug/L	20	71	8.8E+01	8.8E+01	2E-01	2E-01
Zinc	Blue River Reference	BR-1	23-Sep-99	Dissolved	ug/L	10	72	8.9E+01	8.9E+01	1E-01	1E-01
Zinc	Blue River Reference	BR-1	14-Sep-99	Dissolved	ug/L	20	63	7.9E+01	8.0E+01	3E-01	3E-01
Zinc	Blue River Reference	BR-1	05-Sep-99	Dissolved	ug/L	10	60	7.6E+01	7.7E+01	1E-01	1E-01
Zinc	Blue River Reference	BR-1	19-Aug-99	Dissolved	ug/L	10	61	7.7E+01	7.8E+01	1E-01	1E-01
Zinc	Blue River Reference	BR-1	14-Jul-99	Dissolved	ug/L	10	--	nc	nc	nc	nc
Zinc	Blue River Reference	BR-1	10-Jun-99	Dissolved	ug/L	20	--	nc	nc	nc	nc
Zinc	Blue River Reference	BR-1	10-Jun-99	Dissolved	ug/L	20	--	nc	nc	nc	nc
Zinc	Blue River Reference	BR-1	05-May-99	Dissolved	ug/L	20	95	1.1E+02	1.1E+02	2E-01	2E-01
Zinc	Blue River Reference	BR-1	23-Aug-94	Dissolved	ug/L	7	61	7.7E+01	7.8E+01	9E-02	9E-02
Zinc	Blue River Reference	BR-1	23-Jul-96	Dissolved	ug/L	8.8	42	5.6E+01	5.6E+01	2E-01	2E-01
Zinc	Blue River Reference	BR-1	10-Jun-96	Dissolved	ug/L	12.4	54	7.0E+01	7.0E+01	2E-01	2E-01
Zinc	Blue River Reference	BR-1	07-Oct-99	Dissolved	ug/L	30	71	8.8E+01	8.8E+01	3E-01	3E-01
Zinc	Blue River Reference	BR-1	22-Sep-92	Dissolved	ug/L	11	66	8.2E+01	8.3E+01	1E-01	1E-01
Zinc	Blue River Reference	BR-1	16-Nov-93	Dissolved	ug/L	23	67	8.3E+01	8.4E+01	3E-01	3E-01
Zinc	Blue River Reference	BR-1	23-Sep-98	Dissolved	ug/L	10	--	nc	nc	nc	nc
Zinc	Blue River Reference	BR-1	3-Nov-98	Dissolved	ug/L	20	--	nc	nc	nc	nc
Zinc	Blue River Reference	BR-1	2-Dec-98	Dissolved	ug/L	20	--	nc	nc	nc	nc
Zinc	Blue River Reference	BR-1	4-May-89	Dissolved	ug/L	60	67	8.3E+01	8.4E+01	7E-01	7E-01
Zinc	Blue River Reference	BR-1	21-Sep-89	Dissolved	ug/L	5	58	7.4E+01	7.4E+01	7E-02	7E-02
Zinc	Blue River Reference	BR-1	21-Oct-93	Dissolved	ug/L	22	71	8.7E+01	8.8E+01	3E-01	3E-01
Zinc	Blue River Reference	BR-Adams St	24-Oct-95	Dissolved	ug/L	29	68	8.5E+01	8.5E+01	3E-01	3E-01
Zinc	Blue River Reference	BR-Adams St	21-May-96	Dissolved	ug/L	22	57	7.3E+01	7.3E+01	3E-01	3E-01
Zinc	Blue River	643	09-Sep-98	Dissolved	ug/l	202	--	nc	nc	nc	nc
Zinc	Blue River	643	21-Aug-98	Dissolved	ug/l	190	--	nc	nc	nc	nc
Zinc	Blue River	643	22-Jul-98	Dissolved	ug/l	245	--	nc	nc	nc	nc
Zinc	Blue River	643	28-Dec-99	Dissolved	ug/l	213	--	nc	nc	nc	nc
Zinc	Blue River	656	21-May-97	Dissolved	ug/l	635	68	8.5E+01	8.5E+01	**8E+00**	**7E+00**
Zinc	Blue River	656	8-May-97	Dissolved	ug/l	1280	106	1.2E+02	1.2E+02	**1E+01**	**1E+01**
Zinc	Blue River	656	2-Sep-97	Dissolved	ug/l	506	64	8.0E+01	8.1E+01	**6E+00**	**6E+00**
Zinc	Blue River	656	16-Jul-97	Dissolved	ug/l	313	--	nc	nc	nc	nc
Zinc	Blue River	656	2-Jul-97	Dissolved	ug/l	326	44	5.8E+01	5.9E+01	**6E+00**	**6E+00**
Zinc	Blue River	656	18-Jun-97	Dissolved	ug/l	432	58	7.4E+01	7.4E+01	**6E+00**	**6E+00**
Zinc	Blue River	656	4-Jun-97	Dissolved	ug/l	596	60	7.6E+01	7.7E+01	**8E+00**	**8E+00**
Zinc	Blue River	656	24-Apr-97	Dissolved	ug/l	1970	124	1.4E+02	1.4E+02	**1E+01**	**1E+01**
Zinc	Blue River	656	16-May-97	Dissolved	ug/l	686	80	9.7E+01	9.8E+01	**7E+00**	**7E+00**
Zinc	Blue River	656	23-Sep-98	Dissolved	ug/l	1405	94	1.1E+02	1.1E+02	**1E+01**	**1E+01**
Zinc	Blue River	656	24-Sep-97	Dissolved	ug/l	1086	76	9.3E+01	9.4E+01	**1E+01**	**1E+01**
Zinc	Blue River	656	10-Oct-97	Dissolved	ug/l	1488	100	1.2E+02	1.2E+02	**1E+01**	**1E+01**
Zinc	Blue River	656	19-Nov-97	Dissolved	ug/l	3320	128	1.4E+02	1.5E+02	**2E+01**	**2E+01**

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Zinc	Blue River	656	7-Dec-97	Dissolved	ug/l	3400	136	1.5E+02	1.5E+02	**2E+01**	**2E+01**
Zinc	Blue River	656	1-Apr-98	Dissolved	ug/l	3780	164	1.8E+02	1.8E+02	**2E+01**	**2E+01**
Zinc	Blue River	656	5-May-98	Dissolved	ug/l	2094	120	1.4E+02	1.4E+02	**2E+01**	**2E+01**
Zinc	Blue River	656	1-Jul-98	Dissolved	ug/l	717	--	nc	nc	nc	nc
Zinc	Blue River	656	22-Jul-98	Dissolved	ug/l	1008	78	9.5E+01	9.6E+01	**1E+01**	**1E+01**
Zinc	Blue River	656	7-Aug-98	Dissolved	ug/l	479	--	nc	nc	nc	nc
Zinc	Blue River	656	9-Sep-98	Dissolved	ug/l	1229	90	1.1E+02	1.1E+02	**1E+01**	**1E+01**
Zinc	Blue River	656	10-Sep-97	Dissolved	ug/l	944	76	9.3E+01	9.4E+01	**1E+01**	**1E+01**
Zinc	Blue River	656	21-Aug-98	Dissolved	ug/l	1033	--	nc	nc	nc	nc
Zinc	Blue River	657	19-Nov-97	Dissolved	ug/l	99	68	8.5E+01	8.5E+01	1E+00	1E+00
Zinc	Blue River	657	1-Apr-98	Dissolved	ug/l	103	84	1.0E+02	1.0E+02	1E+00	1E+00
Zinc	Blue River	657	5-May-98	Dissolved	ug/l	134	76	9.3E+01	9.4E+01	1E+00	1E+00
Zinc	Blue River	657	18-Jun-97	Dissolved	ug/l	176	54	7.0E+01	7.0E+01	**3E+00**	**3E+00**
Zinc	Blue River	657	2-Jul-97	Dissolved	ug/l	122	46	6.1E+01	6.1E+01	**2E+00**	**2E+00**
Zinc	Blue River	657	23-Sep-98	Dissolved	ug/l	115	--	nc	nc	nc	nc
Zinc	Blue River	657	24-Apr-97	Dissolved	ug/l	122	88	1.1E+02	1.1E+02	1E+00	1E+00
Zinc	Blue River	657	8-May-97	Dissolved	ug/l	121	78	9.5E+01	9.6E+01	1E+00	1E+00
Zinc	Blue River	657	7-Dec-97	Dissolved	ug/l	201	68	8.5E+01	8.5E+01	**2E+00**	**2E+00**
Zinc	Blue River	657	21-May-97	Dissolved	ug/l	197	64	8.0E+01	8.1E+01	**2E+00**	**2E+00**
Zinc	Blue River	657	16-Jul-97	Dissolved	ug/l	113	48	6.3E+01	6.3E+01	**2E+00**	**2E+00**
Zinc	Blue River	657	21-Aug-97	Dissolved	ug/l	103	52	6.7E+01	6.8E+01	**2E+00**	**2E+00**
Zinc	Blue River	657	2-Sep-97	Dissolved	ug/l	114	64	8.0E+01	8.1E+01	1E+00	1E+00
Zinc	Blue River	657	21-Aug-98	Dissolved	ug/l	93	--	nc	nc	nc	nc
Zinc	Blue River	657	4-Jun-97	Dissolved	ug/l	170	58	7.4E+01	7.4E+01	**2E+00**	**2E+00**
Zinc	Blue River	657	9-Sep-98	Dissolved	ug/l	93	--	nc	nc	nc	nc
Zinc	Blue River	657	24-Sep-97	Dissolved	ug/l	146	72	8.9E+01	8.9E+01	**2E+00**	**2E+00**
Zinc	Blue River	657	7-Aug-98	Dissolved	ug/l	89	--	nc	nc	nc	nc
Zinc	Blue River	657	22-Jul-98	Dissolved	ug/l	100	--	nc	nc	nc	nc
Zinc	Blue River	657	1-Jul-98	Dissolved	ug/l	79	--	nc	nc	nc	nc
Zinc	Blue River	657	16-May-97	Dissolved	ug/l	124	72	8.9E+01	8.9E+01	1E+00	1E+00
Zinc	Blue River	BR-2	03-Mar-99	Dissolved	ug/L	3340	--	nc	nc	nc	nc
Zinc	Blue River	BR-2	04-Feb-99	Dissolved	ug/L	4070	174	1.9E+02	1.9E+02	**2E+01**	**2E+01**
Zinc	Blue River	BR-2	07-Apr-99	Dissolved	ug/L	3460	--	nc	nc	nc	nc
Zinc	Blue River	BR-2	07-Apr-99	Dissolved	ug/L	3500	--	nc	nc	nc	nc
Zinc	Blue River	BR-2	04-May-89	Dissolved	ug/L	4200	140	1.6E+02	1.6E+02	**3E+01**	**3E+01**
Zinc	Blue River	BR-2	21-Sep-89	Dissolved	ug/L	1700	108	1.3E+02	1.3E+02	**1E+01**	**1E+01**
Zinc	Blue River	BR-2	23-Sep-98	Dissolved	ug/L	1610	--	nc	nc	nc	nc
Zinc	Blue River	BR-2	19-Aug-99	Dissolved	ug/L	830	75	9.2E+01	9.3E+01	**9E+00**	**9E+00**
Zinc	Blue River	BR-2	17-Nov-99	Dissolved	ug/L	1660	103	1.2E+02	1.2E+02	**1E+01**	**1E+01**
Zinc	Blue River	BR-2	02-Nov-99	Dissolved	ug/L	2230	108	1.3E+02	1.3E+02	**2E+01**	**2E+01**
Zinc	Blue River	BR-2	07-Oct-99	Dissolved	ug/L	1210	91	1.1E+02	1.1E+02	**1E+01**	**1E+01**
Zinc	Blue River	BR-2	23-Sep-99	Dissolved	ug/L	1290	93	1.1E+02	1.1E+02	**1E+01**	**1E+01**
Zinc	Blue River	BR-2	14-Sep-99	Dissolved	ug/L	1490	89	1.1E+02	1.1E+02	**1E+01**	**1E+01**
Zinc	Blue River	BR-2	02-Dec-98	Dissolved	ug/L	2360	--	nc	nc	nc	nc
Zinc	Blue River	BR-2	05-Sep-99	Dissolved	ug/L	1180	81	9.8E+01	9.9E+01	**1E+01**	**1E+01**

Appendix G
Risk Calculations for Aquatic Receptors from Direct Contact with Surface Water

COPCs	General Location	Station ID	Sample Date	Analysis Type	Adj Units	ND Adj Conc	Hardness (mg/L)	AWQC acute	AWQC chronic	HQ acute	HQ chronic
Zinc	Blue River	BR-2	03-Nov-98	Dissolved	ug/L	2040	--	nc	nc	nc	nc
Zinc	Blue River	BR-2	14-Jul-99	Dissolved	ug/L	330	--	nc	nc	nc	nc
Zinc	Blue River	BR-2	10-Jun-99	Dissolved	ug/L	520	--	nc	nc	nc	nc
Zinc	Blue River	BR-2	5-May-99	Dissolved	ug/L	3410	159	1.7E+02	1.7E+02	**2E+01**	**2E+01**
Zinc	Blue River	BR-2	22-Aug-94	Dissolved	ug/L	590	76	9.3E+01	9.4E+01	**6E+00**	**6E+00**
Zinc	Blue River	BR-2	23-Jul-96	Dissolved	ug/L	376.7	49	6.4E+01	6.4E+01	**6E+00**	**6E+00**
Zinc	Blue River	BR-2	10-Jun-96	Dissolved	ug/L	589.4	58	7.4E+01	7.4E+01	**8E+00**	**8E+00**
Zinc	Blue River	BR-2	16-Nov-93	Dissolved	ug/L	2946	126	1.4E+02	1.4E+02	**2E+01**	**2E+01**
Zinc	Blue River	BR-2	21-Oct-93	Dissolved	ug/L	3077	121	1.4E+02	1.4E+02	**2E+01**	**2E+01**
Zinc	Blue River	BR-2	22-Sep-92	Dissolved	ug/L	1887	102	1.2E+02	1.2E+02	**2E+01**	**2E+01**
Zinc	Blue River	BR-2	14-Sep-99	Dissolved	ug/L	1480	88	1.1E+02	1.1E+02	**1E+01**	**1E+01**
Zinc	Blue River	BR-3	04-Feb-99	Dissolved	ug/L	100	85	1.0E+02	1.0E+02	1E+00	1E+00
Zinc	Blue River	BR-3	07-Apr-99	Dissolved	ug/L	70	--	nc	nc	nc	nc
Zinc	Blue River	BR-3	04-May-89	Dissolved	ug/L	80	80	9.7E+01	9.8E+01	8E-01	8E-01
Zinc	Blue River	BR-3	21-Sep-89	Dissolved	ug/L	50	68	8.5E+01	8.5E+01	6E-01	6E-01
Zinc	Blue River	BR-3	16-Nov-93	Dissolved	ug/L	60	75	9.1E+01	9.2E+01	7E-01	7E-01
Zinc	Blue River	BR-3	21-Oct-93	Dissolved	ug/L	71	76	9.3E+01	9.3E+01	8E-01	8E-01
Zinc	Blue River	BR-3	23-Sep-98	Dissolved	ug/L	110	--	nc	nc	nc	nc
Zinc	Blue River	BR-3	3-Nov-98	Dissolved	ug/L	80	--	nc	nc	nc	nc
Zinc	Blue River	BR-3	2-Dec-98	Dissolved	ug/L	70	--	nc	nc	nc	nc
Zinc	Blue River	BR-3	3-Mar-99	Dissolved	ug/L	70	--	nc	nc	nc	nc
Zinc	Blue River	BR-3	23-Jul-96	Dissolved	ug/L	131.2	50	6.5E+01	6.6E+01	**2E+00**	**2E+00**
Zinc	Blue River	BR-3	22-Aug-94	Dissolved	ug/L	70	70	8.6E+01	8.7E+01	8E-01	8E-01
Zinc	Blue River	BR-3	17-Nov-99	Dissolved	ug/L	80	70	8.7E+01	8.7E+01	9E-01	9E-01
Zinc	Blue River	BR-3	10-Jun-96	Dissolved	ug/L	242.7	54	7.0E+01	7.0E+01	**3E+00**	**3E+00**
Zinc	Blue River	BR-3	1-Nov-99	Dissolved	ug/L	90	74	9.1E+01	9.2E+01	1E+00	1E+00
Zinc	Blue River	BR-3	7-Oct-99	Dissolved	ug/L	110	73	9.0E+01	9.0E+01	1E+00	1E+00
Zinc	Blue River	BR-3	7-Oct-99	Dissolved	ug/L	100	60	7.6E+01	7.7E+01	1E+00	1E+00
Zinc	Blue River	BR-3	23-Sep-99	Dissolved	ug/L	120	72	8.9E+01	8.9E+01	1E+00	1E+00
Zinc	Blue River	BR-3	14-Sep-99	Dissolved	ug/L	110	69	8.6E+01	8.6E+01	1E+00	1E+00
Zinc	Blue River	BR-3	5-Sep-99	Dissolved	ug/L	110	63	7.9E+01	8.0E+01	1E+00	1E+00
Zinc	Blue River	BR-3	19-Aug-99	Dissolved	ug/L	130	65	8.1E+01	8.2E+01	**2E+00**	**2E+00**
Zinc	Blue River	BR-3	14-Jul-99	Dissolved	ug/L	100	--	nc	nc	nc	nc
Zinc	Blue River	BR-3	10-Jun-99	Dissolved	ug/L	170	--	nc	nc	nc	nc
Zinc	Blue River	BR-3	5-May-99	Dissolved	ug/L	90	89	1.1E+02	1.1E+02	8E-01	8E-01
Zinc	Blue River	BR-4	22-Sep-92	Dissolved	ug/L	53	73	9.0E+01	9.0E+01	6E-01	6E-01
Zinc	Blue River	BR-5	23-Jul-96	Dissolved	ug/L	99	52	6.7E+01	6.7E+01	1E+00	1E+00
Zinc	Blue River	BR-5	23-Jul-96	Dissolved	ug/L	98.7	52	6.8E+01	6.8E+01	1E+00	1E+00
Zinc	Blue River	BR-5	22-Sep-92	Dissolved	ug/L	31	72	8.9E+01	8.9E+01	4E-01	3E-01
Zinc	Blue River	BR-BFG	25-Oct-95	Dissolved	ug/L	1500	86	1.0E+02	1.0E+02	**1E+01**	**1E+01**
Zinc	Blue River	BR-BFG	22-May-96	Dissolved	ug/L	540	59	7.5E+01	7.6E+01	**7E+00**	**7E+00**
Zinc	Blue River	BR-Dillon	24-May-96	Dissolved	ug/L	120	47	6.2E+01	6.2E+01	**2E+00**	**2E+00**
Zinc	Blue River	BR-Dillon	26-Oct-95	Dissolved	ug/L	69	66	8.2E+01	8.3E+01	8E-01	8E-01

Appendix G
Hazard Quotients for the Mink from Ingestion of Fish

Reach	COPCs	Fish Ingestion					
		Fish EPC (mg/kg ww)	Dose (mg/kg BW/day)	TRV (mg/kg BW/day)		HQ	
				NOAEL	LOAEL	NOAEL	LOAEL
Blue River Reference	Arsenic	3.1E-01	5.0E-02	1.5E-01	4.5E-01	3E-01	1E-01
	Cadmium	3.2E-02	5.2E-03	5.0E-01	9.9E-01	1E-02	5E-03
	Copper	2.3E+00	3.7E-01	8.8E+00	1.3E+01	4E-02	3E-02
	Lead	1.3E-02	2.2E-03	3.1E-01	6.1E-01	7E-03	4E-03
	Manganese	2.9E-01	4.7E-02	1.8E+01	5.7E+01	3E-03	8E-04
	Zinc	2.4E+00	3.8E-01	3.1E+02	9.3E+02	1E-03	4E-04
Blue River	Arsenic	8.7E-03	1.4E-03	1.5E-01	4.5E-01	9E-03	3E-03
	Cadmium	2.2E-01	3.5E-02	5.0E-01	9.9E-01	7E-02	4E-02
	Copper	7.5E-01	1.2E-01	8.8E+00	1.3E+01	1E-02	9E-03
	Lead	1.7E-02	2.8E-03	3.1E-01	6.1E-01	9E-03	5E-03
	Manganese	9.5E-02	1.5E-02	1.8E+01	5.7E+01	9E-04	3E-04
	Zinc	3.2E+00	5.2E-01	3.1E+02	9.3E+02	2E-03	6E-04

Notes:
Dose = [Conc x Ingestion Rate] / BW
na = not available
NC = HQ can not be calculated

Appendix G
Hazard Quotients for the Great Blue Heron from Ingestion of Fish

Reach	COPCs	Fish Ingestion					
		Fish EPC (mg/kg ww)	Dose (mg/kg BW/day)	TRV (mg/kg BW/day)		HQ	
				NOAEL	LOAEL	NOAEL	LOAEL
Blue River Reference	Arsenic	3.1E-01	5.5E-02	8.1E-01	7.1E+00	7E-02	8E-03
	Cadmium	3.2E-02	5.7E-03	8.7E-02	2.4E+00	7E-02	2E-03
	Copper	2.3E+00	4.0E-01	4.0E+00	6.0E+00	1E-01	7E-02
	Lead	1.3E-02	2.4E-03	8.8E-01	1.8E+00	3E-03	1E-03
	Manganese	2.9E-01	5.2E-02	6.5E+01	2.0E+02	8E-04	3E-04
	Zinc	2.4E+00	4.2E-01	2.6E+01	7.9E+01	2E-02	5E-03
Blue River	Arsenic	8.7E-03	1.5E-03	8.1E-01	7.1E+00	2E-03	2E-04
	Cadmium	2.2E-01	3.9E-02	8.7E-02	2.4E+00	4E-01	2E-02
	Copper	7.5E-01	1.3E-01	4.0E+00	6.0E+00	3E-02	2E-02
	Lead	1.7E-02	3.0E-03	8.8E-01	1.8E+00	3E-03	2E-03
	Manganese	9.5E-02	1.7E-02	6.5E+01	2.0E+02	3E-04	9E-05
	Zinc	3.2E+00	5.7E-01	2.6E+01	7.9E+01	2E-02	7E-03

Notes:
Dose = [Conc x Ingestion Rate] / BW
na = not available
NC = HQ can not be calculated

Appendix G

Hazard Quotients for the Mink from Incidental Ingestion of Sediment

Reach	COPCs	Sediment Ingestion					
		Sed EPC (mg/kg)	Dose (mg/kg BW/day)	TRV (mg/kg BW/day)		HQ	
				NOAEL	LOAEL	NOAEL	LOAEL
French Gulch Reference	Aluminum	8.0E+04	2.8E+01	2.3E+00	1.1E+01	**1E+01**	**3E+00**
	Arsenic	6.2E+01	2.2E-02	1.5E-01	4.5E-01	1E-01	5E-02
	Cadmium	6.1E+00	2.1E-03	5.0E-01	9.9E-01	4E-03	2E-03
	Chromium	5.4E+01	1.9E-02	8.0E+02	2.4E+03	2E-05	8E-06
	Copper	6.6E+01	2.3E-02	8.8E+00	1.3E+01	3E-03	2E-03
	Lead	3.8E+02	1.3E-01	3.1E-01	6.1E-01	4E-01	2E-01
	Manganese	1.3E+03	4.6E-01	1.8E+01	5.7E+01	3E-02	8E-03
	Mercury	2.7E-01	9.5E-05	1.4E+00	4.1E+00	7E-05	2E-05
	Molybdenum	6.0E+00	2.1E-03	1.1E-02	2.6E-01	2E-01	8E-03
	Selenium	2.0E+00	7.0E-04	7.9E-02	1.3E-01	9E-03	5E-03
	Zinc	7.8E+02	2.7E-01	3.1E+02	9.3E+02	9E-04	3E-04
North Branch French Gulch	Aluminum	6.6E+04	2.3E+01	2.3E+00	1.1E+01	**1E+01**	**2E+00**
	Arsenic	1.8E+02	6.3E-02	1.5E-01	4.5E-01	4E-01	1E-01
	Cadmium	2.1E+02	7.4E-02	5.0E-01	9.9E-01	1E-01	7E-02
	Chromium	4.0E+01	1.4E-02	8.0E+02	2.4E+03	2E-05	6E-06
	Copper	4.9E+02	1.7E-01	8.8E+00	1.3E+01	2E-02	1E-02
	Lead	6.5E+03	2.3E+00	3.1E-01	6.1E-01	**7E+00**	**4E+00**
	Manganese	1.2E+04	4.2E+00	1.8E+01	5.7E+01	2E-01	7E-02
	Mercury	3.5E-01	1.2E-04	1.4E+00	4.1E+00	9E-05	3E-05
	Molybdenum	1.6E+01	5.6E-03	1.1E-02	2.6E-01	5E-01	2E-02
	Selenium	2.3E+00	8.1E-04	7.9E-02	1.3E-01	1E-02	6E-03
	Zinc	3.5E+04	1.2E+01	3.1E+02	9.3E+02	4E-02	1E-02
South Branch French Gulch	Aluminum	na	na	2.3E+00	1.1E+01	NC	NC
	Arsenic	1.7E+02	6.0E-02	1.5E-01	4.5E-01	4E-01	1E-01
	Cadmium	1.1E+02	3.8E-02	5.0E-01	9.9E-01	8E-02	4E-02
	Chromium	na	na	8.0E+02	2.4E+03	NC	NC
	Copper	na	na	8.8E+00	1.3E+01	NC	NC
	Lead	3.4E+03	1.2E+00	3.1E-01	6.1E-01	**4E+00**	**2E+00**
	Manganese	na	na	1.8E+01	5.7E+01	NC	NC
	Mercury	na	na	1.4E+00	4.1E+00	NC	NC
	Molybdenum	na	na	1.1E-02	2.6E-01	NC	NC
	Selenium	na	na	7.9E-02	1.3E-01	NC	NC
	Zinc	2.0E+04	6.9E+00	3.1E+02	9.3E+02	2E-02	7E-03
French Gulch	Aluminum	7.3E+04	2.6E+01	2.3E+00	1.1E+01	**1E+01**	**2E+00**
	Arsenic	1.2E+02	4.2E-02	1.5E-01	4.5E-01	3E-01	9E-02
	Cadmium	8.2E+01	2.9E-02	5.0E-01	9.9E-01	6E-02	3E-02
	Chromium	5.3E+01	1.9E-02	8.0E+02	2.4E+03	2E-05	8E-06
	Copper	3.2E+02	1.1E-01	8.8E+00	1.3E+01	1E-02	9E-03
	Lead	2.3E+03	8.1E-01	3.1E-01	6.1E-01	**3E+00**	1E+00
	Manganese	9.1E+03	3.2E+00	1.8E+01	5.7E+01	2E-01	6E-02
	Mercury	2.9E-01	1.0E-04	1.4E+00	4.1E+00	7E-05	2E-05
	Molybdenum	1.0E+01	3.5E-03	1.1E-02	2.6E-01	3E-01	1E-02
	Selenium	2.1E+00	7.4E-04	7.9E-02	1.3E-01	9E-03	6E-03
	Zinc	1.8E+04	6.3E+00	3.1E+02	9.3E+02	2E-02	7E-03
Blue River	Aluminum	8.3E+04	2.9E+01	2.3E+00	1.1E+01	**1E+01**	**3E+00**
	Arsenic	2.4E+01	8.5E-03	1.5E-01	4.5E-01	6E-02	2E-02
	Cadmium	1.5E+01	5.3E-03	5.0E-01	9.9E-01	1E-02	5E-03
	Chromium	8.2E+01	2.9E-02	8.0E+02	2.4E+03	4E-05	1E-05
	Copper	1.1E+02	3.9E-02	8.8E+00	1.3E+01	4E-03	3E-03
	Lead	6.4E+02	2.3E-01	3.1E-01	6.1E-01	7E-01	4E-01
	Manganese	1.6E+03	5.6E-01	1.8E+01	5.7E+01	3E-02	1E-02
	Mercury	2.5E-01	8.8E-05	1.4E+00	4.1E+00	6E-05	2E-05
	Molybdenum	7.0E+00	2.5E-03	1.1E-02	2.6E-01	2E-01	9E-03
	Selenium	1.1E+00	3.9E-04	7.9E-02	1.3E-01	5E-03	3E-03
	Zinc	3.0E+03	1.1E+00	3.1E+02	9.3E+02	3E-03	1E-03
Blue River Reference	Aluminum	7.8E+04	2.7E+01	2.3E+00	1.1E+01	**1E+01**	**2E+00**
	Arsenic	1.3E+01	4.6E-03	1.5E-01	4.5E-01	3E-02	1E-02
	Cadmium	2.8E+00	9.9E-04	5.0E-01	9.9E-01	2E-03	1E-03
	Chromium	6.3E+01	2.2E-02	8.0E+02	2.4E+03	3E-05	9E-06
	Copper	4.5E+01	1.6E-02	8.8E+00	1.3E+01	2E-03	1E-03
	Lead	1.6E+02	5.6E-02	3.1E-01	6.1E-01	2E-01	9E-02
	Manganese	1.3E+03	4.6E-01	1.8E+01	5.7E+01	3E-02	8E-03
	Mercury	1.0E-01	3.5E-05	1.4E+00	4.1E+00	3E-05	9E-06
	Molybdenum	5.0E+00	1.8E-03	1.1E-02	2.6E-01	2E-01	7E-03
	Selenium	4.0E-01	1.4E-04	7.9E-02	1.3E-01	2E-03	1E-03
	Zinc	6.0E+02	2.1E-01	3.1E+02	9.3E+02	7E-04	2E-04

Notes:

Dose = [Conc x Ingestion Rate] / BW

na = not available

NC = HQ can not be calculated

Hazard Quotients for the Great Blue Heron from Incidental Ingestion of Sediment

Reach	COPCs	Sediment Ingestion					
		Sed EPC (mg/kg)	Dose (mg/kg BW/day)	TRV (mg/kg BW/day)		HQ	
				NOAEL	LOAEL	NOAEL	LOAEL
French Gulch Reference	Aluminum	8.0E+04	3.4E+01	3.5E+01	1.8E+02	1E+00	2E-01
	Arsenic	6.2E+01	2.6E-02	8.1E-01	7.1E+00	3E-02	4E-03
	Cadmium	6.1E+00	2.6E-03	8.7E-02	2.4E+00	3E-02	1E-03
	Chromium	5.4E+01	2.3E-02	2.0E-01	1.0E+00	1E-01	2E-02
	Copper	6.6E+01	2.8E-02	4.0E+00	6.0E+00	7E-03	5E-03
	Lead	3.8E+02	1.6E-01	8.8E-01	1.8E+00	2E-01	9E-02
	Manganese	1.3E+03	5.5E-01	6.5E+01	2.0E+02	8E-03	3E-03
	Mercury	2.7E-01	1.1E-04	9.0E-02	1.8E-01	1E-03	6E-04
	Molybdenum	6.0E+00	2.5E-03	2.4E+00	7.1E+00	1E-03	4E-04
	Selenium	2.0E+00	8.4E-04	1.0E-01	2.0E-01	8E-03	4E-03
	Zinc	7.8E+02	3.3E-01	2.6E+01	7.9E+01	1E-02	4E-03
North Branch French Gulch	Aluminum	6.6E+04	2.8E+01	3.5E+01	1.8E+02	8E-01	2E-01
	Arsenic	1.8E+02	7.6E-02	8.1E-01	7.1E+00	9E-02	1E-02
	Cadmium	2.1E+02	8.9E-02	8.7E-02	2.4E+00	1E+00	4E-02
	Chromium	4.0E+01	1.7E-02	2.0E-01	1.0E+00	8E-02	2E-02
	Copper	4.9E+02	2.1E-01	4.0E+00	6.0E+00	5E-02	3E-02
	Lead	6.5E+03	2.7E+00	8.8E-01	1.8E+00	**3E+00**	**2E+00**
	Manganese	1.2E+04	5.1E+00	6.5E+01	2.0E+02	8E-02	3E-02
	Mercury	3.5E-01	1.5E-04	9.0E-02	1.8E-01	2E-03	8E-04
	Molybdenum	1.6E+01	6.8E-03	2.4E+00	7.1E+00	3E-03	1E-03
	Selenium	2.3E+00	9.7E-04	1.0E-01	2.0E-01	1E-02	5E-03
	Zinc	3.5E+04	1.5E+01	2.6E+01	7.9E+01	6E-01	2E-01
South Branch French Gulch	Aluminum	na	na	3.5E+01	1.8E+02	NC	NC
	Arsenic	1.7E+02	7.2E-02	8.1E-01	7.1E+00	9E-02	1E-02
	Cadmium	1.1E+02	4.5E-02	8.7E-02	2.4E+00	5E-01	2E-02
	Chromium	na	na	2.0E-01	1.0E+00	NC	NC
	Copper	na	na	4.0E+00	6.0E+00	NC	NC
	Lead	3.4E+03	1.4E+00	8.8E-01	1.8E+00	**2E+00**	8E-01
	Manganese	na	na	6.5E+01	2.0E+02	NC	NC
	Mercury	na	na	9.0E-02	1.8E-01	NC	NC
	Molybdenum	na	na	2.4E+00	7.1E+00	NC	NC
	Selenium	na	na	1.0E-01	2.0E-01	NC	NC
	Zinc	2.0E+04	8.3E+00	2.6E+01	7.9E+01	3E-01	1E-01
French Gulch	Aluminum	7.3E+04	3.1E+01	3.5E+01	1.8E+02	9E-01	2E-01
	Arsenic	1.2E+02	5.1E-02	8.1E-01	7.1E+00	6E-02	7E-03
	Cadmium	8.2E+01	3.5E-02	8.7E-02	2.4E+00	4E-01	1E-02
	Chromium	5.3E+01	2.2E-02	2.0E-01	1.0E+00	1E-01	2E-02
	Copper	3.2E+02	1.4E-01	4.0E+00	6.0E+00	3E-02	2E-02
	Lead	2.3E+03	9.7E-01	8.8E-01	1.8E+00	1E+00	6E-01
	Manganese	9.1E+03	3.8E+00	6.5E+01	2.0E+02	6E-02	2E-02
	Mercury	2.9E-01	1.2E-04	9.0E-02	1.8E-01	1E-03	7E-04
	Molybdenum	1.0E+01	4.2E-03	2.4E+00	7.1E+00	2E-03	6E-04
	Selenium	2.1E+00	8.9E-04	1.0E-01	2.0E-01	9E-03	4E-03
	Zinc	1.8E+04	7.6E+00	2.6E+01	7.9E+01	3E-01	1E-01
Blue River	Aluminum	8.3E+04	3.5E+01	3.5E+01	1.8E+02	1E+00	2E-01
	Arsenic	2.4E+01	1.0E-02	8.1E-01	7.1E+00	1E-02	1E-03
	Cadmium	1.5E+01	6.3E-03	8.7E-02	2.4E+00	7E-02	3E-03
	Chromium	8.2E+01	3.5E-02	2.0E-01	1.0E+00	2E-01	3E-02
	Copper	1.1E+02	4.6E-02	4.0E+00	6.0E+00	1E-02	8E-03
	Lead	6.4E+02	2.7E-01	8.8E-01	1.8E+00	3E-01	2E-01
	Manganese	1.6E+03	6.8E-01	6.5E+01	2.0E+02	1E-02	3E-03
	Mercury	2.5E-01	1.1E-04	9.0E-02	1.8E-01	1E-03	6E-04
	Molybdenum	7.0E+00	3.0E-03	2.4E+00	7.1E+00	1E-03	4E-04
	Selenium	1.1E+00	4.6E-04	1.0E-01	2.0E-01	5E-03	2E-03
	Zinc	3.0E+03	1.3E+00	2.6E+01	7.9E+01	5E-02	2E-02
Blue River Reference	Aluminum	7.8E+04	3.3E+01	3.5E+01	1.8E+02	9E-01	2E-01
	Arsenic	1.3E+01	5.5E-03	8.1E-01	7.1E+00	7E-03	8E-04
	Cadmium	2.8E+00	1.2E-03	8.7E-02	2.4E+00	1E-02	5E-04
	Chromium	6.3E+01	2.7E-02	2.0E-01	1.0E+00	1E-01	3E-02
	Copper	4.5E+01	1.9E-02	4.0E+00	6.0E+00	5E-03	3E-03
	Lead	1.6E+02	6.8E-02	8.8E-01	1.8E+00	8E-02	4E-02
	Manganese	1.3E+03	5.5E-01	6.5E+01	2.0E+02	8E-03	3E-03
	Mercury	1.0E-01	4.2E-05	9.0E-02	1.8E-01	5E-04	2E-04
	Molybdenum	5.0E+00	2.1E-03	2.4E+00	7.1E+00	9E-04	3E-04
	Selenium	4.0E-01	1.7E-04	1.0E-01	2.0E-01	2E-03	8E-04
	Zinc	6.0E+02	2.5E-01	2.6E+01	7.9E+01	1E-02	3E-03

Notes:
Dose = [Conc x Ingestion Rate] / BW
na = not available
NC = HQ can not be calculated

Appendix G
Hazard Quotients for the Mink from Ingestion of Surface Water

Reach	COPCs	Surface Water Ingestion					
		SW EPC (mg/L)	Dose (mg/kg BW/day)	TRV (mg/kg BW/day)		HQ	
				NOAEL	LOAEL	NOAEL	LOAEL
French Gulch Reference	Aluminum	3.6E-01	3.7E-02	1.1E+00	5.5E+00	3E-02	7E-03
	Cadmium	4.2E-04	4.4E-05	1.7E-01	5.0E-01	3E-04	9E-05
	Lead	6.4E-03	6.7E-04	1.6E-01	3.1E-01	4E-03	2E-03
	Manganese	2.0E-01	2.1E-02	8.8E+00	2.8E+01	2E-03	7E-04
	Mercury	1.0E-04	1.0E-05	6.9E-01	2.1E+00	2E-05	5E-06
	Zinc	9.5E-02	1.0E-02	1.6E+02	4.7E+02	6E-05	2E-05
Discharge	Aluminum	1.1E+02	1.2E+01	1.1E+00	5.5E+00	**1E+01**	**2E+00**
	Cadmium	2.3E+01	2.4E+00	1.7E-01	5.0E-01	**1E+01**	**5E+00**
	Lead	5.5E+00	5.8E-01	1.6E-01	3.1E-01	**4E+00**	**2E+00**
	Manganese	1.3E+03	1.3E+02	8.8E+00	2.8E+01	**2E+01**	**5E+00**
	Mercury	4.0E-01	4.2E-02	6.9E-01	2.1E+00	6E-02	2E-02
	Zinc	3.5E+03	3.7E+02	1.6E+02	4.7E+02	**2E+00**	8E-01
North Branch French Gulch	Aluminum	4.6E-01	4.9E-02	1.1E+00	5.5E+00	4E-02	9E-03
	Cadmium	8.7E-02	9.2E-03	1.7E-01	5.0E-01	5E-02	2E-02
	Lead	4.6E-01	4.9E-02	1.6E-01	3.1E-01	3E-01	2E-01
	Manganese	7.5E+01	7.8E+00	8.8E+00	2.8E+01	9E-01	3E-01
	Mercury	1.0E-04	1.0E-05	6.9E-01	2.1E+00	2E-05	5E-06
	Zinc	1.8E+02	1.9E+01	1.6E+02	4.7E+02	1E-01	4E-02
South Branch French Gulch	Aluminum	2.5E-02	2.6E-03	1.1E+00	5.5E+00	2E-03	5E-04
	Cadmium	2.8E-03	2.9E-04	1.7E-01	5.0E-01	2E-03	6E-04
	Lead	2.9E-03	3.0E-04	1.6E-01	3.1E-01	2E-03	1E-03
	Manganese	6.1E-02	6.4E-03	8.8E+00	2.8E+01	7E-04	2E-04
	Mercury	na	na	6.9E-01	2.1E+00	NC	NC
	Zinc	2.4E+00	2.5E-01	1.6E+02	4.7E+02	2E-03	5E-04
French Gulch	Aluminum	1.4E-01	1.5E-02	1.1E+00	5.5E+00	1E-02	3E-03
	Cadmium	6.3E-03	6.7E-04	1.7E-01	5.0E-01	4E-03	1E-03
	Lead	1.0E-02	1.1E-03	1.6E-01	3.1E-01	7E-03	4E-03
	Manganese	7.4E-01	7.7E-02	8.8E+00	2.8E+01	9E-03	3E-03
	Mercury	na	na	6.9E-01	2.1E+00	NC	NC
	Zinc	2.5E+00	2.7E-01	1.6E+02	4.7E+02	2E-03	6E-04
Blue River	Aluminum	2.2E-01	2.3E-02	1.1E+00	5.5E+00	2E-02	4E-03
	Cadmium	2.2E-03	2.3E-04	1.7E-01	5.0E-01	1E-03	5E-04
	Lead	5.3E-03	5.5E-04	1.6E-01	3.1E-01	4E-03	2E-03
	Manganese	7.7E-02	8.1E-03	8.8E+00	2.8E+01	9E-04	3E-04
	Mercury	na	na	6.9E-01	2.1E+00	NC	NC
	Zinc	1.1E+00	1.1E-01	1.6E+02	4.7E+02	7E-04	2E-04
Blue River Reference	Aluminum	1.8E-01	1.9E-02	1.1E+00	5.5E+00	2E-02	4E-03
	Cadmium	1.6E-04	1.7E-05	1.7E-01	5.0E-01	1E-04	3E-05
	Lead	1.0E-03	1.1E-04	1.6E-01	3.1E-01	7E-04	3E-04
	Manganese	2.2E-02	2.3E-03	8.8E+00	2.8E+01	3E-04	8E-05
	Mercury	na	na	6.9E-01	2.1E+00	NC	NC
	Zinc	2.4E-02	2.5E-03	1.6E+02	4.7E+02	2E-05	5E-06

Notes:
Dose = [Conc x Ingestion Rate] / BW
na = not available
NC = HQ can not be calculated

Appendix G
Hazard Quotients for the Great Blue Heron from Ingestion of Surface Water

Reach	COPCs	Surface Water Ingestion					
		SW EPC (mg/L)	Dose (mg/kg BW/day)	TRV (mg/kg BW/day)		HQ	
				NOAEL	LOAEL	NOAEL	LOAEL
French Gulch Reference	Aluminum	3.6E-01	1.6E-02	1.8E+01	8.8E+01	9E-04	2E-04
	Cadmium	4.2E-04	1.9E-05	4.3E-02	1.2E+00	4E-04	2E-05
	Lead	6.4E-03	2.8E-04	4.4E-01	8.8E-01	6E-04	3E-04
	Manganese	2.0E-01	8.8E-03	3.3E+01	9.8E+01	3E-04	9E-05
	Mercury	1.0E-04	4.5E-06	4.5E-02	9.0E-02	1E-04	5E-05
	Zinc	9.5E-02	4.2E-03	1.3E+01	3.9E+01	3E-04	1E-04
Discharge	Aluminum	1.1E+02	5.1E+00	1.8E+01	8.8E+01	3E-01	6E-02
	Cadmium	2.3E+01	1.0E+00	4.3E-02	1.2E+00	**2E+01**	8E-01
	Lead	5.5E+00	2.4E-01	4.4E-01	8.8E-01	6E-01	3E-01
	Manganese	1.3E+03	5.7E+01	3.3E+01	9.8E+01	**2E+00**	6E-01
	Mercury	4.0E-01	1.8E-02	4.5E-02	9.0E-02	4E-01	2E-01
	Zinc	3.5E+03	1.6E+02	1.3E+01	3.9E+01	**1E+01**	**4E+00**
North Branch French Gulch	Aluminum	4.6E-01	2.1E-02	1.8E+01	8.8E+01	1E-03	2E-04
	Cadmium	8.7E-02	3.9E-03	4.3E-02	1.2E+00	9E-02	3E-03
	Lead	4.6E-01	2.1E-02	4.4E-01	8.8E-01	5E-02	2E-02
	Manganese	7.5E+01	3.3E+00	3.3E+01	9.8E+01	1E-01	3E-02
	Mercury	1.0E-04	4.5E-06	4.5E-02	9.0E-02	1E-04	5E-05
	Zinc	1.8E+02	7.9E+00	1.3E+01	3.9E+01	6E-01	2E-01
South Branch French Gulch	Aluminum	2.5E-02	1.1E-03	1.8E+01	8.8E+01	6E-05	1E-05
	Cadmium	2.8E-03	1.3E-04	4.3E-02	1.2E+00	3E-03	1E-04
	Lead	2.9E-03	1.3E-04	4.4E-01	8.8E-01	3E-04	1E-04
	Manganese	6.1E-02	2.7E-03	3.3E+01	9.8E+01	8E-05	3E-05
	Mercury	na	na	4.5E-02	9.0E-02	NC	NC
	Zinc	2.4E+00	1.1E-01	1.3E+01	3.9E+01	8E-03	3E-03
French Gulch	Aluminum	1.4E-01	6.2E-03	1.8E+01	8.8E+01	4E-04	7E-05
	Cadmium	6.3E-03	2.8E-04	4.3E-02	1.2E+00	7E-03	2E-04
	Lead	1.0E-02	4.6E-04	4.4E-01	8.8E-01	1E-03	5E-04
	Manganese	7.4E-01	3.3E-02	3.3E+01	9.8E+01	1E-03	3E-04
	Mercury	na	na	4.5E-02	9.0E-02	NC	NC
	Zinc	2.5E+00	1.1E-01	1.3E+01	3.9E+01	9E-03	3E-03
Blue River	Aluminum	2.2E-01	9.9E-03	1.8E+01	8.8E+01	6E-04	1E-04
	Cadmium	2.2E-03	9.9E-05	4.3E-02	1.2E+00	2E-03	8E-05
	Lead	5.3E-03	2.3E-04	4.4E-01	8.8E-01	5E-04	3E-04
	Manganese	7.7E-02	3.4E-03	3.3E+01	9.8E+01	1E-04	4E-05
	Mercury	na	na	4.5E-02	9.0E-02	NC	NC
	Zinc	1.1E+00	4.8E-02	1.3E+01	3.9E+01	4E-03	1E-03
Blue River Reference	Aluminum	1.8E-01	8.2E-03	1.8E+01	8.8E+01	5E-04	9E-05
	Cadmium	1.6E-04	7.2E-06	4.3E-02	1.2E+00	2E-04	6E-06
	Lead	1.0E-03	4.5E-05	4.4E-01	8.8E-01	1E-04	5E-05
	Manganese	2.2E-02	9.9E-04	3.3E+01	9.8E+01	3E-05	1E-05
	Mercury	na	na	4.5E-02	9.0E-02	NC	NC
	Zinc	2.4E-02	1.1E-03	1.3E+01	3.9E+01	8E-05	3E-05

Notes:
Dose = [Conc x Ingestion Rate] / BW
na = not available
NC = HQ can not be calculated