FINAL

BASELINE ECOLOGICAL RISK ASSESSMENT

FOR THE NELSON TUNNEL SUPERFUND SITE

CREEDE, COLORADO

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Acronyms

Ag	Silver
Al	Aluminum
As	Arsenic
AUF	Area Use Factor
AVG	Average
BCF	Bioconcentration Factor
Be	Beryllium
BERA	Baseline Ecological Risk Assessment
Ca	Calcium
cfs	cubic feet per second
CCC	Criteria Continuous Concentration
Cd	Cadmium
CDPHE	Colorado Department of Public Health and the Environment
CMC	Criteria Maximum Concentration
COPEC	Chemical of Potential Ecological Concern
Cr	Chromium
CSM	Conceptual Site Model
CTE	Central Tendency Exposure
Cu	Copper
Eco-SSL	Ecological Soil Screening Level
EDD	Estimated Daily Dose
EPA	United States Environmental Protection Agency
EPC	Exposure Point Concentration
EPT	Ephemoptera, Plecoptera, Trichoptera
ER-L	Effect Range-Low
ER-M	Effect Range-Median
EU	Exposure Unit
Fe	Iron
ft	foot or feet
gpm	gallons per minute
Hg	Mercury
HQ	Hazard Quotient
K	Potassium
mg/kg	milligrams per kilograms
LOE	Line of Evidence
MDL	Method Detection Limit
Mg	Magnesium
mg/L	milligrams per liter

Mn	Manganese
NA	Not Applicable or Not Available
NRWQC	National Recommended Water Quality Criteria
MET	Minimum Effect Threshold
Na	Sodium
Ni	Nickel
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
NRWQC	National Recommended Water Quality Criteria
Pb	Lead
PEC	Probable Effect Concentration
PEL	Probable Effect Level
PRG	Preliminary Remediation Goal
RI	Remedial Investigation
RL	Reporting Limit
RME	Reasonable Maximum Exposure
Sb	Antimony
Se	Selenium
SiO_2	Silica
SLERA	Screening Level Ecological Risk Assessment
SMDP	Scientific Management Decision Point
Sr	Strontium
SRLW	Soft Reconstituted Laboratory Water
TEC	Threshold Effect Concentration
TEL	Threshold Effect Level
TET	Toxic Effect Threshold
Tl	Thallium
TRV	Toxicity Reference Value
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
µg/L	micrograms per liter
V	Vanadium
WCRC	Willow Creek Reclamation Committee
WQC	Water Quality Criterion
WQS	Water Quality Standard
Zn	Zinc

EXECUTIVE SUMMARY

ES.1 Introduction

A Baseline Ecological Risk Assessment (BERA) was performed on the aquatic habitats potentially affected by the Nelson Tunnel/Commodore Waste Rock Pile Superfund Site (the Site) located one mile upstream of the Town of Creede in Mineral County, Colorado. The Nelson Tunnel adit empties into West Willow Creek which becomes Willow Creek before flowing into the Rio Grande River about four miles downstream from the Site. Immediately upslope and surrounding the Nelson Tunnel is the Commodore Waste Rock Pile, which is comprised of waste rock from past hard rock mining activities in the area.

Both the Commodore Waste Rock Pile and discharge from the Nelson Tunnel are impacted by heavy metals from past mining activities and environmental processes. The Nelson Tunnel system provided both haulage and drainage for mines developed in the Willow Creek Watershed. The portal is the largest single source of metal loading to Willow Creek. The Commodore Waste Rock Pile is comprised of mine wastes from the Commodore and Nelson Tunnel workings, deposited between 1890 and 1960. The pile is comprised of barren and mineralized rock containing metals such as Lead (Pb), Cadmium (Cd), Copper (Cu), and Zinc (Zn). Minerals found in the waste rock include metallic sulfides dominated by pyrite.

The major habitats affected by the Site consist of West Willow Creek, Willow Creek, and the Rio Grande River.

Samples used in the BERA were collected in 2010 on up to three separate occasions (depending on sample type) in April, June, and/or September to represent three distinct seasonal flow regimes in Willow Creek and the Rio Grande River. The analytical data collected during these sampling events were not combined in order to quantify the exposures associated with each sample location and season.

The ecological risk management goal for this BERA is as follows:

"Ensure that acceptable risk levels are achieved for aquatic and aquatic-dependent receptors within the Site boundary and the receiving waters of the Rio Grande by protecting those receptors from the deleterious effects of exposures to Site-related contaminants".

ES.2 Risk Analysis

The Conceptual Site Model (CSM) developed for the SLERA was re-evaluated to identify exposure pathways and receptors in the on- and off-site aquatic habitats. The receptor groups of concern were benthic invertebrates, water column invertebrates, fish, aquatic insectivorous birds, piscivorous birds, omnivorous birds, and herbivorous mammals. Exposure routes included direct exposures in sediment and surface water by aquatic receptors (invertebrates and fish), and ingestion of contaminated surface water and food items (such as aquatic insects, plants, and fish) by wildlife receptors feeding in Willow Creek and the Rio Grande River.

An assessment endpoint was selected for each receptor group of concern. It was not possible to directly quantify the risk to these assessment endpoints in all cases. Instead, different measurement endpoints were used, as follows.

- Compare COPEC levels in sediment and surface water samples to published sediment or surface water benchmarks.
- Expose juvenile rainbow trout for 96 hours in the laboratory to serial dilutions of Willow Creek surface water or undiluted Rio Grande River surface water.
- Quantify the structure and function of the benthic invertebrate community in the Rio Grande River based on a field survey.
- Use food chain modeling to calculate an Estimated Daily Dose (EDD) to the four wildlife receptor groups based on ingesting contaminated surface water and food items from Willow Creek and the Rio Grande River; compare these EDDs to published wildlife Toxicity Reference Values (TRVs).

Specific Exposure Units (EUs) were defined for each assessment endpoint. The analytical data were then summarized per EU for use in exposure calculations. The EUs were based on the following sample locations.

Willow Creek:

- WW-M: located above the Nelson Tunnel discharge confluence to Willow Creek; considered 'background' to the Tunnel influences.
- WW-NT: located at the Nelson Tunnel discharge before its confluence with West Willow Creek.
- WW-F: located in West Willow Creek just below the confluence with the Nelson Tunnel discharge.
- WW-E: located in West Willow Creek below WW-F.
- W-I: located at the end of the western braided channel of Willow Creek just before discharging into the Rio Grande River.
- W-J: located at the end of the eastern braided channel of Willow Creek just before discharging into the Rio Grande River.

Each sample location in the Rio Grande River consisted of a transect running from bank to bank perpendicular to the river from which up to four, equally-spaced grab samples were collected (e.g., sample location RG-2 is comprised of samples RG-2-1, RG-2-2, RG-2-3, and RG-2-4). These sample locations are as follows:

- RG-2: located immediately above the confluence with Willow Creek; represents background conditions for the Rio Grande River.
- RG-4: located at the Wason Ranch Bridge, 1.29 miles below the confluence with Willow Creek.
- RG-8: located at the Hwy 149 bridge (La Garita Bridge), 6.55 miles below the confluence with Willow Creek.
- RG-9: located at the 4UR Bridge, 7.78 miles below the confluence with Willow Creek.

Each EU had an associated "reference" location which was unaffected by the mine but resembled the impacted EUs in all other respects. The reference EUs served to track the risks from local background conditions.

A COPEC-specific Exposure Point Concentration (EPC) was calculated at each EU in terms of a Reasonable Maximum Exposures (RME) represented by the maximum concentration (or the one available concentration, if only a single sample was collected from a sample location per season, as was the case in Willow Creek) and the Central Tendency Exposure (CTE) represented by the arithmetic mean (if more than one sample was collected from a sample location per season, as was the case in the Rio Grande River). All the data sets were too small to calculate 95th percentile upper confidence limits of the means.

Where appropriate, the potential for ecological risk was determined using Hazard Quotients (HQs). An HQ was calculated for each COPEC by dividing an exposure or dose by a corresponding toxicity value. Statistics were also used to determine the presence of risk in the rainbow trout toxicity tests and the benthic invertebrate community assessment.

The BERA presents HQs by: (a) EU (i.e., the individual sample locations on Willow Creek and the Rio Grande River), (b) season (April, June, and/or September 2010), (c) receptor (i.e., benthic invertebrate, aquatic invertebrate, fish, and four wildlife receptors), (d) EPC (mean and/or maximum, depending on sample location), and toxicity measure (i.e., acute and chronic surface water benchmarks, no effect- and effect-based sediment benchmarks, and no effect- and effect-based bird or mammal TRVs).

This executive summary highlights the risks associated with maximum exposures. Only the RME scenarios are presented below to allow for valid COPEC-specific risk comparisons across the two waterways for the same receptor group. Hence, the risk conclusions should be viewed as "worst-case" situations. The BERA also provided CTE scenarios, when available.

ES.3 General Conclusions of the BERA

ES.3.1 Benthic invertebrate community

The potential for ecological risk to the benthic invertebrate community exposed to mine-related contamination was only assessed in the Rio Grande River using two measurement endpoints:

1. Compare COPEC levels in bulk sediment samples to sediment benchmarks.
2. Measure the structure and function of the benthic invertebrate community based on a field survey.

The first measurement endpoint identified Cd, Pb, and Zn as major risk drivers in sediments from the Rio Grande River, based on comparing metal concentrations to effect-based sediment benchmarks (known as Probable Effect Concentrations [PECs]). The risk associated with Cd and Zn both increased with distance from the confluence with Willow Creek, with the highest PEC HQs observed at RG-9, the most down-gradient location, while the risk for Pb remained relatively constant. The risk to the benthic invertebrate community in Willow Creek could not be quantified because sediment samples were not collected from this waterway.

The data from the benthic survey performed in the Rio Grande River in September 2010 did not identify severe mine-related effects to the community at RG-4 and RG-8. Any impacts appeared to be relatively mild and included a potential shift towards scrapers at both RG-4 and RG-8 (presumably due to increased silting), a decreased number of mayfly taxa (but not mayfly numbers) at RG-4, and a decrease in the % intolerant taxa at RG-8. However, the major indicators of community health (e.g., EPT taxa richness and Shannon's Index) did not suggest that benthic invertebrates in the Rio Grande River below the confluence with Willow Creek were systematically affected. The uncertainty associated with this conclusion was moderate however, because the benthic community data sets used in the statistical analyses were small (i.e., three replicates per sample location; three sample locations on the Rio Grande River). The health of the benthic invertebrate community in Willow Creek was unknown because a benthic survey was not performed in this waterway.

The sediment chemistry Line of Evidence (LOE) showed a high potential for ecological risk to the benthic community in the Rio Grande River below the confluence with Willow Creek. However, the benthic community survey LOE suggested that any mine-related risks were probably relatively minor. The survey should be given more weight in the risk decision-making process because it represented location-specific responses measured in benthic invertebrates exposed *in-situ* for long periods of time to mine-derived discharge. This conclusion was considered reliable because it was based on two independent LOEs, including a community survey.

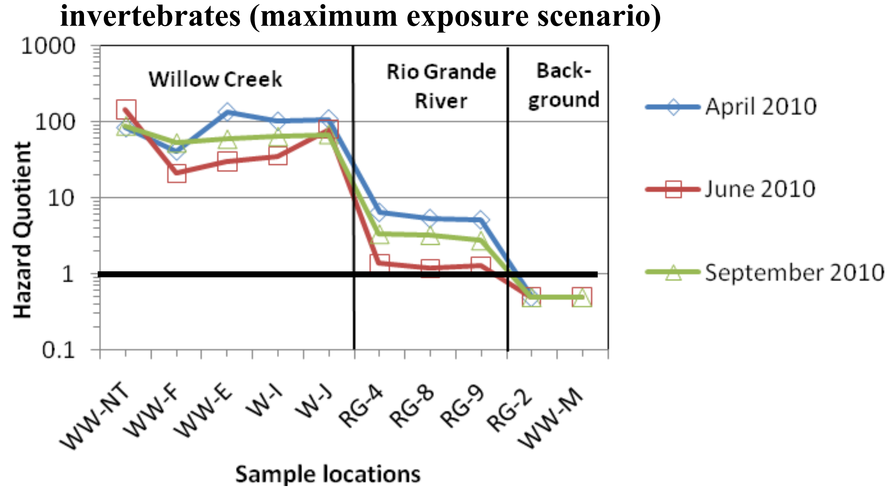
ES.3.2 Water column invertebrate community

The potential for ecological risk to the water column invertebrates exposed to mine-related discharge was assessed for Willow Creek and the Rio Grande River using one measurement endpoint, i.e., comparing the dissolved metal levels in surface water samples to acute and chronic benchmarks. Only the HQs derived from the (more conservative) chronic surface water benchmarks are summarized below, even though the BERA also provides the acute HQs.

This measurement endpoint identified Cd, Pb, and Zn as the main risk drivers in Willow Creek and the Rio Grande River. Manganese (Mn) was only a risk driver in Willow Creek. Risks from Beryllium (Be), Iron (Fe), Selenium (Se), Strontium (Sr), and Vanadium (V) were specific to sample location WW-NT. Cu was identified as a stressor at sample locations WW-NT, WW-E, and W-J in Willow Creek, and at sample location RG-8 in the Rio Grande River. The reliability of this conclusion was low because it was based on a single, semi-qualitative LOE. The potential risk associated with the four major contaminants is discussed below.

Cadmium
The chronic-based HQs (maximum exposure scenario) for Cd exceeded 1.0 at all the sample locations in Willow Creek and the Rio Grande River, except for the background locations (**Figure ES-1**). These HQs ranged from 21.3 to 148.5 for Willow Creek and from 1.2 to 6.5 for the Rio Grande River across the seasons. This LOE indicated severe impact from Cd to the water column community in Willow Creek, with less severe but still substantial impacts possible in the Rio Grande River.

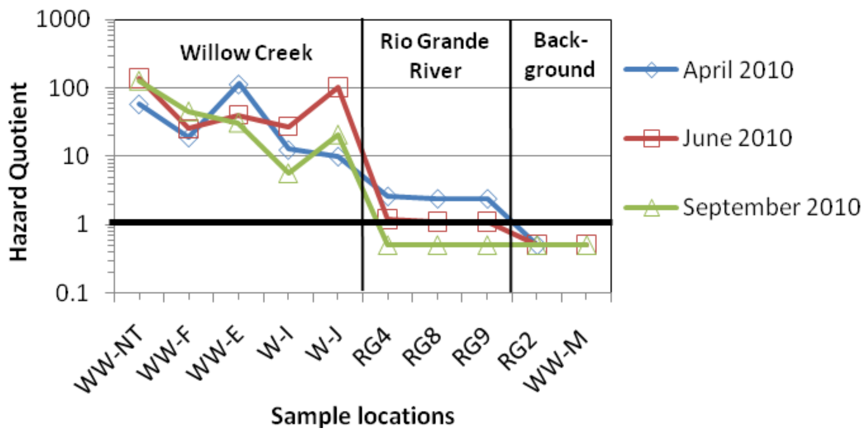
Figure ES-1: Cd chronic-based HQs for water column invertebrates (maximum exposure scenario)



Lead

The Pb chronic-based HQs (maximum exposure scenario) exceeded 1.0 at all the sample locations in Willow Creek and the Rio Grande River, except for the background locations and Rio Grande River in September 2010 (**Figure ES-2**). These HQs ranged from 5.6 to 139.2 for Willow Creek and from <1 to 2.6 for the Rio Grande River across the seasons. This LOE indicated severe impacts of Pb to the water column community at Willow Creek. The impact in the Rio Grande River was relatively small in April and June and non-existent in September.

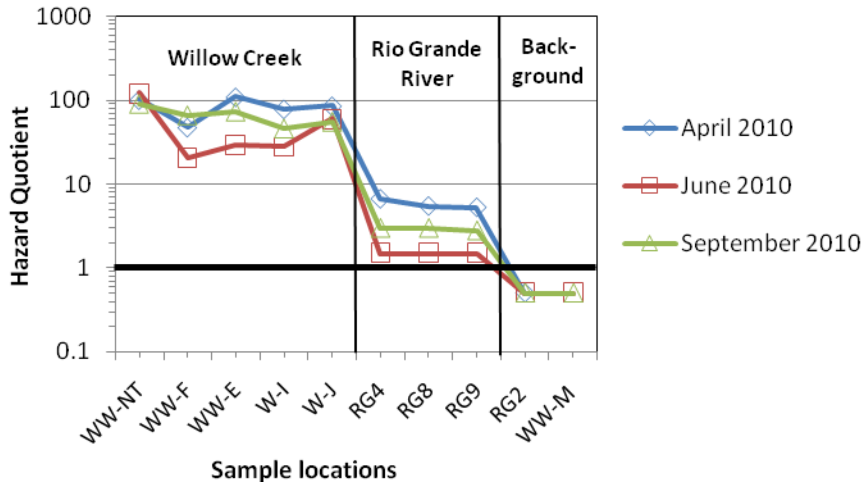
Figure ES-2: Pb chronic-based HQs for water column invertebrates (maximum exposure scenario)



Zinc

The Zn chronic-based HQs (maximum exposure scenario) exceeded 1.0 at all the sample locations in Willow Creek and the Rio Grande River, except for the background locations (**Figure ES-3**). These HQs ranged from 20.6 to 123.2 for Willow Creek and from 1.5 to 6.7 for the Rio Grande River across the seasons. This LOE indicated severe impacts of Zn to the water column community at Willow Creek, with less severe but still substantial impacts possible in the Rio Grande River.

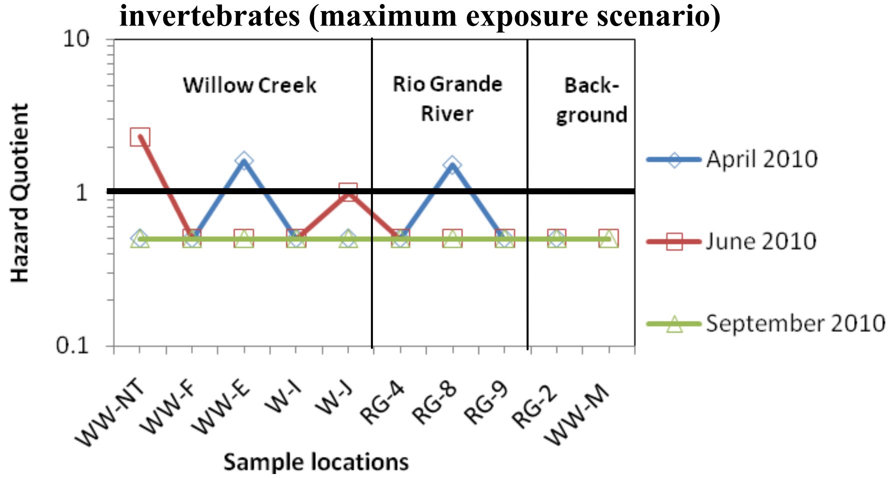
Figure ES-3: Zn chronic-based HQs for water column invertebrates (maximum exposure scenario)



Copper

The chronic-based HQs for Cu (maximum exposure scenario) slightly exceeded 1.0 at sample locations WW-NT, WW-E, W-J, and RG-8. The risk from Cu both in Willow Creek and the Rio Grande River is minimal in April and June, and non-existent in the fall (**Figure ES-4**).

Figure ES-4: Cu chronic-based HQs for water column invertebrates (maximum exposure scenario)



ES.3.3 <u>Fish</u>

The potential for ecological risk to the fish community exposed to mine-related discharge was assessed in Willow Creek and the Rio Grande River using two measurement endpoints:

1. Compare dissolved metal levels in surface water samples to acute and chronic benchmarks.

2. Assess 96-hr acute surface water toxicity using juvenile rainbow trout exposed to surface water from Willow Creek (diluted) and the Rio Grande River (undiluted).

The first measurement endpoint identified Cd, Pb, and Zn as the main risk drivers in Willow Creek and the Rio Grande River. Mn was only identified as a risk driver in Willow Creek. Risks from Be, Fe, Se, Sr, and V were specific to sample location WW-NT. Cu was identified as a stressor at sample locations WW-NT, WW-E, and W-J in Willow Creek, and at sample location RG-8 in the Rio Grande River. The reliability of this conclusion was low because it was based on a single, semi-qualitative LOE. The potential for risk to fish associated with the major contaminants was not repeated here since they were identical to those presented in the previous subsection for the surface water invertebrate community (same exposure route via surface water).

The second measurement endpoint showed that Willow Creek surface water was highly toxic to juvenile rainbow trout. Acute toxicity was only removed after the Willow Creek surface water was diluted down to 3.13% with uncontaminated water. Significant acute toxicity was observed at Rio Grande River sample location RG-8 (75% survival in undiluted water), but not at RG-4 (95% survival in undiluted water), even though the latter was closer to the confluence with Willow Creek.

The available information was interpreted as follows:

- Weakly-diluted Willow Creek surface water was acutely toxic to juvenile rainbow trout.
- The flow of the Rio Grande River below the confluence consisted of about 4% Willow Creek water at the time of sampling in September 2010.
- Acute toxicity in Willow Creek surface water was removed only when this surface water was diluted down to 3.13% of its original volume using uncontaminated water. This dilution was roughly similar to the one observed in the Rio Grande River below the confluence in September.
- The average Cd and Zn levels measured in the non-toxic 3.13% serial dilution test water (diluted by RG-2 water) equaled 0.37 μg/L and 83.7 μg/L, respectively. The hardness-adjusted acute Water Quality Standard (WQS) for Cd and Zn equaled 0.67 μg/L and 57.3 μg/L, respectively. It was notable that Zn exceeded its WQS without causing significant acute toxicity in the 3.13% dilution.
- The test results for the two Rio Grande River surface water samples were contradictory: RG-4 was non-toxic but RG-8was toxic, even though RG-8 was located several miles downstream from RG-4. Regardless, the fact that significant acute toxicity was measured in RG-8 raises concern with the surface water quality in the Rio Grande River downstream of the confluence with Willow Creek.

The challenge with interpreting this information was that the volume of Willow Creek flow into the Rio Grande River resulted in a natural dilution of about 4% which, by chance, fell at the threshold between the presence and absence of acute toxicity observed in the serial dilution test. The observed mortality pattern suggested that acute toxicity in rainbow trout would likely be observed in both the RG-4 and RG-8 samples had the natural dilution been around 6%. On the other hand, it also appears that acute toxicity would be absent from both samples had the natural dilution been around 2%.

Based on the available body of evidence, it would be premature to conclude that the surface water of the Rio Grande River below the confluence with Willow Creek was not toxic to fish. The fact that the hardness-adjusted, chronic WQS for Cd was between three and four times lower than the Cd concentrations measured in the 3.13% Willow Creek dilution used in the acute toxicity test, and in both RG-4 and RG-8, strongly suggested that the Rio Grande River below the confluence may be unable to support a healthy, sustainable fish community due to the presence of Cd. In addition, the concentration of Cd and Zn were higher in the Rio Grande River during April than they were during September when water samples were collected for the toxicity tests. This insight further strengthens the conclusion that sensitive life stages of the fish community in the Rio Grande River below the confluence with Willow Creek are likely impaired due to heavy metals.

ES.3.4 Aquatic insectivorous birds (American dipper)

Risk to birds feeding on aquatic insects over Willow Creek and the Rio Grande River was assessed based on one measurement endpoint, i.e., use generic Bioconcentration Factors (BCFs) to estimate COPEC levels in insects and apply a conservative food chain model to calculate daily doses to the American dipper for comparison to no effect- and effect-based bird TRVs.

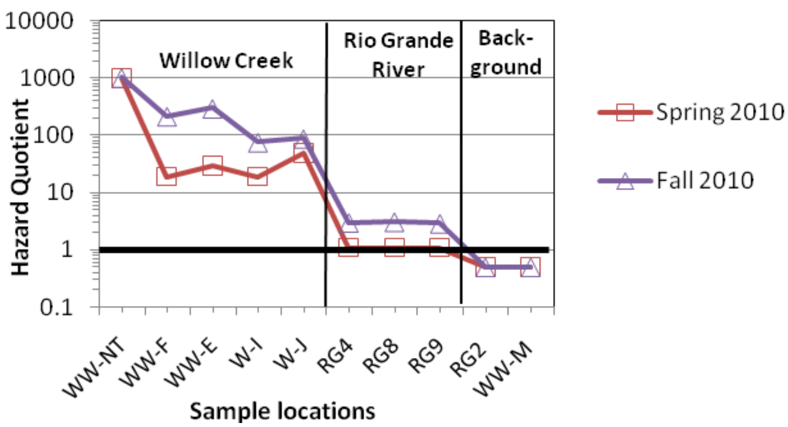
This measurement endpoint identified Zn as the major risk driver to insectivorous birds ingesting surface water and winged aquatic insects from Willow Creek and the Rio Grande River. Cd and Pb were only identified as risk drivers in Willow Creek, while Cu was only a risk driver at sample location WW-NT. The reliability of these findings was low because it was based on a single, semi-qualitative LOE.

The potential risk associated with the major contaminants is discussed below. Note that winged insects were not expected to emerge in substantial numbers from highly-contaminated Willow Creek. Hence, the risk to aquatic insectivorous birds feeding in Willow Creek under current conditions should be considered entirely hypothetical. Also, in this summary, the risk was only discussed in terms of the effect-based HQs for the sake of brevity, even though the BERA also provided the no effect-based HQs.

Zinc

The effect-based HQs (maximum exposure scenario) for Zn exceeded 1.0 at all sample locations in Willow Creek and the Rio Grande River, except for the background locations (**Figure ES-5**). These HQs ranged from 19 to 1,027 for Willow Creek and from 1.1 to 3.1 for the Rio Grande River across the seasons. This LOE indicated a high risk potential from Zn to birds feeding on aquatic insects in Willow Creek, with only a small risk potential for the same birds feeding in the Rio Grande River. The impacts to Willow Creek downstream from WW-NT are also relatively less severe in the spring than in the fall.

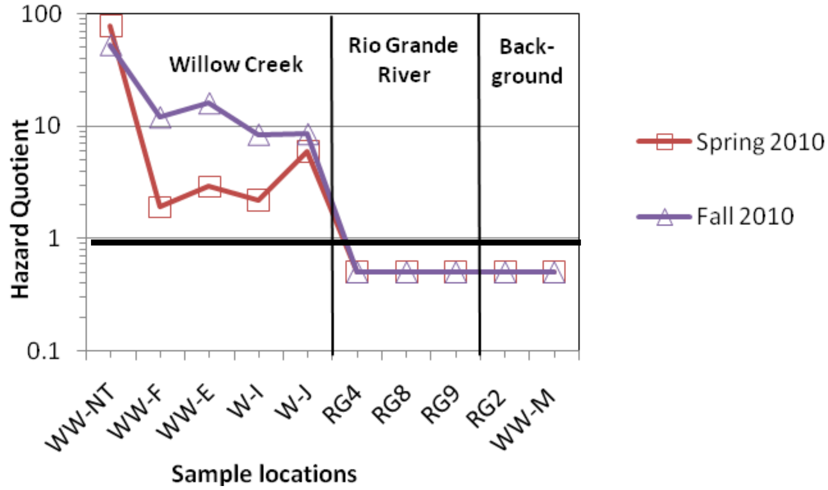
Figure ES-5: Zn effect-based HQs for aquatic insectivorous birds (maximum exposure scenario)



Cadmium

The effect-based HQs (maximum exposure scenario) for Cd exceeded 1.0 at all the sample locations in Willow Creek, but at none of the sample locations in the Rio Grande River (**Figure ES-6**). These HQs ranged from 1.9 to 79 for Willow Creek across the seasons. This LOE indicated a higher potential for risk from Cd in the fall compared to the spring. Cd did not represent a risk to aquatic insectivorous birds feeding over the Rio Grande River.

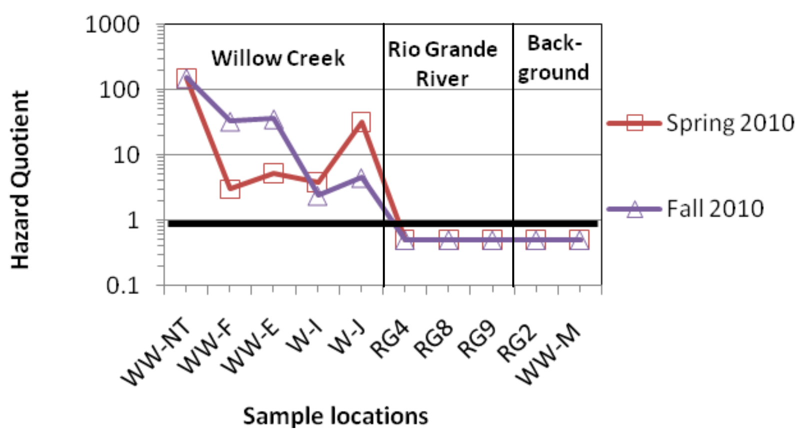
Figure ES-6: Cd effect-based HQs for aquatic insectivorous birds (maximum exposure scenario)



Lead

The effect-based HQs (maximum exposure scenario) for Pb exceeded 1.0 at each sample location in Willow Creek (**Figure ES-7**). These HQs ranged from 3.0 to 153 for Willow Creek across the seasons. This LOE indicated that Pb had a high potential to affect aquatic insectivorous birds feeding in Willow Creek. Pb did not represent a risk to aquatic insectivorous birds feeding over the Rio Grande River.

Figure ES-7: Pb effect-based HQs for aquatic insectivorous birds (maximum exposure scenario)



ES.3.5 Omnivorous birds (mallard)

Risk to omnivorous birds feeding in Willow Creek and the Rio Grande River was assessed based on a single measurement endpoint, i.e., use generic BCFs to estimate the COPEC levels in benthic invertebrates (spring and fall) and aquatic plants (fall only) and apply a conservative food chain model to calculate daily doses to mallards for comparison to no effect- and effect-based avian TRVs.

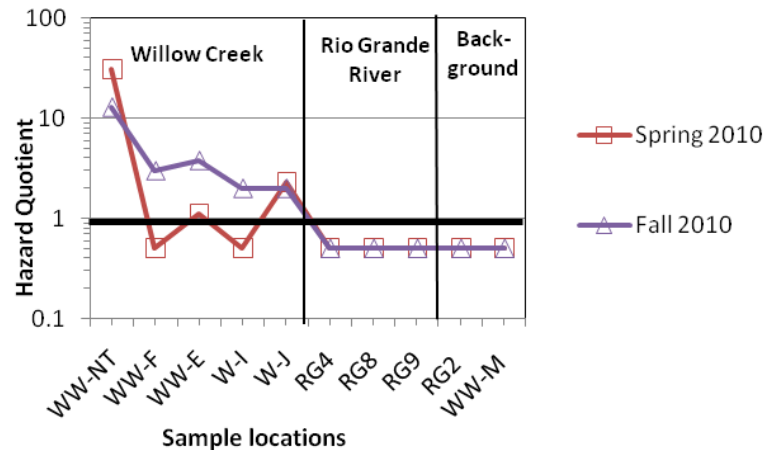
This measurement endpoint identified Cd, Pb, and Zn as the major risk drivers to omnivorous birds ingesting surface water, and feeding on benthic invertebrates and aquatic plants from Willow Creek. Cu was only identified as a risk driver at sample location WW-NT. The reliability of the risk conclusion was considered low because it was based on a single, semi-qualitative LOE.

The potential risk associated with the four major contaminants is discussed below. Note that benthic invertebrates were not expected to be present in substantial numbers in Willow Creek. Hence, the risk to aquatic omnivorous birds feeding on benthic invertebrates in Willow Creek under current conditions should be considered entirely hypothetical. Also, in this summary, the risk was only discussed in terms of the effect-based HQs for the sake of brevity, even though the BERA also provides the no effect-based HQs.

Cadmium

The effect-based HQs (maximum exposure scenario) for Cd exceeded 1.0 at each sample location in Willow Creek, except for sample locations WW-F and WW-I in the spring (**Figure ES-8**). These HQs ranged from <1 to 31 for Willow Creek across the seasons, but fell below 1.0 in the Rio Grande River. This LOE indicated a high potential for risk from Cd to omnivorous birds feeding in Willow Creek (particularly in the fall), but not in the Rio Grande River.

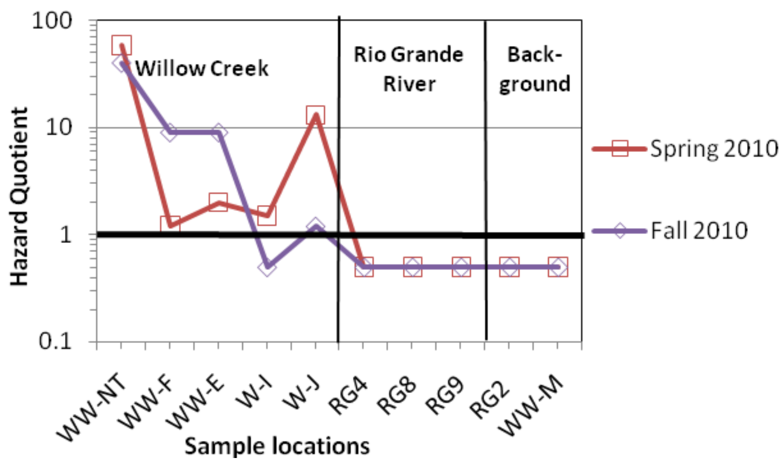
Figure ES-8: Cd effect-based HQs for omnivorous birds (maximum exposure scenario)



Lead

The effect-based HQs (maximum exposure scenario) for Pb exceeded 1.0 at each sample location in Willow Creek, except for sample location W-I in the fall (**Figure ES-9**). These HQs ranged from <1 to 58 for Willow Creek across the seasons, but fell below 1.0 in the Rio Grande River. This LOE indicated a high potential for risk from Pb to omnivorous birds feeding in Willow Creek, but no risk in the Rio Grande River.

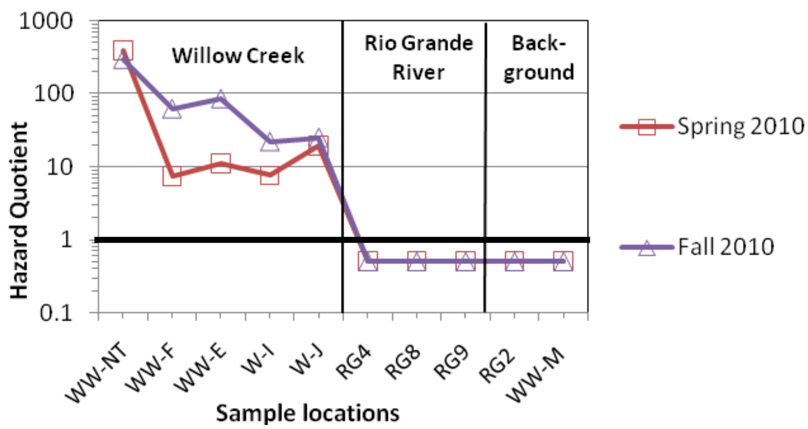
Figure ES-9: Pb effect-based HQs for omnivorous birds (maximum exposure scenario)



Zinc

The Zn effect-based HQs (maximum exposure scenario) exceeded 1.0 at each of the sample locations in Willow Creek (**Figure ES-10**). These HQs ranged from 7.3 to 386 for Willow Creek across the seasons. This LOE indicated that Zn had a high potential to severely impact omnivorous birds feeding in Willow Creek. The impacts of Zn in Willow Creek downstream from WW-NT were relatively less severe in the spring than the fall. No risk from Zn was observed for omnivorous birds feeding in the Rio Grande River.

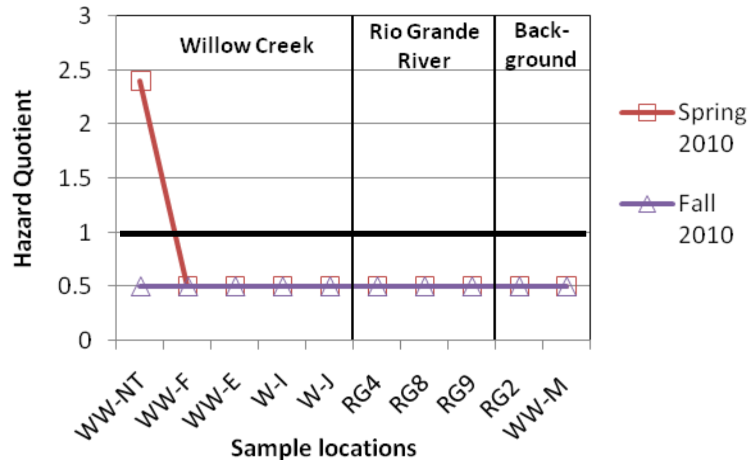
Figure ES-10: Zn effect-based HQs for omnivorous birds (maximum exposure scenario)



Copper

The effect-based HQs (maximum exposure scenario) for Cu exceeded 1.0 at sample location WW-NT only in the spring (**Figure ES-11**). This LOE showed a potential for risk from Cu to omnivorous birds feeding in Willow Creek only at location WW-NT in the spring, with no impact to the rest of Willow Creek or the Rio Grande River.

Figure ES-11: Cu effect-based HQs for omnivorous birds (maximum exposure scenario)



ES.3.6 Piscivorous birds (belted kingfisher)

Risk to piscivorous birds feeding in Willow Creek and the Rio Grande River was assessed based on a single measurement endpoint, i.e., use generic BCFs to estimate the COPEC levels in fish and apply a conservative food chain model to calculate daily doses to belted kingfisher for comparison to no effect- and effect-based avian TRVs.

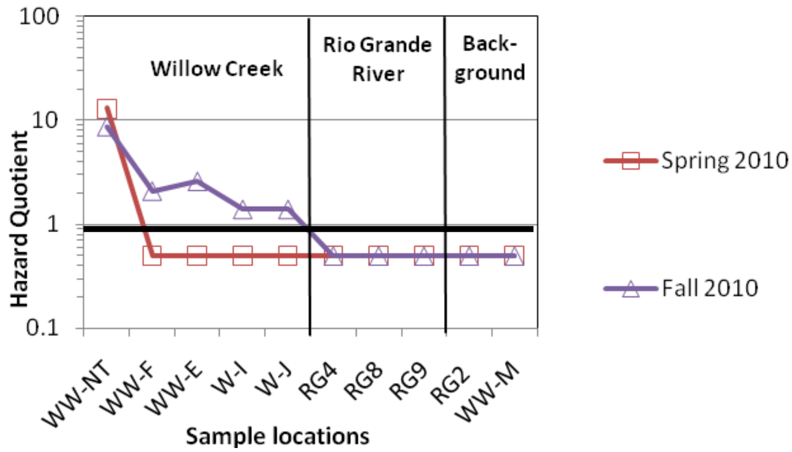
This measurement endpoint identified Cd and Zn as the major risk drivers to piscivorous birds exposed to surface water and fish in Willow Creek. No risk to this receptor group was identified in the Rio Grande River. The reliability of this conclusion was low because it was based on a single, semi-qualitative LOE.

The potential risk associated with the two major contaminants is discussed below. Note that fish were not expected to be present in substantial numbers in Willow Creek. Hence, the risk to piscivorous birds feeding in Willow Creek should be considered entirely hypothetical. Also, in this summary, the risk was only discussed in terms of the effect-based HQs for the sake of brevity, even though the BERA also provided the no effect-based HQs.

Cadmium

All the effect-based HQs (maximum exposure scenario) for Cd exceeded 1.0 in Willow Creek in the fall, whereas risk in the spring was identified at only one sample location (WW-NT) (**Figure ES-12**). These HQs ranged from <1 to 13 for Willow Creek across the seasons. This LOE showed that Cd had a high potential to affect piscivorous birds feeding at sample location WW-NT in the spring and fall, with a lower impact for the rest of Willow Creek in the fall only. No risk from Cd to this receptor group was identified in the Rio Grande River.

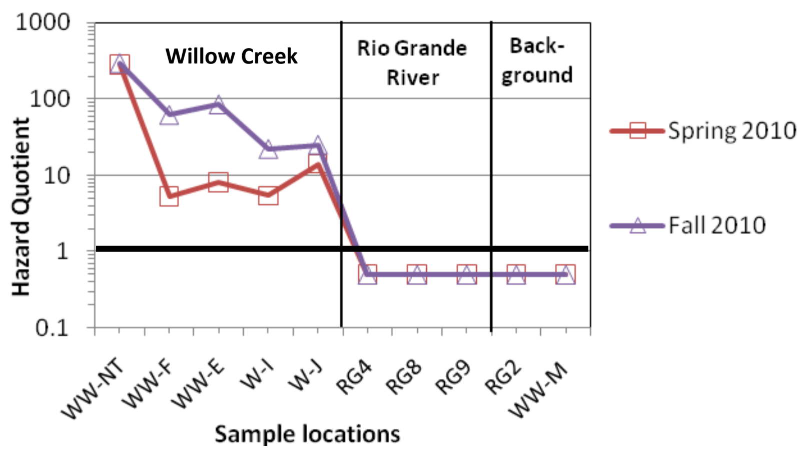
Figure ES-12: Cd effect-based HQs for piscivorous birds (maximum exposure scenario)



Zinc

The effect-based HQs (maximum exposure scenario) for Zn exceeded 1.0 at all the sample locations in Willow Creek, with HQs ranging from 5.4 to 290 across the seasons (**Figure ES-13**). The impacts to Willow Creek downstream from WW-NT were relatively less severe in the spring than in the fall. None of the HQs for Zn exceeded 1.0 in the Rio Grande River. This LOE showed a high potential for risk to piscivorous birds exposed to Zn in Willow Creek.

Figure ES-13: Zn effect-based HQs for piscivorous birds (maximum exposure scenario)



ES.3.7 Herbivorous mammals (muskrat)

Risk to herbivorous mammals feeding in Willow Creek and the Rio Grande River was assessed based on a single measurement endpoint, i.e., use generic BCFs to estimate the COPEC levels in aquatic plants and apply a conservative food chain model to calculate daily doses to muskrat for comparison to no effect- and effect-based mammal TRVs.

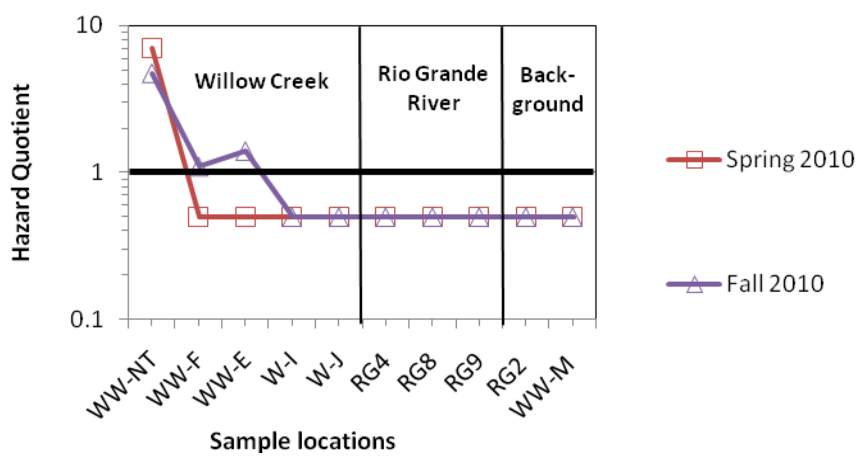
This measurement endpoint identified Cd, Zn, and Pb as the major risk drivers to herbivorous mammals exposed to surface water and aquatic plants in Willow Creek. Pb was only identified as a risk driver at sample locations WW-NT,WW-E, and WW-J. No risk drivers were identified for the Rio Grande River. The reliability of this conclusion was low because it was based on a single, semi-qualitative LOE.

The potential risk associated with the major contaminants is discussed below. In this summary, the risk was only discussed in terms of the effect-based HQs for the sake of brevity, even though the BERA also provides the no effect-based HQs.

Cadmium

The effect-based HQs (maximum exposure scenario) for Cd exceeded 1.0 for sample location WW-NT in the fall and spring, but only for WW-F and WW-E in the fall (**Figure ES-14**). These HQs ranged from <1 to 7.0 for Willow Creek across the seasons. No HQs for Cd exceeded 1.0 in the Rio Grande River. This LOE showed some risk from Cd to herbivorous mammals feeding at sample location WW-NT in the spring and fall, with much lower risk at sample locations WW-F and WW-E in the fall only. No risk from Cd to this receptor group was identified in the Rio Grande River.

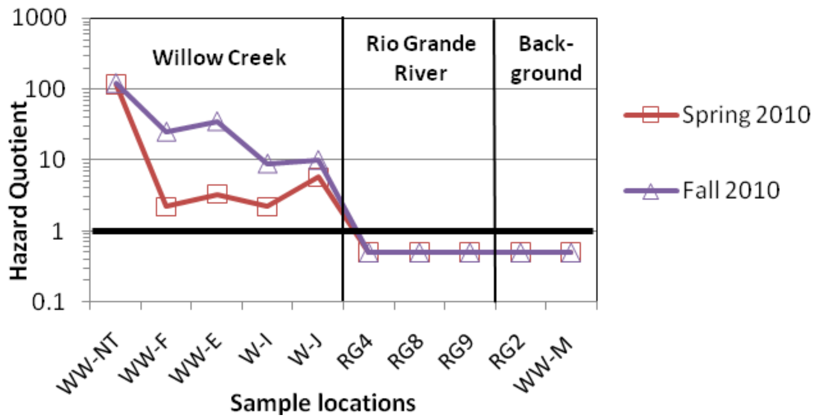
Figure ES-14: Cd effect-based HQs for herbivorous mammals (maximum exposure scenario)



Zinc

The effect-based HQs (maximum exposure scenario) for Zn exceeded 1.0 at all sample locations in Willow Creek (**Figure ES-15**), ranging from 2.2 to 120 across the seasons. No HQs for Zn exceeded 1.0 in the Rio Grande River. This LOE indicated a high potential for risk from Zn to herbivorous mammals feeding in Willow Creek. The risk downstream from WW-NT was less severe in the spring than in the fall.

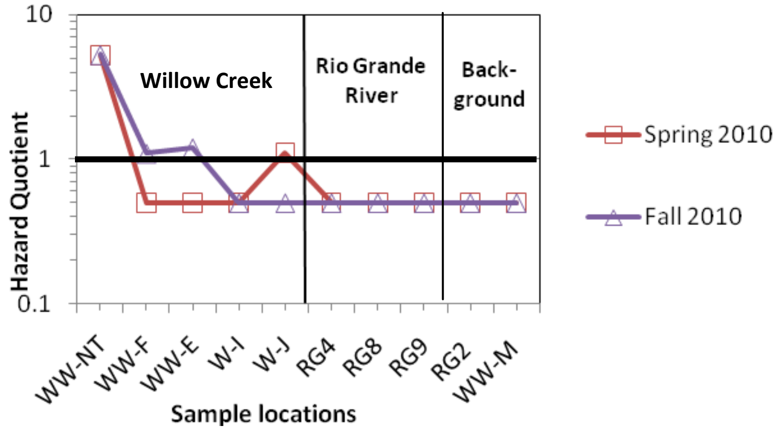
Figure ES-15: Zn effect-based HQs for herbivorous mammals (maximum exposure scenario)



Lead

The effect-based HQs (maximum exposure scenario) for Pb exceeded 1.0 at sample locations WW-NT, WW-F and WW-E in the fall, and WW-NT and W-J in the spring in Willow Creek (**Figure ES-16**). These HQs ranged from <1 to 5.3 for Willow Creek across the seasons, indicating a low potential for risk from Pb to herbivorous mammals feeding at several locations on Willow Creek in spring and fall. No risk from Pb was observed for herbivorous mammals in the Rio Grande River.

Figure ES-16: Pb effect-based HQs for herbivorous mammals (maximum exposure scenario)



In conclusion, completing the BERA represented a point in the process where a Scientific Management Decision Point (SMDP) was achieved. The various LOEs showed that Nelson Tunnel discharge contributed ecological risk to Willow Creek and the Rio Grande River. Cd, Pb, and Zn were the major risk drivers, with several other metals contributing lower levels of risk to the targeted receptor groups.

The rainbow trout toxicity test showed that diluting Willow Creek surface water down to 3.13% in the laboratory achieved the BERA endpoint of "trout survival" under acute exposure conditions. However, this ratio was unlikely to provide a defensible long-term "dilution" PRG for the Rio Grande River for the following reasons:

- Significant acute toxicity in rainbow trout was measured at one location in the Rio Grande River (RG-8) with a flow estimated to consist of about 4% Willow Creek water at the time of the test in September 2010.

- Comparing the Cd levels measured in the 3.13% Willow Creek dilution sample to a hardness-adjusted chronic surface water benchmark for Cd showed that chronic toxicity to trout was most likely present at that dilution, but could not have been detected by the test due to the short-term (96-hour) exposure duration.

Also, the water quality in April was worse than in September when the surface water samples were collected for toxicity testing and chemical analyses. Hence, the toxicity test conducted in September can only be considered a rough approximation of the April flow conditions, with much uncertainty.

The benthic macroinvertebrate community measures showed the potential for risk based on the sediment chemistry LOE, but only a small potential for risk based on the benthic community survey LOE. It would be a challenge to develop realistic sediment PRGs for benthic invertebrates based on the available information because other factors may have affected the benthic community structure and function, such as differences in habitat quality across sample locations or the response by the invertebrates to exposure to metal-enriched surface water or silting.

1.0 INTRODUCTION

1.1 Purpose of this document

This document provides the Baseline Ecological Risk Assessment (BERA) for the Nelson Tunnel/Commodore Waste Rock Pile Superfund Site (the Site). The Site consists of the abandoned Nelson Tunnel and the Commodore Waste Rock Pile surrounding the Nelson Tunnel portal. About 300 gallons per minute (gpm) of water contaminated with heavy metals flow from the Nelson Tunnel portal into West Willow Creek. West Willow Creek drains into Willow Creek which braids into two separate channels before flowing into the Rio Grande River about four miles downstream from the Site. The Site is located about 1 mile from the town of Creede in Mineral County, Colorado.

This BERA evaluates the likelihood of adverse effects to ecological receptors exposed directly or indirectly (via food ingestion) to surface water and sediment potentially affected by Nelson Tunnel portal discharge. The Site covers a restricted area associated with the Nelson Tunnel portal and a small portion of West Willow Creek next to the portal. This BERA provides baseline-level risk characterization of the Site's potential effects to the small West Willow Creek segment within the Superfund area, and the Rio Grande River further downstream.

1.2 Overview of the BERA process

The Remedial Investigation (RI) report (USEPA, 2010a) and Screening-Level Ecological Risk Assessment (SLERA) (USEPA, 2010b) described the potential for risk to ecological receptors from Site releases. The SLERA addressed the first two steps of the eight-step ecological risk assessment process (**Figure 1-1**) by identifying screening-level risks to community level receptors exposed to surface water and soil. The results identified several Chemicals of Potential Ecological Concern (COPECs). However, more Lines of Evidence (LOEs) became available to refine the risks in a BERA. Note that this BERA evaluates all detected analytes instead of focusing only on the initial SLERA COPECs.

Surface water and sediment data were obtained from specific locations in Willow Creek and the Rio Grande River in 2010. Surface water data were collected in April, June, and September from both waterways to capture seasonal changes; sediment samples were only collected in September from the Rio Grande River. The dissolved metals data were used to evaluate exposure to aquatic community receptors, while the total metals data were used to evaluate exposure to wildlife receptor via food chain modeling. The results from each sample location were used to determine spatial change over distance. Therefore, where appropriate, each LOE was analyzed to determine a location-specific and season-specific risk in the risk characterization.

1.3 Purpose and goals of the BERA

This BERA combined several LOEs to characterize the risk from the Nelson Tunnel discharge to the National Priorities List (NPL) portion of West Willow Creek and the Rio Grande River. The purpose of the BERA is two-fold:

- quantify the potential for ecological risk to key aquatic communities and wildlife receptor species living in or feeding on the two waterways affected by Nelson Tunnel discharge, and
- identify a dilution at which Willow Creek surface water would able to support trout survival in the Rio Grande River below the confluence with Willow Creek.

The ecological risk management goal for this BERA is as follows:

"Ensure that acceptable risk levels are achieved for aquatic and aquatic-dependent receptors within the Site boundary and the receiving waters of the Rio Grande by protecting those receptors from the deleterious effects of exposures to Site-related contaminants".

1.4 Document organization

In addition to this introduction, this report is organized into the following sections:

Section 2.0 summarizes the Site characteristics.

Section 3.0 summarizes the data sources used to quantify exposure at each sampling location.

Section 4.0 summarizes the BERA problem formulation, which supports the exposure and effects assessments.

Section 5.0 summarizes the BERA exposure assessment methods for both community level and wildlife receptors.

Section 6.0 summarizes the effects assessment for both community level and wildlife receptors.

Section 7.0 interprets the LOEs to provide risk conclusions by drainage, season and sample location. This section also summarizes the major uncertainties associated with the exposure, effects and risk characterizations.

Section 8.0 provides a summary and conclusions.

Section 9.0 provides the references used in this BERA.

2.0 SITE CHARACTERIZATION

This section describes the environmental setting and hydrology of the Site. The information was obtained from the RI Report (USEPA, 2010a) and the SLERA report (USEPA, 2010b).

2.1 Site setting

The Site is located in Mineral County, Colorado within the San Juan Mountains. It is comprised of the abandoned Nelson Tunnel and the Commodore Waste Rock Pile surrounding the Nelson Tunnel portal (**Figure 2-1**). The Site, which occurs at 9,175 ft elevation at the bottom of a steep canyon with nearly vertical walls, is impacted by heavy metal contamination from historic mining activities. The Nelson Tunnel provided both haulage and drainage for mines developed in the Willow Creek watershed. Previous studies determined that the Nelson Tunnel discharge provided the largest source of metal loading to Willow Creek. This BERA focused specifically on the impacts of Nelson Tunnel discharge to ecological receptors exposed to aquatic media affected by the discharge.

The Commodore Waste Rock Pile was described in the RI (USEPA, 2010a) and SLERA (USEPA, 2010b). This pile, which was reconfigured in 2009 as part of the West Willow Creek rehabilitation efforts, is devoid of vegetation and consists of steep slopes and compacted material. It provides little or no usable habitat for terrestrial receptors and contains high levels of Arsenic (As), Cadmium (Cd), Lead (Pb), and Zinc (Zn). The pile experienced a catastrophic failure in 2005 in response to a less-than-20-year flood event. It is considered unstable and has partially subsided in West Willow Creek and Willow Creek.

Previous studies have been performed in the watershed that includes the Site. EPA completed an '*Aquatic Resources Assessment of the Willow Creek Watershed*' in 2005 to analyze the ecological and hydrological conditions of the watershed's surface water, groundwater, wetlands, and riparian habitat (USEPA, 2005a). The study identified potential stressors affecting these resources. USEPA (2005a) identified more than 200 species of amphibians, reptiles, birds, and mammals known to occur in Mineral County and about 35 other species that are likely to occur in the county. Mammals known to occur in the watershed include elk, mule deer, moose, beaver and others. USFWS (2010) also lists several species of conservation concern in Mineral County. This list, provided as Table 1 in the SLERA (USEPA, 2010b), contains two mammal species, three fish species, one insect species and two bird species.

Contamination of Willow Creek and its tributaries has been documented for over 35 years. The Willow Creek Reclamation Committee (WCRC) was formed by Creede stakeholders in 1999 to investigate the nature and extent of contamination from the watershed. Discharge from the Nelson Tunnel portal is the largest single source of contamination in Willow Creek, as well as Segment 4 of the Rio Grande River (CDPHE, 2010 as summarized in USEPA, 2010a). The

WCRC, State of Colorado and EPA recommended placing the Site on the NPL (USEPA, 2010a) due to the adverse impacts of Nelson Tunnel discharge on the surface water quality in Willow Creek and the Rio Grande River.

2.2 Watershed characteristics

Figure 2-2 shows the sample locations in the Willow Creek and Rio Grande River drainage areas included in this BERA. The figure shows the relationship between the watershed drainages and sample locations.

Nelson Tunnel discharges about 300 gallons per minute (gpm) into West Willow Creek. West Willow Creek merges with East Willow Creek to form the main-stem (Willow Creek). Willow Creek splits into two braided channels, referred to as West Willow and East Willow Creeks, both of which flow southward before joining the Rio Grande River (**Figure 2-1**).

The Site lies on West Willow Creek in the middle section of the Willow Creek watershed, which is divided into four sections, namely the upper, middle, Creede, and lower sections as described in the RI (USEPA, 2010a). This BERA focuses on the small portion of West Willow Creek at the Nelson Tunnel discharge, and the confluence of Willow Creek with the Rio Grande River. The portion of West Willow Creek where the tunnel discharges is confined by narrow canyons and a steep gradient. The lower portion of Willow Creek above the confluence with the Rio Grande River is a gently sloping alluvial floodplain (USEPA, 2005a as cited in USEPA, 2010a).

West Willow Creek between sites WW-M and WW-G flows upstream of the Nelson Tunnel mining site and is characterized as a high-gradient stream with optimal habitat. Most of the stream near site WW-M has good epifaunal substrate and cover, with limited sediment deposition, excellent vegetative protection and a healthy riparian zone. West Willow Creek goes through a canyon as it approaches site WW-G. Waterfalls are prevalent through much of this reach. Site WW-G also shows optimal, unimpaired habitat.

West Willow Creek is affected by past human activities, including channelization, as it flows downstream of WW-G. Vegetation is mostly absent from the stream banks. The streambed at sites WW-F to WW-E is lined with rocks embedded in concrete which results in poor aquatic habitat; riparian vegetation is absent. The Commodore Waste Rock Pile is prevalent on the east side of the stream bank from sites WW-F to WW-E and down to site WW-D. Shoring structures are present by the edge of the stream.

Habitat is poor and no riparian zone exists from site WW-D to WW-B. This section of West Willow Creek is channelized, with boulders placed along the banks for erosion control. Much of the stream also runs through a canyon. The stream is further impacted by County Road 503 between sites WW-B and WW-A. Habitat in this stretch is poor and much of the stream has experienced recent disturbances. West Willow Creek between sites WW-B and WW-A consists of shallow, fast-moving water without any deep pools. This reach lacks vegetative protection or a riparian zone. The banks are stabilized by large rocks and boulders.

West Willow Creek runs through the mining site carrying contamination into Willow Creek and then to the Rio Grande River four miles below the site. A biological assessment of the Willow Creek watershed showed levels for Cd, Pb and Zn above recommended dietary intake benchmarks and eco-based aquatic surface water standards. The assessment identified cleanup of Nelson Tunnel as a key element to restoring the Willow Creek stream and streamside habitat.

Willow Creek from the confluence of East Willow Creek to site W-SN shows poor fish habitat because vegetative protection is missing and the riparian zone is absent. Willow Creek runs through the town of Creede as a straight, concrete-lined channel lacking fish habitat and benthic invertebrates. The stream flows through a floodplain between site W-SN and sites W-I and W-J. Although this section of Willow Creek was not fully investigated for habitat quality, general observations show that the habitat is better than that found further upstream. The riparian zone is more established and epifaunal substrate appears more suitable for colonization by benthic invertebrates.

Flows in the Willow Creek watershed are routinely monitored. The data show that high flow occurs primarily in May and June, which is a period dominated by snowmelt from the surrounding mountains. Low flows occur throughout the fall and winter months. The mean runoff flow in Willow Creek at the confluence with the Rio Grande River (the sum of measurements at monitoring stations W-I and W-J) is 7 cubic feet per second (cfs) with a peak of 160 cfs. Flows in West Willow Creek just below the confluence with the Nelson Tunnel discharge (sampling location WW-F) range from 5 to 70 cfs (USEPA, 2010a).

Tourism and recreation have become a regional economic backbone. Fishing is an important part of recreational activities for visitors and local residents alike. Past mining activities have impacted the fisheries to the point that no fish can survive in Willow Creek for about two miles below of the Site. The fish are sparse and experience reproductive failure further downstream up to the confluence with the Rio Grande River.

The **Rio Grande River** was designated as a "Gold Medal" fishery by the Colorado Division of Wildlife because it provides outstanding angling opportunities for large trout. The river is a hotspot for regional recreation and tourism. The management goals for this river include maintaining the current status of a gold medal fishery and minimizing fish kills due to mining-related input from Willow Creek.

The headwaters of the Rio Grande River originate in the San Juan Mountains, west of Mineral County. Some data exist that characterize the flows of this river at the Willow Creek confluence. Median flows at this location range from 100 to 1,870 cfs. Low flow occurs in January, with a minimum flow of 130 cfs measured between 1952 and 2000 (CDPHE as cited within USEPA, 2010a). High flow is correlated with snowmelt, reaching a peak of more than 3,380 cfs in June, as measured between 1952 and 2000 (USEPA, 2010a).

The habitat at sampling locations RG-2 (upstream reference location), RG-4, RG-8, and RG-9 consists of undercut banks, with an optimum frequency of riffles and pools. Some channelization has occurred, mostly due to human influences. Bridge abutments, roadways, and a boat launch contribute to human disturbance of the river. Bank stability is considered optimal to suboptimal based on the presence of vegetative protection and large rocks and boulders along the river banks. The river bottom consists mostly of boulders and cobbles with little or no embedment and minimal sediment deposition. This substrate provides good quality habitat for benthic invertebrates, although the river lacks logs and snags to allow for optimal colonization. The riparian vegetation is affected by human activities and would be considered marginal. The overall river habitat quality below the confluence with Willow Creek is considered good for a cold water fishery, with the presence of deep pools mixed in with a range of velocity and depth regimes.

3.0 BERA APPROACH AND DATA SOURCES

This BERA determines how the Nelson Tunnel discharge impacts a portion of West Willow Creek at the NPL Site, and the Rio Grande River further downstream. The BERA uses several LOEs to quantify this impact, as follows:

- surface water data collected in April, June and September 2010 at specific locations in Willow Creek above and below Nelson Tunnel and the Commodore Waste Rock Pile, as well as the Rio Grande River above and below the confluence with Willow Creek,
- sediment data collected from the Rio Grande River in September 2010 above and below the confluence with Willow Creek,
- acute toxicity testing in September 2010 using juvenile rainbow trout exposed to serial dilutions of Willow Creek surface water, and undiluted surface water collected from the Rio Grande River,
- benthic macroinvertebrate community health measures collected from the Rio Grande River in September 2010,
- aquatic community (aquatic invertebrates and fish) exposure estimates using analytical data collected in 2010 compared to ecological screening values, and
- wildlife receptor exposure estimates using surface water analytical data collected in 2010, COPEC-specific Bioconcentration Factors (BCFs), and standard food chain modeling methods to calculate a dose for comparison to COPEC-specific wildlife toxicity values.

Table 3-1 summarizes the types of data available for each sample location.

Table 3-1. Summary of data types by sample location used in the BERA.

Sample location	Location description	Surface Water: April 2010[a] Dissolved metals	Surface Water: April 2010[a] Total metals	Surface Water: June 2010 Dissolved metals	Surface Water: June 2010 Total metals	Surface Water: September 2010[a] Dissolved metals	Surface Water: September 2010[a] Total metals	Sediment: September 2010 Total metals	Acute toxicity testing	Benthic inverts. field survey
Willow Creek										
WW-M	Above the Site on Willow Creek (background)	NA	NA	√	√	√	√	NA	NA	NA
WW-NT	Nelson Tunnel Discharge	√	NA	√	√	√	√	NA	NA	NA
WW-F	At the Site just downgradient of WW-NT	√	NA	√	√	√	√	NA	NA	NA
WW-E	At the Site just downgradient of WW-F	√	NA	√	√	√	√	NA	NA	NA
W-I	In West Willow Creek just before confluence with the Rio Grande River	√	NA	√	√	√	√	NA	√	NA
W-J	In East Willow Creek just before confluence with the Rio Grande River	√	NA	√	√	√	√	NA	√	NA

Rio Grande River										
RG-2	In the Rio Grande River just above the Willow Creek confluence.	√	NA	√	√	√	√	√	√	√
RG-4	Wason Ranch Bridge downstream of the Willow Creek confluence.	√	NA	√	√	√	√	√	undiluted RG-4 water	√
RG-8	La Garita Bridge below RG-4.	√	NA	√	√	√	√	√	undiluted RG-8 water	√
RG-9	4UR Bridge below RG-8.	√	NA	√	√	√	√	√	NA	NA

Footnotes:
√ Data is available.
[a] Mercury was not analyzed in this data set.
NA Not Available or Not Analyzed

3.1 Surface water and sediment data

Nelson Tunnel discharges into West Willow Creek, which becomes Willow Creek before it braids into two channels upstream of the confluence with the Rio Grande River. The BERA focused on specific aquatic areas, as follows: (a) a small segment of West Willow Creek within the NPL-delineated area, which includes the Nelson Tunnel discharge, (b) the two braided Willow Creek channels just before their confluence with the Rio Grande River, and (c) four locations in the Rio Grande River. The analytical data from these locations were used to derive Exposure Point Estimates (EPCs) to ecological receptors. As such, the BERA evaluated the risk at each of the sampling location summarized in Section 1.2 and shown in **Figure 2-2**. This BERA evaluated every detected analyte, instead of focusing just on the COPECs originally identified in the SLERA. Also, this BERA did not evaluate soil from the Commodore Waste Rock Pile at the Site because the limited terrestrial habitat associated with this relatively small feature indicates that soil exposure is not expected to have significant population-level effects.

Surface water sampling took place in April, June and September 2010, whereas sediment samples were only collected from the four Rio Grande River locations in September 2010. Samples were collected from West Willow Creek, Willow Creek above the confluence of the Rio Grande River, and the Rio Grande River itself.

All the surface water samples were analyzed for dissolved metals. The June and September surface water samples were also analyzed for total metals. All the sediment samples collected from the Rio Grande River in September 2010 were analyzed for total metals.

3.2 Acute toxicity testing

Surface water samples from Willow Creek near its confluence with the Rio Grande River (specifically, sample locations W-I and W-J), and from the Rio Grande River itself, were collected in September 2010 for aquatic toxicity testing and chemical analyses.

The Willow Creek surface water was serially diluted in the laboratory using either the Rio Grande River reference water (RG-2) collected upstream of the confluence with Willow Creek, or a Soft Reconstituted Laboratory Water (SRLW) of similar hardness. All serial dilutions were chemically analyzed and tested for acute (96-hour) toxicity using juvenile rainbow trout. Two more surface water samples were collected from the Rio Grande River about 1.29 miles (RG-4) and 6.55 miles (RG-8) below the confluence with Willow Creek. Those two samples were also chemically analyzed and tested undiluted for acute toxicity using juvenile rainbow trout.

The goals of the fish toxicity test were twofold: (a) establish a dilution at which Willow Creek water would no longer be acutely toxic to rainbow trout, and (b) use those results to determine if risk to fish was present in the Rio Grande River below the confluence with Willow Creek.

3.3 Benthic macroinvertebrate community measures

Benthic macroinvertebrate samples were collected from the Rio Grande River at sample locations RG-2, RG-4, and RG-8 in September 2010. Three replicates were collected across the sampling transect at each location. Macroinvertebrate samples were collected following methods described in Plafkin et al. (1989) and were identified, counted, and summarized at the Colorado State University in Fort Collins (Timberline Aquatic, Inc.).

The taxa and organism counts were interpreted using several standard benthic macroinvertebrate community indexes and measures. The key to using this information lies in the spatial relationship of the sample locations. RG-2 is located upstream of the confluence with Willow Creek and is unaffected by the Site. RG-4 occurs 1.29 miles below the confluence, and RG-8 occurs 6.65 miles below the confluence. Therefore, spatial trends should be observable if Willow Creek affects the benthic macroinvertebrate community downstream of its confluence with the Rio Grande River.

3.4 Aquatic community receptor exposure estimates

Aquatic community receptors were assumed to be exposed to contaminants in surface water and sediment through both direct contact and ingestion. The dissolved metals in surface water and total metals in sediment collected at each sample locations were used to calculate EPCs for these receptors. Maximum and average EPCs were only calculated for the Rio Grande River sample locations because multiple subsamples were collected from each sampling transects. Only single samples were collected per sampling event from each of the Willow Creek sample locations. Also, each sampling event (i.e., April, June, and/or September) was assumed to represent a different exposure setting to account for seasonal variability.

3.5 Wildlife receptor exposure estimates

Avian and mammalian wildlife species were assumed to be exposed to contaminants in surface water by directly ingesting water and by eating contaminated foods. The BERA calculated an Estimated Daily Dose (EDD) for the American dipper, muskrat, belted kingfisher and mallard at each sampling location in Willow Creek and the Rio Grande River in the spring and the fall. EDDs were derived using total metals in surface water and standard exposure dose methods.

4.0 BERA PROBLEM FORMULATION

Problem formulation identifies the major issues considered in the BERA and describes the approach used to identify ecological risks (USEPA, 1997). It includes developing a Conceptual Site Model (CSM) and identifying endpoints for the Site. This Section summarizes the key Problem Formulation components of the BERA.

4.1 Conceptual site model

Figure 4-1 summarizes the CSM for this BERA. It shows the elements that link a contaminant source to a receptor via one or more exposure pathways. The CSM showed that multiple receptors in Willow Creek and the Rio Grande River could be expected to come in contact with Site-derived COPECs via direct exposure to surface water or sediment, or indirect exposure from drinking surface water and ingesting contaminated food items.

The following sections describe these four components to the CSM of the Site.

4.2 Exposure units

The BERA determined the potential impacts of mine discharge at specific locations (called Exposure Units [EUs]) in Willow Creek - which includes West Willow Creek -and the Rio Grande River. The sample locations in Willow Creek served to characterize the potential contaminant contributions from the Nelson Tunnel discharge carried down Willow Creek to the Rio Grande River. The surface water sample locations in Willow Creek were as follows (note: no sediment samples were collected from Willow Creek):

- WW-M: located above the Nelson Tunnel discharge confluence to Willow Creek; considered 'background' to the Tunnel influences.

- WW-NT: located at the Nelson Tunnel discharge before its confluence with West Willow Creek.

- WW-F: located in West Willow Creek just below the confluence with the Nelson Tunnel discharge, but still within the NPL boundary.

- WW-E: located in West Willow Creek below WW-F, but still within the NPL boundary.

- W-I: located at the end of the western braided channel of Willow Creek just before the confluence with the Rio Grande River.

- W-J: located at the end of the eastern braided channel of Willow Creek just before the confluence with the Rio Grande River.

The samples from the Rio Grande River were collected from sample locations above and below the confluence with Willow Creek. Each of these stations consisted of a transect running perpendicular to the river from which four, equally spaced grab samples were collected. A sample was collected in flowing water nearest to the sample point if a boulder or other object obstructed the actual sampling point. The April and June 2010 surface water samples were collected from the bridges which cross the Rio Grande River at each sample location. A bucket was lowered on a rope to reach the water due to the depth and velocity of the river during snowmelt. A transect line was established across the river for the September 2010 sampling event.

The Rio Grande River sample locations were as follows:

- RG-2: located just above the confluence with Willow Creek; represents background conditions.

- RG-4: located at the Wason Ranch Bridge, 1.29 miles below the confluence with Willow Creek.

- RG-8: located at the Hwy 149 bridge (La Garita Bridge), 6.55 miles below the confluence with Willow Creek.

- RG-9: located at the 4UR Bridge, 7.78 miles below the confluence with Willow Creek.

4.3 <u>Contaminant sources and transport mechanisms</u>

Figure 4-1 shows that the contaminant sources at the Site relate to historic mining activities, including the discharge from the Nelson Tunnel and the Commodore Waste Rock Pile. However, the latter was excluded from the current assessment because the BERA focused only on the Nelson Tunnel discharge.

The specific contaminants were metals detected in surface water and sediment samples collected at and downstream of the Site. The analytes consisted of Aluminum (Al), Antimony (Sb), Arsenic (As), Beryllium (Be), Cadmium (Cd), Calcium (Ca), Chromium (Cr), Copper (Cu), Iron (Fe), Lead (Pb), Magnesium (Mg), Manganese (Mn), Mercury (Hg), Nickel (Ni), Potassium (K), Selenium (Se), Silica (SiO_2), Silver (Ag), Sodium (Na), Strontium (Sr), Thallium (Tl), Vanadium (V) and Zinc (Zn)**.** The SLERA for the Site (USEPA, 2010b) identified only Cd, Pb, Mn and Zn as COPECs in surface water. However, the BERA retained all analytes as COPECs because new analytical data had become available since the SLERA. Therefore, all metals were carried through the BERA process as a precautionary measure.

4.4 Seasonal influences to exposure conditions

The BERA focused on the impacts from the Nelson Tunnel discharge to the surface water quality in West Willow Creek which eventually discharges to the Rio Grande River via Willow Creek. The surface water is in contact with sediment and can partition contaminants to this media. Therefore, both surface water and sediment can act as exposure media.

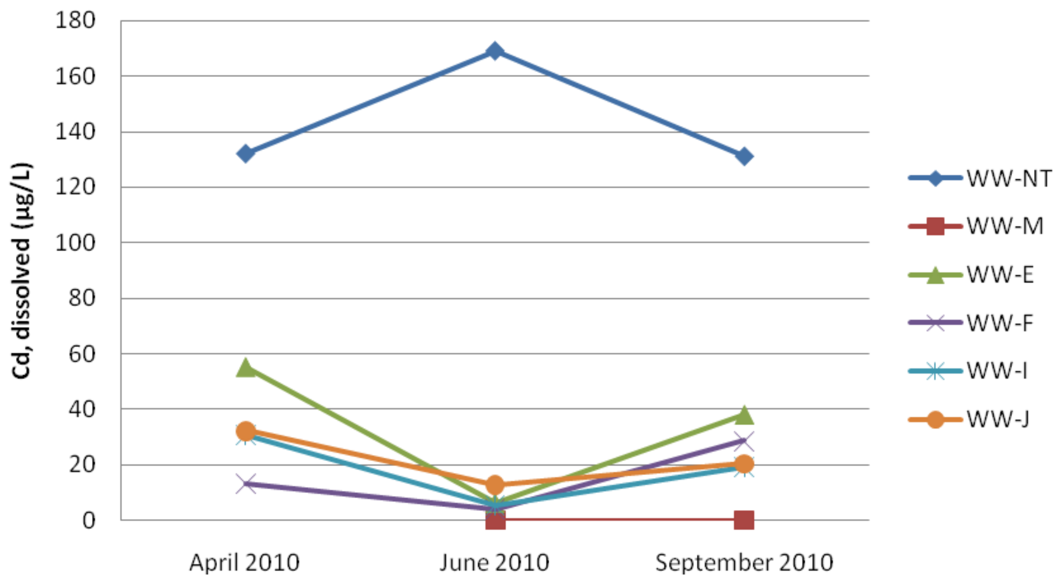
West Willow Creek within the NPL boundaries provides contaminated surface water to both Willow Creek and the Rio Grande River. However, the surface water flows within both drainages are highly variable due to seasonal influences.

The dissolved metals measured in surface water collected in April, June, and September 2010 were plotted to show how the aquatic exposure conditions changed by season (see **Appendix A** for details). **Figures 4-2 and 4-3** show the changes in dissolved Cd and Zn over time at Willow Creek sample locations WW-M, WW-NT, WW-F, WW-E, W-I, and W-J. **Figures 4-4 and 4-5** show the changes in mean dissolved Cd and Zn levels at the four Rio Grande River sample locations. These figures show that the concentrations of these analytes differ across seasons. Early spring melt often carries large loads via run-off. The metals levels drop as run-off decreases and base-flows dominate. Fall can reintroduce high metals load through groundwater sources or storm events.

Figures 4-6 and 4-7 show the spatial change in dissolved Cd and Zn levels over time in Willow Creek and Rio Grande (maximum concentrations) sample locations. **Figures 4-8 and 4-9** show the spatial change in the same two metals over time in Willow Creek and Rio Grande (average concentrations) sample locations. Results show similar trends in both drainages, with the locations immediately down-gradient of the Site source (either the Nelson Tunnel discharge into Willow Creek, or Willow Creek into the Rio Grande River) showing much higher COPEC levels compared to up-gradient reference locations. The concentrations also slowly drop with distance from the source, presumably due to dilution.

The spatial and temporal evaluation of the surface water analytical data showed that exposure would be affected by sample location and season. Therefore, the BERA evaluated exposure at each sample location and for each season, without combining analytical data across sample locations or seasons. This approach resulted in small (n = 1) data sets for Willow Creek because only a single surface water sample was collected from each location during each sample event in this drainage.

Figure 4-2. Dissolved Cd in Willow Creek in 2010.



4-3. Dissolved Zn in Willow Creek in 2010.

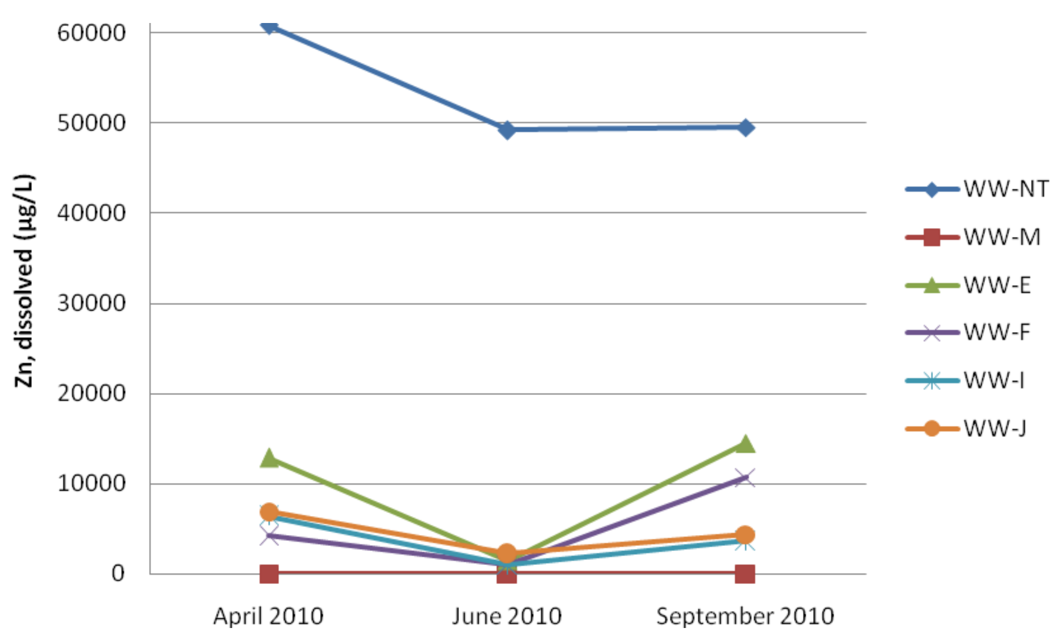


Figure 4-4. Average dissolved Cd in the Rio Grande River in 2010.

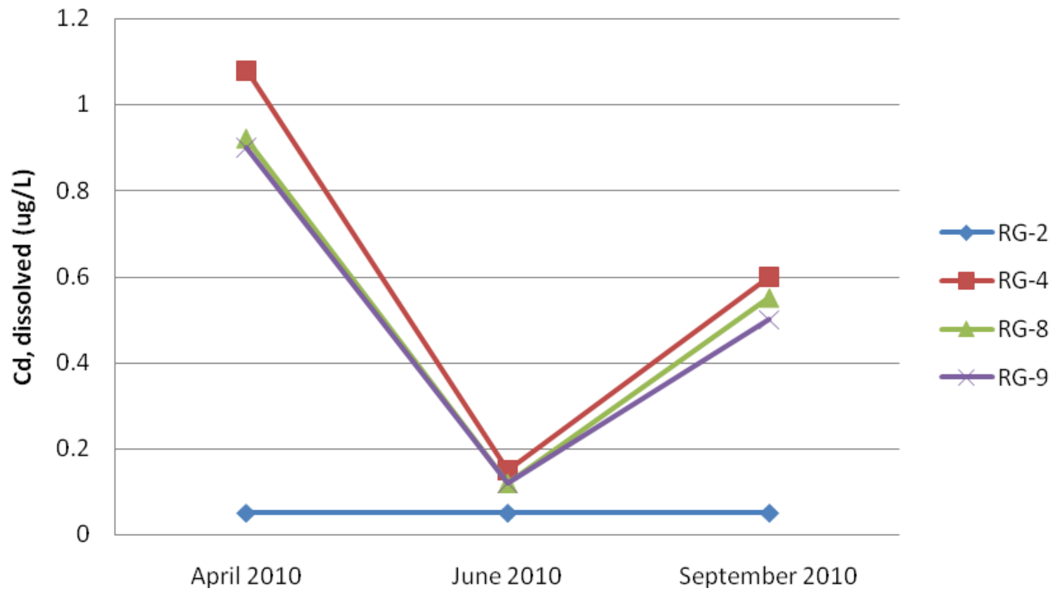


Figure 4-5. Average dissolved Zn in the Rio Grande River in 2010.

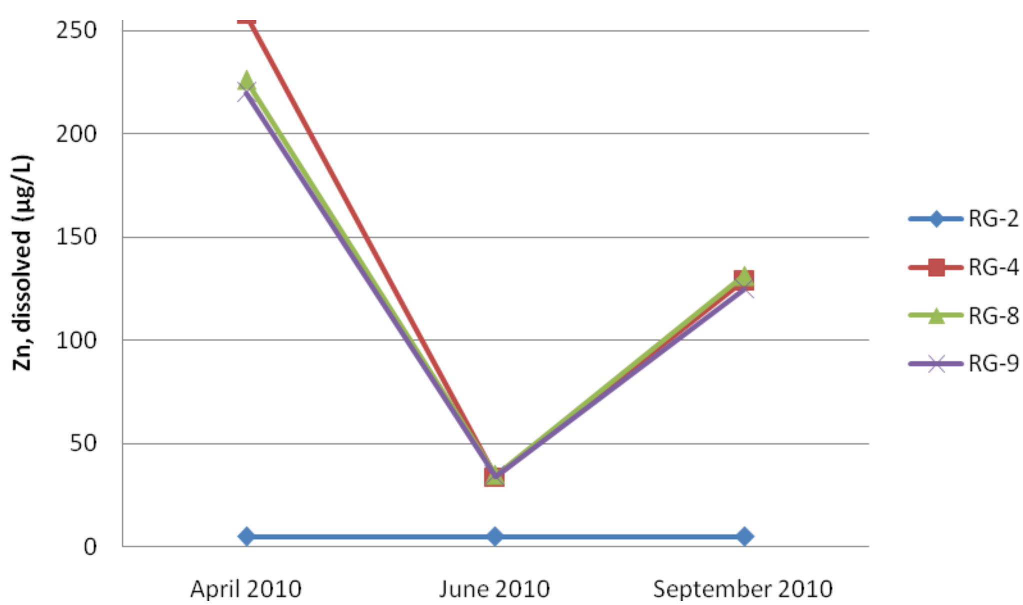


Figure 4.6: Maximum dissolved Cd in Willow Creek and the Rio Grande River in 2010

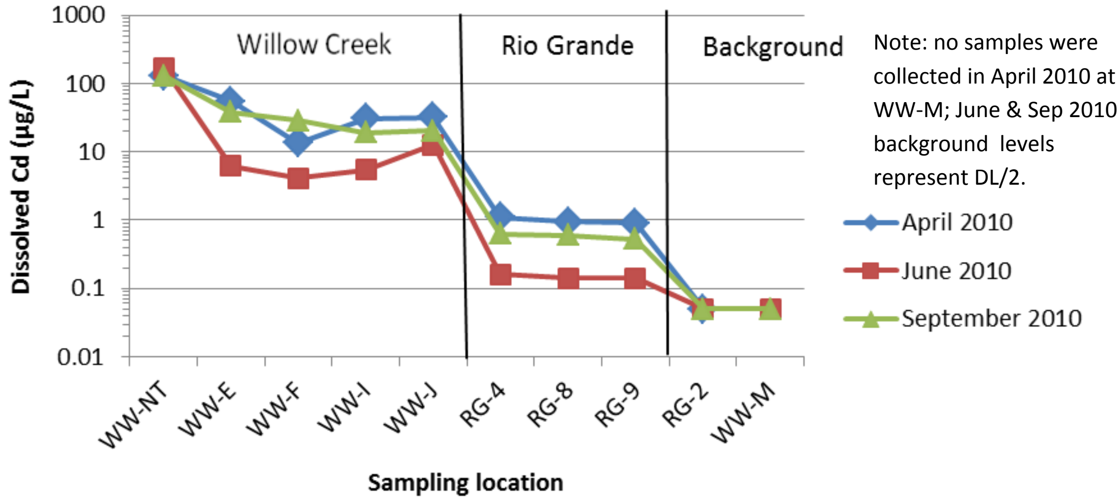


Figure 4.7: Maximum dissolved Zn in Willow Creek and the Rio Grande River in 2010

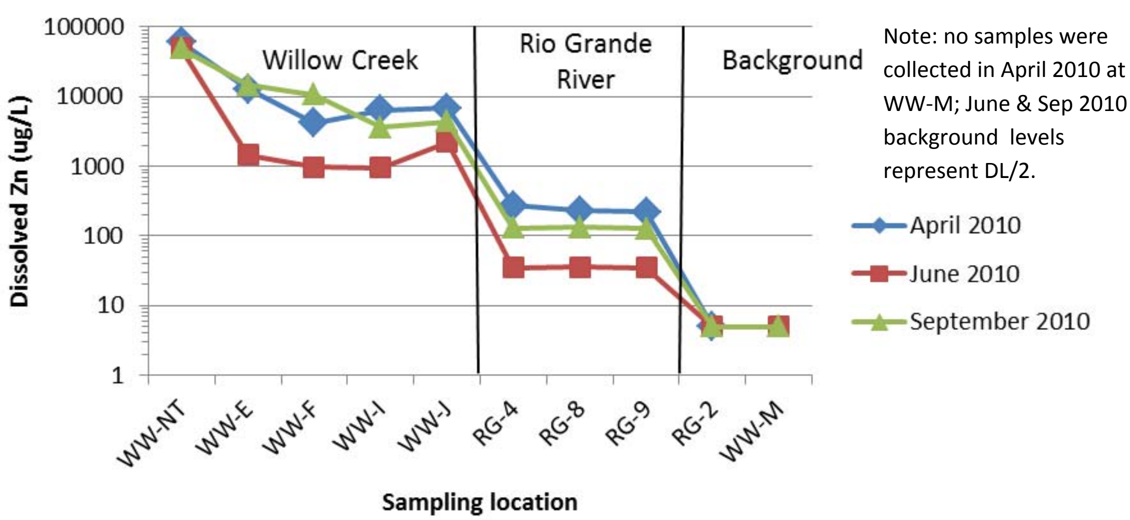


Figure 4.8: Average dissolved Cd in Willow Creek and the Rio Grande River in 2010

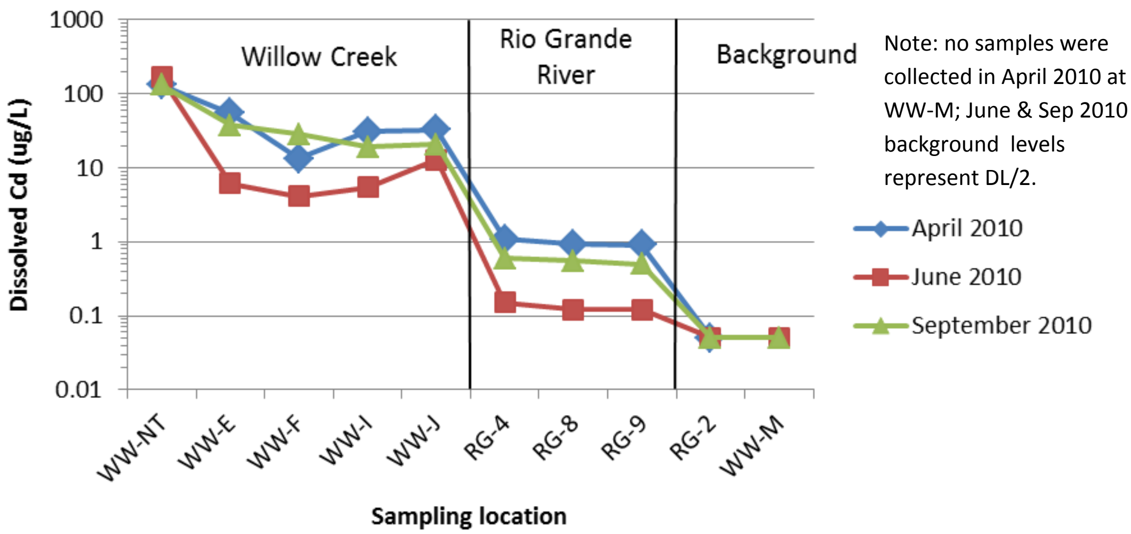
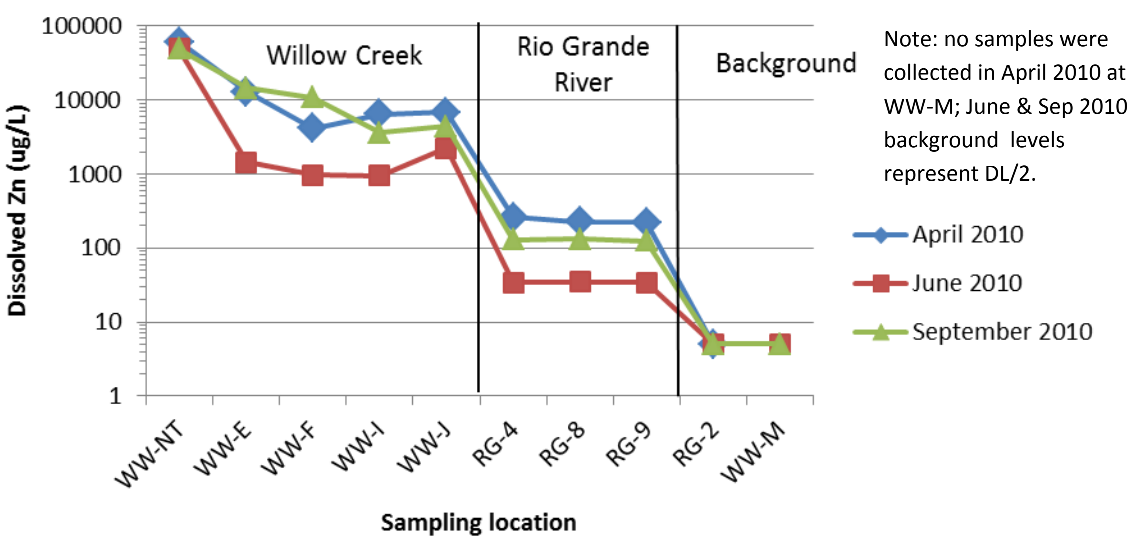


Figure 4.9: Average dissolved Zn in Willow Creek and the Rio Grande River in 2010



4.5 Potential receptors of concern

The BERA evaluated the potential effects of metals to community level receptors exposed directly to surface water or sediment, and to wildlife receptors ingesting surface water and feeding on food items contaminated with metals.

The community-level receptors consisted of aquatic invertebrates (water column-dwelling and sediment-dwelling) and fish.

The wildlife receptors, and their exposure routes, were as follows:

- *Insectivores* (represented by the American dipper) were assumed to eat aquatic invertebrates which accumulated COPECs from surface water. They also ingested COPECs by drinking surface water.

- *Herbivores* (represented by the muskrat) were assumed to eat aquatic plants which accumulated COPECs from surface water. They also ingested COPECs by drinking surface water.

- *Piscivores* (represented by the belted kingfisher) were assumed to eat fish which accumulated COPECs from surface water. They also ingested COPECs by drinking surface water.

- *Omnivores* (represented by the mallard duck) were assumed to eat 100% aquatic invertebrates (spring), or 50% aquatic invertebrates and 50% aquatic plants (fall), which accumulated COPECs from surface water. They also ingested COPECs by drinking surface water.

4.6 BERA assessment and measurement endpoints

An assessment endpoint is defined in EPA (1998) as "an explicit expression of the environmental value to be protected, operationally defined as an ecological entity and its attributes." The BERA used the following assessment and measurement endpoints to evaluate the potential for ecological risks to the aquatic receptor populations, and wildlife receptor populations feeding on aquatic food items. A risk question is appended to each assessment endpoint. It was assumed that by evaluating the assessment endpoints, all receptor populations living in or feeding from both water ways would be protected as well.

Assessment endpoint 1:

A stable and healthy benthic invertebrate community: *Are the total metal levels in sediment high enough to impair the benthic invertebrate community in the Rio Grande River?*

The BERA used the two measurement endpoints to assess the potential impacts of metals to this receptor group (note: this endpoint was not evaluated in Willow Creek):

- Compare the metal levels in bulk sediment samples to conservative no effect- and effect-based sediment benchmarks.

- Evaluate the structure and function of the benthic invertebrate community in the Rio Grande River.

<u>Assessment endpoint 2:</u>

A stable and healthy water column invertebrate community: *Are the dissolved metal levels in surface water high enough to impair the water column invertebrate community in Willow Creek and the Rio Grande River?*

The BERA used one measurement endpoint to assess the potential impacts of metals to this receptor group:

- Compare the dissolved metal levels in surface water samples to acute and chronic surface water benchmarks.

<u>Assessment endpoint 3:</u>

A stable and healthy fish community*: Are the dissolved metal levels in surface water high enough to impair the fish community in Willow Creek and the Rio Grande River?*

The BERA used two measurement endpoints to assess the potential impacts of metals to this receptor group:

- Compare the dissolved metal levels in surface water samples to acute and chronic surface water benchmarks.

- Measure survival in juvenile rainbow trout exposed for 96 hours in the laboratory to serial dilutions of Willow Creek surface water or undiluted Rio Grande River surface water.

Assessment endpoint 4:

Stable and healthy insectivorous birds: *Are the total metal levels in surface water and emergent aquatic insects high enough to impair insectivorous birds foraging in Willow Creek and the Rio Grande River?*

The BERA used one measurement endpoint to assess the potential impacts of metals ingested by this receptor group:

- Use surface water analytical data to estimate metal residues in winged aquatic insects; apply a conservative food chain model to calculate daily doses from ingesting surface water and winged aquatic insects, and compare these doses to bird Toxicity Reference Values (TRVs).

Assessment endpoint 5:

Stable and healthy omnivorous birds: *Are the total metal levels in surface water, aquatic invertebrates, and aquatic plants high enough to impair omnivorous birds foraging in Willow Creek and the Rio Grande River?*

The BERA used one measurement endpoint to assess the potential impacts of metals ingested by this receptor group:

- Use surface water analytical data to estimate metal residues in aquatic invertebrates and aquatic plants; apply a conservative food chain model to calculate daily doses from the ingestion of surface water and food items, and compare these doses to bird TRVs.

Assessment endpoint 6:

Stable and healthy piscivorous birds: *Are the total metal levels in surface water and fish high enough to impair piscivorous birds foraging in Willow Creek and the Rio Grande River?*

The BERA uses one measurement endpoint to assess the potential impacts of metals ingested by this receptor group:

- Use surface water analytical data to estimate metal residues in fish; apply a conservative food chain modeling to calculate daily doses from ingesting surface water and fish, and compare these doses to bird TRVs.

Assessment endpoint 7:

Stable and healthy herbivorous mammals: *Are the total metal levels in surface water and aquatic plants high enough to impair herbivorous mammals foraging in Willow Creek and the Rio Grande River?*

The BERA used one measurement endpoint to assess the potential impacts of metals ingested by this receptor group:

- Use surface water analytical data to estimate metal residues in aquatic plants; apply a conservative food chain model to calculate daily doses from ingesting surface water and aquatic plants and compare these doses to mammal TRVs.

5.0 BERA EXPOSURE ASSESSMENT

5.1 Introduction

The exposure assessment identified and quantified the components of complete exposure pathways associated with surface water and sediment. Exposure occurs when receptors contact the contaminants, either directly or indirectly. A complete exposure requires COPECs, receptors, transport pathways, and uptake pathway into the receptors. The BERA assumes that all receptors occur in each drainage, at each sample location, and during each season. This situation is unlikely to be realized and therefore results in conservative risk estimates.

5.2 Exposure assessment methods

5.2.1 Aquatic community receptor methods

The aquatic community receptors consisted of invertebrates and fish. Sediment and/or surface water were the exposure media for each drainage, sample location and season. Sediment exposures were only evaluated in the Rio Grande River because no sediment samples were collected from Willow Creek during the September 2010 sediment sampling event.

Exposure to aquatic community receptors was estimated using surface water and sediment analytical data. Each seasonal sampling event represented a distinct exposure. The three seasonal exposure conditions consisted of spring melt (April), baseline spring melt/summer flow (June) and fall (September) when baseline flow is dominated by groundwater instead of surface water sources.

The exposure calculations for aquatic community receptors used dissolved metal concentrations because these values represented the bioavailable fraction of COPECs in surface water. Similarly, bulk sediment concentrations were used to estimate exposure to benthic invertebrates. Total metals in surface water were used only for food chain modeling. Note that surface water samples collected in June and September of 2010 were analyzed for dissolved and total metals, whereas the April 2010 surface water samples were only analyzed for dissolved metals. As a result, food chain modeling was only performed on the June and September 2010 total metal datasets.

Each sample location was evaluated as a separate EU to help determine if the risk attributable to the Nelson Tunnel discharge impacted the portion of West Willow Creek within the NPL and the Rio Grande River below the confluence with Willow Creek. Hence, each COPEC concentration at a sampling location in Willow Creek became the EPC used for estimating exposure to aquatic community receptors in April, June, and September.

An arithmetic average and a maximum concentration were calculated for each sampling event on the Rio Grande River because four subsamples were collected at each sample location. The maximum Method Detection Limit (MDL) or the Reporting Limit (RL) was substituted as the EPC if a result was non-detect. One-half of the maximum MDL or RL of a non-detect result was used to calculate location-specific EPCs for the Rio Grande River.

5.2.2 Wildlife receptor methods

The BERA evaluated the potential for risk to the American dipper, mallard, belted king fisher and muskrat. Exposure to these wildlife receptors was estimated using food chain modeling as described below. Similar to the community receptor exposure assumptions, each seasonal sampling event and sample location was used as a distinct exposure setting.

Wildlife species were assumed to be exposed to COPECs by direct ingestion of surface water and by feeding on contaminated food items which accumulated metals from surface water. Sediment contaminated food items and incidental sediment ingestion while foraging were not evaluated due to a lack of sediment analytical data from Willow Creek. The BERA calculated a total EDD for each wildlife receptor to estimate their exposure using standard exposure algorithms which incorporated species-specific natural history parameters (such as feeding rates and dietary composition). The EDD equation was as follows:

Eqn. 5-1. $$EDD_x = \frac{[[\Sigma_i(FIR)(FC_{xi})(PDF_i)] + [(WIR)(WC_x)]*AUF*BAV]}{BW}$$

Where:

EDD_x	=	Estimated daily dose for COPEC "x" (milligram [mg] COPEC/kg body weight/day)
FIR	=	Food ingestion rate (kilograms per day [kg, ww/day])
FC_{xi}	=	Concentration of COPEC "x" in food item I (mg, ww/kg)
PDF_i	=	Proportion of diet composed of food type "i" (unitless)
WIR	=	Water ingestion rate (L/day)
WC_x	=	Concentration of COPEC "x" in water (mg/L)
BW	=	Body weight of receptor (kg)
AUF	=	Area use factor (unitless; assumed 1.0 at each sample location)
BAV	=	Bioavailability (unitless; assumed 1.0 at each sample location)

Table 5-1 presents the intake equations for each wildlife receptor. EPA recommends that only bioaccumulative chemicals (i.e., chemicals listed in Table 4-2 of US EPA [2000]) be evaluated in food chain models. Taking this recommendation into consideration, it was still decided to

included iron (the only non-bioaccumulative COPEC) in the food chain models. A 1:1 transfer relationship was used since transfer coefficients for this metal are either absent or uncertain.

Table 5-2 provides the exposure assumptions (e.g., body weights, ingestion rates, relative consumption of food items) for the wildlife receptors, as well as the reference source and assumptions on which these values were based. Note that the BERA assumed conservatively that the omnivorous mallard fed exclusively on aquatic invertebrates to represent females which feed mainly on protein-rich aquatic invertebrates in April and June to prepare for egg laying. The fall diet for the mallard was assumed to be 50% aquatic invertebrates and 50% aquatic plants.

The target wildlife receptors were assumed to eat aquatic invertebrates, aquatic plants, or fish. **Table 5-3** provides the literature-derived BCFs used to estimate metal concentrations in these food items based on the measured surface water concentrations. No BCFs were found to estimate metals uptake from surface water into vascular aquatic plants. The exposure assessment used surface water-to-algae BCFs instead.

5.3 Exposure assessment results

5.3.1 Aquatic community receptor results

Appendix A summarizes the dissolved and total metal EPCs for each drainage, sample location and season, as well as the sediment EPCs for the Rio Grande River. The aquatic community receptor EPCs are provided below (note: Tables A-7, A-9, A-11, A-13, A-15, A-17, A-19, A-21, A-23, and A-25 are not listed below. They summarize the total metals results for Willow Creek and the Rio Grande River sampled in June and September 2010. Those data were only used as input to the wildlife food chain modeling):

Table A-1	Summary of Dissolved Metals Results for Willow Creek Sampling Locations, April 2010.
Table A-2	Summary of Dissolved Metals Results for RG-2, April 2010.
Table A-3	Summary of Dissolved Metals Results for RG-4, April 2010.
Table A-4	Summary of Dissolved Metals Results for RG-8, April 2010.
Table A-5	Summary of Dissolved Metals Results for RG-9, April 2010.
Table A-6	Summary of Dissolved Metals Results for Willow Creek Sample Locations, June 2010.
Table A-8	Summary of Dissolved Metals Results for RG-2, June 2010.
Table A-10	Summary of Dissolved Metals Results for RG-4, June 2010.
Table A-12	Summary of Dissolved Metals Results for RG-8, June 2010.
Table A-14	Summary of Dissolved Metals Results for RG-9, June 2010.
Table A-16	Summary of Dissolved Metals Results for Willow Creek Sample Locations, September 2010.
Table A-18	Summary of Dissolved Metals Results for RG-2, September 2010.

Table A-20	Summary of Dissolved Metals Results for RG-4, September 2010.
Table A-22	Summary of Dissolved Metals Results for RG-8, September 2010.
Table A-24	Summary of Dissolved Metals Results for RG-9, September 2010.
Table A-26	Summary of Sediment Metals Results for Rio Grande River Sample Locations, September 2010.

5.3.2 Food chain receptor results

Appendix E summarizes the EDDs for the four wildlife receptors feeding at each of the Willow Creek sample locations, as follows:

- **Tables E-6 through E-9** for sample location WW-M (up-gradient, background),
- **Tables E-10 through E-13** for sample location WW-NT (Nelson Tunnel discharge),
- **Tables E-14 through E-17** for sample location WW-F (within the NPL Site, below the Nelson Tunnel discharge),
- **Tables E-18 through E-21** for sample location WW-E (within the NPL Site, below WW-F),
- **Tables E-22 through E-25** for sample location WW-I (braided Willow Creek channel just before the confluence with the Rio Grande River),
- **Tables E-26 through E-29** for sample location WW-J (braided Willow Creek channel just before the confluence with the Rio Grande River)

Appendix E also summarizes the maximum and average EDDs for the four wildlife receptors feeding at each of the Rio Grande River sample locations, as follows:

- **Tables E-30 through E-37** for RG-2 (up-gradient, background),
- **Tables E-38 through E-45** for RG-4 (below Willow Creek confluence at Wason Ranch Bridge),
- **Tables E-46 through E-53** for RG-8 (below Willow Creek confluence and RG-4 at La Garita Ranch Bridge),
- **Tables E-54 through E-61** for RG-9 (below Willow Creek confluence and RG-8 at 4UR Bridge).

Table 5-1. Calculating EDDs for the targeted wildlife receptors

insectivore - American dipper				
estimated daily dose (EDD_x)	=	**aquatic insect exposure** $FIR*FC_{insect}*PDF*AUF$	+	**surface water exposure** $WIR*WC_x*AUF$
mg/kg BW-day		mg/kg BW-day (wet weight)		L/kg BW-day
herbivore - muskrat				
estimated daily dose (EDD_x)	=	**aquatic plant exposure** $FIR*FC_{plant}*PDF*AUF$	+	**surface water exposure** $WIR*WC_x*AUF$
mg/kg BW-day		mg/kg BW-day (wet weight)		L/kg BW-day
piscivore - belted king fisher				
estimated daily dose (EDD_x)	=	**fish exposure** $FIR*FC_{fish}*PDF*AUF$	+	**surface water exposure** $WIR*WC_x*AUF$
mg/kg BW-day		mg/kg BW-day (wet weight)		L/kg BW-day
omnivore - mallard#				
estimated daily dose (EDD_x)	=	**invertebrate and plant exposure** # $FIR[(FC_{invert}*PDF)+(FC_{plant}*PDF)]*AUF$	+	**surface water exposure** $WIR*WC_x*AUF$
mg/kg BW-day		mg/kg BW-day (wet weight)		L/kg BW-day
Footnotes:				
# - The mallard is conservatively assumedto feed on a protein-rich dietof aquatic invertebrates in April and June to prepare for egg laying (USEPA, 1993), but an equal diet of aquatic invertebrates and plants in the fall.				
Concentration of COPEC in food item				
FC_{xi}	=	WCx*BCFx*BAV		
Where:				
EDD_x	=	dietary intake for COPEC "x" (milligram [mg] COPEC/kilograms [kg] BW-day)		
FIR	=	food ingestion rate (kg [wet weight]/kg BW per day)		
FC_{xi}	=	concentration of COPEC "x" in food item I (mg/kg, wet weight)		
PDF_i	=	proportion of diet composed of food type "i" (unitless)		
WIR	=	water ingestion rate (L/day)		
WC_x	=	concentration of COPEC "x" in water (mg/L)		
BCF_x	=	bioconcentration Factor		
BW	=	body weight of wildlife receptor (kg)		
AUF	=	area use factor (unitless)		
BAV	=	bioavailability (unitless)		
COPEC	=	chemical of potential ecological concern		

Table 5-2. Exposure parameters for the four wildlife receptors used in food chain modeling.							
feeding guild/receptor species	body weight (kg)	ingestion rates food (kg/kg BW-day, ww)	ingestion rates water (L/kg BW-day)	dietary composition (%) invert.	dietary composition (%) fish	dietary composition (%) plants	home range
aquatic insectivore							
American dipper (*Cinclus mexicanus*)	0.0565[c]	0.796[a]	0.152[b]	100[h]	--	--	759 m (along a water course)
aquatic herbivore							
muskrat (*Ondatra zibethicus*)	1.17[d]	0.34[e]	0.975[e]	--	--	100[h]	0.13 hectares
piscivore							
belted kingfisher (*Ceryle alcyon*)	0.147[e]	0.5[e]	0.111[e]	--	100[h]	--	2.25 km
omnivore							
mallard (*Anas platyrhynchos*)	1.162[e]	0.31[a]	0.056[e]	100[i] 50[j]	--	50[j]	111 hectares

a - Calculated using IR_{food} (kg dw/day) = $0.0582*(BW, kg)^{0.651}$; Adjusted to wet weight assuming 80% moisture (Nagy, 1987 - found in US EPA, 1993)
b - Calculated using IR_{water} (L/day)=0.059 (BW, kg) $^{0.67}$; [Calder (1981), Skadhauge (1975), Calder and Braun (1983) - found in US EPA, 1993]
c - Ealey, D., 1977
d - Silva and Downing, 1995
e - US EPA, 1993
f - Sullivan, J., 1973
g - Sample & Suter, 1994
h – Assumption
i- Dietary consumption in the spring is assumed to be 100% aquatic invertebrates as females prepare for egg production.
J - Dietary consumption is assumed to be 50% aquatic invertebrates and 50% aquatic plants in the fall.

BW - Body weight

wet wt - Wet weight
ref. – Reference; Invert. - Invertebrate

Table 5-3. Bioconcentration factors used in food chain modeling.			
analyte	**water-to-aquatic invertebrates[a]**	**water-to-plants[b,d]**	**water-to-fish[c]**
Aluminum	4066	833	2.7
Antimony	7	1475	40
Arsenic	73	293	114
Beryllium	45	141	62
Cadmium	3461	782	907
Calcium	--	--	--
Chromium III	--	--	--
Chromium VI	--	--	--
Chromium, total	3000	4406	19
Copper	3718	541	710
Iron	--	--	--
Lead	5059	1706	0.09
Magnesium	--	--	--
Manganese	--	--	--
Mercury (inorganic)	20184	24762	3530
Nickel	28	61	78
Potassium	--	--	--
Selenium	1262	1845	129
Silica	--	--	--
Silver	298	10696	87.71
Sodium	--	--	--
Strontium	--	--	--
Thallium	15000	15000	10000
Vanadium	--	--	--
Zinc	4578	2175	2059

Source: Appendix C in EPA, 1999. SLERA Protocol for Hazardous Waste Combustion Facilities. EPA/530/D-99/001A.

a - Table C-3: Water-to-Aquatic Invertebrate Bioconcentration Factors
b - Table C-4: Water-to-Algae Bioconcentration Factors
c -Table C-5: Water-to-Fish Bioconcentration Factors
d - Water-to-algae BCFs were used as a surrogate for water-to-(vascular) plant because water-to- (vascular) plant BCFs were not available.
-- - No BCF was available, a default value of 1.0 is used.
Note: The metal BCFs presented in the EPA(1999) were derived for use with the dissolved (filtered) fraction in surface water.
The BERA report multiplied these BCFs with the total (unfiltered) faction instead as measure of added conservatism.

6.0 BERA EFFECTS ASSESSMENT

6.1 Introduction

The effects analysis evaluates the toxicity of the COPECs to the receptor groups of interest to the BERA. The effects analysis consisted of the following three major components:

Toxicity-based benchmarks:

- No effect- and effect-based sediment benchmarks
- Acute and chronic surface water benchmarks
- No effect- and effect-based wildlife TRVs for birds and mammals

Toxicity testing:

- 96-hour acute toxicity testing using juvenile rainbow trout (*Oncorhynchus mykiss*) exposed to surface water samples from Willow Creek and the Rio Grande River.

Field community survey:

- benthic invertebrate community survey in the Rio Grande River.

6.2 Toxicity-based benchmarks

6.2.1 Sediment benchmarks

The metal concentrations measured in bulk sediment collected from the Rio Grande River sample locations were compared to the following sediment benchmarks:

- No effect-based sediment benchmarks:

  Threshold Effect Concentrations (TECs), which consisted of the Threshold Effect Level (TEL), the TEL for *Hyalella azteca* in 28-day tests (TEL-HA28), and the Effect Range-Low (ER-L).

- Effect-based sediment benchmarks

  Probable Effect Concentrations (PECs), which consisted of the Probable Effect Level (PEL), the PEL for *Hyalella azteca* in 28-day tests (PEL-HA28), and the Effect Range-Median (ER-M).

The following hierarchy was used to obtain the no effect- and effect-based sediment benchmarks:

- MacDonald et al. (2000); consensus-based TECs and PECs,
- Ingersoll, et al. (1996); TELs and PELs,
- Long and Morgan (1990); ERLs and ERMs.

Table 6-1 summarizes the sediment benchmarks used in the evaluation.

6.2.2 Surface water benchmarks

The dissolved metals concentrations measured in surface water collected from the Willow Creek and Rio Grande sample locations were compared to surface water benchmarks to assess the potential for risk to the aquatic community receptors. The Colorado State Water Quality Criteria (WQC) were the primary source of surface water benchmarks used in the evaluation.

The metal concentrations were compared to the acute and chronic WQC (referred to as Criteria Maximum Concentration [CMC] and the Criteria Continuous Concentration [CCC], respectively). The WQC were primarily the class II cold water values developed by the Colorado Department of Public Health and the Environment (CDPHE, 2009). Note that these benchmarks were based on dissolved metal concentrations, except for Al, Fe, and Hg which were based on total-recoverable metal (CDPHE, 2009). The WQC for Cd, Cu, Pb, Ni and Zn were adjusted to the sample-specific hardness measured at each sample locations (see **Table 6-1** for equations). National Recommended Water Quality Criteria (NRWQC) criteria (EPA, 2009), or acute and chronic toxicity thresholds summarized by the National Oceanic Atmospheric Administration (NOAA) (NOAA, 2008) were used when Colorado State WQC were not available.

Table 6-1 summarizes the acute and chronic surface water benchmarks and equations used in the evaluation.

Table 6-1. Summary of surface water and sediment benchmarks.

analytes	surface water (µg/L) WQC (CDPHE,2009) acute	chronic	NRWQC (USEPA, 2009) acute	chronic	NOAA, 2008 acute	chronic	sediment (µg/Kg) Effect	No Effect
Aluminum	750	87	750	87	750	87	59,572,000	25,519,000
Antimony	NA	NA	NA	NA	88	30	25,000	2,000
Arsenic	340	150	340	150	NA	190	33,000	9,800
Beryllium	NA	NA	NA	NA	35	1	NA	NA
Cadmium	$(1.136672-[\ln(hardness) \text{ x } (0.041838)])\text{x } e^{0.9151[\ln hardness)]-3.6236}$ (trout)	$(1.101672-[\ln(hardness) \text{ x}(0.041838)] \text{ x } e^{0.7998[\ln(hardness)]-4.4451}$ (trout)	eqn	eqn	2	0	5,000	1,000
Calcium	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	$e^{(0.819[\ln(hardness)]+2.5736)}$	$e^{(0.819[\ln(hardness)]+0.5340)}$	eqn	eqn	570	74	111,000	43,000
Copper	$e^{(0.9422[\ln(hardness)]-1.7408)}$	$e^{(0.8545[\ln(hardness)]-1.7428)}$	eqn	eqn	13	9	149,000	32,000
Iron	NA	1,000.00	NA	1,000	NA	1,000	247,600,000	188,400,000
Lead	$(1.46203-[(\ln(hardness) \text{ x } (0.145712)]) \text{ x } e^{(1.273[\ln(hardness)]-1.46)}$	$(1.46203-[(\ln(hardness) \text{ x } (0.145712)]) \text{ x } e^{(1.273[\ln(hardness)]-4.705)}$	eqn	eqn	65	3	128,000	36,000
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	$e^{(0.3331[\ln(hardness)]+6.4676)}$	$e^{(0.3331[\ln(hardness)]+5.8743)}$	eqn	eqn	2,300	80	1,184,000	631,000
Mercury	NA	0.01	1	1	1	1	1,100	180
Nickel	$e^{(0.846[\ln(hardness)]+2.253)}$	$e^{(0.846[\ln(hardness)]+0.0554)}$	470	52	470	52	49,000	23,000
Potassium	NA	NA	NA	NA	373,000		NA	NA
Selenium	18.40	4.60	NA	5	13-186 total	5 total	NA	NA
Silica	NA	NA	NA	NA	NA	NA	NA	NA
Silver	$0.5 \text{ x } e^{(1.72[\ln(hardness)]-6.52)}$	$e^{(1.72[\ln(hardness)]-10.51)}$(trout)	eqn	eqn	1.6 (1/2)	0	4,000	1,000
Sodium	NA	NA	NA	NA	NA	NA	NA	NA
Strontium	NA	NA	NA	NA	15,000	1,500	NA	NA
Thallium	NA	15.00	NA	NA	110	0	NA	NA
Vanadium	NA	NA	NA	NA	280	19	NA	NA
Zinc	$0.978 \text{ x } e^{(0.8525[\ln(hardness)]+1.0617)}$	$0.986 \text{ x } e^{(0.8525[\ln(hardness)]+0.9109)}$	eqn	eqn	120	120	459,000	121,000

Footnotes

Surface water benchmarks based on total recoverable results.

	Benchmark selected for use in the BERA
eqn	Surface Water TRV is hardness derived
PEC	Probable Effects Concentration
TEC	Threshold Effects Concentration
WQC	Colorado Water Quality Criteria
NRWQC	National Recommend Water Quality Criteria
NOAA	National Oceanic Atmospheric Administration

6.2.3 TRVs for wildlife receptors

The following hierarchy was used to obtain the mammalian and avian no effect- and effect-based TRVs:

- USEPA Eco SSLs (http://www.epa.gov/ecotox/ecossl/) and Techlaw Inc, 2008. Close-Out Letter for Calculating Effect-Based Ecological Soil Screening Levels for Fort Devens, Ayers, MA., November 2008 (note: The Eco SSL reports prepared by EPA provided only no-effect based TRVs. The work summarized in the 2008 TechLaw memorandum consisted of calculating effect-based TRVs for birds and mammals using toxicity data and data selection methods described in the EcoSSL reports in order to derive generic, effect-based Eco SSLs for use at a Superfund site).
- Sample et al., 1996, Toxicological Benchmarks for Wildlife: 1996 Revision, ES/ER/TM-86/R3, http://www.esd.ornl.gov/programs/ecorisk/documents/tm86r3.pdf (values represent the test species)
- EPA, 1999, Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities Peer Review Draft. November 1999, http://www.epa.gov/osw/hazard/tsd/td/combust/ecorisk.htm

Tables 6-2 and 6-3 present the mammalian and avian no effect- and effect-based TRVs.

Table 6-2. Toxicity reference values for mammals								
Analyte	**Selected TRV**		**Eco-SSLs**		**1996 toxicological benchmarksfor wildlife[c]**		**1999 mammal TRVs[d]**	
selection preference	**no effect-based**	**effect-based**	**no effect-based[a]**	**effect-based[b]**	**no effect-based**	**effect-based**	**no effect-based**	**effect-based**
			1		***2***		***3***	
Aluminum	1.93	19.3	--	--	1.93	19.3	1.93	--
Antimony	0.059	2.76	0.059	2.76	0.125	1.25	0.066	--
Arsenic	1.04	4.55	1.04	4.55	0.126	1.26	1.25	--
Beryllium	0.532	0.67	0.532	0.67	0.66	--	0.66	--
Cadmium	0.770	6.87	0.770	6.87	1	10	0.0252	--
Calcium	--	--	--	--	--	--	--	--
Chromium III	2.40	58.17	2.40	58.17	2737	--	--	--
Chromium VI	9.24	38.37	9.24	38.37	3.28	13.14	3.5	--
Copper	5.60	82.7	5.60	82.7	11.7	15.4	12	--
Iron	--	--	--	--	--	--	--	--
Lead	4.70	186.4	4.70	186.4	8	80	0.0375	--
Magnesium	--	--	--	--	--	--	--	--
Manganese	51.4	146	51.4	146	88	284	--	--
Mercury (inorganic)	1	--	--	--	1	--	1.01	--
Nickel	1.70	14.77	1.70	14.77	40	80	50	--
Potassium	--	--	--	--	--	--	--	--
Selenium	0.143	0.66	0.143	0.66	0.2	0.33	0.076	--
Silica	--	--	--	--	--	--	--	--
Silver	6.02	119	6.02	119	--	--	0.375	--
Sodium	--	--	--	--	--	--	--	--
Strontium	263	--	--	--	263	--	--	--
Thallium	0.0074	0.074	--	--	0.0074	0.074	0.0131	--
Vanadium	4.16	9.44	4.16	9.44	0.21	2.1	--	--
Zinc	75.4	298	75.4	298	160	320	--	--

Sources

Note: all units are mg/kg bw-day (milligrams per kilogram body weight per day)
a - USEPA Eco SSLs (http://www.epa.gov/ecotox/ecossl/)
b- Techlaw Inc, 2008. Close-Out Letter for Calculating Effect-Based Ecological Soil Screening Levels for Fort Devens, Ayers, MA., November 2008.
c -Sample et al., 1996, Toxicological Benchmarks for Wildlife: 1996 Revision, ES/ER/TM-86/R3, http://www.esd.ornl.gov/programs/ecorisk/documents/tm86r3.pdf (values represent the test species)
d - EPA, 1999, Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities Peer Review Draft. November 1999, http://www.epa.gov/osw/hazard/tsd/td/combust/ecorisk.htm
-- - Not available
TRV - Toxicity Reference Value

Table 6-3. Toxicity reference values for birds									
Analyte	**selected TRV**		**Eco-SSLs**		**1996 toxicological benchmarksfor wildlife[c]**		**1999 bird TRVs[d]**	
selection preference	**no effect-based**	**effect-based**	**no effect-based[a]**	**effect-based[b]**	**no effect-based**	**effect-based**	**no effect-based**	**effect-based**
			1		***2***		***3***	
Aluminum	109.7	--	--	--	109.7	--	100	--
Antimony	--	--	--	--	--	--	--	--
Arsenic	2.24	4.51	2.24	4.51	5.14	12.84	2.46	--
Beryllium	--	--	--	--	--	--	--	--
Cadmium	1.47	6.35	1.47	6.35	1.45	20	1.45	--
Calcium	--	--	--	--	--	--	--	--
Chromium III	2.66	15.6	2.66	15.6	1	5	--	--
Chromium VI	1	--	--	--	--	--	1	--
Copper	4.05	34.87	4.05	34.87	47	61.7	46.97	--
Iron	--	--	--	--	--	--	--	--
Lead	1.63	44.63	1.63	44.63	1.13	11.3	0.025	--
Magnesium	--	--	--	--	--	--	--	--
Manganese	179	377	179	377	997	--	--	--
Mercury	0.45	0.9	--	--	0.45	0.9	3.25	--
Nickel	6.71	18.6	6.71	18.6	77.4	107	65	--
Potassium	--	--	--	--	--	--	--	--
Selenium	0.290	0.82	0.290	0.82	0.5	1	0.5	--
Silica	--	--	--	--	--	--	--	--
Silver	2.02	60.5	2.02	60.5	--	--	178	--
Sodium	--	--	--	--	--	--	--	--
Strontium	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	0.35	--
Vanadium	0.344	1.70	0.344	1.70	11.4	--	--	--
Zinc	66.1	171	66.1	171	14.5	131	130.9	--

Sources

Note: all units are mg/kg bw-day

a - USEPA Eco SSLs (http://www.epa.gov/ecotox/ecossl/)

b- Techlaw Inc, 2008. Close-Out Letter for Calculating Effect-Based Ecological Soil Screening Levels for Fort Devens, Ayers, MA., November 2008.

c -Sample et al., 1996, Toxicological Benchmarks for Wildlife: 1996 Revision, ES/ER/TM-86/R3, http://www.esd.ornl.gov/programs/ecorisk/documents/tm86r3.pdf (values represent the test species)

d - EPA, 1999, Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities Peer Review Draft. November 1999, http://www.epa.gov/osw/hazard/tsd/td/combust/ecorisk.htm

-- - Not available

TRV - Toxicity Reference Value

6.3 Acute toxicity testing

Surface water samples were collected from Willow Creek and the Rio Grande River in September 2010 for chemical analyses and acute (96-hour) toxicity testing using juvenile rainbow trout (*Oncorhynchus mykiss*).

One surface water sample was collected from Willow Creek and three samples from the Rio Grande River (**Table 6-4**).

- Sample WI-J was a composite sample collected from the two Willow Creek channels just above the Rio Grande River confluence. Channel I conveys about 88% of the total flow. As a result, 88% of the composite sample volume came from channel I, whereas the other 12% came from channel J. This composite sample was serially diluted (50%, 25%, 12.5%, 6.25%, 3.13%, and 1.56%,) in the laboratory using either the Rio Grande River reference water collected upstream of the confluence (at RG-2), or SRLW of similar hardness.

- Sample RG-2 was a composite of four samples collected along a transect just above the confluence with Willow Creek (upstream of the bridge near the public boat launch) and represented upstream/background conditions. This sample was used in two serial dilutions of the WI-J sample and was also tested undiluted for use as a reference.

- Samples RG-4 and RG-8 were composites of four samples collected along a transect about1.29 miles and 6.65 miles below the confluence with Willow Creek, respectively. These samples were tested undiluted for acute toxicity. Both samples represented conditions in the mine-impacted section of the Rio Grande River below the confluence with Willow Creek.

Flow measurements taken during the sampling event showed that the flow in the Rio Grande River above the confluence with Willow Creek averaged 166.4 cubic feet per second (cfs), whereas the combined flow in Willow Creek (at locations W-I and W-J) at the confluence with the Rio Grande River equaled 6.9 cfs. These values showed that the surface water from Willow Creek made up around 4% of the total flow in the Rio Grande River below the point of confluence during sampling in September 2010.

Table 6-4. Sample preparation for acute toxicity testing.			
aquatic habitat	**sample name**	**sample dilution**	**comment**
--	SRLW	--	used as laboratory control sample and as diluent for WI-J
Willow Creek	WI-J	50%	RG-2 and SRLW were each used as diluents
		25%	RG-2 and SRLW were each used as diluents
		12.5%	RG-2 and SRLW were each used as diluents
		6.25%	RG-2 and SRLW were each used as diluents
		3.13%	RG-2 and SRLW were each used as diluents
		1.56%	RG-2 and SRLW were each used as diluents
Rio Grande River	RG-2	--	diluent for sample WI-J; also tested undiluted (i.e., full strength)
	RG-4	--	tested undiluted (i.e., full strength)
	RG-8	--	tested undiluted (i.e., full strength)

SRLW – soft reconstituted laboratory water

6.4 Benthic macroinvertebrate community survey

A D-frame kick net was used to collect three separate subsamples of benthic macroinvertebrates from each of three pre-determined locations in the Rio Grande River, namely RG-2, RG-4 and RG-8. The sampling areas were characterized by riffles, runs, and pool habitats containing cobble substrates (richest-target habitat). The samples were collected in September 2010 following standard methods described by Plafkin et al. (1989). All organisms were preserved in 90% percent ethanol. Timberline Aquatics in Ft.Collins, Colorado identified, counted, and summarized the benthic species data in a report provided in **Appendix C**.

7.0 BERA RISK CHARACTERIZATION

7.1 Introduction

The potential for ecological risk is quantified during risk characterization. This phase, which represents the last stage of the BERA, is built around three sequential steps: 1) risk estimation; 2) uncertainty analysis; and 3) risk description.

The exposure analysis and effects analysis described in the two previous sections were integrated to determine the likelihood of adverse effects to the assessment endpoints, given the assumptions inherent in the analysis phase. The uncertainty analysis provides a context for the influences of those assumptions on the risk characterization process. Finally, the risk findings were summarized, interpreted, and discussed in the risk description section using various lines of evidence which addressed the risk estimates as well as the uncertainties associated with them.

The following two approaches were used to support the risk estimation:

- The Hazard Quotient (HQ) method
- Statistical testing of fish acute toxicity data and benthic macroinvertebrate community data

Table 7-1 summarizes the risk estimation approach for each measurement endpoint evaluated in the BERA.

Table 7-1: Summary of risk estimation approach by receptor group, exposure unit, and measurement endpoint				
receptor group	**exposure units**	**measurement endpoint**		**risk estimation approach**
		exposure	**effect**	
benthic invertebrate community	Rio Grande River only	COPECs in bulk sediment	sediment benchmarks	HQ method
		benthic invertebrate community assessment in the field	community structure &function	statistical testing
water column invertebrate community	Willow Creek & Rio Grande River	dissolved COPECs in surface water	surface water benchmarks	HQ method
fish community	Willow Creek & Rio Grande River	dissolved COPECs in surface water	surface water benchmarks	HQ method
		Acute toxicity testing (96-hr) on rainbow trout using field collected surface water.	survival	statistical testing
aquatic insectivorous birds	Willow Creek & Rio Grande River	food chain modeling to calculate an EDD	bird TRVs	HQ method
omnivorous birds	Willow Creek & Rio Grande River	food chain modeling to calculate an EDD	bird TRVs	HQ method
piscivorous birds	Willow Creek & Rio Grande River	food chain modeling to calculate an EDD	bird TRVs	HQ method
herbivorous mammals	Willow Creek & Rio Grande River	food chain modeling to calculate an EDD	mammal TRVs	HQ method

BERA = baseline ecological risk assessment
COPEC = contaminant of potential ecological concern
EDD = estimated daily dose
HQ = hazard quotient
TRV = toxicity reference value

7.1.1 Hazard quotients

The HQ method compares measured exposures (i.e., surface water and sediment EPCs) and estimated exposures (wildlife EDDs) to corresponding toxicity values (i.e., surface water or sediment benchmarks and wildlife TRVs). A COPEC-specific HQ is calculated using the following general equation:

$$HQ = EPC \text{ or } EDD/\text{benchmark or } TRV \qquad \text{Eqn. 7-1.}$$

Where:

HQ	=	Hazard Quotient (unitless)
EPC	=	Exposure Point Concentration (µg/L or µg/Kg)
EDD	=	Estimated Daily Dose (mg/Kg bw-d)
Benchmark	=	surface water or sediment toxicity value (µg/L or µg/Kg)
TRV	=	wildlife Toxicity Reference Value (mg/Kg BW-d)

HQs are not probabilistic estimates. For example, an HQ of 0.01 does not imply a 1 in 100 chance of an adverse effect but simply indicates that the exposure is 100 times lower than the corresponding toxicity value. An HQ of 1.0 indicates that the exposure equals the toxicity value. An HQ of 10 indicates that exposure exceeds the toxicity value by 10. A potential for risk is assumed to be present if an HQ exceeds 1.0. An HQ of 10 versus 1.0 should not be interpreted to mean that the risk was ten times higher because the relationship may not be linear. Instead, the potential for risk in this BERA was simply assumed to qualitatively increase with bigger HQs.

7.1.2 Statistical testing

Statistics were used to analyze the results of the rainbow trout acute toxicity test and the benthic macroinvertebrate community survey. The fish toxicity data were analyzed using the CETIS software package.

Data provided in **Appendix C** for the following benthic community measures and indexes collected from the Rio Grande River were entered in an Excel spreadsheet:

- Mayfly taxa abundance
- Stonefly taxa abundance
- Caddisfly taxa abundance
- Number of taxa (= total taxa richness)
- EPT taxa richness
- Intolerant taxa richness
- % EPT (as % of the total number of organisms)

- % intolerant taxa (as % of total number of taxa)
- % scrapers (as % of total number of organisms)
- % filter feeders (as % of total number of organisms)
- Shannon-Weaver Index
- Hilsenhoff Biotic Index

The mean and one standard deviation for each benthic community measure and index was calculated based on the three replicate samples collected at each of the three sample locations on the Rio Grande River.

A One-Way Analysis of Variance (ANOVA) was used to assess the presence of statistically significant differences across the three sample locations for each measure and index. The significance level was set at $\alpha = 0.05$. Significant differences were further explored using pair-wise multiple comparisons (Tukey Test). Note that the sample size (three sample locations) and the number of replicates (three replicates at each sample location) were quite small. As such, the results of the statistical analyses should be viewed with some caution.

7.2 Assessment endpoint 1: benthic invertebrates

A stable and healthy benthic invertebrate community: *Are the total metal levels in sediment high enough to impair the benthic invertebrate community in the Rio Grande River?*

The potential for ecological risk to the benthic invertebrate community in the Rio Grande River was assessed using two measurement endpoints.

7.2.1 Measurement endpoint 1.A:

Compare the metal levels in bulk sediment samples to conservative no effect- and effect-based sediment benchmarks.

Table D-1 of Appendix D presents the no effect- and effect-based HQs for the benthic invertebrates exposed to sediments from the Rio Grande River (note: sediment samples were collected only in September 2010).

- RG-2: No PEC or TEC HQs exceeded 1.0, except for Mn (TEC HQ = 1.05).
- RG-4: PEC and TEC HQs exceeded 1.0 for Cd, Pb, and Zn, but only the TEC HQs for As and Mn exceeded 1.0.
- RG-8: PEC and TEC HQs exceeded 1.0 for Cd, Pb, and Zn, but only the TEC HQs for As and Mn exceeded 1.0.
- RG-9: PEC and TEC HQs exceeded 1.0 for Cd, Pb, and Zn, but only the TEC HQs for As and Mn exceeded 1.0.

Risk conclusion for measurement endpoint 1.A

Measurement endpoint 1.A identified Cd, Pb, and Zn as likely stressors to the benthic invertebrate community exposed to sediment in the Rio Grande River.

7.2.2 Measurement endpoint 1.B:

The data summarized in the Timberline Aquatics report were retained as a LOE for use in the risk characterization. The indexes and measures are described below. The key to the data interpretation lies in the spatial relationship between the three sample locations on the Rio Grande River. RG-2 is located above the confluence with Willow Creek and therefore represents regional background conditions. RG-4 occurs 1.29 miles below the confluence with Willow Creek, and RG-8 is located another 5.36 miles further downstream. Therefore, spatial trends should be present if mine-derived contaminants in Willow Creek impact the benthic macroinvertebrate community in the Rio Grande River below the confluence.

Mayfly taxa abundance

Studies have used Ephemeroptera (mayflies) as indicators of metal contamination in streams. Low mayfly abundance and richness (as reported by Winner et al., 1980; Clemments, 1994, Clements and Kiffney, 1995) may be related to increased metal levels. Studies have shown that mayflies tend to occupy the 'least polluted' sites. Both mayflies and caddisflies are sensitive to copper and zinc pollution. One genus of mayfly, *Baetis*, is considered by some stream ecologists to be more tolerant than other mayfly taxa, such as the family *Heptageniidae*. Studies in Colorado have shown that the predominance of *Baetis* species in the mayfly community at mining sites and a decrease in the total mayfly community indicates that the *Baetis* species may be more tolerant than other mayflies in the presence of high metal levels (Clements and Kiffney, 1995).

Stonefly taxa abundance

Studies have used Plecoptera (stoneflies) as indicators of metal contamination in streams. Ward(1986) and Clements and Kiffney (1995) showed that changes in temperature and elevation may more strongly affect stoneflies than mayflies or caddisflies in Colorado. Ward (1986) noted that certain abundant stoneflies were missing entirely during summer sampling because the species matured and emerged well before maximum stream temperatures were reached. As a result, stonefly data should be interpreted with caution when large temperature or elevation variables are introduced between sample locations. Clements (1995) found stoneflies to be moderately tolerant of low levels of metals. Stoneflies are also commonly one of the earlier groups to recover when metal levels decrease.

Caddisfly taxa abundance

Trichoptera (caddisflies) abundance and richness has been used as an indicator of metal contamination in streams. Generally, low caddisfly abundance and richness may be related to higher metal levels.

Number of taxa (total taxa richness)

This measure provides the number of taxa in a given sample based on separating the macroinvertebrates into genus (or if possible) species groups. The results, referred to as taxa richness, shows biodiversity by providing the total number of benthic macroinvertebrate taxa at a given sample location. A higher number of taxa suggests a less impaired aquatic environment.

EPT taxa richness

All Ephemoptera, Plecoptera, and Trichoptera (EPT) taxa are separated from the other macroinvertebrate taxa and then summed. This measure is a subset of the total taxa richness measure outlined above in that it focuses specifically on the three insect orders (i.e., EPT) widely considered to be pollution intolerant.

Diversity Indexes

Diversity indexes combine species richness and organism counts into a summary statistic. The number of taxa in a sample provides a richness component, whereas the number of organisms per taxon provides an evenness component.

The Shannon-Weaver Index (Shannon's Index; Ward and Kondratieff, 1992) increases either by adding more unique species, or by having a greater species evenness. This index is obtained (see below) by calculating the proportion of organisms in the i^{th} species, multiplying that proportion by log base 2, and summing the results across all the species identified in a sample.

$$\sum_{i=1}^{s} \left(p_i \cdot (\log_2 \cdot p_i)\right)$$

Where;

p_i : the proportion of organisms in the i^{th} species

The Hilsenhoff Biotic Index (1987) (HBI) classifies individual taxa based on their tolerance or intolerance to water enriched with organic wastes. The HBI is obtained (see below) by multiplying the number of organisms in each taxon by the pollution tolerance value assigned to that taxon, adding these up for all the individuals represented in the sample, and dividing by the total number of organisms for taxa in the sample which have a tolerance value.

$$\sum (n_i * t_i)/N$$

Where;

n_i: the number of organisms in a taxon (genus or species)

t_i : the pollution tolerance value of that taxon

N : the total number of organisms in a sample

The HBI increases at sample locations dominated by benthic invertebrate taxa tolerant to organic pollution. HBIs below 3.75 are considered to reflect benthic communities not affected by organic waste loads.

Intolerant taxa richness

This measure quantifies the number of intolerant taxa (i.e., EPT, plus other pollution-sensitive groups) observed at each sample location.

% intolerant taxa

This measure quantifies the number of intolerant taxa as a % of the total number of taxa observed at a sample location. This measure is expected to drop with increasing pollution impacts.

% scrapers and % filter feeders in relation to the total number of organisms

% scrapers reflect the fraction of all the benthic organisms at a sample location which feed on algae attached to the substrate, whereas the % filter feeders reflect the fraction of benthic organisms which filters food out of the water column. Filter feeders require clear water because filtering mechanisms become clogged by excessive particles in the water column. Filter feeders would also experience more exposures to contaminants which become concentrated in their bodies from filtering large volumes of water. As such, the number of scrapers is expected to increase when water becomes siltier, enriched with nutrients, and/or impacted by contaminants.

Evaluate the structure and function of the benthic invertebrate community in the Rio Grande River.

The data and results of the statistical analyses are summarized in Figures 7-1 to 7-4 and are discussed in the next subsections.

Number of mayfly, stonefly and caddisfly taxa (Figure 7-1)

RG-2 had the highest average number of mayfly, stonefly and caddisfly taxa, even though only the number of mayfly taxa in RG-4 was significantly lower than in RG-2 and RG-8. This information suggested a potential effect on the stonefly assemblage in RG-4, located closest to Willow Creek. This effect was not observed at RG-8.

Additional taxa richness measures (Figure 7-2)

This figure provides three additional taxa richness measures, namely: total taxa richness (i.e., all invertebrate taxa combined, regardless of sensitivity), EPT taxa richness (i.e., the sum of the taxa representing Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies), and intolerant taxa richness (i.e., the EPT taxa richness, plus any other sensitive taxa as reported in the Timberline Aquatics report).

These three measures did not suggest that the species richness of the benthic macroinvertebrate community at RG-4 and RG-8 was significantly affected by mining-derived wastes from Willow Creek. The lower number of mayfly taxa at RG-4 identified in the previous subsection was not enough to significantly affect either the EPT or the intolerant taxa richness measures.

%EPT, % intolerant taxa, % scrapers, and % filter feeders (Figure 7-3)

The measures summarized in Figures 7-1 and 7-2 provided taxa counts but without factoring in the number of organisms. Figure 7-3 presents the data on EPT, intolerant taxa, scrapers, and filter feeders as a fraction of the total number of organisms counted in each sample.

The fraction of EPT species was significantly lower at RG-2 compared to RG-4 and RG-8. This pattern was counter-intuitive but reflected the fact that the mayfly groups Heptageniidae (and to a lesser degree, Ephemerelidae) appeared to be relatively more abundant at RG-4 and even RG-8. Clements and Kiffney (1995) reported that Heptageniida Rhithrogena sp. was a metal-sensitive species. This result indicated that the contaminant levels at this location did not affect all intolerant species.

The fraction of intolerant taxa was significantly lower at RG-8, compared to RG-2 and RG-4, suggesting a potential mining-related signal.

The % scrapers increased in RG-4 and RG-8 but without reaching statistical significance (P = 0.06) when compared to RG-2. This pattern, however, suggested that the silt load carried by Willow Creek may play a subtle role in modifying the benthic community structure and function in the Rio Grande River below the confluence.

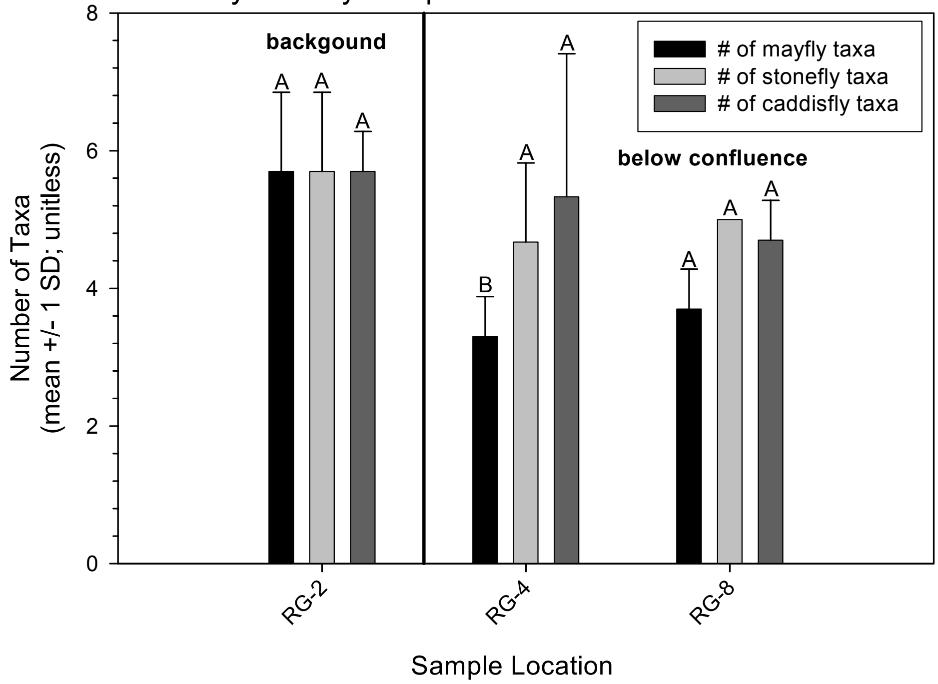
The % filter feeders did not drop significantly in RG-4 and RG-8 in response to the rise in the % scrapers, even though the average % filter feeders in RG-4 was close to half the numbers found at RG-2 (mean of 4.4% at RG-4 versus mean of 8.3% at RG-2). The lack of significance was likely due to the high level of variation across the subsamples (4.4%, 8.1% and 12.3% of filter feeders at RG-2 versus 2.8%, 2.9% and 7.4% of filter feeders at RG-4) caused by the small sample sets.

The Shannon Index and the HBI (Figure 7-4)

The Shannon Index did not differ significantly between the three sample locations on the Rio Grande River. This result suggested that the overall benthic macroinvertebrate community structure was similar above and below the confluence with Willow Creek.

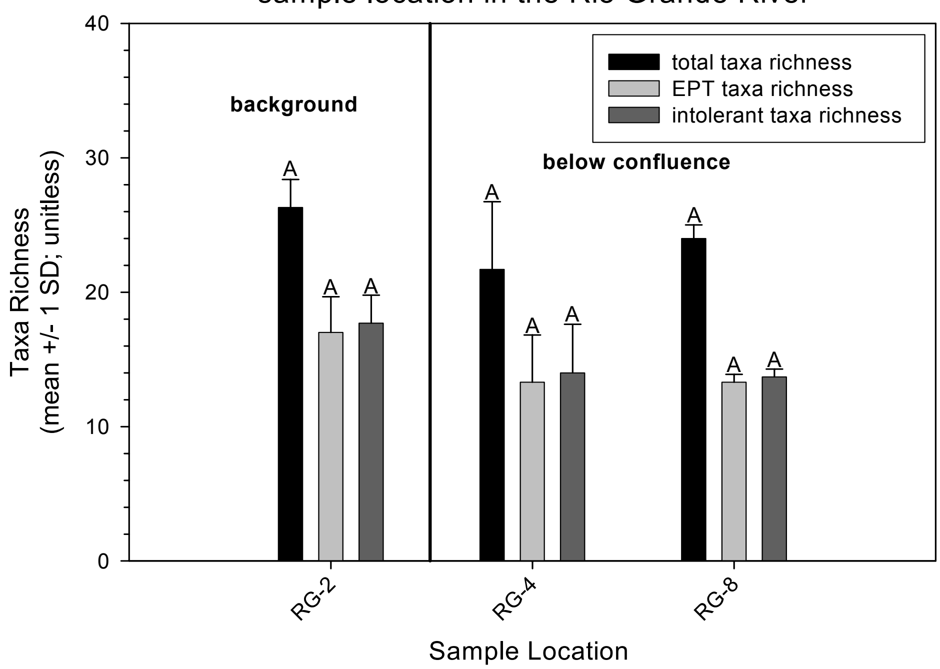
The HBI was statistically lower at RG-4 (mean HBI = 0.71) and RG-8 (mean HBI = 0.97) compared to RG-2 (mean HBI = 1.6). The biological significance of this pattern was unknown, considering that all of these HBIs fell well below 3.50,which is the range considered to reflect highly oxygenated surface water free of organic pollution. The HBI was dropped from the evaluation because this index is used mainly to assess the impact of organic pollution (such as waste water treatment plants), which is not a concern on the Rio Grande River reach between RG-4 and RG-8. It is noted, however, that a waste water treatment plant discharges into Willow Creek above sampling location W-I.

Figure 7-1: Average number of mayfly, stonefly and caddisfly taxa by sample location in the Rio Grande River



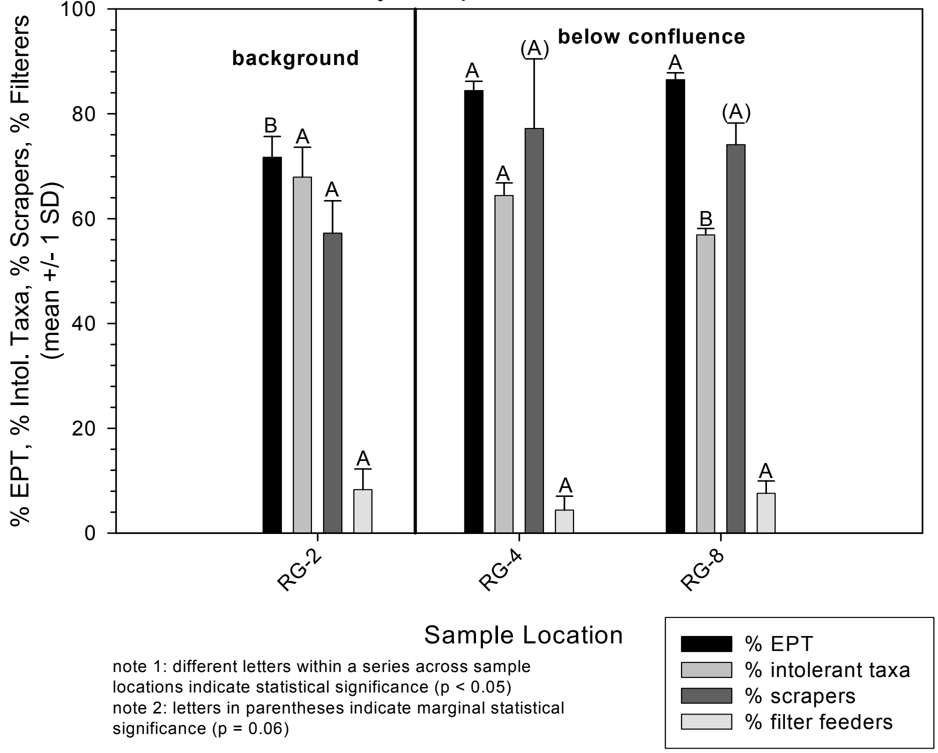
note: different letters within a species group across sample locations indicate statistical significance

Figure 7-2: Average taxa richness measured by sample location in the Rio Grande River



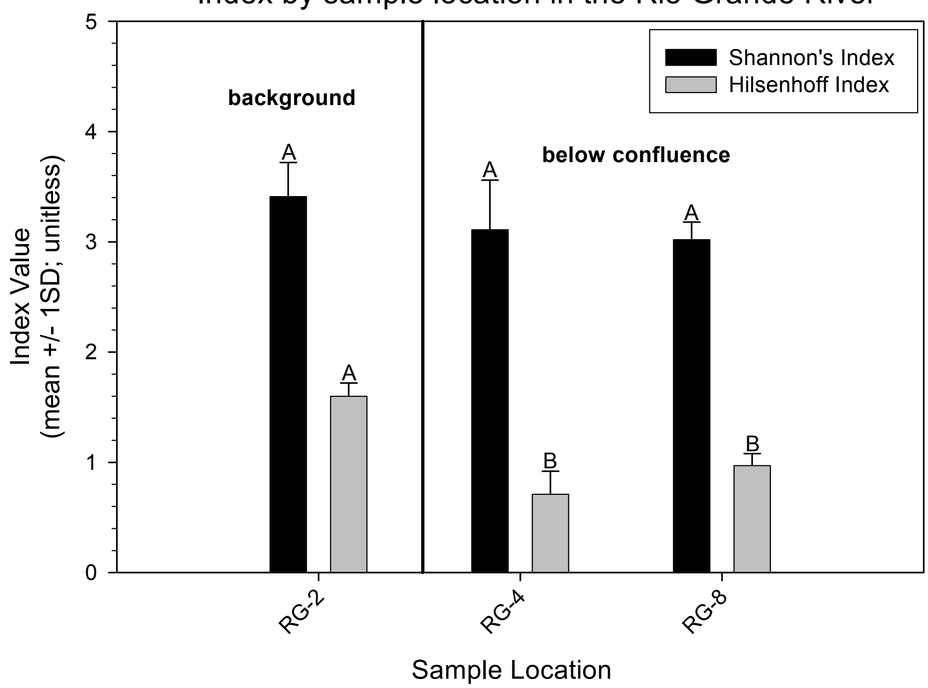
note: different letters within a series across sample locations indicate statistical significance

Figure 7-3: Average % EPT, % intolerant taxa, % scrapers, and % filter feeders by sample location in the Rio Grande River



note 1: different letters within a series across sample locations indicate statistical significance ($p < 0.05$)
note 2: letters in parentheses indicate marginal statistical significance ($p = 0.06$)

Figure 7-4: Average Shannon's Index and Hilsenhoff Index by sample location in the Rio Grande River



note: different letters within a series across sample locations indicate statistical significance

Risk conclusion for measurement endpoint 1.B

The measures and the Shannon Index provided largely inconclusive evidence about the presence of risk to the benthic macroinvertebrate community in the Rio Grande River below the confluence with Willow Creek. Any mining-related signals at RG-4 and RG-8 were subtle, consisting of a potential shift in community structure and function in response to a higher silt load in the Rio Grande River, a drop in the number of mayfly taxa at RG-4, and a drop in the fraction of intolerant taxa at RG-8. The other measures or the Shannon-Weaver Index failed to identify significant risk.

It is therefore concluded that, based on the available evidence, any impairment from mine discharge to the benthic community in the Rio Grande River, if present, was not severe. This conclusion was tempered by the fact that the number of replicates and the number of sample locations were small, which may have resulted in relatively high variation across sample locations.

7.3 Assessment endpoint 2: water column invertebrates

A stable and healthy water column invertebrate community: *Are the dissolved metal levels in surface water high enough to impair the water column invertebrate community in Willow Creek and the Rio Grande River?*

The potential for ecological risk to the water column invertebrate community was assessed using one measurement endpoint.

7.3.1 Measurement endpoint 2.A:

Compare the dissolved metal levels in surface water samples to acute and chronic surface water benchmarks.

Appendix D provides the chronic and acute HQs. The subsection below summarizes the community receptor chronic-based HQs for each sampling event by drainage and sampling location. Only the chronic-based HQs were discussed to avoid information overload. Note, however, that the acute HQs are systematically lower (i.e., less conservative) than the chronic HQs. The reason is that the acute benchmarks used to calculate acute HQs represent shorter exposure durations which require higher contaminant concentrations to results in toxicity. Those higher acute benchmarks, when divided into the exposure concentrations, result in lower HQs.

Willow Creek

April, 2010

- WW-M: No surface water samples were collected at this location in April, 2010 (**Table D-2**).
- WW-NT: Chronic-based HQs exceeded 1.0 for Be, Cd, Pb, Mn, Sr, V, and Zn (**Table D-2**).
- WW-F: Chronic-based HQs exceeded 1.0 for Cd, Pb, Ag, and Zn (**Table D-2**).
- WW-E: Chronic-based HQs exceeded 1.0 for Cd, Cu, Pb, Ag, and Zn (**Table D-2**).
- W-I: Chronic-based HQs exceeded 1.0 for Cd, Pb, Ag, and Zn (**Table D-2**).
- W-J: Chronic-based HQs exceeded 1.0 for Cd, Pb, Ag, and Zn (**Table D-2**).

June, 2010

- WW-M: Chronic-based HQs exceeded 1.0 for Hg and Ag (**Table D-3**).
- WW-NT: Chronic-based HQs exceeded 1.0 for Be, Cd, Cu, Pb, Mn, Hg, Se, and Zn (**Table D-3**).
- WW-F: Chronic-based HQs exceeded 1.0 for Al, Cd, Pb, Hg, Ag, and Zn (**Table D-3**).
- WW-E: Chronic-based HQs exceeded 1.0 for Al, Cd, Pb, Hg, Ag, and Zn (**Table D-3**).
- W-I: Chronic-based HQs exceeded 1.0 for by Al, Cd, Pb, Hg, Ag, and Zn (**Table D-3**).
- W-J: Chronic-based HQs exceeded 1.0 for Al, Cd, Cu, Pb, Hg, Ag, and Zn (**Table D-3**).

September, 2010

- WW-M: Chronic-based HQs exceeded 1.0 only for Ag(**Table D-4**)
- WW-NT: Chronic-based HQs exceeded 1.0 for Be, Cd, Fe, Pb, Mn, Se, Sr, and Zn (**Table D-4**).
- WW-F: Chronic-based HQs exceeded 1.0 for Cd, Pb, Mn, and Zn (**Table D-4**).
- WW-E: Chronic-based HQs exceeded 1.0 for Cd, Pb, Mn, and Zn (**Table D-4**).
- W-I: Chronic-based HQs exceeded 1.0 for by Cd, Pb, Ag, and Zn (**Table D-4**).
- W-J: Chronic-based HQs exceeded 1.0 for Cd, Pb, Ag, and Zn (**Table D-4**).

Rio Grande River

April, 2010

- RG-2: The maximum and average chronic-based HQs exceeded 1.0 only for Ag (**Table D-5**).
- RG-4: The maximum and average chronic-based HQs exceeded 1.0 for Cd, Pb, Ag, and Zn (**Table D-6**).
- RG-8: The maximum and average chronic-based HQs exceeded 1.0 for Cd, Pb, Ag, and Zn, but only the maximum chronic-based HQ for Cu exceeded 1.0 (**Table D-7**).
- RG-9: The maximum and average chronic-based HQs exceeded 1.0 for Cd, Pb, Ag, and Zn (**Table D-8**).

June, 2010

- RG-2: The maximum and average chronic-based HQs exceed 1.0 for Al, Hg, and Ag (**Table D-9**).
- RG-4: The maximum and average chronic-based HQs exceeded 1.0 for Al, Cd, Pb, Hg, Ag, and Zn (**Table D-10**).
- RG-8: The maximum and average chronic-based HQs exceeded 1.0 for Al, Cd, Pb, Hg, Ag, and Zn (**Table D-11**).
- RG-9: The maximum and average chronic-based HQs exceeded 1.0 for Al, Cd, Pb, Hg, Ag, and Zn (**Table D-12**).

September, 2010

- RG-2: The maximum and average chronic-based HQs exceed 1.0 for Al and Ag (**Table D-13**).
- RG-4: The maximum and average chronic-based HQs exceeded 1.0 for Cd, Ag, and Zn (**Table D-14**).
- RG-8: The maximum and average chronic-based HQs exceeded 1.0 for Cd, Ag, and Zn (**Table D-15**).
- RG-9: The maximum and average chronic-based HQs exceeded 1.0 for Al, Cd, Ag, and Zn (**Table D-16**).

Risk conclusion for measurement endpoint 2.A

Measurement endpoint 2.A identified Cd, Pb, and Zn as common stressors to the water column invertebrate community exposed to surface water in both Willow Creek and the Rio Grande River (**Table 7-2**). Mn was identified as a stressor only in Willow Creek. Be, Fe, Se, Sr, and V were identified as stressors only at sample location WW-NT. Cu was identified as a stressor at sample locations WW-NT, WW-E, W-J, and RG-8.

Table 7-2: Summary of chronic HQs > 1.0 for the water column invertebrate community across seasons										
	background		Willow Creek					Rio Grande River		
analyte	WW-M	RG-2	WW-NT	WW-F	WW-E	W-I	W-J	RG-4	RG-8	RG-9
Aluminum		●		●	●	●	●	●	●	●
Beryllium			●							
Cadmium			●	●	●	●	●	●	●	●
Copper			●		●		●		●	
Iron			●							
Lead			●	●	●	●	●	●	●	●
Manganese			●	●	●					
Mercury	●	●	●	●	●	●	●	●	●	●
Selenium			●							
Silver	●	●		●	●	●	●	●	●	●
Strontium			●							
Vanadium			●							
Zinc			●	●	●	●	●	●	●	●

Shading = a chemical has an HQ> 1 in Willow Creek and/or Rio Grande River, but not at the background location(s).

Note: A chemical-specific risk may not be entirely mine-related if risk was also identified for the same chemical at the background location(s).

7.4 Assessment endpoint 3: fish

A stable and healthy fish community: *Are the dissolved metal levels in surface water high enough to impair the fish community in Willow Creek and the Rio Grande River?*

7.4.1 Measurement endpoint 3.A:

Compare the dissolved metal levels in surface water samples to acute and chronic surface water benchmarks.

Note: the evaluation of risk to fish under measurement endpoint 3.A was identical to the risk evaluation performed for the water column invertebrate community under measurement endpoint 2.A (see **Section 7.3.1**). Hence, the evaluation is not repeated here.

Risk conclusion for measurement endpoint 3.A

Measurement endpoint 3.A identified Cd, Pb, and Zn as common stressors to fish exposed to surface water in both Willow Creek and the Rio Grande River (**Table 7-2**). Mn was identified as a stressor only in Willow Creek. Be, Fe, Se, Sr, and V were identified as stressors only at sample location WW-NT. Cu was identified as a stressor at sample locations WW-NT, WW-E, W-J, and RG-8.

7.4.2 Measurement endpoint 3.B:

Measure survival in juvenile rainbow trout exposed for 96 hours in the laboratory to serial dilutions of Willow Creek surface water or undiluted Rio Grande River surface water.

Willow Creek

Willow Creek surface water was serially diluted using either RG-2 (reference water from the Rio Grande River) or SRLW. The results of the acute toxicity tests showed a similar pattern, regardless of the diluent: high mortality occurred in the 50%, 25%, 12.5%, and 6.25% dilutions, whereas no significant mortality was observed in the 3.13% or 1.56% dilutions (see **Table 7-3**). These results showed that conditions in Willow Creek were highly toxic to juvenile rainbow trout under short-term exposure conditions. Acute toxicity was removed only after Willow Creek surface water was diluted down to 3.13%.

The Willow Creek surface water hardness in the RG-2 serial dilutions ranged from 44.5 mg/L to 29.5 mg/L (see **Table 7-3**), with a mean hardness of 34.1 mg/L. The SRLW dilution series resulted in hardness ranging from 53.5 mg/L to 47.0 mg/L (see **Table 7-3**), with a mean hardness of 49.1 mg/L. Table III in CDPHE (2009) provided metal-specific equations to calculate acute and chronic WQS for dissolved metals, including Cd and Zn, whose aquatic toxicities vary by water hardness. **Table 7-4** summarizes the calculated acute and chronic WQS for Cd and Zn using the mean hardnesses measured in RG-2 (34.1 mg/L) and SRLW (49.1 mg/L). Note that the acute WQS for Cd was derived using the "trout" equation provided in Table III of CDPHE (2009) for this metal.

Table 7-5 shows how the diluent-specific acute and chronic WQS for Cd and Zn provided in **Table 7-4** were used to further interpret the acute toxicity data for the serial dilutions presented in **Table 7-3**.

These data indicated a consistent relationship between the presence of acute toxicity and exceedances of the hardness-adjusted acute WQS. Dissolved Zn surpassed its hardness-adjusted acute and chronic WQS in the two 3.13% dilutions, yet did not result in significant acute mortality to the juvenile rainbow trout at that dilution. This pattern suggested that Cd may have been the main toxicant in the Willow Creek composite surface water sample.

The biggest insight from **Table 7-5** is that the hardness-adjusted <u>chronic</u> WQS for both Cd and Zn were exceeded in the 3.13% serial dilution. Given the strong link between acute toxicity in the serial dilutions and exceedances of the hardness-adjusted acute WQS, this pattern suggested that chronic toxicity may have been present in the 3.13% dilution, and perhaps even in the 1.56% dilution. Chronic toxicity was not observed in the tests, however, because the 96-hour exposures were too short to reveal it.

Rio Grande River

The results for RG-4 and RG-8 were contradictory. RG-4 showed 95% survival, whereas RG-8 only had 75% survival (see **Table 7-3**). The latter was a statistically significant drop in survival compared to the reference sample.

The average Cd levels in RG-4 (0.532 µg/L at a hardness of 31.0 mg/L) and RG-8 (0.501 µg/L at a hardness of 32.5 mg/L) (see **Table 7-3**) fell below the hardness-adjusted acute WQC for Cd (0.61 µg/L and 0.64 µg/L, respectively; calculations not shown), which would suggest a lack of acute toxicity due to Cd in both samples.

The average Zn levels in RG-4 (122 µg/L at a hardness of 31.0 mg/L) and RG-8 (135 µg/L at a hardness of 32.5 mg/L; see **Table 7-3**) exceeded their hardness-adjusted acute WQS (52.8 µg/L and 55.0 µg/L, respectively; calculations not shown) by a factor of over two. The measured Zn levels would be expected to have caused toxicity in both samples.

The fact that the Cd and Zn levels in both sample were quite similar, yet one sample was non-toxic whereas the other was toxic, created an uncertainty in the risk interpretation.

Table 7-3: Acute toxicity and select dissolved metals in Willow Creek and Rio GrandeRiver test water.

aquatic habitat	sample name	sample dilution*	diluent	% survival (+/- 1 SD)	[Cd][a,b] (µg/l)	[Zn][a,b] (µg/l)	[hardness][b] (mg/L)
--	SRLW	--	--	97.5 ± 5.0[B]	0.05	5.0	47.0
Willow Creek	WI-J	50%	RG-2	0[A]	9.28	1895	44.5
		25%	RG-2	0[A]	4.27	795	36.5
		12.5%	RG-2	2.5 ± 5.0[A]	1.96	352	33.0
		6.25%	RG-2	37.5 ± 17.1[A]	0.90	177	31.0
		3.13%	RG-2	92.5 ± 5.0[B]	0.373	83.7	30.0
		1.56%	RG-2	100 ± 0[B]	0.152	43.0	29.5
		50%	SRLW	0[A]	9.04	1660	53.5
		25%	SRLW	0[A]	4.68	858	50.5
		12.5%	SRLW	20 ± 14.1[A]	2.17	390	49.0
		6.25%	SRLW	25.0 ± 5.8[A]	1.0	195	47.5
		3.13%	SRLW	85.0 ± 10.0[B]	0.486	95.4	47.0
		1.56%	SRLW	100 ± 0[B]	0.245	50.4	47.0
Rio Grande River	RG-2	--	--	97.5 ± 5.0[B]	0.05	5.0	29.0
	RG-4	--	--	95.0 ± 5.8[B]	0.532	122	31.0
	RG-8	--	--	75.0 ± 10.0[A]	0.501	135	32.5

SRLW = soft reconstituted laboratory water

note: letters next to survival values show statistically significant differences compared to the diluents
[a] dissolved metal concentrations
[b] these values represent the average concentration of two samples collected at the start and end of the test
*"dilution" refers to the fraction of original Willow Creek sample remaining after adding the diluent (either RG-2 or SRLW)

Table 7-4: Cd and Zn acute and chronic WQS for two surface water hardnesses.

analyte	WQS[a]	average hardness: RG-2 (34.1 mg/L)	average hardness: SRLW (49.1 mg/L)
Cadmium	acute	0.67 µg/L	0.92 µg/L
	chronic	0.19 µg/L	0.24 µg/L
Zinc	acute	57.3 µg/L	78.2 µg/L
	chronic	49.7 µg/L	67.8 µg/L

[a] The metal-specific acute and chronic WQS for Cd and Zn were calculated using the average hardness values presented in this table (i.e., 34.1 mg/L for RG-2 and 49.1 mg/L for SRLW) and the metal-specific acute and chronic equations for Cd and Zn provided in Table III of the of CDPHE (2009). Note that the "trout" equation in CDPHE (2009) was used to calculate the acute WQS for Cd.

SRLW = soft reconstituted laboratory water
WQS = water quality standard

Table 7-5. Comparing the hardness-adjusted surface water criteria for Cd and Zn to survival in rainbow trout.

		RG-2 diluent (34.1 mg/L hardness)				SRLW diluent (49.1 mg/L)			
metal	dilution*	survival[a]	ave. [Cd] (µg/L)	exceeds aWQS?[b]	exceeds cWQS?[b]	survival	ave. [Cd] (µg/L)	exceeds aWQS?[b]	exceeds cWQS?[b]
cad-mium	50%	0^{A}	9.28	**Y**	**Y**	0^{A}	9.04	**Y**	**Y**
	25%	0^{A}	4.27	**Y**	**Y**	0^{A}	4.68	**Y**	**Y**
	12.5%	$2.5±5.0^{A}$	1.96	**Y**	**Y**	$20±14.1^{A}$	2.17	**Y**	**Y**
	6.25%	$37.5±17.1^{A}$	0.90	**Y**	**Y**	$25.0±5.8^{A}$	1.0	**Y**	**Y**
	3.13%	$92.5±5.0^{B}$	0.373	N	**Y**	$85.0±10.0^{B}$	0.486	N	**Y**
	1.56%	$100±0^{B}$	0.152	N	N	$100±0^{B}$	0.245	N	**Y**
metal	**dilution**	**survival**	**ave. [Zn] (µg/L)**	**exceeds aWQS?[b]**	**exceeds cWQS?[b]**	**survival**	**ave. [Zn] (µg/L)**	**exceeds aWQS?[b]**	**exceeds cWQS?[b]**
zinc	50%	0^{A}	1895	**Y**	**Y**	0^{A}	1660	**Y**	**Y**
	25%	0^{A}	795	**Y**	**Y**	0^{A}	858	**Y**	**Y**
	12.5%	$2.5±5.0^{A}$	352	**Y**	**Y**	$20±14.1^{A}$	390	**Y**	**Y**
	6.25%	$37.5±17.1^{A}$	177	**Y**	**Y**	$25.0±5.8^{A}$	195	**Y**	**Y**
	3.13%	$92.5±5.0^{B}$	83.7	**Y**	**Y**	$85.0±10.0^{B}$	95.4	**Y**	**Y**
	1.56%	$100±0^{B}$	43.0	N	N	$100±0^{B}$	50.4	N	N

[a] note: letters next to survival values show statistically significant differences compared to the diluents
[b] see Table B.4 for the hardness-adjusted WQS for Cd and Zn
*"dilution" refers to the fraction of original Willow Creek sample remaining after adding the diluent (either RG-2 or SRLW)
aWQS = acute water quality standard
cWQS = chronic water quality standard
SRLW = soft reconstituted laboratory water

Risk conclusion for measurement endpoint 3.B

The acute toxicity test showed that conditions in Willow Creek were highly toxic to juvenile rainbow trout under short-term exposure conditions. Acute toxicity was removed only after the Willow Creek surface water was diluted down to 3.13%. Acute toxicity in the Rio Grande River was observed, but only at RG-8 which is downstream from RG-4.

The hardness-adjusted chronic WQS for both Cd and Zn were exceeded in the 3.13% serial dilution (**Table 7-5**). Given the strong link between acute toxicity in the serial dilutions and exceedances of the hardness-adjusted acute WQS, this pattern suggested that chronic toxicity may have been present in the 3.13% dilution, and perhaps even in the 1.56% dilution. Chronic toxicity could not be observed in the tests because the 96-hour exposures were too short to reveal it.

7.5 Assessment endpoint 4: aquatic insectivorous birds (American dipper)

Stable and healthy insectivorous bird populations: *Are the total metal levels in surface water and emergent aquatic insects high enough to impair insectivorous birds foraging in Willow Creek and the Rio Grande River?*

The BERA used one measurement endpoint to assess the potential impacts of metals ingested by this receptor group:

7.5.1 Measurement endpoint 4.A:

Use surface water analytical data to estimate metal residues in winged aquatic insects; apply a conservative food chain model to calculate daily doses from ingesting surface water and winged aquatic insects, and compare these doses to bird TRVs.

Appendix E provides the no effect- and effect-based HQs for insectivorous birds. The subsection below summarizes the effect-based HQs for each season by drainage and sample location. Only the effect-based HQs are discussed to avoid information overload.

Willow Creek

- WW-M: The spring effect-based HQs for Hg and Se exceeded 1.0, but only the fall effect-based HQ for Se exceeded 1.0 (**Table E-62**).

- WW-NT: The spring and fall effect-based HQs for Cd, Cu, Pb, Se, and Zn exceeded 1.0, but only the spring effect-based HQ for Hg exceeded 1.0 (**Table E-66**).
- WW-F: The spring and fall effect-based HQs for Cd, Pb, Se, and Zn exceeded 1.0, but only the spring effect-based HQ for Hg exceeded 1.0. (**Table E-70**).
- WW-E: The spring and fall effect-based HQs for Cd, Pb, Se, and Zn exceeded 1.0, but only the spring effect-based HQ for Hg exceeded 1.0. (**Table E-74**).
- WW-I: The spring and fall effect-based HQs for Cd, Pb, Se, and Zn exceeded 1.0, but only the spring effect-based HQ for Hg exceeded 1.0. (**Table E-78**).
- WW-J: The spring and fall effect-based HQs for Cd, Pb, Se, and Zn exceeded 1.0, but only the spring effect-based HQ for Hg exceeded 1.0. (**Table E-82**).

Rio Grande River

Maximum exposure
- RG-2: The spring and fall effect-based HQs for Se exceeded 1.0, but only the spring effect-based HQ for Hg exceeded 1.0 (**Table E-86**).
- RG-4: The spring and fall effect-based HQs for Se and Zn exceeded 1.0, but only the spring effect-based HQ for Hg exceeded 1.0 (**Table E-94**).
- RG-8: The spring and fall effect-based HQs for Se and Zn exceeded 1.0, but only the spring effect-based HQ for Hg exceeded 1.0 (**Table E-102**).
- RG-9: The spring and fall effect-based HQs for Se and Zn exceeded 1.0, but only the spring effect-based HQ for Hg exceeded 1.0 (**Table E-110**).

Average exposure
- RG-2: The spring and fall effect-based HQ for Se exceeded 1.0. (**Table E-87**).
- RG-4: The spring and fall effect-based HQs for Se and Zn exceeded 1.0. (**Table E-95**).
- RG-8: The spring and fall effect-based HQs for Se and Zn exceeded 1.0. (**Table E-103**).
- RG-9: The spring and fall effect-based HQs for Se and Zn exceeded 1.0. (**Table E-111**).

Risk conclusion for measurement endpoint 4.A

Measurement endpoint 4.A identified Zn as a major stressor both in Willow Creek and the Rio Grande River to insectivorous birds exposed to mine-related contaminants from ingesting surface water and winged aquatic insects (**Table 7-6**). Cd and Pb were only identified as stressors in Willow Creek. Cu was only identified as a stressor at sample location WW-NT.

Table 7-6: Summary of effect-based HQs > 1.0 for insectivorous birds across seasons										
	background		Willow Creek					Rio Grande River		
analyte	WW-M	RG-2	WW-NT	WW-F	WW-E	W-I	W-J	RG-4	RG-8	RG-9
Cadmium			●	●	●	●	●			
Copper			●							
Lead			●	●	●	●	●			
Mercury	●		●	●	●	●	●			
Selenium	●	●	●	●	●	●	●	●	●	●
Zinc			●	●	●	●	●	●	●	●

Shading = a chemical has an HQ> 1 in Willow Creek and/or Rio Grande River, but not at the background location(s).

Note: A chemical-specific risk may not be entirely mine-related if risk was also identified for the same chemical at the background location(s).

7.6 Assessment endpoint 5: omnivorous birds (mallard)

Stable and healthy omnivorous bird populations: *Are the total metal levels in surface water, aquatic invertebrates, and aquatic plants high enough to impair omnivorous birds foraging in Willow Creek and the Rio Grande River?*

The BERA used one measurement endpoint to assess the potential impacts of metals ingested by this receptor group:

7.6.1 Measurement endpoint 5.A:

Use surface water analytical data to estimate metal residues in aquatic invertebrates and aquatic plants; apply a conservative food chain model to calculate daily doses from ingesting surface water and food items, and compare these doses to bird TRVs.

Appendix E provides the no effect- and effect-based HQs for the omnivorous birds. The subsection below summarizes the effect-based HQs for each seasonal sampling event by drainage and sampling location. Only the effect-based HQs are discussed to avoid information overload.

Willow Creek

- WW-M: The spring and fall effect-based HQs for Se exceeded 1.0. (**Table E-65**).
- WW-NT: The spring and fall effect-based HQs for Cd, Pb, Se, and Zn exceeded 1.0, but only the spring effect-based HQ for Cu exceeded 1.0 (**Table 69**).
- WW-F: The spring and fall effect-based HQs for Pb, Se, and Zn exceeded 1.0, but only the fall effect-based HQ for Cd exceeded 1.0 (**Table E-73**).

- WW-E: The spring and fall effect-based HQs for Cd, Pb, Se, and Zn exceeded 1.0. (**Table E-77**).
- WW-I: The spring and fall effect-based HQs for Se and Zn exceeded 1.0, but only the spring effect-based HQ for Pb and the fall HQ for Cd exceed 1.0 (**Table E-81**).
- WW-J: The spring and fall effect-based HQs for Cd, Pb, Se, and Zn exceeded 1.0. (**Table E-85**).

Rio Grande River

Maximum exposure

- RG-2: The spring and fall effect-based HQs for Se exceeded 1.0 (**Table E-92**).
- RG-4: The spring and fall effect-based HQs for Se exceeded 1.0(**Table E-100**).
- RG-8: The spring and fall effect-based HQs for Se exceeded 1.0(**Table E-108**).
- RG-9: The spring and fall effect-based HQs for Se exceeded 1.0(**Table E-116**).

Average exposure

- RG-2: None of the spring effect-based HQs exceeded 1.0., and only the fall effect-based HQ for Se exceeded 1.0 (**Table E-93**).
- RG-4: None of the spring or fall effect-based HQs exceeded 1.0. (**Table E-101**).
- RG-8: None of the spring or fall effect-based HQs exceeded 1.0. (**Table E-109**).
- RG-9: None the spring or fall effect-based HQs exceeded 1.0. (**Table E-117**).

Risk conclusion for measurement endpoint 5.A

Measurement endpoint 5.A identified Cd, Pb, and Zn as stressors to omnivorous birds exposed to mine-related contaminants from ingesting surface water, aquatic invertebrates, and aquatic plants in Willow Creek (**Table 7-7**). Cu was only identified as a stressor at sample location WW-NT. No mine-related stressors were identified in the Rio Grande River.

Table 7-7: Summary of effect-based HQs > 1.0 for omnivorous birds across seasons

	background		Willow Creek					Rio Grande River		
analyte	WW-M	RG-2	WW-NT	WW-F	WW-E	W-I	W-J	RG-4	RG-8	RG-9
Cadmium			●	●	●	●	●			
Copper			●							
Lead			●	●	●	●	●			
Selenium	●	●	●	●	●	●	●	●	●	●
Zinc			●	●	●	●	●			

Shading = a chemical has an HQ> 1 in Willow Creek and/or Rio Grande River, but not at the background location(s).

Note: A chemical-specific risk may not be entirely mine-related if risk was also identified for the same chemical at the background location(s).

7.7 Assessment endpoint 6: piscivorous birds (belted kingfisher)

Stable and healthy piscivorous bird populations: *Are the total metal levels in surface water and fish high enough to impair piscivorous birds foraging in Willow Creek and the Rio Grande River?*

The BERA uses one measurement endpoint to assess the potential impacts of metals ingested by this receptor group:

7.7.1 Measurement endpoint 6.A:

Use surface water analytical data to estimate metal residues in fish; apply a conservative food chain model to calculate daily doses from ingesting surface water and fish, and compare these doses to bird TRVs.

Appendix E provides the no effect- and effect-based HQs for piscivorous birds. The subsection below summarizes the community receptor effect-based HQs for each seasonal sampling event by drainage and sampling location. Only the effect-based HQs are provided to avoid information overload.

Willow Creek

- WW-M: None of the spring or fall effect-based HQs exceeded 1.0 (**Table E-64**).
- WW-NT: The spring and fall effect-based HQs for Cd and Zn exceeded 1.0 (**Table E-68**).
- WW-F: The spring and fall effect-based HQs for Zn exceeded 1.0, but only the fall HQ for Cd exceeded 1.0 (**Table E-72**).
- WW-E: The spring and fall effect-based HQs for Zn exceeded 1.0, but only the fall HQ for Cd exceeded 1.0 (**Table E-76**).
- WW-I: The spring and fall effect-based HQs for Zn exceeded 1.0, but only the fall HQ for Cd exceeded 1.0 (**Table E-80**).
- WW-J: The spring and fall effect-based HQs for Zn exceeded 1.0, but only the fall HQ for Cd exceeded 1.0 (**Table E-84**).

Rio Grande River

Maximum exposure

- RG-2: None of the spring or fall effect-based HQs exceeded 1.0. (**Table E-90**).
- RG-4: None of the spring or fall effect-based HQs exceeded 1.0. (**Table E-98**).
- RG-8: None of the spring or fall effect-based HQs exceeded 1.0. (**Table E-106**).
- RG-9: None of the spring or fall effect-based HQs exceeded 1.0. (**Table E-114**).

Average exposure

- RG-2: None of the spring or fall effect-based HQs exceeded 1.0. (**Table E-91**).

- RG-4: None of the spring or fall effect-based HQs exceeded 1.0. (**Table E-99**).
- RG-8: None of the spring or fall effect-based HQs exceeded 1.0. (**Table E-107**).
- RG-9: None of the spring or fall effect-based HQs exceeded 1.0. (**Table E-115**).

Risk conclusion for measurement endpoint 6.A

Measurement endpoint 6.A identified Cd and Zn as stressors to piscivorous birds ingesting surface water and feeding on fish from Willow Creek (**Table 7-8**). No stressors were identified for piscivorous birds feeding in the Rio Grande River.

Table 7-8: Summary of effect-based HQs > 1.0 for piscivorous birds across seasons										
	background		**Willow Creek**					**Rio Grande River**		
analyte	**WW-M**	**RG-2**	**WW-NT**	**WW-F**	**WW-E**	**W-I**	**W-J**	**RG-4**	**RG-8**	**RG-9**
Cadmium			●	●	●	●	●			
Zinc			●	●	●	●	●			

Shading = a chemical has an HQ> 1 in Willow Creek and/or Rio Grande River, but not at the background location(s).

Note: A chemical-specific risk may not be entirely mine-related if risk was also identified for the same chemical at the background location(s).

7.8 Assessment endpoint 7: herbivorous mammals (muskrat)

Stable and healthy herbivorous mammal populations: *Are the total metal levels in surface water and aquatic plants high enough to impair herbivorous mammals foraging in Willow Creek and the Rio Grande River?*

The BERA used one measurement endpoint to assess the potential impacts of metals ingested by this receptor group:

7.8.1 Measurement endpoint 7.A:

Use surface water analytical data to estimate metal residues in aquatic plants; apply a conservative food chain model to calculate daily doses from ingesting surface water and aquatic plants, and compare these doses to mammal TRVs.

Appendix E provides the no effect- and effect-based HQs for the herbivorous mammals. The subsection below summarizes the community receptor effect-based HQs for each seasonal sampling event by drainage and sampling location. Only the effect-based HQs are provided to avoid information overload.

Willow Creek

- WW-M: The spring and fall effect-based HQs for Al, Se, and Tl exceeded 1.0 (**Table E-63**).
- WW-NT: The spring and fall effect-based HQs for Al, Cd, Pb, Se, Tl, and Zn exceeded 1.0 (**Table E-67**).
- WW-F: The spring and fall effect-based HQs for Al, Se, Tl, and Zn exceeded 1.0, but only the fall effect-based HQ for Cd and Pb exceeded 1.0(**Table E-71**).
- WW-E: The effect-based HQs for Al, Se, Tl, and Zn exceeded 1.0, but only the fall effect-based HQs for Cd and Pb exceeded 1.0 (**Table E-75**).
- WW-I: The effect-based HQs for Se, Tl, and Zn exceeded 1.0, but only the spring effect-based HQ for Al exceeded 1.0 (**Table E-79**).
- WW-J: The effect-based HQs for Se, Tl, and Zn exceeded 1.0, but only the spring effect-based HQs for Al and Pb exceeded 1.0 (**Table E-83**).

Rio Grande River

Maximum exposure

- RG-2:The spring and fall effect-based HQs for Al, Se, and Tl exceeded 1.0 (**Table E-88**).
- RG-4: The spring and fall effect-based HQs for Al, Se, and Tl exceeded 1.0 (**Table E-96**).
- RG-8: The spring and fall effect-based HQs for Al, Se, and Tl exceeded 1.0 (**Table E-104**).
- RG-9: The spring and fall effect-based HQs for Al, Se, and Tl exceeded 1.0 (**Table E-112**).

Average exposure

- RG-2: The spring and fall effect-based HQs for Al, Se, and Tl exceeded 1.0 (**Table E-89**).
- RG-4: The spring and fall effect-based HQs for Al, Se, and Tl exceeded 1.0 (**Table E-97**).
- RG-8: The spring and fall effect-based HQs for Al, Se, and Tl exceeded 1.0 (**Table E-105**).
- RG-9: The spring and fall effect-based HQs for Al, Se, and Tl exceeded 1.0 (**Table E-113**).

Risk conclusion for measurement endpoint 7.A

Measurement endpoint 7.A identified Cd, Pb and Zn as stressors to herbivorous mammals ingesting surface water and feeding on plants from Willow Creek (**Table 7-9**). No stressors were identified for herbivorous mammals feeding in the Rio Grande River.

Table 7-9: Summary of effect-based HQs > 1.0 for herbivorous mammals across seasons										
	Background		Willow Creek					Rio Grande River		
analyte	WW-M	RG-2	WW-NT	WW-F	WW-E	W-I	W-J	RG-4	RG-8	RG-9
Aluminum	●	●	●	●	●	●	●	●	●	●
Cadmium			●	●	●					
Lead			●	●	●		●			
Selenium	●	●	●	●	●	●	●	●	●	●
Thallium	●	●	●	●	●	●	●	●	●	●
Zinc			●	●	●	●	●			

Shading = a chemical has an HQ> 1 in Willow Creek and/or Rio Grande River, but not at the background location(s).

Note: A chemical-specific risk may not be entirely mine-related if risk was also identified for the same chemical at the background location(s).

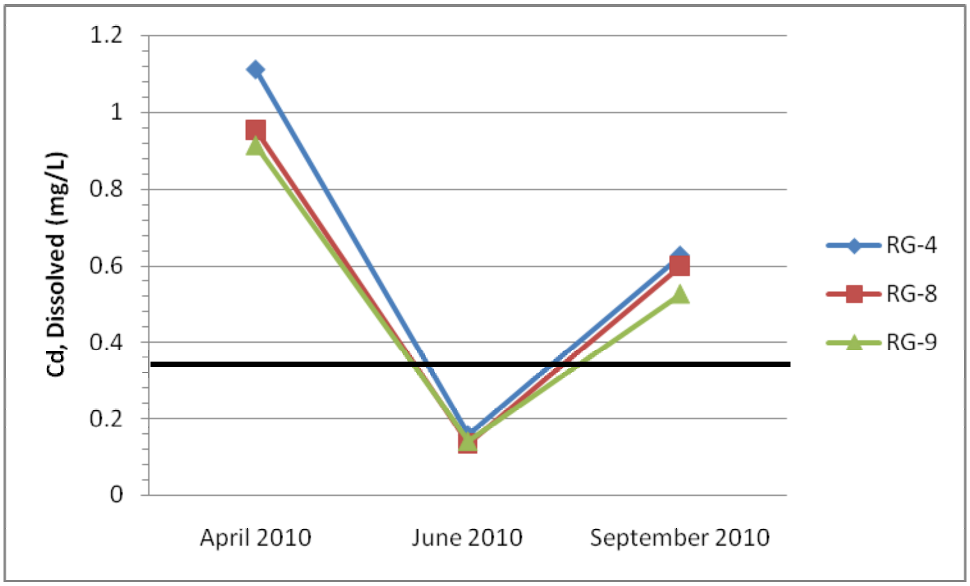
7.9 Uncertainty analysis

The major sources of uncertainty associated with the BERA are summarized below.

7.9.1 Acute toxicity test with rainbow trout

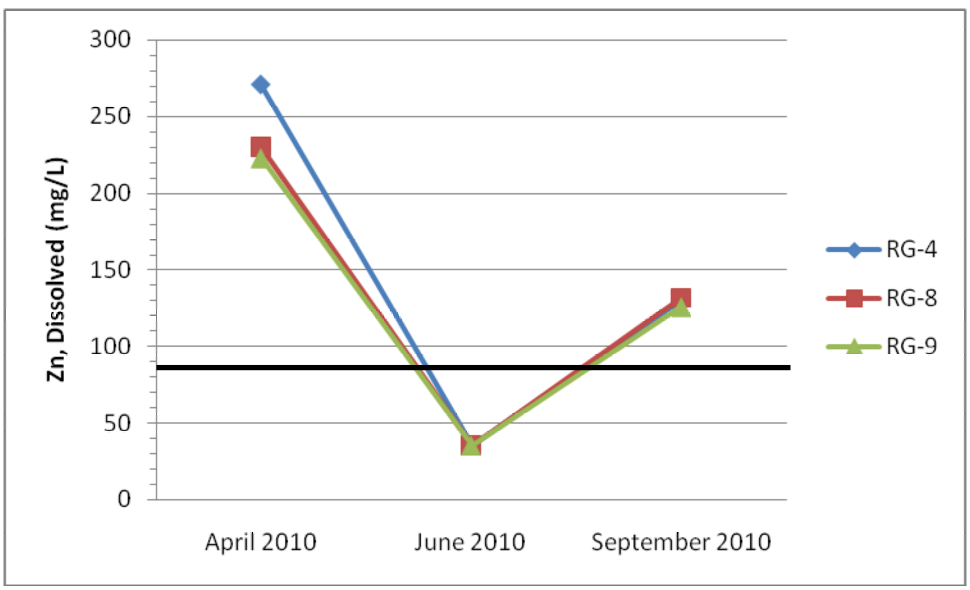
The toxicity test used field-collected surface water samples to determine Willow Creek impacts to rainbow trout populations in the Rio Grande River. The study was designed to determine the dilution ratios of affected water to un-impacted water under acute exposure conditions. Surface water for toxicity testing was collected only in September, 2010 which represented one specific temporal exposure setting. **Figures 7-5 and 7-6** show that Cd and Zn levels measured in the Rio Grande River in the fall were roughly 50% lower than those measured in the spring. It is therefore quite possible that the fall season may not represent 'worst case' exposure conditions, even when allowing for higher flows in the Rio Grande River in the spring (i.e., greater dilution of Willow Creek water). This seasonal variability suggested that acute toxicity reported in this BERA may have underestimated the true risk experienced by trout populations in the river. It represented a substantial uncertainty which should be considered in the risk management decision-making process.

Figure 7-5: Seasonal variation in dissolved Cd concentrations in the Rio Grande River versus the measured no effect acute toxicity



Solid line – Acute toxicity was observed for Cd (dissolved) at concentrations above 0.373 mg/L

Figure 7-6: Seasonal variation in dissolved Zn concentrations in the Rio Grande River versus the measured no effect acute toxicity



Solid line – Acute toxicity was observed for Zn (dissolved) at concentrations above 83.7 mg/L

Cd and Zn were the only metals evaluated to explain the responses in the rainbow trout toxicity test. The reason was that they were the only compounds which consistently exceeded their acute WQS values, and thus were assumed to be the main sources of the observed toxicity. It is possible that other metals may have also contributed (at a lower level) to the toxicity. The uncertainty associated with focusing on the Cd and Zn appears low given the strong relationship between their concentrations in the test water and the measured toxicities. Besides, the tests showed toxicity in one of the Rio Grande River samples, irrespective of which metals were selected afterwards for data interpretation.

More sensitive (sub)chronic toxicity tests would most likely have identified effects to the juvenile rainbow trout at lower dilutions of Willow Creek surface water samples. Hence, the acute test results discussed earlier in this report should be considered “best-case” because juvenile trout are exposed to ambient conditions for months throughout their early development, instead of just for 96 hours as in the laboratory test. The probability of underestimating ecological risk using acute exposures alone is therefore quite large, meaning that the risk to the trout populations in the Rio Grande River are likely substantially higher than those reported here. This important uncertainty should be considered in the risk management decision-making process.

7.9.2 Benthic macroinvertebrate community health measures

The benthic macroinvertebrate community sampling occurred at locations in the Rio Grande River above and below the confluence with Willow Creek. This design is optimal for using population biometrics since the location above the confluence represented background to which the data collected below the confluence could be compared against.

The uncertainty with this line of evidence relates to variables which may have affected the local benthic community but were not associated with contaminants. Of particular concern were potential differences in habitat quality which are known to affect community biometrics, independent of the contaminants. No habitat data were collected from the three benthic sample locations in the Rio Grande River. The BERA assumed that the unmeasured habitat characteristics were equivalent across sample locations, and that any observed responses reflected impacts from contaminants alone.

Only three locations in the Rio Grande River below the confluence with Willow Creek were sampled to assess benthic macroinvertebrate community health. Data from these three locations were used to assess conditions in over six miles of river. The lack of more sampling locations created uncertainty about the full extent of risk to benthic macroinvertebrates in the Rio Grande River. Collecting sediment chemistry and biological data from more sampling stations would have provided a fuller understanding of the impacts to the benthic community, although it appears unlikely that such data would have substantially changed the overall conclusions of the BERA.

It was unclear how much of the benthic community responses measured in the field reflected contaminants present in sediment (as assessed in Section 7.2.1, measurement endpoint 1.A; see also the sediment HQs in Table D-1) versus surface water (as assessed in Section 7.3.1, measurement endpoint 2.A; see also the surface water HQs in Table D-5 to D-16). The assessment endpoint for the benthic invertebrate community explicitly assumed that risk to this community would be caused by contaminated sediment. It was reasonable to assume, in light of the generally coarse nature of the substrate in the Rio Grande River, that benthic invertebrates may also experience substantial exposures to metals in surface water. This uncertainty would be a limitation if the need arises in the future to derive sediment PRGs for the Rio Grande River, since it cannot be known what fraction of the total risk reflected sediment exposures versus surface water exposures.

Bulk sediment data can be poor predictors of toxicity due to unaccounted differences in metal bioavailability between samples. Pore (or interstitial) water data provide a stronger measure of the chemical conditions experienced by benthic invertebrates living in the substrate (EPA, 2005c). Pore water data were not collected at any of the sampling locations in Willow Creek or the Rio Grande River for comparison to chronic surface water benchmarks or for use in toxicity testing. The lack of such data increased the uncertainty of the risk conclusions that were derived from the one (Willow Creek) or two (Rio Grande River) benthic invertebrate LOEs evaluated in the BERA.

Similarly, no data on Acid Volatile Sulfide (AVS) or Simultaneously Extracted Metals (SEM) were available for the divalent metals Cd, Cu, Pb, Ni, Ag, and Zn in the sediment samples collected from Willow Creek and the Rio Grande River. AVS-SEM measures the bioavailability, and hence the toxicity, of divalent metals in sediment based on the equilibrium partitioning approach as outlined in EPA (2005c). This information would have provided an additional LOE for use in the risk characterization.

Finally, none of the sediment samples collected from Willow Creek or the Rio Grande River were tested for toxicity using juvenile life stages of benthic invertebrates in the laboratory. Such tests can help identify a direct link between exposure (i.e., sediment chemistry) and effect (i.e., changes in survival, growth, and/or reproduction). The lack of sediment toxicity data did not invalidate the conclusions, but instead would have provided one more LOE available for use in the risk characterization.

7.9.3 Community receptor and food chain receptor exposure and effects estimates

The community and food chain receptor exposure assessment used conservative exposure estimates and assumptions. The small data sets for each sample location in Willow Creek (i.e., a single surface water sample per sampling round) produced uncertain EPC estimates and only reflected the exposure conditions at the time of sampling.

The dose modeling used generic surface water-to-biota partition coefficients (BCFs) and dose estimate approaches, instead of relying on field-collected tissue samples to estimate COPEC levels in aquatic invertebrates, fish, and plants. It was not known how well the literature-derived BCFs reflected Site-specific contaminant uptake and tissue levels, resulting in uncertainty. In addition, the plant BCF for the herbivores was based on algae because no vascular aquatic plant BCFs were available. It is not known if or how metal uptake differs between algae and vascular aquatic plants, resulting in uncertainty about actual risk to the omnivorous birds (fall only) and the herbivorous mammals.

The dose modeling used literature-derived life history parameters for the target receptors. Conservative assumptions were used when species-specific information was not available in order to derive a missing life history variable (i.e., ingestion rates).

The exposure modeling assumed that the sample location equaled a wildlife receptor's entire home range/forage range (i.e., area use factor = 1.0). This assumption was unrealistic and introduced a large degree of uncertainty in the risk characterization because, depending on the target species, each location may only represent a small fraction of a receptor's home range. The exposure modeling also excluded sediment ingestion on the grounds that the substrate in Willow Creek and the Rio Grande River consisted mostly of coarser sands, gravels, pebbles, and cobbles, instead of fine sands/silts. Sediment ingestion during feeding activities was assumed to be negligible. The impact on the risk conclusions of omitting sediment ingestion was assumed to be minimal.

The characterization of exposure assumed that enough aquatic invertebrates, fish, and aquatic plants were present at the sample locations in Willow Creek to feed the four wildlife receptor populations evaluated in the BERA. This assumption was highly speculative in light of the extreme aquatic toxicity measured in undiluted Willow Creek surface water using rainbow trout. Instead, it was more reasonable to assume that invertebrates, fish, and plants were largely absent from Willow Creek under current conditions. As such, all of the wildlife exposures and risks in Willow Creek discussed in this BERA should be considered completely hypothetical.

On the other hand, the benthic survey showed that the invertebrate community in the Rio Grande River below the confluence with Willow Creek would provide enough food for the local trout populations because the average number of organisms (± one standard deviation) were roughly equal across the three sample locations (i.e., RG-2 = 640±255; RG-4 = 865±123; RG-8 = 722±106).

The effects assessment for the wildlife receptors used published TRVs to estimate COPEC toxicity. The assessment endpoints focused on preserving 'populations' or 'communities', whereas TRVs are derived from data on individuals of a test species. Extrapolating individual sublethal effects to higher levels of ecological organization is inherently uncertain, particularly because these extrapolations are applied across non-related species (e.g., chicken to belted king fisher, or mouse to muskrat).

It is believed that the consistent use of conservative assumptions (particularly using an AUF of 1.0, assuming 100% of contaminant bioavailability in food items, assuming feeding in habitat which lacks food items, relying on TRVs derived from tests using soluble or other highly bioavailable fractions of the test chemical, and using conservative TRVs, when possible) most likely greatly overestimated risk to the wildlife receptors feeding at Willow Creek and the Rio Grande River. As a result, the actual risk to wildlife receptors may be substantially lower than reported in this BERA.

8.0 SUMMARY AND CONCLUSIONS

8.1 Introduction

A BERA was performed to quantify the potential ecological risk to aquatic communities and wildlife receptors potentially exposed to discharges from the Nelson Tunnel/Commodore Waste Rock Pile Superfund Site (the Site) located one mile upstream of the Town of Creede in Mineral County, Colorado.

The aquatic habitats affected by the Site consist of Willow Creek (which includes West Willow Creek) and the Rio Grande River. The BERA evaluated the following ecological receptor groups in one or both of these aquatic habitats:

- Benthic invertebrates
- Water column invertebrates
- Fish
- Aquatic Insectivorous birds
- Omnivorous birds
- Piscivorous birds
- Herbivorous mammals

This summary highlights the risks associated with the "maximum exposure scenario". Only one surface water sample was collected from each location in Willow Creek during the three sampling events in 2010, whereas several surface water samples were collected from each sample location on the Rio Grande River during the same sampling events. The single samples from Willow Creek were assumed to represent maximum exposures, whereas both maximum and average exposures were calculated from the multiple samples collected from each sample location on the Rio Grande River. Only the maximum exposure scenario is discussed below to make valid COPEC-specific risk comparisons across the two waterways for the same receptor group. Hence, the risk conclusions summarized in this section should be viewed as "worst-case" situations.

8.2 General conclusions of the BERA

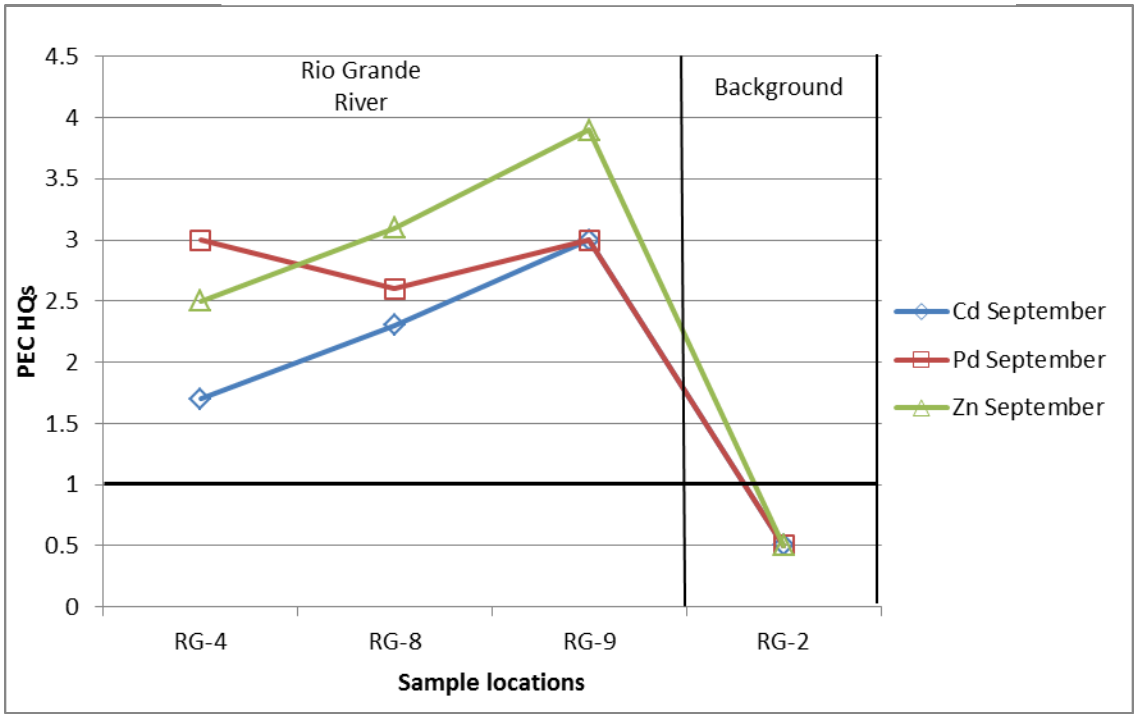
8.2.1 Benthic invertebrate community

The potential for ecological risk to the benthic invertebrate community exposed to mine-related contamination was only assessed in the Rio Grande River (specifically, sample locations RG-4, RG-8 and RG-9 located downstream of the confluence with Willow Creek) using two measurement endpoints:

1. Compare COPEC levels in bulk sediment samples to sediment benchmarks.
2. Quantify the health of the benthic invertebrate community based on a field survey.

The first measurement endpoint identified Cd, Pb, and Zn as the major risk drivers in sediments from the Rio Grande River, based on comparing the metal concentrations to PECs (i.e., effect-based sediment benchmarks). The risk associated with Cd and Zn both increased with distance from the confluence with Willow Creek, with the highest PEC HQs observed at RG-9, the most down-gradient location, while the risk for Pb remained relatively constant (**Figure 8.1**). The risk to the benthic invertebrate community in Willow Creek could not be quantified using this approach because sediment samples were not collected from this waterway.

Figure 8.1: Sediment PEC HQs for Cd, Pb, and Zn



The data from the benthic survey performed in the Rio Grande River in September 2010 did not identify severe mine-related effects to the community at RG-4 and RG-8. Any impacts appeared to be relatively mild and included a potential shift towards scrapers at both RG-4 and RG-8 (presumably due to increased silting), a decreased number of mayfly taxa (but not mayfly numbers) at RG-4, and a decrease in the % intolerant taxa at RG-8. However, the major indicators of community health (e.g., EPT taxa richness and Shannon's Index) did not suggest that benthic invertebrates in the Rio Grande River below the confluence with Willow Creek were strongly affected. The uncertainty associated with this conclusion was moderate because the benthic community data sets used in the statistical analyses were small (i.e., three replicates per sample location; three sample locations on the Rio Grande River). The health of the benthic invertebrate community in Willow Creek was unknown because a benthic survey was not performed in this waterway.

The sediment chemistry LOE showed a relatively high potential for ecological risk to the benthic community in the Rio Grande River below the confluence with Willow Creek. However, the benthic community survey LOE suggested that any mine-related risks were relatively minor. The survey should be given more weight in the risk decision-making process because it represented location-specific responses measured in benthic invertebrates exposed *in-situ* for long periods of time to mine-derived discharge. This conclusion was considered reliable because it was based on two independent LOEs, including a community survey.

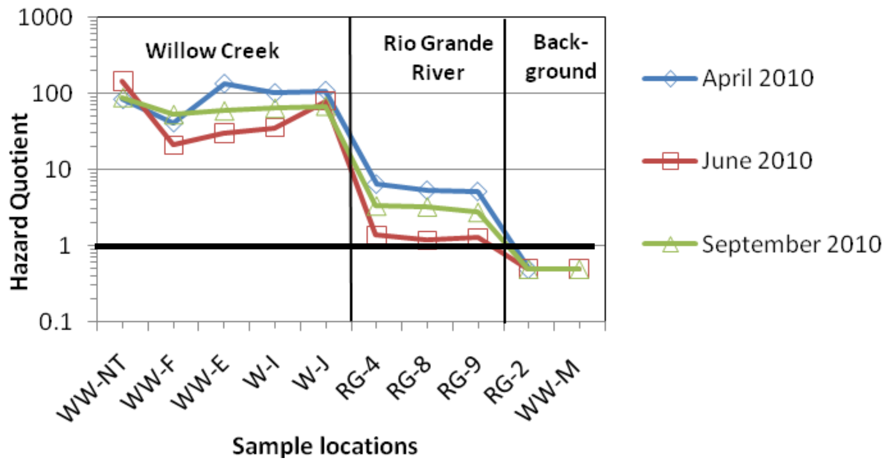
8.2.2 Water column invertebrates

The potential for ecological risk to the water column invertebrate community exposed to mine-related discharge was assessed for Willow Creek and the Rio Grande River using a single measurement endpoint, i.e., comparing dissolved metal levels in surface water samples to acute and chronic benchmarks. Only the HQs derived from the (more conservative) chronic surface water benchmarks are summarized below.

This measurement endpoint identified Cd, Pb, and Zn as the main risk drivers in Willow Creek and the Rio Grande River. Mn was only identified as a risk driver in Willow Creek. Risks from Be, Fe, Se, Sr, and V were specific to sample location WW-NT. Cu was identified as a stressor at sample locations WW-NT, WW-E, and W-J in Willow Creek, and at sample location RG-8 in the Rio Grande River. The reliability of this conclusion was low because it was based on a single, semi-qualitative LOE. The potential risk associated with the four major contaminants is discussed below.

Cadmium
The chronic-based HQs (maximum exposure scenario) for Cd exceeded 1.0 at all the sample locations in Willow Creek and the Rio Grande River, except for the background locations (**Figure 8-2**). These HQs ranged from 21.3 to 148.5 for Willow Creek and from 1.2 to 6.5 for the Rio Grande River across the seasons. This LOE indicated severe impact from Cd to the water column community in Willow Creek, with less severe but still substantial impacts possible in the Rio Grande River.

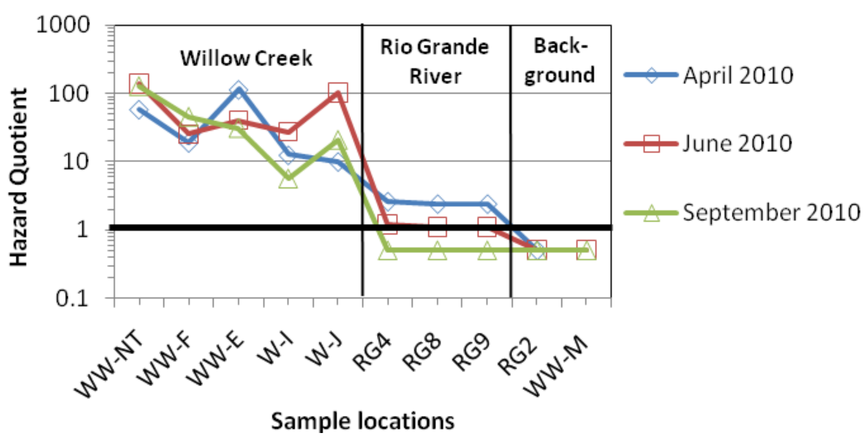
Figure 8-2: Cd chronic-based HQs for water column invertebrates (maximum exposure scenario)



Lead

The Pb chronic-based HQs (maximum exposure scenario) exceeded 1.0 at all the sample locations in Willow Creek and the Rio Grande River, except for the background locations and Rio Grande River in September 2010 (**Figure 8-3**). Theses HQs ranged from 5.6 to 139.2 for Willow Creek and from <1 to 2.6 for the Rio Grande River across seasons. This LOE indicated severe impacts of Pb to the water column community at Willow Creek. The impact in the Rio Grande River, however, was relatively small in April and June and non-existent in September.

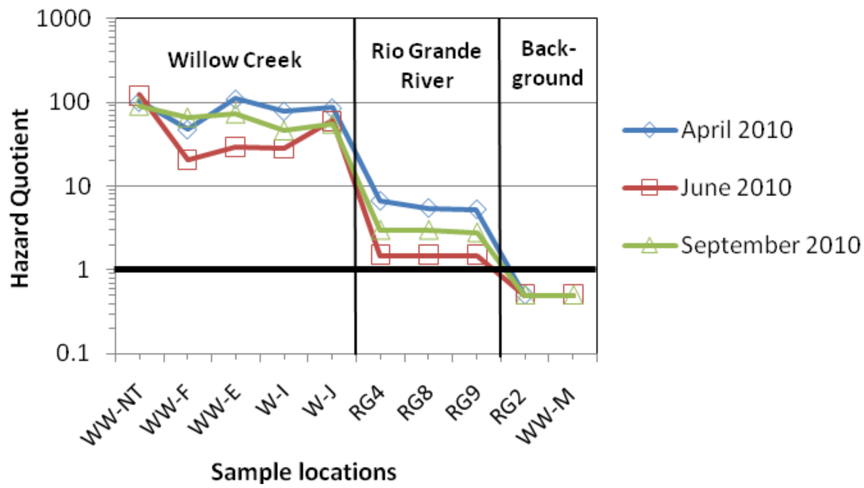
Figure 8-3: Pb chronic-based HQs for water column invertebrates (maximum exposure scenario)



Zinc

The Zn chronic-based HQs (maximum exposure scenario) exceeded 1.0 at all the sample locations in Willow Creek and the Rio Grande River, except for the background locations (**Figure 8-4**). These HQs ranged from 20.6 to 123.2 for Willow Creek and from 1.5 to 6.7 for the Rio Grande River across seasons. This LOE indicated severe impacts of Zn to the water column community at Willow Creek, with less severe but still substantial impacts possible in the Rio Grande River.

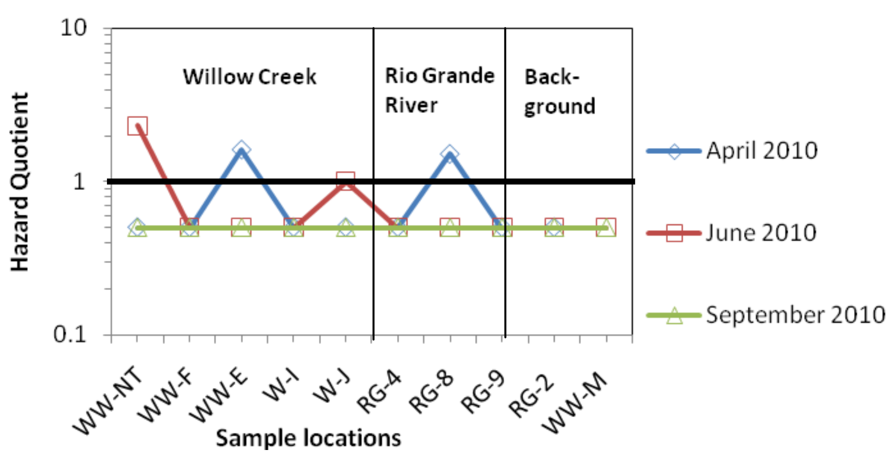
Figure 8-4: Zn chronic-based HQs for water column invertebrates (maximum exposure scenario)



Copper

The chronic-based HQs for Cu (maximum exposure scenario) slightly exceeded 1.0 at sample locations WW-NT, WW-E, W-J, and RG-8. The risk from Cu both in Willow Creek and the Rio Grande River was minimal in April and June, and non-existent in the fall (**Figure 8-5**).

Figure 8-5: Cu chronic-based HQs for water column invertebrates (maximum exposure scenario)



8.2.3 Fish

The potential for ecological risk to the fish community exposed to mine-related contamination was assessed in Willow Creek and the Rio Grande River using two measurement endpoints:

1. Compare dissolved metal levels in surface water samples to acute and chronic benchmarks.
2. Assess 96-hr acute surface water toxicity using juvenile rainbow trout.

The first measurement endpoint identified Cd, Pb, and Zn as the main risk drivers in Willow Creek and the Rio Grande River. Mn was only identified as a risk driver in Willow Creek. Risks from Be, Fe, Se, Sr, and V were specific to sample location WW-NT. Cu was identified as a stressor at sample locations WW-NT, WW-E, and W-J in Willow Creek, and at sample location RG-8 in the Rio Grande River. The potential for risk to fish associated with the major contaminants was not repeated here since they were identical to those presented in **Section 8.2** for the surface water invertebrate community (same exposure route via surface water).

The second measurement endpoint showed that Willow Creek surface water was highly toxic to juvenile rainbow trout. Acute toxicity was only removed after the Willow Creek surface water was diluted down to 3.13% with uncontaminated water. Significant acute toxicity was observed at Rio Grande River sample location RG-8 (75% survival in undiluted river water), but not at RG-4 (95% survival in undiluted river water), even though the latter was closer to the confluence with Willow Creek.

Figures 8-6 and **8-7** integrate the acute toxicity test results and the analytical chemistry data for the Willow creek serial dilution test which used RG-2 as the diluent. Figures for the SRLW serial dilution test were prepared but are not shown because the trends were nearly identical. The information can be interpreted as follows:

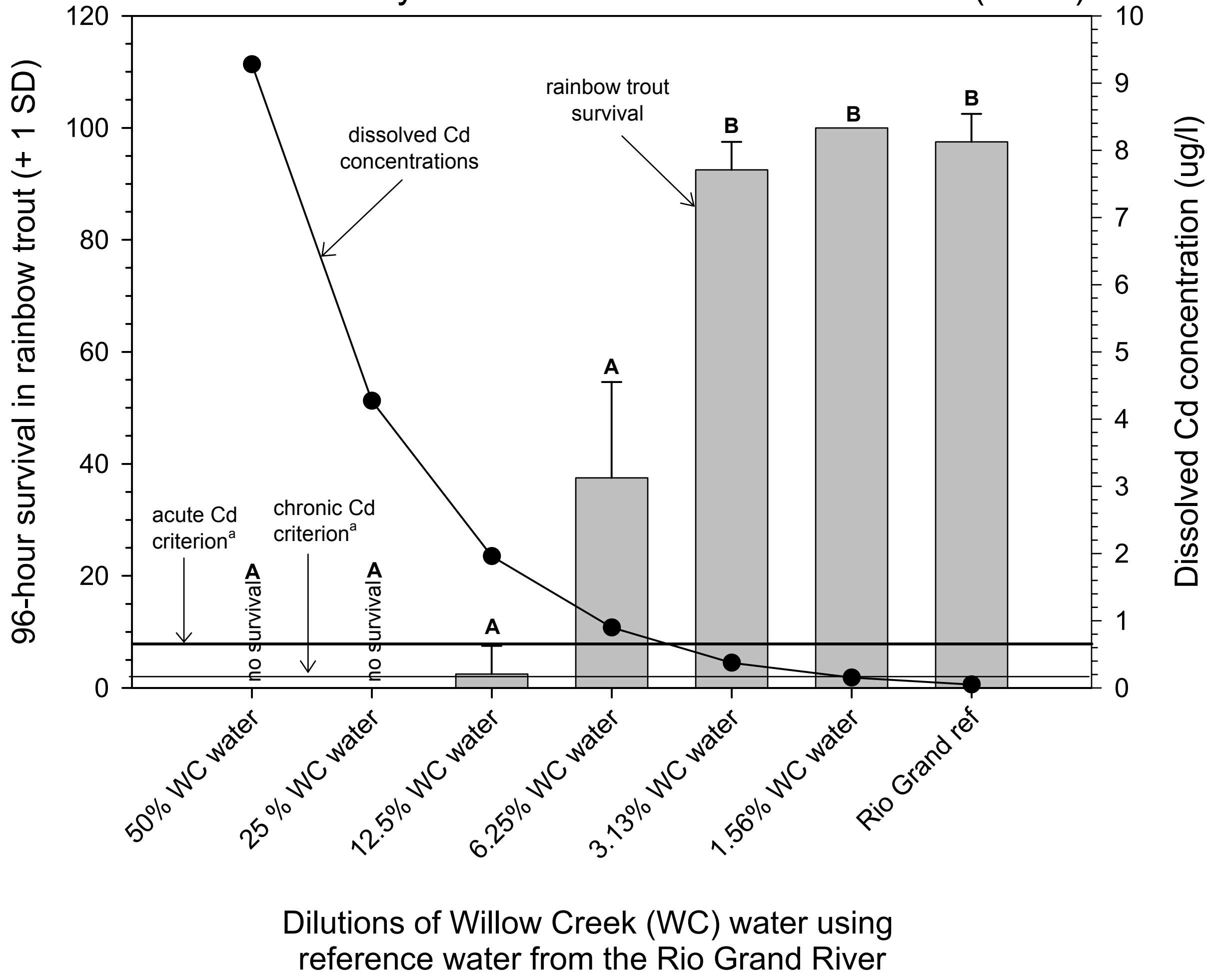
- Weakly diluted Willow Creek surface water was acutely toxic to juvenile rainbow trout.
- The flow of the Rio Grande River below the confluence consisted of about 4% Willow Creek water at the time of sampling in September 2010.
- Acute toxicity in Willow Creek surface water was removed only when the surface water was diluted down to 3.13% of its original volume using uncontaminated water. This dilution was roughly similar to the one observed in the Rio Grande River below the confluence in September.
- The average Cd and Zn levels measured in the non-toxic 3.13% serial dilution test water (diluted by RG-2 water) equaled 0.37 µg/L and 83.7 µg/L, respectively. The hardness-adjusted acute WQS for Cd and Zn equaled 0.67 µg/L and 57.3 µg/L, respectively. It was notable that Zn exceeded its WQS without causing significant acute toxicity in the 3.13% dilution.
- The test results for the two Rio Grande River surface water samples were contradictory: RG-4 was non-toxic but RG-8 was toxic, even though RG-8 was located several miles downstream from RG-4. Regardless, the fact that significant toxicity was measured in RG-8 raises concern with the surface water quality in the Rio Grande River downstream of the confluence with Willow Creek.

The challenge with interpreting the available data set was that the volume of Willow Creek flow into the Rio Grande River resulted in a natural dilution of about 4% which, by chance, fell at the threshold between the presence and absence of acute toxicity observed in the serial dilution test. The observed mortality pattern suggested that acute toxicity in rainbow trout would likely be observed in both the RG-4 and RG-8 samples had the natural dilution been around 6%. On the other hand, it also appears that acute toxicity would be absent from both samples had the natural dilution been around 2%.

Based on the available body of evidence, it would be premature to conclude that the surface water of the Rio Grande River below the confluence with Willow Creek was not toxic to fish. The fact that the hardness-adjusted chronic WQS for Cd is between three and four times lower than the Cd concentrations measured in the 3.13% Willow Creek dilution used in the acute toxicity test, and in both RG-4 and RG-8, strongly suggested that the Rio Grande River below the confluence may be unable to support a healthy, sustainable fish community due to the presence of Cd. In addition, the concentration of Cd and Zn were higher in the Rio Grande River during April than they were during September when the water samples were collected for use in the toxicity tests. This insight further strengthens the conclusion that sensitive life stages of the fish community are likely impaired due to heavy metals.

The only way to verify this point would be to perform longer-term exposures of rainbow trout either in the field or in the laboratory, and/or to perform a fish survey in the Rio Grande River above and below the confluence with Willow Creek to quantify fish community health. Without the benefit of these additional data, it seems prudent to conclude that risk to the fish community in the Rio Grande River below the confluence with Willow Creek is possible, until proven otherwise.

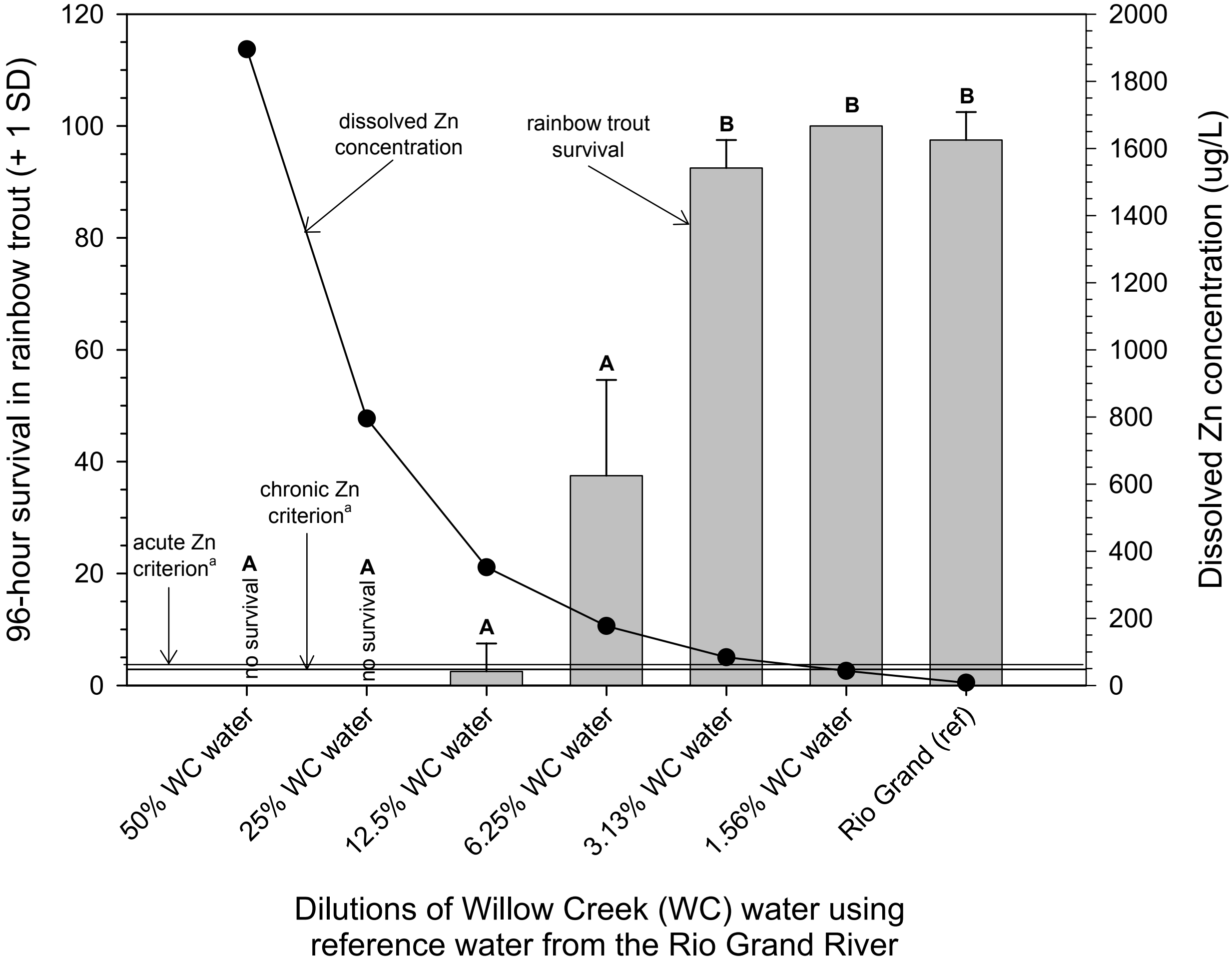
Figure 8-6: Survival of juvenile rainbow trout exposed for 96 hours to different dissolved Cd levels in Willow Creek water diluted by Rio Grand River reference water (RG-2)



[a] the acute criterion (0.67 ug/L) and chronic criterion (0.19 ug/L) are adjusted to an average test water hardness of 34.1 mg/L

note: bold letters show the results of the statistical analysis; survival in the 1.56% and 3.13% dilutions did not differ from the reference

Figure 8-7: Survival of juvenile rainbow trout exposed for 96 hours to different dissolved Zn levels in Willow Creek water diluted by Rio Grand River reference water (RG-2)



[a]the acute criterion (57.3 ug/L) and chronic criterion (49.7 ug/L) are adjusted to an average test water hardness of 34.1 mg/L

Note: bold letters show the results of the statistical analysis; survival in the 1.56% and 3.13% dilutions did not differ from the reference

8.2.4 Aquatic insectivorous birds

Risk to birds feeding on aquatic insects over Willow Creek and the Rio Grande River was assessed based on one measurement endpoint, i.e., use generic BCFs to estimate COPEC levels in emergent winged insects and apply a conservative food chain model to calculate daily doses to the American dipper for comparison to no effect- and effect-based bird TRVs.

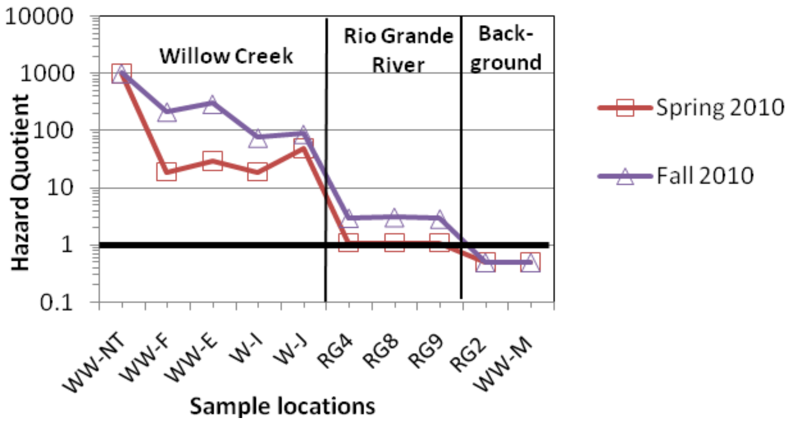
This measurement endpoint identified Zn as the major risk driver to insectivorous birds ingesting surface water and winged aquatic insects from Willow Creek and the Rio Grande River. Cd and Pb were only identified as risk drivers in Willow Creek, while Cu was only a risk driver at sample location WW-NT. The reliability of these findings was low because it was based on a single, semi-qualitative LOE.

The potential risk associated with the major contaminants is discussed below. Note that winged insects were not expected to emerge in substantial numbers from highly-contaminated Willow Creek. Hence, the risk to aquatic insectivorous birds feeding in Willow Creek under current conditions should be considered entirely hypothetical. Also, in this summary, the risk was only discussed in terms effect-based HQs for the sake of brevity, even though the BERA also described risk in terms of no effect-based HQs.

Zinc

The effect-based HQs (maximum exposure scenario) for Zn exceeded 1.0 at all sample locations in Willow Creek and the Rio Grande River, except for the background locations (**Figure 8-8**). These HQs ranged from 19 to 1,027 for Willow Creek and from 1.1 to 3.1 for the Rio Grande River across the seasons. This LOE indicated a high risk potential from Zn to birds feeding on aquatic insects in Willow Creek, with only a small risk potential for the same birds feeding in the Rio Grande River. The impacts to Willow Creek downstream from WW-NT were also relatively less severe in the spring than in the fall.

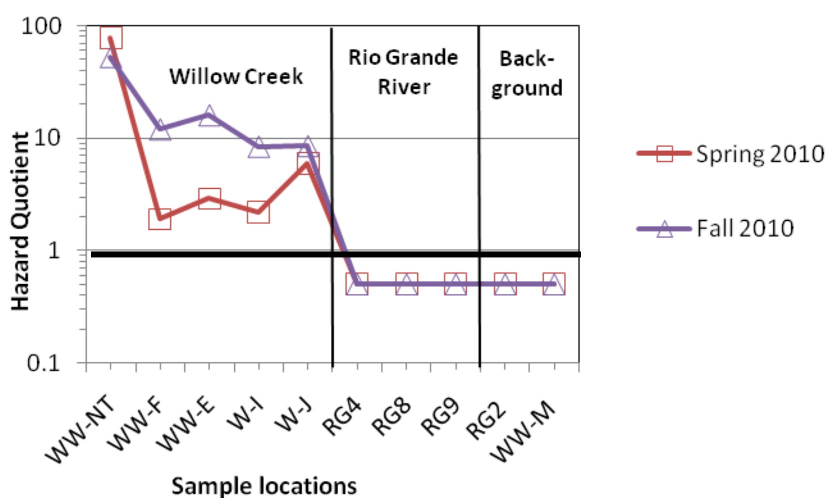
Figure 8-8: Zn effect-based HQs for aquatic insectivorous birds (maximum exposure scenario)



Cadmium

The effect-based HQs (maximum exposure scenario) for Cd exceeded 1.0 at all the sample locations in Willow Creek, but at none of the sample locations in the Rio Grande River (**Figure 8-9**). These HQs ranged from 1.9 to 79 for Willow Creek across seasons. This LOE indicated a higher potential for risk from Cd in the fall compared to the spring. Cd did not represent a risk to aquatic insectivorous birds feeding over the Rio Grande River.

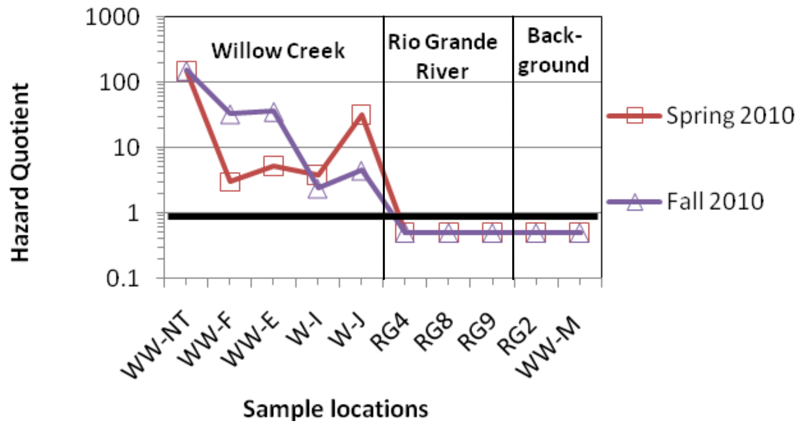
Figure 8-9: Cd effect-based HQs for aquatic insectivorous birds (maximum exposure scenario)



Lead

The effect-based HQs (maximum exposure scenario) for Pb exceeded 1.0 at each sample location in Willow Creek (**Figure 8-10**). These HQs ranged from 3.0 to 153 for Willow Creek across seasons. This LOE indicated that Pb had a high potential to affect aquatic insectivorous birds feeding in Willow Creek. Pb did not represent a risk to aquatic insectivorous birds feeding over the Rio Grande River.

Figure 8-10: Pb effect-based HQs for aquatic insectivorous birds (maximum exposure scenario)



8.2.5 Omnivorous birds

Risk to omnivorous birds feeding in Willow Creek and the Rio Grande River was assessed based on a single measurement endpoint, i.e., use generic BCFs to estimate the COPEC levels in benthic invertebrates (spring and fall) and aquatic plants (fall only) and apply a conservative food chain model to calculate daily doses to mallards for comparison to no effect- and effect-based avian TRVs.

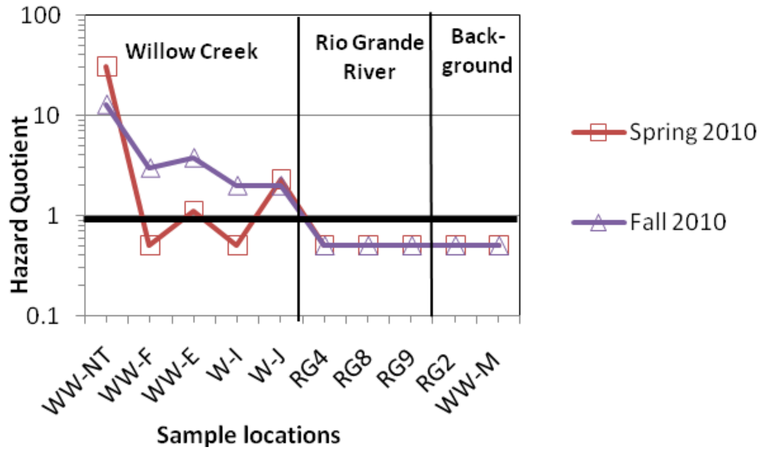
This measurement endpoint identified Cd, Pb, and Zn as the major risk drivers to omnivorous birds ingesting surface water, and feeding on benthic invertebrates and aquatic plants from Willow Creek. Cu was only identified as a risk driver at sample location WW-NT. The reliability of the risk conclusion was considered low because it was based on a single, semi-qualitative LOE.

The potential risk associated with the four major contaminants is discussed below. Note that benthic invertebrates were not expected to be present in substantial numbers in Willow Creek. Hence, the risk to aquatic omnivorous birds feeding in Willow Creek under current conditions should be considered entirely hypothetical. Also, in this summary, the risk was only discussed in terms effect-based HQs for the sake of brevity, even though the BERA also described risk in terms of no effect-based HQs.

Cadmium

The effect-based HQs (maximum exposure scenario) for Cd exceeded 1.0 at each sample location in Willow Creek, except for sample locations WW-F and WW-I in the spring (**Figure 8-11**). These HQs ranged from <1 to 31 for Willow Creek across the seasons, but fell below 1.0 in the Rio Grande River. This LOE indicated a high potential for risk from Cd to omnivorous birds feeding in Willow Creek (particularly in the fall), but not in the Rio Grande River.

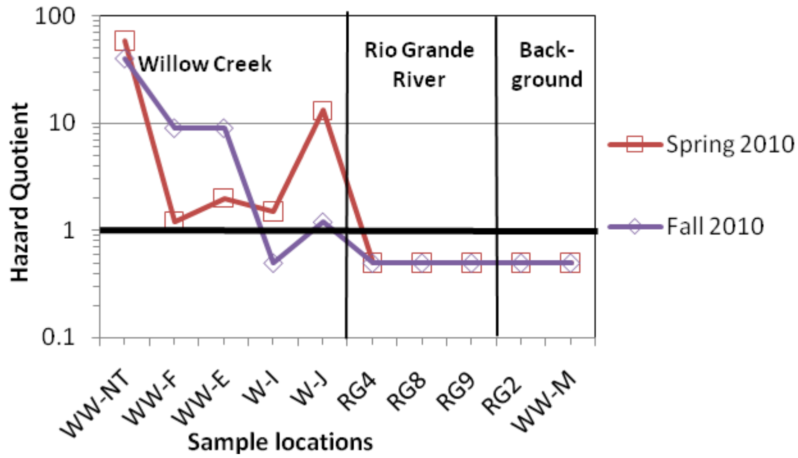
Figure 8-11: Cd effect-based HQs for omnivorous birds (maximum exposure scenario)



Lead

The effect-based HQs (maximum exposure scenario) for Pb exceeded 1.0 at each sample location in Willow Creek, except for sample location W-I in the fall (**Figure 8-12**). These HQs ranged from <1 to 58 for Willow Creek across seasons, but fell below 1.0 in the Rio Grande River. This LOE indicated a high potential for risk from Pb to omnivorous birds feeding in Willow Creek, but no risk in the Rio Grande River.

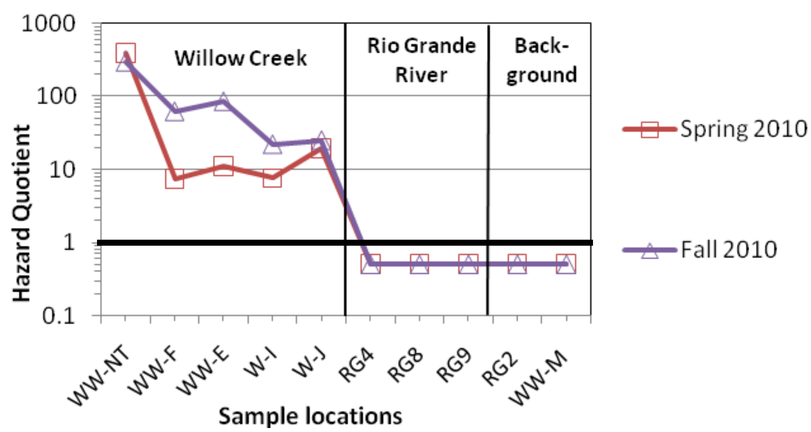
Figure 8-12: Pb effect-based HQs for omnivorous birds (maximum exposure scenario)



Zinc

The Zn effect-based HQs (maximum exposure scenario) exceeded 1.0 at each of the sample locations in Willow Creek (**Figure 8-13**). These HQs ranged from 7.3 to 386 for Willow Creek across the seasons. This LOE indicated that Zn had a high potential to severely impact omnivorous birds feeding in Willow Creek. The impacts of Zn in Willow Creek downstream from WW-NT were less severe in the spring than the fall. No risk from Zn was observed for omnivorous birds feeding in the Rio Grande River.

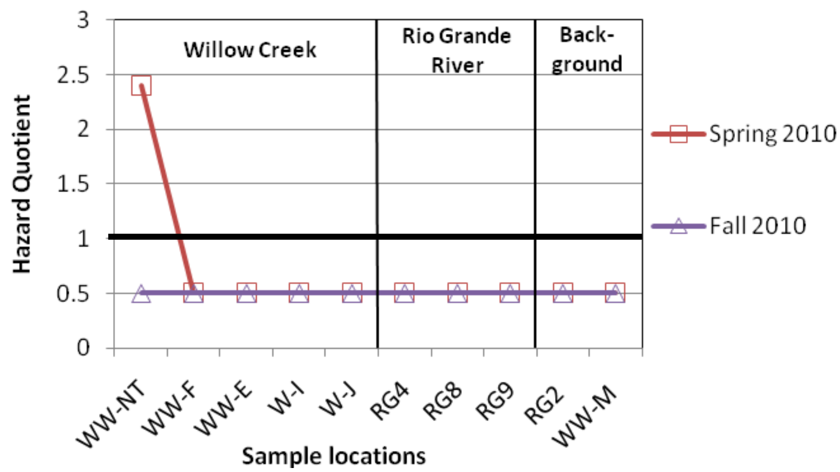
Figure 8-13: Zn effect-based HQs for omnivorous birds (maximum exposure scenario)



Copper

The effect-based HQs (maximum exposure scenario) for Cu exceeded 1.0 at sample location WW-NT only in the spring (**Figure 8-14**). This LOE showed a potential for risk from Cu to omnivorous birds feeding in Willow Creek only at location WW-NT in the spring, with no impact to the rest of Willow Creek or the Rio Grande River.

Figure 8-14: Cu effect-based HQs for omnivorous birds (maximum exposure scenario)



8.2.6 Piscivorous birds

Risk to piscivorous birds feeding in Willow Creek and the Rio Grande River was assessed using a single measurement endpoint, i.e., use generic BCFs to estimate the COPEC levels in fish and apply a conservative food chain model to calculate daily doses to belted kingfisher for comparison to no effect- and effect-based avian TRVs.

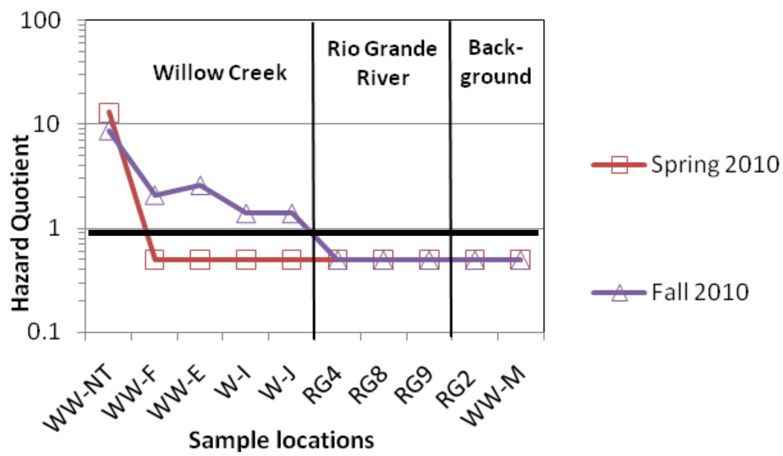
This measurement endpoint identified Cd and Zn as the major risk drivers to piscivorous birds exposed to surface water and fish in Willow Creek. No risk to this receptor group was identified in the Rio Grande River. The reliability of this conclusion was low because it was based on a single, semi-qualitative LOE.

The potential risk associated with the two major contaminants is discussed below. Note that fish were not expected to be present in substantial numbers in Willow Creek. Hence, the risk to piscivorous birds feeding in Willow Creek should be considered entirely hypothetical. Also, in this summary, the risk was only discussed in terms effect-based HQs for the sake of brevity, even though the BERA also described risk in terms of no effect-based HQs.

Cadmium

All the effect-based HQs (maximum exposure scenario) for Cd exceeded 1.0 in Willow Creek in the fall, whereas risk in the spring was identified at only one sample location (WW-NT) (**Figure 8-15**). These HQs ranged from <1 to 13 for Willow Creek across seasons. This LOE showed that Cd had a high potential to affect piscivorous birds feeding at sample location WW-NT in the spring and fall, with a lower impact for the rest of Willow Creek in the fall. No risk from Cd to this receptor group was identified in the Rio Grande River.

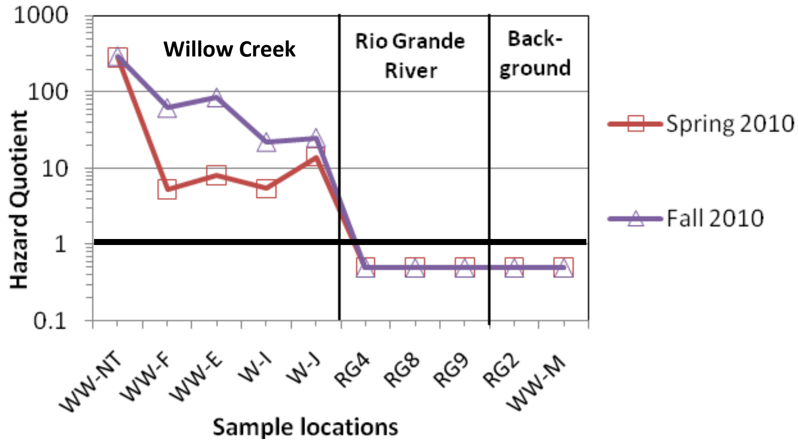
Figure 8-15: Cd effect-based HQs for piscivorous birds (maximum exposure scenario)



Zinc

The effect-based HQs (maximum exposure scenario) for Zn exceeded 1.0 at all the sample locations in Willow Creek, with HQs ranging from 5.4 to 290 across the seasons (**Figure 8-16**). The impacts to Willow Creek downstream from WW-NT were less severe in the spring than in the fall. None of the HQs for Zn exceeded 1.0 in the Rio Grande River. This LOE showed a high potential for risk to piscivorous birds exposed to Zn in Willow Creek.

Figure 8-16: Zn effect-based HQs for piscivorous birds (maximum exposure scenario)



8.2.7 Herbivorous mammals

Risk to herbivorous mammals feeding in Willow Creek and the Rio Grande River was assessed based on a single measurement endpoint, i.e., use generic BCFs to estimate the COPEC levels in aquatic plants and apply a conservative food chain model to calculate daily doses to muskrat for comparison to no effect- and effect-based mammal TRVs.

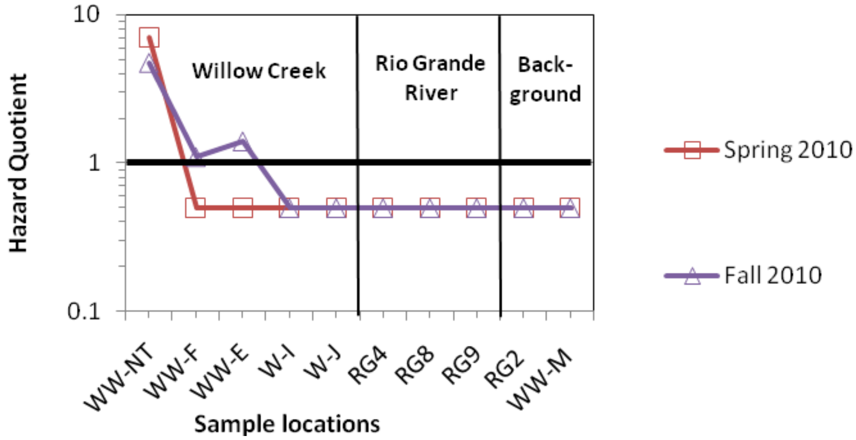
This measurement endpoint identified Cd, Zn, and Pb as the major risk drivers to herbivorous mammals exposed to surface water and aquatic plants in Willow Creek. Pb was only identified as a risk driver at sample locations WW-NT, WW-E and WW-J. No risk drivers were identified for the Rio Grande River. The reliability of this conclusion was low because it was based on a single, semi-qualitative LOE.

The potential risk associated with the major contaminants is discussed below. In this summary, the risk was only discussed in terms effect-based HQs for the sake of brevity, even though the BERA also described risk in terms of no effect-based HQs.

Cadmium

The effect-based HQs (maximum exposure scenario) for Cd exceeded 1.0 for sample location WW-NT in the fall and spring, but only for WW-F and WW-E in the fall (**Figure 8-17**). These HQs ranged from <1 to 7.0 for Willow Creek across seasons. No HQs for Cd exceeded 1.0 in the Rio Grande River. This LOE showed some risk from Cd to herbivorous mammals feeding at sample location WW-NT in the spring and fall, with much lower risk at sample locations WW-F and WW-E in the fall only. No risk from Cd to this receptor group was identified in the Rio Grande River.

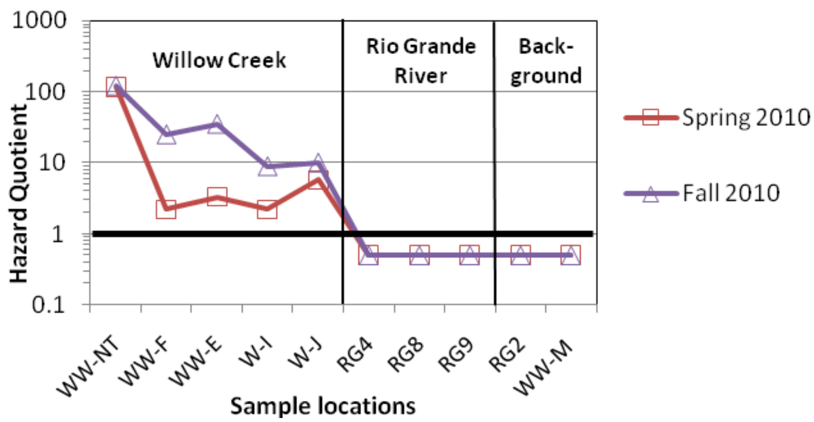
Figure 8-17: Cd effect-based HQs for herbivorous mammals (maximum exposure scenario)



Zinc

The effect-based HQs (maximum exposure scenario) for Zn exceeded 1.0 at all sample locations in Willow Creek ranging from 2.2 to 120across the seasons (**Figure 8-18**). No HQs for Zn exceeded 1.0 in the Rio Grande River. This LOE indicated a high potential for risk from Zn to herbivorous mammals feeding in Willow Creek. The risk downstream from WW-NT was less severe in the spring than in the fall.

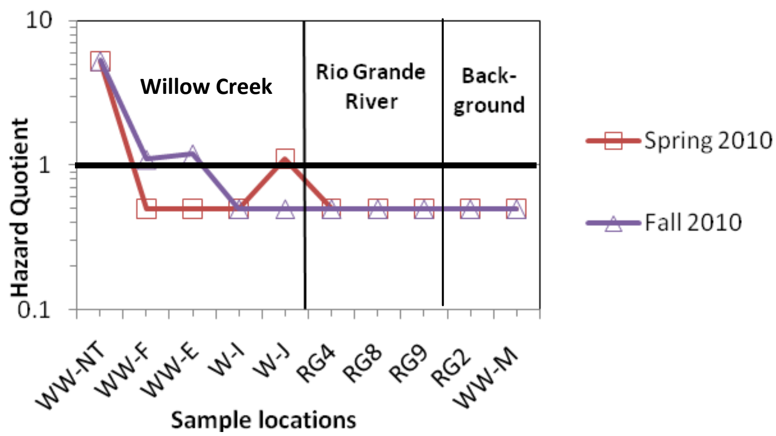
Figure 8-18: Zn effect-based HQs for herbivorous mammals (maximum exposure scenario)



Lead

The effect-based HQs (maximum exposure scenario) for Pb exceeded 1.0 at sample locations WW-NT, WW-F and WW-E in the fall, and WW-NT and W-J in the spring in Willow Creek (**Figure 8-19**). These HQs ranged from <1 to 5.3 for Willow Creek across the seasons, indicating a low potential for risk from Pb to herbivorous mammals feeding at several locations on Willow Creek in spring and fall. No risk from Pb was observed for this receptor group in the Rio Grande River.

Figure 8-19: Pb effect-based HQs for herbivorous mammals (maximum exposure scenario)



8.3 Recommended PRG and scientific management decision point

According to the eight-step ecological risk assessment process, completing the BERA represented a point in the process where a Scientific Management Decision Point (SMDP) was achieved. The various LOEs showed that Nelson Tunnel discharge contributed ecological risk to Willow Creek and the Rio Grande River. Cd, Pb, and Zn were the major risk drivers, with several other metals contributing lower levels of risk to the targeted receptor groups.

The rainbow trout toxicity test showed that diluting Willow Creek surface water down to 3.13% in the laboratory achieved the BERA endpoint of "trout survival" under acute exposure conditions. However, this ratio was unlikely to provide a defensible long-term "dilution" PRG for the Rio Grande River for the following reasons:

- Significant acute toxicity in rainbow trout was measured at one location in the Rio Grande River (RG-8) with a flow estimated to consist of about 4% Willow Creek water at the time of the test in September 2010.

- Comparing the Cd levels measured in the 3.13% Willow Creek dilution sample to a hardness-adjusted chronic surface water benchmark for Cd showed that chronic toxicity to trout was most likely present at that dilution, but could not have been detected by the test due to the short-term (96-hour) exposure duration.

Also, the water quality in April was worse than in September when the surface water samples were collected for toxicity testing and chemical analyses. Hence, the toxicity test conducted in

September can only be considered a rough approximation of the April flow conditions, with much uncertainty.

The benthic macroinvertebrate community measures showed the potential for risk based on the sediment chemistry LOE, but only a small potential for risk based on the benthic community survey LOE. It would be a challenge to develop realistic sediment PRGs for benthic invertebrates based on the available information because other factors may have affected the benthic community structure and function, such as differences in habitat quality across sample locations or the response by the invertebrates to exposure to metal-enriched surface water or silting.

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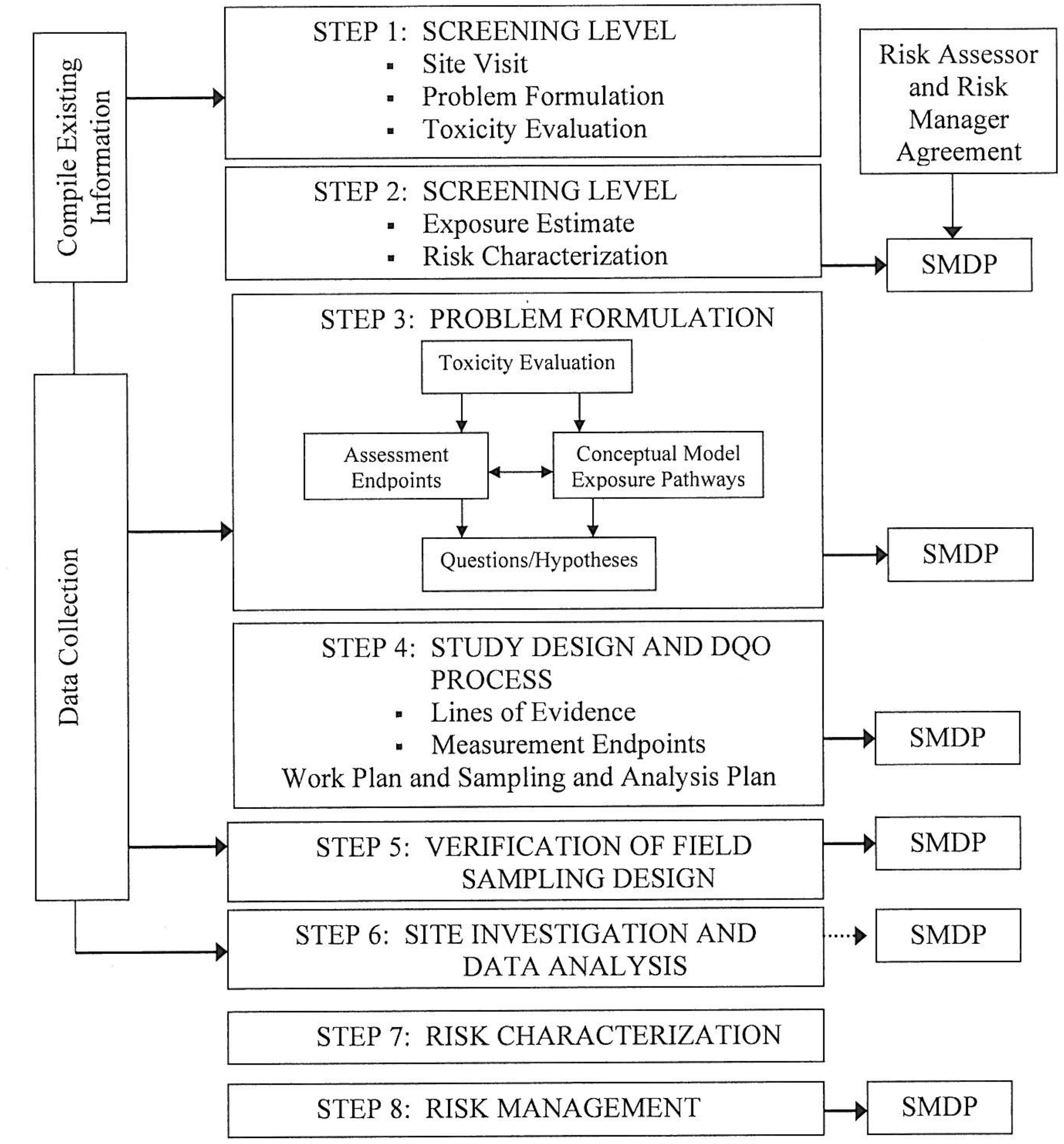
Figure 1-1. Eight Step Process for Ecological Risk Assessment at Superfund Sites

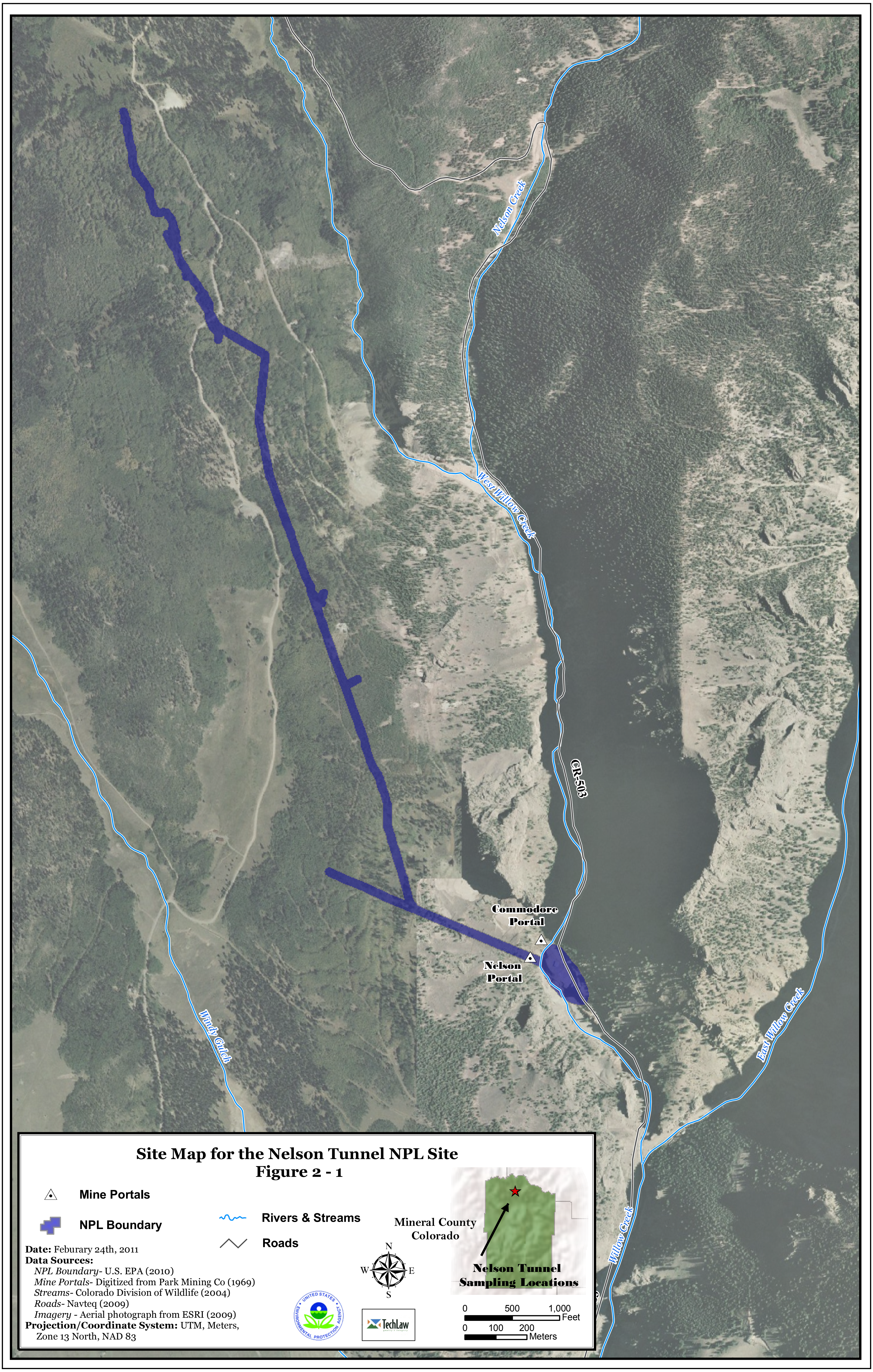
Screening Level Ecological Risk Assessment for the Barker Hughesville Site



Steps 1 & 2 – Tier 1 (Screening-Level Assessment)
Steps 3 to 7 – Tier 2 (Baseline Assessment)

SMDP = Scientific/Management Decision Point

Source: USEPA 1997



Nelson Creek
West Willow Creek
CR-503
Commodore Portal
Nelson Portal
Windy Gulch
East Willow Creek
Willow Creek
Site Map for the Nelson Tunnel NPL Site
Figure 2 - 1
Mine Portals
NPL Boundary
Rivers & Streams
Roads
Mineral County Colorado
Nelson Tunnel Sampling Locations
Date: Feburary 24th, 2011
Data Sources:
NPL Boundary- U.S. EPA (2010)
Mine Portals- Digitized from Park Mining Co (1969)
Streams- Colorado Division of Wildlife (2004)
Roads- Navteq (2009)
Imagery - Aerial photograph from ESRI (2009)
Projection/Coordinate System: UTM, Meters, Zone 13 North, NAD 83
N
W
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100
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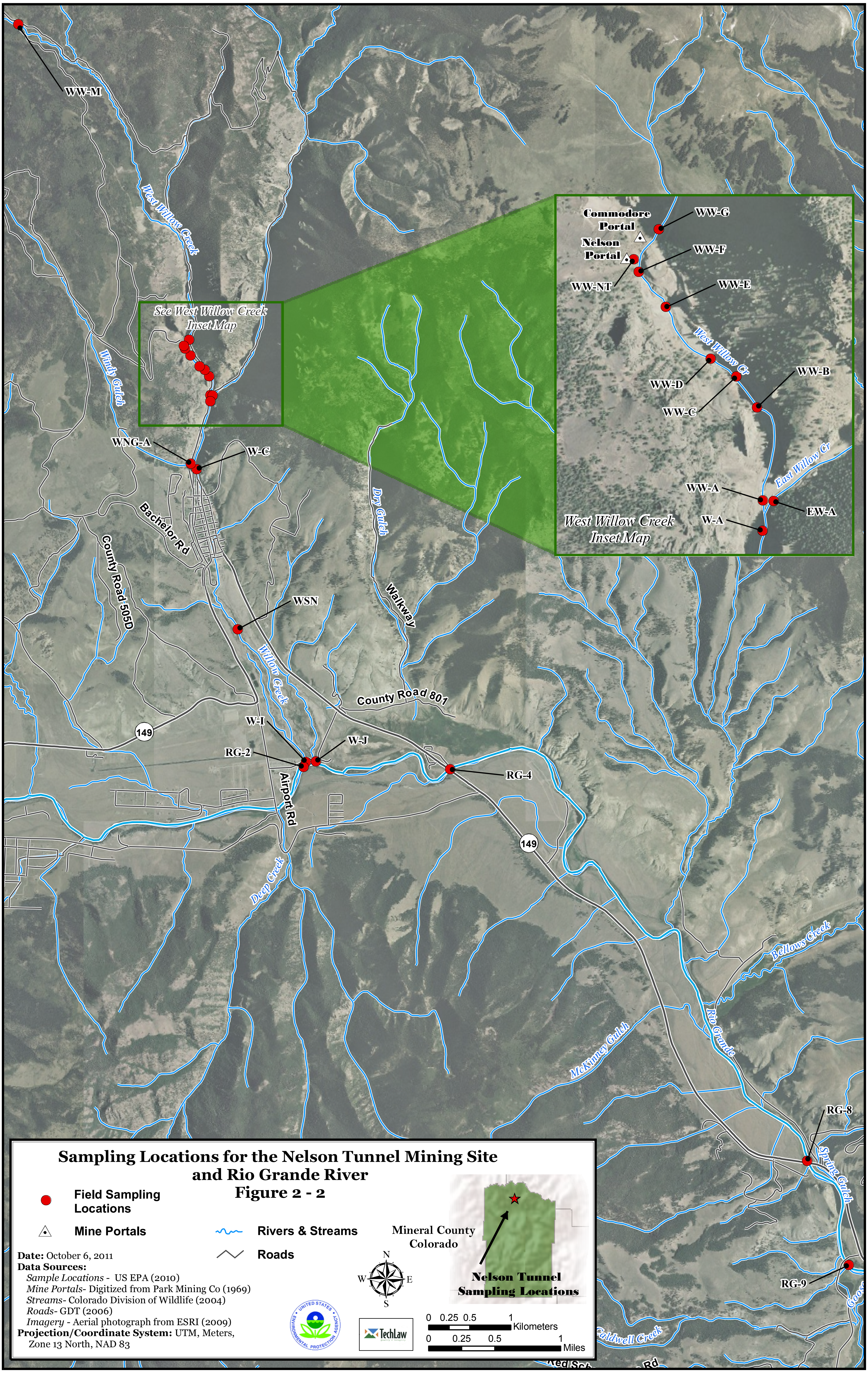
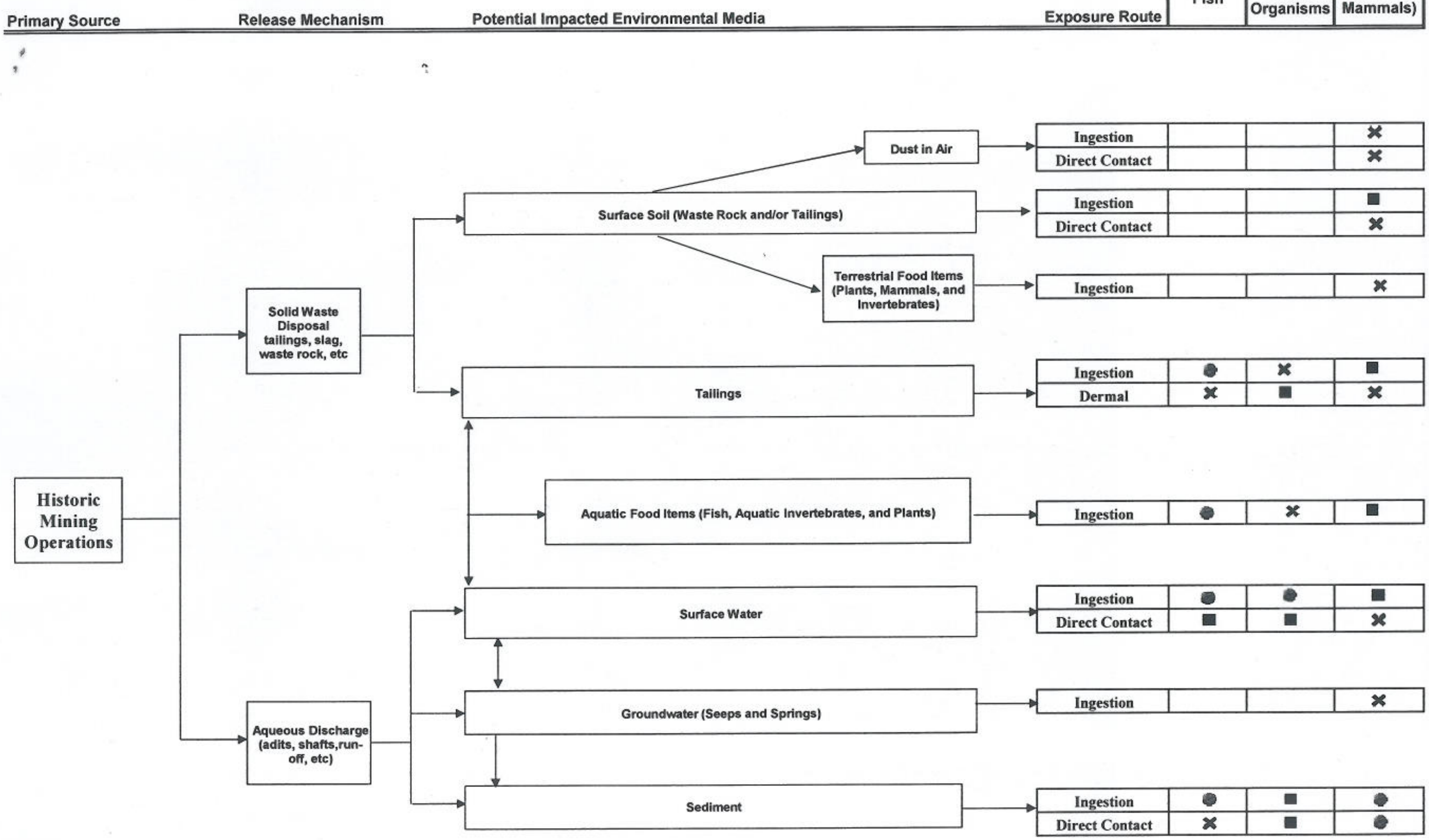
Meters



Sampling Locations for the Nelson Tunnel Mining Site and Rio Grande River
Figure 2 - 2

Figure 4-1: Conceptual Site Model for Ecological Exposure



Potential Impacted Environmental Media	Exposure Route	Aquatic Receptors: Fish	Aquatic Receptors: Benthic Organisms	Wildlife Receptors (Birds & Mammals)
Dust in Air	Ingestion			✖
	Direct Contact			✖
Surface Soil (Waste Rock and/or Tailings)	Ingestion			■
	Direct Contact			✖
Terrestrial Food Items (Plants, Mammals, and Invertebrates)	Ingestion			✖
Tailings	Ingestion	●	✖	■
	Dermal	✖	■	✖
Aquatic Food Items (Fish, Aquatic Invertebrates, and Plants)	Ingestion	●	✖	■
Surface Water	Ingestion	●	●	■
	Direct Contact	■	■	✖
Groundwater (Seeps and Springs)	Ingestion			✖
Sediment	Ingestion	●	■	●
	Direct Contact	✖	■	●

Legend

	Pathway is incomplete; no evaluation completed
✖	Pathway is complete but is judged to be minor compared to other exposure pathways or falls outside of the scope of this assessment; no evaluation completed
●	Pathway is complete and might be significant but not enough data available; no evaluation completed (surface water toxicity data available)
■	Pathway is complete and might be significant; enough data are available for quantitative evaluation in the BERA

APPENDIX A

SURFACE WATER AND SEDIMENT DATA SETS

Table A-1. Summary of Dissolved Metals Results for Willow Creek Sample Locations, April 2010.												
Analytes	**Units**	**WW-M**		**WW-NT**		**WW-F**		**WW-E**		**W-I Average[(a)]**	**W-J**	
		Conc.	**EPC**	**Conc.**	**EPC**	**Conc.**	**EPC**	**Conc.**	**EPC**	**EPC**	**Conc.**	**EPC**
Aluminum	ug/L	NA	NA	346JD	346.00	56.10	56.10	36.0J	36.00	72.95	58.50	58.50
Antimony	ug/L	NA	NA	<5.00U	5.00	<5.00U	5.00	0.759J	0.76	0.52	0.574J	0.57
Arsenic	ug/L	NA	NA	<5.00U	5.00	1.55J	1.55	1.02J	1.02	0.95	0.542J	0.54
Beryllium	ug/L	NA	NA	3.72D	3.72	0.22	0.22	0.14J	0.14	0.10	<0.10U	0.10
Cadmium	ug/L	NA	NA	132D	132.00	13.40	13.40	55.00	55.00	30.60	32.40	32.40
Calcium	ug/L	NA	NA	207000D	20,700.00	24,300.00	24,300.00	33,600.00	33,600.00	22,050.00	21,500.00	21,500.00
Chromium	ug/L	NA	NA	<5.00U	5.00	<5.00U	5.00	<5.00U	5.00	0.50	<0.50U	0.50
Copper	ug/L	NA	NA	13.7D	13.70	4.04	4.04	13.80	13.80	5.06	5.66	5.66
Iron	ug/L	NA	NA	<1000U	1,000.00	<100U	100.00	<100U	100.00	100.00	<100U	100.00
Lead	ug/L	NA	NA	927D	927.00	32.40	32.40	276.00	276.00	19.35	15.20	15.20
Magnesium	ug/L	NA	NA	14400D	14,400.00	2,160.00	2,160.00	2,940.00	2,940.00	2,150.00	2,160.00	2,160.00
Manganese	ug/L	NA	NA	17100D	17,100.00	1,120.00	1,120.00	857.00	857.00	363.00	538.00	538.00
Mercury	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	ug/L	NA	NA	9.03JD	9.03	0.502J	0.50	1.28	1.28	0.54	0.723J	0.72
Potassium	ug/L	NA	NA	5240JD	5,240.00	1,420.00	1,420.00	1,640.00	1,640.00	1,540.00	1,490.00	1,490.00
Selenium	ug/L	NA	NA	<0.50U	0.50	<0.50	0.50	0.760J	0.76	0.61	0.888J	0.89
Silica (SiO2)	ug/L	NA	NA	38600D	38,600.00	16,400.00	16,400.00	17,200.00	17,200.00	18,250.00	18,400.00	18,400.00
Silver	ug/L	NA	NA	<1.00U	1.00	<0.100U	0.10	<0.10	0.10	0.10	<0.10U	0.10
Sodium	ug/L	NA	NA	59000D	59,000.00	6,590.00	6,590.00	8,660.00	8,660.00	6,140.00	5,810.00	5,810.00
Strontium	ug/L	NA	NA	2130D	2,130.00	254.00	254.00	316.00	316.00	179.50	174.00	174.00
Thallium	ug/L	NA	NA	3.33D	3.33	0.34	0.34	0.48	0.48	0.17	0.21	0.21
Vanadium	ug/L	NA	NA	<100U	100.00	<10.0U	10.00	<10.0U	10.00	10.00	<10.0U	10.00
Zinc	ug/L	NA	NA	60800D	60,800.00	4,190.00	4,190.00	12,900.00	12,900.00	6,400.00	6,880.00	6,880.00
Hardness	mg/L	NA	NA	576D	NA	70.00	NA	96.00	NA	64.00	63.00	NA

Footnotes:

(a) The average for W-I was calculated using the maximum non-detect values if both values were ND, or 1/2 the MDL if only one of the two results was non-detect.

Conc. Detected Concentration of the Analyte or the Method Detection Limit if the result was non-detect.

NA Not Available or Not Analyzed

EPC Sample specific Exposure Point Concentration

ND Non-Detected result

Qual. Analytical Qualifier (refer to definitions below)

- U Result occurs below MDL
- J Result occurs between the MDL and the Reporting Limit, therefore this value is estimated.

Table A-2. Summary of Dissolved Metals Results for RG-2, April 2010.

Analytes	Units	RG -2-1			RG -2-2			RG -2-3			RG -2-4			No. of Detects	No. of NDs	No. of Samples	Max. Detect	Max. ND	MAXIMUM	AVERAGE
		Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.							
Aluminum	ug/L	59.30			79.30			73.30			76.80			4	0	4	79.30	0.00	79.30	72.18
Antimony	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Arsenic	ug/L	0.52		J	0.55		J	0.55		J	0.62		J	4	0	4	0.62	0.00	0.62	0.56
Beryllium	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Cadmium	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Calcium	ug/L	8,810.00			8,790.00			8,760.00			8,820.00			4	0	4	8,820.00	0.00	8,820.00	8,795.00
Chromium	ug/L	0.55		J	0.57		J	0.54		J	0.62		J	4	0	4	0.62	0.00	0.62	0.57
Copper	ug/L	<0.50	0.25	U	<0.50	0.25	U	<0.50	0.25	U	<0.50	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Iron	ug/L	184.00		J	212.00		J	208.00		J	209.00		J	4	0	4	212.00	0.00	212.00	203.25
Lead	ug/L	<0.10	0.05	U	<0.10	0.05	U	<0.10	0.05	U	<0.10	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Magnesium	ug/L	1,600.00			1,590.00			1,600.00			1,600.00			4	0	4	1,600.00	0.00	1,600.00	1,597.50
Manganese	ug/L	21.70			21.80			21.60			21.80			4	0	4	21.80	0.00	21.80	21.73
Mercury	ug/L	NA			NA			NA			NA			NA	NA	NA	NA	NA	NA	NA
Nickel	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Potassium	ug/L	2,390.00			2,380.00			2,400.00			2,420.00			4	0	4	2,420.00	0.00	2,420.00	2,397.50
Selenium	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Silica (SiO2)	ug/L	19,400.00			19,500.00			19,500.00			19,500.00			4	0	4	19,500.00	0.00	19,500.00	19,475.00
Silver	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Sodium	ug/L	3,200.00			3,160.00			3,190.00			3,200.00			4	0	4	3,200.00	0.00	3,200.00	3,187.50
Strontium	ug/L	69.40			69.40			69.50			69.50			4	0	4	69.50	0.00	69.50	69.45
Thallium	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Vanadium	ug/L	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	0	4	4	0.00	5.00	10.00	5.00
Zinc	ug/L	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	0	4	4	0.00	5.00	10.00	5.00
Hardness	mg/L	29.00			28.00			28.00			29.00			4	0	4	29.00	NA	29.00	28.50

Footnotes:

Conc. Concentration of the Analyte

NA Not Available or Not Analyzed

MDL One-half of the reported Method Detection Limit (MDL) was substituted for the Non-Detected values in order to derive the average.

Max. Maximum

No. Number

ND Non-Detected result

Qual. Analytical Qualifier (refer to definitions below)

- U Result occurs below MDL
- J Result occurs between the MDL and the Reporting Limit, therefore this value is estimated.

Table A-3. Summary of Dissolved Metals Results for RG-4, April 2010.

Analytes	Units	RG -4-1			RG -4-2			RG -4-3			RG -4-4			No. of Detects	No. of NDs	No. of Samples	Max. Detect	Max. ND	MAXIMUM	AVERAGE
		Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.							
Aluminum	ug/L	67.90			68.20			66.70			64.70			4	0	4	68.20	0.00	68.20	66.88
Antimony	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Arsenic	ug/L	0.62		J	0.61		J	0.58		J	0.60		J	4	0	4	0.62	0.00	0.62	0.60
Beryllium	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Cadmium	ug/L	1.09			1.11			1.06			1.06			4	0	4	1.11	0.00	1.11	1.08
Calcium	ug/L	9,460.00			9,350.00			9,440.00			9,510.00			4	0	4	9,510.00	0.00	9,510.00	9,440.00
Chromium	ug/L	0.55		J	<0.500	0.25	U	<0.500	0.25	U	0.69		J	2	2	4	0.69	0.25	0.69	0.43
Copper	ug/L	0.56		J	0.62		J	0.59		J	1.15			4	0	4	1.15	0.00	1.15	0.73
Iron	ug/L	168.00		J	186.00		J	187.00		J	180.00		J	4	0	4	187.00	0.00	187.00	180.25
Lead	ug/L	1.65			1.71			1.71			1.75			4	0	4	1.75	0.00	1.75	1.71
Magnesium	ug/L	1,620.00			1,600.00			1,610.00			1,620.00			4	0	4	1,620.00	0.00	1,620.00	1,612.50
Manganese	ug/L	37.10			37.20			37.40			38.00			4	0	4	38.00	0.00	38.00	37.43
Mercury	ug/L	NA			NA			NA			NA			NA	NA	NA	NA	NA	NA	NA
Nickel	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Potassium	ug/L	2,350.00			2,300.00			2,310.00			2,690.00			4	0	4	2,690.00	0.00	2,690.00	2,412.50
Selenium	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Silica (SiO2)	ug/L	19,100.00			19,000.00			19,100.00			19,300.00			4	0	4	19,300.00	0.00	19,300.00	19,125.00
Silver	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Sodium	ug/L	3,340.00			3,290.00			3,320.00			3,770.00			4	0	4	3,770.00	0.00	3,770.00	3,430.00
Strontium	ug/L	74.10			74.20			74.00			75.40			4	0	4	75.40	0.00	75.40	74.43
Thallium	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Vanadium	ug/L	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	0	4	4	0.00	5.00	10.00	5.00
Zinc	ug/L	256.00			253.00			252.00			271.00			4	0	4	271.00	0.00	271.00	258.00
Hardness	mg/L	30.00			30.00			30.00			30.00			4	0	4	30.00	NA	30.00	30.00

Footnotes:

Conc. Concentration of the Analyte
NA Not Available or Not Analyzed
MDL One-half of the reported Method Detection Limit (MDL) was substituted for the Non-Detected values in order to derive the average.
Max. Maximum
No. Number
ND Non-Detected result
Qual. Analytical Qualifier (refer to definitions below)
U Result occurs below MDL
J Result occurs between the MDL and the Reporting Limit, therefore this value is estimated.

Table A-4. Summary of Dissolved Metals Results for RG-8, April 2010.

Analytes	Units	RG -8-1			RG -8-2			RG -8-3			RG -8-4			No. of Detects	No. of NDs	No. of Samples	Max. Detect	Max. ND	MAXIMUM	AVERAGE
		Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.							
Aluminum	ug/L	71.70			71.00			79.80			68.60			4	0	4	79.80	0.00	79.80	72.78
Antimony	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Arsenic	ug/L	0.66		J	0.63		J	0.70		J	0.67		J	4	0	4	0.70	0.00	0.70	0.66
Beryllium	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Cadmium	ug/L	0.85			0.95			0.93			0.94			4	0	4	0.95	0.00	0.95	0.92
Calcium	ug/L	9,720.00			9,630.00			9,570.00			9,550.00			4	0	4	9,720.00	0.00	9,720.00	9,617.50
Chromium	ug/L	<0.500	0.25	U	<0.500	0.25		<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Copper	ug/L	0.56		J	0.62		J	0.86		J	5.04			4	0	4	5.04	0.00	5.04	1.77
Iron	ug/L	174.00		J	183.00		J	180.00		J	174.00		J	4	0	4	183.00	0.00	183.00	177.75
Lead	ug/L	1.60			1.65			1.64			1.53			4	0	4	1.65	0.00	1.65	1.61
Magnesium	ug/L	1,600.00			1,600.00			1,580.00			1,580.00			4	0	4	1,600.00	0.00	1,600.00	1,590.00
Manganese	ug/L	30.40			30.60			30.60			30.80			4	0	4	30.80	0.00	30.80	30.60
Mercury	ug/L	NA			NA			NA			NA			NA	NA	NA	NA	NA	NA	NA
Nickel	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Potassium	ug/L	2,350.00			2,400.00			2,410.00			2,340.00			4	0	4	2,410.00	0.00	2,410.00	2,375.00
Selenium	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Silica (SiO2)	ug/L	19,500.00			19,500.00			19,400.00			19,700.00			4	0	4	19,700.00	0.00	19,700.00	19,525.00
Silver	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Sodium	ug/L	3,450.00			3,480.00			3,560.00			3,400.00			4	0	4	3,560.00	0.00	3,560.00	3,472.50
Strontium	ug/L	75.10			74.90			74.20			74.10			4	0	4	75.10	0.00	75.10	74.58
Thallium	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Vanadium	ug/L	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	0	4	4	0.00	5.00	10.00	5.00
Zinc	ug/L	225.00			230.00			226.00			224.00			4	0	4	230.00	0.00	230.00	226.25
Hardness	mg/L	31.00			31.00			30.00			30.00			4	0	4	31.00	NA	31.00	30.50

Footnotes:

Conc. Concentration of the Analyte

NA Not Available or Not Analyzed

MDL One-half of the reported Method Detection Limit (MDL) was substituted for the Non-Detected values in order to derive the average.

Max. Maximum

No. Number

ND Non-Detected result

Qual. Analytical Qualifier (refer to definitions below)

- U Result occurs below MDL
- J Result occurs between the MDL and the Reporting Limit, therefore this value is estimated.

Table A-5. Summary of Dissolved Metals Results for RG-9, April 2010.

Analytes	Units	RG -9-1			RG -9-2			RG -9-3			RG -9-4			No. of Detects	No. of NDs	No. of Samples	Max. Detect	Max. ND	MAXIMUM	AVERAGE
		Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.							
Aluminum	ug/L	74.30			76.20			81.40			68.00			4	0	4	81.40	0.00	81.40	74.98
Antimony	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Arsenic	ug/L	0.77		J	0.70		J	0.74		J	0.69		J	4	0	4	0.77	0.00	0.77	0.72
Beryllium	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Cadmium	ug/L	0.91			0.90			0.88			0.90			4	0	4	0.91	0.00	0.91	0.90
Calcium	ug/L	9,700.00			9,670.00			9,700.00			9,710.00			4	0	4	9,710.00	0.00	9,710.00	9,695.00
Chromium	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Copper	ug/L	0.50		J	<0.500	0.25	U	0.60		J	0.65		J	3	1	4	0.65	0.25	0.65	0.50
Iron	ug/L	167.00		J	168.00		J	184.00		J	174.00		J	4	0	4	184.00	0.00	184.00	173.25
Lead	ug/L	1.61			1.61			1.56			1.64			4	0	4	1.64	0.00	1.64	1.61
Magnesium	ug/L	1,590.00			1,580.00			1,580.00			1,580.00			4	0	4	1,590.00	0.00	1,590.00	1,582.50
Manganese	ug/L	29.80			29.80			29.60			29.60			4	0	4	29.80	0.00	29.80	29.70
Mercury	ug/L	NA			NA			NA			NA			NA	NA	NA	NA	NA	NA	NA
Nickel	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Potassium	ug/L	2,350.00			2,330.00			2,340.00			2,390.00			4	0	4	2,390.00	0.00	2,390.00	2,352.50
Selenium	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Silica (SiO2)	ug/L	19,700.00			19,600.00			19,800.00			19,700.00			4	0	4	19,800.00	0.00	19,800.00	19,700.00
Silver	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Sodium	ug/L	3,460.00			3,420.00			3,450.00			3,530.00			4	0	4	3,530.00	0.00	3,530.00	3,465.00
Strontium	ug/L	75.20			74.90			74.80			75.00			4	0	4	75.20	0.00	75.20	74.98
Thallium	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Vanadium	ug/L	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	0	4	4	0.00	5.00	10.00	5.00
Zinc	ug/L	223.00			219.00			219.00			219.00			4	0	4	223.00	0.00	223.00	220.00
Hardness	mg/L	31.00			31.00			31.00			31.00			4	0	4	31.00	NA	31.00	31.00

Footnotes:

Conc. Concentration of the Analyte
NA Not Available or Not Analyzed
MDL One-half of the reported Method Detection Limit (MDL) was substituted for the Non-Detected values in order to derive the average.
Max. Maximum
No. Number
ND Non-Detected result
Qual. Analytical Qualifier (refer to definitions below)
U Result occurs below MDL
J Result occurs between the MDL and the Reporting Limit, therefore this value is estimated.

Table A-6. Summary of Dissolved Metals Results for Willow Creek Sample Locations, June 2010.

Analytes	Units	WW-M		WW-NT		WW-F		WW-E		W-I		W-J Average[(a)]
		Conc.	EPC	Conc.	EPC	Conc.	EPC	Conc.	EPC	Conc.	EPC	EPC
Aluminum	ug/L	<20.00U	20.00	894.00	894.00	30.2J	30.20	28.5J	28.50	37.3J	37.30	46.90
Antimony	ug/L	<0.50U	0.50	<0.50U	0.50	<0.50U	0.50	<0.50U	0.50	<0.50U	0.50	0.50
Arsenic	ug/L	<0.50U	0.50	2.11	2.11	0.54J	0.54	0.685J	0.69	1.19J	1.19	1.27
Beryllium	ug/L	<0.10U	0.10	2.92	2.92	<0.10U	0.10	<0.10U	0.10	<0.10U	0.10	0.10
Cadmium	ug/L	<0.10U	0.10	169.00	169.00	4.09	4.09	6.17	6.17	5.42	5.42	12.75
Calcium	ug/L	10,600.00	10,600.00	131,000.00	131,000.00	11,800.00	11,800.00	12,500.00	12,500.00	8,420.00	8,420.00	9,240.00
Chromium	ug/L	<0.50U	0.50	<0.50U	0.50	<0.50U	0.50	<0.50U	0.50	<0.50U	0.50	0.50
Copper	ug/L	<0.50U	0.50	64.50	64.50	1.88	1.88	3.35	3.35	2.49	2.49	3.07
Iron	ug/L	<100U	100.00	<100U	100.00	<100U	100.00	<100U	100.00	<100U	100.00	100.00
Lead	ug/L	<0.10U	0.10	1,410.00	1,410.00	19.90	19.90	34.00	34.00	14.80	14.80	59.70
Magnesium	ug/L	1,260.00	1,260.00	10,900.00	10,900.00	1,320.00	1,320.00	1,360.00	1,360.00	904.00	904.00	1,025.00
Manganese	ug/L	6.06	6.06	8,800.00	8,800.00	155.00	155.00	172.00	172.00	49.00	49.00	80.55
Mercury	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	ug/L	<0.50U	0.50	7.34	7.34	<0.50U	0.50	<0.50U	0.50	<0.50U	0.50	0.50
Potassium	ug/L	641J	641.00	4,820.00	4,820.00	827J	827.00	893J	893.00	890J	890.00	1,140.00
Selenium	ug/L	<0.50U	0.50	6.23	6.23	<0.50U	0.50	<0.50U	0.50	<0.50U	0.50	0.51
Silica (SiO2)	ug/L	10,800.00	10,800.00	40,500.00	40,500.00	12,500.00	12,500.00	12,800.00	12,800.00	15,700.00	15,700.00	16,600.00
Silver	ug/L	<0.10U	0.10	0.68	0.68	<0.10U	0.10	<0.10U	0.10	<0.10U	0.10	0.10
Sodium	ug/L	2,450.00	2,450.00	41,200.00	41,200.00	3,110.00	3,110.00	3,330.00	3,330.00	2,910.00	2,910.00	3,210.00
Strontium	ug/L	123.00	123.00	1,320.00	1,320.00	130.00	130.00	136.00	136.00	70.00	70.00	78.55
Thallium	ug/L	<0.50U	0.50	3.85	3.85	<0.50U	0.50	<0.50U	0.50	<0.50U	0.50	0.50
Vanadium	ug/L	<10.0U	10.00	<10.0U	10.00	<10.0U	10.00	<10.0U	10.00	<10.0U	10.00	10.00
Zinc	ug/L	<10.0U	10.00	49,200.00	49,200.00	963.00	963.00	1,450.00	1,450.00	958.00	958.00	2,225.00
Hardness	mg/L	32.00	NA	371.00	NA	35.00	NA	37.00	NA	25.00	NA	27.00

Footnotes:

(a) The average for W-J was calculated using the maximum non-detect values if both values were ND, or 1/2 the MDL if only one of the two results was non-detect.

Conc. Detected Concentration of the Analyte or the Method Detection Limit if the result was non-detect.

NA Not Available or Not Analyzed

EPC Sample specific Exposure Point Concentration

ND Non-Detected result

Qual. Analytical Qualifier (refer to definitions below)

U Result occurs below MDL

J Result occurs between the MDL and the Reporting Limit, therefore this value is estimated.

Table A-7. Summary of Total Metals Results for Willow Creek Sample Locations, June 2010.													
Analytes	**Units**	**WW-M**		**WW-NT**		**WW-F**		**WW-E**		**W-I**		**W-J average[(a)]**
		Conc.	**EPC**	**Conc.**	**EPC**	**Conc.**	**EPC**	**Conc.**	**EPC**	**Conc.**	**EPC**	**EPC**
Aluminum	ug/L	101	101	877	877	122	122	139	139	159	159	661
Antimony	ug/L	<2.50U	2.5	<2.50U	2.5	<2.50U	2.5	<2.50U	2.5	<2.50U	2.5	2.5
Arsenic	ug/L	<2.50U	2.5	2.98JD	2.98	<2.50U	2.5	<2.50U	2.5	<2.50U	2.5	6.63
Beryllium	ug/L	<0.500U	0.5	3.65D	3.65	<0.500U	0.5	<0.500U	0.5	<0.500U	0.5	0.5
Cadmium	ug/L	<0.500U	0.5	183D	183	4.33D	4.33	6.60D	6.6	4.98D	4.98	13.75
Calcium	ug/L	10300	10300	127000	127000	11400	11400	12100	12100	8330	8330	8955
Chromium	ug/L	<2.50U	2.5	<2.50U	2.5	<2.50U	2.5	<2.50U	2.5	3.07JD	3.07	3.02
Copper	ug/L	<2.50U	2.5	74.1D	74.1	<2.50U	2.5	4.22JD	4.22	3.19JD	3.19	7.965
Iron	ug/L	123J	123	988	988	123J	123	139J	139	114J	114	637
Lead	ug/L	<0.500U	0.5	1660D	1660	33.1D	33.1	57.3D	57.3	42.2D	42.2	355
Magnesium	ug/L	1240	1240	10500	10500	1290	1290	1330	1330	901	901	1110
Manganese	ug/L	10.6D	10.6	10200D	10200	174D	174	195D	195	54.3D	54.3	139.5
Mercury	ug/L	<0.100U	0.1	<0.100U	0.1	<0.100U	0.1	<0.100U	0.1	<0.100U	0.1	0.1
Nickel	ug/L	<2.50U	2.5	10.7D	10.7	<2.50U	2.5	<2.50U	2.5	<2.50U	2.5	2.5
Potassium	ug/L	673J	673	4720	4720	858J	858	924J	924	905J	905	1330
Selenium	ug/L	<2.50U	2.5	8.13D	8.13	<2.50U	2.5	<2.50U	2.5	<2.50U	2.5	2.5
Silica (SiO2)	ug/L	10800	10800	39200	39200	12100	12100	12800	12800	15300	15300	18800
Silver	ug/L	<0.500U	0.5	1.12JD	1.12	<0.500U	0.5	<0.500U	0.5	<0.500U	0.5	0.846
Sodium	ug/L	2390	2390	40500	40500	3020	3020	3230	3230	2840	2840	3115
Strontium	ug/L	123	123	1300	1300	128	128	136	136	69	69	80.55
Thallium	ug/L	<2.50U	2.5	5.26D	5.26	<2.50U	2.5	<2.50U	2.5	<2.50U	2.5	2.5
Vanadium	ug/L	<10.0U	10	<10.0U	10	<10.0U	10	<10.0U	10	<10.0U	10	10
Zinc	ug/L	<10.0U	10	46500	46500	878	878	1340	1340	903	903	2295

Footnotes:

(a) The average for W-J was calculated using the maximum non-detect values if both values were ND, or 1/2 the MDL if only one of the two results was non-detect.

Conc. Detected Concentration of the Analyte or the Method Detection Limit if the result was non-detect.

NA Not Available or Not Analyzed

EPC Sample specific Exposure Point Concentration

ND Non-Detected result

Qual. Analytical Qualifier (refer to definitions below)

U Result occurs below MDL

J Result occurs between the MDL and the Reporting Limit, therefore this value is estimated.

Table A-8. Summary of Dissolved Metals Results for RG-2, June 2010.

Analytes	Units	RG -2-1			RG -2-2			RG -2-3			RG -2-4			No. of Detects	No. of NDs	No. of Samples	Max. Detect	Max. ND	MAXIMUM	AVERAGE
		Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.							
Aluminum	ug/L	46.70		J	37.10		J	33.40		J	35.60		J	4	0	4	46.70	0.00	46.70	38.20
Antimony	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Arsenic	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Beryllium	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Cadmium	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Calcium	ug/L	5,210.00			5,120.00			5,090.00			5,100.00			4	0	4	5,210.00	0.00	5,210.00	5,130.00
Chromium	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Copper	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Iron	ug/L	<100	50.00	U	<100	50.00	U	<100	50.00	U	<100	50.00	U	0	4	4	0.00	50.00	100.00	50.00
Lead	ug/L	<0.10	0.05	U	<0.10	0.05	U	<0.10	0.05	U	<0.10	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Magnesium	ug/L	884.00			868.00			858.00			855.00			4	0	4	884.00	0.00	884.00	866.25
Manganese	ug/L	4.86			4.68			4.76			4.98			4	0	4	4.98	0.00	4.98	4.82
Mercury	ug/L	NA			NA			NA			NA			NA	NA	NA	NA	NA	NA	NA
Nickel	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Potassium	ug/L	1,110.00			1,080.00			1,080.00			1,100.00			4	0	4	1,110.00	0.00	1,110.00	1,092.50
Selenium	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Silica (SiO2)	ug/L	13,300.00			13,400.00			13,500.00			13,300.00			4	0	4	13,500.00	0.00	13,500.00	13,375.00
Silver	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Sodium	ug/L	1,700.00			1,670.00			1,680.00			1,690.00			4	0	4	1,700.00	0.00	1,700.00	1,685.00
Strontium	ug/L	49.40			50.00			49.40			48.70			4	0	4	50.00	0.00	50.00	49.38
Thallium	ug/L	<0.50	0.25	U	<0.50	0.25	U	<0.50	0.25	U	<0.50	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Vanadium	ug/L	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	0	4	4	0.00	5.00	10.00	5.00
Zinc	ug/L	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	0	4	4	0.00	5.00	10.00	5.00
Hardness	mg/L	17.00			16.00			16.00			16.00			4	0	4	17.00	NA	17.00	16.00

Footnotes:

Conc. Concentration of the Analyte
NA Not Available or Not Analyzed
MDL One-half of the reported Method Detection Limit (MDL) was substituted for the Non-Detected values in order to derive the average.
Max. Maximum
No. Number
ND Non-Detected result
Qual. Analytical Qualifier (refer to definitions below)
U Result occurs below MDL
J Result occurs between the MDL and the Reporting Limit, therefore this value is estimated.

Table A-9. Summary of Total Metals Results for RG-2, June 2010.

Analytes	Units	RG -2-1			RG -2-2			RG -2-3			RG -2-4			No. of Detects	No. of NDs	No. of Samples	Max. Detect	Max. ND	MAXIMUM	AVERAGE
		Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.							
Aluminum	ug/L	592.00			504.00			525.00			531.00			4	0	4	592.00	0.00	592.00	538.00
Antimony	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Arsenic	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Beryllium	ug/L	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Cadmium	ug/L	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Calcium	ug/L	5,150.00			5,240.00			5,090.00			5,140.00			4	0	4	5,240.00	0.00	5,240.00	5,155.00
Chromium	ug/L	2.74			2.66			<2.50U	1.25	U	<2.50U	1.25	U	2	2	4	2.74	1.25	2.74	1.98
Copper	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Iron	ug/L	510.00			438.00			461.00			481.00			4	0	4	510.00	0.00	510.00	472.50
Lead	ug/L	0.59			0.53			0.52			0.50			4	0	4	0.59	0.00	0.59	0.54
Magnesium	ug/L	928.00			936.00			907.00			918.00			4	0	4	936.00	0.00	936.00	922.25
Manganese	ug/L	25.30			22.80			24.60			23.40			4	0	4	25.30	0.00	25.30	24.03
Mercury	ug/L	<0.100U	0.05	U	<0.100U	0.05	U	<0.100U	0.05	U	<0.100U	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Nickel	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Potassium	ug/L	1,250.00			1,230.00			1,210.00			1,230.00			4	0	4	1,250.00	0.00	1,250.00	1,230.00
Selenium	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Silica (SiO2)	ug/L	15,500.00			15,300.00			15,600.00			15,300.00			4	0	4	15,600.00	0.00	15,600.00	15,425.00
Silver	ug/L	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Sodium	ug/L	1,680.00			1,700.00			1,670.00			1,700.00			4	0	4	1,700.00	0.00	1,700.00	1,687.50
Strontium	ug/L	52.00			52.40			52.20			51.20			4	0	4	52.40	0.00	52.40	51.95
Thallium	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Vanadium	ug/L	<10.0U	5.00	U	<10.0U	5.00	U	<10.0U	5.00	U	<10.0U	5.00	U	0	4	4	0.00	5.00	10.00	5.00
Zinc	ug/L	<10.0U	5.00	U	<10.0U	5.00	U	11.20			11.40			2	2	4	11.40	5.00	11.40	8.15

Footnotes:

Conc. Concentration of the Analyte

NA Not Available or Not Analyzed

MDL One-half of the reported Method Detection Limit (MDL) was substituted for the Non-Detected values in order to derive the average.

Max. Maximum

No. Number

ND Non-Detected result

Qual. Analytical Qualifier (refer to definitions below)

- U Result occurs below MDL
- J Result occurs between the MDL and the Reporting Limit, therefore this value is estimated.

Table A-10. Summary of Dissolved Metals Results for RG-4, June 2010.

Analytes	Units	RG -4-1			RG -4-2			RG -4-3			RG -4-4			No. of Detects	No. of NDs	No. of Samples	Max. Detect	Max. ND	MAXIMUM	AVERAGE
		Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.							
Aluminum	ug/L	31.10		J	32.40		J	27.00		J	32.50		J	4	0	4	32.50	0.00	32.50	30.75
Antimony	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Arsenic	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Beryllium	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Cadmium	ug/L	0.15		J	0.13		J	0.16		J	0.16		J	4	0	4	0.16	0.00	0.16	0.15
Calcium	ug/L	5,260.00			5,290.00			5,190.00			5,370.00			4	0	4	5,370.00	0.00	5,370.00	5,277.50
Chromium	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Copper	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Iron	ug/L	<100	50.00	U	<100	50.00	U	<100	50.00	U	<100	50.00	U	0	4	4	0.00	50.00	100.00	50.00
Lead	ug/L	0.33			0.38			0.43			0.36			4	0	4	0.43	0.00	0.43	0.38
Magnesium	ug/L	873.00			874.00			850.00			886.00			4	0	4	886.00	0.00	886.00	870.75
Manganese	ug/L	6.87			6.52			6.44			6.55			4	0	4	6.87	0.00	6.87	6.60
Mercury	ug/L	NA			NA			NA			NA			NA	NA	NA	NA	NA	NA	NA
Nickel	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Potassium	ug/L	1,050.00			1,060.00			1,030.00			1,080.00			4	0	4	1,080.00	0.00	1,080.00	1,055.00
Selenium	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Silica (SiO2)	ug/L	13,500.00			13,600.00			13,200.00			13,300.00			4	0	4	13,600.00	0.00	13,600.00	13,400.00
Silver	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Sodium	ug/L	1,720.00			1,730.00			1,710.00			1,760.00			4	0	4	1,760.00	0.00	1,760.00	1,730.00
Strontium	ug/L	50.70			51.00			49.90			50.60			4	0	4	51.00	0.00	51.00	50.55
Thallium	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Vanadium	ug/L	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	0	4	4	0.00	5.00	10.00	5.00
Zinc	ug/L	32.40			34.00			35.30			34.10			4	0	4	35.30	0.00	35.30	33.95
Hardness	mg/L	17.00			17.00			16.00			17.00			4	0	4	17.00	NA	17.00	17.00

Footnotes:

Conc. Concentration of the Analyte

NA Not Available or Not Analyzed

MDL One-half of the reported Method Detection Limit (MDL) was substituted for the Non-Detected values in order to derive the average.

Max. Maximum

No. Number

ND Non-Detected result

Qual. Analytical Qualifier (refer to definitions below)

U Result occurs below MDL

J Result occurs between the MDL and the Reporting Limit, therefore this value is estimated.

Table A-11. Summary of Total Metals Results for RG-4, June 2010.

Analytes	Units	RG -4-1			RG -4-2			RG -4-3			RG -4-4			No. of Detects	No. of NDs	No. of Samples	Max. Detect	Max. ND	MAXIMUN	AVERAGE
		Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.							
Aluminum	ug/L	543.00			531.00			530.00			603.00			4	0	4	603.00	0.00	603.00	551.75
Antimony	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Arsenic	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Beryllium	ug/L	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Cadmium	ug/L	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Calcium	ug/L	5,230.00			5,280.00			5,170.00			5,410.00			4	0	4	5,410.00	0.00	5,410.00	5,272.50
Chromium	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Copper	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Iron	ug/L	462.00			455.00			460.00			495.00			4	0	4	495.00	0.00	495.00	468.00
Lead	ug/L	2.26			2.30			2.62			2.84			4	0	4	2.84	0.00	2.84	2.51
Magnesium	ug/L	923.00			929.00			902.00			955.00			4	0	4	955.00	0.00	955.00	927.25
Manganese	ug/L	25.90			25.60			25.10			26.90			4	0	4	26.90	0.00	26.90	25.88
Mercury	ug/L	<0.100U	0.05	U	<0.100U	0.05	U	<0.100U	0.05	U	<0.100U	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Nickel	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Potassium	ug/L	1,180.00			1,190.00			1,170.00			1,250.00			4	0	4	1,250.00	0.00	1,250.00	1,197.50
Selenium	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Silica (SiO_2)	ug/L	15,500.00			15,400.00			15,300.00			15,900.00			4	0	4	15,900.00	0.00	15,900.00	15,525.00
Silver	ug/L	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Sodium	ug/L	1,710.00			1,740.00			1,710.00			1,790.00			4	0	4	1,790.00	0.00	1,790.00	1,737.50
Strontium	ug/L	52.50			52.40			52.00			54.10			4	0	4	54.10	0.00	54.10	52.75
Thallium	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Vanadium	ug/L	<10.0U	5.00	U	<10.0U	5.00	U	<10.0U	5.00	U	<10.0U	5.00	U	0	4	4	0.00	5.00	10.00	5.00
Zinc	ug/L	47.50			47.20			49.20			51.10			4	0	4	51.10	0.00	51.10	48.75

Footnotes:

Conc. Concentration of the Analyte
NA Not Available or Not Analyzed
MDL One-half of the reported Method Detection Limit (MDL) was substituted for the Non-Detected values in order to derive the average.
Max. Maximum
No. Number
ND Non-Detected result
Qual. Analytical Qualifier (refer to definitions below)
U Result occurs below MDL
J Result occurs between the MDL and the Reporting Limit, therefore this value is estimated.

Table A-12. Summary of Dissolved Metals Results for RG-8, June 2010.

Analytes	Units	RG -8-1			RG -8-2			RG -8-3			RG -8-4			No. of Detects	No. of NDs	No. of Samples	Max. Detect	Max. ND	MAXIMUM	AVERAGE
		Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.							
Aluminum	ug/L	33.40		J	32.10		J	33.20		J	29.10		J	4	0	4	33.40	0.00	33.40	31.95
Antimony	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Arsenic	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Beryllium	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Cadmium	ug/L	0.14		J	0.12		J	0.12		J	0.13		J	4	0	4	0.14	0.00	0.14	0.12
Calcium	ug/L	5,470.00			5,430.00			5,410.00			5,440.00			4	0	4	5,470.00	0.00	5,470.00	5,437.50
Chromium	ug/L	<0.500	0.25	U	<0.500	0.25		<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Copper	ug/L	<0.500	0.25	U	<0.500	0.25		<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Iron	ug/L	<100	50.00	U	<100	50.00	U	<100	50.00	U	<100	50.00	U	0	4	4	0.00	50.00	100.00	50.00
Lead	ug/L	0.36			0.37			0.38			0.36			4	0	4	0.38	0.00	0.38	0.37
Magnesium	ug/L	881.00			880.00			876.00			877.00			4	0	4	881.00	0.00	881.00	878.50
Manganese	ug/L	6.13			5.97			6.00			6.21			4	0	4	6.21	0.00	6.21	6.08
Mercury	ug/L	NA			NA			NA			NA			NA	NA	NA	NA	NA	NA	NA
Nickel	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Potassium	ug/L	1,110.00			1,090.00			1,080.00			1,070.00			4	0	4	1,110.00	0.00	1,110.00	1,087.50
Selenium	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Silica (SiO2)	ug/L	14,100.00			14,000.00			13,500.00			13,700.00			4	0	4	14,100.00	0.00	14,100.00	13,825.00
Silver	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Sodium	ug/L	1,830.00			1,790.00			1,780.00			1,770.00			4	0	4	1,830.00	0.00	1,830.00	1,792.50
Strontium	ug/L	51.20			51.50			51.50			51.60			4	0	4	51.60	0.00	51.60	51.45
Thallium	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Vanadium	ug/L	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	0	4	4	0.00	5.00	10.00	5.00
Zinc	ug/L	34.30			35.40			34.70			34.90			4	0	4	35.40	0.00	35.40	34.83
Hardness	mg/L	17.00			17.00			17.00			17.00			4	0	4	17.00	NA	17.00	17.00

Footnotes:

Conc. Concentration of the Analyte
NA Not Available or Not Analyzed
MDL One-half of the reported Method Detection Limit (MDL) was substituted for the Non-Detected values in order to derive the average.
Max. Maximum
No. Number
ND Non-Detected result
Qual. Analytical Qualifier (refer to definitions below)
U Result occurs below MDL
J Result occurs between the MDL and the Reporting Limit, therefore this value is estimated.

Table A-13. Summary of Total Metals Results for RG-8, June 2010.

Analytes	Units	RG -8-1			RG -8-2			RG -8-3			RG -8-4			No. of Detects	No. of NDs	No. of Samples	Max. Detect	Max. ND	MAXIMUM	AVERAGE
		Conc	MDL	Qual	Conc	MDL	Qual	Conc	MDL	Qual	Conc	MDL	Qual							
Aluminum	ug/L	529			502			568			597			4	0	4	597.00	0.00	597.00	549.00
Antimony	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Arsenic	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Beryllium	ug/L	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Cadmium	ug/L	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Calcium	ug/L	5280			5260			5300			5670			4	0	4	5,670.00	0.00	5,670.00	5,377.50
Chromium	ug/L	<2.50U	1.25	U	2.67			<2.50U	1.25	U	<2.50U	1.25	U	1	3	4	2.67	1.25	2.67	1.61
Copper	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Iron	ug/L	458			421			478			487			4	0	4	487.00	0.00	487.00	461.00
Lead	ug/L	2.63			2.37			2.9			2.67			4	0	4	2.90	0.00	2.90	2.64
Magnesium	ug/L	912			907			915			974			4	0	4	974.00	0.00	974.00	927.00
Manganese	ug/L	27.4			23.5			24.6			26.2			4	0	4	27.40	0.00	27.40	25.43
Mercury	ug/L	<0.100U	0.05	U	<0.100U	0.05	U	<0.100U	0.05	U	<0.100U	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Nickel	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Potassium	ug/L	1200			1200			1210			1270			4	0	4	1,270.00	0.00	1,270.00	1,220.00
Selenium	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Silica (SiO2)	ug/L	15700			15400			15800			16300			4	0	4	16,300.00	0.00	16,300.00	15,800.00
Silver	ug/L	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Sodium	ug/L	1770			1750			1760			1860			4	0	4	1,860.00	0.00	1,860.00	1,785.00
Strontium	ug/L	52.5			52.1			52.9			54.6			4	0	4	54.60	0.00	54.60	53.03
Thallium	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Vanadium	ug/L	<10.0U	5	U	<10.0U	5	U	<10.0U	5	U	<10.0U	5	U	0	4	4	0.00	5.00	10.00	5.00
Zinc	ug/L	51.1			47.4			47.6			51.3			4	0	4	51.30	0.00	51.30	49.35

Footnotes:

Conc. Concentration of the Analyte
NA Not Available or Not Analyzed
MDL One-half of the reported Method Detection Limit (MDL) was substituted for the Non-Detected values in order to derive the average.
Max. Maximum
No. Number
ND Non-Detected result
Qual. Analytical Qualifier (refer to definitions below)
U Result occurs below MDL
J Result occurs between the MDL and the Reporting Limit, therefore this value is estimated.

Table A-14. Summary of Dissolved Metals Results for RG-9, June 2010.

Analytes	Units	RG -9-1			RG -9-2			RG -9-3			RG -9-4			No. of Detects	No. of NDs	No. of Samples	Max. Detect	Max. ND	MAXIMUM	AVERAGE
		Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.							
Aluminum	ug/L	33.80		J	33.30		J	32.60		J	30.60		J	4	0	4	33.80	0.00	33.80	32.58
Antimony	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Arsenic	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Beryllium	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Cadmium	ug/L	0.14		J	0.10		J	0.12		J	0.13		J	4	0	4	0.14	0.00	0.14	0.12
Calcium	ug/L	5,500.00			5,490.00			5,430.00			5,510.00			4	0	4	5,510.00	0.00	5,510.00	5,482.50
Chromium	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Copper	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Iron	ug/L	<100	50.00	U	<100	50.00	U	<100	50.00	U	<100	50.00	U	0	4	4	0.00	50.00	100.00	50.00
Lead	ug/L	0.37			0.38			0.35			0.37			4	0	4	0.38	0.00	0.38	0.37
Magnesium	ug/L	876.00			883.00			876.00			885.00			4	0	4	885.00	0.00	885.00	880.00
Manganese	ug/L	6.03			6.14			5.89			5.95			4	0	4	6.14	0.00	6.14	6.00
Mercury	ug/L	NA			NA			NA			NA			NA	NA	NA	NA	NA	NA	NA
Nickel	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Potassium	ug/L	1,070.00			1,110.00			1,070.00			1,090.00			4	0	4	1,110.00	0.00	1,110.00	1,085.00
Selenium	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Silica (SiO2)	ug/L	13,900.00			13,900.00			13,800.00			13,900.00			4	0	4	13,900.00	0.00	13,900.00	13,875.00
Silver	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Sodium	ug/L	1,780.00			1,860.00			1,780.00			1,790.00			4	0	4	1,860.00	0.00	1,860.00	1,802.50
Strontium	ug/L	51.40			51.60			51.20			51.60			4	0	4	51.60	0.00	51.60	51.45
Thallium	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Vanadium	ug/L	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	0	4	4	0.00	5.00	10.00	5.00
Zinc	ug/L	32.50			34.60			33.60			35.30			4	0	4	35.30	0.00	35.30	34.00
Hardness	mg/L	17.00			17.00			17.00			17.00			4	0	4	17.00	NA	17.00	17.00

Footnotes:

Conc. Concentration of the Analyte

NA Not Available or Not Analyzed

MDL One-half of the reported Method Detection Limit (MDL) was substituted for the Non-Detected values in order to derive the average.

Max. Maximum

No. Number

ND Non-Detected result

Qual. Analytical Qualifier (refer to definitions below)

- U Result occurs below MDL
- J Result occurs between the MDL and the Reporting Limit, therefore this value is estimated.

Table A-15. Summary of Total Metals Results for RG-9, June 2010.

Analytes	Units	RG -9-1			RG -9-2			RG -9-3			RG -9-4			No. of Detects	No. of NDs	No. of Samples	Max. Detect	Max. ND	MAXIMUM	AVERAGE
		Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.							
Aluminum	ug/L	577			659			535			597			4	0	4	659.00	0.00	659.00	592.00
Antimony	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Arsenic	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Beryllium	ug/L	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Cadmium	ug/L	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Calcium	ug/L	5520			5610			5490			5560			4	0	4	5,610.00	0.00	5,610.00	5,545.00
Chromium	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Copper	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Iron	ug/L	476			501			445			491			4	0	4	501.00	0.00	501.00	478.25
Lead	ug/L	2.79			3.09			3.02			3.38			4	0	4	3.38	0.00	3.38	3.07
Magnesium	ug/L	949			968			940			963			4	0	4	968.00	0.00	968.00	955.00
Manganese	ug/L	27.2			25.6			23.9			27			4	0	4	27.20	0.00	27.20	25.93
Mercury	ug/L	<0.100U	0.05	U	<0.100U	0.05	U	<0.100U	0.05	U	<0.100U	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Nickel	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Potassium	ug/L	1250			1320			1230			1260			4	0	4	1,320.00	0.00	1,320.00	1,265.00
Selenium	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Silica (SiO2)	ug/L	16400			16700			15800			16200			4	0	4	16,700.00	0.00	16,700.00	16,275.00
Silver	ug/L	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Sodium	ug/L	1830			1910			1820			1850			4	0	4	1,910.00	0.00	1,910.00	1,852.50
Strontium	ug/L	53.9			54.5			53			54.2			4	0	4	54.50	0.00	54.50	53.90
Thallium	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Vanadium	ug/L	<10.0U	5	U	<10.0U	5	U	<10.0U	5	U	<10.0U	5	U	0	4	4	0.00	5.00	10.00	5.00
Zinc	ug/L	52.6			50.2			50.8			50.3			4	0	4	52.60	0.00	52.60	50.98

Footnotes:

Conc. Concentration of the Analyte
NA Not Available or Not Analyzed
MDL One-half of the reported Method Detection Limit (MDL) was substituted for the Non-Detected values in order to derive the average.
Max. Maximum
No. Number
ND Non-Detected result
Qual. Analytical Qualifier (refer to definitions below)
U Result occurs below MDL
J Result occurs between the MDL and the Reporting Limit, therefore this value is estimated.

Table A-16. Summary of Dissolved Metals Results for Willow Creek Sample Locations, September 2010.												
Analytes	**Units**	**WW-M**		**WW-NT**		**WW-F**		**WW-E**		**W-I Average[(a)]**	**W-J**	
		Conc.	**EPC**	**Conc.**	**EPC**	**Conc.**	**EPC**	**Conc.**	**EPC**	**EPC**	**Conc.**	**EPC**
Aluminum	ug/L	<20.0U	20.00	640.00	640.00	72.20	72.20	77.80	77.80	20.00	<20.0U	20.00
Antimony	ug/L	<0.50U	0.50	<5.0U	5.00	<0.50U	0.50	<0.50U	0.50	0.50	<0.50U	0.50
Arsenic	ug/L	<0.50U	0.50	<5.0U	5.00	1.01J	1.01	0.88J	0.88	1.23	1.14J	1.14
Beryllium	ug/L	<0.10U	0.10	4.0D	4.00	0.59	0.59	0.65	0.65	0.10	<0.10U	0.10
Cadmium	ug/L	<0.10U	0.10	131D	131.00	28.70	28.70	37.90	37.90	19.10	20.60	20.60
Calcium	ug/L	16,400.00	16,400.00	184,000.00	184,000.00	47,800.00	47,800.00	59,800.00	59,800.00	21,200.00	21,200.00	21,200.00
Chromium	ug/L	<0.50U	0.50	<5.0U	5.00	<0.50U	0.50	<0.50U	0.50	0.50	<0.50U	0.50
Copper	ug/L	<0.50U	0.50	27.6D	27.60	4.69	4.69	4.52	4.52	1.83	1.53	1.53
Iron	ug/L	<100U	100.00	494.00	494.00	<100U	100.00	<100U	100.00	100.00	<100U	100.00
Lead	ug/L	<0.10U	0.10	1,770D	1,770.00	157.00	157.00	136.00	136.00	8.24	30.50	30.50
Magnesium	ug/L	1,860.00	1,860.00	13,500.00	13,500.00	4,020.00	4,020.00	4,880.00	4,880.00	2,070.00	2,160.00	2,160.00
Manganese	ug/L	16.40	16.40	10,600D	10,600.00	1,960.00	1,960.00	2,680.00	2,680.00	102.00	79.20	79.20
Mercury	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	ug/L	<0.50U	0.50	<5.0U	5.00	<0.50U	0.50	<0.50U	0.50	0.50	<0.50U	0.50
Potassium	ug/L	1,010.00	1,010.00	5,140.00	5,140.00	1,890.00	1,890.00	2,180.00	2,180.00	1,440.00	1,450.00	1,450.00
Selenium	ug/L	<0.50U	0.50	<5.0U	5.00	0.865J	0.87	1.06	1.06	0.50	<0.50U	0.50
Silica (SiO2)	ug/L	13,900.00	13,900.00	41,800.00	41,800.00	22,100.00	22,100.00	23,800.00	23,800.00	20,650.00	22,400.00	22,400.00
Silver	ug/L	<0.10U	0.10	<1.0U	1.00	<0.10U	0.10	<0.10U	0.10	0.10	<0.10U	0.10
Sodium	ug/L	3,570.00	3,570.00	53,900.00	53,900.00	13,500.00	13,500.00	17,100.00	17,100.00	6,610.00	6,620.00	6,620.00
Strontium	ug/L	197.00	197.00	1,850.00	1,850.00	501.00	501.00	631.00	631.00	182.00	181.00	181.00
Thallium	ug/L	<0.50U	0.50	<5.0U	5.00	0.839J	0.84	1.19	1.19	0.50	<0.50U	0.50
Vanadium	ug/L	<10.0U	10.00	<10.0U	10.00	<10.0U	10.00	<10.0U	10.00	10.00	<10.0U	10.00
Zinc	ug/L	<10.0U	10.00	49,500.00	49,500.00	10,700.00	10,700.00	14,500.00	14,500.00	3,630.00	4,390.00	4,390.00
Hardness	mg/L	49.00	NA	515.00	NA	136.00	NA	169.00	NA	61.50	62.00	NA

Footnotes:

(a) The average for W-I was calculated using the maximum non-detect values if both values were ND, or 1/2 the MDL if only one of the two results was non-detect.

Conc. Detected Concentration of the Analyte or the Method Detection Limit if the result was non-detect.

NA Not Available or Not Analyzed

EPC Sample specific Exposure Point Concentration

ND Non-Detected result

Qual. Analytical Qualifier (refer to definitions below)

U Result occurs below MDL

J Result occurs between the MDL and the Reporting Limit, therefore this value is estimated.

Table A-17. Summary of Total Metals Results for Willow Creek Sample Locations, September 2010.

Analytes	Units	WW-M		WW-NT		WW-F		WW-E		W-I average[a]	W-J	
		Conc.	EPC	Conc.	EPC	Conc.	EPC	Conc.	EPC	EPC	Conc.	EPC
Aluminum	ug/L	133	133.00	630	630.00	155.00	155.00	168	168.00	67.00	52.7	52.70
Antimony	ug/L	<2.50U	2.50	<5.00U	5.00	<2.50U	2.50	<2.50U	2.50	2.50	<2.50U	2.50
Arsenic	ug/L	<2.50U	2.50	<5.00U	5.00	<2.50U	2.50	<2.50U	2.50	2.50	<2.50U	2.50
Beryllium	ug/L	<0.500U	0.50	4.10D	4.10	0.697JD	0.70	0.998JD	1.00	0.50	<0.500U	0.50
Cadmium	ug/L	<0.500U	0.50	122D	122.00	28.8D	28.80	36.5D	36.50	19.25	19.7D	19.70
Calcium	ug/L	15600	15,600.00	174000	174,000.00	44,400.00	44,400.00	56200	56,200.00	20,050.00	20400	20,400.00
Chromium	ug/L	<2.50U	2.50	<5.00U	5.00	<2.50U	2.50	<2.50U	2.50	3.13	3.05JD	3.05
Copper	ug/L	<2.50U	2.50	27.1D	27.10	8.05D	8.05	8.39D	8.39	3.28	<2.50U	2.50
Iron	ug/L	152J	152.00	3800	3,800.00	837.00	837.00	853	853.00	100.00	<100U	100.00
Lead	ug/L	<0.500U	0.50	1700D	1,700.00	366D	366.00	397D	397.00	26.85	49.6D	49.60
Magnesium	ug/L	1810	1,810.00	13000	13,000.00	3,780.00	3,780.00	4630	4,630.00	1,995.00	2110	2,110.00
Manganese	ug/L	22.8D	22.80	9950D	9,950.00	1940D	1,940.00	2590D	2,590.00	108.50	82.7D	82.70
Mercury	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	ug/L	<2.50U	2.50	<5.00U	5.00	<2.50U	2.50	<2.50U	2.50	2.50	<2.50U	2.50
Potassium	ug/L	1030	1,030.00	5020	5,020.00	1,810.00	1,810.00	2100	2,100.00	1,405.00	1450	1,450.00
Selenium	ug/L	<2.50U	2.50	6.14JD	6.14	<2.50U	2.50	<2.50U	2.50	2.50	<2.50U	2.50
Silica (SiO2)	ug/L	14000	14,000.00	41400	41,400.00	21,700.00	21,700.00	23300	23,300.00	20,500.00	22100	22,100.00
Silver	ug/L	<0.500U	0.50	<1.00U	1.00	<0.500U	0.50	<0.500U	0.50	0.50	<0.500U	0.50
Sodium	ug/L	3470	3,470.00	52700	52,700.00	12,900.00	12,900.00	16400	16,400.00	6,430.00	6490	6,490.00
Strontium	ug/L	201	201.00	1920	1,920.00	510.00	510.00	641	641.00	183.50	184	184.00
Thallium	ug/L	<2.50U	2.50	<5.00U	5.00	<2.50U	2.50	<2.50U	2.50	2.50	<2.50U	2.50
Vanadium	ug/L	<10.0U	10.00	<10.0U	10.00	<10.0U	10.00	<10.0U	10.00	10.00	<10.0U	10.00
Zinc	ug/L	<10.0U	10.00	48200	48,200.00	10,200.00	10,200.00	13900	13,900.00	3,585.00	4140	4,140.00

Footnotes:

(a) The average for W-I was calculated using the maximum non-detect values if both values were ND, or 1/2 the MDL if only one of the two results was non-detect.

Conc. Detected Concentration of the Analyte or the Method Detection Limit if the result was non-detect.

NA Not Available or Not Analyzed

EPC Sample specific Exposure Point Concentration

ND Non-Detected result

Qual. Analytical Qualifier (refer to definitions below)

U Result occurs below MDL

J Result occurs between the MDL and the Reporting Limit, therefore this value is estimated.

Table A-18. Summary of Dissolved Metals Results for RG-2, September 2010.

Analytes	Units	RG -2-1			RG -2-2			RG -2-3			RG -2-4			No. of Detects	No. of NDs	No. of Samples	Max. Detect	Max. ND	MAXIMUM	AVERAGE
		Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.							
Aluminum	ug/L	<20.00	10.00	U	<20.00	10.00	U	<20.00	10.00	U	<20.00	10.00	U	0	4	4	0.00	10.00	20.00	10.00
Antimony	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Arsenic	ug/L	0.78		J	0.71		J	0.81		J	0.73		J	4	0	4	0.81	0.00	0.81	0.76
Beryllium	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Cadmium	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Calcium	ug/L	9,210.00			9,330.00			9,230.00			9,340.00			4	0	4	9,340.00	0.00	9,340.00	9,277.50
Chromium	ug/L	0.56		J	0.63		J	0.62		J	<0.500	0.25	U	3	1	4	0.63	0.25	0.63	0.51
Copper	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Iron	ug/L	<100	50.00	U	<100	50.00	U	<100	50.00	U	<100	50.00	U	0	4	4	0.00	50.00	100.00	50.00
Lead	ug/L	<0.10	0.05	U	<0.10	0.05	U	<0.10	0.05	U	<0.10	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Magnesium	ug/L	1,610.00			1,640.00			1,620.00			1,630.00			4	0	4	1,640.00	0.00	1,640.00	1,625.00
Manganese	ug/L	3.06			2.88			3.34			4.70			4	0	4	4.70	0.00	4.70	3.50
Mercury	ug/L	NA			NA			NA			NA			NA	NA	NA	NA	NA	NA	NA
Nickel	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Potassium	ug/L	1,790.00			1,820.00			1,800.00			1,820.00			4	0	4	1,820.00	0.00	1,820.00	1,807.50
Selenium	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Silica (SiO2)	ug/L	22,500.00			22,400.00			22,500.00			22,500.00			4	0	4	22,500.00	0.00	22,500.00	22,475.00
Silver	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Sodium	ug/L	3,320.00			3,410.00			3,400.00			3,420.00			4	0	4	3,420.00	0.00	3,420.00	3,387.50
Strontium	ug/L	74.20			74.40			74.40			74.50			4	0	4	74.50	0.00	74.50	74.38
Thallium	ug/L	<0.50	0.25	U	<0.50	0.25	U	<0.50	0.25	U	<0.50	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Vanadium	ug/L	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	0	4	4	0.00	5.00	10.00	5.00
Zinc	ug/L	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	0	4	4	0.00	5.00	10.00	5.00
Hardness	mg/L	30.00			30.00			30.00			30.00			4	0	4	30.00	NA	30.00	30.00

Footnotes:

Conc. Concentration of the Analyte

NA Not Available or Not Analyzed

MDL One-half of the reported Method Detection Limit (MDL) was substituted for the Non-Detected values in order to derive the average.

Max. Maximum

No. Number

ND Non-Detected result

Qual. Analytical Qualifier (refer to definitions below)

- U Result occurs below MDL
- J Result occurs between the MDL and the Reporting Limit, therefore this value is estimated.

Table A-19. Summary of Total Metals Results for RG-2, September 2010.

Analytes	Units	RG -2-1			RG -2-2			RG -2-3			RG -2-4			No. of Detects	No. of NDs	No. of Samples	Max. Detect	Max. ND	MAXIMUM	AVERAGE
		Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.							
Aluminum	ug/L	97.5			105			107			102			4	0	4	107.00	0.00	107.00	102.88
Antimony	ug/L	NA			NA			NA			NA			0	0	0	0.00	0.00	NA	NA
Arsenic	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Beryllium	ug/L	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Cadmium	ug/L	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Calcium	ug/L	9030			9090			9030			9230			4	0	4	9,230.00	0.00	9,230.00	9,095.00
Chromium	ug/L	4.42			4.37			4.35			4.55			4	0	4	4.55	0.00	4.55	4.42
Copper	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	3.98			1	3	4	3.98	1.25	3.98	1.93
Iron	ug/L	222			232			226			222			4	0	4	232.00	0.00	232.00	225.50
Lead	ug/L	<0.500U	0.25	U	0.561			<0.500U	0.25	U	<0.500U	0.25	U	1	3	4	0.56	0.25	0.56	0.33
Magnesium	ug/L	1580			1590			1590			1610			4	0	4	1,610.00	0.00	1,610.00	1,592.50
Manganese	ug/L	18			16.6			17.5			18.3			4	0	4	18.30	0.00	18.30	17.60
Mercury	ug/L	NA			NA			NA			NA			NA	NA	NA	NA	NA	NA	NA
Nickel	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Potassium	ug/L	1780			1790			1790			1800			4	0	4	1,800.00	0.00	1,800.00	1,790.00
Selenium	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Silica (SiO2)	ug/L	22500			22400			22300			22400			4	0	4	22,500.00	0.00	22,500.00	22,400.00
Silver	ug/L	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Sodium	ug/L	3290			3320			3320			3370			4	0	4	3,370.00	0.00	3,370.00	3,325.00
Strontium	ug/L	73.2			73.1			72.4			73.1			4	0	4	73.20	0.00	73.20	72.95
Thallium	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Vanadium	ug/L	<10.0U	5	U	<10.0U	5	U	<10.0U	5	U	<10.0U	5	U	0	4	4	0.00	5.00	10.00	5.00
Zinc	ug/L	<10.0U	5	U	<10.0U	5	U	<10.0U	5	U	<10.0U	5	U	0	4	4	0.00	5.00	10.00	5.00

Footnotes:

Conc. Concentration of the Analyte
NA Not Available or Not Analyzed
MDL One-half of the reported Method Detection Limit (MDL) was substituted for the Non-Detected values in order to derive the average.
Max. Maximum
No. Number
ND Non-Detected result
Qual. Analytical Qualifier (refer to definitions below)
U Result occurs below MDL
J Result occurs between the MDL and the Reporting Limit, therefore this value is estimated.

Table A-20. Summary of Dissolved Metals Results for RG-4, September 2010.

Analytes	Units	RG -4-1			RG -4-2			RG -4-3			RG -4-4			No. of Detects	No. of NDs	No. of Samples	Max. Detect	Max. ND	MAXIMUM	AVERAGE
		Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.							
Aluminum	ug/L	<20.00	10.00	U	<20.00	10.00	U	<20.00	10.00	U	<20.00	10.00	U	0	4	4	0.00	10.00	20.00	10.00
Antimony	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Arsenic	ug/L	0.81		J	0.73		J	0.78		J	0.78		J	4	0	4	0.81	0.00	0.81	0.77
Beryllium	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Cadmium	ug/L	0.61			0.63			0.59			0.58			4	0	4	0.63	0.00	0.63	0.60
Calcium	ug/L	10,300.00			10,200.00			10,300.00			10,200.00			4	0	4	10,300.00	0.00	10,300.00	10,250.00
Chromium	ug/L	0.65		J	0.63		J	0.67		J	0.57		J	4	0	4	0.67	0.00	0.67	0.63
Copper	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Iron	ug/L	<100	50.00	U	<100	50.00	U	<100	50.00	U	<100	50.00	U	0	4	4	0.00	50.00	100.00	50.00
Lead	ug/L	0.22			0.22			0.22			0.23			4	0	4	0.23	0.00	0.23	0.22
Magnesium	ug/L	1,700.00			1,690.00			1,700.00			1,680.00			4	0	4	1,700.00	0.00	1,700.00	1,692.50
Manganese	ug/L	7.10			6.98			7.15			7.15			4	0	4	7.15	0.00	7.15	7.10
Mercury	ug/L	NA			NA			NA			NA			NA	NA	NA	NA	NA	NA	NA
Nickel	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Potassium	ug/L	1,860.00			1,840.00			1,840.00			1,820.00			4	0	4	1,860.00	0.00	1,860.00	1,840.00
Selenium	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Silica (SiO2)	ug/L	22,700.00			22,900.00			22,800.00			22,900.00			4	0	4	22,900.00	0.00	22,900.00	22,825.00
Silver	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Sodium	ug/L	3,720.00			3,700.00			3,690.00			3,680.00			4	0	4	3,720.00	0.00	3,720.00	3,697.50
Strontium	ug/L	80.60			80.40			80.60			80.60			4	0	4	80.60	0.00	80.60	80.55
Thallium	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Vanadium	ug/L	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	0	4	4	0.00	5.00	10.00	5.00
Zinc	ug/L	129.00			131.00			128.00			127.00			4	0	4	131.00	0.00	131.00	128.75
Hardness	mg/L	33.00			32.00			33.00			32.00			4	0	4	33.00	NA	33.00	32.50

Footnotes:

Conc. Concentration of the Analyte
NA Not Available or Not Analyzed
MDL One-half of the reported Method Detection Limit (MDL) was substituted for the Non-Detected values in order to derive the average.
Max. Maximum
No. Number
ND Non-Detected result
Qual. Analytical Qualifier (refer to definitions below)
U Result occurs below MDL
J Result occurs between the MDL and the Reporting Limit, therefore this value is estimated.

Table A-21. Summary of Total Metals Results for RG-4, September 2010.

Analytes	Units	RG -4-1			RG -4-2			RG -4-3			RG -4-4			No. of Detects	No. of NDs	No. of Samples	Max. Detect	Max. ND	MAXIMUM	AVERAGE
		Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.							
Aluminum	ug/L	92.9			98.1			83.6			92.4			4	0	4	98.10	0.00	98.10	91.75
Antimony	ug/L	NA			NA			NA			NA			0	0	0	0.00	0.00	NA	NA
Arsenic	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Beryllium	ug/L	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Cadmium	ug/L	0.613			0.767			<0.500U	0.25	U	0.663			3	1	4	0.77	0.25	0.77	0.57
Calcium	ug/L	10000			9930			9920			10000			4	0	4	10,000.00	0.00	10,000.00	9,962.50
Chromium	ug/L	4.38			4.37			4.33			4.01			4	0	4	4.38	0.00	4.38	4.27
Copper	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Iron	ug/L	205			207			198			198			4	0	4	207.00	0.00	207.00	202.00
Lead	ug/L	1.52			1.25			1.12			1.28			4	0	4	1.52	0.00	1.52	1.29
Magnesium	ug/L	1640			1630			1620			1640			4	0	4	1,640.00	0.00	1,640.00	1,632.50
Manganese	ug/L	18.6			18.4			17.2			18.7			4	0	4	18.70	0.00	18.70	18.23
Mercury	ug/L	NA			NA			NA			NA			NA	NA	NA	NA	NA	NA	NA
Nickel	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Potassium	ug/L	1800			1780			1770			1790			4	0	4	1,800.00	0.00	1,800.00	1,785.00
Selenium	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Silica (SiO_2)	ug/L	22700			22400			22400			22600			4	0	4	22,700.00	0.00	22,700.00	22,525.00
Silver	ug/L	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Sodium	ug/L	3670			3580			3560			3590			4	0	4	3,670.00	0.00	3,670.00	3,600.00
Strontium	ug/L	78.8			77.9			78.1			78.1			4	0	4	78.80	0.00	78.80	78.23
Thallium	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Vanadium	ug/L	<10.0U	5	U	<10.0U	5	U	<10.0U	5	U	<10.0U	5	U	0	4	4	0.00	5.00	10.00	5.00
Zinc	ug/L	139			138			137			142			4	0	4	142.00	0.00	142.00	139.00

Footnotes:

Conc. Concentration of the Analyte
NA Not Available or Not Analyzed
MDL One-half of the reported Method Detection Limit (MDL) was substituted for the Non-Detected values in order to derive the average.
Max. Maximum
No. Number
ND Non-Detected result
Qual. Analytical Qualifier (refer to definitions below)
U Result occurs below MDL
J Result occurs between the MDL and the Reporting Limit, therefore this value is estimated.

Table A-22. Summary of Dissolved Metals Results for RG-8, September 2010.

Analytes	Units	RG -8-1			RG -8-2			RG -8-3			RG -8-4			No. of Detects	No. of NDs	No. of Samples	Max. Detect	Max. ND	MAXIMUM	AVERAGE
		Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.							
Aluminum	ug/L	<20.00	10.00	U	<20.00	10.00	U	<20.00	10.00	U	<20.00	10.00	U	0	4	4	0.00	10.00	20.00	10.00
Antimony	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Arsenic	ug/L	0.98		J	0.83		J	0.89		J	0.95		J	4	0	4	0.98	0.00	0.98	0.91
Beryllium	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Cadmium	ug/L	0.53			0.56			0.52			0.60			4	0	4	0.60	0.00	0.60	0.55
Calcium	ug/L	10,600.00			10,600.00			10,500.00			10,500.00			4	0	4	10,600.00	0.00	10,600.00	10,550.00
Chromium	ug/L	0.57		J	<0.500	0.25	U	0.55		J	<0.500	0.25	U	2	2	4	0.57	0.25	0.57	0.41
Copper	ug/L	<0.500	0.25	U	<0.500	0.25		<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Iron	ug/L	<100	50.00	U	<100	50.00	U	<100	50.00	U	<100	50.00	U	0	4	4	0.00	50.00	100.00	50.00
Lead	ug/L	0.21			0.23			0.22			0.23			4	0	4	0.23	0.00	0.23	0.22
Magnesium	ug/L	1,660.00			1,660.00			1,640.00			1,650.00			4	0	4	1,660.00	0.00	1,660.00	1,652.50
Manganese	ug/L	5.41			5.33			5.51			5.88			4	0	4	5.88	0.00	5.88	5.53
Mercury	ug/L	NA			NA			NA			NA			NA	NA	NA	NA	NA	NA	NA
Nickel	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Potassium	ug/L	1,830.00			1,830.00			1,820.00			1,840.00			4	0	4	1,840.00	0.00	1,840.00	1,830.00
Selenium	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Silica (SiO2)	ug/L	23,000.00			22,900.00			22,800.00			23,200.00			4	0	4	23,200.00	0.00	23,200.00	22,975.00
Silver	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Sodium	ug/L	3,730.00			3,710.00			3,700.00			3,730.00			4	0	4	3,730.00	0.00	3,730.00	3,717.50
Strontium	ug/L	80.80			80.40			80.70			80.30			4	0	4	80.80	0.00	80.80	80.55
Thallium	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Vanadium	ug/L	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	0	4	4	0.00	5.00	10.00	5.00
Zinc	ug/L	132.00			131.00			130.00			132.00			4	0	4	132.00	0.00	132.00	131.25
Hardness	mg/L	33.00			33.00			33.00			33.00			4	0	4	33.00	NA	33.00	33.00

Footnotes:

Conc. Concentration of the Analyte
NA Not Available or Not Analyzed
MDL One-half of the reported Method Detection Limit (MDL) was substituted for the Non-Detected values in order to derive the average.
Max. Maximum
No. Number
ND Non-Detected result
Qual. Analytical Qualifier (refer to definitions below)
U Result occurs below MDL
J Result occurs between the MDL and the Reporting Limit, therefore this value is estimated.

Table A-23. Summary of Total Metals Results for RG-8, September 2010.

Analytes	Units	RG -8-1			RG -8-2			RG -8-3			RG -8-4			No. of Detects	No. of NDs	No. of Samples	Max. Detect	Max. ND	MAXIMUM	AVERAGE
		Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.							
Aluminum	ug/L	76.4			79.4			99.5			90.5			4	0	4	99.50	0.00	99.50	86.45
Antimony	ug/L	NA			NA			NA			NA			0	0	0	0.00	0.00	NA	NA
Arsenic	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Beryllium	ug/L	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Cadmium	ug/L	0.514			0.782			<0.500U	0.25	U	0.505			3	1	4	0.78	0.25	0.78	0.51
Calcium	ug/L	10400			10500			10500			10400			4	0	4	10,500.00	0.00	10,500.00	10,450.00
Chromium	ug/L	4.18			4.41			4.55			4.35			4	0	4	4.55	0.00	4.55	4.37
Copper	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Iron	ug/L	183			184			195			201			4	0	4	201.00	0.00	201.00	190.75
Lead	ug/L	1.4			1.21			1.45			1.6			4	0	4	1.60	0.00	1.60	1.42
Magnesium	ug/L	1600			1610			1620			1600			4	0	4	1,620.00	0.00	1,620.00	1,607.50
Manganese	ug/L	15.4			15.3			16.3			16.6			4	0	4	16.60	0.00	16.60	15.90
Mercury	ug/L	NA			NA			NA			NA			NA	NA	NA	NA	NA	NA	NA
Nickel	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Potassium	ug/L	1760			1790			1790			1770			4	0	4	1,790.00	0.00	1,790.00	1,777.50
Selenium	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Silica (SiO_2)	ug/L	22600			22700			22900			22800			4	0	4	22,900.00	0.00	22,900.00	22,750.00
Silver	ug/L	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Sodium	ug/L	3600			3620			3650			3600			4	0	4	3,650.00	0.00	3,650.00	3,617.50
Strontium	ug/L	78			77.7			77.6			76.8			4	0	4	78.00	0.00	78.00	77.53
Thallium	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Vanadium	ug/L	<10.0U	5	U	<10.0U	5	U	<10.0U	5	U	<10.0U	5	U	0	4	4	0.00	5.00	10.00	5.00
Zinc	ug/L	144			143			145			141			4	0	4	145.00	0.00	145.00	143.25

Footnotes:

- Conc. Concentration of the Analyte
- NA Not Available or Not Analyzed
- MDL One-half of the reported Method Detection Limit (MDL) was substituted for the Non-Detected values in order to derive the average.
- Max. Maximum
- No. Number
- ND Non-Detected result
- Qual. Analytical Qualifier (refer to definitions below)
  - U Result occurs below MDL
  - J Result occurs between the MDL and the Reporting Limit, therefore this value is estimated.

Table A-24. Summary of Dissolved Metals Results for RG-9, September 2010.

Analytes	Units	RG -9-1			RG -9-2			RG -9-3			RG -9-4			No. of Detects	No. of NDs	No. of Samples	Max. Detect	Max. ND	MAXIMUM	AVERAGE
		Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.							
Aluminum	ug/L	<20.00	10.00	U	<20.00	10.00	U	<20.00	10.00	U	<20.00	10.00	U	0	4	4	0.00	10.00	20.00	10.00
Antimony	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Arsenic	ug/L	0.92		J	0.94		J	1.05		J	0.88		J	4	0	4	1.05	0.00	1.05	0.95
Beryllium	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0	4	4	0.00	0.05	0.10	0.05
Cadmium	ug/L	0.48			0.51			0.48			0.53			4	0	4	0.53	0.00	0.53	0.50
Calcium	ug/L	10,900.00			10,700.00			10,700.00			10,900.00			4	0	4	10,900.00	0.00	10,900.00	10,800.00
Chromium	ug/L	<0.500	0.25	U	0.57		J	0.51		J	0.52		J	3	1	4	0.57	0.25	0.57	0.46
Copper	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0.50		J	1	3	4	0.50	0.25	0.50	0.31
Iron	ug/L	<100	50.00	U	<100	50.00	U	<100	50.00	U	<100	50.00	U	0	4	4	0.00	50.00	100.00	50.00
Lead	ug/L	0.23			0.22			0.22			0.25			4	0	4	0.25	0.00	0.25	0.23
Magnesium	ug/L	1,660.00			1,650.00			1,650.00			1,670.00			4	0	4	1,670.00	0.00	1,670.00	1,657.50
Manganese	ug/L	5.25			5.25			5.14			5.24			4	0	4	5.25	0.00	5.25	5.22
Mercury	ug/L	NA			NA			NA			NA			NA	NA	NA	NA	NA	NA	NA
Nickel	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Potassium	ug/L	1,850.00			1,830.00			1,810.00			1,840.00			4	0	4	1,850.00	0.00	1,850.00	1,832.50
Selenium	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Silica (SiO2)	ug/L	23,000.00			23,100.00			22,900.00			23,000.00			4	0	4	23,100.00	0.00	23,100.00	23,000.00
Silver	ug/L	<0.100	0.05	U	<0.100	0.05	U	<0.100	0.05	U	0.12		J	1	3	4	0.12	0.05	0.12	0.07
Sodium	ug/L	3,800.00			3,770.00			3,770.00			3,800.00			4	0	4	3,800.00	0.00	3,800.00	3,785.00
Strontium	ug/L	81.30			81.20			81.20			80.40			4	0	4	81.30	0.00	81.30	81.03
Thallium	ug/L	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	<0.500	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Vanadium	ug/L	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	<10.0	5.00	U	0	4	4	0.00	5.00	10.00	5.00
Zinc	ug/L	124.00			126.00			123.00			126.00			4	0	4	126.00	0.00	126.00	124.75
Hardness	mg/L	34.00			34.00			34.00			34.00			4	0	4	34.00	NA	34.00	34.00

Footnotes:

Conc. Concentration of the Analyte
NA Not Available or Not Analyzed
MDL One-half of the reported Method Detection Limit (MDL) was substituted for the Non-Detected values in order to derive the average.
Max. Maximum
No. Number
ND Non-Detected result
Qual. Analytical Qualifier (refer to definitions below)
U Result occurs below MDL
J Result occurs between the MDL and the Reporting Limit, therefore this value is estimated.

Table A-25. Summary of Total Metals Results for RG-9, September 2010.																				
Analytes	**Units**	**RG -9-1**			**RG -9-2**			**RG -9-3**			**RG -9-4**			**No. of Detects**	**No. of NDs**	**No. of Samples**	**Max. Detect**	**Max. ND**	**MAXIMUM**	**AVERAGE**
		Conc.	**MDL**	**Qual.**	**Conc.**	**MDL**	**Qual.**	**Conc.**	**MDL**	**Qual.**	**Conc.**	**MDL**	**Qual.**							
Aluminum	ug/L	234			97.7			81.6			78.2			4	0	4	234.00	0.00	234.00	122.88
Antimony	ug/L	NA			NA			NA			<2.50U	1.25	U	0	1	1	0.00	1.25	2.50	1.25
Arsenic	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Beryllium	ug/L	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Cadmium	ug/L	0.545			<0.500U	0.25	U	0.664			1.07			3	1	4	1.07	0.25	1.07	0.63
Calcium	ug/L	10600			10800			10600			10100			4	0	4	10,800.00	0.00	10,800.00	10,525.00
Chromium	ug/L	4.74			4.26			4.1			3.37			4	0	4	4.74	0.00	4.74	4.12
Copper	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Iron	ug/L	289			190			181			185			4	0	4	289.00	0.00	289.00	211.25
Lead	ug/L	1.36			1.25			1.22			1.46			4	0	4	1.46	0.00	1.46	1.32
Magnesium	ug/L	1630			1630			1600			1560			4	0	4	1,630.00	0.00	1,630.00	1,605.00
Manganese	ug/L	19.8			14.3			14.5			15.9			4	0	4	19.80	0.00	19.80	16.13
Mercury	ug/L	NA			NA			NA			NA			NA	NA	NA	NA	NA	NA	NA
Nickel	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Potassium	ug/L	1780			1810			1770			1760			4	0	4	1,810.00	0.00	1,810.00	1,780.00
Selenium	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Silica (SiO2)	ug/L	23000			22600			22600			22800			4	0	4	23,000.00	0.00	23,000.00	22,750.00
Silver	ug/L	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	<0.500U	0.25	U	0	4	4	0.00	0.25	0.50	0.25
Sodium	ug/L	3610			3710			3650			3590			4	0	4	3,710.00	0.00	3,710.00	3,640.00
Strontium	ug/L	76.9			77.2			77			80.9			4	0	4	80.90	0.00	80.90	78.00
Thallium	ug/L	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	<2.50U	1.25	U	0	4	4	0.00	1.25	2.50	1.25
Vanadium	ug/L	<10.0U	5	U	<10.0U	5	U	<10.0U	5	U	<10.0U	5	U	0	4	4	0.00	5.00	10.00	5.00
Zinc	ug/L	136			137			137			133			4	0	4	137.00	0.00	137.00	135.75

Footnotes:

Conc. Concentration of the Analyte
NA Not Available or Not Analyzed
MDL One-half of the reported Method Detection Limit (MDL) was substituted for the Non-Detected values in order to derive the average.
Max. Maximum
No. Number
ND Non-Detected result
Qual. Analytical Qualifier (refer to definitions below)
U Result occurs below MDL
J Result occurs between the MDL and the Reporting Limit, therefore this value is estimated.

Table A-26. Summary of Sediment Metals Results for Rio Grande River Sample Locations, September 2010.

Analytes	Units	RG -2			RG -4			RG -8			RG -9			No. of Detects	No. of NDs	No. of Samples	Max. Detect	Max. ND	MAXIMUM
		Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.	Conc.	MDL	Qual.						
Aluminum	ug/Kg	12,000,000		D	10,400,000		D	12,700,000		D	14,300,000		D	4	0	4	14300000	0.00	14300000
Antimony	ug/Kg	<500	250	U	564		JD	799		JD	948		JD	3	1	4	948	250.00	948
Arsenic	ug/Kg	4,880		D	14,700		D	20,800		D	23,900		D	4	0	4	23900	0.00	23900
Beryllium	ug/Kg	744		D	730		D	810		D	999		D	4	0	4	999	0.00	999
Cadmium	ug/Kg	302		D	8,620		D	11,400		D	15,100		D	4	0	4	15100	0.00	15100
Calcium	ug/Kg	5,750,000		D	5,940,000		D	7,640,000		D	7,650,000		D	4	0	4	7650000	0.00	7650000
Chromium	ug/Kg	7,650		D	9,050		D	7,340		D	10,600		D	4	0	4	10600	0.00	10600
Copper	ug/Kg	12,200		D	19,700		D	20,000		D	23,800		D	4	0	4	23800	0.00	23800
Iron	ug/Kg	26,800,000		D	23,600,000		D	22,500,000		D	27,900,000		D	4	0	4	27900000	0.00	27900000
Lead	ug/Kg	12,100		D	378,000		D	332,000		D	387,000		D	4	0	4	387000	0.00	387000
Magnesium	ug/Kg	3,550,000		D	3,140,000		D	3,820,000		D	4,250,000		D	4	0	4	4250000	0.00	4250000
Manganese	ug/Kg	662,000		D	1,120,000		D	1,010,000		D	884,000		D	4	0	4	1120000	0.00	1120000
Mercury	ug/Kg	NA			NA			NA			NA			NA	NA	NA	NA	NA	NA
Nickel	ug/Kg	5,450		D	6,230		D	5,630		D	7,130		D	4	0	4	7130	0.00	7130
Potassium	ug/Kg	1,840,000		D	1,640,000		D	2,380,000		D	2,390,000		D	4	0	4	2390000	0.00	2390000
Selenium	ug/Kg	900		JD	673		JD	1,130		D	1250		D	4	0	4	1250	0.00	1250
Silica (SiO2)	ug/Kg	4,110,000		D	4,610,000		D	5,130,000		D	4,620,000		D	4	0	4	5130000	0.00	5130000
Silver	ug/Kg	109		JD	832		D	836		D	964		D	4	0	4	964	0.00	964
Sodium	ug/Kg	471,000		JD	414,000		JD	415,000		JD	455,000		JD	4	0	4	471000	0.00	471000
Strontium	ug/Kg	92,600		D	79,900		D	136,000		D	129,000		D	4	0	4	136000	0.00	136000
Thallium	ug/Kg	<500	250	U	1,110		D	630		JD	607		JD	3	1	4	1110	250.00	1110
Vanadium	ug/Kg	44,100		JD	39,000		JD	32,000		JD	44,000		JD	4	0	4	44100	0.00	44100
Zinc	ug/Kg	62,600		D	1,150,000		D	1,420,000		D	1,780,000		D	4	0	4	1780000	0.00	1780000

Footnotes:

Conc. Concentration of the Analyte
NA Not Available or Not Analyzed
MDL Method Detection Limit
Max. Maximum
No. Number
ND Non-Detected result
Qual. Analytical Qualifier (refer to definitions below)
- U Result occurs below MDL
- J Result occurs between the MDL and the Reporting Limit, therefore this value is estimated.
- D Value back-calculated based on dillution.

APPENDIX B

ANALYSIS AND INTERPRETATION OF THE RAINBOW TROUT ACUTE TOXICITY TEST RESULTS

Note: The original text and figures from Appendix B were fully incorporated in the final version of the baseline ecological risk assessment. As such, Appendix B is no longer available as a stand-alone report.

APPENDIX C

TIMBERLINE AQUATICS BENTHIC MACROINVERTEBRATE COMMUNITY MEASURES

Timberline Aquatics, Inc.

January 25, 2010

Mr. Steve Auer
TechLaw
16194 W. 45th Drive
Denver, CO 80403

Dear Mr. Auer,

Enclosed are the results from the analysis of 9 benthic macroinvertebrate samples collected for the Nelson Tunnel Project during the fall of 2010. Data are reported as number of organisms per sample. Please contact me if you have any questions.

Sincerely,

Timberline Aquatics, Inc.

David E. Rees
President

Enc.

/dr

4219 Table Mountain Place, Suite A ◈ Fort Collins, CO 80526
Phone: (970) 266-9222 ◈ Web: http://www.timberlineaquatics.com ◈ E-mail: drees@timberlineaquatics.com

Nelson Tunnel Macroinvertebrate Data
Site: RG - 2 - 1
20 Sept. 2010

			REP 1
INSECTA			
EPHEMEROPTERA			**136**
	Ameletidae	*Ameletus* sp.	1
	Baetidae	*Acentrella* sp.	4
	Baetidae	*Baetis* (*tricaudatus*)	1
	Ephemerellidae	*Drunella doddsi*	1
	Ephemerellidae	*Drunella grandis*	1
	Ephemerellidae	*Ephemerella dorothea infrequens*	7
	Heptageniidae	*Rhithrogena* sp.	121
PLECOPTERA			**34**
	Pteronarcyidae	*Pteronarcella badia*	10
	Pteronarcyidae	*Pteronarcys californica*	11
	Chloroperlidae	Chloroperlidae	1
	Perlodidae	*Isogenoides* sp.	3
	Perlodidae	*Isoperla* sp.	1
	Perlodidae	*Skwala americana*	1
	Perlidae	*Claassenia sabulosa*	7
TRICHOPTERA			**102**
	Brachycentridae	*Brachycentrus occidentalis*	5
	Glossosomatidae	*Culoptila sp.*	4
	Glossosomatidae	*Glossosoma* sp.	38
	Hydropsychidae	*Hydropsyche* sp.	11
	Lepidostomatidae	*Lepidostoma* sp.	41
	Uenoidae	*Oligophlebodes* sp.	3
DIPTERA			**31**
	Chironomidae	Chironomidae	26
	Athericidae	*Atherix pachypus*	4
	Tipulidae	*Hexatoma* sp.	1
COLEOPTERA			**61**
	Elmidae	*Optioservus* sp.	28
	Elmidae	*Zaitzevia parvula*	33
HYDRACARINA			**1**
	Lebertiidae	*Lebertia* sp.	1
TURBELLARIA			**1**
	Planariidae	Polycelis coronata	1

NEMATODA			**1**
	Nematoda	Nematoda	1

Total Number (#/sample)	367
Number of Taxa	28
Shannon Weaver Diversity (H')	3.42
Hilsenhoff Biotic Index (HBI)	1.57
Total EPT Taxa	20
EPT Index (% of total number of taxa)	71.4%
Ephemeroptera Abundance (% of total number)	37.1%
# Ephemeroptera Taxa	7
# Plecoptera Taxa	7
# Trichoptera Taxa	6
% EPT (% of Total Number)	74.1%
# Intolerant Taxa	20
Tolerant Organisms (% of Total Number)	0.3%
Dominant Taxon (% of Total Number)	33.0%
Filterers (% of Total Number)	4.4%
Scrapers (% of Total Number)	53.4%
# Clinger Taxa	19
Clingers (% of Total Number)	78.2%

Nelson Tunnel Macroinvertebrate Data
Site: RG - 2 - 2
20 Sept. 2010

		REP 1
INSECTA		
EPHEMEROPTERA		**164**
Baetidae	*Baetis* (*tricaudatus*)	4
Ephemerellidae	*Drunella doddsi*	8
Ephemerellidae	*Drunella grandis*	3
Ephemerellidae	*Ephemerella dorothea infrequens*	13
Heptageniidae	*Rhithrogena* sp.	136
PLECOPTERA		**41**
Pteronarcyidae	*Pteronarcella badia*	16
Pteronarcyidae	*Pteronarcys californica*	9
Chloroperlidae	Chloroperlidae	5
Perlidae	*Claassenia sabulosa*	9
Perlidae	*Hesperoperla pacifica*	2
TRICHOPTERA		**380**
Brachycentridae	*Brachycentrus occidentalis*	2
Glossosomatidae	*Glossosoma* sp.	302
Hydropsychidae	*Arctopsyche grandis*	1
Hydropsychidae	*Hydropsyche* sp.	67
Uenoidae	*Oligophlebodes* sp.	8
DIPTERA		**64**
Chironomidae	Chironomidae	27
Athericidae	*Atherix pachypus*	21
Blephariceridae	*Bibiocephala* sp.	2
Simuliidae	*Simulium* sp.	1
Tanyderidae	*Protanyderus margarita*	1
Tipulidae	*Hexatoma* sp.	11
Empididae	*Chelifera/Neoplasta* sp.	1
COLEOPTERA		**215**
Elmidae	*Narpus concolor*	2
Elmidae	*Optioservus* sp.	102
Elmidae	*Zaitzevia parvula*	111
HYDRACARINA		**8**
Protziidae	*Protzia* sp.	1
Sperchontidae	*Sperchon* sp.	7
Total Number (#/sample)		872
Number of Taxa		27
Shannon Weaver Diversity (H')		3.09
Hilsenhoff Biotic Index (HBI)		1.73

Total EPT Taxa	15
EPT Index (% of total number of taxa)	55.6%
Ephemeroptera Abundance (% of total number)	18.8%
# Ephemeroptera Taxa	5
# Plecoptera Taxa	5
# Trichoptera Taxa	5
% EPT (% of Total Number)	67.1%
# Intolerant Taxa	17
Tolerant Organisms (% of Total Number)	0.9%
Dominant Taxon (% of Total Number)	34.6%
Filterers (% of Total Number)	8.1%
Scrapers (% of Total Number)	64.3%
# Clinger Taxa	21
Clingers (% of Total Number)	92.5%

Nelson Tunnel Macroinvertebrate Data
Site: RG - 2 - 3
20 Sept. 2010

			REP 1
INSECTA			
EPHEMEROPTERA			**164**
	Baetidae	*Acentrella* sp.	6
	Baetidae	*Baetis* (*tricaudatus*)	4
	Ephemerellidae	*Drunella grandis*	19
	Ephemerellidae	*Ephemerella dorothea infrequens*	19
	Heptageniidae	*Rhithrogena* sp.	116
PLECOPTERA			**94**
	Pteronarcyidae	*Pteronarcella badia*	19
	Pteronarcyidae	*Pteronarcys californica*	60
	Perlodidae	*Isoperla* sp.	2
	Perlidae	*Claassenia sabulosa*	11
	Perlidae	*Hesperoperla pacifica*	2
TRICHOPTERA			**246**
	Brachycentridae	*Brachycentrus occidentalis*	56
	Glossosomatidae	*Culoptila sp.*	11
	Glossosomatidae	*Glossosoma* sp.	129
	Hydropsychidae	*Hydropsyche* sp.	28
	Lepidostomatidae	*Lepidostoma* sp.	13
	Uenoidae	*Oligophlebodes* sp.	9
DIPTERA			**43**
	Chironomidae	Chironomidae	24
	Athericidae	*Atherix pachypus*	9
	Blephariceridae	*Bibiocephala* sp.	6
	Tipulidae	*Hexatoma* sp.	2
	Empididae	*Chelifera*/*Neoplasta* sp.	2
COLEOPTERA			**131**
	Elmidae	*Optioservus* sp.	77
	Elmidae	*Zaitzevia parvula*	54
HYDRACARINA			**4**
	Sperchontidae	*Sperchon* sp.	4

Total Number (#/sample)	682
Number of Taxa	24
Shannon Weaver Diversity (H')	3.71
Hilsenhoff Biotic Index (HBI)	1.50
Total EPT Taxa	16
EPT Index (% of total number of taxa)	66.7%
Ephemeroptera Abundance (% of total number)	24.2%

# Ephemeroptera Taxa	5
# Plecoptera Taxa	5
# Trichoptera Taxa	6
% EPT (% of Total Number)	73.9%
# Intolerant Taxa	16
Tolerant Organisms (% of Total Number)	0.6%
Dominant Taxon (% of Total Number)	18.9%
Filterers (% of Total Number)	12.3%
Scrapers (% of Total Number)	53.8%
# Clinger Taxa	17
Clingers (% of Total Number)	91.2%

Nelson Tunnel Macroinvertebrate Data
Site: RG - 4 - 1
20 Sept. 2010

			REP 1
INSECTA			
EPHEMEROPTERA			**576**
	Baetidae	*Baetis* (*tricaudatus*)	3
	Ephemerellidae	*Drunella doddsi*	132
	Heptageniidae	*Rhithrogena* sp.	441
PLECOPTERA			**37**
	Pteronarcyidae	*Pteronarcella badia*	18
	Pteronarcyidae	*Pteronarcys californica*	1
	Perlodidae	*Isoperla* sp.	3
	Perlidae	*Claassenia sabulosa*	15
TRICHOPTERA			**195**
	Glossosomatidae	*Culoptila sp.*	27
	Glossosomatidae	*Glossosoma* sp.	141
	Hydropsychidae	*Hydropsyche* sp.	27
DIPTERA			**73**
	Chironomidae	Chironomidae	9
	Athericidae	*Atherix pachypus*	27
	Blephariceridae	*Bibiocephala* sp.	36
	Tipulidae	*Hexatoma* sp.	1
COLEOPTERA			**66**
	Elmidae	*Optioservus* sp.	33
	Elmidae	*Zaitzevia parvula*	33
HYDRACARINA			**3**
	Protziidae	*Protzia* sp.	3

Total Number (#/sample)	950
Number of Taxa	17
Shannon Weaver Diversity (H')	2.64
Hilsenhoff Biotic Index (HBI)	0.60
Total EPT Taxa	10
EPT Index (% of total number of taxa)	58.8%
Ephemeroptera Abundance (% of total number)	60.6%
# Ephemeroptera Taxa	3
# Plecoptera Taxa	4
# Trichoptera Taxa	3
% EPT (% of Total Number)	85.1%
# Intolerant Taxa	11

Tolerant Organisms (% of Total Number)	0.3%
Dominant Taxon (% of Total Number)	46.4%
Filterers (% of Total Number)	2.8%
Scrapers (% of Total Number)	85.3%
# Clinger Taxa	13
Clingers (% of Total Number)	95.8%

Nelson Tunnel Macroinvertebrate Data
Site: RG - 4 - 2
20 Sept. 2010

		REP 1
INSECTA		
EPHEMEROPTERA		**474**
Baetidae	*Baetis* (*tricaudatus*)	6
Ephemerellidae	*Drunella doddsi*	207
Heptageniidae	*Rhithrogena* sp.	261
PLECOPTERA		**54**
Pteronarcyidae	*Pteronarcella badia*	27
Pteronarcyidae	*Pteronarcys californica*	9
Perlodidae	*Isogenoides* sp.	12
Perlidae	*Claassenia sabulosa*	6
TRICHOPTERA		**231**
Brachycentridae	*Brachycentrus americanus*	3
Glossosomatidae	*Culoptila sp.*	96
Glossosomatidae	*Glossosoma* sp.	99
Hydropsychidae	*Hydropsyche* sp.	18
Lepidostomatidae	*Lepidostoma* sp.	9
Uenoidae	*Oligophlebodes* sp.	6
DIPTERA		**102**
Chironomidae	Chironomidae	12
Athericidae	*Atherix pachypus*	6
Blephariceridae	*Bibiocephala* sp.	75
Simuliidae	*Simulium* sp.	6
Empididae	*Chelifera*/*Neoplasta* sp.	3
COLEOPTERA		**57**
Elmidae	*Optioservus* sp.	33
Elmidae	*Zaitzevia parvula*	24
HYDRACARINA		**3**
Sperchontidae	*Sperchon* sp.	3

Total Number (#/sample)	921
Number of Taxa	21
Shannon Weaver Diversity (H')	3.16
Hilsenhoff Biotic Index (HBI)	0.59
Total EPT Taxa	13
EPT Index (% of total number of taxa)	61.9%
Ephemeroptera Abundance (% of total number)	51.5%

# Ephemeroptera Taxa	3
# Plecoptera Taxa	4
# Trichoptera Taxa	6
% EPT (% of Total Number)	82.4%
# Intolerant Taxa	13
Tolerant Organisms (% of Total Number)	0.3%
Dominant Taxon (% of Total Number)	28.3%
Filterers (% of Total Number)	2.9%
Scrapers (% of Total Number)	84.4%
# Clinger Taxa	16
Clingers (% of Total Number)	96.1%

Nelson Tunnel Macroinvertebrate Data
Site: RG - 4 - 3
20 Sept. 2010

			REP 1
INSECTA			
EPHEMEROPTERA			**317**
	Ameletidae	*Ameletus* sp.	2
	Baetidae	*Baetis* (*tricaudatus*)	2
	Ephemerellidae	*Drunella doddsi*	64
	Heptageniidae	*Rhithrogena* sp.	249
PLECOPTERA			**76**
	Pteronarcyidae	*Pteronarcella badia*	36
	Pteronarcyidae	*Pteronarcys californica*	19
	Perlodidae	*Isogenoides* sp.	2
	Perlodidae	*Isoperla* sp.	4
	Perlodidae	*Skwala americana*	9
	Perlidae	*Claassenia sabulosa*	6
TRICHOPTERA			**228**
	Brachycentridae	*Brachycentrus occidentalis*	36
	Glossosomatidae	*Culoptila sp.*	34
	Glossosomatidae	*Glossosoma* sp.	69
	Hydropsychidae	*Hydropsyche* sp.	17
	Lepidostomatidae	*Lepidostoma* sp.	49
	Leptoceridae	*Oecetis* sp.	2
	Uenoidae	*Oligophlebodes* sp.	21
DIPTERA			**53**
	Chironomidae	Chironomidae	26
	Athericidae	*Atherix pachypus*	19
	Tipulidae	*Antocha* sp.	4
	Tipulidae	*Hexatoma* sp.	2
	Empididae	*Chelifera*/*Neoplasta* sp.	2
COLEOPTERA			**41**
	Elmidae	*Optioservus* sp.	13
	Elmidae	*Zaitzevia parvula*	28
HYDRACARINA			**6**
	Lebertiidae	*Lebertia* sp.	2
	Sperchontidae	*Sperchon* sp.	4
TURBELLARIA			**2**
	Planariidae	Polycelis coronata	2

Total Number (#/sample)	723
Number of Taxa	27
Shannon Weaver Diversity (H')	3.54
Hilsenhoff Biotic Index (HBI)	0.95
Total EPT Taxa	17
EPT Index (% of total number of taxa)	63.0%
Ephemeroptera Abundance (% of total number)	43.7%
# Ephemeroptera Taxa	4
# Plecoptera Taxa	6
# Trichoptera Taxa	7
% EPT (% of Total Number)	85.8%
# Intolerant Taxa	18
Tolerant Organisms (% of Total Number)	1.2%
Dominant Taxon (% of Total Number)	34.3%
Filterers (% of Total Number)	7.4%
Scrapers (% of Total Number)	61.9%
# Clinger Taxa	18
Clingers (% of Total Number)	85.3%

Nelson Tunnel Macroinvertebrate Data
Site: RG - 8 - 1
20 Sept. 2010

			REP 1
INSECTA			
EPHEMEROPTERA			**241**
	Baetidae	*Baetis* (*tricaudatus*)	5
	Ephemerellidae	*Drunella doddsi*	28
	Heptageniidae	*Rhithrogena* sp.	208
PLECOPTERA			**36**
	Pteronarcyidae	*Pteronarcella badia*	10
	Pteronarcyidae	*Pteronarcys californica*	8
	Chloroperlidae	Chloroperlidae	5
	Perlodidae	*Isogenoides* sp.	3
	Perlidae	*Claassenia sabulosa*	10
TRICHOPTERA			**440**
	Brachycentridae	*Brachycentrus occidentalis*	10
	Glossosomatidae	*Culoptila sp.*	95
	Glossosomatidae	*Glossosoma* sp.	270
	Hydropsychidae	*Hydropsyche* sp.	40
	Lepidostomatidae	*Lepidostoma* sp.	25
DIPTERA			**29**
	Chironomidae	Chironomidae	15
	Athericidae	*Atherix pachypus*	2
	Simuliidae	*Simulium* sp.	3
	Tipulidae	*Hexatoma* sp.	8
	Empididae	*Chelifera*/*Neoplasta* sp.	1
COLEOPTERA			**63**
	Elmidae	*Narpus concolor*	3
	Elmidae	*Optioservus* sp.	40
	Elmidae	*Zaitzevia parvula*	20
HYDRACARINA			**3**
	Sperchontidae	*Sperchon* sp.	3
TURBELLARIA			**3**
	Planariidae	Polycelis coronata	3
NEMATODA			**8**
	Nematoda	Nematoda	8

Total Number (#/sample)	823
Number of Taxa	24
Shannon Weaver Diversity (H')	3.04
Hilsenhoff Biotic Index (HBI)	0.85
Total EPT Taxa	13
EPT Index (% of total number of taxa)	54.2%
Ephemeroptera Abundance (% of total number)	29.3%
# Ephemeroptera Taxa	3
# Plecoptera Taxa	5
# Trichoptera Taxa	5
% EPT (% of Total Number)	87.4%
# Intolerant Taxa	14
Tolerant Organisms (% of Total Number)	0.3%
Dominant Taxon (% of Total Number)	33.0%
Filterers (% of Total Number)	6.4%
Scrapers (% of Total Number)	78.2%
# Clinger Taxa	16
Clingers (% of Total Number)	92.0%

Nelson Tunnel Macroinvertebrate Data
Site: RG - 8 - 2
20 Sept. 2010

		REP 1
INSECTA		
EPHEMEROPTERA		**330**
Baetidae	*Acentrella* sp.	1
Baetidae	*Baetis* (*tricaudatus*)	2
Ephemerellidae	*Drunella doddsi*	59
Heptageniidae	*Rhithrogena* sp.	268
PLECOPTERA		**35**
Pteronarcyidae	*Pteronarcella badia*	12
Pteronarcyidae	*Pteronarcys californica*	2
Chloroperlidae	Chloroperlidae	2
Perlodidae	*Isoperla* sp.	1
Perlidae	*Claassenia sabulosa*	18
TRICHOPTERA		**167**
Brachycentridae	*Brachycentrus occidentalis*	3
Glossosomatidae	*Culoptila sp.*	11
Glossosomatidae	*Glossosoma* sp.	97
Hydropsychidae	*Hydropsyche* sp.	56
DIPTERA		**36**
Chironomidae	Chironomidae	10
Athericidae	*Atherix pachypus*	14
Blephariceridae	*Bibiocephala* sp.	4
Simuliidae	*Simulium* sp.	4
Tipulidae	*Dicranota* sp.	1
Tipulidae	*Hexatoma* sp.	2
Empididae	*Chelifera*/*Neoplasta* sp.	1
COLEOPTERA		**39**
Dytiscidae	*Oreodytes* sp.	1
Elmidae	*Optioservus* sp.	15
Elmidae	*Zaitzevia parvula*	23
HYDRACARINA		**3**
Sperchontidae	*Sperchon* sp.	3
NEMATODA		**1**
Nematoda	Nematoda	1
Total Number (#/sample)		611
Number of Taxa		25

Shannon Weaver Diversity (H')	2.85
Hilsenhoff Biotic Index (HBI)	1.00
Total EPT Taxa	13
EPT Index (% of total number of taxa)	52.0%
Ephemeroptera Abundance (% of total number)	54.0%
# Ephemeroptera Taxa	4
# Plecoptera Taxa	5
# Trichoptera Taxa	4
% EPT (% of Total Number)	87.1%
# Intolerant Taxa	14
Tolerant Organisms (% of Total Number)	0.5%
Dominant Taxon (% of Total Number)	43.9%
Filterers (% of Total Number)	10.3%
Scrapers (% of Total Number)	74.3%
# Clinger Taxa	16
Clingers (% of Total Number)	94.6%

Nelson Tunnel Macroinvertebrate Data
Site: RG - 8 - 3
20 Sept. 2010

			REP 1
INSECTA			
EPHEMEROPTERA			**231**
	Baetidae	*Acentrella* sp.	2
	Baetidae	*Baetis* (*tricaudatus*)	4
	Ephemerellidae	*Drunella doddsi*	26
	Heptageniidae	*Rhithrogena* sp.	199
PLECOPTERA			**59**
	Pteronarcyidae	*Pteronarcella badia*	30
	Pteronarcyidae	*Pteronarcys californica*	2
	Chloroperlidae	Chloroperlidae	6
	Perlodidae	*Isogenoides* sp.	4
	Perlidae	*Claassenia sabulosa*	17
TRICHOPTERA			**334**
	Brachycentridae	*Brachycentrus occidentalis*	13
	Glossosomatidae	*Culoptila sp.*	24
	Glossosomatidae	*Glossosoma* sp.	199
	Hydropsychidae	*Hydropsyche* sp.	32
	Lepidostomatidae	*Lepidostoma* sp.	66
DIPTERA			**20**
	Chironomidae	Chironomidae	15
	Athericidae	*Atherix pachypus*	1
	Tipulidae	*Hexatoma* sp.	2
	Empididae	*Chelifera*/*Neoplasta* sp.	2
COLEOPTERA			**85**
	Elmidae	*Heterlimnius corpulentus*	2
	Elmidae	*Optioservus* sp.	66
	Elmidae	*Zaitzevia parvula*	17
HYDRACARINA			**2**
	Sperchontidae	*Sperchon* sp.	2
ANNELIDA			
OLIGOCHAETA			**2**
	Tubificidae	Tubificidae	2
Total Number (#/sample)			733
Number of Taxa			23
Shannon Weaver Diversity (H')			3.16

Hilsenhoff Biotic Index (HBI)	1.07
Total EPT Taxa	14
EPT Index (% of total number of taxa)	60.9%
Ephemeroptera Abundance (% of total number)	31.4%
# Ephemeroptera Taxa	4
# Plecoptera Taxa	5
# Trichoptera Taxa	5
% EPT (% of Total Number)	85.0%
# Intolerant Taxa	13
Tolerant Organisms (% of Total Number)	0.6%
Dominant Taxon (% of Total Number)	27.0%
Filterers (% of Total Number)	6.1%
Scrapers (% of Total Number)	69.9%
# Clinger Taxa	15
Clingers (% of Total Number)	87.1%

APPENDIX D

COMMUNITY RECEPTORS EXPOSURE, EFFECT, AND RISK ESTIMATES

Table D-1. Sediment Hazard Quotient Results for Rio Grande River Sample Locations, September 2010.

Analytes	Units	PEC	TEC	RG-2			RG-4			RG-8			RG-9		
				EPC	PEC HQ	TEC HQ	EPC	PEC HQ	TEC HQ	EPC	PEC HQ	TEC HQ	EPC	PEC HQ	TEC HQ
Aluminum[(a)]	ug/kg	59,572,000	25,519,000	12,000,000	<1	<1	10,400,000	<1	<1	12,700,000	<1	<1	14,300,000	<1	<1
Antimony	ug/kg	25,000	2,000	500	<1	<1	564	<1	<1	799	<1	<1	948	<1	<1
Arsenic	ug/kg	33,000	9,800	4,880	<1	<1	14,700	<1	**1.5**	20,800	<1	**2.1**	23,900	<1	**2.4**
Beryllium	ug/kg	NA	NA	744	no PEC	no TEC	730	no PEC	no TEC	810	no PEC	no TEC	999	no PEC	no TEC
Cadmium	ug/kg	5,000	1,000	302	<1	<1	8,620	**1.7**	**8.6**	11,400	**2.3**	**11**	15,100	**3.0**	**15**
Calcium	ug/kg	NA	NA	5,750,000	no PEC	no TEC	5,940,000	no PEC	no TEC	7,640,000	no PEC	no TEC	7,650,000	no PEC	no TEC
Chromium	ug/kg	111,000	43,000	7,650	<1	<1	9,050	<1	<1	7,340	<1	<1	10,600	<1	<1
Copper	ug/kg	149,000	32,000	12,200	<1	<1	19,700	<1	<1	20,000	<1	<1	23,800	<1	<1
Iron[(a)]	ug/kg	247,600,000	188,400,000	26,800,000	<1	<1	23,600,000	<1	<1	22,500,000	<1	<1	27,900,000	<1	<1
Lead	ug/kg	128,000	36,000	12,100	<1	<1	378,000	**3.0**	**11**	332,000	**2.6**	**9.2**	387,000	**3.0**	**11**
Magnesium	ug/kg	NA	NA	3,550,000	no PEC	no TEC	3,140,000	no PEC	no TEC	3,820,000	no PEC	no TEC	4,250,000	no PEC	no TEC
Manganese	ug/kg	1,184,000	631,000	662,000	<1	**1.05**	1,120,000	<1	**1.8**	1,010,000	<1	**1.6**	884,000	<1	**1.4**
Mercury	ug/kg	1,100	180	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	ug/kg	49,000	23,000	5,450	<1	<1	6,230	<1	<1	5,630	<1	<1	7,130	<1	<1
Potassium	ug/kg	NA	NA	1,840,000	no PEC	no TEC	1,640,000	no PEC	no TEC	2,380,000	no PEC	no TEC	2,390,000	no PEC	no TEC
Selenium	ug/kg	NA	NA	900	no PEC	no TEC	673	no PEC	no TEC	1,130	no PEC	no TEC	1,250	no PEC	no TEC
Silica (SiO2)	ug/kg	NA	NA	4,110,000	no PEC	no TEC	4,610,000	no PEC	no TEC	5,130,000	no PEC	no TEC	4,620,000	no PEC	no TEC
Silver	ug/kg	4,000	1,000	109	<1	<1	832	<1	<1	836	<1	<1	964	<1	<1
Sodium	ug/kg	NA	NA	471,000	no PEC	no TEC	414,000	no PEC	no TEC	415,000	no PEC	no TEC	455,000	no PEC	no TEC
Strontium	ug/kg	NA	NA	92,600	no PEC	no TEC	79,900	no PEC	no TEC	136,000	no PEC	no TEC	129,000	no PEC	no TEC
Thallium	ug/kg	NA	NA	500	no PEC	no TEC	1,110	no PEC	no TEC	630	no PEC	no TEC	607	no PEC	no TEC
Vanadium	ug/kg	NA	NA	44,100	no PEC	no TEC	39,000	no PEC	no TEC	32,000	no PEC	no TEC	44,000	no PEC	no TEC
Zinc	ug/kg	459,000	121,000	62,600	<1	<1	1,150,000	**2.5**	**9.5**	1,420,000	**3.1**	**12**	1,780,000	**3.9**	**15**

Footnotes:

EPC	Exposure Point Concentration
NA	Not Available or Not Analyzed
HQ	Hazard Quotient
PEC	Probable Effects Concentration
TEC	Theshold Effects Concentration

Table D-2. Willow Creek Sample Location Hazard Quotients, April 2010.

Analytes	Units	WW-M	WW-NT			WW-F			WW-E			W-I Average			W-J		
		EPC	EPC	Acute HQ	Chronic HQ	EPC	Acute HQ	Chronic HQ	EPC	Acute HQ	Chronic HQ	EPC	Acute HQ	Chronic HQ	EPC	Acute HQ	Chronic HQ
Aluminum	ug/L	NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA
Antimony	ug/L	NA	5.00	<1	<1	5.00	<1	<1	0.759	<1	<1	0.520	<1	<1	0.574	<1	<1
Arsenic	ug/L	NA	5.00	<1	<1	1.55	<1	<1	1.02	<1	<1	0.950	<1	<1	0.542	<1	<1
Beryllium	ug/L	NA	3.72	<1	**5.6**	0.220	<1	<1	0.140	<1	<1	0.100	<1	<1	0.100	<1	<1
Cadmium	ug/L	NA	132	**13.4**	**83.4**	13.4	**8.7**	**41.3**	55.0	**26.9**	**133.7**	30.6	**21.4**	**101.0**	32.4	**23.0**	**108.2**
Calcium	ug/L	NA	20,700	no TRV	no TRV	24,300	no TRV	no TRV	33,600	no TRV	no TRV	22,050	no TRV	no TRV	21,500	no TRV	no TRV
Chromium	ug/L	NA	5.00	<1	<1	5.00	<1	<1	5.00	<1	<1	0.500	<1	<1	0.500	<1	<1
Copper	ug/L	NA	13.7	<1	<1	4.04	<1	<1	13.8	**1.1**	**1.6**	5.06	<1	<1	5.66	<1	<1
Iron	ug/L	NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA
Lead	ug/L	NA	927	**2.3**	**58.5**	32.4	<1	**19.0**	276	**4.5**	**114.7**	19.4	<1	**12.5**	15.2	<1	**10.0**
Magnesium	ug/L	NA	14,400	no TRV	no TRV	2,160	no TRV	no TRV	2,940	no TRV	no TRV	2,150	no TRV	no TRV	2,160	no TRV	no TRV
Manganese	ug/L	NA	17,100	**3.2**	**5.8**	1,120	<1	<1	857	<1	<1	363	<1	<1	538	<1	<1
Mercury	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	ug/L	NA	9.03	<1	<1	0.502	<1	<1	1.28	<1	<1	0.540	<1	<1	0.723	<1	<1
Potassium	ug/L	NA	5,240	<1	no TRV	1,420	<1	no TRV	1,640	<1	no TRV	1,540	<1	no TRV	1,490	<1	no TRV
Selenium	ug/L	NA	0.500	<1	<1	0.500	<1	<1	0.760	<1	<1	0.610	<1	<1	0.888	<1	<1
Silica (SiO_2)	ug/L	NA	38,600	no TRV	no TRV	16,400	no TRV	no TRV	17,200	no TRV	no TRV	18,250	no TRV	no TRV	18,400	no TRV	no TRV
Silver	ug/L	NA	1.00	<1	<1	0.100	<1	**2.5**	0.100	<1	**1.4**	0.100	<1	**2.9**	0.100	<1	**2.9**
Sodium	ug/L	NA	59,000	no TRV	no TRV	6,590	no TRV	no TRV	8,660	no TRV	no TRV	6,140	no TRV	no TRV	5,810	no TRV	no TRV
Strontium	ug/L	NA	2,130	<1	**1.4**	254	<1	<1	316	<1	<1	180	<1	<1	174	<1	<1
Thallium	ug/L	NA	3.33	no TRV	<1	0.339	no TRV	<1	0.484	no TRV	<1	0.170	no TRV	<1	0.210	no TRV	<1
Vanadium	ug/L	NA	100	<1	**5.3**	10.0	<1	<1	10.0	<1	<1	10.0	<1	<1	10.0	<1	<1
Zinc	ug/L	NA	60,800	**77.3**	**102.1**	4,190	**36.2**	**47.8**	12,900	**83.7**	**110.5**	6,400	**60.0**	**79.2**	6,880	**65.5**	**86.4**
Hardness	mg/L	NA	576			70.0			96.0			64.0			63.0		

Footnotes:

NA	Not Available or Not Analyzed
EPC	Sample specific Exposure Point Concentration
HQ	Hazard Quotient
no TRV	No Toxicity Reference Value Available
TREC/NA	TRV for Aluminum, mercury and iron are based upon total recoverable results which are not available within the April 2010 dataset.

Table D-3. Willow Creek Sample Location Hazard Quotients, June 2010.

Analytes	Units	WW-M			WW-NT			WW-F			WW-E			W-I			W-J Average		
		EPC	Acute HQ	Chronic HQ	EPC	Acute HQ	Chronic HQ	EPC	Acute HQ	Chronic HQ	EPC	Acute HQ	Chronic HQ	EPC	Acute HQ	Chronic HQ	EPC	Acute HQ	Chronic HQ
Aluminum[(a)]	ug/L	101	<1	<1	877	<1	<1	122	<1	**1.1**	139	<1	**1.1**	159	<1	**2.2**	661	**1.2**	**8.1**
Antimony	ug/L	0.500	<1	<1	0.500	<1	<1	0.500	<1	<1	0.500	<1	<1	0.500	<1	<1	0.500	<1	<1
Arsenic	ug/L	0.500	<1	<1	2.11	<1	<1	0.540	<1	<1	0.685	<1	<1	1.19	<1	<1	1.27	<1	<1
Beryllium	ug/L	0.100	<1	<1	2.92	<1	**4.4**	0.100	<1	<1	0.100	<1	<1	0.100	<1	<1	0.100	<1	<1
Cadmium	ug/L	0.100	<1	<1	169	**25.2**	**148.5**	4.09	**4.9**	**21.3**	6.17	**7.0**	**30.8**	5.42	**8.7**	**36.4**	12.8	**19.0**	**80.8**
Calcium	ug/L	10,600	no TRV	no TRV	131,000	no TRV	no TRV	11,800	no TRV	no TRV	12,500	no TRV	no TRV	8,420	no TRV	no TRV	9,240	no TRV	no TRV
Chromium	ug/L	0.500	<1	<1	0.500	<1	<1	0.500	<1	<1	0.500	<1	<1	0.500	<1	<1	0.500	<1	<1
Copper	ug/L	0.500	<1	<1	64.5	**1.4**	**2.3**	1.88	<1	<1	3.35	<1	<1	2.49	<1	<1	3.07	<1	1.0
Iron[(a)]	ug/L	123	no TRV	<1	988	no TRV	<1	123	no TRV	<1	139	no TRV	<1	114	no TRV	<1	637	no TRV	<1
Lead	ug/L	0.100	<1	<1	1,410	**5.4**	**139.2**	19.9	<1	**25.2**	34.0	**1.6**	**40.5**	14.8	**1.1**	**27.4**	59.7	**3.9**	**101.2**
Magnesium	ug/L	1,260	no TRV	no TRV	10,900	no TRV	no TRV	1,320	no TRV	no TRV	1,360	no TRV	no TRV	904	no TRV	no TRV	1,025	no TRV	no TRV
Manganese	ug/L	6.06	<1	<1	8,800	**1.9**	**3.4**	155	<1	<1	172	<1	<1	49.0	<1	<1	80.6	<1	<1
Mercury	ug/L	0.100	no TRV	**10.0**	0.100	no TRV	**10.0**	0.100	no TRV	**10.0**	0.100	no TRV	**10.0**	0.100	no TRV	**10.0**	0.100	no TRV	**10.0**
Nickel	ug/L	0.500	<1	<1	7.34	<1	<1	0.500	<1	<1	0.500	<1	<1	0.500	<1	<1	0.500	<1	<1
Potassium	ug/L	641	<1	no TRV	4,820	<1	no TRV	827	<1	no TRV	893	<1	no TRV	890	<1	no TRV	1,140	<1	no TRV
Selenium	ug/L	0.500	<1	<1	6.23	<1	**1.4**	0.500	<1	<1	0.500	<1	<1	0.500	<1	<1	0.510	<1	<1
Silica (SiO2)	ug/L	10,800	no TRV	no TRV	40,500	no TRV	no TRV	12,500	no TRV	no TRV	12,800	no TRV	no TRV	15,700	no TRV	no TRV	16,600	no TRV	no TRV
Silver	ug/L	0.100	<1	**9.5**	0.680	<1	<1	0.100	<1	**8.1**	0.100	<1	**7.4**	0.100	<1	**14.5**	0.100	<1	**12.7**
Sodium	ug/L	2,450	no TRV	no TRV	41,200	no TRV	no TRV	3,110	no TRV	no TRV	3,330	no TRV	no TRV	2,910	no TRV	no TRV	3,210	no TRV	no TRV
Strontium	ug/L	123	<1	<1	1,320	<1	<1	130	<1	<1	136	<1	<1	70.0	<1	<1	78.6	<1	<1
Thallium	ug/L	0.500	no TRV	<1	3.85	no TRV	<1	0.500	no TRV	<1	0.500	no TRV	<1	0.500	no TRV	<1	0.500	no TRV	<1
Vanadium	ug/L	10.0	<1	<1	10.0	<1	<1	10.0	<1	<1	10.0	<1	<1	10.0	<1	<1	10.0	<1	<1
Zinc	ug/L	10.0	<1	<1	49,200	**93.3**	**123.2**	963	**15.6**	**20.6**	1,450	**22.4**	**29.6**	958	**21.1**	**27.9**	2,225	**45.7**	**60.4**
Hardness	mg/L	32.0			371			35.0			37.0			25.0			27.0		

Footnotes:

NA Not Available or Not Analyzed

EPC Sample specific Exposure Point Concentration

(a) Since the Surface Water TRV for aluminum and iron are based on the total fraction, the EPC for these analytes was derived from the total metals dataset.

no TRV no Toxicity Reference Value available

Table D-4. Willow Creek Sample Location Hazard Quotients, September 2010.

Analytes	Units	WW-M			WW-NT			WW-F			WW-E			W-I Average			W-J		
		EPC	Acute HQ	Chronic HQ	EPC	Acute HQ	Chronic HQ	EPC	Acute HQ	Chronic HQ	EPC	Acute HQ	Chronic HQ	EPC	Acute HQ	Chronic HQ	EPC	Acute HQ	Chronic HQ
Aluminum[(a)]	ug/L	133	<1	<1	630	<1	<1	155	<1	<1	168	<1	<1	52.7	<1	<1	67.0	<1	<1
Antimony	ug/L	0.500	<1	<1	5.00	<1	<1	0.500	<1	<1	0.500	<1	<1	0.500	<1	<1	0.500	<1	<1
Arsenic	ug/L	0.500	<1	<1	5.00	<1	<1	1.01	<1	<1	0.880	<1	<1	1.23	<1	<1	1.14	<1	<1
Beryllium	ug/L	0.100	<1	<1	4.00	<1	**6.1**	0.593	<1	<1	0.646	<1	<1	0.100	<1	<1	0.100	<1	<1
Cadmium	ug/L	0.100	<1	<1	131	**14.7**	**90.0**	28.7	**10.3**	**53.7**	37.9	**11.3**	**60.2**	19.1	**13.8**	**65.0**	20.6	**14.8**	**69.6**
Calcium	ug/L	16,400	no TRV	no TRV	184,000	no TRV	no TRV	47,800	no TRV	no TRV	59,800	no TRV	no TRV	21,200	no TRV	no TRV	21,200	no TRV	no TRV
Chromium	ug/L	0.500	<1	<1	5.00	<1	<1	0.500	<1	<1	0.500	<1	<1	0.500	<1	<1	0.500	<1	<1
Copper	ug/L	0.500	<1	<1	27.6	<1	<1	4.69	<1	<1	4.52	<1	<1	1.83	<1	<1	1.53	<1	<1
Iron[(a)]	ug/L	152	no TRV	<1	3,800	no TRV	**3.8**	837	no TRV	<1	853	no TRV	<1	100	no TRV	<1	100	no TRV	<1
Lead	ug/L	0.100	<1	<1	1,770	**4.9**	**125.1**	157	**1.7**	**44.7**	136	**1.2**	**30.7**	8.24	<1	**5.6**	30.5	<1	**20.5**
Magnesium	ug/L	1,860	no TRV	no TRV	13,500	no TRV	no TRV	4,020	no TRV	no TRV	4,880	no TRV	no TRV	2,070	no TRV	no TRV	2,160	no TRV	no TRV
Manganese	ug/L	16.4	<1	<1	10,600	**2.1**	**3.7**	1,960	<1	**1.1**	2,680	<1	**1.4**	102	<1	<1	79.2	<1	<1
Mercury	ug/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	ug/L	0.500	<1	<1	5.00	<1	<1	0.500	<1	<1	0.500	<1	<1	0.500	<1	<1	0.500	<1	<1
Potassium	ug/L	1,010	<1	no TRV	5,140	<1	no TRV	1,890	<1	no TRV	2,180	<1	no TRV	1,440	<1	no TRV	1,450	<1	no TRV
Selenium	ug/L	0.500	<1	<1	5.00	<1	**1.1**	0.865	<1	<1	1.06	<1	<1	0.500	<1	<1	0.500	<1	<1
Silica (SiO2)	ug/L	13,900	no TRV	no TRV	41,800	no TRV	no TRV	22,100	no TRV	no TRV	23,800	no TRV	no TRV	20,650	no TRV	no TRV	22,400	no TRV	no TRV
Silver	ug/L	0.100	<1	**4.5**	1.00	<1	<1	0.100	<1	<1	0.100	<1	<1	0.100	<1	**3.1**	0.100	<1	**3.0**
Sodium	ug/L	3,570	no TRV	no TRV	53,900	no TRV	no TRV	13,500	no TRV	no TRV	17,100	no TRV	no TRV	6,610	no TRV	no TRV	6,620	no TRV	no TRV
Strontium	ug/L	197	<1	<1	1,850	<1	**1.2**	501	<1	<1	631	<1	<1	182	<1	<1	181	<1	<1
Thallium	ug/L	0.500	no TRV	<1	5.00	no TRV	<1	0.839	no TRV	<1	1.19	no TRV	<1	0.500	no TRV	<1	0.500	no TRV	<1
Vanadium	ug/L	10.0	<1	<1	10.0	<1	<1	10.0	<1	<1	10.0	<1	<1	10.0	<1	<1	10.0	<1	<1
Zinc	ug/L	10.0	<1	<1	49,500	**69.7**	**92.0**	10,700	**50.6**	**66.8**	14,500	**56.2**	**74.2**	3,630	**35.3**	**46.6**	4,390	**42.4**	**56.0**
Hardness	mg/L	49.0			515			136			169			61.5			62.0		

Footnotes:

NA Not Available or Not Analyzed
EPC Sample specific Exposure Point Concentration
no TRV no Toxicity Reference Value available
(a) Since the Surface Water TRV for aluminum and iron are based on the total fraction, the EPC for these analytes was derived from the total metals dataset.

Table D-5. RG-2 Hazard Quotient Results, April 2010.							
Analytes	**Units**	**Maximum**			**Average**		
		EPC	**Acute HQ**	**Chronic HQ**	**EPC**	**Acute HQ**	**Chronic HQ**
Aluminum	ug/L	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA
Antimony	ug/L	0.500	<1	<1	0.250	<1	<1
Arsenic	ug/L	0.622	<1	<1	0.562	<1	<1
Beryllium	ug/L	0.100	<1	<1	0.050	<1	<1
Cadmium	ug/L	0.100	<1	<1	0.050	<1	<1
Calcium	ug/L	8,820	no TRV	no TRV	8,795	no TRV	no TRV
Chromium	ug/L	0.618	<1	<1	0.569	<1	<1
Copper	ug/L	0.500	<1	<1	2.50	<1	<1
Iron	ug/L	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA
Lead	ug/L	0.100	<1	<1	0.500	<1	<1
Magnesium	ug/L	1,600	no TRV	no TRV	1,598	no TRV	no TRV
Manganese	ug/L	21.8	<1	<1	21.7	<1	<1
Mercury	ug/L	NA	NA	NA	NA	NA	NA
Nickel	ug/L	0.500	<1	<1	0.250	<1	<1
Potassium	ug/L	2,420	<1	no TRV	2,398	<1	no TRV
Selenium	ug/L	0.500	<1	<1	0.250	<1	<1
Silica (SiO2)	ug/L	19,500	no TRV	no TRV	19,475	no TRV	no TRV
Silver	ug/L	0.100	<1	**11.2**	0.050	<1	**5.8**
Sodium	ug/L	3,200	no TRV	no TRV	3,188	no TRV	no TRV
Strontium	ug/L	69.5	<1	<1	69.5	<1	<1
Thallium	ug/L	0.100	no TRV	<1	0.050	no TRV	<1
Vanadium	ug/L	10.0	<1	<1	5.00	<1	<1
Zinc	ug/L	10.0	<1	<1	5.00	<1	<1
Hardness	mg/L	29.0			28.5		

Footnotes:

EPC	Exposure Point Concentration
NA	Not Available or Not Analyzed
HQ	Hazard Quotient
no TRV	no Toxicity Reference Value available.
TREC/NA	TRV for aluminum, mercury and iron are based on total recoverable results which are not available in the April 2010 dataset.

Table D-6. RG-4 Hazard Quotient Results, April 2010.							
Analytes	**Units**	**Maximum**			**Average**		
		EPC	**Acute HQ**	**Chronic HQ**	**EPC**	**Acute HQ**	**Chronic HQ**
Aluminum	ug/L	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA
Antimony	ug/L	0.500	<1	<1	0.250	<1	<1
Arsenic	ug/L	0.622	<1	<1	0.603	<1	<1
Beryllium	ug/L	0.100	<1	<1	0.050	<1	<1
Cadmium	ug/L	1.11	**1.5**	**6.5**	1.08	**1.5**	**6.3**
Calcium	ug/L	9,510	no TRV	no TRV	9,440	no TRV	no TRV
Chromium	ug/L	0.685	<1	<1	0.434	<1	<1
Copper	ug/L	1.15	<1	<1	0.731	<1	<1
Iron	ug/L	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA
Lead	ug/L	1.75	<1	**2.6**	1.71	<1	**2.6**
Magnesium	ug/L	1,620	no TRV	no TRV	1,613	no TRV	no TRV
Manganese	ug/L	38.0	<1	<1	37.4	<1	<1
Mercury	ug/L	NA	NA	NA	NA	NA	NA
Nickel	ug/L	0.500	<1	<1	0.250	<1	<1
Potassium	ug/L	2,690	<1	no TRV	2,413	<1	no TRV
Selenium	ug/L	0.500	<1	<1	0.250	<1	<1
Silica (SiO2)	ug/L	19,300	no TRV	no TRV	19,125	no TRV	no TRV
Silver	ug/L	0.100	<1	**10.6**	0.050	<1	**5.3**
Sodium	ug/L	3,770	no TRV	no TRV	3,430	no TRV	no TRV
Strontium	ug/L	75.4	<1	<1	74.4	<1	<1
Thallium	ug/L	0.100	no TRV	<1	0.050	no TRV	<1
Vanadium	ug/L	10.0	<1	<1	5.00	<1	<1
Zinc	ug/L	271	**5.1**	**6.7**	258	**4.8**	**6.4**
Hardness	mg/L	30.0			30.0		

Footnotes:

EPC	Exposure Point Concentration
NA	Not Available or Not Analyzed
HQ	Hazard Quotient
no TRV	no Toxicity Reference Value available.
TREC/NA	TRV for aluminum, mercury and iron are based on total recoverable results which are not available in the April 2010 dataset.

Table D-7. RG-8 Hazard Quotient Results, April 2010.

Analytes	Units	Maximum			Average		
		EPC	Acute HQ	Chronic HQ	EPC	Acute HQ	Chronic HQ
Aluminum	ug/L	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA
Antimony	ug/L	0.500	<1	<1	0.250	<1	<1
Arsenic	ug/L	0.703	<1	<1	0.664	<1	<1
Beryllium	ug/L	0.100	<1	<1	0.050	<1	<1
Cadmium	ug/L	0.953	**1.3**	**5.4**	0.918	**1.2**	**5.3**
Calcium	ug/L	9,720	no TRV	no TRV	9,618	no TRV	no TRV
Chromium	ug/L	0.500	<1	<1	0.250	<1	<1
Copper	ug/L	5.04	**1.1**	**1.5**	1.77	<1	<1
Iron	ug/L	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA
Lead	ug/L	1.65	<1	**2.4**	1.61	<1	**2.4**
Magnesium	ug/L	1,600	no TRV	no TRV	1,590	no TRV	no TRV
Manganese	ug/L	30.8	<1	<1	30.6	<1	<1
Mercury	ug/L	NA	NA	NA	NA	NA	NA
Nickel	ug/L	0.500	<1	<1	0.250	<1	<1
Potassium	ug/L	2,410	<1	no TRV	2,375	<1	no TRV
Selenium	ug/L	0.500	<1	<1	0.250	<1	<1
Silica (SiO2)	ug/L	19,700	no TRV	no TRV	19,525	no TRV	no TRV
Silver	ug/L	0.100	<1	**10.0**	0.050	<1	**5.1**
Sodium	ug/L	3,560	no TRV	no TRV	3,473	no TRV	no TRV
Strontium	ug/L	75.1	<1	<1	74.6	<1	<1
Thallium	ug/L	0.10	no TRV	<1	0.050	no TRV	<1
Vanadium	ug/L	10.0	<1	<1	5.00	<1	<1
Zinc	ug/L	230	**4.2**	**5.5**	226	**4.2**	**5.5**
Hardness	mg/L	31.0			30.5		

Footnotes:

EPC	Exposure Point Concentration
NA	Not Available or Not Analyzed
HQ	Hazard Quotient
no TRV	no Toxicity Reference Value available.
TREC/NA	TRV for aluminum, mercury and iron are based on total recoverable results which are not available in the April 2010 dataset.

Table D-8. RG-9 Hazard Quotient Results, April 2010.							
Analytes	**Units**	**Maximum**			**Average**		
		EPC	**Acute HQ**	**Chronic HQ**	**EPC**	**Acute HQ**	**Chronic HQ**
Aluminum	ug/L	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA
Antimony	ug/L	0.500	<1	<1	0.250	<1	<1
Arsenic	ug/L	0.769	<1	<1	0.722	<1	<1
Beryllium	ug/L	0.100	<1	<1	0.050	<1	<1
Cadmium	ug/L	0.913	**1.2**	**5.2**	0.899	**1.2**	**5.1**
Calcium	ug/L	9,710	no TRV	no TRV	9,695	no TRV	no TRV
Chromium	ug/L	0.500	<1	<1	0.250	<1	<1
Copper	ug/L	0.684	<1	<1	0.509	<1	<1
Iron	ug/L	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA	TREC/NA
Lead	ug/L	1.64	<1	**2.4**	1.61	<1	**2.3**
Magnesium	ug/L	1,590	no TRV	no TRV	1,583	no TRV	no TRV
Manganese	ug/L	29.8	<1	<1	29.7	<1	<1
Mercury	ug/L	NA	NA	NA	NA	NA	NA
Nickel	ug/L	0.500	<1	<1	0.250	<1	<1
Potassium	ug/L	2,390	<1	no TRV	2,353	<1	no TRV
Selenium	ug/L	0.500	<1	<1	0.250	<1	<1
Silica (SiO2)	ug/L	19,800	no TRV	no TRV	19,700	no TRV	no TRV
Silver	ug/L	0.100	<1	**10.0**	0.050	<1	**5.0**
Sodium	ug/L	3,530	no TRV	no TRV	3,465	no TRV	no TRV
Strontium	ug/L	75.2	<1	<1	75.0	<1	<1
Thallium	ug/L	0.100	no TRV	<1	0.050	no TRV	<1
Vanadium	ug/L	10.0	<1	<1	5.00	<1	<1
Zinc	ug/L	223	**4.0**	**5.3**	220	**4.0**	**5.3**
Hardness	mg/L	31.0			31.0		

Footnotes:

EPC	Exposure Point Concentration
NA	Not Available or Not Analyzed
HQ	Hazard Quotient
no TRV	no Toxicity Reference Value available.
TREC/NA	TRV for aluminum, mercury and iron are based on total recoverable results which are not available in the April 2010 dataset.

Table D-9. RG-2 Hazard Quotient Results, June 2010.							
Analytes	**Units**	**Maximum**			**Average**		
		EPC	**Acute HQ**	**Chronic HQ**	**EPC**	**Acute HQ**	**Chronic HQ**
Aluminum[(a)]	ug/L	592	**2.0**	**13.7**	538	**1.9**	**13.6**
Antimony	ug/L	0.500	<1	<1	0.250	<1	<1
Arsenic	ug/L	0.500	<1	<1	0.250	<1	<1
Beryllium	ug/L	0.100	<1	<1	0.050	<1	<1
Cadmium	ug/L	0.100	<1	<1	0.050	<1	<1
Calcium	ug/L	5,210	no TRV	no TRV	5,130	no TRV	no TRV
Chromium	ug/L	0.500	<1	<1	0.250	<1	<1
Copper	ug/L	0.500	<1	<1	0.250	<1	<1
Iron[(a)]	ug/L	510	no TRV	<1	472.5	no TRV	<1
Lead	ug/L	0.100	<1	<1	0.050	<1	<1
Magnesium	ug/L	884	no TRV	no TRV	866	no TRV	no TRV
Manganese	ug/L	4.98	<1	<1	4.82	<1	<1
Mercury	ug/L	0.100	no TRV	**10.0**	0.050	no TRV	**5.0**
Nickel	ug/L	0.500	<1	<1	0.250	<1	<1
Potassium	ug/L	1,110	<1	no TRV	1,093	<1	no TRV
Selenium	ug/L	0.500	<1	<1	0.250	<1	<1
Silica (SiO2)	ug/L	13,500	no TRV	no TRV	13,375	no TRV	no TRV
Silver	ug/L	0.100	**1.0**	**28.1**	0.050	<1	**15.6**
Sodium	ug/L	1,700	no TRV	no TRV	1,685	no TRV	no TRV
Strontium	ug/L	50.0	<1	<1	49.4	<1	<1
Thallium	ug/L	0.500	no TRV	<1	0.250	no TRV	<1
Vanadium	ug/L	10.0	<1	<1	5.00	<1	<1
Zinc	ug/L	10.0	<1	<1	5.00	<1	<1
Hardness	mg/L	17.0			16.0		

Footnotes:

EPC	Exposure Point Concentration
NA	Not Available or Not Analyzed
HQ	Hazard Quotient
no TRV	no Toxicity Reference Value available
(a)	Since the surface water benchmark for aluminum and iron are based on the total fraction, the EPC for these analytes was derived from the total metals dataset.

Table D-10. RG-4 Hazard Quotient Results, June 2010.

Analytes	Units	Maximum			Average		
		EPC	Acute HQ	Chronic HQ	EPC	Acute HQ	Chronic HQ
Aluminum[(a)]	ug/L	603	**2.0**	**14.0**	552	**1.8**	**12.8**
Antimony	ug/L	0.500	<1	<1	0.250	<1	<1
Arsenic	ug/L	0.500	<1	<1	0.250	<1	<1
Beryllium	ug/L	0.100	<1	<1	0.050	<1	<1
Cadmium	ug/L	0.159	<1	**1.4**	0.148	<1	**1.3**
Calcium	ug/L	5,370	no TRV	no TRV	5,278	no TRV	no TRV
Chromium	ug/L	0.500	<1	<1	0.250	<1	<1
Copper	ug/L	0.500	<1	<1	0.250	<1	<1
Iron[(a)]	ug/L	495	no TRV	<1	468	no TRV	<1
Lead	ug/L	0.427	<1	**1.2**	0.375	<1	**1.1**
Magnesium	ug/L	886	no TRV	no TRV	871	no TRV	no TRV
Manganese	ug/L	6.87	<1	<1	6.60	<1	<1
Mercury	ug/L	0.100	no TRV	**10.0**	0.050	no TRV	**5.0**
Nickel	ug/L	0.500	<1	<1	0.250	<1	<1
Potassium	ug/L	1,080	<1	no TRV	1,055	<1	no TRV
Selenium	ug/L	0.500	<1	<1	0.250	<1	<1
Silica (SiO2)	ug/L	13,600	no TRV	no TRV	13,400	no TRV	no TRV
Silver	ug/L	0.100	**1.0**	**28.1**	0.050	<1	**14.0**
Sodium	ug/L	1,760	no TRV	no TRV	1,730	no TRV	no TRV
Strontium	ug/L	51.0	<1	<1	50.6	<1	<1
Thallium	ug/L	0.500	no TRV	<1	0.250	no TRV	<1
Vanadium	ug/L	10.0	<1	<1	5.00	<1	<1
Zinc	ug/L	35.3	**1.1**	**1.5**	34.0	**1.1**	**1.4**
Hardness	mg/L	17.0			17.0		

Footnotes:

EPC	Exposure Point Concentration
NA	Not Available or Not Analyzed
HQ	Hazard Quotient
no TRV	no Toxicity Reference Value available
(a)	Since the surface water benchmark for aluminum and iron are based on the total fraction, the EPC for these analytes was derived from the total metals dataset.

Table D-11. RG-8 Hazard Quotient Results, June 2010.

Analytes	Units	Maximum			Average		
		EPC	Acute HQ	Chronic HQ	EPC	Acute HQ	Chronic HQ
Aluminum(a)	ug/L	597	**2.0**	**13.8**	549	**1.8**	**12.7**
Antimony	ug/L	0.500	<1	<1	0.250	<1	<1
Arsenic	ug/L	0.500	<1	<1	0.250	<1	<1
Beryllium	ug/L	0.100	<1	<1	0.050	<1	<1
Cadmium	ug/L	0.135	<1	**1.2**	0.124	<1	**1.1**
Calcium	ug/L	5,470	no TRV	no TRV	5,438	no TRV	no TRV
Chromium	ug/L	0.500	<1	<1	0.250	<1	<1
Copper	ug/L	0.500	<1	<1	0.250	<1	<1
Iron(a)	ug/L	487	no TRV	<1	461	no TRV	<1
Lead	ug/L	0.378	<1	**1.1**	0.369	<1	**1.1**
Magnesium	ug/L	881	no TRV	no TRV	879	no TRV	no TRV
Manganese	ug/L	6.21	<1	<1	6.08	<1	<1
Mercury	ug/L	0.100	no TRV	**10.0**	0.050	no TRV	**5.0**
Nickel	ug/L	0.500	<1	<1	0.250	<1	<1
Potassium	ug/L	1,110	<1	no TRV	1,088	<1	no TRV
Selenium	ug/L	0.500	<1	<1	0.250	<1	<1
Silica (SiO2)	ug/L	14,100	no TRV	no TRV	13,825	no TRV	no TRV
Silver	ug/L	0.100	**1.0**	**28.1**	0.050	<1	**14.0**
Sodium	ug/L	1,830	no TRV	no TRV	1,793	no TRV	no TRV
Strontium	ug/L	51.6	<1	<1	51.5	<1	<1
Thallium	ug/L	0.500	no TRV	<1	0.250	no TRV	<1
Vanadium	ug/L	10.0	<1	<1	5.00	<1	<1
Zinc	ug/L	35.4	**1.1**	**1.5**	34.8	**1.1**	**1.4**
Hardness	mg/L	17.0			17.0		

Footnotes:

EPC	Exposure Point Concentration
NA	Not Available or Not Analyzed
HQ	Hazard Quotient
no TRV	no Toxicity Reference Value available
(a)	Since the surface water benchmark for aluminum and iron are based on the total fraction, the EPC for these analytes was derived from the total metals dataset.

Table D-12. RG-9 Hazard Quotient Results, June 2010.							
Analytes	**Units**	**Maximum**			**Average**		
		EPC	**Acute HQ**	**Chronic HQ**	**EPC**	**Acute HQ**	**Chronic HQ**
Aluminum[(a)]	ug/L	659	**2.2**	**15.3**	592	**2.0**	**13.7**
Antimony	ug/L	0.500	<1	<1	0.250	<1	<1
Arsenic	ug/L	0.500	<1	<1	0.250	<1	<1
Beryllium	ug/L	0.100	<1	<1	0.050	<1	<1
Cadmium	ug/L	0.140	<1	**1.3**	0.124	<1	**1.1**
Calcium	ug/L	5,510	no TRV	no TRV	5,483	no TRV	no TRV
Chromium	ug/L	0.500	<1	<1	0.250	<1	<1
Copper	ug/L	0.500	<1	<1	0.250	<1	<1
Iron[(a)]	ug/L	501	no TRV	<1	478	no TRV	<1
Lead	ug/L	0.379	<1	**1.1**	0.368	<1	**1.1**
Magnesium	ug/L	885	no TRV	no TRV	880	no TRV	no TRV
Manganese	ug/L	6.14	<1	<1	6.00	<1	<1
Mercury	ug/L	0.100	no TRV	**10.0**	0.050	no TRV	**5.0**
Nickel	ug/L	0.500	<1	<1	0.250	<1	<1
Potassium	ug/L	1,110	<1	no TRV	1,085	<1	no TRV
Selenium	ug/L	0.500	<1	<1	0.250	<1	<1
Silica (SiO2)	ug/L	13,900	no TRV	no TRV	13,875	no TRV	no TRV
Silver	ug/L	0.100	**1.0**	**28.1**	0.050	<1	**14.0**
Sodium	ug/L	1,860	no TRV	no TRV	1,803	no TRV	no TRV
Strontium	ug/L	51.6	<1	<1	51.5	<1	<1
Thallium	ug/L	0.500	no TRV	<1	0.250	no TRV	<1
Vanadium	ug/L	10.0	<1	<1	5.00	<1	<1
Zinc	ug/L	35.3	**1.1**	**1.5**	34.0	**1.1**	**1.4**
Hardness	mg/L	17.0			17.0		

Footnotes:

EPC	Exposure Point Concentration
NA	Not Available or Not Analyzed
HQ	Hazard Quotient
no TRV	no Toxicity Reference Value available
(a)	Since the surface water TRV for aluminum and iron are based on the total fraction, the EPC for these analytes was derived from the total metals dataset.

Table D-13. RG-2 Hazard Quotient Results, September 2010.							
Analytes	**Units**	**Maximum**			**Average**		
		EPC	**Acute HQ**	**Chronic HQ**	**EPC**	**Acute HQ**	**Chronic HQ**
Aluminum[(a)]	ug/L	107	<1	**1.1**	103	<1	**1.1**
Antimony	ug/L	0.500	<1	<1	0.250	<1	<1
Arsenic	ug/L	0.807	<1	<1	0.758	<1	<1
Beryllium	ug/L	0.100	<1	<1	0.050	<1	<1
Cadmium	ug/L	0.100	<1	<1	0.050	<1	<1
Calcium	ug/L	9,340	no TRV	no TRV	9,278	no TRV	no TRV
Chromium	ug/L	2.50	<1	<1	1.07	<1	<1
Copper	ug/L	0.500	<1	<1	0.250	<1	<1
Iron[(a)]	ug/L	232	no TRV	<1	226	no TRV	<1
Lead	ug/L	0.100	<1	<1	0.050	<1	<1
Magnesium	ug/L	1,640	no TRV	no TRV	1,625	no TRV	no TRV
Manganese	ug/L	4.70	<1	<1	3.50	<1	<1
Mercury	ug/L	NA	NA	NA	NA	NA	NA
Nickel	ug/L	0.500	<1	<1	0.250	<1	<1
Potassium	ug/L	1,820	<1	no TRV	1,808	<1	no TRV
Selenium	ug/L	0.500	<1	<1	0.250	<1	<1
Silica (SiO2)	ug/L	22,500	no TRV	no TRV	22,475	no TRV	no TRV
Silver	ug/L	0.100	<1	**10.6**	0.050	<1	**5.3**
Sodium	ug/L	3,420	no TRV	no TRV	3,388	no TRV	no TRV
Strontium	ug/L	74.5	<1	<1	74.4	<1	<1
Thallium	ug/L	0.500	no TRV	<1	0.250	no TRV	<1
Vanadium	ug/L	10.0	<1	<1	5.00	<1	<1
Zinc	ug/L	10.0	<1	<1	5.00	<1	<1
Hardness	mg/L	30.0			30.0		

Footnotes:

EPC	Exposure Point Concentration
NA	Not Available or Not Analyzed
HQ	Hazard Quotient
no TRV	No Toxicity Reference Value available
(a)	Since the surface water TRV for aluminum and iron are based on the total fraction, the EPC for these analytes was derived from the total metals dataset.

Table D-14. RG-4 Hazard Quotient Results, September 2010.							
Analytes	**Units**	**Maximum**			**Average**		
		EPC	**Acute HQ**	**Chronic HQ**	**EPC**	**Acute HQ**	**Chronic HQ**
Aluminum[(a)]	ug/L	98.1	<1	<1	91.7	<1	<1
Antimony	ug/L	0.500	<1	<1	0.250	<1	<1
Arsenic	ug/L	0.810	<1	<1	0.775	<1	<1
Beryllium	ug/L	0.100	<1	<1	0.050	<1	<1
Cadmium	ug/L	0.627	<1	**3.4**	0.601	<1	**3.3**
Calcium	ug/L	10,300	no TRV	no TRV	10,250	no TRV	no TRV
Chromium	ug/L	0.667	<1	<1	0.628	<1	<1
Copper	ug/L	0.500	<1	<1	0.250	<1	<1
Iron[(a)]	ug/L	207	no TRV	<1	202	no TRV	<1
Lead	ug/L	0.231	<1	<1	0.222	<1	<1
Magnesium	ug/L	1,700	no TRV	no TRV	1,693	no TRV	no TRV
Manganese	ug/L	7.15	<1	<1	7.10	<1	<1
Mercury	ug/L	NA	NA	NA	NA	NA	NA
Nickel	ug/L	0.500	<1	<1	0.250	<1	<1
Potassium	ug/L	1,860	<1	no TRV	1,840	<1	no TRV
Selenium	ug/L	0.500	<1	<1	0.250	<1	<1
Silica (SiO2)	ug/L	22,900	no TRV	no TRV	22,825	no TRV	no TRV
Silver	ug/L	0.100	<1	**9.0**	0.050	<1	**4.6**
Sodium	ug/L	3,720	no TRV	no TRV	3,698	no TRV	no TRV
Strontium	ug/L	80.6	<1	<1	80.6	<1	<1
Thallium	ug/L	0.500	no TRV	<1	0.250	no TRV	<1
Vanadium	ug/L	10.0	<1	<1	5.00	<1	<1
Zinc	ug/L	131	**2.2**	**3.0**	129	**2.2**	**3.0**
Hardness	mg/L	33.0			32.5		

Footnotes:

EPC	Exposure Point Concentration
NA	Not Available or Not Analyzed
HQ	Hazard Quotient
no TRV	No Toxicity Reference Value available
(a)	Since the surface water TRV for aluminum and iron are based on the total fraction, the EPC for these analytes was derived from the total metals dataset.

Table D-15. RG-8 Hazard Quotient Results, September 2010.							
Analytes	**Units**	**Maximum**			**Average**		
		EPC	**Acute HQ**	**Chronic HQ**	**EPC**	**Acute HQ**	**Chronic HQ**
Aluminum[(a)]	ug/L	99.5	<1	<1	86.5	<1	<1
Antimony	ug/L	0.500	<1	<1	0.250	<1	<1
Arsenic	ug/L	0.980	<1	<1	0.910	<1	<1
Beryllium	ug/L	0.100	<1	<1	0.050	<1	<1
Cadmium	ug/L	0.599	<1	**3.3**	0.553	<1	**3.0**
Calcium	ug/L	10,600	no TRV	no TRV	10,550	no TRV	no TRV
Chromium	ug/L	0.574	<1	<1	0.407	<1	<1
Copper	ug/L	0.500	<1	<1	0.250	<1	<1
Iron[(a)]	ug/L	201	no TRV	<1	191	no TRV	<1
Lead	ug/L	0.228	<1	<1	0.222	<1	<1
Magnesium	ug/L	1,660	no TRV	no TRV	1,653	no TRV	no TRV
Manganese	ug/L	5.88	<1	<1	5.53	<1	<1
Mercury	ug/L	NA	NA	NA	NA	no TRV	NA
Nickel	ug/L	0.500	<1	<1	0.250	<1	<1
Potassium	ug/L	1,840	<1	no TRV	1,830	<1	no TRV
Selenium	ug/L	0.500	<1	<1	0.250	<1	<1
Silica (SiO2)	ug/L	23,200	no TRV	no TRV	22,975	no TRV	no TRV
Silver	ug/L	0.100	<1	**9.0**	0.050	<1	**4.5**
Sodium	ug/L	3,730	no TRV	no TRV	3,718	no TRV	no TRV
Strontium	ug/L	80.8	<1	<1	80.6	<1	<1
Thallium	ug/L	0.500	no TRV	<1	0.250	no TRV	<1
Vanadium	ug/L	10.0	<1	<1	5.00	<1	<1
Zinc	ug/L	132	**2.3**	**3.0**	131	**2.2**	**3.0**
Hardness	mg/L	33.0			33.0		

Footnotes:

EPC	Exposure Point Concentration
NA	Not Available or Not Analyzed
HQ	Hazard Quotient
no TRV	No Toxicity Reference Value available
(a)	Since the surface water TRV for aluminum and iron are based on the total fraction, the EPC for these analytes was derived from the total metals dataset.

Table D-16. RG-9 Hazard Quotient Results, September 2010.

Analytes	Units	Maximum			Average		
		EPC	Acute HQ	Chronic HQ	EPC	Acute HQ	Chronic HQ
Aluminum[(a)]	ug/L	234	<1	**2.1**	123	<1	**1.1**
Antimony	ug/L	0.500	<1	<1	0.250	<1	<1
Arsenic	ug/L	1.05	<1	<1	0.949	<1	<1
Beryllium	ug/L	0.100	<1	<1	0.050	<1	<1
Cadmium	ug/L	0.526	<1	**2.8**	0.498	<1	**2.6**
Calcium	ug/L	10,900	no TRV	no TRV	10,800	no TRV	no TRV
Chromium	ug/L	0.574	<1	<1	0.462	<1	<1
Copper	ug/L	0.501	<1	<1	0.313	<1	<1
Iron[(a)]	ug/L	289	no TRV	<1	211	no TRV	<1
Lead	ug/L	0.247	<1	<1	0.228	<1	<1
Magnesium	ug/L	1,670	no TRV	no TRV	1,658	no TRV	no TRV
Manganese	ug/L	5.25	<1	<1	5.22	<1	<1
Mercury	ug/L	NA	NA	NA	NA	NA	NA
Nickel	ug/L	0.500	<1	<1	0.250	<1	<1
Potassium	ug/L	1,850	<1	no TRV	1,833	<1	no TRV
Selenium	ug/L	0.500	<1	<1	0.250	<1	<1
Silica (SiO2)	ug/L	23,100	no TRV	no TRV	23,000	no TRV	no TRV
Silver	ug/L	0.121	<1	**10.3**	0.068	<1	**5.8**
Sodium	ug/L	3,800	no TRV	no TRV	3,785	no TRV	no TRV
Strontium	ug/L	81.3	<1	<1	81.0	<1	<1
Thallium	ug/L	0.500	no TRV	<1	0.250	no TRV	<1
Vanadium	ug/L	10.0	<1	<1	5.00	<1	<1
Zinc	ug/L	126	**2.1**	**2.8**	125	**2.1**	**2.7**
Hardness	mg/L	34.0			34.0		

Footnotes:

EPC	Exposure Point Concentration
NA	Not Available or Not Analyzed
HQ	Hazard Quotient
no TRV	No Toxicity Reference Value available
(a)	Since the surface water TRV for aluminum and iron are based on the total fraction, the EPC for these analytes was derived from the total metals dataset.

APPENDIX E

FOOD CHAIN RECEPTOR EXPOSURE, EFFECT, AND RISK ESTIMATES

Table E-1. Food Chain Receptor Exposure Estimate Methods.

Insectivorous Measurement Receptor - Dietary Exposure (e.g., American Dipper)

Estimated Daily Dose		Aquatic Insect Exposure		Surface Water Exposure
(EDD_x)	=	$FIR*FC_{insect}*PDF*AUF$	+	$WIR*WC_x*AUF$
mg/kg BW-day		mg/kg BW-day (wet weight)		L/kg BW-day

Herbivorous Measurement Receptor - Dietary Exposure (e.g., Muskrat)

Estimated Daily Dose		Plant Exposure		Surface Water Exposure
(EDD_x)	=	$FIR*FC_{plant}*PDF*AUF$	+	$WIR*WC_x*AUF$
mg/kg BW-day		mg/kg BW-day (wet weight)		L/kg BW-day

Piscivorous Measurement Receptor - Dietary Exposure (e.g., Belted King fisher)

Estimated Daily Dose		Prey (fish) Exposure		Surface Water Exposure
(EDD_x)	=	$FIR*FC_{fish}*PDF*AUF$	+	$WIR*WC_x*AUF$
mg/kg BW-day		mg/kg BW-day (wet weight)		L/kg BW-day

Omnivorous Measurement Receptor - Dietary Exposure (e.g., Mallard) [#]

Estimated Daily Dose		Invertebrate and Plant Exposure[#]		Surface Water Exposure
(EDD_x)	=	FIR[(FCinvert*PDF)+(FCplant*PDF)]*AUF	+	$WIR*WC_x*AUF$
mg/kg BW-day		mg/kg BW-day (wet weight)		L/kg BW-day

Footnotes:

[#] - The mallard is conservatively assumed to feed on a protein-rich diet of aquatic invertebrates in the spring to prepare for egg laying (USEPA, 1993) and a diet of aquatic invertebrates and plants in the fall.

Concentration of COPEC in food item

$$FC_{xi} = WCx*BCFx*BAV$$

Where:

EDD_x	=	Dietary intake for COPEC "x" (milligram [mg] COPEC/kilograms [kg] BW-day)
FIR	=	Food ingestion rate (kg [wet weight]/kg BW per day)
FC_{xi}	=	Concentration of COPEC "x" in food item I (mg/kg, wet weight)
PDF_i	=	Proportion of diet composed of food type "i" (unitless)
WIR	=	Water ingestion rate (L/day)
WC_x	=	Concentration of COPEC "x" in water (mg/L)
BCF_x	=	Bioconcentation Factor
BW	=	Body weight of measurement receptor (kg)
AUF	=	Area Use Factor (unitless)
BAV	=	Bioavailability (unitless)
COPEC	=	Chemical of Potential Ecological Concern

Table E-2. Exposure Parameters for Food Chain Receptors.

Feeding Guild/Receptor Species	Body Weight (kg)	Body Weight Ref.	Ingestion Rates: Food (kg/kg BW-day, wet wt)	Ref.	Water (L/kg BW-day)	Ref.	Dietary Composition (%): Invert.	Fish	Plants	Ref.	Home Range	Reference
Aquatic Insectivore												
American Dipper (*Cinclus mexicanus*)	0.0565	Ealey, D., 1977	0.796	see footnote[a]	0.152	see footnote[b]	100	--	--	Assumption	759 m (along a water course)	Sullivan, J., 1973
Herbivore												
Muskrat (Ondatra zibethicus)	1.17	Silva and Downing, 1995	0.34	US EPA, 1993	0.975	US EPA, 1993	--	--	100	Assumption	0.13 hectares	US EPA, 1993
Piscivore												
Belted King fisher (Ceryle alcyon)	0.147	US EPA, 1993	0.5	US EPA, 1993	0.111	US EPA, 1993	--	100	--	Assumption	2.25 km	Sample & Suter, 1994
Omnivore												
Mallard (Anas platyrhynchos)	1.162	US EPA, 1993	0.31	see footnote[a]	0.056	US EPA, 1993	100[d] 50[e]	--	50[e]	Assumption	111 hectares	US EPA, 1993

a - Calculated using IR_{food} (kg dw/day) = $0.0582*(BW, kg)^{0.651}$; Adjusted to wet weight assuming 80% moisture (Nagy, 1987 - found in US EPA, 1993)

b - Calcluated using IR_{water} (L/day)=$0.059 (BW, kg)^{0.67}$; [Calder (1981), Skadhauge (1975), Calder and Braun (1983) - found in US EPA, 1993]

c - Ealey, D., 1977

d- Dietary consumption in the spring is assumed to be 100% invertebrates as females prepare for egg production.

e - Dietary consumption is assumed to be 50% invertebrates and 50% plants in the fall.

BW - Body weight

Table E-3. Bioconcentration Factors used in Food Chain Modeling.			
Analyte	**Water-to-Aquatic Invertebrates[a]**	**Water-to-Plants[b,d]**	**Water-to-Fish[c]**
Aluminum	4066	833	2.7
Antimony	7	1475	40
Arsenic	73	293	114
Beryllium	45	141	62
Cadmium	3461	782	907
Calcium	--	--	--
Chromium III	--	--	--
Chromium VI		--	--
Chromium, total	3000	4406	19
Copper	3718	541	710
Iron	--	--	--
Lead	5059	1706	0.09
Magnesium	--	--	--
Manganese	--	--	--
Mercury (inorganic)	20184	24762	3530
Nickel	28	61	78
Potassium	--	--	--
Selenium	1262	1845	129
Silica	--	--	--
Silver	298	10696	87.71
Sodium	--	--	--
Strontium	--	--	--
Thallium	15000	15000	10000
Vanadium	--	--	--
Zinc	4578	2175	2059

Source: EPA, 1999, SLERA Protocol for Hazardous Waste Combustion Facilities -Media-to-Receptor BCFs, Nov. 1999
http://www.epa.gov/osw/hazard/tsd/td/combust/eco-risk/volume3/appx-c.pdf

a - Table C-3: Water-to-Aquatic Invertebrate Bioconcentration Factors

b - Table C-4: Water-to-Algae Bioconcentration Factors

c -Table C-5: Water-to-Fish Bioconcentration Factors

d - Water-to-algae BCFs were used as a surrogate for water-to-plant because no water-to-plant BCFs were available.

-- - No BCF was available, a default value of 1.0 is used.

Note: The metal BCFs presented in the EPA(1999) were derived for use with the dissolved (filtered) fraction in surface water.
The BERA report multipled these BCFs with the total (unfiltered) faction instead as measure of added conservatism.

Table E-4. Toxicity Reference Values for Mammals.

Analyte	Selected TRV		Eco-SSLs		1996 Toxicological Benchmarks for Wildlife[c]		1999 Mammal TRVs[d]	
	Toxicity Reference Values (mg/kg bw-day)							
	No effected-based	Effect-based	No effect-based[a]	Effect-based[b]	No effected-based	Effect-based	No effected-based	Effect-based
Selection Preference			***1***		***2***		***3***	
Aluminum	1.93	19.3	--	--	1.93	19.3	1.93	--
Antimony	0.059	2.76	0.059	2.76	0.125	1.25	0.066	--
Arsenic	1.04	4.55	1.04	4.55	0.126	1.26	1.25	--
Beryllium	0.532	0.67	0.532	0.67	0.66	--	0.66	--
Cadmium	0.77	6.87	0.77	6.87	1	10	0.0252	--
Calcium	--	--	--	--	--	--	--	--
Chromium III	2.4	58.17	2.4	58.17	2737	--	--	--
Chromium VI	9.24	38.37	9.24	38.37	3.28	13.14	3.5	--
Copper	5.6	82.7	5.6	82.7	11.7	15.4	12	--
Iron	--	--	--	--	--	--	--	--
Lead	4.7	186.4	4.7	186.4	8	80	0.0375	--
Magnesium	--	--	--	--	--	--	--	--
Manganese	51.4	146	51.4	146	88	284	--	--
Mercury (inorganic)	1	--	--	--	1	--	1.01	--
Nickel	1.7	14.77	1.7	14.77	40	80	50	--
Potassium	--	--	--	--	--	--	--	--
Selenium	0.143	0.66	0.143	0.66	0.2	0.33	0.076	--
Silica	--	--	--	--	--	--	--	--
Silver	6.02	119	6.02	119	--	--	0.375	--
Sodium	--	--	--	--	--	--	--	--
Strontium	263	--	--	--	263	--	--	--
Thallium	0.0074	0.074	--	--	0.0074	0.074	0.0131	--
Vanadium	4.16	9.44	4.16	9.44	0.21	2.1	--	--
Zinc	75.4	298	75.4	298	160	320	--	--

Sources

a - USEPA Eco SSLs (http://www.epa.gov/ecotox/ecossl/)

b- Techlaw Inc, 2008. Close-Out Letter for Calculating Effect-Based Ecological Soil Screening Levels for Fort Devens, Ayers, MA., November 2008.

c -Sample et al., 1996, Toxicological Benchmarks for Wildlife: 1996 Revision, ES/ER/TM-86/R3, http://www.esd.ornl.gov/programs/ecorisk/documents/tm86r3.pdf (values represent the test species)

d - EPA, 1999, Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities Peer Review Draft. November 1999, http://www.epa.gov/osw/hazard/tsd/td/combust/ecorisk.htm

-- - Not available

mg/kg-d - milligrams per kilogram body weight per day

TRV - Toxicity Reference Value

Table E-5. Toxicity Reference Values for Birds.

Analyte	Selected TRV		Eco-SSLs		1996 Toxicological Benchmarks for Wildlife[c]		1999 Bird TRVs[d]	
	Toxicity Reference Values (mg/kg bw-day)							
	No effected-based	Effect-based	No effect-based[a]	Effect-based[b]	No effected-based	Effect-based	No effected-based	Effect-based
Selection Preference			*1*		*2*		*3*	
Aluminum	109.7	--	--	--	109.7	--	100	--
Antimony	--	--	--	--	--	--	--	--
Arsenic	2.24	4.51	2.24	4.51	5.14	12.84	2.46	--
Beryllium	--	--	--	--	--	--	--	--
Cadmium	1.47	6.35	1.47	6.35	1.45	20	1.45	--
Calcium	--	--	--	--	--	--	--	--
Chromium III	2.66	15.6	2.66	15.6	1	5	--	--
Chromium VI	1	--	--	--	--	--	1	--
Copper	4.05	34.87	4.05	34.87	47	61.7	46.97	--
Iron	--	--	--	--	--	--	--	--
Lead	1.63	44.63	1.63	44.63	1.13	11.3	0.025	--
Magnesium	--	--	--	--	--	--	--	--
Manganese	179	377	179	377	997	--	--	--
Mercury	0.45	0.9	--	--	0.45	0.9	3.25	--
Nickel	6.71	18.6	6.71	18.6	77.4	107	65	--
Potassium	--	--	--	--	--	--	--	--
Selenium	0.29	0.82	0.29	0.82	0.5	1	0.5	--
Silica	--	--	--	--	--	--	--	--
Silver	2.02	60.5	2.02	60.5	--	--	178	--
Sodium	--	--	--	--	--	--	--	--
Strontium	--	--	--	--	--	--	--	--
Thallium	--	--	--	--	--	--	0.35	--
Vanadium	0.344	1.7	0.344	1.7	11.4	--	--	--
Zinc	66.1	171	66.1	171	14.5	131	130.9	--

Sources

a - USEPA Eco SSLs (http://www.epa.gov/ecotox/ecossl/)

b- Techlaw Inc, 2008. Close-Out Letter for Calculating Effect-Based Ecological Soil Screening Levels for Fort Devens, Ayers, MA., November 2008.

c -Sample et al., 1996, Toxicological Benchmarks for Wildlife: 1996 Revision, ES/ER/TM-86/R3, http://www.esd.ornl.gov/programs/ecorisk/documents/tm86r3.pdf (values represent the test species)

d - EPA, 1999, Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities Peer Review Draft. November 1999, http://www.epa.gov/osw/hazard/tsd/td/combust/ecorisk.htm

-- - Not available

mg/kg-d - milligrams per kilogram body weight per day

TRV - Toxicity Reference Value

Table E-6.
Estimated Daily Doses for the American Dipper at Sample Location WW-M (Background)

	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
Analytes	Surface Water (mg/L)*	Aquatic Invertebrate BCF [#]	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]	Surface Water (mg/L)*	Aquatic Invertebrate BCF [#]	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]
Aluminum	0.101	4066	411	1.0	1.0	327	0.015	327	0.133	4066	541	1.0	1.0	430	0.020	430
Antimony	0.0025	7	0.018	1.0	1.0	0.014	0.0004	0.014	0.0025	7	0.018	1.0	1.0	0.014	0.0004	0.014
Arsenic	0.0025	73	0.183	1.0	1.0	0.145	0.0004	0.146	0.0025	73	0.183	1.0	1.0	0.145	0.0004	0.146
Beryllium	0.0005	45	0.023	1.0	1.0	0.018	0.00008	0.018	0.0005	45	0.023	1.0	1.0	0.018	0.00008	0.018
Cadmium	0.0005	3461	1.73	1.0	1.0	1.38	0.00008	1.38	0.0005	3461	1.73	1.0	1.0	1.38	0.00008	1.38
Calcium	10.3	1.0	10.3	1.0	1.0	8.20	1.55	9.74	15.6	1.0	15.6	1.0	1.0	12.4	2.34	14.8
Chromium	0.0025	3000	7.50	1.0	1.0	5.97	0.0004	5.97	0.0025	3000	7.50	1.0	1.0	5.97	0.0004	5.97
Copper	0.0025	3718	9.30	1.0	1.0	7.40	0.0004	7.40	0.0025	3718	9.30	1.0	1.0	7.40	0.0004	7.40
Iron	0.123	1.0	0.123	1.0	1.0	0.098	0.018	0.116	0.152	1.0	0.152	1.0	1.0	0.121	0.0228	0.144
Lead	0.0005	5059	2.53	1.0	1.0	2.01	0.00008	2.01	0.0005	5059	2.53	1.0	1.0	2.01	0.00008	2.01
Magnesium	1.24	1.0	1.24	1.0	1.0	0.987	0.186	1.17	1.81	1.0	1.81	1.0	1.0	1.44	0.272	1.71
Manganese	0.0106	1.0	0.011	1.0	1.0	0.008	0.002	0.010	0.0228	1.0	0.023	1.0	1.0	0.018	0.0034	0.022
Mercury (Inorganic)	0.0001	20184	2.02	1.0	1.0	1.61	0.00002	1.61	NA	20184	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	28	0.070	1.0	1.0	0.056	0.0004	0.056	0.0025	28	0.070	1.0	1.0	0.056	0.0004	0.056
Potassium	0.673	1.0	0.673	1.0	1.0	0.536	0.101	0.637	1.03	1.0	1.03	1.0	1.0	0.820	0.155	0.974
Selenium	0.0025	1262	3.16	1.0	1.0	2.51	0.0004	2.51	0.0025	1262	3.16	1.0	1.0	2.51	0.0004	2.51
Silica	10.8	1.0	10.8	1.0	1.0	8.60	1.62	10.2	14	1.0	14.0	1.0	1.0	11.1	2.10	13.2
Silver	0.0005	298	0.149	1.0	1.0	0.119	0.00008	0.119	0.0005	298	0.149	1.0	1.0	0.119	0.00008	0.119
Sodium	2.39	1.0	2.39	1.0	1.0	1.90	0.359	2.26	3.47	1.0	3.47	1.0	1.0	2.76	0.521	3.28
Strontium	0.123	1.0	0.123	1.0	1.0	0.098	0.018	0.116	0.201	1.0	0.201	1.0	1.0	0.160	0.030	0.190
Thallium	0.0025	15000	37.5	1.0	1.0	29.9	0.0004	29.9	0.0025	15000	37.5	1.0	1.0	29.9	0.0004	29.9
Vanadium	0.01	1.0	0.010	1.0	1.0	0.008	0.0015	0.009	0.01	1.0	0.010	1.0	1.0	0.008	0.002	0.009
Zinc	0.01	4578	45.8	1.0	1.0	36.4	0.0015	36.4	0.01	4578	45.8	1.0	1.0	36.4	0.002	36.4

* - Surface water concentrations converted from ug/L to mg/L
[#] - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentration
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDDdiet = (IR_{diet} \times C_{invert}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)
IR_{diet} 0.796 kg/kg BW-day
IR_{water} 0.15 L/kg BW-day

Table E-7.
Estimated Daily Doses for the Muskrat at Sample Location WW-M (Background)

	Spring Exposure Scenario								**Fall Exposure Scenario**							
	EPC	**Diet**				**Estimated Daily Dose (mg/kg bw-day)**			**EPC**	**Diet**				**Estimated Daily Dose (mg/kg bw-day)**		
Analytes	**Surface Water (mg/L)***	**Plant BCF#**	**Plant Concentration (mg/kg, wet wt)**	**BAV**	**AUF**	**EDD_{diet} [1]**	**EDD_{water} [2]**	**EDD_{total} [3]**	**Surface Water (mg/L)***	**Plant BCF#**	**Plant Concentration (mg/kg, wet wt)**	**BAV**	**AUF**	**EDD_{diet} [1]**	**EDD_{water} [2]**	**EDD_{total} [3]**
Aluminum	0.101	833	84.1	1.0	1.0	28.6	0.098	28.7	0.133	833	111	1.0	1.0	37.7	0.130	37.8
Antimony	0.0025	1475	3.69	1.0	1.0	1.25	0.00244	1.26	0.0025	1475	3.69	1.0	1.0	1.25	0.002	1.26
Arsenic	0.0025	293	0.733	1.0	1.0	0.249	0.002	0.251	0.0025	293	0.733	1.0	1.0	0.249	0.002	0.251
Beryllium	0.0005	141	0.071	1.0	1.0	0.024	0.0005	0.024	0.0005	141	0.071	1.0	1.0	0.024	0.0005	0.024
Cadmium	0.0005	782	0.391	1.0	1.0	0.133	0.0005	0.133	0.0005	782	0.391	1.0	1.0	0.133	0.0005	0.133
Calcium	10.3	1.0	10.3	1.0	1.0	3.5	10.0	13.54	15.6	1.0	15.6	1.0	1.0	5.30	15.2	20.5
Chromium	0.0025	4406	11.0	1.0	1.0	3.75	0.002	3.75	0.0025	4406	11.0	1.0	1.0	3.75	0.002	3.75
Copper	0.0025	541	1.35	1.0	1.0	0.460	0.002	0.462	0.0025	541	1.35	1.0	1.0	0.460	0.002	0.462
Iron	0.123	1.0	0.123	1.0	1.0	0.042	0.120	0.162	0.152	1.0	0.152	1.0	1.0	0.052	0.148	0.200
Lead	0.0005	1706	0.853	1.0	1.0	0.290	0.0005	0.291	0.0005	1706	0.853	1.0	1.0	0.290	0.0005	0.291
Magnesium	1.24	1.0	1.24	1.0	1.0	0.422	1.21	1.631	1.81	1.0	1.81	1.0	1.0	0.615	1.76	2.38
Manganese	0.0106	1.0	0.011	1.0	1.0	0.004	0.010	0.014	0.0228	1.0	0.023	1.0	1.0	0.008	0.022	0.030
Mercury (Inorganic)	0.0001	24762	2.48	1.0	1.0	0.842	0.0001	0.842	NA	24762	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	61	0.153	1.0	1.0	0.052	0.002	0.054	0.0025	61	0.153	1.0	1.0	0.052	0.002	0.054
Potassium	0.673	1.0	0.673	1.0	1.0	0.229	0.656	0.885	1.03	1.0	1.03	1.0	1.0	0.350	1.00	1.35
Selenium	0.0025	1845	4.61	1.0	1.0	1.57	0.002	1.57	0.0025	1845	4.61	1.0	1.0	1.57	0.002	1.57
Silica	10.8	1.0	10.8	1.0	1.0	3.67	10.5	14.2	14	1.0	14.0	1.0	1.0	4.76	13.7	18.4
Silver	0.0005	10696	5.35	1.0	1.0	1.82	0.0005	1.82	0.0005	10696	5.35	1.0	1.0	1.82	0.0005	1.82
Sodium	2.39	1.0	2.39	1.0	1.0	0.813	2.33	3.14	3.47	1.0	3.47	1.0	1.0	1.18	3.38	4.56
Strontium	0.123	1.0	0.123	1.0	1.0	0.042	0.120	0.162	0.201	1.0	0.201	1.0	1.0	0.068	0.196	0.264
Thallium	0.0025	15000	37.5	1.0	1.0	12.8	0.002	12.8	0.0025	15000	37.5	1.0	1.0	12.8	0.002	12.8
Vanadium	0.01	1.0	0.010	1.0	1.0	0.003	0.010	0.013	0.01	1.0	0.010	1.0	1.0	0.003	0.010	0.013
Zinc	0.01	2175	21.8	1.0	1.0	7.40	0.010	7.40	0.01	2175	21.8	1.0	1.0	7.40	0.010	7.40

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentrations
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg Bw-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{plant}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)

IR_{diet}	0.34	kg/kg BW-day
IR_{water}	0.975	L/kg BW-day

Table E-8.
Estimated Daily Doses for the Belted King Fisher at Sample Location WW-M (Background)

	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	**Diet**				**Estimated Daily Dose (mg/kg bw-day)**			**EPC**	**Diet**				**Estimated Daily Dose (mg/kg bw-day)**		
Analyte	**Surface Water (mg/L)***	**Fish BCF#**	**Fish Concentration (mg/kg, wet wt)**	**BAV**	**AUF**	**EDD_{diet}[1]**	**EDD_{water}[2]**	**EDD_{total}[3]**	**Surface Water (mg/L)***	**Fish BCF#**	**Fish Concentration (mg/kg, wet wt)**	**BAV**	**AUF**	**EDD_{diet}[1]**	**EDD_{water}[2]**	**EDD_{total}[3]**
Aluminum	0.101	2.7	0.273	1.0	1.0	0.136	0.011	0.148	0.133	2.7	0.359	1.0	1.0	0.180	0.015	0.194
Antimony	0.0025	40	0.100	1.0	1.0	0.050	0.0003	0.050	0.0025	40	0.100	1.0	1.0	0.050	0.0003	0.050
Arsenic	0.0025	114	0.285	1.0	1.0	0.143	0.0003	0.143	0.0025	114	0.285	1.0	1.0	0.143	0.0003	0.143
Beryllium	0.0005	62	0.031	1.0	1.0	0.016	0.00006	0.016	0.0005	62	0.031	1.0	1.0	0.016	0.00006	0.016
Cadmium	0.0005	907	0.454	1.0	1.0	0.227	0.00006	0.227	0.0005	907	0.454	1.0	1.0	0.227	0.00006	0.227
Calcium	10.3	1.0	10.3	1.0	1.0	5.15	1.14	6.29	15.6	1.0	15.6	1.0	1.0	7.80	1.73	9.53
Chromium	0.0025	19	0.048	1.0	1.0	0.024	0.0003	0.024	0.0025	19	0.048	1.0	1.0	0.024	0.0003	0.024
Copper	0.0025	710	1.78	1.0	1.0	0.888	0.0003	0.888	0.0025	710	1.78	1.0	1.0	0.888	0.0003	0.888
Iron	0.123	1.0	0.123	1.0	1.0	0.062	0.014	0.075	0.152	1.0	0.152	1.0	1.0	0.076	0.017	0.093
Lead	0.0005	0.09	0.00005	1.0	1.0	0.00002	0.00006	0.00008	0.0005	0.09	0.00005	1.0	1.0	0.00002	0.00006	0.00008
Magnesium	1.24	1.0	1.24	1.0	1.0	0.620	0.138	0.758	1.81	1.0	1.81	1.0	1.0	0.905	0.201	1.11
Manganese	0.0106	1.0	0.011	1.0	1.0	0.005	0.001	0.006	0.0228	1.0	0.023	1.0	1.0	0.011	0.0025	0.014
Mercury (Inorganic)	0.0001	3530	0.353	1.0	1.0	0.177	0.00001	0.177	NA	3530	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	78	0.195	1.0	1.0	0.098	0.0003	0.098	0.0025	78	0.195	1.0	1.0	0.098	0.0003	0.098
Potassium	0.673	1.0	0.673	1.0	1.0	0.337	0.075	0.411	1.03	1.0	1.03	1.0	1.0	0.515	0.114	0.629
Selenium	0.0025	129	0.323	1.0	1.0	0.161	0.0003	0.162	0.0025	129	0.323	1.0	1.0	0.161	0.0003	0.162
Silica	10.8	1.0	10.8	1.0	1.0	5.40	1.20	6.60	14	1.0	14.0	1.0	1.0	7.00	1.55	8.55
Silver	0.0005	87.71	0.044	1.0	1.0	0.022	0.00006	0.022	0.0005	87.71	0.044	1.0	1.0	0.022	0.00006	0.022
Sodium	2.39	1.0	2.39	1.0	1.0	1.20	0.265	1.46	3.47	1.0	3.47	1.0	1.0	1.74	0.385	2.12
Strontium	0.123	1.0	0.123	1.0	1.0	0.062	0.014	0.075	0.201	1.0	0.201	1.0	1.0	0.101	0.022	0.123
Thallium	0.0025	10000	25.0	1.0	1.0	12.5	0.0003	12.5	0.0025	10000	25.0	1.0	1.0	12.5	0.0003	12.5
Vanadium	0.01	1.0	0.010	1.0	1.0	0.005	0.001	0.006	0.01	1.0	0.010	1.0	1.0	0.005	0.001	0.006
Zinc	0.01	2059	20.6	1.0	1.0	10.3	0.001	10.3	0.01	2059	20.6	1.0	1.0	10.3	0.001	10.3

* - Surface water concentrations converted from ug/L to mg/L
# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentration
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{fish}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)
IR_{diet} 0.5 kg/kg BW-day
IR_{water} 0.111 L/kg BW-day

Table E-9.
Estimated Daily Doses for the Mallard at Sample Location WW-M (Background)

	Spring Exposure Scenario								Fall Exposure Scenario									
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet						Estimated Daily Dose (mg/kg bw-day)		
Analyte	Surface Water (mg/L)*	Aquatic Invertebrate BCF[#]	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet}[1]	EDD_{water}[2]	EDD_{total}[3]	Surface Water (mg/L)*	Aquatic Invertebrate BCF[#]	Aquatic Invertebrate Concentration (mg/kg, wet wt)	Plant BCF [#]	Plant Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet}[4]	EDD_{water}[2]	EDD_{total}[3]
Aluminum	0.101	4066	411	1.0	1.0	127	0.006	127	0.133	4066	541	833	111	1.0	1.0	101	0.007	101
Antimony	0.00250	7	0.018	1.0	1.0	0.005	0.0001	0.006	0.0025	7	0.018	1475	3.69	1.0	1.0	0.574	0.0001	0.574
Arsenic	0.00250	73	0.183	1.0	1.0	0.057	0.0001	0.057	0.0025	73	0.183	293	0.733	1.0	1.0	0.142	0.0001	0.142
Beryllium	0.00050	45	0.023	1.0	1.0	0.007	0.00003	0.007	0.0005	45	0.023	141	0.071	1.0	1.0	0.014	0.00003	0.014
Cadmium	0.00050	3461	1.73	1.0	1.0	0.536	0.00003	0.536	0.0005	3461	1.73	782	0.391	1.0	1.0	0.329	0.00003	0.329
Calcium	10.3	1.0	10.3	1.0	1.0	3.19	0.577	3.77	15.6	1.0	15.6	1.0	15.6	1.0	1.0	4.84	0.874	5.71
Chromium	0.00250	3000	7.50	1.0	1.0	2.33	0.0001	2.33	0.0025	3000	7.50	4406	11.0	1.0	1.0	2.87	0.0001	2.87
Copper	0.00250	3718	9.30	1.0	1.0	2.88	0.0001	2.88	0.0025	3718	9.30	541	1.35	1.0	1.0	1.65	0.0001	1.65
Iron	0.123	1.0	0.123	1.0	1.0	0.038	0.007	0.045	0.152	1.0	0.152	1.0	0.152	1.0	1.0	0.047	0.009	0.056
Lead	0.00050	5059	2.53	1.0	1.0	0.784	0.00003	0.784	0.0005	5059	2.53	1706	0.853	1.0	1.0	0.524	0.00003	0.524
Magnesium	1.24	1.0	1.24	1.0	1.0	0.384	0.069	0.454	1.81	1.0	1.81	1.0	1.81	1.0	1.0	0.561	0.101	0.662
Manganese	0.0106	1.0	0.011	1.0	1.0	0.003	0.0006	0.004	0.0228	1.0	0.023	1.0	0.023	1.0	1.0	0.007	0.0013	0.008
Mercury (Inorganic)	0.00010	20184	2.02	1.0	1.0	0.626	0.00001	0.626	NA	20184	NC	24762	NC	1.0	1.0	NC	NC	NC
Nickel	0.00250	28	0.070	1.0	1.0	0.022	0.0001	0.022	0.0025	28	0.070	61	0.153	1.0	1.0	0.034	0.0001	0.035
Potassium	0.673	1.0	0.673	1.0	1.0	0.209	0.0377	0.246	1.03	1.0	1.030	1.0	1.03	1.0	1.0	0.319	0.058	0.377
Selenium	0.00250	1262	3.16	1.0	1.0	0.978	0.0001	0.978	0.0025	1262	3.16	1845	4.61	1.0	1.0	1.20	0.0001	1.204
Silica	10.8	1.0	10.8	1.0	1.0	3.35	0.605	3.95	14	1.0	14.0	1.0	14.0	1.0	1.0	4.34	0.784	5.12
Silver	0.00050	298	0.149	1.0	1.0	0.046	0.00003	0.046	0.0005	298	0.149	10696	5.35	1.0	1.0	0.852	0.00003	0.852
Sodium	2.39	1.0	2.39	1.0	1.0	0.741	0.134	0.875	3.47	1.0	3.47	1.0	3.47	1.0	1.0	1.08	0.194	1.27
Strontium	0.123	1.0	0.123	1.0	1.0	0.038	0.007	0.045	0.201	1.0	0.201	1.0	0.201	1.0	1.0	0.062	0.011	0.074
Thallium	0.00250	15000	37.5	1.0	1.0	11.6	0.0001	11.6	0.0025	15000	37.5	15000	37.5	1.0	1.0	11.6	0.00014	11.6
Vanadium	0.010	1.0	0.010	1.0	1.0	0.003	0.0006	0.004	0.01	1.0	0.010	1.0	0.010	1.0	1.0	0.003	0.0006	0.004
Zinc	0.010	4578	45.8	1.0	1.0	14.2	0.0006	14.2	0.01	4578	45.8	2175	21.8	1.0	1.0	10.5	0.0006	10.5

* - Surface water concentrations converted from ug/L to mg/L
[#] - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
EPC - Exposure Point Concentration
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg Bw-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{invert}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$
[4] $EDD_{diet} = IR_{diet}[(C_{invert} \times BAF \times 0.5)+(C_{plant} \times BAV \times 0.5)] \times AUF$

Ingestion Rates (IR)
IR_{diet} 0.31 kg/kg BW-day
IR_{water} 0.056 L/kg BW-day

Table E-10.
Estimated Daily Doses for the American Dipper at Sample Location WW-NT

Analyte	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
	Surface Water (mg/L)*	Aquatic Invertebrate BCF #	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} 1	EDD_{water} 2	EDD_{total} 3	Surface Water (mg/L)*	Aquatic Invertebrate BCF #	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} 1	EDD_{water} 2	EDD_{total} 3
Aluminum	0.877	4066	3566	1.0	1.0	2838	0.132	2839	0.63	4066	2562	1.0	1.0	2039	0.095	2039
Antimony	0.0025	7	0.018	1.0	1.0	0.014	0.0004	0.014	0.005	7	0.035	1.0	1.0	0.028	0.0008	0.029
Arsenic	0.00298	73	0.218	1.0	1.0	0.173	0.0004	0.174	0.005	73	0.365	1.0	1.0	0.291	0.0008	0.291
Beryllium	0.00365	45	0.164	1.0	1.0	0.131	0.0005	0.131	0.0041	45	0.185	1.0	1.0	0.147	0.0006	0.147
Cadmium	0.183	3461	633	1.0	1.0	504	0.027	504	0.122	3461	422	1.0	1.0	336	0.018	336
Calcium	127	1.0	127	1.0	1.0	101	19.1	120	174	1	174	1.0	1.0	139	26.1	165
Chromium	0.0025	3000	7.50	1.0	1.0	5.97	0.0004	5.97	0.005	3000	15.0	1.0	1.0	11.9	0.0008	11.9
Copper	0.0741	3718	276	1.0	1.0	219	0.011	219	0.0271	3718	101	1.0	1.0	80.2	0.004	80.2
Iron	0.988	1.0	0.988	1.0	1.0	0.786	0.148	0.935	3.8	1	3.80	1.0	1.0	3.02	0.570	3.59
Lead	1.66	5059	8398	1.0	1.0	6685	0.249	6685	1.7	5059	8600	1.0	1.0	6846	0.255	6846
Magnesium	10.5	1.0	10.5	1.0	1.0	8.36	1.58	9.93	13	1	13.0	1.0	1.0	10.3	1.95	12.3
Manganese	10.2	1.0	10.2	1.0	1.0	8.12	1.53	9.65	9.95	1	10.0	1.0	1.0	7.92	1.49	9.41
Mercury (Inorganic)	0.0001	20184	2.02	1.0	1.0	1.61	0.00002	1.61	NA	20184	NC	1.0	1.0	NC	NC	NC
Nickel	0.0107	28	0.300	1.0	1.0	0.238	0.002	0.240	0.005	28	0.140	1.0	1.0	0.111	0.0008	0.112
Potassium	4.72	1.0	4.72	1.0	1.0	3.76	0.708	4.47	5.02	1	5.02	1.0	1.0	4.00	0.753	4.75
Selenium	0.00813	1262	10.3	1.0	1.0	8.17	0.001	8.17	0.00614	1262	7.75	1.0	1.0	6.17	0.0009	6.17
Silica	39.2	1.0	39.2	1.0	1.0	31.2	5.88	37.1	41.4	1	41.4	1.0	1.0	33.0	6.21	39.2
Silver	0.00112	298	0.334	1.0	1.0	0.266	0.0002	0.266	0.001	298	0.298	1.0	1.0	0.237	0.0002	0.237
Sodium	40.5	1.0	40.5	1.0	1.0	32.2	6.08	38.3	52.7	1	52.7	1.0	1.0	41.9	7.91	49.9
Strontium	1.3	1.0	1.30	1.0	1.0	1.03	0.20	1.23	1.92	1	1.9	1.0	1.0	1.53	0.288	1.82
Thallium	0.00526	15000	78.9	1.0	1.0	62.8	0.0008	62.8	0.005	15000	75.0	1.0	1.0	59.7	0.0008	59.7
Vanadium	0.01	1.0	0.010	1.0	1.0	0.008	0.002	0.009	0.01	1	0.010	1.0	1.0	0.008	0.002	0.009
Zinc	46.5	4578	212877	1.0	1.0	169450	6.98	169457	48.2	4578	220660	1.0	1.0	175645	7.23	175652

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentration
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
1 $EDDdiet = (IR_{diet} X C_{invert}) X AUF X BAV$
2 $EDD_{water} = IR_{water} X C_{water} X AUF$
3 $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)
IR_{diet} 0.796 kg/kg BW-day
IR_{water} 0.15 L/kg BW-day

Table E-11.
Estimated Daily Doses for the Muskrat at Sample Location WW-NT

Analyte	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
	Surface Water (mg/L)*	Plant BCF#	Plant Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]	Surface Water (mg/L)*	Plant BCF#	Plant Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]
Aluminum	0.877	833	731	1.0	1.0	248	0.855	249	0.63	833	525	1.0	1.0	178	0.614	179
Antimony	0.0025	1475	3.69	1.0	1.0	1.25	0.0024	1.26	0.005	1475	7.38	1.0	1.0	2.51	0.005	2.51
Arsenic	0.00298	293	0.873	1.0	1.0	0.297	0.0029	0.300	0.005	293	1.47	1.0	1.0	0.498	0.005	0.503
Beryllium	0.00365	141	0.515	1.0	1.0	0.175	0.0036	0.179	0.0041	141	0.578	1.0	1.0	0.197	0.004	0.201
Cadmium	0.183	782	143	1.0	1.0	48.7	0.178	48.8	0.122	782	95.4	1.0	1.0	32.4	0.119	32.6
Calcium	127	1.0	127	1.0	1.0	43.2	124	167	174	1.0	174	1.0	1.0	59.2	170	229
Chromium	0.0025	4406	11.0	1.0	1.0	3.75	0.002	3.75	0.005	4406	22.0	1.0	1.0	7.49	0.005	7.50
Copper	0.0741	541	40.1	1.0	1.0	13.6	0.072	13.7	0.0271	541	14.7	1.0	1.0	4.98	0.026	5.01
Iron	0.988	1.0	0.988	1.0	1.0	0.336	0.963	1.30	3.8	1.0	3.80	1.0	1.0	1.29	3.71	5.00
Lead	1.66	1706	2832	1.0	1.0	963	1.62	964	1.7	1706	2900	1.0	1.0	986	1.66	988
Magnesium	10.5	1.0	10.5	1.0	1.0	3.57	10.2	13.8	13	1.0	13.0	1.0	1.0	4.42	12.7	17.1
Manganese	10.2	1.0	10.2	1.0	1.0	3.47	9.95	13.4	9.95	1.0	9.95	1.0	1.0	3.38	9.70	13.1
Mercury (Inorganic)	0.0001	24762	2.48	1.0	1.0	0.842	0.0001	0.842	NA	24762	NC	1.0	1.0	NC	NC	NC
Nickel	0.0107	61	0.653	1.0	1.0	0.222	0.010	0.232	0.005	61	0.305	1.0	1.0	0.104	0.005	0.109
Potassium	4.72	1.0	4.72	1.0	1.0	1.60	4.60	6.21	5.02	1.0	5.02	1.0	1.0	1.71	4.89	6.60
Selenium	0.00813	1845	15.0	1.0	1.0	5.10	0.0079	5.11	0.00614	1845	11.3	1.0	1.0	3.85	0.006	3.86
Silica	39.2	1.0	39.2	1.0	1.0	13.3	38.2	51.5	41.4	1.0	41.4	1.0	1.0	14.1	40.4	54.4
Silver	0.00112	10696	12.0	1.0	1.0	4.07	0.0011	4.07	0.001	10696	10.7	1.0	1.0	3.64	0.001	3.64
Sodium	40.5	1.0	40.5	1.0	1.0	13.8	39.5	53.3	52.7	1.0	52.7	1.0	1.0	17.9	51.4	69.3
Strontium	1.3	1.0	1.30	1.0	1.0	0.442	1.27	1.71	1.92	1.0	1.92	1.0	1.0	0.653	1.87	2.52
Thallium	0.00526	15000	78.9	1.0	1.0	26.8	0.005	26.8	0.005	15000	75.0	1.0	1.0	25.5	0.005	25.5
Vanadium	0.01	1.0	0.010	1.0	1.0	0.003	0.010	0.013	0.01	1.0	0.010	1.0	1.0	0.003	0.010	0.013
Zinc	46.5	2175	101138	1.0	1.0	34387	45.3	34432	48.2	2175	104835	1.0	1.0	35644	47.0	35691

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentrations
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
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mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{plant}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)
IR_{diet} 0.34 kg/kg BW-day
IR_{water} 0.975 L/kg BW-day

Table E-12.
Estimated Daily Doses for the Belted King Fisher at Sample Location WW-NT

	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	**Diet**				**Estimated Daily Dose (mg/kg bw-day)**			**EPC**	**Diet**				**Estimated Daily Dose (mg/kg bw-day)**		
Analyte	**Surface Water (mg/L)***	**Fish BCF#**	**Fish Concentration (mg/kg, wet wt)**	**BAV**	**AUF**	**EDD_{diet} [1]**	**EDD_{water} [2]**	**EDD_{total} [3]**	**Surface Water (mg/L)***	**Fish BCF#**	**Fish Concentration (mg/kg, wet wt)**	**BAV**	**AUF**	**EDD_{diet} [1]**	**EDD_{water} [2]**	**EDD_{total} [3]**
Aluminum	0.877	2.7	2.37	1.0	1.0	1.18	0.097	1.28	0.63	2.7	1.70	1.0	1.0	0.851	0.070	0.920
Antimony	0.0025	40	0.100	1.0	1.0	0.050	0.0003	0.050	0.005	40	0.200	1.0	1.0	0.100	0.0006	0.101
Arsenic	0.00298	114	0.340	1.0	1.0	0.170	0.0003	0.170	0.005	114	0.570	1.0	1.0	0.285	0.0006	0.286
Beryllium	0.00365	62	0.226	1.0	1.0	0.113	0.0004	0.114	0.0041	62	0.254	1.0	1.0	0.127	0.0005	0.128
Cadmium	0.183	907	166	1.0	1.0	83.0	0.020	83.0	0.122	907	111	1.0	1.0	55.3	0.014	55.3
Calcium	127	1.0	127	1.0	1.0	63.5	14.1	77.6	174	1.0	174	1.0	1.0	87.0	19.3	106
Chromium	0.0025	19	0.048	1.0	1.0	0.024	0.0003	0.024	0.005	19	0.095	1.0	1.0	0.048	0.0006	0.048
Copper	0.0741	710	52.6	1.0	1.0	26.3	0.008	26.3	0.0271	710	19.2	1.0	1.0	9.62	0.003	9.62
Iron	0.988	1.0	0.988	1.0	1.0	0.494	0.110	0.604	3.8	1.0	3.80	1.0	1.0	1.90	0.422	2.32
Lead	1.66	0.09	0.149	1.0	1.0	0.075	0.184	0.259	1.7	0.09	0.153	1.0	1.0	0.077	0.189	0.265
Magnesium	10.5	1.0	10.5	1.0	1.0	5.25	1.17	6.42	13	1.0	13.0	1.0	1.0	6.50	1.44	7.94
Manganese	10.2	1.0	10.2	1.0	1.0	5.10	1.13	6.23	9.95	1.0	10.0	1.0	1.0	4.98	1.10	6.08
Mercury (Inorganic)	0.0001	3530	0.353	1.0	1.0	0.177	0.00001	0.177	NA	3530	NC	1.0	1.0	NC	NC	NC
Nickel	0.0107	78	0.835	1.0	1.0	0.417	0.001	0.418	0.005	78	0.390	1.0	1.0	0.195	0.0006	0.196
Potassium	4.72	1.0	4.72	1.0	1.0	2.36	0.524	2.88	5.02	1.0	5.02	1.0	1.0	2.51	0.557	3.07
Selenium	0.00813	129	1.05	1.0	1.0	0.524	0.0009	0.525	0.00614	129	0.792	1.0	1.0	0.396	0.0007	0.397
Silica	39.2	1.0	39.2	1.0	1.0	19.6	4.35	24.0	41.4	1.0	41.4	1.0	1.0	20.7	4.60	25.3
Silver	0.00112	87.71	0.098	1.0	1.0	0.049	0.0001	0.049	0.001	87.71	0.088	1.0	1.0	0.044	0.0001	0.044
Sodium	40.5	1.0	40.5	1.0	1.0	20.3	4.50	24.7	52.7	1.0	52.7	1.0	1.0	26.4	5.85	32.2
Strontium	1.3	1.0	1.30	1.0	1.0	0.650	0.144	0.794	1.92	1.0	1.92	1.0	1.0	0.960	0.213	1.17
Thallium	0.00526	10000	52.6	1.0	1.0	26.3	0.0006	26.3	0.005	10000	50.0	1.0	1.0	25.0	0.0006	25.0
Vanadium	0.01	1.0	0.010	1.0	1.0	0.005	0.001	0.006	0.01	1.0	0.010	1.0	1.0	0.005	0.001	0.006
Zinc	46.5	2059	95744	1.0	1.0	47872	5.16	47877	48.2	2059	99244	1.0	1.0	49622	5.35	49627

* - Surface water concentrations converted from ug/L to mg/L
# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentration
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{fish}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)
IR_{diet} 0.5 kg/kg BW-day
IR_{water} 0.111 L/kg BW-day

Table E-13.
Estimated Daily Doses for the Mallard at Sample Location WW-NT

Analyte	Spring Exposure Scenario								Fall Exposure Scenario									
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet						Estimated Daily Dose (mg/kg bw-day)		
	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	Plant BCF #	Plant Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [4]	EDD_{water} [2]	EDD_{total} [3]
Aluminum	0.877	4066	3566	1.0	1.0	1105	0.049	1105	0.63	4066	2562	833	525	1.0	1.0	478	0.035	478
Antimony	0.0025	7	0.018	1.0	1.0	0.005	0.0001	0.006	0.005	7	0.035	1475	7.38	1.0	1.0	1	0.0003	1.1488
Arsenic	0.00298	73	0.218	1.0	1.0	0.067	0.0002	0.068	0.005	73	0.365	293	1.47	1.0	1.0	0.284	0.0003	0.284
Beryllium	0.00365	45	0.164	1.0	1.0	0.051	0.0002	0.051	0.0041	45	0.185	141	0.578	1.0	1.0	0.118	0.0002	0.118
Cadmium	0.183	3461	633	1.0	1.0	196	0.010	196	0.122	3461	422	782	95.4	1.0	1.0	80	0.007	80
Calcium	127	1.0	127	1.0	1.0	39.4	7.11	46.5	174	1.0	174	1.0	174	1.0	1.0	54	9.74	63.7
Chromium	0.0025	3000	7.50	1.0	1.0	2.33	0.0001	2.33	0.005	3000	15.0	4406	22.0	1.0	1.0	6	0.0003	5.74
Copper	0.0741	3718	276	1.0	1.0	85.4	0.0041	85.4	0.0271	3718	101	541	14.7	1.0	1.0	18	0.0015	17.9
Iron	0.988	1.0	0.988	1.0	1.0	0.306	0.055	0.362	3.8	1.0	3.80	1.0	3.80	1.0	1.0	1	0.213	1.39
Lead	1.66	5059	8398	1.0	1.0	2603	0.093	2603	1.7	5059	8600	1706	2900	1.0	1.0	1783	0.095	1783
Magnesium	10.5	1.0	10.5	1.0	1.0	3.26	0.588	3.84	13	1.0	13.0	1.0	13.0	1.0	1.0	4	0.728	4.76
Manganese	10.2	1.0	10.2	1.0	1.0	3.16	0.571	3.73	9.95	1.0	9.95	1.0	10.0	1.0	1.0	3	0.557	3.64
Mercury (Inorganic)	0.0001	20184	2.02	1.0	1.0	0.626	0.00001	0.626	NA	20184	NC	24762	NC	1.0	1.0	NC	NC	NC
Nickel	0.0107	28	0.300	1.0	1.0	0.093	0.0006	0.093	0.005	28	0.140	61	0.305	1.0	1.0	0.069	0.0003	0.069
Potassium	4.72	1.0	4.72	1.0	1.0	1.46	0.264	1.73	5.02	1.0	5.02	1.0	5.02	1.0	1.0	2	0.281	1.84
Selenium	0.00813	1262	10.3	1.0	1.0	3.18	0.0005	3.18	0.00614	1262	7.75	1845	11.3	1.0	1.0	3	0.0003	2.96
Silica	39.2	1.0	39.2	1.0	1.0	12.2	2.20	14.3	41.4	1.0	41.4	1.0	41.4	1.0	1.0	13	2.32	15.2
Silver	0.00112	298	0.334	1.0	1.0	0.103	0.00006	0.104	0.001	298	0.298	10696	10.7	1.0	1.0	2	0.00006	1.7041
Sodium	40.5	1.0	40.5	1.0	1.0	12.6	2.27	14.8	52.7	1.0	52.7	1.0	52.7	1.0	1.0	16	2.95	19.3
Strontium	1.3	1.0	1.30	1.0	1.0	0.403	0.073	0.476	1.92	1.0	1.92	1.0	1.92	1.0	1.0	0.595	0.108	0.703
Thallium	0.00526	15000	78.9	1.0	1.0	24.5	0.0003	24.5	0.005	15000	75.0	15000	75.0	1.0	1.0	23	0.0003	23.3
Vanadium	0.01	1.0	0.010	1.0	1.0	0.003	0.0006	0.004	0.01	1.0	0.010	1.0	0.010	1.0	1.0	0.003	0.0006	0.004
Zinc	46.5	4578	212877	1.0	1.0	65992	2.60	65994	48.2	4578	220660	2175	104835	1.0	1.0	50452	2.70	50454

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
EPC - Exposure Point Concentration
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} X C_{invert}) X AUF X BAV$
[2] $EDD_{water} = IR_{water} X C_{water} X AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$
[4] $EDD_{diet} = IR_{diet}[(C_{invert} X BAF X 0.5)+(C_{plant} X BAV X 0.5)]X AUF$

Ingestion Rates (IR)
IR_{diet} 0.31 kg/kg BW-day
IR_{water} 0.056 L/kg BW-day

Table E-14.
Estimated Daily Doses for the American Dipper at Sample Location WW-F

	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
Analyte	Surface Water (mg/L)*	Aquatic Invertebrate BCF #	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} 1	EDD_{water} 2	EDD_{total} 3	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} 1	EDD_{water} 2	EDD_{total} 3
Aluminum	0.122	4066	496	1.0	1.0	395	0.018	395	0.155	4066	630	1.0	1.0	502	0.023	502
Antimony	0.0025	7.0	0.018	1.0	1.0	0.014	0.0004	0.014	0.0025	7.0	0.018	1.0	1.0	0.014	0.0004	0.014
Arsenic	0.0025	73	0.183	1.0	1.0	0.145	0.0004	0.146	0.0025	73	0.183	1.0	1.0	0.145	0.0004	0.146
Beryllium	0.0005	45	0.023	1.0	1.0	0.018	0.00008	0.018	0.000697	45	0.031	1.0	1.0	0.025	0.0001	0.025
Cadmium	0.00433	3461	15.0	1.0	1.0	11.9	0.0006	11.9	0.0288	3461	100	1.0	1.0	79.3	0.004	79.3
Calcium	11.4	1.0	11.4	1.0	1.0	9.07	1.71	10.8	44.4	1.0	44.4	1.0	1.0	35.3	6.66	42.0
Chromium	0.0025	3000	7.50	1.0	1.0	5.97	0.0004	5.97	0.0025	3000	7.50	1.0	1.0	5.97	0.0004	5.97
Copper	0.0025	3718	9.30	1.0	1.0	7.4	0.0004	7.40	0.00805	3718	29.9	1.0	1.0	23.8	0.001	23.8
Iron	0.123	1.0	0.123	1.0	1.0	0.098	0.018	0.116	0.837	1.0	0.837	1.0	1.0	0.666	0.126	0.792
Lead	0.0331	5059	167	1.0	1.0	133	0.005	133	0.366	5059	1852	1.0	1.0	1474	0.055	1474
Magnesium	1.29	1.0	1.29	1.0	1.0	1.03	0.194	1.22	3.78	1.0	3.78	1.0	1.0	3.01	0.567	3.58
Manganese	0.174	1.0	0.174	1.0	1.0	0.139	0.026	0.165	1.94	1.0	1.94	1.0	1.0	1.54	0.291	1.84
Mercury (Inorganic)	0.0001	20184	2.02	1.0	1.0	1.61	0.00002	1.61	NA	20184	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	28	0.070	1.0	1.0	0.056	0.0004	0.056	0.0025	28	0.070	1.0	1.0	0.056	0.0004	0.056
Potassium	0.858	1.0	0.858	1.0	1.0	0.683	0.129	0.812	1.81	1.0	1.81	1.0	1.0	1.44	0.272	1.71
Selenium	0.0025	1262	3.16	1.0	1.0	2.51	0.0004	2.51	0.0025	1262	3.16	1.0	1.0	2.51	0.0004	2.51
Silica	12.1	1.0	12.1	1.0	1.0	9.63	1.82	11.4	21.7	1.0	21.7	1.0	1.0	17.3	3.26	20.5
Silver	0.0005	298	0.149	1.0	1.0	0.119	0.00008	0.119	0.0005	298	0.149	1.0	1.0	0.119	0.00008	0.119
Sodium	3.02	1.0	3.02	1.0	1.0	2.40	0.453	2.86	12.9	1.0	12.9	1.0	1.0	10.3	1.94	12.2
Strontium	0.128	1.0	0.128	1.0	1.0	0.102	0.019	0.121	0.51	1.0	0.510	1.0	1.0	0.406	0.077	0.482
Thallium	0.0025	15000	37.5	1.0	1.0	29.9	0.0004	29.9	0.0025	15000	37.5	1.0	1.0	29.9	0.0004	29.9
Vanadium	0.01	1.0	0.010	1.0	1.0	0.008	0.002	0.009	0.01	1.0	0.010	1.0	1.0	0.008	0.002	0.009
Zinc	0.878	4578	4019	1.0	1.0	3200	0.132	3200	10.2	4578	46696	1.0	1.0	37170	1.53	37171

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentration
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg Bw-d - Liters per kilogram body weight per day

EDD Equations
1 $EDDdiet = (IR_{diet} X C_{invert}) X AUF X BAV$
2 $EDD_{water} = IR_{water} X C_{water} X AUF$
3 $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)
IR_{diet} 0.796 kg/kg BW-day
IR_{water} 0.15 L/kg BW-day

Table E-15.
Estimated Daily Doses for the Muskrat at Sample Location WW-F

	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
Analyte	Surface Water (mg/L)*	Plant BCF[#]	Plant Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet}[1]	EDD_{water}[2]	EDD_{total}[3]	Surface Water (mg/L)*	Plant BCF[#]	Plant Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet}[1]	EDD_{water}[2]	EDD_{total}[3]
Aluminum	0.122	833	102	1.0	1.0	34.6	0.1190	34.7	0.155	833	129	1.0	1.0	43.9	0.151	44.1
Antimony	0.0025	1475	3.69	1.0	1.0	1.25	0.0024	1.26	0.0025	1475	3.69	1.0	1.0	1.25	0.0024	1.26
Arsenic	0.0025	293	0.733	1.0	1.0	0.249	0.0024	0.251	0.0025	293	0.733	1.0	1.0	0.249	0.0024	0.251
Beryllium	0.0005	141	0.071	1.0	1.0	0.024	0.00049	0.024	0.000697	141	0.098	1.0	1.0	0.033	0.00068	0.034
Cadmium	0.00433	782	3.39	1.0	1.0	1.15	0.0042	1.16	0.0288	782	22.5	1.0	1.0	7.66	0.028	7.69
Calcium	11.4	1.0	11.4	1.0	1.0	3.88	11.12	14.99	44.4	1.0	44.4	1.0	1.0	15.1	43.29	58.4
Chromium	0.0025	4406	11.02	1.0	1.0	3.75	0.0024	3.75	0.0025	4406	11.0	1.0	1.0	3.75	0.0024	3.75
Copper	0.0025	541	1.35	1.0	1.0	0.460	0.0024	0.462	0.00805	541	4.36	1.0	1.0	1.48	0.0078	1.49
Iron	0.123	1.0	0.123	1.0	1.0	0.042	0.120	0.162	0.837	1.0	0.837	1.0	1.0	0.285	0.816	1.101
Lead	0.0331	1706	56.5	1.0	1.0	19.2	0.032	19.2	0.366	1706	624	1.0	1.0	212	0.357	213
Magnesium	1.29	1.0	1.29	1.0	1.0	0.439	1.258	1.696	3.78	1.0	3.78	1.0	1.0	1.29	3.686	4.97
Manganese	0.174	1.0	0.174	1.0	1.0	0.059	0.170	0.229	1.94	1.0	1.94	1.0	1.0	0.660	1.892	2.551
Mercury (Inorganic)	0.0001	24762	2.48	1.0	1.0	0.842	0.00010	0.842	NA	24762	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	61	0.153	1.0	1.0	0.052	0.0024	0.054	0.0025	61	0.153	1.0	1.0	0.052	0.0024	0.054
Potassium	0.858	1.0	0.858	1.0	1.0	0.292	0.837	1.128	1.81	1.0	1.81	1.0	1.0	0.615	1.765	2.380
Selenium	0.0025	1845	4.61	1.0	1.0	1.57	0.0024	1.57	0.0025	1845	4.61	1.0	1.0	1.57	0.0024	1.57
Silica	12.1	1.0	12.1	1.0	1.0	4.11	11.80	15.91	21.7	1.0	21.7	1.0	1.0	7.38	21.16	28.54
Silver	0.0005	10696	5.35	1.0	1.0	1.82	0.00049	1.82	0.0005	10696	5.35	1.0	1.0	1.82	0.00049	1.82
Sodium	3.02	1.0	3.02	1.0	1.0	1.03	2.945	3.97	12.9	1.0	12.9	1.0	1.0	4.39	12.58	16.96
Strontium	0.128	1.0	0.128	1.0	1.0	0.044	0.125	0.168	0.51	1.0	0.510	1.0	1.0	0.173	0.497	0.671
Thallium	0.0025	15000	37.5	1.0	1.0	12.8	0.0024	12.8	0.0025	15000	37.5	1.0	1.0	12.8	0.0024	12.8
Vanadium	0.01	1.0	0.010	1.0	1.0	0.003	0.0098	0.013	0.01	1.0	0.010	1.0	1.0	0.003	0.010	0.013
Zinc	0.878	2175	1910	1.0	1.0	649	0.856	650	10.2	2175	22185	1.0	1.0	7543	9.945	7553

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentrations
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{plant}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)

IR_{diet}	0.34	kg/kg BW-day
IR_{water}	0.975	L/kg BW-day

Table E-16.
Estimated Daily Doses for the Belted King Fisher at Sample Location WW-F

	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
Analyte	Surface Water (mg/L)*	Fish BCF#	Fish Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]	Surface Water (mg/L)*	Fish BCF#	Fish Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]
Aluminum	0.122	2.7	0.329	1.0	1.0	0.165	0.014	0.178	0.155	2.7	0.42	1.0	1.0	0.209	0.017	0.226
Antimony	0.0025	40	0.100	1.0	1.0	0.050	0.0003	0.050	0.0025	40	0.100	1.0	1.0	0.050	0.0003	0.050
Arsenic	0.0025	114	0.285	1.0	1.0	0.143	0.0003	0.143	0.0025	114	0.285	1.0	1.0	0.143	0.0003	0.143
Beryllium	0.0005	62	0.031	1.0	1.0	0.016	0.00006	0.016	0.000697	62	0.043	1.0	1.0	0.022	0.0001	0.022
Cadmium	0.00433	907	3.9	1.0	1.0	1.96	0.0005	1.96	0.0288	907	26.1	1.0	1.0	13.1	0.003	13.1
Calcium	11.4	1.0	11.4	1.0	1.0	5.70	1.27	6.97	44.4	1.0	44.4	1.0	1.0	22.2	4.93	27.1
Chromium	0.0025	19	0.048	1.0	1.0	0.024	0.0003	0.024	0.0025	19	0.048	1.0	1.0	0.024	0.0003	0.024
Copper	0.0025	710	1.78	1.0	1.0	0.888	0.0003	0.888	0.00805	710	5.72	1.0	1.0	2.86	0.0009	2.86
Iron	0.123	1.0	0.123	1.0	1.0	0.062	0.014	0.075	0.837	1.0	0.837	1.0	1.0	0.419	0.093	0.511
Lead	0.0331	0.09	0.003	1.0	1.0	0.001	0.004	0.005	0.366	0.09	0.033	1.0	1.0	0.016	0.041	0.057
Magnesium	1.29	1.0	1.29	1.0	1.0	0.645	0.143	0.788	3.78	1.0	3.78	1.0	1.0	1.89	0.420	2.31
Manganese	0.174	1.0	0.174	1.0	1.0	0.087	0.019	0.106	1.94	1.0	1.94	1.0	1.0	0.97	0.215	1.19
Mercury (Inorganic)	0.0001	3530	0.353	1.0	1.0	0.177	0.00001	0.177	NA	3530	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	78	0.195	1.0	1.0	0.098	0.0003	0.098	0.0025	78	0.195	1.0	1.0	0.098	0.0003	0.098
Potassium	0.858	1.0	0.858	1.0	1.0	0.429	0.095	0.524	1.81	1.0	1.81	1.0	1.0	0.905	0.201	1.11
Selenium	0.0025	129	0.323	1.0	1.0	0.161	0.0003	0.162	0.0025	129	0.323	1.0	1.0	0.161	0.0003	0.162
Silica	12.1	1.0	12.1	1.0	1.0	6.05	1.34	7.39	21.7	1.0	21.7	1.0	1.0	10.9	2.41	13.3
Silver	0.0005	87.71	0.044	1.0	1.0	0.022	0.00006	0.022	0.0005	87.71	0.044	1.0	1.0	0.022	0.00006	0.022
Sodium	3.02	1.0	3.02	1.0	1.0	1.51	0.335	1.85	12.9	1.0	12.9	1.0	1.0	6.45	1.43	7.88
Strontium	0.128	1.0	0.128	1.0	1.0	0.064	0.014	0.078	0.51	1.0	0.510	1.0	1.0	0.255	0.057	0.312
Thallium	0.0025	10000	25.0	1.0	1.0	12.5	0.0003	12.5	0.0025	10000	25.0	1.0	1.0	12.5	0.0003	12.5
Vanadium	0.01	1.0	0.010	1.0	1.0	0.005	0.001	0.006	0.01	1.0	0.010	1.0	1.0	0.005	0.001	0.006
Zinc	0.878	2059	1808	1.0	1.0	904	0.097	904	10.2	2059	21002	1.0	1.0	10501	1.13	10502

* - Surface water concentrations converted from ug/L to mg/L
# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentration
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg Bw-d - Kilograms per kilogram body weight per day
L/kg Bw-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{fish}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)

IR_{diet}	0.5	kg/kg BW-day
IR_{water}	0.111	L/kg BW-day

Table E-17.
Estimated Daily Doses for the Mallard at Sample Location WW-F

	Spring Exposure Scenario								Fall Exposure Scenario									
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet						Estimated Daily Dose (mg/kg bw-day)		
Analyte	Surface Water (mg/L)*	Aquatic Invertebrate BCF[#]	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet}[1]	EDD_{water}[2]	EDD_{total}[3]	Surface Water (mg/L)*	Aquatic Invertebrate BCF[#]	Aquatic Invertebrate Concentration (mg/kg, wet wt)	Plant BCF [#]	Plant Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet}[1]	EDD_{water}[2]	EDD_{total}[3]
Aluminum	0.122	4066	496	1.0	1.0	154	0.007	154	0.155	4066	630	833	129	1.0	1.0	118	0.009	118
Antimony	0.0025	7.0	0.018	1.0	1.0	0.005	0.0001	0.006	0.0025	7.0	0.018	1475	3.69	1.0	1.0	0.574	0.0001	0.574
Arsenic	0.0025	73	0.183	1.0	1.0	0.057	0.0001	0.057	0.0025	73	0.183	293	0.733	1.0	1.0	0.142	0.00014	0.142
Beryllium	0.0005	45	0.023	1.0	1.0	0.007	0.00003	0.007	0.000697	45	0.031	141	0.098	1.0	1.0	0.020	0.00004	0.020
Cadmium	0.00433	3461	15.0	1.0	1.0	4.65	0.0002	4.65	0.0288	3461	100	782	22.5	1.0	1.0	18.9	0.002	18.9
Calcium	11.4	1.0	11.4	1.0	1.0	3.53	0.638	4.17	44.4	1.0	44.4	1.0	44.4	1.0	1.0	13.8	2.49	16.3
Chromium	0.0025	3000	7.50	1.0	1.0	2.33	0.0001	2.33	0.0025	3000	7.50	4406	11.0	1.0	1.0	2.87	0.0001	2.87
Copper	0.0025	3718	9.30	1.0	1.0	2.88	0.0001	2.88	0.00805	3718	29.9	541	4.36	1.0	1.0	5.31	0.0005	5.31
Iron	0.123	1.0	0.123	1.0	1.0	0.038	0.007	0.045	0.837	1.0	0.837	1.0	0.837	1.0	1.0	0.259	0.047	0.306
Lead	0.0331	5059	167	1.0	1.0	51.9	0.002	51.9	0.366	5059	1852	1706	624	1.0	1.0	384	0.020	384
Magnesium	1.29	1.0	1.29	1.0	1.0	0.400	0.072	0.472	3.78	1.0	3.78	1.0	3.78	1.0	1.0	1.17	0.212	1.38
Manganese	0.174	1.0	0.174	1.0	1.0	0.054	0.010	0.064	1.94	1.0	1.94	1.0	1.94	1.0	1.0	0.601	0.109	0.710
Mercury (Inorganic)	0.0001	20184	2.02	1.0	1.0	0.626	0.000006	0.626	NA	20184	NC	24762	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	28	0.070	1.0	1.0	0.022	0.0001	0.022	0.0025	28	0.070	61	0.153	1.0	1.0	0.034	0.0001	0.035
Potassium	0.858	1.0	0.858	1.0	1.0	0.266	0.048	0.314	1.81	1.0	1.81	1.0	1.81	1.0	1.0	0.561	0.101	0.662
Selenium	0.0025	1262	3.16	1.0	1.0	0.978	0.0001	0.978	0.0025	1262	3.16	1845	4.61	1.0	1.0	1.20	0.0001	1.204
Silica	12.1	1.0	12.1	1.0	1.0	3.75	0.678	4.43	21.7	1.0	21.7	1.0	21.7	1.0	1.0	6.73	1.22	7.94
Silver	0.0005	298	0.149	1.0	1.0	0.046	0.00003	0.046	0.0005	298	0.149	10696	5.35	1.0	1.0	0.852	0.00003	0.852
Sodium	3.02	1.0	3.02	1.0	1.0	0.936	0.169	1.11	12.9	1.0	12.9	1.0	12.9	1.0	1.0	4.00	0.722	4.72
Strontium	0.128	1.0	0.128	1.0	1.0	0.040	0.0072	0.047	0.51	1.0	0.510	1.0	0.510	1.0	1.0	0.158	0.029	0.187
Thallium	0.0025	15000	37.5	1.0	1.0	11.6	0.0001	11.6	0.0025	15000	37.5	15000	37.5	1.0	1.0	11.6	0.0001	11.6
Vanadium	0.01	1.0	0.010	1.0	1.0	0.003	0.0006	0.004	0.01	1.0	0.010	1.0	0.010	1.0	1.0	0.003	0.001	0.004
Zinc	0.878	4578	4019	1.0	1.0	1246	0.049	1246	10.2	4578	46696	2175	22185	1.0	1.0	10676	0.571	10677

* - Surface water concentrations converted from ug/L to mg/L
[#] - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
EPC - Exposure Point Concentration
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
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mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg Bw-d - Kilograms per kilogram body weight per day
L/kg Bw-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} X C_{invert}) X AUF X BAV$
[2] $EDD_{water} = IR_{water} X C_{water} X AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$
[4] $EDD_{diet} = IR_{diet}[(C_{invert} X BAF X 0.5)+(C_{plant} X BAV X 0.5)] X AUF$

Ingestion Rates (IR)
IR_{diet} 0.31 kg/kg BW-day
IR_{water} 0.056 L/kg BW-day

Table E-18.
Estimated Daily Doses for the American Dipper at Sample Location WW-E

Analyte	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
	Surface Water (mg/L)*	Aquatic Invertebrate BCF #	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} 1	EDD_{water} 2	EDD_{total} 3	Surface Water (mg/L)*	Aquatic Invertebrate BCF #	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} 1	EDD_{water} 2	EDD_{total} 3
Aluminum	0.139	4066	565	1.0	1.0	450	0.0209	450	0.168	4066	683	1.0	1.0	544	0.025	544
Antimony	0.0025	7	0.018	1.0	1.0	0.014	0.0004	0.014	0.0025	7	0.0175	1.0	1.0	0.014	0.0004	0.014
Arsenic	0.0025	73	0.183	1.0	1.0	0.145	0.0004	0.146	0.0025	73	0.183	1.0	1.0	0.145	0.0004	0.146
Beryllium	0.0005	45	0.023	1.0	1.0	0.018	0.0001	0.018	0.000998	45	0.045	1.0	1.0	0.036	0.0001	0.036
Cadmium	0.0066	3461	22.8	1.0	1.0	18.2	0.001	18.2	0.0365	3461	126	1.0	1.0	101	0.005	101
Calcium	12.1	1.0	12.1	1.0	1.0	9.63	1.82	11.4	56.2	1.0	56.2	1.0	1.0	44.7	8.43	53.2
Chromium	0.0025	3000	7.50	1.0	1.0	5.97	0.0004	5.97	0.0025	3000	7.50	1.0	1.0	5.97	0.0004	5.97
Copper	0.00422	3718	15.7	1.0	1.0	12.5	0.0006	12.5	0.00839	3718	31.2	1.0	1.0	24.8	0.001	24.8
Iron	0.139	1.0	0.139	1.0	1.0	0.111	0.021	0.131	0.853	1.0	0.853	1.0	1.0	0.679	0.128	0.807
Lead	0.0573	5059	290	1.0	1.0	231	0.009	231	0.397	5059	2008	1.0	1.0	1599	0.060	1599
Magnesium	1.33	1.0	1.33	1.0	1.0	1.06	0.200	1.26	4.63	1.0	4.63	1.0	1.0	3.69	0.695	4.38
Manganese	0.195	1.0	0.195	1.0	1.0	0.155	0.029	0.184	2.59	1.0	2.59	1.0	1.0	2.06	0.389	2.45
Mercury (Inorganic)	0.0001	20184	2.02	1.0	1.0	1.61	0.00002	1.61	NA	20184	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	28	0.070	1.0	1.0	0.056	0.0004	0.056	0.0025	28	0.070	1.0	1.0	0.056	0.0004	0.056
Potassium	0.924	1.0	0.924	1.0	1.0	0.736	0.139	0.874	2.1	1.0	2.10	1.0	1.0	1.67	0.315	1.99
Selenium	0.0025	1262	3.16	1.0	1.0	2.51	0.0004	2.51	0.0025	1262	3.16	1.0	1.0	2.51	0.0004	2.51
Silica	12.8	1.0	12.8	1.0	1.0	10.2	1.92	12.1	23.3	1.0	23.3	1.0	1.0	18.5	3.50	22.0
Silver	0.0005	298	0.149	1.0	1.0	0.119	0.0001	0.119	0.0005	298	0.149	1.0	1.0	0.119	0.0001	0.119
Sodium	3.23	1.0	3.23	1.0	1.0	2.57	0.485	3.06	16.4	1.0	16.4	1.0	1.0	13.1	2.46	15.5
Strontium	0.136	1.0	0.136	1.0	1.0	0.108	0.020	0.129	0.641	1.0	0.641	1.0	1.0	0.510	0.096	0.606
Thallium	0.0025	15000	37.5	1.0	1.0	29.9	0.0004	29.9	0.0025	15000	37.5	1.0	1.0	29.9	0.0004	29.9
Vanadium	0.01	1.0	0.010	1.0	1.0	0.008	0.002	0.009	0.01	1.0	0.010	1.0	1.0	0.008	0.002	0.009
Zinc	1.34	4578	6135	1.0	1.0	4883	0.201	4883	13.9	4578	63634	1.0	1.0	50653	2.09	50655

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentration
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
1 $EDDdiet = (IR_{diet} X C_{invert}) X AUF X BAV$
2 $EDD_{water} = IR_{water} X C_{water} X AUF$
3 $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)
IR_{diet} 0.796 kg/kg BW-day
IR_{water} 0.15 L/kg BW-day

Table E-19.
Estimated Daily Doses for the Muskrat at Sample Location WW-E

Analyte	Spring Exposure Scenario: EPC: Surface Water (mg/L)*	Spring: Diet: Plant BCF#	Spring: Diet: Plant Concentration (mg/kg, wet wt)	Spring: Diet: BAV	Spring: Diet: AUF	Spring: Estimated Daily Dose (mg/kg bw-day): EDD_{diet} 1	Spring: EDD_{water} 2	Spring: EDD_{total} 3	Fall Exposure Scenario: EPC: Surface Water (mg/L)*	Fall: Diet: Plant BCF#	Fall: Diet: Plant Concentration (mg/kg, wet wt)	Fall: Diet: BAV	Fall: Diet: AUF	Fall: Estimated Daily Dose (mg/kg bw-day): EDD_{diet} 1	Fall: EDD_{water} 2	Fall: EDD_{total} 3
Aluminum	0.139	833	116	1.0	1.0	39.4	0.136	39.5	0.168	833	140	1.0	1.0	47.6	0.164	47.7
Antimony	0.0025	1475	3.69	1.0	1.0	1.25	0.002	1.26	0.0025	1475	3.69	1.0	1.0	1.25	0.002	1.26
Arsenic	0.0025	293	0.733	1.0	1.0	0.249	0.002	0.251	0.0025	293	0.733	1.0	1.0	0.249	0.002	0.251
Beryllium	0.0005	141	0.071	1.0	1.0	0.024	0.0005	0.024	0.000998	141	0.141	1.0	1.0	0.048	0.001	0.049
Cadmium	0.0066	782	5.16	1.0	1.0	1.75	0.006	1.76	0.0365	782	28.5	1.0	1.0	9.70	0.036	9.74
Calcium	12.1	1.0	12.1	1.0	1.0	4.11	11.8	15.9	56.2	1.0	56.2	1.0	1.0	19.1	54.8	73.9
Chromium	0.0025	4406	11.0	1.0	1.0	3.75	0.002	3.75	0.0025	4406	11.0	1.0	1.0	3.75	0.002	3.75
Copper	0.00422	541	2.28	1.0	1.0	0.776	0.004	0.780	0.00839	541	4.54	1.0	1.0	1.54	0.008	1.55
Iron	0.139	1.0	0.139	1.0	1.0	0.047	0.14	0.183	0.853	1.0	0.853	1.0	1.0	0.290	0.832	1.12
Lead	0.0573	1706	97.8	1.0	1.0	33.2	0.056	33.3	0.397	1706	677	1.0	1.0	230	0.387	231
Magnesium	1.33	1.0	1.33	1.0	1.0	0.452	1.30	1.75	4.63	1.0	4.63	1.0	1.0	1.57	4.51	6.09
Manganese	0.195	1.0	0.195	1.0	1.0	0.066	0.190	0.256	2.59	1.0	2.59	1.0	1.0	0.881	2.53	3.41
Mercury (Inorganic)	0.0001	24762	2.48	1.0	1.0	0.842	0.0001	0.842	NA	24762	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	61	0.153	1.0	1.0	0.052	0.002	0.054	0.0025	61	0.153	1.0	1.0	0.052	0.002	0.054
Potassium	0.924	1.0	0.924	1.0	1.0	0.314	0.901	1.22	2.1	1.0	2.10	1.0	1.0	0.714	2.05	2.76
Selenium	0.0025	1845	4.61	1.0	1.0	1.57	0.002	1.57	0.0025	1845	4.61	1.0	1.0	1.57	0.002	1.57
Silica	12.8	1.0	12.8	1.0	1.0	4.35	12.5	16.8	23.3	1.0	23.3	1.0	1.0	7.92	22.7	30.6
Silver	0.0005	10696	5.35	1.0	1.0	1.82	0.0005	1.82	0.0005	10696	5.35	1.0	1.0	1.82	0.0005	1.82
Sodium	3.23	1.0	3.23	1.0	1.0	1.10	3.15	4.25	16.4	1.0	16.4	1.0	1.0	5.58	16.0	21.6
Strontium	0.136	1.0	0.136	1.0	1.0	0.046	0.133	0.179	0.641	1.0	0.641	1.0	1.0	0.218	0.625	0.843
Thallium	0.0025	15000	37.5	1.0	1.0	12.8	0.002	12.8	0.0025	15000	37.5	1.0	1.0	12.8	0.002	12.8
Vanadium	0.01	1.0	0.010	1.0	1.0	0.003	0.010	0.013	0.01	1.0	0.010	1.0	1.0	0.003	0.010	0.013
Zinc	1.34	2175	2915	1.0	1.0	991	1.31	992	13.9	2175	30233	1.0	1.0	10279	13.6	10293

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentrations
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg, dry wt - milligrams per kilogram, dry weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
1 $EDD_{diet} = (IR_{diet} \times C_{plant}) \times AUF \times BAV$
2 $EDD_{water} = IR_{water} \times C_{water} \times AUF$
3 $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)

IR_{diet}	0.34	kg/kg BW-day
IR_{water}	0.975	L/kg BW-day

Table E-20.
Estimated Daily Doses for the Belted King Fisher at Sample Location WW-E

Analyte	Spring Exposure Scenario: EPC: Surface Water (mg/L)*	Spring: Diet: Fish BCF#	Spring: Diet: Fish Concentration (mg/kg, wet wt)	Spring: Diet: BAV	Spring: Diet: AUF	Spring: Estimated Daily Dose (mg/kg bw-day): EDD_{diet}[1]	Spring: EDD_{water}[2]	Spring: EDD_{total}[3]	Fall Exposure Scenario: EPC: Surface Water (mg/L)*	Fall: Diet: Fish BCF#	Fall: Diet: Fish Concentration (mg/kg, wet wt)	Fall: Diet: BAV	Fall: Diet: AUF	Fall: Estimated Daily Dose (mg/kg bw-day): EDD_{diet}[1]	Fall: EDD_{water}[2]	Fall: EDD_{total}[3]
Aluminum	0.139	2.7	0.375	1.0	1.0	0.188	0.0154	0.203	0.168	2.7	0.454	1.0	1.0	0.227	0.019	0.245
Antimony	0.0025	40	0.100	1.0	1.0	0.0500	0.0003	0.050	0.0025	40	0.100	1.0	1.0	0.050	0.0003	0.050
Arsenic	0.0025	114	0.285	1.0	1.0	0.143	0.0003	0.143	0.0025	114	0.285	1.0	1.0	0.143	0.0003	0.143
Beryllium	0.0005	62	0.0310	1.0	1.0	0.016	0.0001	0.016	0.000998	62	0.062	1.0	1.0	0.031	0.0001	0.031
Cadmium	0.0066	907	5.99	1.0	1.0	2.99	0.0007	2.99	0.0365	907	33.1	1.0	1.0	16.6	0.004	16.6
Calcium	12.1	1.0	12.1	1.0	1.0	6.05	1.34	7.39	56.2	1.0	56.2	1.0	1.0	28.1	6.24	34.3
Chromium	0.0025	19	0.048	1.0	1.0	0.024	0.0003	0.024	0.0025	19	0.048	1.0	1.0	0.024	0.0003	0.024
Copper	0.00422	710	3.00	1.0	1.0	1.50	0.0005	1.50	0.00839	710	5.96	1.0	1.0	2.98	0.001	2.98
Iron	0.139	1.0	0.139	1.0	1.0	0.070	0.015	0.085	0.853	1.0	0.853	1.0	1.0	0.427	0.095	0.521
Lead	0.0573	0.09	0.005	1.0	1.0	0.003	0.006	0.009	0.397	0.09	0.036	1.0	1.0	0.018	0.044	0.062
Magnesium	1.33	1.0	1.33	1.0	1.0	0.665	0.148	0.813	4.63	1.0	4.63	1.0	1.0	2.32	0.514	2.83
Manganese	0.195	1.0	0.195	1.0	1.0	0.098	0.022	0.119	2.59	1.0	2.59	1.0	1.0	1.30	0.287	1.58
Mercury (Inorganic)	0.0001	3530	0.353	1.0	1.0	0.177	0.00001	0.177	NA	3530	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	78	0.195	1.0	1.0	0.098	0.0003	0.098	0.0025	78	0.195	1.0	1.0	0.098	0.0003	0.098
Potassium	0.924	1.0	0.924	1.0	1.0	0.462	0.103	0.565	2.1	1.0	2.10	1.0	1.0	1.05	0.233	1.28
Selenium	0.0025	129	0.323	1.0	1.0	0.161	0.0003	0.162	0.0025	129	0.323	1.0	1.0	0.161	0.0003	0.162
Silica	12.8	1.0	12.8	1.0	1.0	6.40	1.42	7.82	23.3	1.0	23.3	1.0	1.0	11.7	2.59	14.2
Silver	0.0005	87.71	0.044	1.0	1.0	0.022	0.00006	0.022	0.0005	87.71	0.044	1.0	1.0	0.022	0.0001	0.022
Sodium	3.23	1.0	3.23	1.0	1.0	1.62	0.359	1.97	16.4	1.0	16.4	1.0	1.0	8.20	1.82	10.0
Strontium	0.136	1.0	0.136	1.0	1.0	0.068	0.015	0.083	0.641	1.0	0.641	1.0	1.0	0.321	0.071	0.392
Thallium	0.0025	10000	25.0	1.0	1.0	12.5	0.0003	12.5	0.0025	10000	25.0	1.0	1.0	12.5	0.0003	12.5
Vanadium	0.01	1.0	0.010	1.0	1.0	0.005	0.001	0.006	0.01	1.0	0.010	1.0	1.0	0.005	0.001	0.006
Zinc	1.34	2059	2759	1.0	1.0	1380	0.149	1380	13.9	2059	28620	1.0	1.0	14310	1.54	14312

* - Surface water concentrations converted from ug/L to mg/L

\# - A default value of 1.0 was used when no BCF was available.

COPECs - Chemicals of Potential Ecological Concern

EPC - Exposure Point Concentration

EDD - Estimated Daily Dose

BCF - Bioconcentration Factor

AUF - Area Use Factor (unitless)

BAV - Bioavailability Adjustment Factor (unitless)

NA - Not available

NC - Not calculated

mg/L - milligrams per liter; mg/L = mg/kg

mg/kg, wet wt - milligrams per kilogram, wet weight

mg/kg bw-day - milligrams per kilogram of body weight per day

kg/kg BW-d - Kilograms per kilogram body weight per day

L/kg BW-d - Liters per kilogram body weight per day

EDD Equations

[1] $EDD_{diet} = (IR_{diet} \times C_{fish}) \times AUF \times BAV$

[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$

[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)

IR_{diet}	0.5	kg/kg BW-day
IR_{water}	0.111	L/kg BW-day

Table E-21.
Estimated Daily Doses for the Mallard at Sample Location WW-E

	Spring Exposure Scenario								Fall Exposure Scenario									
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet						Estimated Daily Dose (mg/kg bw-day)		
Analyte	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	Plant BCF #	Plant Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [4]	EDD_{water} [2]	EDD_{total} [3]
Aluminum	0.139	4066	565	1.0	1.0	175	0.008	175	0.168	4066	683	833	140	1.0	1.0	128	0.009	128
Antimony	0.0025	7	0.018	1.0	1.0	0.005	0.0001	0.006	0.0025	7	0.018	1475	3.69	1.0	1.0	1	0.0001	0.574
Arsenic	0.0025	73	0.183	1.0	1.0	0.057	0.0001	0.057	0.0025	73	0.183	293	0.733	1.0	1.0	0	0.0001	0.142
Beryllium	0.0005	45	0.023	1.0	1.0	0.007	0.00003	0.007	0.000998	45	0.045	141	0.141	1.0	1.0	0	0.0001	0.029
Cadmium	0.0066	3461	22.8	1.0	1.0	7.08	0.0004	7.08	0.0365	3461	126	782	28.5	1.0	1.0	24	0.002	24.0
Calcium	12.1	1.0	12.1	1.0	1.0	3.75	0.678	4.43	56.2	1.0	56.2	1.0	56.2	1.0	1.0	17	3.15	20.6
Chromium	0.0025	3000	7.50	1.0	1.0	2.33	0.0001	2.33	0.0025	3000	7.50	4406	11.0	1.0	1.0	3	0.0001	2.87
Copper	0.00422	3718	15.7	1.0	1.0	4.86	0.0002	4.86	0.00839	3718	31.2	541	4.54	1.0	1.0	6	0.0005	5.54
Iron	0.139	1.0	0.139	1.0	1.0	0.043	0.008	0.051	0.853	1.0	0.853	1.0	0.853	1.0	1.0	0	0.048	0.312
Lead	0.0573	5059	290	1.0	1.0	89.9	0.003	89.9	0.397	5059	2008	1706	677	1.0	1.0	416	0.022	416
Magnesium	1.33	1.0	1.33	1.0	1.0	0.412	0.074	0.487	4.63	1.0	4.63	1.0	4.63	1.0	1.0	1	0.259	1.69
Manganese	0.195	1.0	0.195	1.0	1.0	0.060	0.011	0.071	2.59	1.0	2.59	1.0	2.59	1.0	1.0	1	0.145	0.948
Mercury (Inorganic)	0.0001	20184	2.02	1.0	1.0	0.626	0.00001	0.626	NA	20184	NC	24762	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	28	0.070	1.0	1.0	0.022	0.0001	0.022	0.0025	28	0.070	61	0.153	1.0	1.0	0	0.0001	0.035
Potassium	0.924	1.0	0.924	1.0	1.0	0.286	0.052	0.338	2.1	1.0	2.10	1.0	2.10	1.0	1.0	1	0.118	0.769
Selenium	0.0025	1262	3.16	1.0	1.0	0.978	0.0001	0.978	0.0025	1262	3.16	1845	4.61	1.0	1.0	1	0.0001	1.204
Silica	12.8	1.0	12.8	1.0	1.0	3.97	0.717	4.68	23.3	1.0	23.3	1.0	23.3	1.0	1.0	7	1.30	8.53
Silver	0.0005	298	0.149	1.0	1.0	0.046	0.00003	0.046	0.0005	298	0.149	10696	5.35	1.0	1.0	1	0.00003	0.852
Sodium	3.23	1.0	3.23	1.0	1.0	1.00	0.181	1.18	16.4	1.0	16.4	1.0	16.4	1.0	1.0	5	0.918	6.00
Strontium	0.136	1.0	0.136	1.0	1.0	0.042	0.008	0.050	0.641	1.0	0.641	1.0	0.641	1.0	1.0	0	0.036	0.235
Thallium	0.0025	15000	37.5	1.0	1.0	11.6	0.0001	11.6	0.0025	15000	37.5	15000	37.5	1.0	1.0	12	0.0001	11.6
Vanadium	0.01	1.0	0.010	1.0	1.0	0.003	0.0006	0.004	0.01	1.0	0.010	1.0	0.010	1.0	1.0	0	0.0006	0.004
Zinc	1.34	4578	6135	1.0	1.0	1902	0.075	1902	13.9	4578	63634	2175	30233	1.0	1.0	14549	0.778	14550

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
EPC - Exposure Point Concentration

BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{invert}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$
[4] $EDD_{diet} = IR_{diet}[(C_{invert} \times BAF \times 0.5)+(C_{plant} \times BAV \times 0.5)] \times AUF$

Ingestion Rates (IR)
IR_{diet} 0.31 kg/kg BW-day
IR_{water} 0.056 L/kg BW-day

Table E-22.
Estimated Daily Doses for the American Dipper at Sample Location W-I

Analyte	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
	Surface Water (mg/L)*	Aquatic Invertebrate BCF #	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} 1	EDD_{water} 2	EDD_{total} 3	Surface Water (mg/L)*	Aquatic Invertebrate BCF #	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} 1	EDD_{water} 2	EDD_{total} 3
Aluminum	0.159	4066	646	1.0	1.0	515	0.024	515	0.067	4066	272	1.0	1.0	217	0.010	217
Antimony	0.0025	7.0	0.018	1.0	1.0	0.014	0.0004	0.014	0.0025	7.0	0.018	1.0	1.0	0.014	0.0004	0.014
Arsenic	0.0025	73	0.183	1.0	1.0	0.145	0.0004	0.146	0.0025	73	0.183	1.0	1.0	0.145	0.0004	0.146
Beryllium	0.0005	45	0.023	1.0	1.0	0.018	0.00008	0.018	0.0005	45	0.023	1.0	1.0	0.018	0.00008	0.018
Cadmium	0.00498	3461	17.2	1.0	1.0	13.7	0.0007	13.7	0.01925	3461	66.6	1.0	1.0	53.0	0.003	53.0
Calcium	8.33	1.0	8.33	1.0	1.0	6.63	1.25	7.88	20.05	1.0	20.1	1.0	1.0	16.0	3.01	19.0
Chromium	0.00307	3000	9.21	1.0	1.0	7.33	0.0005	7.33	0.00313	3000	9.39	1.0	1.0	7.47	0.0005	7.47
Copper	0.00319	3718	11.9	1.0	1.0	9.44	0.0005	9.44	0.00328	3718	12.2	1.0	1.0	9.71	0.0005	9.71
Iron	0.114	1.0	0.114	1.0	1.0	0.091	0.017	0.108	0.1	1.0	0.100	1.0	1.0	0.080	0.015	0.095
Lead	0.0422	5059	213	1.0	1.0	170	0.006	170	0.02685	5059	136	1.0	1.0	108	0.004	108
Magnesium	0.901	1.0	0.901	1.0	1.0	0.717	0.135	0.852	1.995	1.0	2.00	1.0	1.0	1.59	0.299	1.89
Manganese	0.0543	1.0	0.054	1.0	1.0	0.043	0.008	0.051	0.1085	1.0	0.109	1.0	1.0	0.086	0.016	0.103
Mercury (Inorganic)	0.0001	20184	2.02	1.0	1.0	1.61	0.00002	1.61	NA	20184	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	28	0.070	1.0	1.0	0.056	0.0004	0.056	0.0025	28	0.070	1.0	1.0	0.056	0.0004	0.056
Potassium	0.905	1.0	0.905	1.0	1.0	0.720	0.136	0.856	1.405	1.0	1.41	1.0	1.0	1.12	0.211	1.33
Selenium	0.0025	1262	3.16	1.0	1.0	2.51	0.0004	2.51	0.0025	1262	3.16	1.0	1.0	2.51	0.0004	2.51
Silica	15.3	1.0	15.3	1.0	1.0	12.2	2.30	14.5	20.5	1.0	20.5	1.0	1.0	16.3	3.08	19.4
Silver	0.0005	298	0.149	1.0	1.0	0.119	0.00008	0.119	0.0005	298	0.149	1.0	1.0	0.119	0.00008	0.119
Sodium	2.84	1.0	2.84	1.0	1.0	2.26	0.426	2.69	6.43	1.0	6.43	1.0	1.0	5.12	0.965	6.08
Strontium	0.069	1.0	0.069	1.0	1.0	0.055	0.010	0.065	0.1835	1.0	0.184	1.0	1.0	0.146	0.0275	0.174
Thallium	0.0025	15000	37.5	1.0	1.0	29.9	0.0004	29.9	0.0025	15000	37.5	1.0	1.0	29.9	0.0004	29.9
Vanadium	0.01	1.0	0.010	1.0	1.0	0.008	0.002	0.009	0.01	1.0	0.010	1.0	1.0	0.008	0.002	0.009
Zinc	0.903	4578	4134	1.0	1.0	3291	0.135	3291	3.585	4578	16412	1.0	1.0	13064	0.538	13065

* - Surface water concentrations converted from ug/L to mg/L
# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentration
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
1 EDDdiet = (IR_{diet} X C_{invert}) X AUF X BAV
2 EDD_{water} = IR_{water} X C_{water} X AUF
3 EDD_{total} = EDD_{diet} + EDD_{water}

Ingestion Rates (IR)
IR_{diet} 0.796 kg/kg BW-day
IR_{water} 0.15 L/kg BW-day

Table E-23.
Estimated Daily Doses for the Muskrat at Sample Location W-I

Analytes	Spring Exposure Scenario: EPC: Surface Water (mg/L)*	Spring: Diet: Plant BCF#	Spring: Diet: Plant Concentration (mg/kg, wet wt)	Spring: Diet: BAV	Spring: Diet: AUF	Spring: Estimated Daily Dose (mg/kg bw-day): EDD_{diet} [1]	Spring: EDD: EDD_{water} [2]	Spring: EDD: EDD_{total} [3]	Fall Exposure Scenario: EPC: Surface Water (mg/L)*	Fall: Diet: Plant BCF#	Fall: Diet: Plant Concentration (mg/kg, wet wt)	Fall: Diet: BAV	Fall: Diet: AUF	Fall: Estimated Daily Dose (mg/kg bw-day): EDD_{diet} [1]	Fall: EDD: EDD_{water} [2]	Fall: EDD: EDD_{total} [3]
Aluminum	0.159	833	132	1.0	1.0	45.0	0.155	45.2	0.067	833	55.8	1.0	1.0	19.0	0.065	19.0
Antimony	0.0025	1475	3.69	1.0	1.0	1.25	0.0024	1.26	0.0025	1475	3.69	1.0	1.0	1.25	0.002	1.26
Arsenic	0.0025	293	0.733	1.0	1.0	0.249	0.002	0.251	0.0025	293	0.733	1.0	1.0	0.249	0.002	0.251
Beryllium	0.0005	141	0.071	1.0	1.0	0.024	0.0005	0.024	0.0005	141	0.071	1.0	1.0	0.024	0.0005	0.024
Cadmium	0.00498	782	3.89	1.0	1.0	1.32	0.005	1.33	0.01925	782	15.1	1.0	1.0	5.12	0.019	5.14
Calcium	8.33	1.0	8.33	1.0	1.0	2.83	8.12	10.95	20.05	1.0	20.1	1.0	1.0	6.82	19.5	26.4
Chromium	0.00307	4406	13.5	1.0	1.0	4.60	0.003	4.60	0.00313	4406	13.8	1.0	1.0	4.69	0.003	4.69
Copper	0.00319	541	1.73	1.0	1.0	0.587	0.003	0.590	0.00328	541	1.77	1.0	1.0	0.603	0.003	0.607
Iron	0.114	1.0	0.114	1.0	1.0	0.039	0.111	0.150	0.1	1.0	0.100	1.0	1.0	0.034	0.098	0.132
Lead	0.0422	1706	72.0	1.0	1.0	24.5	0.041	24.5	0.02685	1706	45.8	1.0	1.0	15.6	0.026	15.6
Magnesium	0.901	1.0	0.901	1.0	1.0	0.306	0.878	1.185	1.995	1.0	2.00	1.0	1.0	0.678	1.95	2.62
Manganese	0.0543	1.0	0.054	1.0	1.0	0.018	0.053	0.071	0.1085	1.0	0.109	1.0	1.0	0.037	0.106	0.143
Mercury (Inorganic)	0.0001	24762	2.48	1.0	1.0	0.842	0.0001	0.842	NA	24762	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	61	0.153	1.0	1.0	0.052	0.002	0.054	0.0025	61	0.153	1.0	1.0	0.052	0.002	0.054
Potassium	0.905	1.0	0.905	1.0	1.0	0.308	0.882	1.190	1.405	1.0	1.41	1.0	1.0	0.478	1.37	1.85
Selenium	0.0025	1845	4.61	1.0	1.0	1.57	0.002	1.57	0.0025	1845	4.61	1.0	1.0	1.57	0.002	1.57
Silica	15.3	1.0	15.3	1.0	1.0	5.20	14.9	20.12	20.5	1.0	20.5	1.0	1.0	6.97	20.0	27.0
Silver	0.0005	10696	5.35	1.0	1.0	1.82	0.0005	1.82	0.0005	10696	5.35	1.0	1.0	1.82	0.0005	1.82
Sodium	2.84	1.0	2.84	1.0	1.0	0.966	2.77	3.73	6.43	1.0	6.43	1.0	1.0	2.19	6.27	8.46
Strontium	0.069	1.0	0.069	1.0	1.0	0.023	0.067	0.091	0.1835	1.0	0.184	1.0	1.0	0.062	0.179	0.241
Thallium	0.0025	15000	37.5	1.0	1.0	12.8	0.002	12.8	0.0025	15000	37.5	1.0	1.0	12.8	0.002	12.8
Vanadium	0.01	1.0	0.010	1.0	1.0	0.003	0.010	0.013	0.01	1.0	0.010	1.0	1.0	0.003	0.010	0.013
Zinc	0.903	2175	1964	1.0	1.0	668	0.880	669	3.585	2175	7797	1.0	1.0	2651	3.50	2655

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentrations
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{plant}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)
IR_{diet} 0.34 kg/kg BW-day
IR_{water} 0.975 L/kg BW-day

Table E-24.
Estimated Daily Doses for the Belted King Fisher at Sample Location W-I

	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
Analytes	Surface Water (mg/L)*	Fish BCF#	Fish Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]	Surface Water (mg/L)*	Fish BCF#	Fish Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]
Aluminum	0.159	2.7	0.429	1.0	1.0	0.215	0.018	0.232	0.067	2.7	0.181	1.0	1.0	0.090	0.007	0.098
Antimony	0.0025	40	0.100	1.0	1.0	0.050	0.0003	0.050	0.0025	40	0.100	1.0	1.0	0.050	0.0003	0.050
Arsenic	0.0025	114	0.285	1.0	1.0	0.143	0.0003	0.143	0.0025	114	0.285	1.0	1.0	0.143	0.0003	0.143
Beryllium	0.0005	62	0.031	1.0	1.0	0.016	0.00006	0.016	0.0005	62	0.031	1.0	1.0	0.016	0.00006	0.016
Cadmium	0.00498	907	4.52	1.0	1.0	2.26	0.0006	2.26	0.01925	907	17.5	1.0	1.0	8.73	0.002	8.73
Calcium	8.33	1.0	8.33	1.0	1.0	4.17	0.925	5.09	20.05	1.0	20.1	1.0	1.0	10.0	2.23	12.3
Chromium	0.00307	19	0.058	1.0	1.0	0.029	0.0003	0.030	0.00313	19	0.059	1.0	1.0	0.030	0.0003	0.030
Copper	0.00319	710	2.26	1.0	1.0	1.13	0.0004	1.13	0.00328	710	2.33	1.0	1.0	1.16	0.0004	1.16
Iron	0.114	1.0	0.114	1.0	1.0	0.057	0.0127	0.070	0.1	1.0	0.100	1.0	1.0	0.050	0.011	0.061
Lead	0.0422	0.09	0.004	1.0	1.0	0.002	0.005	0.007	0.02685	0.09	0.002	1.0	1.0	0.001	0.003	0.004
Magnesium	0.901	1.0	0.901	1.0	1.0	0.451	0.100	0.551	1.995	1.0	2.00	1.0	1.0	0.998	0.221	1.22
Manganese	0.0543	1.0	0.054	1.0	1.0	0.027	0.006	0.033	0.1085	1.0	0.109	1.0	1.0	0.054	0.012	0.066
Mercury (Inorganic)	0.0001	3530	0.353	1.0	1.0	0.177	0.00001	0.177	NA	3530	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	78	0.195	1.0	1.0	0.098	0.0003	0.098	0.0025	78	0.195	1.0	1.0	0.098	0.0003	0.098
Potassium	0.905	1.0	0.905	1.0	1.0	0.453	0.100	0.553	1.405	1.0	1.41	1.0	1.0	0.703	0.156	0.858
Selenium	0.0025	129	0.323	1.0	1.0	0.161	0.0003	0.162	0.0025	129	0.323	1.0	1.0	0.161	0.0003	0.162
Silica	15.3	1.0	15.3	1.0	1.0	7.65	1.70	9.35	20.5	1.0	20.5	1.0	1.0	10.3	2.28	12.5
Silver	0.0005	87.71	0.044	1.0	1.0	0.022	0.00006	0.022	0.0005	87.71	0.044	1.0	1.0	0.022	0.00006	0.022
Sodium	2.84	1.0	2.84	1.0	1.0	1.42	0.315	1.74	6.43	1.0	6.43	1.0	1.0	3.22	0.714	3.93
Strontium	0.069	1.0	0.069	1.0	1.0	0.035	0.008	0.042	0.1835	1.0	0.184	1.0	1.0	0.092	0.020	0.112
Thallium	0.0025	10000	25.0	1.0	1.0	12.5	0.0003	12.5	0.0025	10000	25.0	1.0	1.0	12.5	0.0003	12.5
Vanadium	0.01	1.0	0.010	1.0	1.0	0.005	0.001	0.006	0.01	1.0	0.010	1.0	1.0	0.005	0.001	0.006
Zinc	0.903	2059	1859	1.0	1.0	930	0.100	930	3.585	2059	7382	1.0	1.0	3691	0.398	3691

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentration
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{fish}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)
IR_{diet} 0.5 kg/kg BW-day
IR_{water} 0.111 L/kg BW-day

Table E-25.
Estimated Daily Doses for the Mallard at Sample Location W-I

	Spring Exposure Scenario								Fall Exposure Scenario									
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet						Estimated Daily Dose (mg/kg bw-day)		
Analytes	Surface Water (mg/L)*	Aquatic Invertebrate BCF[#]	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet}[1]	EDD_{water}[2]	EDD_{total}[3]	Surface Water (mg/L)*	Aquatic Invertebrate BCF[#]	Aquatic Invertebrate Concentration (mg/kg, wet wt)	Plant BCF[#]	Plant Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet}[4]	EDD_{water}[2]	EDD_{total}[3]
Aluminum	0.159	4066	646	1.0	1.0	200	0.009	200	0.067	4066	272	833	55.8	1.0	1.0	50.9	0.004	50.9
Antimony	0.0025	7	0.018	1.0	1.0	0.005	0.0001	0.006	0.0025	7	0.018	1475	3.69	1.0	1.0	0.574	0.0001	0.574
Arsenic	0.0025	73	0.183	1.0	1.0	0.057	0.0001	0.057	0.0025	73	0.183	293	0.733	1.0	1.0	0.142	0.0001	0.142
Beryllium	0.0005	45	0.023	1.0	1.0	0.007	0.00003	0.007	0.0005	45	0.023	141	0.071	1.0	1.0	0.014	0.00003	0.014
Cadmium	0.00498	3461	17.2	1.0	1.0	5.34	0.0003	5.34	0.01925	3461	66.6	782	15.1	1.0	1.0	12.7	0.001	12.7
Calcium	8.33	1.0	8.33	1.0	1.0	2.58	0.466	3.05	20.05	1.0	20.1	1.0	20.1	1.0	1.0	6.22	1.12	7.34
Chromium	0.00307	3000	9.21	1.0	1.0	2.86	0.0002	2.86	0.00313	3000	9.39	4406	13.8	1.0	1.0	3.59	0.0002	3.59
Copper	0.00319	3718	11.9	1.0	1.0	3.68	0.0002	3.68	0.00328	3718	12.2	541	1.77	1.0	1.0	2.17	0.0002	2.17
Iron	0.114	1.0	0.114	1.0	1.0	0.035	0.006	0.042	0.1	1.0	0.100	1.0	0.100	1.0	1.0	0.031	0.006	0.037
Lead	0.0422	5059	213	1.0	1.0	66.2	0.002	66.2	0.02685	5059	136	1706	45.8	1.0	1.0	28.2	0.002	28.2
Magnesium	0.901	1.0	0.901	1.0	1.0	0.279	0.050	0.330	1.995	1.0	2.00	1.0	2.00	1.0	1.0	0.618	0.112	0.730
Manganese	0.0543	1.0	0.054	1.0	1.0	0.017	0.003	0.020	0.1085	1.0	0.109	1.0	0.109	1.0	1.0	0.034	0.006	0.040
Mercury (Inorganic)	0.0001	20184	2.02	1.0	1.0	0.626	0.00001	0.626	NA	20184	NC	24762	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	28	0.070	1.0	1.0	0.022	0.0001	0.022	0.0025	28	0.070	61	0.153	1.0	1.0	0.034	0.0001	0.035
Potassium	0.905	1.0	0.905	1.0	1.0	0.281	0.051	0.331	1.405	1.0	1.41	1.0	1.41	1.0	1.0	0.436	0.079	0.514
Selenium	0.0025	1262	3.16	1.0	1.0	0.978	0.0001	0.978	0.0025	1262	3.16	1845	4.61	1.0	1.0	1.20	0.0001	1.204
Silica	15.3	1.0	15.30	1.0	1.0	4.74	0.857	5.60	20.5	1.0	20.5	1.0	20.5	1.0	1.0	6.36	1.15	7.50
Silver	0.0005	298	0.149	1.0	1.0	0.046	0.00003	0.046	0.0005	298	0.149	10696	5.35	1.0	1.0	0.852	0.00003	0.852
Sodium	2.84	1.0	2.84	1.0	1.0	0.880	0.159	1.04	6.43	1.0	6.43	1.0	6.43	1.0	1.0	1.99	0.360	2.35
Strontium	0.069	1.0	0.069	1.0	1.0	0.021	0.004	0.025	0.1835	1.0	0.184	1.0	0.184	1.0	1.0	0.057	0.010	0.067
Thallium	0.0025	15000	37.5	1.0	1.0	11.6	0.00014	11.6	0.0025	15000	37.5	15000	37.5	1.0	1.0	11.6	0.0001	11.6
Vanadium	0.01	1.0	0.010	1.0	1.0	0.003	0.00056	0.004	0.01	1.0	0.010	1.0	0.010	1.0	1.0	0.003	0.0006	0.004
Zinc	0.903	4578	4134	1.0	1.0	1282	0.0506	1282	3.585	4578	16412	2175	7797	1.0	1.0	3752.5	0.201	3753

* - Surface water concentrations converted from ug/L to mg/L
[#] - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
EPC - Exposure Point Concentration

BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{invert}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$
[4] $EDD_{diet} = IR_{diet}[(C_{invert} \times BAF \times 0.5)+(C_{plant} \times BAV \times 0.5)] \times AUF$

Ingestion Rates (IR)
IR_{diet} 0.31 kg/kg BW-day
IR_{water} 0.056 L/kg BW-day

Table E-26.
Estimated Daily Doses for the American Dipper at Sample Location W-J

	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
Analytes	Surface Water (mg/L)*	Aquatic Invertebrate BCF #	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]	Surface Water (mg/L)*	Aquatic Invertebrate BCF #	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]
Aluminum	0.661	4066	2688	1.0	1.0	2139	0.099	2139	0.0527	4066	214	1.0	1.0	171	0.008	171
Antimony	0.0025	7.0	0.018	1.0	1.0	0.014	0.0004	0.014	0.0025	7.0	0.018	1.0	1.0	0.014	0.0004	0.014
Arsenic	0.00663	73	0.484	1.0	1.0	0.385	0.001	0.386	0.0025	73	0.183	1.0	1.0	0.145	0.0004	0.146
Beryllium	0.0005	45	0.023	1.0	1.0	0.018	0.00008	0.018	0.0005	45	0.023	1.0	1.0	0.018	0.00008	0.018
Cadmium	0.01375	3461	47.6	1.0	1.0	37.9	0.002	37.9	0.0197	3461	68.2	1.0	1.0	54.3	0.003	54.3
Calcium	8.955	1.0	8.96	1.0	1.0	7.13	1.34	8.47	20.4	1.0	20.4	1.0	1.0	16.2	3.06	19.3
Chromium	0.00302	3000	9.06	1.0	1.0	7.21	0.0005	7.21	0.00305	3000	9.15	1.0	1.0	7.28	0.0005	7.28
Copper	0.007965	3718	29.6	1.0	1.0	23.6	0.001	23.6	0.0025	3718	9.30	1.0	1.0	7.40	0.0004	7.40
Iron	0.637	1.0	0.637	1.0	1.0	0.507	0.096	0.603	0.1	1.0	0.100	1.0	1.0	0.080	0.015	0.095
Lead	0.355	5059	1796	1.0	1.0	1430	0.053	1430	0.0496	5059	251	1.0	1.0	200	0.007	200
Magnesium	1.11	1.0	1.11	1.0	1.0	0.884	0.167	1.05	2.11	1.0	2.11	1.0	1.0	1.68	0.317	2.00
Manganese	0.1395	1.0	0.140	1.0	1.0	0.111	0.021	0.132	0.0827	1.0	0.083	1.0	1.0	0.066	0.012	0.078
Mercury (Inorganic)	0.0001	20184	2.02	1.0	1.0	1.61	0.00002	1.61	NA	20184	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	28	0.070	1.0	1.0	0.056	0.0004	0.056	0.0025	28	0.070	1.0	1.0	0.056	0.0004	0.056
Potassium	1.33	1.0	1.33	1.0	1.0	1.06	0.200	1.26	1.45	1.0	1.45	1.0	1.0	1.15	0.218	1.37
Selenium	0.0025	1262	3.16	1.0	1.0	2.51	0.0004	2.51	0.0025	1262	3.16	1.0	1.0	2.51	0.0004	2.51
Silica	18.8	1.0	18.8	1.0	1.0	15.0	2.82	17.8	22.1	1.0	22.1	1.0	1.0	17.6	3.32	20.9
Silver	0.000846	298	0.252	1.0	1.0	0.201	0.0001	0.201	0.0005	298	0.149	1.0	1.0	0.119	0.00008	0.119
Sodium	3.115	1.0	3.12	1.0	1.0	2.48	0.467	2.95	6.49	1.0	6.49	1.0	1.0	5.17	0.974	6.14
Strontium	0.08055	1.0	0.081	1.0	1.0	0.064	0.012	0.076	0.184	1.0	0.184	1.0	1.0	0.146	0.028	0.174
Thallium	0.0025	15000	37.5	1.0	1.0	29.9	0.0004	29.9	0.0025	15000	37.5	1.0	1.0	29.9	0.0004	29.9
Vanadium	0.01	1.0	0.010	1.0	1.0	0.008	0.002	0.009	0.01	1.0	0.010	1.0	1.0	0.008	0.002	0.009
Zinc	2.295	4578	10507	1.0	1.0	8363	0.344	8364	4.14	4578	18953	1.0	1.0	15087	0.621	15087

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentration
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDDdiet = (IR_{diet} \times C_{invert}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)
IR_{diet} 0.796 kg/kg BW-day
IR_{water} 0.15 L/kg BW-day

Table E-27.
Estimated Daily Doses for the Muskrat at Sample Location W-J

	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
Analytes	Surface Water (mg/L)*	Plant BCF#	Plant Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]	Surface Water (mg/L)*	Plant BCF#	Plant Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]
Aluminum	0.661	833	551	1.0	1.0	187	0.644	188	0.0527	833	43.9	1.0	1.0	14.9	0.051	15.0
Antimony	0.0025	1475	3.69	1.0	1.0	1.25	0.0024	1.26	0.0025	1475	3.69	1.0	1.0	1.25	0.0024	1.26
Arsenic	0.00663	293	1.94	1.0	1.0	0.660	0.0065	0.667	0.0025	293	0.733	1.0	1.0	0.249	0.0024	0.251
Beryllium	0.0005	141	0.071	1.0	1.0	0.024	0.00049	0.024	0.0005	141	0.071	1.0	1.0	0.024	0.00049	0.024
Cadmium	0.01375	782	10.8	1.0	1.0	3.66	0.013	3.67	0.0197	782	15.4	1.0	1.0	5.24	0.019	5.26
Calcium	8.955	1.0	8.96	1.0	1.0	3.04	8.731	11.78	20.4	1.0	20.4	1.0	1.0	6.94	19.89	26.83
Chromium	0.00302	4406	13.3	1.0	1.0	4.52	0.0029	4.53	0.00305	4406	13.4	1.0	1.0	4.57	0.0030	4.57
Copper	0.007965	541	4.31	1.0	1.0	1.47	0.0078	1.47	0.0025	541	1.35	1.0	1.0	0.460	0.0024	0.462
Iron	0.637	1.0	0.637	1.0	1.0	0.217	0.621	0.838	0.1	1.0	0.100	1.0	1.0	0.034	0.098	0.132
Lead	0.355	1706	606	1.0	1.0	206	0.346	206	0.0496	1706	84.6	1.0	1.0	28.8	0.048	28.8
Magnesium	1.11	1.0	1.11	1.0	1.0	0.377	1.082	1.460	2.11	1.0	2.11	1.0	1.0	0.717	2.057	2.775
Manganese	0.1395	1.0	0.140	1.0	1.0	0.047	0.136	0.183	0.0827	1.0	0.083	1.0	1.0	0.028	0.081	0.109
Mercury (Inorganic)	0.0001	24762	2.48	1.0	1.0	0.842	0.00010	0.842	NA	24762	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	61	0.153	1.0	1.0	0.052	0.0024	0.054	0.0025	61	0.153	1.0	1.0	0.052	0.0024	0.054
Potassium	1.33	1.0	1.33	1.0	1.0	0.452	1.297	1.749	1.45	1.0	1.45	1.0	1.0	0.493	1.414	1.907
Selenium	0.0025	1845	4.61	1.0	1.0	1.57	0.0024	1.57	0.0025	1845	4.61	1.0	1.0	1.57	0.0024	1.57
Silica	18.8	1.0	18.8	1.0	1.0	6.39	18.33	24.72	22.1	1.0	22.1	1.0	1.0	7.51	21.55	29.06
Silver	0.000846	10696	9.05	1.0	1.0	3.08	0.00082	3.08	0.0005	10696	5.35	1.0	1.0	1.82	0.00049	1.82
Sodium	3.115	1.0	3.12	1.0	1.0	1.06	3.037	4.10	6.49	1.0	6.49	1.0	1.0	2.21	6.328	8.53
Strontium	0.08055	1.0	0.081	1.0	1.0	0.027	0.079	0.106	0.184	1.0	0.184	1.0	1.0	0.063	0.179	0.242
Thallium	0.0025	15000	37.5	1.0	1.0	12.8	0.0024	12.8	0.0025	15000	37.5	1.0	1.0	12.8	0.0024	12.8
Vanadium	0.01	1.0	0.010	1.0	1.0	0.003	0.010	0.013	0.01	1.0	0.010	1.0	1.0	0.003	0.0098	0.013
Zinc	2.295	2175	4992	1.0	1.0	1697	2.238	1699	4.14	2175	9005	1.0	1.0	3062	4.037	3066

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentrations
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{plant}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)
IR_{diet} 0.34 kg/kg BW-day
IR_{water} 0.975 L/kg BW-day

Table E-28.
Estimated Daily Doses for the Belted King Fisher at Sample Location W-J

Analytes	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
	Surface Water (mg/L)*	Fish BCF[#]	Fish Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet}[1]	EDD_{water}[2]	EDD_{total}[3]	Surface Water (mg/L)*	Fish BCF[#]	Fish Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet}[1]	EDD_{water}[2]	EDD_{total}[3]
Aluminum	0.661	2.7	1.78	1.0	1.0	0.892	0.073	0.966	0.0527	2.7	0.142	1.0	1.0	0.071	0.006	0.077
Antimony	0.0025	40	0.100	1.0	1.0	0.050	0.0003	0.050	0.0025	40	0.100	1.0	1.0	0.050	0.0003	0.050
Arsenic	0.00663	114	0.756	1.0	1.0	0.378	0.0007	0.379	0.0025	114	0.285	1.0	1.0	0.143	0.0003	0.143
Beryllium	0.0005	62	0.031	1.0	1.0	0.016	0.00006	0.016	0.0005	62	0.031	1.0	1.0	0.016	0.00006	0.016
Cadmium	0.01375	907	12.5	1.0	1.0	6.24	0.002	6.24	0.0197	907	17.9	1.0	1.0	8.93	0.002	8.94
Calcium	8.955	1.0	8.96	1.0	1.0	4.48	0.994	5.47	20.4	1.0	20.4	1.0	1.0	10.2	2.26	12.5
Chromium	0.00302	19	0.057	1.0	1.0	0.029	0.0003	0.029	0.00305	19	0.058	1.0	1.0	0.029	0.0003	0.029
Copper	0.007965	710	5.66	1.0	1.0	2.83	0.0009	2.83	0.0025	710	1.78	1.0	1.0	0.888	0.0003	0.888
Iron	0.637	1.0	0.637	1.0	1.0	0.319	0.071	0.389	0.1	1.0	0.100	1.0	1.0	0.050	0.011	0.061
Lead	0.355	0.09	0.032	1.0	1.0	0.016	0.039	0.055	0.0496	0.09	0.004	1.0	1.0	0.002	0.006	0.008
Magnesium	1.11	1.0	1.11	1.0	1.0	0.555	0.123	0.678	2.11	1.0	2.11	1.0	1.0	1.06	0.234	1.29
Manganese	0.1395	1.0	0.140	1.0	1.0	0.070	0.015	0.085	0.0827	1.0	0.083	1.0	1.0	0.041	0.009	0.051
Mercury (Inorganic)	0.0001	3530	0.353	1.0	1.0	0.177	0.00001	0.177	NA	3530	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	78	0.195	1.0	1.0	0.098	0.0003	0.098	0.0025	78	0.195	1.0	1.0	0.098	0.0003	0.098
Potassium	1.33	1.0	1.33	1.0	1.0	0.665	0.148	0.813	1.45	1.0	1.45	1.0	1.0	0.725	0.161	0.886
Selenium	0.0025	129	0.323	1.0	1.0	0.161	0.0003	0.162	0.0025	129	0.323	1.0	1.0	0.161	0.0003	0.162
Silica	18.8	1.0	18.8	1.0	1.0	9.40	2.09	11.5	22.1	1.0	22.1	1.0	1.0	11.1	2.45	13.5
Silver	0.000846	87.71	0.074	1.0	1.0	0.037	0.00009	0.037	0.0005	87.71	0.044	1.0	1.0	0.022	0.00006	0.022
Sodium	3.115	1.0	3.12	1.0	1.0	1.56	0.346	1.90	6.49	1.0	6.49	1.0	1.0	3.25	0.720	3.97
Strontium	0.08055	1.0	0.081	1.0	1.0	0.040	0.009	0.049	0.184	1.0	0.184	1.0	1.0	0.092	0.020	0.112
Thallium	0.0025	10000	25.0	1.0	1.0	12.5	0.0003	12.5	0.0025	10000	25.0	1.0	1.0	12.5	0.0003	12.5
Vanadium	0.01	1.0	0.010	1.0	1.0	0.005	0.001	0.006	0.01	1.0	0.010	1.0	1.0	0.005	0.001	0.006
Zinc	2.295	2059	4725	1.0	1.0	2363	0.255	2363	4.14	2059	8524	1.0	1.0	4262	0.460	4263

* - Surface water concentrations converted from ug/L to mg/L
[#] - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentration
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{fish}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)
IR_{diet} 0.5 kg/kg BW-day
IR_{water} 0.111 L/kg BW-day

Table E-29.
Estimated Daily Doses for the Mallard at Sample Location W-J

	Spring Exposure Scenario								Fall Exposure Scenario									
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet						Estimated Daily Dose (mg/kg bw-day)		
Analytes	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	Plant BCF #	Plant Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [4]	EDD_{water} [2]	EDD_{total} [3]
Aluminum	0.661	4066	2688	1.0	1.0	833	0.037	833	0.0527	4066	214	833	43.9	1.0	1.0	40.0	0.003	40.0
Antimony	0.0025	7	0.018	1.0	1.0	0.005	0.0001	0.006	0.0025	7	0.018	1475	3.69	1.0	1.0	0.574	0.0001	0.574
Arsenic	0.00663	73	0.484	1.0	1.0	0.150	0.0004	0.150	0.0025	73	0.183	293	0.733	1.0	1.0	0.142	0.0001	0.142
Beryllium	0.0005	45	0.023	1.0	1.0	0.007	0.00003	0.007	0.0005	45	0.023	141	0.071	1.0	1.0	0.014	0.00003	0.014
Cadmium	0.01375	3461	47.6	1.0	1.0	14.8	0.0008	14.8	0.0197	3461	68.2	782	15.4	1.0	1.0	13.0	0.001	13.0
Calcium	8.955	1.0	8.96	1.0	1.0	2.78	0.501	3.28	20.4	1.0	20.4	1.0	20.4	1.0	1.0	6.32	1.14	7.47
Chromium	0.00302	3000	9.06	1.0	1.0	2.81	0.0002	2.81	0.00305	3000	9.15	4406	13.4	1.0	1.0	3.50	0.0002	3.50
Copper	0.007965	3718	29.6	1.0	1.0	9.18	0.0004	9.18	0.0025	3718	9.30	541	1.35	1.0	1.0	1.65	0.0001	1.65
Iron	0.637	1.0	0.637	1.0	1.0	0.197	0.036	0.233	0.1	1.0	0.100	1.0	0.100	1.0	1.0	0.031	0.006	0.037
Lead	0.355	5059	1796	1.0	1.0	557	0.020	557	0.0496	5059	251	1706	84.6	1.0	1.0	52.0	0.003	52.0
Magnesium	1.11	1.0	1.11	1.0	1.0	0.344	0.062	0.406	2.11	1.0	2.11	1.0	2.11	1.0	1.0	0.654	0.118	0.772
Manganese	0.1395	1.0	0.140	1.0	1.0	0.043	0.008	0.051	0.0827	1.0	0.083	1.0	0.083	1.0	1.0	0.026	0.005	0.030
Mercury (Inorganic)	0.0001	20184	2.02	1.0	1.0	0.626	0.00001	0.626	NA	20184	NC	24762	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	28	0.070	1.0	1.0	0.022	0.0001	0.022	0.0025	28	0.070	61	0.153	1.0	1.0	0.034	0.0001	0.035
Potassium	1.33	1.0	1.33	1.0	1.0	0.412	0.074	0.487	1.45	1.0	1.45	1.0	1.45	1.0	1.0	0.450	0.081	0.531
Selenium	0.0025	1262	3.16	1.0	1.0	0.978	0.0001	0.978	0.0025	1262	3.16	1845	4.61	1.0	1.0	1.20	0.0001	1.204
Silica	18.8	1.0	18.8	1.0	1.0	5.83	1.05	6.88	22.1	1.0	22.1	1.0	22.1	1.0	1.0	6.9	1.24	8.09
Silver	0.000846	298	0.252	1.0	1.0	0.078	0.00005	0.078	0.0005	298	0.149	10696	5.35	1.0	1.0	0.852	0.00003	0.852
Sodium	3.115	1.0	3.12	1.0	1.0	0.966	0.174	1.14	6.49	1.0	6.49	1.0	6.49	1.0	1.0	2.01	0.363	2.38
Strontium	0.08055	1.0	0.081	1.0	1.0	0.025	0.005	0.029	0.184	1.0	0.184	1.0	0.184	1.0	1.0	0.057	0.010	0.067
Thallium	0.0025	15000	37.5	1.0	1.0	11.6	0.0001	11.6	0.0025	15000	37.5	15000	37.5	1.0	1.0	11.6	0.0001	11.6
Vanadium	0.01	1.0	0.010	1.0	1.0	0.003	0.0006	0.004	0.01	1.0	0.010	1.0	0.010	1.0	1.0	0.003	0.0006	0.004
Zinc	2.295	4578	10507	1.0	1.0	3257	0.129	3257	4.14	4578	18953	2175	9005	1.0	1.0	4333.4	0.232	4334

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
EPC - Exposure Point Concentration

BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} X C_{invert}) X AUF X BAV$
[2] $EDD_{water} = IR_{water} X C_{water} X AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$
[4] $EDD_{diet} = IR_{diet}[(C_{invert} X BAF X 0.5)+(C_{plant} X BAV X 0.5)] X AUF$

Ingestion Rates (IR)
IR_{diet} 0.31 kg/kg BW-day
IR_{water} 0.056 L/kg BW-day

Table E- 30.
Estimated Daily Doses for the American Dipper at Sample Location RG 2 - Maximum EPC

	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
Analyte	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]
Aluminum	0.592	4066	2407	1.0	1.0	1916	0.089	1916	0.107	4066	435	1.0	1.0	346	0.016	346
Antimony	0.0025	7	0.018	1.0	1.0	0.014	0.0004	0.014	NA	7	NC	1.0	1.0	NC	NC	NC
Arsenic	0.0025	73	0.183	1.0	1.0	0.145	0.0004	0.146	0.0025	73	0.183	1.0	1.0	0.145	0.0004	0.146
Beryllium	0.0005	45	0.023	1.0	1.0	0.018	0.0001	0.018	0.0005	45	0.023	1.0	1.0	0.018	0.0001	0.018
Cadmium	0.0005	3461	1.731	1.0	1.0	1.377	0.0001	1.38	0.0005	3461	1.73	1.0	1.0	1.38	0.0001	1.38
Calcium	5.24	1.0	5.24	1.0	1.0	4.17	0.786	4.96	9.23	1.0	9.23	1.0	1.0	7.35	1.385	8.7
Chromium	0.00274	3000	8.22	1.0	1.0	6.54	0.0004	6.54	0.00455	3000	13.7	1.0	1.0	10.9	0.001	10.9
Copper	0.0025	3718	9.30	1.0	1.0	7.40	0.0004	7.40	0.00398	3718	14.8	1.0	1.0	11.8	0.0006	11.8
Iron	0.51	1.0	0.510	1.0	1.0	0.406	0.077	0.482	0.232	1.0	0.232	1.0	1.0	0.185	0.035	0.219
Lead	0.00059	5059	2.985	1.0	1.0	2.38	0.0001	2.38	0.000561	5059	2.84	1.0	1.0	2.26	0.0001	2.26
Magnesium	0.936	1.0	0.936	1.0	1.0	0.745	0.140	0.885	1.61	1.0	1.610	1.0	1.0	1.28	0.242	1.52
Manganese	0.0253	1.0	0.025	1.0	1.0	0.020	0.004	0.024	0.0183	1.0	0.018	1.0	1.0	0.015	0.003	0.017
Mercury (inorganic)	0.0001	20184	2.018	1.0	1.0	1.61	0.00002	1.61	NA	20184	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	28	0.070	1.0	1.0	0.056	0.0004	0.056	0.0025	28	0.1	1.0	1.0	0.1	0.0004	0.1
Potassium	1.25	1.0	1.250	1.0	1.0	0.995	0.188	1.18	1.8	1.0	1.800	1.0	1.0	1.43	0.270	1.70
Selenium	0.0025	1262	3.16	1.0	1.0	2.51	0.0004	2.51	0.0025	1262	3	1.0	1.0	3	0.000	3
Silica	15.6	1.0	15.6	1.0	1.0	12.4	2.340	14.8	22.5	1.0	22.5	1.0	1.0	17.9	3.38	21.3
Silver	0.0005	298	0.149	1.0	1.0	0.119	0.0001	0.119	0.0005	298	0	1.0	1.0	0	0.0001	0
Sodium	1.7	1.0	1.700	1.0	1.0	1.35	0.255	1.61	3.37	1.0	3.37	1.0	1.0	2.68	0.506	3.19
Strontium	0.0524	1.0	0.052	1.0	1.0	0.042	0.008	0.050	0.0732	1.0	0.073	1.0	1.0	0.058	0.011	0.069
Thallium	0.0025	15000	37.5	1.0	1.0	29.9	0.0004	29.9	0.0025	15000	37.5	1.0	1.0	29.9	0.0004	29.9
Vanadium	0.01	1.0	0.010	1.0	1.0	0.008	0.002	0.009	0.01	1.0	0.010	1.0	1.0	0.008	0.002	0.009
Zinc	0.0114	4578	52.2	1.0	1.0	41.5	0.002	41.5	0.01	4578	46	1.0	1.0	36	0.002	36

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentration
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDDdiet = (IR_{diet} X C_{invert}) X AUF X BAV$
[2] $EDD_{water} = IR_{water} X C_{water} X AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)
IR_{diet} 0.796 kg/kg BW-day
IR_{water} 0.15 L/kg BW-day

Table E - 31.
Estimated Daily Doses for the American Dipper at Sample Location RG 2 - Average

Analytes	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]
Aluminum	0.538	4066	2188	1.0	1.0	1741	0.081	1741	0.103	4066	418	1.0	1.0	333	0.015	333
Antimony	0.001	7.0	0.009	1.0	1.0	0.007	0.0002	0.007	NA	7.0	NC	1.0	1.0	NC	NC	NC
Arsenic	0.001	73	0.091	1.0	1.0	0.073	0.0002	0.073	0.001	73	0.091	1.0	1.0	0.073	0.0002	0.073
Beryllium	0.0003	45	0.011	1.0	1.0	0.009	0.00004	0.009	0.000	45	0.011	1.0	1.0	0.009	0.00004	0.009
Cadmium	0.0003	3461	0.865	1.0	1.0	0.689	0.00004	0.689	0.000	3461	0.865	1.0	1.0	0.689	0.00004	0.689
Calcium	5.16	1.0	5.16	1.0	1.0	4.10	0.773	4.88	9.095	1.0	9.10	1.0	1.0	7.24	1.36	8.60
Chromium	0.002	3000	5.93	1.0	1.0	4.72	0.0003	4.72	0.004	3000	13.3	1.0	1.0	10.6	0.001	10.6
Copper	0.001	3718	4.65	1.0	1.0	3.70	0.0002	3.70	0.002	3718	7.19	1.0	1.0	5.72	0.0003	5.72
Iron	0.473	1.0	0.473	1.0	1.0	0.376	0.071	0.447	0.226	1.0	0.226	1.0	1.0	0.179	0.034	0.213
Lead	0.001	5059	2.713	1.0	1.0	2.16	0.0001	2.16	0.000	5059	1.658	1.0	1.0	1.32	0.00005	1.32
Magnesium	0.922	1.0	0.922	1.0	1.0	0.734	0.138	0.872	1.593	1.0	1.593	1.0	1.0	1.27	0.239	1.51
Manganese	0.024	1.0	0.024	1.0	1.0	0.019	0.004	0.023	0.018	1.0	0.018	1.0	1.0	0.014	0.003	0.017
Mercury (inorganic)	0.0001	20184	1.009	1.0	1.0	0.803	0.000	0.803	NA	20184	NC	1.0	1.0	NC	NC	NC
Nickel	0.001	28	0.035	1.0	1.0	0.028	0.0002	0.028	0.001	28	0.035	1.0	1.0	0.028	0.0002	0.028
Potassium	1.230	1.0	1.230	1.0	1.0	0.979	0.185	1.16	1.790	1.0	1.790	1.0	1.0	1.42	0.26850	1.693
Selenium	0.001	1262	1.578	1.0	1.0	1.26	0.0002	1.26	0.001	1262	2	1.0	1.0	1.26	0.0002	1
Silica	15.4	1.0	15.4	1.0	1.0	12.3	2.314	14.6	22.4	1.0	22.4	1.0	1.0	17.8	3.36	21.2
Silver	0.0003	298	0.075	1.0	1.0	0.059	0.00004	0.059	0.000	298	0	1.0	1.0	0.059	0.00004	0.059
Sodium	1.688	1.0	1.688	1.0	1.0	1.34	0.253	1.60	3.325	1.0	3.33	1.0	1.0	2.65	0.499	3.15
Strontium	0.052	1.0	0.052	1.0	1.0	0.041	0.008	0.049	0.073	1.0	0.073	1.0	1.0	0.058	0.01094	0.069
Thallium	0.001	15000	18.8	1.0	1.0	14.9	0.0002	14.9	0.001	15000	18.8	1.0	1.0	14.9	0.0002	14.9
Vanadium	0.005	1.0	0.005	1.0	1.0	0.004	0.001	0.005	0.005	1.0	0.005	1.0	1.0	0.004	0.001	0.005
Zinc	0.008	4578	37.3	1.0	1.0	29.7	0.001	29.7	0.005	4578	23	1.0	1.0	18	0.001	18

* - Surface water concentrations converted from ug/L to mg/L

\# - A default value of 1.0 was used when no BCF was available.

COPECs - Chemicals of Potential Ecological Concern

EPC - Exposure Point Concentration

EDD - Estimated Daily Dose

BCF - Bioconcentration Factor

AUF - Area Use Factor (unitless)

BAV - Bioavailability Adjustment Factor (unitless)

NA - Not available

NC - Not calculated

mg/L - milligrams per liter; mg/L = mg/kg

mg/kg, wet wt - milligrams per kilogram, wet weight

mg/kg bw-day - milligrams per kilogram of body weight per day

kg/kg BW-d - Kilograms per kilogram body weight per day

L/kg BW-d - Liters per kilogram body weight per day

EDD Equations

[1] $EDDdiet = (IR_{diet} \times C_{invert}) \times AUF \times BAV$

[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$

[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)

IR_{diet}	0.796	kg/kg BW-day
IR_{water}	0.15	L/kg BW-day

Table E - 32.
Estimated Daily Doses for the Muskrat at Sample Location RG 2 - Maximum EPC

Analyte	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
	Surface Water (mg/L)*	Plant BCF#	Plant Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]	Surface Water (mg/L)*	Plant BCF#	Plant Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]
Aluminum	0.592	833	493	1.0	1.0	168	0.577	168	0.107	833	89.1	1.0	1.0	30.3	0.104	30.4
Antimony	0.0025	1475	3.69	1.0	1.0	1.25	0.0024	1.26	NA	1475	NC	1.0	1.0	NC	NC	NC
Arsenic	0.0025	293	0.733	1.0	1.0	0.249	0.0024	0.251	0.0025	293	0.733	1.0	1.0	0.249	0.0024	0.251
Beryllium	0.0005	141	0.071	1.0	1.0	0.024	0.00049	0.024	0.0005	141	0.071	1.0	1.0	0.024	0.00049	0.024
Cadmium	0.0005	782	0.391	1.0	1.0	0.133	0.00049	0.133	0.0005	782	0.391	1.0	1.0	0.133	0.00049	0.133
Calcium	5.24	1.0	5.24	1.0	1.0	1.782	5.109	6.891	9.23	1.0	9.23	1.0	1.0	3.14	8.999	12.14
Chromium	0.00274	4406	12.1	1.0	1.0	4.10	0.0027	4.11	0.00455	4406	20.0	1.0	1.0	6.82	0.0044	6.82
Copper	0.0025	541	1.353	1.0	1.0	0.460	0.0024	0.462	0.00398	541	2.153	1.0	1.0	0.732	0.0039	0.736
Iron	0.51	1.0	0.510	1.0	1.0	0.173	0.497	0.671	0.232	1.0	0.232	1.0	1.0	0.079	0.226	0.305
Lead	0.00059	1706	1.007	1.0	1.0	0.342	0.0006	0.343	0.000561	1706	0.957	1.0	1.0	0.325	0.0005	0.326
Magnesium	0.936	1.0	0.936	1.0	1.0	0.318	0.913	1.231	1.61	1.0	1.610	1.0	1.0	0.547	1.570	2.117
Manganese	0.0253	1.0	0.025	1.0	1.0	0.009	0.025	0.033	0.0183	1.0	0.018	1.0	1.0	0.006	0.018	0.024
Mercury (Inorganic)	0.0001	24762	2.476	1.0	1.0	0.842	0.00010	0.842	NA	24762	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	61	0.153	1.0	1.0	0.052	0.0024	0.054	0.0025	61	0.153	1.0	1.0	0.052	0.0024	0.054
Potassium	1.25	1.0	1.250	1.0	1.0	0.425	1.219	1.644	1.8	1.0	1.800	1.0	1.0	0.612	1.755	2.367
Selenium	0.0025	1845	4.61	1.0	1.0	1.568	0.0024	1.571	0.0025	1845	4.61	1.0	1.0	1.568	0.0024	1.571
Silica	15.6	1.0	15.6	1.0	1.0	5.30	15.210	20.51	22.5	1.0	22.5	1.0	1.0	7.65	21.938	29.59
Silver	0.0005	10696	5.35	1.0	1.0	1.818	0.00049	1.819	0.0005	10696	5.35	1.0	1.0	1.818	0.00049	1.819
Sodium	1.7	1.0	1.700	1.0	1.0	0.578	1.658	2.236	3.37	1.0	3.37	1.0	1.0	1.146	3.286	4.432
Strontium	0.0524	1.0	0.052	1.0	1.0	0.018	0.051	0.069	0.0732	1.0	0.073	1.0	1.0	0.025	0.071	0.096
Thallium	0.0025	15000	37.5	1.0	1.0	12.8	0.0024	12.8	0.0025	15000	37.5	1.0	1.0	12.8	0.0024	12.8
Vanadium	0.01	1.0	0.010	1.0	1.0	0.003	0.010	0.013	0.01	1.0	0.010	1.0	1.0	0.003	0.010	0.013
Zinc	0.0114	2175	24.8	1.0	1.0	8.43	0.011	8.44	0.01	2175	21.8	1.0	1.0	7.40	0.010	7.40

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentrations
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{plant}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)
IR_{diet} 0.34 kg/kg BW-day
IR_{water} 0.975 L/kg BW-day

Table E - 33.
Estimated Daily Doses for the Muskrat at Sample Location RG 2 - Average EPC

	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
Analyte	**Surface Water (mg/L)***	**Plant BCF#**	**Plant Concentration (mg/kg, wet wt)**	**BAV**	**AUF**	**EDD_{diet} [1]**	**EDD_{water} [2]**	**EDD_{total} [3]**	**Surface Water (mg/L)***	**Plant BCF#**	**Plant Concentration (mg/kg, wet wt)**	**BAV**	**AUF**	**EDD_{diet} [1]**	**EDD_{water} [2]**	**EDD_{total} [3]**
Aluminum	0.538	833	448	1.0	1.0	152	0.525	153	0.103	833	85.7	1.0	1.0	29.1	0.100	29.2
Antimony	0.001	1475	1.844	1.0	1.0	0.627	0.0012	0.628	NA	1475	NC	1.0	1.0	NC	NC	NC
Arsenic	0.001	293	0.366	1.0	1.0	0.125	0.0012	0.126	0.001	293	0.366	1.0	1.0	0.125	0.0012	0.126
Beryllium	0.0003	141	0.035	1.0	1.0	0.012	0.00024	0.012	0.0003	141	0.035	1.0	1.0	0.012	0.00024	0.012
Cadmium	0.0003	782	0.196	1.0	1.0	0.066	0.00024	0.067	0.0003	782	0.196	1.0	1.0	0.066	0.00024	0.067
Calcium	5.16	1.0	5.16	1.0	1.0	1.753	5.026	6.779	9.10	1.0	9.10	1.0	1.0	3.09	8.868	11.96
Chromium	0.002	4406	8.70	1.0	1.0	2.959	0.0019	2.961	0.004	4406	19.5	1.0	1.0	6.63	0.0043	6.63
Copper	0.001	541	0.676	1.0	1.0	0.230	0.0012	0.231	0.002	541	1.045	1.0	1.0	0.355	0.0019	0.357
Iron	0.473	1.0	0.473	1.0	1.0	0.161	0.461	0.621	0.226	1.0	0.226	1.0	1.0	0.077	0.220	0.297
Lead	0.001	1706	0.915	1.0	1.0	0.311	0.0005	0.312	0.0003	1706	0.559	1.0	1.0	0.190	0.00032	0.190
Magnesium	0.922	1.0	0.922	1.0	1.0	0.314	0.899	1.213	1.593	1.0	1.593	1.0	1.0	0.541	1.553	2.094
Manganese	0.024	1.0	0.024	1.0	1.0	0.008	0.023	0.032	0.018	1.0	0.018	1.0	1.0	0.006	0.017	0.023
Mercury (inorganic)	0.0001	24762	1.238	1.0	1.0	0.421	0.000049	0.421	NA	24762	NC	1.0	1.0	NC	NC	NC
Nickel	0.001	61	0.076	1.0	1.0	0.026	0.0012	0.027	0.001	61	0.076	1.0	1.0	0.026	0.0012	0.027
Potassium	1.230	1.0	1.230	1.0	1.0	0.418	1.199	1.617	1.790	1.0	1.790	1.0	1.0	0.609	1.745	2.354
Selenium	0.001	1845	2.306	1.0	1.0	0.784	0.0012	0.785	0.001	1845	2.306	1.0	1.0	0.784	0.0012	0.785
Silica	15.4	1.0	15.4	1.0	1.0	5.24	15.039	20.28	22.4	1.0	22.4	1.0	1.0	7.62	21.840	29.46
Silver	0.0003	10696	2.674	1.0	1.0	0.909	0.00024	0.909	0.0003	10696	2.674	1.0	1.0	0.909	0.00024	0.909
Sodium	1.688	1.0	1.688	1.0	1.0	0.574	1.645	2.219	3.325	1.0	3.33	1.0	1.0	1.131	3.242	4.372
Strontium	0.052	1.0	0.052	1.0	1.0	0.018	0.051	0.068	0.073	1.0	0.073	1.0	1.0	0.025	0.071	0.096
Thallium	0.001	15000	18.8	1.0	1.0	6.38	0.0012	6.38	0.001	15000	18.8	1.0	1.0	6.38	0.0012	6.38
Vanadium	0.005	1.0	0.005	1.0	1.0	0.002	0.0049	0.007	0.005	1.0	0.005	1.0	1.0	0.002	0.0049	0.007
Zinc	0.008	2175	17.7	1.0	1.0	6.03	0.0079	6.03	0.005	2175	10.9	1.0	1.0	3.70	0.0049	3.70

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentrations
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BQ -d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} X C_{plant})$ X AUF X BAV
[2] $EDD_{water} = IR_{water} X C_{water}$ X AUF
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)
IR_{diet} 0.34 kg/kg BW-day
IR_{water} 0.975 L/kg BW-day

Table E - 34.
Estimated Daily Doses for the Belted King Fisher at Sample Location RG 2 - Maximum EPC

	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
Analyte	Surface Water (mg/L)*	Fish BCF#	Fish Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet}[1]	EDD_{water}[2]	EDD_{total}[3]	Surface Water (mg/L)*	Fish BCF#	Fish Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet}[1]	EDD_{water}[2]	EDD_{total}[3]
Aluminum	0.592	2.7	1.598	1.0	1.0	0.799	0.066	0.865	0.107	2.7	0.289	1.0	1.0	0.144	0.012	0.156
Antimony	0.0025	40	0.100	1.0	1.0	0.050	0.0003	0.050	NC	40	NC	1.0	1.0	NC	NC	NC
Arsenic	0.0025	114	0.285	1.0	1.0	0.143	0.0003	0.143	0.0025	114	0.285	1.0	1.0	0.143	0.00028	0.143
Beryllium	0.0005	62	0.031	1.0	1.0	0.016	0.0001	0.016	0.0005	62	0.031	1.0	1.0	0.016	0.00006	0.016
Cadmium	0.0005	907	0.454	1.0	1.0	0.227	0.0001	0.227	0.0005	907	0.454	1.0	1.0	0.227	0.00006	0.227
Calcium	5.24	1.0	5.24	1.0	1.0	2.620	0.582	3.20	9.23	1.0	9.23	1.0	1.0	4.62	1.025	5.64
Chromium	0.00274	19	0.052	1.0	1.0	0.026	0.000	0.026	0.00455	19	0.086	1.0	1.0	0.043	0.001	0.044
Copper	0.0025	710	1.775	1.0	1.0	0.888	0.000	0.888	0.00398	710	2.826	1.0	1.0	1.413	0.00044	1.413
Iron	0.51	1.0	0.510	1.0	1.0	0.255	0.057	0.312	0.232	1.0	0.232	1.0	1.0	0.116	0.026	0.142
Lead	0.00059	0.09	0.000	1.0	1.0	0.00003	0.0001	0.0001	0.000561	0.09	0.000	1.0	1.0	0.00003	0.00006	0.00009
Magnesium	0.936	1.0	0.936	1.0	1.0	0.468	0.104	0.572	1.61	1.0	1.610	1.0	1.0	0.805	0.179	0.984
Manganese	0.0253	1.0	0.025	1.0	1.0	0.013	0.003	0.015	0.0183	1.0	0.018	1.0	1.0	0.009	0.002	0.011
Mercury (Inorganic)	0.0001	3530	0.353	1.0	1.0	0.177	0.00001	0.177	NC	3530	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	78	0.195	1.0	1.0	0.098	0.0003	0.098	0.0025	78	0.195	1.0	1.0	0.098	0.00028	0.098
Potassium	1.25	1.0	1.250	1.0	1.0	0.625	0.139	0.764	1.8	1.0	1.800	1.0	1.0	0.900	0.200	1.100
Selenium	0.0025	129	0.323	1.0	1.0	0.161	0.0003	0.162	0.0025	129	0.323	1.0	1.0	0.161	0.00028	0.162
Silica	15.6	1.0	15.6	1.0	1.0	7.80	1.732	9.53	22.5	1.0	22.5	1.0	1.0	11.3	2.498	13.7
Silver	0.0005	87.71	0.044	1.0	1.0	0.022	0.0001	0.022	0.0005	87.71	0.044	1.0	1.0	0.022	0.00006	0.022
Sodium	1.7	1.0	1.700	1.0	1.0	0.850	0.189	1.039	3.37	1.0	3.37	1.0	1.0	1.685	0.374	2.059
Strontium	0.0524	1.0	0.052	1.0	1.0	0.026	0.006	0.032	0.0732	1.0	0.073	1.0	1.0	0.037	0.008	0.045
Thallium	0.0025	10000	25.0	1.0	1.0	12.5	0.0003	12.5	0.0025	10000	25.0	1.0	1.0	12.5	0.00028	12.50
Vanadium	0.01	1.0	0.010	1.0	1.0	0.005	0.001	0.006	0.01	1.0	0.010	1.0	1.0	0.005	0.001	0.006
Zinc	0.0114	2059	23.5	1.0	1.0	11.7	0.001	11.7	0.01	2059	20.6	1.0	1.0	10.3	0.001	10.3

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentration
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{fish}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)
IR_{diet} 0.5 kg/kg BW-day
IR_{water} 0.111 L/kg BW-day

Table E - 35.
Estimated Daily Doses for the Belted King Fisher at Sample Location RG 2 - Average EPC

	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
Analyte	Surface Water (mg/L)*	Fish BCF#	Fish Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]	Surface Water (mg/L)*	Fish BCF#	Fish Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]
Aluminum	0.538	2.7	1.453	1.0	1.0	0.726	0.060	0.786	0.103	2.7	0.278	1.0	1.0	0.139	0.011	0.150
Antimony	0.001	40	0.050	1.0	1.0	0.025	0.0001	0.025	NA	40	NC	1.0	1.0	NC	NC	NC
Arsenic	0.001	114	0.143	1.0	1.0	0.071	0.0001	0.071	0.001	114	0.143	1.0	1.0	0.071	0.0001	0.071
Beryllium	0.0003	62	0.016	1.0	1.0	0.008	0.00003	0.008	0.0003	62	0.016	1.0	1.0	0.008	0.00003	0.008
Cadmium	0.0003	907	0.227	1.0	1.0	0.113	0.00003	0.113	0.0003	907	0.227	1.0	1.0	0.113	0.00003	0.113
Calcium	5.16	1.0	5.16	1.0	1.0	2.578	0.572	3.15	9.10	1.0	9.10	1.0	1.0	4.55	1.010	5.56
Chromium	0.002	19	0.038	1.0	1.0	0.019	0.0002	0.019	0.004	19	0.084	1.0	1.0	0.042	0.0005	0.043
Copper	0.001	710	0.888	1.0	1.0	0.444	0.0001	0.444	0.002	710	1.372	1.0	1.0	0.686	0.0002	0.686
Iron	0.473	1.0	0.473	1.0	1.0	0.236	0.052	0.289	0.226	1.0	0.226	1.0	1.0	0.113	0.025	0.138
Lead	0.001	0.09	0.000	1.0	1.0	0.00002	0.0001	0.0001	0.0003	0.09	0.00003	1.0	1.0	0.00001	0.00004	0.00005
Magnesium	0.922	1.0	0.922	1.0	1.0	0.461	0.102	0.563	1.593	1.0	1.593	1.0	1.0	0.796	0.177	0.973
Manganese	0.024	1.0	0.024	1.0	1.0	0.012	0.003	0.015	0.018	1.0	0.018	1.0	1.0	0.009	0.002	0.011
Mercury (Inorganic)	0.000	3530	0.177	1.0	1.0	0.088	0.00001	0.088	NA	3530	NC	1.0	1.0	NC	NC	NC
Nickel	0.001	78	0.098	1.0	1.0	0.049	0.0001	0.049	0.001	78	0.098	1.0	1.0	0.049	0.0001	0.049
Potassium	1.230	1.0	1.230	1.0	1.0	0.615	0.137	0.752	1.790	1.0	1.790	1.0	1.0	0.895	0.199	1.094
Selenium	0.001	129	0.161	1.0	1.0	0.081	0.0001	0.081	0.001	129	0.161	1.0	1.0	0.081	0.0001	0.081
Silica	15.4	1.0	15.4	1.0	1.0	7.71	1.712	9.42	22.4	1.0	22.4	1.0	1.0	11.2	2.486	13.7
Silver	0.0003	87.71	0.022	1.0	1.0	0.011	0.00003	0.011	0.0003	87.71	0.022	1.0	1.0	0.011	0.00003	0.011
Sodium	1.688	1.0	1.688	1.0	1.0	0.844	0.187	1.031	3.33	1.0	3.33	1.0	1.0	1.663	0.369	2.032
Strontium	0.052	1.0	0.052	1.0	1.0	0.026	0.006	0.032	0.073	1.0	0.073	1.0	1.0	0.036	0.008	0.045
Thallium	0.001	10000	12.5	1.0	1.0	6.25	0.0001	6.25	0.001	10000	12.5	1.0	1.0	6.25	0.0001	6.25
Vanadium	0.005	1.0	0.005	1.0	1.0	0.003	0.001	0.003	0.005	1.0	0.005	1.0	1.0	0.003	0.001	0.003
Zinc	0.008	2059	16.8	1.0	1.0	8.39	0.001	8.39	0.005	2059	10.3	1.0	1.0	5.15	0.001	5.15

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentration
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{fish}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)
IR_{diet} 0.5 kg/kg BW-day
IR_{water} 0.111 L/kg BW-day

Table E - 36.
Estimated Daily Doses for the Mallard at Sample Location RG 2 - Maximum EPC

	Spring Exposure Scenario								**Fall Exposure Scenario**									
	EPC	**Diet**				**Estimated Daily Dose (mg/kg bw-day)**			**EPC**	**Diet**						**Estimated Daily Dose (mg/kg bw-day)**		
Analyte	**Surface Water (mg/L)***	**Aquatic Invertebrate BCF#**	**Aquatic Invertebrate Concentration (mg/kg, wet wt)**	**BAV**	**AUF**	**EDD_{diet}[1]**	**EDD_{water}[2]**	**EDD_{total}[3]**	**Surface Water (mg/L)***	**Aquatic Invertebrate BCF#**	**Aquatic Invertebrate Concentration (mg/kg, wet wt)**	**Plant BCF [#]**	**Plant Concentration (mg/kg, wet wt)**	**BAV**	**AUF**	**EDD_{diet}[4]**	**EDD_{water}[2]**	**EDD_{total}[3]**
Aluminum	0.592	4066	2407	1.0	1.0	746	0.033	746	0.107	4066	435	833	89.1	1.0	1.0	81.2	0.006	81
Antimony	0.003	7	0.018	1.0	1.0	0.005	0.0001	0.006	NA	7	NC	1475	NC	1.0	1.0	NC	NC	NC
Arsenic	0.003	73	0.183	1.0	1.0	0.057	0.0001	0.057	0.003	73	0.183	293	0.733	1.0	1.0	0.142	0.0001	0.142
Beryllium	0.001	45	0.023	1.0	1.0	0.007	0.00003	0.007	0.001	45	0.023	141	0.071	1.0	1.0	0.014	0.00003	0.014
Cadmium	0.001	3461	1.73	1.0	1.0	0.536	0.00003	0.536	0.001	3461	1.731	782	0.391	1.0	1.0	0.329	0.00003	0.329
Calcium	5.240	1.0	5.24	1.0	1.0	1.62	0.293	1.92	9.23	1.0	9.23	1.0	9.23	1.0	1.0	2.86	0.517	3.38
Chromium	0.003	3000	8.22	1.0	1.0	2.55	0.0002	2.55	0.005	3000	13.7	4406	20.0	1.0	1.0	5.22	0.0003	5.22
Copper	0.003	3718	9.30	1.0	1.0	2.88	0.0001	2.88	0.004	3718	14.8	541	2.15	1.0	1.0	2.63	0.0002	2.63
Iron	0.510	1.0	0.510	1.0	1.0	0.158	0.029	0.187	0.232	1.0	0.232	1.0	0.232	1.0	1.0	0.072	0.013	0.085
Lead	0.001	5059	2.98	1.0	1.0	0.925	0.00003	0.925	0.001	5059	2.838	1706	0.957	1.0	1.0	0.588	0.00003	0.588
Magnesium	0.936	1.0	0.936	1.0	1.0	0.290	0.052	0.343	1.61	1.0	1.610	1.0	1.61	1.0	1.0	0.499	0.090	0.589
Manganese	0.025	1.0	0.025	1.0	1.0	0.008	0.001	0.009	0.018	1.0	0.018	1.0	0.018	1.0	1.0	0.006	0.001	0.007
Mercury (Inorganic)	0.0001	20184	2.02	1.0	1.0	0.626	0.00001	0.626	NA	20184	NC	24762	NC	1.0	1.0	NC	NC	NC
Nickel	0.003	28	0.070	1.0	1.0	0.022	0.0001	0.022	0.003	28	0.070	61	0.153	1.0	1.0	0.034	0.0001	0.035
Potassium	1.25	1.0	1.25	1.0	1.0	0.388	0.070	0.458	1.80	1.0	1.800	1.0	1.80	1.0	1.0	0.56	0.101	0.659
Selenium	0.003	1262	3.16	1.0	1.0	0.978	0.0001	0.978	0.003	1262	3.16	1845	4.61	1.0	1.0	1.20	0.0001	1.204
Silica	15.6	1.0	15.6	1.0	1.0	4.84	0.874	5.71	22.5	1.0	22.5	1.0	22.5	1.0	1.0	6.98	1.26	8.24
Silver	0.001	298	0.149	1.0	1.0	0.046	0.00003	0.046	0.001	298	0.149	10696	5.35	1.0	1.0	0.85	0.00003	0.852
Sodium	1.70	1.0	1.70	1.0	1.0	0.527	0.095	0.622	3.37	1.0	3.37	1.0	3.37	1.0	1.0	1.04	0.189	1.23
Strontium	0.052	1.0	0.052	1.0	1.0	0.016	0.003	0.019	0.073	1.0	0.073	1.0	0.073	1.0	1.0	0.023	0.004	0.027
Thallium	0.003	15000	37.5	1.0	1.0	11.6	0.0001	11.6	0.003	15000	37.5	15000	37.5	1.0	1.0	11.6	0.0001	11.6
Vanadium	0.010	1.0	0.010	1.0	1.0	0.003	0.001	0.004	0.010	1.0	0.010	1.0	0.010	1.0	1.0	0.003	0.001	0.004
Zinc	0.011	4578	52.2	1.0	1.0	16.2	0.001	16.2	0.010	4578	45.8	2175	21.8	1.0	1.0	10.5	0.001	10.5

* - Surface water concentrations converted from ug/L to mg/L
[#] - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
EPC - Exposure Point Concentration

BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{invert}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$
[4] $EDD_{diet} = IR_{diet}[(C_{invert} \times BAF \times 0.5)+(C_{plant} \times BAV \times 0.5)] \times AUF$

Ingestion Rates (IR)
IR_{diet} 0.31 kg/kg BW-day
IR_{water} 0.056 L/kg BW-day

Table E - 37.
Estimated Daily Doses for the Mallard at Sample Location RG 2 - Average EPC

Analyte	Spring Exposure Scenario								Fall Exposure Scenario									
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet						Estimated Daily Dose (mg/kg bw-day)		
	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet}[1]	EDD_{water}[2]	EDD_{total}[3]	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	Plant BCF #	Plant Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet}[4]	EDD_{water}[2]	EDD_{total}[3]
Aluminum	0.538	4066	2188	1.0	1.0	678	0.030	678	0.103	4066	418	833	85.7	1.0	1.0	78	0.006	78
Antimony	0.001	7	0.009	1.0	1.0	0.003	0.0001	0.003	NA	7	NC	1475	NC	1.0	1.0	NC	NC	NC
Arsenic	0.001	73	0.091	1.0	1.0	0.028	0.0001	0.028	0.001	73	0.091	293	0.366	1.0	1.0	0.071	0.0001	0.071
Beryllium	0.0003	45	0.011	1.0	1.0	0.003	0.00001	0.004	0.0003	45	0.011	141	0.035	1.0	1.0	0.007	0.00001	0.007
Cadmium	0.0003	3461	0.865	1.0	1.0	0.268	0.00001	0.268	0.0003	3461	0.865	782	0.196	1.0	1.0	0.164	0.00001	0.164
Calcium	5.16	1.0	5.16	1.0	1.0	1.598	0.289	1.887	9.10	1.0	9.10	1.0	9.10	1.0	1.0	2.819	0.509	3.33
Chromium	0.002	3000	5.93	1.0	1.0	1.837	0.0001	1.837	0.004	3000	13.3	4406	19.5	1.0	1.0	5.08	0.0002	5.08
Copper	0.001	3718	4.65	1.0	1.0	1.441	0.0001	1.441	0.002	3718	7.19	541	1.05	1.0	1.0	1.28	0.0001	1.276
Iron	0.473	1.0	0.473	1.0	1.0	0.146	0.026	0.173	0.226	1.0	0.226	1.0	0.226	1.0	1.0	0.070	0.013	0.083
Lead	0.001	5059	2.713	1.0	1.0	0.841	0.00003	0.841	0.0003	5059	1.658	1706	0.559	1.0	1.0	0.344	0.00002	0.344
Magnesium	0.922	1.0	0.922	1.0	1.0	0.286	0.052	0.338	1.593	1.0	1.593	1.0	1.59	1.0	1.0	0.494	0.089	0.583
Manganese	0.024	1.0	0.024	1.0	1.0	0.007	0.001	0.009	0.018	1.0	0.018	1.0	0.018	1.0	1.0	0.005	0.001	0.006
Mercury (Inorganic)	0.0001	20184	1.009	1.0	1.0	0.313	0.000003	0.313	NA	20184	NC	24762	NC	1.0	1.0	NC	NC	NC
Nickel	0.001	28	0.035	1.0	1.0	0.011	0.0001	0.011	0.001	28	0.035	61	0.076	1.0	1.0	0.017	0.0001	0.017
Potassium	1.230	1.0	1.230	1.0	1.0	0.381	0.069	0.450	1.790	1.0	1.790	1.0	1.79	1.0	1.0	0.555	0.100	0.655
Selenium	0.001	1262	1.578	1.0	1.0	0.489	0.0001	0.489	0.001	1262	1.578	1845	2.31	1.0	1.0	0.602	0.0001	0.602
Silica	15.4	1.0	15.4	1.0	1.0	4.78	0.864	5.65	22.4	1.0	22.4	1.0	22.4	1.0	1.0	6.94	1.254	8.20
Silver	0.0003	298	0.075	1.0	1.0	0.023	0.00001	0.023	0.0003	298	0.075	10696	2.67	1.0	1.0	0.426	0.00001	0.426
Sodium	1.688	1.0	1.688	1.0	1.0	0.523	0.095	0.618	3.33	1.0	3.33	1.0	3.33	1.0	1.0	1.03	0.186	1.217
Strontium	0.052	1.0	0.052	1.0	1.0	0.016	0.003	0.019	0.073	1.0	0.073	1.0	0.073	1.0	1.0	0.023	0.004	0.027
Thallium	0.001	15000	18.8	1.0	1.0	5.81	0.0001	5.81	0.001	15000	18.8	15000	18.8	1.0	1.0	5.81	0.0001	5.81
Vanadium	0.005	1.0	0.005	1.0	1.0	0.002	0.0003	0.002	0.005	1.0	0.005	1.0	0.005	1.0	1.0	0.002	0.0003	0.002
Zinc	0.008	4578	37.3	1.0	1.0	11.6	0.0005	11.6	0.005	4578	22.9	2175	10.9	1.0	1.0	5.23	0.0003	5.23

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
EPC - Exposure Point Concentration

BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg Bw-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} X C_{invert})$ X AUF X BAV
[2] $EDD_{water} = IR_{water} X C_{water}$ X AUF
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$
[4] $EDD_{diet} = IR_{diet}[(C_{invert} X BAF X 0.5)+(C_{plant} X BAV X 0.5)]$X AUF

Ingestion Rates (IR)
IR_{diet} 0.31 kg/kg BW-day
IR_{water} 0.056 L/kg BW-day

Table E - 38.
Estimated Daily Doses for the American Dipper at Sample Location RG 4 - Maximum EPC

	Spring Exposure Scenario								**Fall Exposure Scenario**							
	EPC	**Diet**				**Estimated Daily Dose (mg/kg bw-day)**			**EPC**	**Diet**				**Estimated Daily Dose (mg/kg bw-day)**		
Analyte	**Surface Water (mg/L)***	**Aquatic Invertebrate BCF#**	**Aquatic Invertebrate Concentration (mg/kg, wet wt)**	**BAV**	**AUF**	**EDD_{diet} [1]**	**EDD_{water} [2]**	**EDD_{total} [3]**	**Surface Water (mg/L)***	**Aquatic Invertebrate BCF#**	**Aquatic Invertebrate Concentration (mg/kg, wet wt)**	**BAV**	**AUF**	**EDD_{diet} [1]**	**EDD_{water} [2]**	**EDD_{total} [3]**
Aluminum	0.603	4066	2452	1.0	1.0	1952	0.090	1952	0.0981	4066	399	1.0	1.0	318	0.015	318
Antimony	0.0025	7.0	0.018	1.0	1.0	0.014	0.0004	0.014	NA	7.0	NC	1.0	1.0	NC	NC	NC
Arsenic	0.0025	73	0.183	1.0	1.0	0.145	0.0004	0.146	0.0025	73	0.183	1.0	1.0	0.145	0.0004	0.146
Beryllium	0.0005	45	0.023	1.0	1.0	0.018	0.0001	0.018	0.0005	45	0.023	1.0	1.0	0.018	0.0001	0.018
Cadmium	0.0005	3461	1.731	1.0	1.0	1.377	0.0001	1.378	0.000767	3461	2.65	1.0	1.0	2.113	0.0001	2.113
Calcium	5.41	1.0	5.41	1.0	1.0	4.31	0.812	5.12	10.0	1.0	10.0	1.0	1.0	7.96	1.500	9.46
Chromium	0.0025	3000	7.50	1.0	1.0	5.97	0.0004	5.97	0.00438	3000	13.1	1.0	1.0	10.5	0.001	10.5
Copper	0.0025	3718	9.30	1.0	1.0	7.40	0.0004	7.40	0.0025	3718	9.30	1.0	1.0	7.40	0.0004	7.40
Iron	0.495	1.0	0.495	1.0	1.0	0.394	0.074	0.468	0.207	1.0	0.207	1.0	1.0	0.165	0.031	0.196
Lead	0.00284	5059	14.4	1.0	1.0	11.4	0.0004	11.4	0.00152	5059	7.69	1.0	1.0	6.12	0.0002	6.12
Magnesium	0.955	1.0	0.955	1.0	1.0	0.76	0.143	0.903	1.64	1.0	1.640	1.0	1.0	1.305	0.246	1.551
Manganese	0.0269	1.0	0.027	1.0	1.0	0.021	0.004	0.025	0.0187	1.0	0.019	1.0	1.0	0.015	0.003	0.018
Mercury (Inorganic)	0.0001	20184	2.018	1.0	1.0	1.607	0.0000	1.607	NA	20184	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	28	0.070	1.0	1.0	0.056	0.0004	0.056	0.0025	28	0.070	1.0	1.0	0.056	0.0004	0.056
Potassium	1.25	1.0	1.250	1.0	1.0	0.995	0.188	1.183	1.8	1.0	1.800	1.0	1.0	1.433	0.270	1.703
Selenium	0.0025	1262	3.16	1.0	1.0	2.51	0.0004	2.512	0.0025	1262	3.16	1.0	1.0	2.511	0.0004	2.512
Silica	15.9	1.0	15.9	1.0	1.0	12.7	2.385	15.0	22.7	1.0	22.7	1.0	1.0	18.1	3.41	21.5
Silver	0.0005	298	0.149	1.0	1.0	0.119	0.0001	0.119	0.0005	298	0.149	1.0	1.0	0.119	0.0001	0.119
Sodium	1.79	1.0	1.790	1.0	1.0	1.425	0.269	1.693	3.67	1.0	3.67	1.0	1.0	2.921	0.551	3.47
Strontium	0.0541	1.0	0.054	1.0	1.0	0.043	0.008	0.051	0.0788	1.0	0.079	1.0	1.0	0.063	0.012	0.075
Thallium	0.0025	15000	37.5	1.0	1.0	29.9	0.0004	29.9	0.0025	15000	37.5	1.0	1.0	29.9	0.0004	29.9
Vanadium	0.01	1.0	0.010	1.0	1.0	0.008	0.002	0.009	0.01	1.0	0.010	1.0	1.0	0.008	0.002	0.009
Zinc	0.0511	4578	234	1.0	1.0	186	0.008	186	0.142	4578	650	1.0	1.0	517	0.021	517

* - Surface water concentrations converted from ug/L to mg/L
[#] - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentration
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDDdiet = (IR_{diet} X C_{invert}) X AUF X BAV$
[2] $EDD_{water} = IR_{water} X C_{water} X AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)
IR_{diet} 0.796 kg/kg BW-day
IR_{water} 0.15 L/kg BW-day

Table E - 39.
Estimated Daily Doses for the American Dipper at Sample Location RG 4 - Average EPC

	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
Analyte	**Surface Water (mg/L)***	**Aquatic Invertebrate BCF#**	**Aquatic Invertebrate Concentration (mg/kg, wet wt)**	**BAV**	**AUF**	**EDD_{diet}[1]**	**EDD_{water}[2]**	**EDD_{total}[3]**	**Surface Water (mg/L)***	**Aquatic Invertebrate BCF#**	**Aquatic Invertebrate Concentration (mg/kg, wet wt)**	**BAV**	**AUF**	**EDD_{diet}[1]**	**EDD_{water}[2]**	**EDD_{total}[3]**
Aluminum	0.552	4066	2243	1.0	1.0	1786	0.083	1786	0.092	4066	373	1.0	1.0	297	0.014	297
Antimony	0.001	7.0	0.009	1.0	1.0	0.007	0.0002	0.007	NA	7.0	NC	1.0	1.0	NC	NC	NC
Arsenic	0.001	73	0.091	1.0	1.0	0.073	0.0002	0.073	0.001	73	0.091	1.0	1.0	0.073	0.0002	0.073
Beryllium	0.0003	45	0.011	1.0	1.0	0.009	0.00004	0.009	0.0003	45	0.011	1.0	1.0	0.009	0.00004	0.009
Cadmium	0.0003	3461	0.865	1.0	1.0	0.689	0.00004	0.689	0.001	3461	1.98	1.0	1.0	1.58	0.0001	1.58
Calcium	5.27	1.0	5.27	1.0	1.0	4.20	0.791	4.99	9.96	1.0	10.0	1.0	1.0	7.93	1.494	9.42
Chromium	0.001	3000	3.75	1.0	1.0	2.99	0.0002	2.99	0.004	3000	12.8	1.0	1.0	10.2	0.001	10.2
Copper	0.001	3718	4.65	1.0	1.0	3.70	0.0002	3.70	0.001	3718	4.65	1.0	1.0	3.70	0.0002	3.70
Iron	0.468	1.0	0.468	1.0	1.0	0.373	0.070	0.443	0.202	1.0	0.202	1.0	1.0	0.161	0.030	0.191
Lead	0.003	5059	12.7	1.0	1.0	10.1	0.0004	10.1	0.001	5059	6.54	1.0	1.0	5.20	0.0002	5.21
Magnesium	0.927	1.0	0.927	1.0	1.0	0.738	0.139	0.877	1.633	1.0	1.63	1.0	1.0	1.30	0.245	1.54
Manganese	0.026	1.0	0.026	1.0	1.0	0.021	0.004	0.024	0.018	1.0	0.018	1.0	1.0	0.015	0.003	0.017
Mercury (inorganic)	0.0001	20184	1.009	1.0	1.0	0.803	0.00001	0.803	NA	20184	NC	1.0	1.0	NC	NC	NC
Nickel	0.001	28	0.035	1.0	1.0	0.028	0.0002	0.028	0.001	28	0.035	1.0	1.0	0.028	0.0002	0.028
Potassium	1.198	1.0	1.198	1.0	1.0	0.953	0.180	1.13	1.785	1.0	1.79	1.0	1.0	1.42	0.268	1.69
Selenium	0.001	1262	1.578	1.0	1.0	1.26	0.0002	1.26	0.001	1262	1.58	1.0	1.0	1.26	0.0002	1.26
Silica	15.5	1.0	15.5	1.0	1.0	12.4	2.329	14.7	22.5	1.0	22.5	1.0	1.0	17.9	3.38	21.3
Silver	0.0003	298	0.075	1.0	1.0	0.059	0.00004	0.059	0.0003	298	0.075	1.0	1.0	0.059	0.00004	0.059
Sodium	1.738	1.0	1.738	1.0	1.0	1.38	0.261	1.64	3.60	1.0	3.60	1.0	1.0	2.87	0.540	3.41
Strontium	0.053	1.0	0.053	1.0	1.0	0.042	0.008	0.050	0.078	1.0	0.078	1.0	1.0	0.062	0.012	0.074
Thallium	0.001	15000	18.75	1.0	1.0	14.9	0.0002	14.9	0.001	15000	18.8	1.0	1.0	14.9	0.0002	14.9
Vanadium	0.005	1.0	0.005	1.0	1.0	0.004	0.001	0.005	0.005	1.0	0.005	1.0	1.0	0.004	0.001	0.005
Zinc	0.049	4578	223	1.0	1.0	178	0.007	178	0.139	4578	636	1.0	1.0	507	0.021	507

* - Surface water concentrations converted from ug/L to mg/L
[#] - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentration
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDDdiet = (IR_{diet} \times C_{invert}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)
IR_{diet} 0.796 kg/kg BW-day
IR_{water} 0.15 L/kg BW-day

Table E - 40.
Estimated Daily Doses for the Muskrat at Sample Location RG 4 - Maximum EPC

Analyte	Spring Exposure Scenario: EPC Surface Water (mg/L)*	Spring Diet: Plant BCF#	Spring Diet: Plant Concentration (mg/kg, wet wt)	Spring Diet: BAV	Spring Diet: AUF	Spring Estimated Daily Dose (mg/kg bw-day): EDD_{diet} [1]	Spring EDD_{water} [2]	Spring EDD_{total} [3]	Fall Exposure Scenario: EPC Surface Water (mg/L)*	Fall Diet: Plant BCF#	Fall Diet: Plant Concentration (mg/kg, wet wt)	Fall Diet: BAV	Fall Diet: AUF	Fall Estimated Daily Dose (mg/kg bw-day): EDD_{diet} [1]	Fall EDD_{water} [2]	Fall EDD_{total} [3]
Aluminum	0.603	833	502	1.0	1.0	171	0.588	171	0.0981	833	81.7	1.0	1.0	27.8	0.096	27.9
Antimony	0.0025	1475	3.69	1.0	1.0	1.254	0.0024	1.256	NA	1475	NC	1.0	1.0	NC	NC	NC
Arsenic	0.0025	293	0.733	1.0	1.0	0.249	0.0024	0.251	0.0025	293	0.733	1.0	1.0	0.249	0.0024	0.251
Beryllium	0.0005	141	0.071	1.0	1.0	0.024	0.00049	0.024	0.0005	141	0.071	1.0	1.0	0.024	0.00049	0.024
Cadmium	0.0005	782	0.391	1.0	1.0	0.133	0.00049	0.133	0.000767	782	0.600	1.0	1.0	0.204	0.0007	0.205
Calcium	5.41	1.0	5.41	1.0	1.0	1.839	5.275	7.114	10	1.0	10.0	1.0	1.0	3.40	9.750	13.15
Chromium	0.0025	4406	11.0	1.0	1.0	3.75	0.0024	3.75	0.00438	4406	19.3	1.0	1.0	6.56	0.0043	6.57
Copper	0.0025	541	1.353	1.0	1.0	0.460	0.0024	0.462	0.0025	541	1.353	1.0	1.0	0.460	0.0024	0.462
Iron	0.495	1.0	0.495	1.0	1.0	0.168	0.483	0.651	0.207	1.0	0.207	1.0	1.0	0.070	0.202	0.272
Lead	0.00284	1706	4.85	1.0	1.0	1.647	0.0028	1.650	0.00152	1706	2.593	1.0	1.0	0.882	0.0015	0.883
Magnesium	0.955	1.0	0.955	1.0	1.0	0.325	0.931	1.256	1.64	1.0	1.640	1.0	1.0	0.558	1.599	2.157
Manganese	0.0269	1.0	0.027	1.0	1.0	0.009	0.026	0.035	0.0187	1.0	0.019	1.0	1.0	0.006	0.018	0.025
Mercury (Inorganic)	0.0001	24762	2.476	1.0	1.0	0.842	0.00010	0.842	NA	24762	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	61	0.153	1.0	1.0	0.052	0.0024	0.054	0.0025	61	0.153	1.0	1.0	0.052	0.0024	0.054
Potassium	1.25	1.0	1.250	1.0	1.0	0.425	1.219	1.644	1.8	1.0	1.800	1.0	1.0	0.612	1.755	2.367
Selenium	0.0025	1845	4.61	1.0	1.0	1.568	0.0024	1.571	0.0025	1845	4.61	1.0	1.0	1.568	0.0024	1.571
Silica	15.9	1.0	15.90	1.0	1.0	5.41	15.503	20.91	22.7	1.0	22.7	1.0	1.0	7.72	22.133	29.85
Silver	0.0005	10696	5.35	1.0	1.0	1.818	0.00049	1.819	0.0005	10696	5.35	1.0	1.0	1.818	0.00049	1.819
Sodium	1.79	1.0	1.790	1.0	1.0	0.609	1.745	2.354	3.67	1.0	3.67	1.0	1.0	1.248	3.578	4.826
Strontium	0.0541	1.0	0.054	1.0	1.0	0.018	0.053	0.071	0.0788	1.0	0.079	1.0	1.0	0.027	0.077	0.104
Thallium	0.0025	15000	37.5	1.0	1.0	12.8	0.0024	12.8	0.0025	15000	37.5	1.0	1.0	12.8	0.0024	12.8
Vanadium	0.01	1.0	0.010	1.0	1.0	0.003	0.010	0.013	0.01	1.0	0.010	1.0	1.0	0.003	0.010	0.013
Zinc	0.0511	2175	111	1.0	1.0	37.8	0.050	37.8	0.142	2175	309	1.0	1.0	105	0.138	105

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentrations
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{plant}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)

IR_{diet}	0.34	kg/kg BW-day
IR_{water}	0.975	L/kg BW-day

Table E - 41.
Estimated Daily Doses for the Muskrat at Sample Location RG 4 - Average EPC

Analyte	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
	Surface Water (mg/L)*	Plant BCF#	Plant Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]	Surface Water (mg/L)*	Plant BCF#	Plant Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]
Aluminum	0.552	833	460	1.0	1.0	156	0.538	157	0.092	833	76.4	1.0	1.0	26.0	0.089	26.1
Antimony	0.001	1475	1.844	1.0	1.0	0.627	0.0012	0.628	NA	1475	NC	1.0	1.0	NC	NC	NC
Arsenic	0.001	293	0.366	1.0	1.0	0.125	0.0012	0.126	0.001	293	0.366	1.0	1.0	0.125	0.0012	0.126
Beryllium	0.0003	141	0.035	1.0	1.0	0.012	0.00024	0.012	0.000	141	0.035	1.0	1.0	0.012	0.00024	0.012
Cadmium	0.0003	782	0.196	1.0	1.0	0.066	0.00024	0.067	0.001	782	0.448	1.0	1.0	0.152	0.0006	0.153
Calcium	5.27	1.0	5.27	1.0	1.0	1.793	5.141	6.933	9.96	1.0	9.96	1.0	1.0	3.39	9.713	13.10
Chromium	0.001	4406	5.51	1.0	1.0	1.873	0.0012	1.874	0.004	4406	18.8	1.0	1.0	6.40	0.0042	6.40
Copper	0.001	541	0.676	1.0	1.0	0.230	0.0012	0.231	0.001	541	0.676	1.0	1.0	0.230	0.0012	0.231
Iron	0.468	1.0	0.468	1.0	1.0	0.159	0.456	0.615	0.202	1.0	0.202	1.0	1.0	0.069	0.197	0.266
Lead	0.003	1706	4.27	1.0	1.0	1.453	0.0024	1.455	0.001	1706	2.205	1.0	1.0	0.750	0.0013	0.751
Magnesium	0.927	1.0	0.927	1.0	1.0	0.315	0.904	1.219	1.633	1.0	1.633	1.0	1.0	0.555	1.592	2.147
Manganese	0.026	1.0	0.026	1.0	1.0	0.009	0.025	0.034	0.018	1.0	0.018	1.0	1.0	0.006	0.018	0.024
Mercury (Inorganic)	0.0001	24762	1.238	1.0	1.0	0.421	0.000049	0.421	NA	24762	NC	1.0	1.0	NC	NC	NC
Nickel	0.001	61	0.076	1.0	1.0	0.026	0.0012	0.027	0.001	61	0.076	1.0	1.0	0.026	0.0012	0.027
Potassium	1.198	1.0	1.198	1.0	1.0	0.407	1.168	1.575	1.785	1.0	1.785	1.0	1.0	0.607	1.740	2.347
Selenium	0.001	1845	2.306	1.0	1.0	0.784	0.0012	0.785	0.001	1845	2.306	1.0	1.0	0.784	0.0012	0.785
Silica	15.5	1.0	15.5	1.0	1.0	5.28	15.137	20.42	22.53	1.0	22.5	1.0	1.0	7.66	21.962	29.62
Silver	0.0003	10696	2.674	1.0	1.0	0.909	0.00024	0.909	0.0003	10696	2.674	1.0	1.0	0.909	0.00024	0.909
Sodium	1.738	1.0	1.738	1.0	1.0	0.591	1.694	2.285	3.60	1.0	3.6	1.0	1.0	1.224	3.510	4.734
Strontium	0.053	1.0	0.053	1.0	1.0	0.018	0.051	0.069	0.078	1.0	0.078	1.0	1.0	0.027	0.076	0.103
Thallium	0.001	15000	18.8	1.0	1.0	6.38	0.0012	6.38	0.001	15000	18.8	1.0	1.0	6.38	0.0012	6.38
Vanadium	0.005	1.0	0.005	1.0	1.0	0.002	0.0049	0.007	0.005	1.0	0.005	1.0	1.0	0.002	0.0049	0.007
Zinc	0.049	2175	106	1.0	1.0	36.1	0.048	36.1	0.139	2175	302	1.0	1.0	103	0.136	103

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentrations
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{plant}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)
IR_{diet} 0.34 kg/kg BW-day
IR_{water} 0.975 L/kg BW-day

Table E - 42.
Estimated Daily Doses for the Belted King Fisher at Sample Location RG 4 - Maximum EPC

Analyte	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
	Surface Water (mg/L)*	Fish BCF#	Fish Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]	Surface Water (mg/L)*	Fish BCF#	Fish Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]
Aluminum	0.603	2.7	1.628	1.0	1.0	0.814	0.067	0.881	0.0981	2.7	0.265	1.0	1.0	0.132	0.011	0.143
Antimony	0.0025	40	0.100	1.0	1.0	0.050	0.0003	0.050	NA	40	NC	1.0	1.0	NC	NC	NC
Arsenic	0.0025	114	0.285	1.0	1.0	0.143	0.0003	0.143	0.0025	114	0.285	1.0	1.0	0.143	0.0003	0.143
Beryllium	0.0005	62	0.031	1.0	1.0	0.016	0.0001	0.016	0.0005	62	0.031	1.0	1.0	0.016	0.0001	0.016
Cadmium	0.0005	907	0.454	1.0	1.0	0.227	0.0001	0.227	0.000767	907	0.696	1.0	1.0	0.348	0.0001	0.348
Calcium	5.41	1.0	5.41	1.0	1.0	2.705	0.601	3.31	10	1.0	10.0	1.0	1.0	5.00	1.110	6.11
Chromium	0.0025	19	0.048	1.0	1.0	0.024	0.0003	0.024	0.00438	19	0.083	1.0	1.0	0.042	0.0005	0.042
Copper	0.0025	710	1.775	1.0	1.0	0.888	0.0003	0.888	0.0025	710	1.775	1.0	1.0	0.888	0.0003	0.888
Iron	0.495	1.0	0.495	1.0	1.0	0.248	0.055	0.302	0.207	1.0	0.207	1.0	1.0	0.104	0.023	0.126
Lead	0.00284	0.09	0.0003	1.0	1.0	0.0001	0.0003	0.0004	0.00152	0.09	0.0001	1.0	1.0	0.0001	0.0002	0.0002
Magnesium	0.955	1.0	0.955	1.0	1.0	0.478	0.106	0.584	1.64	1.0	1.640	1.0	1.0	0.820	0.182	1.002
Manganese	0.0269	1.0	0.027	1.0	1.0	0.013	0.003	0.016	0.0187	1.0	0.019	1.0	1.0	0.009	0.002	0.011
Mercury (Inorganic)	0.0001	3530	0.353	1.0	1.0	0.177	0.00001	0.177	NA	3530	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	78	0.195	1.0	1.0	0.098	0.0003	0.098	0.0025	78	0.195	1.0	1.0	0.098	0.0003	0.098
Potassium	1.25	1.0	1.250	1.0	1.0	0.625	0.139	0.764	1.8	1.0	1.800	1.0	1.0	0.900	0.200	1.100
Selenium	0.0025	129	0.323	1.0	1.0	0.161	0.0003	0.162	0.0025	129	0.323	1.0	1.0	0.161	0.0003	0.162
Silica	15.9	1.0	15.9	1.0	1.0	7.95	1.765	9.71	22.7	1.0	22.7	1.0	1.0	11.4	2.520	13.9
Silver	0.0005	87.71	0.044	1.0	1.0	0.022	0.0001	0.022	0.0005	87.71	0.044	1.0	1.0	0.022	0.0001	0.022
Sodium	1.79	1.0	1.790	1.0	1.0	0.895	0.199	1.094	3.67	1.0	3.67	1.0	1.0	1.835	0.407	2.242
Strontium	0.0541	1.0	0.054	1.0	1.0	0.027	0.006	0.033	0.0788	1.0	0.079	1.0	1.0	0.039	0.009	0.048
Thallium	0.0025	10000	25.0	1.0	1.0	12.5	0.0003	12.5	0.0025	10000	25.0	1.0	1.0	12.5	0.0003	12.5
Vanadium	0.01	1.0	0.010	1.0	1.0	0.005	0.001	0.006	0.01	1.0	0.010	1.0	1.0	0.005	0.001	0.006
Zinc	0.0511	2059	105	1.0	1.0	52.6	0.006	52.6	0.142	2059	292	1.0	1.0	146	0.016	146

* - Surface water concentrations converted from ug/L to mg/L
[#] - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentration
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{fish}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)
IR_{diet} 0.5 kg/kg BW-day
IR_{water} 0.111 L/kg BW-day

Table E - 43.
Estimated Daily Doses for the Belted King Fisher at Sample Location RG 4 - Average EPC

Analyte	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
	Surface Water (mg/L)*	Fish BCF#	Fish Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]	Surface Water (mg/L)*	Fish BCF#	Fish Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]
Aluminum	0.552	2.7	1.490	1.0	1.0	0.745	0.061	0.806	0.092	2.7	0.248	1.0	1.0	0.124	0.010	0.134
Antimony	0.001	40	0.050	1.0	1.0	0.025	0.0001	0.025	NA	40	NC	1.0	1.0	NC	NC	NC
Arsenic	0.001	114	0.143	1.0	1.0	0.071	0.0001	0.071	0.001	114	0.143	1.0	1.0	0.071	0.000	0.071
Beryllium	0.0003	62	0.016	1.0	1.0	0.008	0.00003	0.008	0.0003	62	0.016	1.0	1.0	0.008	0.000	0.008
Cadmium	0.0003	907	0.227	1.0	1.0	0.113	0.00003	0.113	0.001	907	0.520	1.0	1.0	0.260	0.000	0.260
Calcium	5.27	1.0	5.27	1.0	1.0	2.636	0.585	3.22	9.96	1.0	10.0	1.0	1.0	4.98	1.106	6.09
Chromium	0.001	19	0.024	1.0	1.0	0.012	0.000	0.012	0.004	19	0.081	1.0	1.0	0.041	0.000	0.041
Copper	0.001	710	0.888	1.0	1.0	0.444	0.000	0.444	0.001	710	0.888	1.0	1.0	0.444	0.000	0.444
Iron	0.468	1.0	0.468	1.0	1.0	0.234	0.052	0.286	0.202	1.0	0.202	1.0	1.0	0.101	0.022	0.123
Lead	0.003	0.09	0.0002	1.0	1.0	0.0001	0.0003	0.0004	0.001	0.09	0.0001	1.0	1.0	0.000	0.000	0.000
Magnesium	0.927	1.0	0.927	1.0	1.0	0.464	0.103	0.567	1.633	1.0	1.633	1.0	1.0	0.816	0.181	0.997
Manganese	0.026	1.0	0.026	1.0	1.0	0.013	0.003	0.016	0.018	1.0	0.018	1.0	1.0	0.009	0.002	0.011
Mercury (Inorganic)	0.0001	3530	0.177	1.0	1.0	0.088	0.00001	0.088	NA	3530	NC	1.0	1.0	NC	NC	NC
Nickel	0.001	78	0.098	1.0	1.0	0.049	0.0001	0.049	0.001	78	0.098	1.0	1.0	0.049	0.000	0.049
Potassium	1.198	1.0	1.198	1.0	1.0	0.599	0.133	0.732	1.785	1.0	1.785	1.0	1.0	0.893	0.198	1.091
Selenium	0.001	129	0.161	1.0	1.0	0.081	0.0001	0.081	0.001	129	0.161	1.0	1.0	0.081	0.000	0.081
Silica	15.5	1.0	15.5	1.0	1.0	7.76	1.723	9.49	22.5	1.0	22.5	1.0	1.0	11.3	2.500	13.8
Silver	0.0003	87.71	0.022	1.0	1.0	0.011	0.00003	0.011	0.0003	87.71	0.022	1.0	1.0	0.011	0.000	0.011
Sodium	1.738	1.0	1.738	1.0	1.0	0.869	0.193	1.062	3.60	1.0	3.60	1.0	1.0	1.800	0.400	2.200
Strontium	0.053	1.0	0.053	1.0	1.0	0.026	0.006	0.032	0.078	1.0	0.078	1.0	1.0	0.039	0.009	0.048
Thallium	0.001	10000	12.5	1.0	1.0	6.25	0.0001	6.25	0.001	10000	12.5	1.0	1.0	6.25	0.000	6.25
Vanadium	0.005	1.0	0.005	1.0	1.0	0.003	0.001	0.003	0.005	1.0	0.005	1.0	1.0	0.003	0.001	0.003
Zinc	0.049	2059	100	1.0	1.0	50.2	0.005	50.2	0.139	2059	286	1.0	1.0	143	0.015	143

* - Surface water concentrations converted from ug/L to mg/L
[#] - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentration
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{fish}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)

IR_{diet}	0.5	kg/kg BW-day
IR_{water}	0.111	L/kg BW-day

Table E - 44.
Estimated Daily Doses for the Mallard at Sample Location RG 4 - Maximum EPC

	Spring Exposure Scenario								**Fall Exposure Scenario**									
	EPC	**Diet**				**Estimated Daily Dose (mg/kg bw-day)**			**EPC**	**Diet**						**Estimated Daily Dose (mg/kg bw-day)**		
Analyte	**Surface Water (mg/L)***	**Aquatic Invertebrate BCF#**	**Aquatic Invertebrate Concentration (mg/kg, wet wt)**	**BAV**	**AUF**	**EDD_{diet} [1]**	**EDD_{water} [2]**	**EDD_{total} [3]**	**Surface Water (mg/L)***	**Aquatic Invertebrate BCF#**	**Aquatic Invertebrate Concentration (mg/kg, wet wt)**	**Plant BCF #**	**Plant Concentration (mg/kg, wet wt)**	**BAV**	**AUF**	**EDD_{diet} [4]**	**EDD_{water} [2]**	**EDD_{total} [3]**
Aluminum	0.603	4066	2452	1.0	1.0	760	0.034	760	0.098	4066	399	833	81.7	1.0	1.0	74.5	0.005	74.5
Antimony	0.003	7	0.018	1.0	1.0	0.005	0.0001	0.006	NA	7	NC	1475	NC	1.0	1.0	NC	NC	NC
Arsenic	0.003	73	0.183	1.0	1.0	0.057	0.0001	0.057	0.003	73	0.183	293	0.733	1.0	1.0	0.142	0.0001	0.142
Beryllium	0.001	45	0.023	1.0	1.0	0.007	0.00003	0.007	0.001	45	0.023	141	0.071	1.0	1.0	0.014	0.00003	0.014
Cadmium	0.001	3461	1.73	1.0	1.0	0.536	0.00003	0.536	0.001	3461	2.65	782	0.600	1.0	1.0	0.504	0.00004	0.504
Calcium	5.41	1.0	5.41	1.0	1.0	1.68	0.303	1.98	10.0	1.0	10.0	1.0	10.0	1.0	1.0	3.10	0.560	3.66
Chromium	0.003	3000	7.50	1.0	1.0	2.33	0.0001	2.33	0.004	3000	13.14	4406	19.3	1.0	1.0	5.03	0.0002	5.03
Copper	0.003	3718	9.30	1.0	1.0	2.88	0.0001	2.88	0.003	3718	9.30	541	1.35	1.0	1.0	1.65	0.0001	1.65
Iron	0.495	1.0	0.495	1.0	1.0	0.153	0.028	0.181	0.207	1.0	0.207	1.0	0.207	1.0	1.0	0.064	0.012	0.076
Lead	0.003	5059	14.4	1.0	1.0	4.45	0.0002	4.45	0.002	5059	7.69	1706	2.59	1.0	1.0	1.59	0.0001	1.59
Magnesium	0.955	1.0	0.955	1.0	1.0	0.296	0.053	0.350	1.64	1.0	1.64	1.0	1.64	1.0	1.0	0.508	0.092	0.600
Manganese	0.027	1.0	0.027	1.0	1.0	0.008	0.002	0.010	0.019	1.0	0.019	1.0	0.019	1.0	1.0	0.006	0.001	0.007
Mercury (Inorganic)	0.0001	20184	2.02	1.0	1.0	0.626	0.00001	0.626	NA	20184	NC	24762	NC	1.0	1.0	NC	NC	NC
Nickel	0.003	28	0.070	1.0	1.0	0.022	0.0001	0.022	0.003	28	0.070	61	0.153	1.0	1.0	0.034	0.0001	0.035
Potassium	1.25	1.0	1.25	1.0	1.0	0.388	0.070	0.458	1.80	1.0	1.80	1.0	1.80	1.0	1.0	0.558	0.101	0.659
Selenium	0.003	1262	3.16	1.0	1.0	0.978	0.0001	0.978	0.003	1262	3.16	1845	4.61	1.0	1.0	1.20	0.0001	1.20
Silica	15.9	1.0	15.9	1.0	1.0	4.93	0.890	5.82	22.7	1.0	22.7	1.0	22.7	1.0	1.0	7.04	1.27	8.31
Silver	0.001	298	0.149	1.0	1.0	0.046	0.00003	0.046	0.001	298	0.149	10696	5.35	1.0	1.0	0.852	0.00003	0.852
Sodium	1.790	1.0	1.79	1.0	1.0	0.555	0.100	0.655	3.67	1.0	3.67	1.0	3.67	1.0	1.0	1.14	0.206	1.34
Strontium	0.054	1.0	0.054	1.0	1.0	0.017	0.003	0.020	0.079	1.0	0.079	1.0	0.079	1.0	1.0	0.024	0.004	0.029
Thallium	0.003	15000	37.5	1.0	1.0	11.6	0.0001	11.6	0.003	15000	37.5	15000	37.5	1.0	1.0	11.6	0.0001	11.6
Vanadium	0.010	1.0	0.01	1.0	1.0	0.003	0.001	0.004	0.010	1.0	0.010	1.0	0.010	1.0	1.0	0.003	0.001	0.004
Zinc	0.051	4578	234	1.0	1.0	72.5	0.003	72.5	0.142	4578	650	2175	309	1.0	1.0	149	0.008	149

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
EPC - Exposure Point Concentration

BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} X C_{invert}) X AUF X BAV$
[2] $EDD_{water} = IR_{water} X C_{water} X AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$
[4] $EDD_{diet} = IR_{diet}[(C_{invert} X BAF X 0.5)+(C_{plant} X BAV X 0.5)] X AUF$

Ingestion Rates (IR)
IR_{diet} 0.31 kg/kg BW-day
IR_{water} 0.056 L/kg BW-day

Table E - 45.
Estimated Daily Doses for the Mallard at Sample Location RG 4 - Average EPC

	Spring Exposure Scenario								Fall Exposure Scenario									
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet						Estimated Daily Dose (mg/kg bw-day)		
Analyte	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	Plant BCF #	Plant Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [4]	EDD_{water} [2]	EDD_{total} [3]
Aluminum	0.552	4066	2243	1.0	1.0	695	0.031	695	0.092	4066	373	833	76.4	1.0	1.0	69.7	0.005	69.7
Antimony	0.001	7	0.009	1.0	1.0	0.003	0.0001	0.003	NA	7	NC	1475	NC	1.0	1.0	NC	NC	NC
Arsenic	0.001	73	0.091	1.0	1.0	0.028	0.0001	0.028	0.001	73	0.091	293	0.366	1.0	1.0	0.071	0.0001	0.071
Beryllium	0.0003	45	0.011	1.0	1.0	0.003	0.00001	0.004	0.0003	45	0.011	141	0.035	1.0	1.0	0.007	0.00001	0.007
Cadmium	0.0003	3461	0.865	1.0	1.0	0.268	0.00001	0.268	0.001	3461	1.98	782	0.448	1.0	1.0	0.377	0.00003	0.377
Calcium	5.27	1.0	5.27	1.0	1.0	1.634	0.295	1.930	9.96	1.0	9.96	1.0	10.0	1.0	1.0	3.09	0.558	3.65
Chromium	0.001	3000	3.75	1.0	1.0	1.163	0.0001	1.163	0.004	3000	12.8	4406	18.8	1.0	1.0	4.90	0.0002	4.90
Copper	0.001	3718	4.65	1.0	1.0	1.441	0.0001	1.441	0.001	3718	4.65	541	0.676	1.0	1.0	0.825	0.0001	0.83
Iron	0.468	1.0	0.468	1.0	1.0	0.145	0.026	0.171	0.202	1.0	0.202	1.0	0.202	1.0	1.0	0.063	0.011	0.074
Lead	0.003	5059	12.7	1.0	1.0	3.93	0.0001	3.93	0.001	5059	6.54	1706	2.21	1.0	1.0	1.36	0.0001	1.36
Magnesium	0.927	1.0	0.927	1.0	1.0	0.287	0.052	0.339	1.633	1.0	1.63	1.0	1.63	1.0	1.0	0.506	0.091	0.597
Manganese	0.026	1.0	0.026	1.0	1.0	0.008	0.001	0.009	0.018	1.0	0.018	1.0	0.018	1.0	1.0	0.006	0.001	0.007
Mercury (Inorganic)	0.0001	20184	1.01	1.0	1.0	0.313	0.000003	0.313	NA	20184	NC	24762	NC	1.0	1.0	NC	NC	NC
Nickel	0.001	28	0.035	1.0	1.0	0.011	0.0001	0.011	0.001	28	0.035	61	0.076	1.0	1.0	0.017	0.0001	0.017
Potassium	1.20	1.0	1.20	1.0	1.0	0.371	0.067	0.438	1.79	1.0	1.79	1.0	1.79	1.0	1.0	0.553	0.100	0.653
Selenium	0.001	1262	1.58	1.0	1.0	0.489	0.0001	0.489	0.001	1262	1.58	1845	2.31	1.0	1.0	0.602	0.0001	0.602
Silica	15.5	1.0	15.5	1.0	1.0	4.81	0.869	5.68	22.5	1.0	22.5	1.0	22.5	1.0	1.0	6.98	1.26	8.24
Silver	0.0003	298	0.075	1.0	1.0	0.023	0.00001	0.023	0.0003	298	0.075	10696	2.67	1.0	1.0	0.426	0.00001	0.426
Sodium	1.74	1.0	1.74	1.0	1.0	0.539	0.097	0.636	3.60	1.0	3.6	1.0	3.60	1.0	1.0	1.12	0.202	1.32
Strontium	0.053	1.0	0.053	1.0	1.0	0.016	0.003	0.019	0.078	1.0	0.078	1.0	0.078	1.0	1.0	0.024	0.004	0.029
Thallium	0.001	15000	18.8	1.0	1.0	5.81	0.0001	5.81	0.001	15000	18.8	15000	18.8	1.0	1.0	5.81	0.0001	5.81
Vanadium	0.005	1.0	0.005	1.0	1.0	0.002	0.0003	0.002	0.005	1.0	0.005	1.0	0.005	1.0	1.0	0.002	0.0003	0.002
Zinc	0.049	4578	223	1.0	1.0	69.2	0.003	69.2	0.139	4578	636	2175	302	1.0	1.0	145	0.008	146

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
EPC - Exposure Point Concentration

BCF - Bioconcentration Factor
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BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{invert}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$
[4] $EDD_{diet} = IR_{diet}[(C_{invert} \times BAF \times 0.5)+(C_{plant} \times BAV \times 0.5)] \times AUF$

Ingestion Rates (IR)
IR_{diet} 0.31 kg/kg BW-day
IR_{water} 0.056 L/kg BW-day

Table E - 46.
Estimated Daily Doses for the American Dipper at Sample Location RG 8 - Maximum EPC

	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
Analyte	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet}[1]	EDD_{water}[2]	EDD_{total}[3]	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet}[1]	EDD_{water}[2]	EDD_{total}[3]
Aluminum	0.597	4066	2427	1.0	1.0	1932	0.090	1932	0.0995	4066	405	1.0	1.0	322	0.015	322
Antimony	0.0025	7.0	0.018	1.0	1.0	0.014	0.0004	0.014	NA	7.0	NC	1.0	1.0	NC	NC	NC
Arsenic	0.0025	73	0.183	1.0	1.0	0.145	0.0004	0.146	0.0025	73	0.183	1.0	1.0	0.145	0.0004	0.146
Beryllium	0.0005	45	0.023	1.0	1.0	0.018	0.0001	0.018	0.0005	45	0.023	1.0	1.0	0.018	0.00008	0.018
Cadmium	0.0005	3461	1.731	1.0	1.0	1.377	0.0001	1.378	0.000782	3461	2.707	1.0	1.0	2.154	0.00012	2.154
Calcium	5.67	1.0	5.67	1.0	1.0	4.51	0.851	5.36	10.5	1.0	10.5	1.0	1.0	8.36	1.575	9.93
Chromium	0.00267	3000	8.01	1.0	1.0	6.38	0.0004	6.38	0.00455	3000	13.7	1.0	1.0	10.9	0.001	10.9
Copper	0.0025	3718	9.30	1.0	1.0	7.40	0.0004	7.40	0.0025	3718	9.30	1.0	1.0	7.40	0.00038	7.40
Iron	0.487	1.0	0.487	1.0	1.0	0.388	0.073	0.461	0.201	1.0	0.201	1.0	1.0	0.160	0.030	0.190
Lead	0.0029	5059	14.7	1.0	1.0	11.7	0.0004	11.7	0.0016	5059	8.09	1.0	1.0	6.44	0.00024	6.44
Magnesium	0.974	1.0	0.974	1.0	1.0	0.775	0.146	0.921	1.62	1.0	1.620	1.0	1.0	1.290	0.243	1.533
Manganese	0.0274	1.0	0.027	1.0	1.0	0.022	0.004	0.026	0.0166	1.0	0.017	1.0	1.0	0.013	0.002	0.016
Mercury (Inorganic)	0.0001	20184	2.018	1.0	1.0	1.607	0.00002	1.607	NA	20184	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	28	0.070	1.0	1.0	0.056	0.0004	0.056	0.0025	28	0.070	1.0	1.0	0.056	0.00038	0.056
Potassium	1.27	1.0	1.270	1.0	1.0	1.011	0.191	1.201	1.79	1.0	1.790	1.0	1.0	1.425	0.269	1.693
Selenium	0.0025	1262	3.16	1.0	1.0	2.511	0.0004	2.512	0.0025	1262	3.16	1.0	1.0	2.511	0.00038	2.512
Silica	16.3	1.0	16.3	1.0	1.0	13.0	2.445	15.4	22.9	1.0	22.9	1.0	1.0	18.2	3.44	21.7
Silver	0.0005	298	0.149	1.0	1.0	0.119	0.0001	0.119	0.0005	298	0.149	1.0	1.0	0.119	0.00008	0.119
Sodium	1.86	1.0	1.860	1.0	1.0	1.481	0.279	1.760	3.65	1.0	3.65	1.0	1.0	2.91	0.548	3.45
Strontium	0.0546	1.0	0.055	1.0	1.0	0.043	0.008	0.052	0.078	1.0	0.078	1.0	1.0	0.062	0.012	0.074
Thallium	0.0025	15000	37.5	1.0	1.0	29.9	0.0004	29.9	0.0025	15000	37.5	1.0	1.0	29.9	0.00038	29.9
Vanadium	0.01	1.0	0.010	1.0	1.0	0.008	0.002	0.009	0.01	1.0	0.010	1.0	1.0	0.008	0.002	0.009
Zinc	0.0513	4578	235	1.0	1.0	187	0.008	187	0.145	4578	664	1.0	1.0	528	0.022	528

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentration
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDDdiet = (IR_{diet} X C_{invert}) X AUF X BAV$
[2] $EDD_{water} = IR_{water} X C_{water} X AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)
IR_{diet} 0.796 kg/kg BW-day
IR_{water} 0.15 L/kg BW-day

Table E - 47.
Estimated Daily Doses for the American Dipper at Sample Location RG 8 - Average EPC

	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
Analyte	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet}[1]	EDD_{water}[2]	EDD_{total}[3]	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet}[1]	EDD_{water}[2]	EDD_{total}[3]
Aluminum	0.549	4066	2232	1.0	1.0	1777	0.082	1777	0.086	4066	352	1.0	1.0	280	0.013	280
Antimony	0.001	7.0	0.009	1.0	1.0	0.007	0.0002	0.007	NA	7.0	NC	1.0	1.0	NC	NC	NC
Arsenic	0.001	73	0.091	1.0	1.0	0.073	0.0002	0.073	0.001	73	0.091	1.0	1.0	0.073	0.0002	0.073
Beryllium	0.0003	45	0.011	1.0	1.0	0.009	0.00004	0.009	0.0003	45	0.011	1.0	1.0	0.009	0.00004	0.009
Cadmium	0.0003	3461	0.865	1.0	1.0	0.689	0.00004	0.689	0.001	3461	1.775	1.0	1.0	1.41	0.0001	1.41
Calcium	5.38	1.0	5.38	1.0	1.0	4.28	0.807	5.09	10.5	1.0	10.5	1.0	1.0	8.32	1.568	9.89
Chromium	0.002	3000	4.82	1.0	1.0	3.83	0.0002	3.83	0.004	3000	13.1	1.0	1.0	10.4	0.001	10.4
Copper	0.001	3718	4.65	1.0	1.0	3.70	0.0002	3.70	0.001	3718	4.65	1.0	1.0	3.70	0.0002	3.70
Iron	0.461	1.0	0.461	1.0	1.0	0.367	0.069	0.436	0.191	1.0	0.191	1.0	1.0	0.15	0.029	0.180
Lead	0.003	5059	13.4	1.0	1.0	10.6	0.0004	10.6	0.001	5059	7.16	1.0	1.0	5.70	0.0002	5.70
Magnesium	0.927	1.0	0.927	1.0	1.0	0.738	0.139	0.877	1.608	1.0	1.608	1.0	1.0	1.280	0.241	1.52
Manganese	0.025	1.0	0.025	1.0	1.0	0.020	0.004	0.024	0.016	1.0	0.016	1.0	1.0	0.013	0.002	0.015
Mercury (Inorganic)	0.0001	20184	1.009	1.0	1.0	0.803	0.00001	0.803	NA	20184	NC	1.0	1.0	NC	NC	NC
Nickel	0.001	28	0.035	1.0	1.0	0.028	0.0002	0.028	0.001	28	0.035	1.0	1.0	0.028	0.0002	0.028
Potassium	1.220	1.0	1.220	1.0	1.0	0.971	0.183	1.15	1.778	1.0	1.778	1.0	1.0	1.41	0.267	1.68
Selenium	0.001	1262	1.578	1.0	1.0	1.26	0.0002	1.26	0.001	1262	1.578	1.0	1.0	1.26	0.0002	1.26
Silica	15.8	1.0	15.8	1.0	1.0	12.6	2.370	14.9	22.8	1.0	22.8	1.0	1.0	18.1	3.41	21.5
Silver	0.0003	298	0.075	1.0	1.0	0.059	0.00004	0.059	0.0003	298	0.075	1.0	1.0	0.059	0.00004	0.059
Sodium	1.785	1.0	1.785	1.0	1.0	1.42	0.268	1.69	3.62	1.0	3.62	1.0	1.0	2.88	0.543	3.42
Strontium	0.053	1.0	0.053	1.0	1.0	0.042	0.008	0.050	0.078	1.0	0.078	1.0	1.0	0.062	0.012	0.073
Thallium	0.001	15000	18.8	1.0	1.0	14.9	0.0002	14.9	0.001	15000	18.8	1.0	1.0	14.9	0.0002	14.9
Vanadium	0.005	1.0	0.005	1.0	1.0	0.004	0.001	0.005	0.005	1.0	0.005	1.0	1.0	0.004	0.001	0.005
Zinc	0.049	4578	226	1.0	1.0	180	0.007	180	0.143	4578	656	1.0	1.0	522	0.02	522

* - Surface water concentrations converted from ug/L to mg/L

[#] - A default value of 1.0 was used when no BCF was available.

COPECs - Chemicals of Potential Ecological Concern

EPC - Exposure Point Concentration

EDD - Estimated Daily Dose

BCF - Bioconcentration Factor

AUF - Area Use Factor (unitless)

BAV - Bioavailability Adjustment Factor (unitless)

NA - Not available

NC - Not calculated

mg/L - milligrams per liter; mg/L = mg/kg

mg/kg, wet wt - milligrams per kilogram, wet weight

mg/kg bw-day - milligrams per kilogram of body weight per day

kg/kg BW-d - Kilograms per kilogram body weight per day

L/kg BW-d - Liters per kilogram body weight per day

EDD Equations

[1] $EDDdiet = (IR_{diet} X C_{invert}) X AUF X BAV$

[2] $EDD_{water} = IR_{water} X C_{water} X AUF$

[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)

IR_{diet}	0.796	kg/kg BW-day
IR_{water}	0.15	L/kg BW-day

Table E - 48.
Estimated Daily Doses for the Muskrat at Sample Location RG 8 - Maximum EPC

	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
Analyte	Surface Water (mg/L)*	Plant BCF#	Plant Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet}[1]	EDD_{water}[2]	EDD_{total}[3]	Surface Water (mg/L)*	Plant BCF#	Plant Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet}[1]	EDD_{water}[2]	EDD_{total}[3]
Aluminum	0.597	833	497	1.0	1.0	169	0.582	170	0.0995	833	82.9	1.0	1.0	28.2	0.097	28.3
Antimony	0.0025	1475	3.69	1.0	1.0	1.254	0.0024	1.256	NA	1475	NC	1.0	1.0	NC	NC	NC
Arsenic	0.0025	293	0.733	1.0	1.0	0.249	0.0024	0.251	0.0025	293	0.733	1.0	1.0	0.249	0.0024	0.251
Beryllium	0.0005	141	0.071	1.0	1.0	0.024	0.00049	0.024	0.0005	141	0.071	1.0	1.0	0.024	0.00049	0.024
Cadmium	0.0005	782	0.391	1.0	1.0	0.133	0.00049	0.133	0.000782	782	0.612	1.0	1.0	0.208	0.0008	0.209
Calcium	5.67	1.0	5.67	1.0	1.0	1.928	5.528	7.456	10.5	1.0	10.5	1.0	1.0	3.57	10.238	13.81
Chromium	0.00267	4406	11.8	1.0	1.0	4.00	0.0026	4.00	0.00455	4406	20.0	1.0	1.0	6.82	0.0044	6.82
Copper	0.0025	541	1.353	1.0	1.0	0.460	0.0024	0.462	0.0025	541	1.353	1.0	1.0	0.460	0.0024	0.462
Iron	0.487	1.0	0.487	1.0	1.0	0.166	0.475	0.640	0.201	1.0	0.201	1.0	1.0	0.068	0.196	0.264
Lead	0.0029	1706	4.95	1.0	1.0	1.682	0.0028	1.685	0.0016	1706	2.730	1.0	1.0	0.928	0.0016	0.930
Magnesium	0.974	1.0	0.974	1.0	1.0	0.331	0.950	1.281	1.62	1.0	1.620	1.0	1.0	0.551	1.580	2.130
Manganese	0.0274	1.0	0.027	1.0	1.0	0.009	0.027	0.036	0.0166	1.0	0.017	1.0	1.0	0.006	0.016	0.022
Mercury (Inorganic)	0.0001	24762	2.476	1.0	1.0	0.842	0.00010	0.842	NA	24762	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	61	0.153	1.0	1.0	0.052	0.0024	0.054	0.0025	61	0.153	1.0	1.0	0.052	0.0024	0.054
Potassium	1.27	1.0	1.270	1.0	1.0	0.432	1.238	1.670	1.79	1.0	1.790	1.0	1.0	0.609	1.745	2.354
Selenium	0.0025	1845	4.61	1.0	1.0	1.568	0.0024	1.571	0.0025	1845	4.61	1.0	1.0	1.568	0.0024	1.571
Silica	16.3	1.0	16.3	1.0	1.0	5.54	15.893	21.43	22.9	1.0	22.9	1.0	1.0	7.79	22.328	30.1
Silver	0.0005	10696	5.35	1.0	1.0	1.818	0.00049	1.819	0.0005	10696	5.35	1.0	1.0	1.818	0.00049	1.819
Sodium	1.86	1.0	1.860	1.0	1.0	0.632	1.814	2.446	3.65	1.0	3.65	1.0	1.0	1.241	3.559	4.800
Strontium	0.0546	1.0	0.055	1.0	1.0	0.019	0.053	0.072	0.078	1.0	0.078	1.0	1.0	0.027	0.076	0.103
Thallium	0.0025	15000	37.5	1.0	1.0	12.8	0.0024	12.8	0.0025	15000	37.5	1.0	1.0	12.8	0.0024	12.8
Vanadium	0.01	1.0	0.010	1.0	1.0	0.003	0.010	0.013	0.01	1.0	0.010	1.0	1.0	0.003	0.010	0.013
Zinc	0.0513	2175	112	1.0	1.0	37.9	0.050	38.0	0.145	2175	315	1.0	1.0	107	0.141	107

* - Surface water concentrations converted from ug/L to mg/L
# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentrations
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{plant}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)

IR_{diet}	0.34	kg/kg BW-day
IR_{water}	0.975	L/kg BW-day

Table E - 49.
Estimated Daily Doses for the Muskrat at Sample Location RG 8 - Average EPC

	Spring Exposure Scenario								**Fall Exposure Scenario**							
	EPC	**Diet**				**Estimated Daily Dose (mg/kg bw-day)**			**EPC**	**Diet**				**Estimated Daily Dose (mg/kg bw-day)**		
Analyte	**Surface Water (mg/L)***	**Plant BCF#**	**Plant Concentration (mg/kg, wet wt)**	**BAV**	**AUF**	**EDD_{diet} [1]**	**EDD_{water} [2]**	**EDD_{total} [3]**	**Surface Water (mg/L)***	**Plant BCF#**	**Plant Concentration (mg/kg, wet wt)**	**BAV**	**AUF**	**EDD_{diet} [1]**	**EDD_{water} [2]**	**EDD_{total} [3]**
Aluminum	0.549	833	457	1.0	1.0	155	0.535	156	0.086	833	72.0	1.0	1.0	24.5	0.084	24.6
Antimony	0.001	1475	1.844	1.0	1.0	0.627	0.0012	0.628	NA	1475	NC	1.0	1.0	NC	NC	NC
Arsenic	0.001	293	0.366	1.0	1.0	0.125	0.0012	0.126	0.001	293	0.366	1.0	1.0	0.125	0.0012	0.126
Beryllium	0.0003	141	0.035	1.0	1.0	0.012	0.00024	0.012	0.0003	141	0.035	1.0	1.0	0.012	0.00024	0.012
Cadmium	0.0003	782	0.196	1.0	1.0	0.066	0.00024	0.067	0.001	782	0.401	1.0	1.0	0.136	0.00050	0.137
Calcium	5.38	1.0	5.38	1.0	1.0	1.828	5.243	7.071	10.5	1.0	10.5	1.0	1.0	3.55	10.189	13.74
Chromium	0.002	4406	7.07	1.0	1.0	2.404	0.0016	2.406	0.004	4406	19.3	1.0	1.0	6.55	0.0043	6.55
Copper	0.001	541	0.676	1.0	1.0	0.230	0.0012	0.231	0.001	541	0.676	1.0	1.0	0.230	0.0012	0.231
Iron	0.461	1.0	0.461	1.0	1.0	0.157	0.449	0.606	0.191	1.0	0.191	1.0	1.0	0.065	0.186	0.251
Lead	0.003	1706	4.51	1.0	1.0	1.533	0.0026	1.535	0.001	1706	2.414	1.0	1.0	0.821	0.0014	0.822
Magnesium	0.927	1.0	0.927	1.0	1.0	0.315	0.904	1.219	1.608	1.0	1.608	1.0	1.0	0.547	1.567	2.114
Manganese	0.025	1.0	0.025	1.0	1.0	0.009	0.025	0.033	0.016	1.0	0.016	1.0	1.0	0.005	0.016	0.021
Mercury (Inorganic)	0.0001	24762	1.238	1.0	1.0	0.421	0.000049	0.421	NA	24762	NC	1.0	1.0	NC	NC	NC
Nickel	0.001	61	0.076	1.0	1.0	0.026	0.0012	0.027	0.001	61	0.076	1.0	1.0	0.026	0.0012	0.027
Potassium	1.220	1.0	1.220	1.0	1.0	0.415	1.190	1.604	1.778	1.0	1.778	1.0	1.0	0.604	1.733	2.337
Selenium	0.001	1845	2.306	1.0	1.0	0.784	0.0012	0.785	0.001	1845	2.306	1.0	1.0	0.784	0.0012	0.785
Silica	15.8	1.0	15.8	1.0	1.0	5.37	15.405	20.78	22.8	1.0	22.8	1.0	1.0	7.74	22.181	29.92
Silver	0.0003	10696	2.674	1.0	1.0	0.909	0.00024	0.909	0.0003	10696	2.674	1.0	1.0	0.909	0.00024	0.909
Sodium	1.785	1.0	1.785	1.0	1.0	0.607	1.740	2.347	3.618	1.0	3.62	1.0	1.0	1.230	3.527	4.757
Strontium	0.053	1.0	0.053	1.0	1.0	0.018	0.052	0.070	0.078	1.0	0.078	1.0	1.0	0.026	0.076	0.102
Thallium	0.001	15000	18.8	1.0	1.0	6.38	0.0012	6.38	0.001	15000	18.8	1.0	1.0	6.38	0.0012	6.38
Vanadium	0.005	1.0	0.005	1.0	1.0	0.002	0.0049	0.007	0.005	1.0	0.005	1.0	1.0	0.002	0.0049	0.007
Zinc	0.049	2175	107	1.0	1.0	36.5	0.048	36.5	0.143	2175	312	1.0	1.0	106	0.140	106

* - Surface water concentrations converted from ug/L to mg/L
# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentrations
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} X C_{plant}) X AUF X BAV$
[2] $EDD_{water} = IR_{water} X C_{water} X AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)

IR_{diet}	0.34	kg/kg BW-day
IR_{water}	0.975	L/kg BW-day

Table E - 50.
Estimated Daily Doses for the Belted King Fisher at Sample Location RG 8 - Maximum EPC

Analyte	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	**Diet**				**Estimated Daily Dose (mg/kg bw-day)**			**EPC**	**Diet**				**Estimated Daily Dose (mg/kg bw-day)**		
	Surface Water (mg/L)*	**Fish BCF#**	**Fish Concentration (mg/kg, wet wt)**	**BAV**	**AUF**	**EDD_{diet} [1]**	**EDD_{water} [2]**	**EDD_{total} [3]**	**Surface Water (mg/L)***	**Fish BCF#**	**Fish Concentration (mg/kg, wet wt)**	**BAV**	**AUF**	**EDD_{diet} [1]**	**EDD_{water} [2]**	**EDD_{total} [3]**
Aluminum	0.597	2.7	1.612	1.0	1.0	0.806	0.066	0.872	0.0995	2.7	0.269	1.0	1.0	0.134	0.011	0.145
Antimony	0.0025	40	0.100	1.0	1.0	0.050	0.0003	0.050	NA	40	NC	1.0	1.0	NC	NC	NC
Arsenic	0.0025	114	0.285	1.0	1.0	0.143	0.0003	0.143	0.0025	114	0.285	1.0	1.0	0.143	0.0003	0.143
Beryllium	0.0005	62	0.031	1.0	1.0	0.016	0.0001	0.016	0.0005	62	0.031	1.0	1.0	0.016	0.0001	0.016
Cadmium	0.0005	907	0.454	1.0	1.0	0.227	0.0001	0.227	0.000782	907	0.709	1.0	1.0	0.355	0.0001	0.355
Calcium	5.67	1.0	5.67	1.0	1.0	2.835	0.629	3.46	10.5	1.0	10.5	1.0	1.0	5.25	1.166	6.42
Chromium	0.00267	19	0.051	1.0	1.0	0.025	0.0003	0.026	0.00455	19	0.086	1.0	1.0	0.043	0.001	0.044
Copper	0.0025	710	1.775	1.0	1.0	0.888	0.0003	0.888	0.0025	710	1.775	1.0	1.0	0.888	0.0003	0.888
Iron	0.487	1.0	0.487	1.0	1.0	0.244	0.054	0.298	0.201	1.0	0.201	1.0	1.0	0.101	0.022	0.123
Lead	0.0029	0.09	0.0003	1.0	1.0	0.0001	0.0003	0.0005	0.0016	0.09	0.0001	1.0	1.0	0.0001	0.0002	0.0002
Magnesium	0.974	1.0	0.974	1.0	1.0	0.487	0.108	0.595	1.62	1.0	1.620	1.0	1.0	0.810	0.180	0.990
Manganese	0.0274	1.0	0.027	1.0	1.0	0.014	0.003	0.017	0.0166	1.0	0.017	1.0	1.0	0.008	0.002	0.010
Mercury (Inorganic)	0.0001	3530	0.353	1.0	1.0	0.177	0.0000	0.177	NA	3530	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	78	0.195	1.0	1.0	0.098	0.0003	0.098	0.0025	78	0.195	1.0	1.0	0.098	0.0003	0.098
Potassium	1.27	1.0	1.270	1.0	1.0	0.635	0.141	0.776	1.79	1.0	1.790	1.0	1.0	0.895	0.199	1.094
Selenium	0.0025	129	0.323	1.0	1.0	0.161	0.0003	0.162	0.0025	129	0.323	1.0	1.0	0.161	0.0003	0.162
Silica	16.3	1.0	16.3	1.0	1.0	8.15	1.809	9.96	22.9	1.0	22.9	1.0	1.0	11.5	2.542	14.0
Silver	0.0005	87.71	0.044	1.0	1.0	0.02	0.0001	0.022	0.0005	87.71	0.044	1.0	1.0	0.022	0.0001	0.022
Sodium	1.86	1.0	1.860	1.0	1.0	0.930	0.206	1.136	3.65	1.0	3.7	1.0	1.0	1.825	0.405	2.230
Strontium	0.0546	1.0	0.055	1.0	1.0	0.027	0.006	0.033	0.078	1.0	0.078	1.0	1.0	0.039	0.009	0.048
Thallium	0.0025	10000	25.0	1.0	1.0	12.5	0.0003	12.5	0.0025	10000	25.0	1.0	1.0	12.5	0.0003	12.5
Vanadium	0.01	1.0	0.010	1.0	1.0	0.005	0.001	0.006	0.01	1.0	0.010	1.0	1.0	0.005	0.001	0.006
Zinc	0.0513	2059	106	1.0	1.0	52.8	0.006	52.8	0.145	2059	299	1.0	1.0	149	0.016	149

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentration
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{fish}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)

IR_{diet}	0.5	kg/kg BW-day
IR_{water}	0.111	L/kg BW-day

Table E - 51.
Estimated Daily Doses for the Belted King Fisher at Sample Location RG 8 - Average EPC

Analyte	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
	Surface Water (mg/L)*	Fish BCF#	Fish Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]	Surface Water (mg/L)*	Fish BCF#	Fish Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]
Aluminum	0.549	2.7	1.482	1.0	1.0	0.741	0.061	0.802	0.086	2.7	0.233	1.0	1.0	0.117	0.010	0.126
Antimony	0.001	40	0.050	1.0	1.0	0.025	0.0001	0.025	NA	40	NC	1.0	1.0	NC	NC	NC
Arsenic	0.001	114	0.143	1.0	1.0	0.071	0.0001	0.071	0.001	114	0.143	1.0	1.0	0.071	0.0001	0.071
Beryllium	0.0003	62	0.016	1.0	1.0	0.008	0.00003	0.008	0.0003	62	0.016	1.0	1.0	0.008	0.00003	0.008
Cadmium	0.0003	907	0.227	1.0	1.0	0.113	0.00003	0.113	0.001	907	0.465	1.0	1.0	0.233	0.0001	0.233
Calcium	5.38	1.0	5.38	1.0	1.0	2.689	0.597	3.29	10.5	1.0	10.5	1.0	1.0	5.23	1.160	6.38
Chromium	0.002	19	0.030	1.0	1.0	0.015	0.0002	0.015	0.004	19	0.083	1.0	1.0	0.042	0.0005	0.042
Copper	0.001	710	0.888	1.0	1.0	0.444	0.0001	0.444	0.001	710	0.888	1.0	1.0	0.444	0.0001	0.444
Iron	0.461	1.0	0.461	1.0	1.0	0.231	0.051	0.282	0.191	1.0	0.191	1.0	1.0	0.095	0.021	0.117
Lead	0.003	0.09	0.0002	1.0	1.0	0.0001	0.0003	0.0004	0.001	0.09	0.0001	1.0	1.0	0.0001	0.0002	0.0002
Magnesium	0.927	1.0	0.927	1.0	1.0	0.464	0.103	0.566	1.608	1.0	1.608	1.0	1.0	0.804	0.178	0.982
Manganese	0.025	1.0	0.025	1.0	1.0	0.013	0.003	0.016	0.016	1.0	0.016	1.0	1.0	0.008	0.002	0.010
Mercury (Inorganic)	0.0001	3530	0.177	1.0	1.0	0.088	0.00001	0.088	NA	3530	NC	1.0	1.0	NC	NC	NC
Nickel	0.001	78	0.098	1.0	1.0	0.049	0.0001	0.049	0.001	78	0.098	1.0	1.0	0.049	0.0001	0.049
Potassium	1.220	1.0	1.220	1.0	1.0	0.610	0.135	0.745	1.778	1.0	1.778	1.0	1.0	0.889	0.197	1.086
Selenium	0.001	129	0.161	1.0	1.0	0.081	0.0001	0.081	0.001	129	0.161	1.0	1.0	0.081	0.0001	0.081
Silica	15.8	1.0	15.8	1.0	1.0	7.90	1.754	9.65	22.8	1.0	22.8	1.0	1.0	11.4	2.525	13.9
Silver	0.0003	87.71	0.022	1.0	1.0	0.011	0.00003	0.011	0.0003	87.71	0.022	1.0	1.0	0.011	0.00003	0.011
Sodium	1.785	1.0	1.785	1.0	1.0	0.893	0.198	1.091	3.62	1.0	3.62	1.0	1.0	1.809	0.402	2.210
Strontium	0.053	1.0	0.053	1.0	1.0	0.027	0.006	0.032	0.078	1.0	0.078	1.0	1.0	0.039	0.009	0.047
Thallium	0.001	10000	12.5	1.0	1.0	6.25	0.0001	6.25	0.001	10000	12.5	1.0	1.0	6.25	0.0001	6.25
Vanadium	0.005	1.0	0.005	1.0	1.0	0.003	0.001	0.003	0.005	1.0	0.005	1.0	1.0	0.003	0.001	0.003
Zinc	0.049	2059	102	1.0	1.0	50.8	0.005	50.8	0.143	2059	295	1.0	1.0	147	0.016	147

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentration
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{fish}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)

IR_{diet}	0.5	kg/kg BW-day
IR_{water}	0.111	L/kg BW-day

Table E - 52.
Estimated Daily Doses for the Mallard at Sample Location RG 8 - Maximum EPC

Analyte	Spring Exposure Scenario								Fall Exposure Scenario									
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet						Estimated Daily Dose (mg/kg bw-day)		
	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	Plant BCF #	Plant Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [4]	EDD_{water} [2]	EDD_{total} [3]
Aluminum	0.597	4066	2427	1.0	1.0	752	0.033	753	0.100	4066	405	833	82.9	1.0	1.0	76	0.006	76
Antimony	0.003	7	0.018	1.0	1.0	0.005	0.0001	0.006	NA	7	NC	1475	NC	1.0	1.0	NC	NC	NC
Arsenic	0.003	73	0.183	1.0	1.0	0.057	0.0001	0.057	0.003	73	0.183	293	0.733	1.0	1.0	0.142	0.0001	0.142
Beryllium	0.001	45	0.023	1.0	1.0	0.007	0.0000	0.007	0.001	45	0.023	141	0.071	1.0	1.0	0.014	0.00003	0.014
Cadmium	0.001	3461	1.73	1.0	1.0	0.536	0.0000	0.536	0.001	3461	2.71	782	0.612	1.0	1.0	0.51	0.00004	0.514
Calcium	5.67	1.0	5.7	1.0	1.0	1.76	0.318	2.08	10.5	1.0	10.5	1.0	10.5	1.0	1.0	3.26	0.588	3.84
Chromium	0.003	3000	8.01	1.0	1.0	2.48	0.0001	2.48	0.005	3000	13.7	4406	20.0	1.0	1.0	5.22	0.0003	5.22
Copper	0.003	3718	9.30	1.0	1.0	2.88	0.0001	2.88	0.003	3718	9.30	541	1.35	1.0	1.0	1.65	0.0001	1.65
Iron	0.487	1.0	0.487	1.0	1.0	0.151	0.027	0.178	0.201	1.0	0.201	1.0	0.201	1.0	1.0	0.062	0.011	0.074
Lead	0.003	5059	14.7	1.0	1.0	4.55	0.0002	4.55	0.002	5059	8.09	1706	2.73	1.0	1.0	1.68	0.0001	1.68
Magnesium	0.974	1.0	0.974	1.0	1.0	0.302	0.055	0.356	1.620	1.0	1.62	1.0	1.62	1.0	1.0	0.50	0.091	0.593
Manganese	0.027	1.0	0.027	1.0	1.0	0.008	0.002	0.010	0.017	1.0	0.017	1.0	0.017	1.0	1.0	0.005	0.001	0.006
Mercury (Inorganic)	0.0001	20184	2.02	1.0	1.0	0.626	0.00001	0.626	NA	20184	NC	24762	NC	1.0	1.0	NC	NC	NC
Nickel	0.003	28	0.070	1.0	1.0	0.022	0.0001	0.022	0.003	28	0.070	61	0.153	1.0	1.0	0.034	0.0001	0.035
Potassium	1.27	1.0	1.27	1.0	1.0	0.394	0.071	0.465	1.79	1.0	1.790	1.0	1.79	1.0	1.0	0.55	0.100	0.655
Selenium	0.003	1262	3.16	1.0	1.0	0.978	0.0001	0.978	0.003	1262	3.16	1845	4.61	1.0	1.0	1.20	0.0001	1.204
Silica	16.3	1.0	16.3	1.0	1.0	5.05	0.913	5.97	22.9	1.0	22.9	1.0	22.9	1.0	1.0	7.10	1.28	8.38
Silver	0.001	298	0.149	1.0	1.0	0.046	0.00003	0.046	0.001	298	0.149	10696	5.35	1.0	1.0	0.85	0.00003	0.8521
Sodium	1.860	1.0	1.86	1.0	1.0	0.577	0.104	0.681	3.65	1.0	3.65	1.0	3.65	1.0	1.0	1.13	0.204	1.34
Strontium	0.055	1.0	0.055	1.0	1.0	0.017	0.003	0.020	0.078	1.0	0.078	1.0	0.078	1.0	1.0	0.024	0.004	0.029
Thallium	0.003	15000	37.5	1.0	1.0	11.6	0.0001	11.6	0.003	15000	37.5	15000	37.5	1.0	1.0	11.6	0.0001	11.6
Vanadium	0.010	1.0	0.010	1.0	1.0	0.003	0.001	0.004	0.010	1.0	0.010	1.0	0.010	1.0	1.0	0.003	0.001	0.004
Zinc	0.051	4578	235	1.0	1.0	72.8	0.003	72.8	0.145	4578	664	2175	315	1.0	1.0	152	0.008	152

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
EPC - Exposure Point Concentration

BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg Bw-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} X C_{invert}) X AUF X BAV$
[2] $EDD_{water} = IR_{water} X C_{water} X AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$
[4] $EDD_{diet} = IR_{diet}[(C_{invert} X BAF X 0.5)+(C_{plant} X BAV X 0.5)] X AUF$

Ingestion Rates (IR)
IR_{diet} 0.31 kg/kg BW-day
IR_{water} 0.056 L/kg BW-day

Table E - 53.
Estimated Daily Doses for the Mallard at Sample Location RG 8 - Average EPC

Spring Exposure Scenario

Analyte	EPC: Surface Water (mg/L)*	Diet: Aquatic Invertebrate BCF#	Diet: Aquatic Invertebrate Concentration (mg/kg, wet wt)	Diet: BAV	Diet: AUF	Estimated Daily Dose (mg/kg bw-day): EDD_{diet}[1]	Estimated Daily Dose (mg/kg bw-day): EDD_{water}[2]	Estimated Daily Dose (mg/kg bw-day): EDD_{total}[3]
Aluminum	0.549	4066	2232	1.0	1.0	692	0.031	692
Antimony	0.001	7	0.009	1.0	1.0	0.003	0.0001	0.003
Arsenic	0.001	73	0.091	1.0	1.0	0.028	0.0001	0.028
Beryllium	0.0003	45	0.011	1.0	1.0	0.003	0.00001	0.004
Cadmium	0.0003	3461	0.865	1.0	1.0	0.268	0.00001	0.268
Calcium	5.38	1.0	5.38	1.0	1.0	1.67	0.301	1.97
Chromium	0.002	3000	4.82	1.0	1.0	1.49	0.0001	1.49
Copper	0.001	3718	4.65	1.0	1.0	1.44	0.0001	1.44
Iron	0.461	1.0	0.461	1.0	1.0	0.143	0.026	0.169
Lead	0.003	5059	13.4	1.0	1.0	4.14	0.0001	4.14
Magnesium	0.927	1.0	0.927	1.0	1.0	0.287	0.052	0.339
Manganese	0.025	1.0	0.025	1.0	1.0	0.008	0.001	0.009
Mercury (Inorganic)	0.0001	20184	1.01	1.0	1.0	0.313	0.000003	0.313
Nickel	0.001	28	0.035	1.0	1.0	0.011	0.0001	0.011
Potassium	1.220	1.0	1.22	1.0	1.0	0.378	0.068	0.447
Selenium	0.001	1262	1.58	1.0	1.0	0.489	0.0001	0.489
Silica	15.8	1.0	15.8	1.0	1.0	4.90	0.885	5.78
Silver	0.0003	298	0.075	1.0	1.0	0.023	0.00001	0.023
Sodium	1.785	1.0	1.79	1.0	1.0	0.553	0.100	0.653
Strontium	0.053	1.0	0.053	1.0	1.0	0.016	0.003	0.019
Thallium	0.001	15000	18.8	1.0	1.0	5.81	0.0001	5.81
Vanadium	0.005	1.0	0.005	1.0	1.0	0.002	0.0003	0.002
Zinc	0.049	4578	226	1.0	1.0	70.0	0.003	70.0

Fall Exposure Scenario

Analyte	EPC: Surface Water (mg/L)*	Diet: Aquatic Invertebrate BCF#	Diet: Aquatic Invertebrate Concentration (mg/kg, wet wt)	Diet: Plant BCF #	Diet: Plant Concentration (mg/kg, wet wt)	Diet: BAV	Diet: AUF	Estimated Daily Dose (mg/kg bw-day): EDD_{diet}[4]	Estimated Daily Dose (mg/kg bw-day): EDD_{water}[2]	Estimated Daily Dose (mg/kg bw-day): EDD_{total}[3]
Aluminum	0.086	4066	352	833	72.0	1.0	1.0	66	0.005	66
Antimony	NA	7	NC	1475	NC	1.0	1.0	NC	NC	NC
Arsenic	0.001	73	0.091	293	0.366	1.0	1.0	0.071	0.0001	0.071
Beryllium	0.0003	45	0.011	141	0.035	1.0	1.0	0.007	0.00001	0.007
Cadmium	0.001	3461	1.77	782	0.401	1.0	1.0	0.337	0.00003	0.337
Calcium	10.5	1.0	10.45	1.0	10.5	1.0	1.0	3.24	0.585	3.82
Chromium	0.004	3000	13.1	4406	19.3	1.0	1.0	5.02	0.0002	
Copper	0.001	3718	4.65	541	0.676	1.0	1.0	0.83	0.0001	0.83
Iron	0.191	1.0	0.191	1.0	0.191	1.0	1.0	0.059	0.011	0.070
Lead	0.001	5059	7.16	1706	2.41	1.0	1.0	1.48	0.0001	1.48
Magnesium	1.608	1.0	1.608	1.0	1.61	1.0	1.0	0.498	0.090	0.588
Manganese	0.016	1.0	0.016	1.0	0.016	1.0	1.0	0.005	0.001	0.006
Mercury (Inorganic)	NA	20184	NC	24762	NC	1.0	1.0	NC	NC	NC
Nickel	0.001	28	0.035	61	0.076	1.0	1.0	0.017	0.0001	0.017
Potassium	1.778	1.0	1.78	1.0	1.78	1.0	1.0	0.55	0.100	0.651
Selenium	0.001	1262	1.58	1845	2.31	1.0	1.0	0.60	0.0001	0.602
Silica	22.8	1.0	22.8	1.0	23	1.0	1.0	7.05	1.27	8.33
Silver	0.0003	298	0.075	10696	2.67	1.0	1.0	0.426	0.00001	0.426
Sodium	3.618	1.0	3.62	1.0	3.62	1.0	1.0	1.12	0.203	1.32
Strontium	0.078	1.0	0.078	1.0	0.078	1.0	1.0	0.024	0.004	0.028
Thallium	0.001	15000	18.8	15000	18.8	1.0	1.0	5.81	0.0001	5.81
Vanadium	0.005	1.0	0.005	1.0	0.005	1.0	1.0	0.002	0.0003	0.002
Zinc	0.143	4578	656	2175	312	1.0	1.0	150	0.008	150

* - Surface water concentrations converted from ug/L to mg/L
[#] - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
EPC - Exposure Point Concentration

BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} X C_{invert}) X AUF X BAV$
[2] $EDD_{water} = IR_{water} X C_{water} X AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$
[4] $EDD_{diet} = IR_{diet}[(C_{invert} X BAF X 0.5)+(C_{plant} X BAV X 0.5)]X AUF$

Ingestion Rates (IR)
IR_{diet} 0.31 kg/kg BW-day
IR_{water} 0.056 L/kg BW-day

Table E - 54.
Estimated Daily Doses for the American Dipper at Sample Location RG 9 - Maximum EPC

Analyte	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]
Aluminum	0.659	4066	2679	1.0	1.0	2133	0.099	2133	0.234	4066	951	1.0	1.0	757	0.035	757
Antimony	0.003	7.0	0.018	1.0	1.0	0.014	0.0004	0.014	0.001	7.0	0.009	1.0	1.0	0.007	0.0002	0.007
Arsenic	0.003	73	0.183	1.0	1.0	0.145	0.0004	0.146	0.003	73	0.183	1.0	1.0	0.145	0.0004	0.146
Beryllium	0.001	45	0.023	1.0	1.0	0.018	0.0001	0.018	0.001	45	0.023	1.0	1.0	0.018	0.0001	0.018
Cadmium	0.001	3461	1.731	1.0	1.0	1.38	0.0001	1.38	0.001	3461	3.70	1.0	1.0	2.948	0.0002	2.948
Calcium	5.61	1.0	5.61	1.0	1.0	4.47	0.842	5.31	10.8	1.0	10.8	1.0	1.0	8.60	1.620	10.2
Chromium	0.003	3000	7.50	1.0	1.0	5.97	0.0004	5.97	0.005	3000	14	1.0	1.0	11.3	0.001	11.3
Copper	0.003	3718	9.30	1.0	1.0	7.40	0.0004	7.40	0.003	3718	9.30	1.0	1.0	7.40	0.0004	7.40
Iron	0.501	1.0	0.501	1.0	1.0	0.399	0.075	0.474	0.289	1.0	0.289	1.0	1.0	0.230	0.043	0.273
Lead	0.003	5059	17.1	1.0	1.0	13.6	0.001	13.6	0.001	5059	7.39	1.0	1.0	5.88	0.0002	5.88
Magnesium	0.968	1.0	0.968	1.0	1.0	0.771	0.145	0.916	1.630	1.0	1.630	1.0	1.0	1.297	0.245	1.542
Manganese	0.027	1.0	0.027	1.0	1.0	0.022	0.004	0.026	0.020	1.0	0.020	1.0	1.0	0.016	0.003	0.019
Mercury (Inorganic)	0.0001	20184	2.018	1.0	1.0	1.61	0.00002	1.61	NC	20184	NC	1.0	1.0	NC	NC	NC
Nickel	0.003	28	0.070	1.0	1.0	0.056	0.0004	0.056	0.003	28	0.070	1.0	1.0	0.056	0.0004	0.056
Potassium	1.320	1.0	1.320	1.0	1.0	1.05	0.198	1.25	1.810	1.0	1.810	1.0	1.0	1.441	0.272	1.712
Selenium	0.003	1262	3.16	1.0	1.0	2.51	0.0004	2.51	0.003	1262	3.16	1.0	1.0	2.511	0.0004	2.512
Silica	16.7	1.0	16.7	1.0	1.0	13.3	2.505	15.8	23.0	1.0	23.0	1.0	1.0	18.31	3.45	21.8
Silver	0.001	298	0.149	1.0	1.0	0.119	0.0001	0.119	0.001	298	0.149	1.0	1.0	0.119	0.0001	0.119
Sodium	1.910	1.0	1.910	1.0	1.0	1.52	0.287	1.81	3.71	1.0	3.71	1.0	1.0	2.953	0.557	3.51
Strontium	0.055	1.0	0.055	1.0	1.0	0.043	0.008	0.052	0.081	1.0	0.081	1.0	1.0	0.064	0.012	0.077
Thallium	0.003	15000	37.5	1.0	1.0	29.9	0.0004	29.9	0.003	15000	37.5	1.0	1.0	29.9	0.0004	29.9
Vanadium	0.010	1.0	0.010	1.0	1.0	0.008	0.002	0.009	0.010	1.0	0.010	1.0	1.0	0.008	0.002	0.009
Zinc	0.053	4578	241	1.0	1.0	192	0.008	192	0.137	4578	627	1.0	1.0	499	0.021	499

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentration
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] EDDdiet = (IR_{diet} X C_{invert}) X AUF X BAV
[2] EDD_{water} = IR_{water} X C_{water} X AUF
[3] EDD_{total} = EDD_{diet} + EDD_{water}

Ingestion Rates (IR)
IR_{diet} 0.796 kg/kg BW-day
IR_{water} 0.15 L/kg BW-day

Table E - 55.
Estimated Daily Doses for the American Dipper at Sample Location RG 9 - Average EPC

	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
Analyte	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]
Aluminum	0.592	4066	2407	1.0	1.0	1916	0.089	1916	0.123	4066	500	1.0	1.0	398	0.02	398
Antimony	0.001	7.0	0.009	1.0	1.0	0.007	0.0002	0.007	0.001	7.0	0.009	1.0	1.0	0.007	0.0002	0.007
Arsenic	0.001	73	0.091	1.0	1.0	0.073	0.0002	0.073	0.001	73	0.091	1.0	1.0	0.073	0.0002	0.073
Beryllium	0.0003	45	0.011	1.0	1.0	0.009	0.00004	0.009	0.000	45	0.011	1.0	1.0	0.009	0.00004	0.009
Cadmium	0.0003	3461	0.865	1.0	1.0	0.689	0.00004	0.689	0.001	3461	2.188	1.0	1.0	1.74	0.0001	1.74
Calcium	5.55	1.0	5.55	1.0	1.0	4.41	0.832	5.25	10.5	1.0	10.5	1.0	1.0	8.38	1.579	9.96
Chromium	0.001	3000	3.75	1.0	1.0	2.99	0.0002	2.99	0.004	3000	12.4	1.0	1.0	9.83	0.001	9.83
Copper	0.001	3718	4.65	1.0	1.0	3.70	0.0002	3.70	0.001	3718	4.65	1.0	1.0	3.70	0.0002	3.70
Iron	0.478	1.0	0.478	1.0	1.0	0.381	0.072	0.452	0.211	1.0	0.211	1.0	1.0	0.168	0.032	0.200
Lead	0.003	5059	15.5	1.0	1.0	12.4	0.0005	12.4	0.001	5059	6.69	1.0	1.0	5.33	0.0002	5.33
Magnesium	0.955	1.0	0.955	1.0	1.0	0.760	0.143	0.903	1.605	1.0	1.605	1.0	1.0	1.28	0.241	1.52
Manganese	0.026	1.0	0.026	1.0	1.0	0.021	0.004	0.025	0.016	1.0	0.016	1.0	1.0	0.013	0.002	0.015
Mercury (Inorganic)	0.0001	20184	1.009	1.0	1.0	0.803	0.00001	0.803	NA	20184	NC	1.0	1.0	NC	NC	NC
Nickel	0.001	28	0.035	1.0	1.0	0.028	0.0002	0.028	0.001	28	0.035	1.0	1.0	0.028	0.0002	0.028
Potassium	1.265	1.0	1.265	1.0	1.0	1.01	0.190	1.20	1.780	1.0	1.780	1.0	1.0	1.42	0.267	1.68
Selenium	0.001	1262	1.578	1.0	1.0	1.26	0.0002	1.26	0.001	1262	1.578	1.0	1.0	1.26	0.0002	1.26
Silica	16.3	1.0	16.3	1.0	1.0	13.0	2.4413	15.4	22.8	1.0	22.8	1.0	1.0	18.1	3.413	21.5
Silver	0.0003	298	0.075	1.0	1.0	0.059	0.00004	0.059	0.000	298	0.075	1.0	1.0	0.059	0.00004	0.059
Sodium	1.853	1.0	1.853	1.0	1.0	1.47	0.278	1.75	3.64	1.0	3.64	1.0	1.0	2.90	0.546	3.44
Strontium	0.054	1.0	0.054	1.0	1.0	0.043	0.008	0.051	0.078	1.0	0.078	1.0	1.0	0.062	0.012	0.074
Thallium	0.001	15000	18.8	1.0	1.0	14.9	0.0002	14.93	0.001	15000	18.8	1.0	1.0	14.9	0.0002	14.9
Vanadium	0.005	1.0	0.005	1.0	1.0	0.004	0.001	0.005	0.005	1.0	0.005	1.0	1.0	0.004	0.001	0.005
Zinc	0.051	4578	233	1.0	1.0	186	0.008	186	0.136	4578	621	1.0	1.0	495	0.020	495

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentration
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDDdiet = (IR_{diet} X C_{invert}) X AUF X BAV$
[2] $EDD_{water} = IR_{water} X C_{water} X AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)
IR_{diet} 0.796 kg/kg BW-day
IR_{water} 0.15 L/kg BW-day

Table E - 56.
Estimated Daily Doses for the Muskrat at Sample Location RG 9 - Maximum EPC

	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
Analyte	Surface Water (mg/L)*	Plant BCF#	Plant Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]	Surface Water (mg/L)*	Plant BCF#	Plant Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]
Aluminum	0.659	833	549	1.0	1.0	187	0.643	187	0.234	833	195	1.0	1.0	66.3	0.228	66.5
Antimony	0.0025	1475	3.69	1.0	1.0	1.254	0.0024	1.256	0.0025	1475	3.688	1.0	1.0	1.254	0.0024	1.256
Arsenic	0.0025	293	0.733	1.0	1.0	0.249	0.0024	0.251	0.0025	293	0.733	1.0	1.0	0.249	0.0024	0.251
Beryllium	0.0005	141	0.071	1.0	1.0	0.024	0.00049	0.024	0.0005	141	0.071	1.0	1.0	0.024	0.00049	0.024
Cadmium	0.0005	782	0.391	1.0	1.0	0.133	0.00049	0.133	0.00107	782	0.837	1.0	1.0	0.284	0.0010	0.286
Calcium	5.61	1.0	5.61	1.0	1.0	1.907	5.470	7.377	10.8	1.0	10.8	1.0	1.0	3.67	10.530	14.20
Chromium	0.0025	4406	11.0	1.0	1.0	3.75	0.0024	3.75	0.00474	4406	20.9	1.0	1.0	7.10	0.0046	7.11
Copper	0.0025	541	1.353	1.0	1.0	0.460	0.0024	0.462	0.0025	541	1.353	1.0	1.0	0.460	0.0024	0.462
Iron	0.501	1.0	0.501	1.0	1.0	0.170	0.488	0.659	0.289	1.0	0.289	1.0	1.0	0.098	0.282	0.380
Lead	0.00338	1706	5.77	1.0	1.0	1.961	0.0033	1.964	0.00146	1706	2.491	1.0	1.0	0.847	0.0014	0.848
Magnesium	0.968	1.0	0.968	1.0	1.0	0.329	0.944	1.273	1.63	1.0	1.630	1.0	1.0	0.554	1.589	2.143
Manganese	0.0272	1.0	0.027	1.0	1.0	0.009	0.027	0.036	0.0198	1.0	0.020	1.0	1.0	0.007	0.019	0.026
Mercury (Inorganic)	0.0001	24762	2.476	1.0	1.0	0.842	0.00010	0.842	NA	24762	NA	1.0	1.0	NC	NC	NC
Nickel	0.0025	61	0.153	1.0	1.0	0.052	0.0024	0.054	0.0025	61	0.153	1.0	1.0	0.052	0.0024	0.054
Potassium	1.32	1.0	1.320	1.0	1.0	0.449	1.287	1.736	1.81	1.0	1.810	1.0	1.0	0.615	1.765	2.380
Selenium	0.0025	1845	4.61	1.0	1.0	1.568	0.0024	1.571	0.0025	1845	4.61	1.0	1.0	1.568	0.0024	1.571
Silica	16.7	1.0	16.7	1.0	1.0	5.68	16.283	21.96	23	1.0	23	1.0	1.0	7.82	22.425	30.2
Silver	0.0005	10696	5.35	1.0	1.0	1.818	0.00049	1.819	0.0005	10696	5.35	1.0	1.0	1.818	0.00049	1.819
Sodium	1.91	1.0	1.910	1.0	1.0	0.649	1.862	2.512	3.71	1.0	3.71	1.0	1.0	1.261	3.617	4.879
Strontium	0.0545	1.0	0.055	1.0	1.0	0.019	0.053	0.072	0.0809	1.0	0.0809	1.0	1.0	0.028	0.079	0.106
Thallium	0.0025	15000	37.5	1.0	1.0	12.8	0.0024	12.8	0.0025	15000	37.5	1.0	1.0	12.8	0.0024	12.8
Vanadium	0.01	1.0	0.010	1.0	1.0	0.003	0.010	0.013	0.01	1.0	0.010	1.0	1.0	0.003	0.010	0.013
Zinc	0.0526	2175	114	1.0	1.0	38.9	0.051	38.9	0.137	2175	298	1.0	1.0	101	0.134	101

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentrations
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, dry wt - milligrams per kilogram, dry weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{plant}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)
IR_{diet} 0.34 kg/kg BW-day
IR_{water} 0.975 L/kg BW-day

Table E - 57.
Estimated Daily Doses for the Muskrat at Sample Location RG 9 - Average EPC

Analyte	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
	Surface Water (mg/L)*	Plant BCF#	Plant Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet}[1]	EDD_{water}[2]	EDD_{total}[3]	Surface Water (mg/L)*	Plant BCF#	Plant Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet}[1]	EDD_{water}[2]	EDD_{total}[3]
Aluminum	0.592	833	493	1.0	1.0	168	0.577	168	0.123	833	102	1.0	1.0	34.8	0.120	34.9
Antimony	0.001	1475	1.844	1.0	1.0	0.627	0.001	0.628	0.001	1475	1.844	1.0	1.0	0.627	0.0012	0.628
Arsenic	0.001	293	0.366	1.0	1.0	0.125	0.001	0.126	0.001	293	0.366	1.0	1.0	0.125	0.0012	0.126
Beryllium	0.0003	141	0.035	1.0	1.0	0.012	0.000	0.012	0.0003	141	0.035	1.0	1.0	0.012	0.00024	0.012
Cadmium	0.0003	782	0.196	1.0	1.0	0.066	0.000	0.067	0.001	782	0.494	1.0	1.0	0.168	0.0006	0.169
Calcium	5.55	1.0	5.55	1.0	1.0	1.885	5.406	7.292	10.5	1.0	10.5	1.0	1.0	3.58	10.262	13.84
Chromium	0.001	4406	5.51	1.0	1.0	1.873	0.001	1.874	0.004	4406	18.1	1.0	1.0	6.17	0.0040	6.17
Copper	0.001	541	0.676	1.0	1.0	0.230	0.001	0.231	0.001	541	0.676	1.0	1.0	0.230	0.0012	0.231
Iron	0.478	1.0	0.478	1.0	1.0	0.163	0.466	0.629	0.211	1.0	0.211	1.0	1.0	0.072	0.206	0.278
Lead	0.003	1706	5.24	1.0	1.0	1.781	0.003	1.784	0.001	1706	2.256	1.0	1.0	0.767	0.0013	0.768
Magnesium	0.955	1.0	0.955	1.0	1.0	0.325	0.931	1.256	1.605	1.0	1.605	1.0	1.0	0.546	1.565	2.111
Manganese	0.026	1.0	0.026	1.0	1.0	0.009	0.025	0.034	0.016	1.0	0.016	1.0	1.0	0.005	0.016	0.021
Mercury (Inorganic)	0.0001	24762	1.238	1.0	1.0	0.421	0.000	0.421	NA	24762	NC	1.0	1.0	NC	NC	NC
Nickel	0.001	61	0.076	1.0	1.0	0.026	0.001	0.027	0.001	61	0.076	1.0	1.0	0.026	0.001	0.027
Potassium	1.265	1.0	1.265	1.0	1.0	0.430	1.233	1.663	1.780	1.0	1.780	1.0	1.0	0.605	1.736	2.341
Selenium	0.001	1845	2.306	1.0	1.0	0.784	0.001	0.785	0.001	1845	2.306	1.0	1.0	0.784	0.0012	0.785
Silica	16.3	1.0	16.3	1.0	1.0	5.53	15.868	21.40	22.8	1.0	22.8	1.0	1.0	7.74	22.181	29.92
Silver	0.0003	10696	2.674	1.0	1.0	0.909	0.000	0.909	0.0003	10696	2.674	1.0	1.0	0.909	0.00024	0.909
Sodium	1.853	1.0	1.853	1.0	1.0	0.630	1.806	2.436	3.64	1.0	3.64	1.0	1.0	1.238	3.549	4.787
Strontium	0.054	1.0	0.054	1.0	1.0	0.018	0.053	0.071	0.078	1.0	0.078	1.0	1.0	0.027	0.076	0.103
Thallium	0.001	15000	18.8	1.0	1.0	6.38	0.001	6.38	0.001	15000	18.8	1.0	1.0	6.38	0.0012	6.38
Vanadium	0.005	1.0	0.005	1.0	1.0	0.002	0.005	0.007	0.005	1.0	0.005	1.0	1.0	0.002	0.0049	0.007
Zinc	0.051	2175	111	1.0	1.0	37.7	0.050	37.7	0.136	2175	295	1.0	1.0	100	0.132	101

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentrations
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{plant}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)
IR_{diet} 0.34 kg/kg BW-day
IR_{water} 0.975 L/kg BW-day

Table E - 58.
Estimated Daily Doses for the Belted King Fisher at Sample Location RG 9 - Maximum EPC

Analyte	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
	Surface Water (mg/L)*	Fish BCF#	Fish Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]	Surface Water (mg/L)*	Fish BCF#	Fish Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]
Aluminum	0.659	2.7	1.779	1.0	1.0	0.890	0.073	0.963	0.234	2.7	0.632	1.0	1.0	0.316	0.026	0.342
Antimony	0.0025	40	0.100	1.0	1.0	0.050	0.0003	0.050	0.00125	40	0.050	1.0	1.0	0.025	0.0001	0.025
Arsenic	0.0025	114	0.285	1.0	1.0	0.143	0.0003	0.143	0.0025	114	0.285	1.0	1.0	0.143	0.0003	0.143
Beryllium	0.0005	62	0.031	1.0	1.0	0.016	0.0001	0.016	0.0005	62	0.031	1.0	1.0	0.016	0.0001	0.016
Cadmium	0.0005	907	0.454	1.0	1.0	0.227	0.0001	0.227	0.00107	907	0.970	1.0	1.0	0.485	0.0001	0.485
Calcium	5.61	1.0	5.61	1.0	1.0	2.805	0.623	3.43	10.8	1.0	10.8	1.0	1.0	5.40	1.199	6.60
Chromium	0.0025	19	0.048	1.0	1.0	0.024	0.0003	0.024	0.00474	19	0.090	1.0	1.0	0.045	0.001	0.046
Copper	0.0025	710	1.775	1.0	1.0	0.888	0.0003	0.888	0.0025	710	1.775	1.0	1.0	0.888	0.0003	0.888
Iron	0.501	1.0	0.501	1.0	1.0	0.251	0.056	0.306	0.289	1.0	0.289	1.0	1.0	0.145	0.032	0.177
Lead	0.00338	0.09	0.0003	1.0	1.0	0.0002	0.0004	0.001	0.00146	0.09	0.0001	1.0	1.0	0.0001	0.0002	0.0002
Magnesium	0.968	1.0	0.968	1.0	1.0	0.484	0.107	0.591	1.63	1.0	1.630	1.0	1.0	0.815	0.181	0.996
Manganese	0.0272	1.0	0.027	1.0	1.0	0.014	0.003	0.017	0.0198	1.0	0.020	1.0	1.0	0.010	0.002	0.012
Mercury (Inorganic)	0.0001	3530	0.353	1.0	1.0	0.177	0.00001	0.177	NA	3530	NC	1.0	1.0	NC	NC	NC
Nickel	0.0025	78	0.195	1.0	1.0	0.098	0.0003	0.098	0.0025	78	0.195	1.0	1.0	0.098	0.0003	0.098
Potassium	1.32	1.0	1.320	1.0	1.0	0.660	0.147	0.807	1.81	1.0	1.810	1.0	1.0	0.905	0.201	1.106
Selenium	0.0025	129	0.323	1.0	1.0	0.161	0.0003	0.162	0.0025	129	0.323	1.0	1.0	0.161	0.0003	0.162
Silica	16.7	1.0	16.7	1.0	1.0	8.35	1.854	10.2	23	1.0	23.0	1.0	1.0	11.5	2.553	14.1
Silver	0.0005	87.71	0.044	1.0	1.0	0.022	0.0001	0.022	0.0005	87.71	0.044	1.0	1.0	0.022	0.0001	0.022
Sodium	1.91	1.0	1.910	1.0	1.0	0.955	0.212	1.167	3.71	1.0	3.71	1.0	1.0	1.855	0.412	2.267
Strontium	0.0545	1.0	0.055	1.0	1.0	0.027	0.006	0.033	0.0809	1.0	0.081	1.0	1.0	0.040	0.009	0.049
Thallium	0.0025	10000	25.0	1.0	1.0	12.5	0.0003	12.5	0.0025	10000	25.0	1.0	1.0	12.5	0.0003	12.5
Vanadium	0.01	1.0	0.010	1.0	1.0	0.005	0.001	0.006	0.01	1.0	0.010	1.0	1.0	0.005	0.001	0.006
Zinc	0.0526	2059	108	1.0	1.0	54.2	0.006	54.2	0.137	2059	282	1.0	1.0	141	0.015	141

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentration
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{fish}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)
IR_{diet} 0.5 kg/kg BW-day
IR_{water} 0.111 L/kg BW-day

Table E - 59.
Estimated Daily Doses for the Belted King Fisher at Sample Location RG 9 - Average EPC

	Spring Exposure Scenario								Fall Exposure Scenario							
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet				Estimated Daily Dose (mg/kg bw-day)		
Analyte	Surface Water (mg/L)*	Fish BCF#	Fish Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]	Surface Water (mg/L)*	Fish BCF#	Fish Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]
Aluminum	0.592	2.7	1.598	1.0	1.0	0.799	0.066	0.865	0.123	2.7	0.332	1.0	1.0	0.166	0.014	0.180
Antimony	0.001	40	0.050	1.0	1.0	0.025	0.0001	0.025	0.001	40	0.050	1.0	1.0	0.025	0.0001	0.025
Arsenic	0.001	114	0.143	1.0	1.0	0.071	0.0001	0.071	0.001	114	0.143	1.0	1.0	0.071	0.0001	0.071
Beryllium	0.0003	62	0.016	1.0	1.0	0.008	0.00003	0.008	0.0003	62	0.016	1.0	1.0	0.008	0.00003	0.008
Cadmium	0.0003	907	0.227	1.0	1.0	0.113	0.00003	0.113	0.001	907	0.573	1.0	1.0	0.287	0.0001	0.287
Calcium	5.55	1.0	5.55	1.0	1.0	2.773	0.615	3.39	10.5	1.0	10.5	1.0	1.0	5.26	1.168	6.43
Chromium	0.001	19	0.024	1.0	1.0	0.012	0.0001	0.012	0.004	19	0.078	1.0	1.0	0.039	0.0005	0.040
Copper	0.001	710	0.888	1.0	1.0	0.444	0.0001	0.444	0.001	710	0.888	1.0	1.0	0.444	0.0001	0.444
Iron	0.478	1.0	0.478	1.0	1.0	0.239	0.053	0.292	0.211	1.0	0.211	1.0	1.0	0.106	0.023	0.129
Lead	0.003	0.09	0.0003	1.0	1.0	0.000	0.0003	0.0005	0.001	0.09	0.0001	1.0	1.0	0.0001	0.0001	0.0002
Magnesium	0.955	1.0	0.955	1.0	1.0	0.478	0.106	0.584	1.605	1.0	1.605	1.0	1.0	0.803	0.178	0.981
Manganese	0.026	1.0	0.026	1.0	1.0	0.013	0.003	0.016	0.016	1.0	0.016	1.0	1.0	0.008	0.002	0.010
Mercury (Inorganic)	0.0001	3530	0.177	1.0	1.0	0.088	0.00001	0.088	NA	3530	NC	1.0	1.0	NC	NC	NC
Nickel	0.001	78	0.098	1.0	1.0	0.049	0.0001	0.049	0.001	78	0.098	1.0	1.0	0.049	0.0001	0.049
Potassium	1.265	1.0	1.265	1.0	1.0	0.633	0.140	0.773	1.780	1.0	1.780	1.0	1.0	0.890	0.198	1.088
Selenium	0.001	129	0.161	1.0	1.0	0.081	0.0001	0.081	0.001	129	0.161	1.0	1.0	0.081	0.0001	0.081
Silica	16.28	1.0	16.3	1.0	1.0	8.14	1.807	9.94	22.8	1.0	22.8	1.0	1.0	11.4	2.525	13.9
Silver	0.0003	87.71	0.022	1.0	1.0	0.011	0.00003	0.011	0.0003	87.71	0.022	1.0	1.0	0.011	0.00003	0.011
Sodium	1.853	1.0	1.853	1.0	1.0	0.926	0.206	1.132	3.64	1.0	3.64	1.0	1.0	1.820	0.404	2.224
Strontium	0.054	1.0	0.054	1.0	1.0	0.027	0.006	0.033	0.078	1.0	0.078	1.0	1.0	0.039	0.009	0.048
Thallium	0.001	10000	12.5	1.0	1.0	6.25	0.0001	6.25	0.001	10000	12.5	1.0	1.0	6.25	0.0001	6.25
Vanadium	0.005	1.0	0.005	1.0	1.0	0.003	0.001	0.003	0.005	1.0	0.005	1.0	1.0	0.003	0.001	0.003
Zinc	0.051	2059	105	1.0	1.0	52.5	0.006	52.5	0.136	2059	280	1.0	1.0	140	0.015	140

* - Surface water concentrations converted from ug/L to mg/L
[#] - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EPC - Exposure Point Concentration
EDD - Estimated Daily Dose
BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{fish}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$

Ingestion Rates (IR)
IR_{diet} 0.5 kg/kg BW-day
IR_{water} 0.111 L/kg BW-day

Table E - 60.
Estimated Daily Doses for the Mallard at Sample Location RG 9 - Maximum EPC

	Spring Exposure Scenario								Fall Exposure Scenario									
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet						Estimated Daily Dose (mg/kg bw-day)		
Analyte	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet}[1]	EDD_{water}[2]	EDD_{total}[3]	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	Plant BCF #	Plant Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet}[4]	EDD_{water}[2]	EDD_{total}[3]
Aluminum	0.659	4066	2679	1.0	1.0	831	0.037	831	0.234	4066	951	833	195	1.0	1.0	178	0.013	178
Antimony	0.003	7	0.018	1.0	1.0	0.005	0.0001	0.006	0.001	7	0.009	1475	NC	1.0	1.0	NC	0.0001	NC
Arsenic	0.003	73	0.183	1.0	1.0	0.057	0.0001	0.057	0.003	73	0.183	293	0.733	1.0	1.0	0.142	0.0001	0.142
Beryllium	0.001	45	0.023	1.0	1.0	0.007	0.00003	0.007	0.001	45	0.023	141	0.071	1.0	1.0	0.014	0.00003	0.014
Cadmium	0.001	3461	1.731	1.0	1.0	0.536	0.00003	0.536	0.001	3461	3.70	782	0.837	1.0	1.0	0.70	0.0001	0.70
Calcium	5.61	1.0	5.61	1.0	1.0	1.74	0.314	2.05	10.8	1.0	10.8	1.0	10.8	1.0	1.0	3.35	0.605	3.95
Chromium	0.003	3000	7.50	1.0	1.0	2.33	0.0001	2.33	0.005	3000	14.2	4406	20.9	1.0	1.0	5.44	0.0003	5.44
Copper	0.003	3718	9.30	1.0	1.0	2.88	0.0001	2.88	0.003	3718	9.30	541	1.35	1.0	1.0	1.65	0.0001	1.65
Iron	0.501	1.0	0.501	1.0	1.0	0.155	0.028	0.183	0.289	1.0	0.289	1.0	0.289	1.0	1.0	0.090	0.016	0.106
Lead	0.003	5059	17.1	1.0	1.0	5.30	0.0002	5.30	0.001	5059	7.39	1706	2.49	1.0	1.0	1.53	0.0001	1.53
Magnesium	0.968	1.0	0.968	1.0	1.0	0.300	0.054	0.354	1.630	1.0	1.63	1.0	1.63	1.0	1.0	0.51	0.091	0.597
Manganese	0.027	1.0	0.027	1.0	1.0	0.008	0.002	0.010	0.020	1.0	0.020	1.0	0.020	1.0	1.0	0.006	0.001	0.007
Mercury (Inorganic)	0.0001	20184	2.02	1.0	1.0	0.626	0.00001	0.626	NA	20184	NC	24762	NC	1.0	1.0	NC	NC	NC
Nickel	0.003	28	0.070	1.0	1.0	0.022	0.0001	0.022	0.003	28	0.070	61	0.153	1.0	1.0	0.034	0.0001	0.035
Potassium	1.320	1.0	1.32	1.0	1.0	0.409	0.074	0.483	1.810	1.0	1.81	1.0	1.81	1.0	1.0	0.56	0.101	0.662
Selenium	0.003	1262	3.16	1.0	1.0	0.978	0.0001	0.978	0.003	1262	3.16	1845	4.61	1.0	1.0	1.20	0.0001	1.204
Silica	16.7	1.0	16.7	1.0	1.0	5.18	0.935	6.11	23.0	1.0	23	1.0	23.0	1.0	1.0	7.13	1.29	8.42
Silver	0.001	298	0.149	1.0	1.0	0.046	0.00003	0.046	0.001	298	0.149	10696	5.35	1.0	1.0	0.85	0.00003	0.852
Sodium	1.910	1.0	1.91	1.0	1.0	0.592	0.107	0.699	3.71	1.0	3.71	1.0	3.71	1.0	1.0	1.15	0.208	1.36
Strontium	0.055	1.0	0.055	1.0	1.0	0.017	0.003	0.020	0.081	1.0	0.081	1.0	0.081	1.0	1.0	0.025	0.005	0.030
Thallium	0.003	15000	37.5	1.0	1.0	11.6	0.0001	11.6	0.003	15000	37.5	15000	37.5	1.0	1.0	11.6	0.0001	11.6
Vanadium	0.010	1.0	0.010	1.0	1.0	0.003	0.001	0.004	0.010	1.0	0.010	1.0	0.010	1.0	1.0	0.003	0.001	0.004
Zinc	0.053	4578	241	1.0	1.0	74.6	0.003	74.7	0.137	4578	627	2175	298	1.0	1.0	143	0.008	143

* - Surface water concentrations converted from ug/L to mg/L
[#] - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
EPC - Exposure Point Concentration

BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
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mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg BW-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} X C_{invert}) X AUF X BAV$
[2] $EDD_{water} = IR_{water} X C_{water} X AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$
[4] $EDD_{diet} = IR_{diet}[(C_{invert} X BAF X 0.5)+(C_{plant} X BAV X 0.5)] X AUF$

Ingestion Rates (IR)
IR_{diet} 0.31 kg/kg BW-day
IR_{water} 0.056 L/kg BW-day

Table E - 61.
Estimated Daily Doses for the Mallard at Sample Location RG 9 - Average EPC

	Spring Exposure Scenario								Fall Exposure Scenario									
	EPC	Diet				Estimated Daily Dose (mg/kg bw-day)			EPC	Diet						Estimated Daily Dose (mg/kg bw-day)		
Analyte	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [1]	EDD_{water} [2]	EDD_{total} [3]	Surface Water (mg/L)*	Aquatic Invertebrate BCF#	Aquatic Invertebrate Concentration (mg/kg, wet wt)	Plant BCF #	Plant Concentration (mg/kg, wet wt)	BAV	AUF	EDD_{diet} [4]	EDD_{water} [2]	EDD_{total} [3]
Aluminum	0.592	4066	2407	1.0	1.0	746	0.033	746	0.123	4066	500	833	102	1.0	1.0	93	0.007	93
Antimony	0.001	7	0.009	1.0	1.0	0.003	0.0001	0.003	0.001	7	0.009	1475	1.84	1.0	1.0	0.287	0.0001	0.287
Arsenic	0.001	73	0.091	1.0	1.0	0.028	0.0001	0.028	0.001	73	0.091	293	0.366	1.0	1.0	0.071	0.0001	0.071
Beryllium	0.0003	45	0.011	1.0	1.0	0.003	0.00001	0.004	0.0003	45	0.011	141	0.035	1.0	1.0	0.007	0.00001	0.007
Cadmium	0.0003	3461	0.865	1.0	1.0	0.268	0.00001	0.268	0.001	3461	2.188	782	0.494	1.0	1.0	0.416	0.00004	0.416
Calcium	5.55	1.0	5.55	1.0	1.0	1.72	0.311	2.03	10.5	1.0	10.5	1.0	10.5	1.0	1.0	3.263	0.589	3.85
Chromium	0.001	3000	3.75	1.0	1.0	1.16	0.0001	1.16	0.004	3000	12.4	4406	18.1	1.0	1.0	4.727	0.0002	4.73
Copper	0.001	3718	4.65	1.0	1.0	1.44	0.0001	1.44	0.001	3718	4.65	541	0.68	1.0	1.0	0.825	0.0001	0.83
Iron	0.478	1.0	0.478	1.0	1.0	0.148	0.027	0.175	0.211	1.0	0.211	1.0	0.211	1.0	1.0	0.065	0.012	0.077
Lead	0.003	5059	15.5	1.0	1.0	4.81	0.0002	4.81	0.001	5059	6.69	1706	2.26	1.0	1.0	1.387	0.0001	1.39
Magnesium	0.955	1.0	0.955	1.0	1.0	0.296	0.053	0.350	1.605	1.0	1.605	1.0	1.61	1.0	1.0	0.498	0.090	0.587
Manganese	0.026	1.0	0.026	1.0	1.0	0.008	0.001	0.009	0.016	1.0	0.016	1.0	0.016	1.0	1.0	0.005	0.001	0.006
Mercury (Inorganic)	0.0001	20184	1.01	1.0	1.0	0.313	0.000003	0.313	NA	20184	NC	24762	NC	1.0	1.0	NC	NC	NC
Nickel	0.001	28	0.035	1.0	1.0	0.011	0.0001	0.011	0.001	28	0.035	61	0.076	1.0	1.0	0.017	0.0001	0.017
Potassium	1.265	1.0	1.27	1.0	1.0	0.392	0.071	0.463	1.780	1.0	1.780	1.0	1.78	1.0	1.0	0.552	0.100	0.651
Selenium	0.001	1262	1.58	1.0	1.0	0.489	0.0001	0.489	0.001	1262	1.578	1845	2.31	1.0	1.0	0.602	0.0001	0.602
Silica	16.3	1.0	16.3	1.0	1.0	5.05	0.911	5.96	22.8	1.0	22.8	1.0	22.8	1.0	1.0	7.053	1.274	8.33
Silver	0.0003	298	0.075	1.0	1.0	0.023	0.00001	0.023	0.0003	298	0.075	10696	2.67	1.0	1.0	0.426	0.00001	0.426
Sodium	1.853	1.0	1.85	1.0	1.0	0.574	0.104	0.678	3.64	1.0	3.64	1.0	3.64	1.0	1.0	1.128	0.204	1.33
Strontium	0.054	1.0	0.054	1.0	1.0	0.017	0.003	0.020	0.078	1.0	0.078	1.0	0.078	1.0	1.0	0.024	0.004	0.029
Thallium	0.001	15000	18.8	1.0	1.0	5.81	0.0001	5.81	0.001	15000	18.8	15000	18.8	1.0	1.0	5.813	0.0001	5.81
Vanadium	0.005	1.0	0.005	1.0	1.0	0.002	0.0003	0.002	0.005	1.0	0.005	1.0	0.005	1.0	1.0	0.002	0.0003	0.002
Zinc	0.051	4578	233	1.0	1.0	72.3	0.003	72.3	0.136	4578	621	2175	295	1.0	1.0	142	0.008	142

* - Surface water concentrations converted from ug/L to mg/L
\# - A default value of 1.0 was used when no BCF was available.
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
EPC - Exposure Point Concentration

BCF - Bioconcentration Factor
AUF - Area Use Factor (unitless)
BAV - Bioavailability Adjustment Factor (unitless)
NA - Not available
NC - Not calculated
mg/L - milligrams per liter; mg/L = mg/kg
mg/kg, wet wt - milligrams per kilogram, wet weight
mg/kg bw-day - milligrams per kilogram of body weight per day
kg/kg BW-d - Kilograms per kilogram body weight per day
L/kg Bw-d - Liters per kilogram body weight per day

EDD Equations
[1] $EDD_{diet} = (IR_{diet} \times C_{invert}) \times AUF \times BAV$
[2] $EDD_{water} = IR_{water} \times C_{water} \times AUF$
[3] $EDD_{total} = EDD_{diet} + EDD_{water}$
[4] $EDD_{diet} = IR_{diet}[(C_{invert} \times BAF \times 0.5)+(C_{plant} \times BAV \times 0.5)] \times AUF$

Ingestion Rates (IR)
IR_{diet} 0.31 kg/kg BW-day
IR_{water} 0.056 L/kg BW-day

Table E-62.
Hazard Quotients for the American Dipper at Sample Location WW-M (Background)

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario					Fall Exposure Scenario				
			Spring Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ	Fall Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ
Aluminum	1 / 1	1 / 1	327	109.7	--	**3.0**	--	430	109.7	--	**3.9**	--
Antimony	0 / 1	0 / 1	0.014	--	--	--	--	0.014	--	--	--	--
Arsenic	0 / 1	0 / 1	0.146	2.24	4.51	<1	<1	0.146	2.24	4.51	<1	<1
Beryllium	0 / 1	0 / 1	0.018	--	--	--	--	0.018	--	--	--	--
Cadmium	0 / 1	0 / 1	1.38	1.47	6.35	<1	<1	1.38	1.47	6.35	<1	<1
Calcium	1 / 1	1 / 1	9.74	--	--	--	--	14.8	--	--	--	--
Chromium	0 / 1	0 / 1	5.97	2.66	15.6	**2.2**	<1	5.97	2.66	15.6	**2.2**	<1
Copper	0 / 1	0 / 1	7.40	4.05	34.87	**1.8**	<1	7.40	4.05	34.87	**1.8**	<1
Iron	1 / 1	1 / 1	0.116	--	--	--	--	0.144	--	--	--	--
Lead	0 / 1	0 / 1	2.01	1.63	44.63	**1.2**	<1	2.01	1.63	44.63	**1.2**	<1
Magnesium	1 / 1	1 / 1	1.17	--	--	--	--	1.71	--	--	--	--
Manganese	1 / 1	1 / 1	0.010	179	377	<1	<1	0.022	179	377	<1	<1
Mercury (Inorganic)	0 / 1	NA	1.61	0.45	0.9	**3.6**	**1.8**	NC	0.45	0.9	--	--
Nickel	0 / 1	0 / 1	0.056	6.71	18.6	<1	<1	0.056	6.71	18.6	<1	<1
Potassium	1 / 1	1 / 1	0.637	--	--	--	--	0.974	--	--	--	--
Selenium	0 / 1	0 / 1	2.51	0.290	0.82	**8.7**	**3.1**	2.51	0.29	0.82	**8.7**	**3.1**
Silica	1 / 1	1 / 1	10.2	--	--	--	--	13.2	--	--	--	--
Silver	0 / 1	0 / 1	0.119	2.02	60.5	<1	<1	0.119	2.02	60.5	<1	<1
Sodium	1 / 1	1 / 1	2.26	--	--	--	--	3.28	--	--	--	--
Strontium	1 / 1	1 / 1	0.116	--	--	--	--	0.190	--	--	--	--
Thallium	0 / 1	0 / 1	29.9	--	--	--	--	29.9	--	--	--	--
Vanadium	0 / 1	0 / 1	0.009	0.344	1.7	<1	<1	0.009	0.344	1.7	<1	<1
Zinc	0 / 1	0 / 1	36.4	66.1	171	<1	<1	36.4	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NC - Not calculated
NA - Not analyzed
TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E-63.
Hazard Quotients for the Muskrat at Sample Location WW-M (Background)

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario					Fall Exposure Scenario				
			Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ	Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ
Aluminum	1 / 1	1 / 1	28.7	1.93	19.3	**15**	**1.5**	37.80	1.93	19.3	**20**	**2.0**
Antimony	0 / 1	0 / 1	1.26	0.059	2.76	**21**	<1	1.26	0.059	2.76	**21**	<1
Arsenic	0 / 1	0 / 1	0.251	1.04	4.55	<1	<1	0.251	1.04	4.55	<1	<1
Beryllium	0 / 1	0 / 1	0.024	0.532	0.67	<1	<1	0.024	0.532	0.67	<1	<1
Cadmium	0 / 1	0 / 1	0.133	0.77	6.87	<1	<1	0.133	0.77	6.87	<1	<1
Calcium	1 / 1	1 / 1	13.54	--	--	--	--	20.51	--	--	--	--
Chromium	0 / 1	0 / 1	3.75	2.4	58.17	**1.6**	<1	3.75	2.4	58.17	**1.6**	<1
Copper	0 / 1	0 / 1	0.462	5.6	82.7	<1	<1	0.462	5.6	82.7	<1	<1
Iron	1 / 1	1 / 1	0.162	--	--	--	--	0.200	--	--	--	--
Lead	0 / 1	0 / 1	0.291	4.7	186.4	<1	<1	0.291	4.7	186.4	<1	<1
Magnesium	1 / 1	1 / 1	1.631	--	--	--	--	2.380	--	--	--	--
Manganese	1 / 1	1 / 1	0.014	51.4	146	<1	<1	0.030	51.4	146	<1	<1
Mercury (Inorganic)	0 / 1	NA	0.842	1	--	<1	--	NC	1	--	--	--
Nickel	0 / 1	0 / 1	0.054	1.70	14.77	<1	<1	0.054	1.7	14.77	<1	<1
Potassium	1 / 1	1 / 1	0.885	--	--	--	--	1.354	--	--	--	--
Selenium	0 / 1	0 / 1	1.57	0.143	0.66	**11**	**2.4**	1.57	0.143	0.66	**11**	**2.4**
Silica	1 / 1	1 / 1	14.20	--	--	--	--	18.41	--	--	--	--
Silver	0 / 1	0 / 1	1.82	6.02	119	<1	<1	1.82	6.02	119	<1	<1
Sodium	1 / 1	1 / 1	3.14	--	--	--	--	4.56	--	--	--	--
Strontium	1 / 1	1 / 1	0.162	263	--	<1	--	0.264	263	--	<1	--
Thallium	0 / 1	0 / 1	12.8	0.0074	0.074	**1723**	**172**	12.8	0.0074	0.074	**1723**	**172**
Vanadium	0 / 1	0 / 1	0.013	4.16	9.44	<1	<1	0.013	4.16	9.44	<1	<1
Zinc	0 / 1	0 / 1	7.40	75.4	298	<1	<1	7.40	75.4	298	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NC - Not calculated
NA - Not analyzed
TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E-64.
Hazard Quotients for the Belted King Fisher at Sample Location WW-M (Background)

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario					Fall Exposure Scenario				
			Total EDD (mg/kg bw-day)	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**
Aluminum	1 / 1	1 / 1	0.148	109.7	--	<1	--	0.194	109.7	--	<1	--
Antimony	0 / 1	0 / 1	0.050	--	--	--	--	0.050	--	--	--	--
Arsenic	0 / 1	0 / 1	0.143	2.24	4.51	<1	<1	0.143	2.24	4.51	<1	<1
Beryllium	0 / 1	0 / 1	0.016	--	--	--	--	0.016	--	--	--	--
Cadmium	0 / 1	0 / 1	0.227	1.47	6.35	<1	<1	0.227	1.47	6.35	<1	<1
Calcium	1 / 1	1 / 1	6.29	--	--	--	--	9.53	--	--	--	--
Chromium	0 / 1	0 / 1	0.024	2.66	15.6	<1	<1	0.024	2.66	15.6	<1	<1
Copper	0 / 1	0 / 1	0.888	4.05	34.87	<1	<1	0.888	4.05	34.87	<1	<1
Iron	1 / 1	1 / 1	0.075	--	--	--	--	0.093	--	--	--	--
Lead	0 / 1	0 / 1	0.00008	1.63	44.63	<1	<1	0.00008	1.63	44.63	<1	<1
Magnesium	1 / 1	1 / 1	0.758	--	--	--	--	1.11	--	--	--	--
Manganese	1 / 1	1 / 1	0.006	179	377	<1	<1	0.014	179	377	<1	<1
Mercury (Inorganic)	0 / 1	NA	0.177	0.45	0.9	<1	<1	NC	0.45	0.9	--	--
Nickel	0 / 1	0 / 1	0.098	6.71	18.6	<1	<1	0.098	6.71	18.6	<1	<1
Potassium	1 / 1	1 / 1	0.411	--	--	--	--	0.629	--	--	--	--
Selenium	0 / 1	0 / 1	0.162	0.290	0.820	<1	<1	0.162	0.29	0.82	<1	<1
Silica	1 / 1	1 / 1	6.60	--	--	--	--	8.55	--	--	--	--
Silver	0 / 1	0 / 1	0.022	2.02	60.5	<1	<1	0.022	2.02	60.5	<1	<1
Sodium	1 / 1	1 / 1	1.46	--	--	--	--	2.12	--	--	--	--
Strontium	1 / 1	1 / 1	0.075	--	--	--	--	0.123	--	--	--	--
Thallium	0 / 1	0 / 1	12.5	--	--	--	--	12.5	--	--	--	--
Vanadium	0 / 1	0 / 1	0.006	0.344	1.7	<1	<1	0.006	0.344	1.7	<1	<1
Zinc	0 / 1	0 / 1	10.3	66.1	171	<1	<1	10.3	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NC - Not calculated
NA - Not analyzed

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available.

Table E-65.
Hazard Quotients for the Mallard at Sample Location WW-M (Background)

			Spring Exposure Scenario					Fall Exposure Scenario				
Analyte	**Spring Frequency of Detection**	**Fall Frequency of Detection**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**
Aluminum	1 / 1	1 / 1	127	109.7	--	**1.2**	--	101	109.7	--	<1	--
Antimony	0 / 1	0 / 1	0.006	--	--	--	--	0.574	--	--	--	--
Arsenic	0 / 1	0 / 1	0.057	2.24	4.51	<1	<1	0.142	2.24	4.51	<1	<1
Beryllium	0 / 1	0 / 1	0.007	--	--	--	--	0.014	--	--	--	--
Cadmium	0 / 1	0 / 1	0.536	1.47	6.35	<1	<1	0.329	1.47	6.35	<1	<1
Calcium	1 / 1	1 / 1	3.77	--	--	--	--	5.71	--	--	--	--
Chromium	0 / 1	0 / 1	2.33	2.66	15.6	<1	<1	2.87	2.66	15.6	**1.1**	<1
Copper	0 / 1	0 / 1	2.88	4.05	34.87	<1	<1	1.65	4.05	34.87	<1	<1
Iron	1 / 1	1 / 1	0.045	--	--	--	--	0.056	--	--	--	--
Lead	0 / 1	0 / 1	0.784	1.63	44.63	<1	<1	0.524	1.63	44.63	<1	<1
Magnesium	1 / 1	1 / 1	0.454	--	--	--	--	0.662	--	--	--	--
Manganese	1 / 1	1 / 1	0.004	179	377	<1	<1	0.008	179	377	<1	<1
Mercury (Inorganic)	0 / 1	NA	0.626	0.45	0.9	**1.4**	<1	NC	0.45	0.9	--	--
Nickel	0 / 1	0 / 1	0.022	6.71	18.6	<1	<1	0.035	6.71	18.6	<1	<1
Potassium	1 / 1	1 / 1	0.246	--	--	--	--	0.377	--	--	--	--
Selenium	0 / 1	0 / 1	0.978	0.290	0.82	**3.4**	**1.2**	1.20	0.29	0.82	**4.2**	**1.5**
Silica	1 / 1	1 / 1	3.95	--	--	--	--	5.12	--	--	--	--
Silver	0 / 1	0 / 1	0.046	2.02	60.5	<1	<1	0.852	2.02	60.5	<1	<1
Sodium	1 / 1	1 / 1	0.875	--	--	--	--	1.27	--	--	--	--
Strontium	1 / 1	1 / 1	0.045	--	--	--	--	0.074	--	--	--	--
Thallium	0 / 1	0 / 1	11.6	--	--	--	--	11.6	--	--	--	--
Vanadium	0 / 1	0 / 1	0.004	0.344	1.7	<1	<1	0.004	0.344	1.7	<1	<1
Zinc	0 / 1	0 / 1	14.2	66.1	171	<1	<1	10.5	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NC - Not calculated
NA - Not analyzed
TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E-66.
Hazard Quotients for the American Dipper at Sample Location WW-NT

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario: Spring Total EDD (mg/kg bw-day)	Spring Exposure Scenario: No Effect-based TRV	Spring Exposure Scenario: Effect-based TRV	Spring Exposure Scenario: No Effect-based HQ	Spring Exposure Scenario: Effect-based HQ	Fall Exposure Scenario: Fall Total EDD (mg/kg bw-day)	Fall Exposure Scenario: No Effect-based TRV	Fall Exposure Scenario: Effect-based TRV	Fall Exposure Scenario: No Effect-based HQ	Fall Exposure Scenario: Effect-based HQ
Aluminum	1 / 1	1 / 1	2839	109.7	--	**26**	--	2039	109.7	--	**19**	--
Antimony	0 / 1	0 / 1	0.014	--	--	--	--	0.029	--	--	--	--
Arsenic	1 / 1	0 / 1	0.174	2.24	4.51	<1	<1	0.291	2.24	4.51	<1	<1
Beryllium	1 / 1	1 / 1	0.131	--	--	--	--	0.147	--	--	--	--
Cadmium	1 / 1	1 / 1	504	1.47	6.35	**343**	**79**	336	1.47	6.35	**229**	**53**
Calcium	1 / 1	1 / 1	120	--	--	--	--	165	--	--	--	--
Chromium	0 / 1	0 / 1	5.97	2.66	15.6	**2.2**	<1	11.9	2.66	15.6	**4.5**	<1
Copper	1 / 1	1 / 1	219	4.05	34.87	**54**	**6.3**	80.2	4.05	34.87	**20**	**2.3**
Iron	1 / 1	1 / 1	0.935	--	--	--	--	3.59	--	--	--	--
Lead	1 / 1	1 / 1	6685	1.63	44.63	**4101**	**150**	6846	1.63	44.63	**4200**	**153**
Magnesium	1 / 1	1 / 1	9.93	--	--	--	--	12.3	--	--	--	--
Manganese	1 / 1	1 / 1	9.65	179	377	<1	<1	9.41	179	377	<1	<1
Mercury (Inorganic)	0 / 1	NA	1.61	0.45	0.9	**3.6**	**1.8**	NC	0.45	0.9	--	--
Nickel	1 / 1	0 / 1	0.240	6.71	18.6	<1	<1	0.112	6.71	18.6	<1	<1
Potassium	1 / 1	1 / 1	4.47	--	--	--	--	4.75	--	--	--	--
Selenium	1 / 1	1 / 1	8.17	0.290	0.82	**28**	**10**	6.17	0.29	0.82	**21**	**7.5**
Silica	1 / 1	1 / 1	37.1	--	--	--	--	39.2	--	--	--	--
Silver	1 / 1	0 / 1	0.266	2.02	60.5	<1	<1	0.237	2.02	60.5	<1	<1
Sodium	1 / 1	1 / 1	38.3	--	--	--	--	49.9	--	--	--	--
Strontium	1 / 1	1 / 1	1.23	--	--	--	--	1.82	--	--	--	--
Thallium	1 / 1	0 / 1	62.8	--	--	--	--	59.7	--	--	--	--
Vanadium	0 / 1	0 / 1	0.009	0.344	1.7	<1	<1	0.009	0.344	1.7	<1	<1
Zinc	1 / 1	1 / 1	169457	66.1	171	**2564**	**991**	175652	66.1	171	**2657**	**1027**

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NC - Not calculated
NA - Not analyzed

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E-67.
Hazard Quotients for the Muskrat at Sample Location WW-NT

			Spring Exposure Scenario					Fall Exposure Scenario				
Analyte	**Spring Frequency of Detection**	**Fall Frequency of Detection**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**
Aluminum	1 / 1	1 / 1	249	1.93	19.3	**129**	**13**	179	1.93	19.3	**93**	**9.3**
Antimony	0 / 1	0 / 1	1.26	0.059	2.76	**21**	<1	2.51	0.059	2.76	**43**	<1
Arsenic	1 / 1	0 / 1	0.300	1.04	4.55	<1	<1	0.503	1.04	4.55	<1	<1
Beryllium	1 / 1	1 / 1	0.179	0.532	0.67	<1	<1	0.201	0.532	0.67	<1	<1
Cadmium	1 / 1	1 / 1	48.8	0.77	6.87	**63**	**7**	32.6	0.77	6.87	**42**	**4.7**
Calcium	1 / 1	1 / 1	167.0	--	--	--	--	228.8	--	--	--	--
Chromium	0 / 1	0 / 1	3.75	2.4	58.17	**1.6**	<1	7.50	2.4	58.17	**3.1**	<1
Copper	1 / 1	1 / 1	13.7	5.6	82.7	**2.4**	<1	5.01	5.6	82.7	<1	<1
Iron	1 / 1	1 / 1	1.299	--	--	--	--	5.00	--	--	--	--
Lead	1 / 1	1 / 1	964	4.7	186.4	**205**	**5.2**	988	4.7	186.4	**210**	**5.3**
Magnesium	1 / 1	1 / 1	13.81	--	--	--	--	17.10	--	--	--	--
Manganese	1 / 1	1 / 1	13.41	51.4	146	<1	<1	13.08	51.4	146	<1	<1
Mercury (Inorganic)	0 / 1	NA	0.842	1	--	<1	--	NC	1	--	--	--
Nickel	1 / 1	0 / 1	0.232	1.7	14.77	<1	<1	0.109	1.7	14.77	<1	<1
Potassium	1 / 1	1 / 1	6.21	--	--	--	--	6.60	--	--	--	--
Selenium	1 / 1	1 / 1	5.11	0.143	0.66	**36**	**7.7**	3.86	0.143	0.66	**27**	**5.8**
Silica	1 / 1	1 / 1	51.5	--	--	--	--	54.4	--	--	--	--
Silver	1 / 1	0 / 1	4.07	6.02	119	<1	<1	3.64	6.02	119	<1	<1
Sodium	1 / 1	1 / 1	53.3	--	--	--	--	69.3	--	--	--	--
Strontium	1 / 1	1 / 1	1.710	263	--	<1	--	2.52	263	--	<1	--
Thallium	1 / 1	0 / 1	26.8	0.0074	0.074	**3626**	**363**	25.5	0.0074	0.074	**3447**	**345**
Vanadium	0 / 1	0 / 1	0.013	4.16	9.44	<1	<1	0.013	4.16	9.44	<1	<1
Zinc	1 / 1	1 / 1	34432	75.4	298	**457**	**116**	35691	75.4	298	**473**	**120**

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NC - Not calculated
NA - Not analyzed
TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E-68.
Hazard Quotients for the Belted King Fisher at Sample Location WW-NT

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario					Fall Exposure Scenario				
			Total EDD (mg/kg bw-day)	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**
Aluminum	1 / 1	1 / 1	1.28	109.7	--	<1	--	0.920	109.7	--	<1	--
Antimony	0 / 1	0 / 1	0.050	--	--	--	--	0.101	--	--	--	--
Arsenic	1 / 1	0 / 1	0.170	2.24	4.51	<1	<1	0.286	2.24	4.51	<1	<1
Beryllium	1 / 1	1 / 1	0.114	--	--	--	--	0.128	--	--	--	--
Cadmium	1 / 1	1 / 1	83.0	1.47	6.35	**56**	**13**	55.3	1.47	6.35	**38**	**8.7**
Calcium	1 / 1	1 / 1	77.6	--	--	--	--	106	--	--	--	--
Chromium	0 / 1	0 / 1	0.024	2.66	15.6	<1	<1	0.048	2.66	15.6	<1	<1
Copper	1 / 1	1 / 1	26.3	4.05	34.87	**6.5**	<1	9.62	4.05	34.87	**2.4**	<1
Iron	1 / 1	1 / 1	0.604	--	--	--	--	2.32	--	--	--	--
Lead	1 / 1	1 / 1	0.259	1.63	44.63	<1	<1	0.265	1.63	44.63	<1	<1
Magnesium	1 / 1	1 / 1	6.42	--	--	--	--	7.94	--	--	--	--
Manganese	1 / 1	1 / 1	6.23	179	377	<1	<1	6.08	179	377	<1	<1
Mercury (Inorganic)	0 / 1	NA	0.177	0.45	0.9	<1	<1	NC	0.45	0.9	--	--
Nickel	1 / 1	0 / 1	0.418	6.71	18.6	<1	<1	0.196	6.71	18.6	<1	<1
Potassium	1 / 1	1 / 1	2.88	--	--	--	--	3.07	--	--	--	--
Selenium	1 / 1	1 / 1	0.525	0.290	0.82	**1.8**	<1	0.397	0.29	0.82	**1.4**	<1
Silica	1 / 1	1 / 1	24.0	--	--	--	--	25.3	--	--	--	--
Silver	1 / 1	0 / 1	0.049	2.02	60.5	<1	<1	0.044	2.02	60.5	<1	<1
Sodium	1 / 1	1 / 1	24.7	--	--	--	--	32.2	--	--	--	--
Strontium	1 / 1	1 / 1	0.794	--	--	--	--	1.17	--	--	--	--
Thallium	1 / 1	0 / 1	26.3	--	--	--	--	25.0	--	--	--	--
Vanadium	0 / 1	0 / 1	0.006	0.344	1.7	<1	<1	0.006	0.344	1.7	<1	<1
Zinc	1 / 1	1 / 1	47877	66.1	171	**724**	**280**	49627	66.1	171	**751**	**290**

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NC - Not calculated
NA - Not analyzed
TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E-69.
Hazard Quotients for the Mallard at Sample Location WW-NT

			Spring Exposure Scenario					Fall Exposure Scenario				
Analyte	**Spring Frequency of Detection**	**Fall Frequency of Detection**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**
Aluminum	1 / 1	1 / 1	1105	109.7	--	**10**	--	478	109.7	--	**4.4**	--
Antimony	0 / 1	0 / 1	0.006	--	--	--	--	1.15	--	--	--	--
Arsenic	1 / 1	0 / 1	0.068	2.24	4.51	<1	<1	0.284	2.24	4.51	<1	<1
Beryllium	1 / 1	1 / 1	0.051	--	--	--	--	0.118	--	--	--	--
Cadmium	1 / 1	1 / 1	196	1.47	6.35	**134**	**31**	80.2	1.47	6.35	**55**	**13**
Calcium	1 / 1	1 / 1	46.5	--	--	--	--	63.7	--	--	--	--
Chromium	0 / 1	0 / 1	2.33	2.66	15.6	<1	<1	5.74	2.66	15.6	**2.2**	<1
Copper	1 / 1	1 / 1	85.4	4.05	34.87	**21**	**2.4**	17.9	4.05	34.87	**4.4**	<1
Iron	1 / 1	1 / 1	0.362	--	--	--	--	1.39	--	--	--	--
Lead	1 / 1	1 / 1	2603	1.63	44.63	**1597**	**58**	1783	1.63	44.63	**1094**	**40**
Magnesium	1 / 1	1 / 1	3.84	--	--	--	--	4.76	--	--	--	--
Manganese	1 / 1	1 / 1	3.73	179	377	<1	<1	3.64	179	377	<1	<1
Mercury (Inorganic)	0 / 1	NA	0.626	0.45	0.9	**1.4**	<1	NC	0.45	0.9	--	--
Nickel	1 / 1	0 / 1	0.093	6.71	18.6	<1	<1	0.069	6.71	18.6	<1	<1
Potassium	1 / 1	1 / 1	1.73	--	--	--	--	1.84	--	--	--	--
Selenium	1 / 1	1 / 1	3.18	0.290	0.82	**11**	**3.9**	2.96	0.29	0.82	**10**	**3.6**
Silica	1 / 1	1 / 1	14.3	--	--	--	--	15.2	--	--	--	--
Silver	1 / 1	0 / 1	0.104	2.02	60.5	<1	<1	1.70	2.02	60.5	<1	<1
Sodium	1 / 1	1 / 1	14.8	--	--	--	--	19.3	--	--	--	--
Strontium	1 / 1	1 / 1	0.476	--	--	--	--	0.703	--	--	--	--
Thallium	1 / 1	0 / 1	24.5	--	--	--	--	23.3	--	--	--	--
Vanadium	0 / 1	0 / 1	0.004	0.344	1.7	<1	<1	0.004	0.344	1.7	<1	<1
Zinc	1 / 1	1 / 1	65994	66.1	171	**998**	**386**	50454	66.1	171	**763**	**295**

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NC - Not calculated
NA - Not analyzed
TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E-70.
Hazard Quotients for the American Dipper at Sample Location WW-F

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario					Fall Exposure Scenario				
			Spring Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ	Fall Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ
Aluminum	1 / 1	1 / 1	395	109.7	--	**3.6**	--	502	109.7	--	**4.6**	--
Antimony	0 / 1	0 / 1	0.014	--	--	--	--	0.014	--	--	--	--
Arsenic	0 / 1	0 / 1	0.146	2.24	4.51	<1	<1	0.146	2.24	4.51	<1	<1
Beryllium	0 / 1	1 / 1	0.018	--	--	--	--	0.025	--	--	--	--
Cadmium	1 / 1	1 / 1	11.9	1.47	6.35	**8.1**	**1.9**	79.3	1.47	6.35	**54**	**12**
Calcium	1 / 1	1 / 1	10.8	--	--	--	--	42.0	--	--	--	--
Chromium	0 / 1	0 / 1	5.97	2.66	15.6	**2.2**	<1	5.97	2.66	15.6	**2.2**	<1
Copper	0 / 1	1 / 1	7.40	4.05	34.87	**1.8**	<1	23.8	4.05	34.87	**5.9**	<1
Iron	1 / 1	1 / 1	0.116	--	--	--	--	0.792	--	--	--	--
Lead	1 / 1	1 / 1	133	1.63	44.63	**82**	**3.0**	1474	1.63	44.63	**904**	**33**
Magnesium	1 / 1	1 / 1	1.22	--	--	--	--	3.58	--	--	--	--
Manganese	1 / 1	1 / 1	0.165	179	377	<1	<1	1.84	179	377	<1	<1
Mercury (Inorganic)	0 / 1	NA	1.61	0.45	0.9	**3.6**	**1.8**	NC	0.45	0.9	--	--
Nickel	0 / 1	0 / 1	0.056	6.71	18.6	<1	<1	0.056	6.71	18.6	<1	<1
Potassium	1 / 1	1 / 1	0.812	--	--	--	--	1.71	--	--	--	--
Selenium	0 / 1	0 / 1	2.51	0.290	0.82	**8.7**	**3.1**	2.51	0.29	0.82	**8.7**	**3.1**
Silica	1 / 1	1 / 1	11.4	--	--	--	--	20.5	--	--	--	--
Silver	0 / 1	0 / 1	0.119	2.02	60.5	<1	<1	0.119	2.02	60.5	<1	<1
Sodium	1 / 1	1 / 1	2.86	--	--	--	--	12.2	--	--	--	--
Strontium	1 / 1	1 / 1	0.121	--	--	--	--	0.482	--	--	--	--
Thallium	0 / 1	0 / 1	29.9	--	--	--	--	29.9	--	--	--	--
Vanadium	0 / 1	0 / 1	0.009	0.344	1.7	<1	<1	0.009	0.344	1.7	<1	<1
Zinc	1 / 1	1 / 1	3200	66.1	171	**48**	**19**	37171	66.1	171	**562**	**217**

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NC - Not calculated
NA - Not analyzed

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E-71.
Hazard Quotients for the Muskrat at Sample Location WW-F

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario: Total EDD (mg/kg bw-day)	Spring: No Effect-based TRV	Spring: Effect-based TRV	Spring: No Effect-based HQ	Spring: Effect-based HQ	Fall Exposure Scenario: Total EDD (mg/kg bw-day)	Fall: No Effect-based TRV	Fall: Effect-based TRV	Fall: No Effect-based HQ	Fall: Effect-based HQ
Aluminum	1 / 1	1 / 1	34.7	1.93	19.3	**18**	**1.8**	44.1	1.93	19.3	**23**	**2.3**
Antimony	0 / 1	0 / 1	1.26	0.059	2.76	**21**	<1	1.26	0.059	2.76	**21**	<1
Arsenic	0 / 1	0 / 1	0.251	1.04	4.55	<1	<1	0.251	1.04	4.55	<1	<1
Beryllium	0 / 1	1 / 1	0.024	0.532	0.67	<1	<1	0.034	0.532	0.67	<1	<1
Cadmium	1 / 1	1 / 1	1.16	0.770	6.87	**1.5**	<1	7.69	0.77	6.87	**10**	**1.1**
Calcium	1 / 1	1 / 1	14.99	--	--	--	--	58.4	--	--	--	--
Chromium	0 / 1	0 / 1	3.75	2.40	58.17	**1.6**	<1	3.75	2.4	58.17	**1.6**	<1
Copper	0 / 1	1 / 1	0.462	5.60	82.7	<1	<1	1.49	5.6	82.7	<1	<1
Iron	1 / 1	1 / 1	0.162	--	--	--	--	1.101	--	--	--	--
Lead	1 / 1	1 / 1	19.2	4.70	186.4	**4.1**	<1	213	4.7	186.4	**45**	**1.1**
Magnesium	1 / 1	1 / 1	1.696	--	--	--	--	4.97	--	--	--	--
Manganese	1 / 1	1 / 1	0.229	51.4	146	<1	<1	2.551	51.4	146	<1	<1
Mercury (Inorganic)	0 / 1	NA	0.842	1	--	<1	--	NC	1	--	--	--
Nickel	0 / 1	0 / 1	0.054	1.70	14.77	<1	<1	0.054	1.7	14.77	<1	<1
Potassium	1 / 1	1 / 1	1.128	--	--	--	--	2.380	--	--	--	--
Selenium	0 / 1	0 / 1	1.57	0.143	0.66	**11**	**2.4**	1.57	0.143	0.66	**11**	**2.4**
Silica	1 / 1	1 / 1	15.91	--	--	--	--	28.54	--	--	--	--
Silver	0 / 1	0 / 1	1.82	6.02	119	<1	<1	1.82	6.02	119	<1	<1
Sodium	1 / 1	1 / 1	3.97	--	--	--	--	16.96	--	--	--	--
Strontium	1 / 1	1 / 1	0.168	263	--	<1	--	0.671	263	--	<1	--
Thallium	0 / 1	0 / 1	12.8	0.0074	0.074	**1723**	**172**	12.8	0.0074	0.074	**1723**	**172**
Vanadium	0 / 1	0 / 1	0.013	4.16	9.44	<1	<1	0.013	4.16	9.44	<1	<1
Zinc	1 / 1	1 / 1	650	75.4	298	**8.6**	**2.2**	7553	75.4	298	**100**	**25**

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NC - Not calculated
NA - Not analyzed
TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E-72.
Hazard Quotients for the Belted King Fisher at Sample Location WW-F

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario					Fall Exposure Scenario				
			Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ	Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ
Aluminum	1 / 1	1 / 1	0.178	109.7	--	<1	--	0.226	109.7	--	<1	--
Antimony	0 / 1	0 / 1	0.050	--	--	--	--	0.050	--	--	--	--
Arsenic	0 / 1	0 / 1	0.143	2.24	4.51	<1	<1	0.143	2.24	4.51	<1	<1
Beryllium	0 / 1	1 / 1	0.016	--	--	--	--	0.022	--	--	--	--
Cadmium	1 / 1	1 / 1	1.96	1.47	6.35	**1.3**	<1	13.1	1.47	6.35	**8.9**	**2.1**
Calcium	1 / 1	1 / 1	6.97	--	--	--	--	27.1	--	--	--	--
Chromium	0 / 1	0 / 1	0.024	2.66	15.6	<1	<1	0.024	2.66	15.6	<1	<1
Copper	0 / 1	1 / 1	0.888	4.05	34.87	<1	<1	2.86	4.05	34.87	<1	<1
Iron	1 / 1	1 / 1	0.075	--	--	--	--	0.511	--	--	--	--
Lead	1 / 1	1 / 1	0.005	1.63	44.63	<1	<1	0.057	1.63	44.63	<1	<1
Magnesium	1 / 1	1 / 1	0.788	--	--	--	--	2.31	--	--	--	--
Manganese	1 / 1	1 / 1	0.106	179	377	<1	<1	1.19	179	377	<1	<1
Mercury (Inorganic)	0 / 1	NA	0.177	0.45	0.9	<1	<1	NC	0.45	0.9	--	--
Nickel	0 / 1	0 / 1	0.098	6.71	18.6	<1	<1	0.098	6.71	18.6	<1	<1
Potassium	1 / 1	1 / 1	0.524	--	--	--	--	1.11	--	--	--	--
Selenium	0 / 1	0 / 1	0.162	0.290	0.82	<1	<1	0.162	0.29	0.82	<1	<1
Silica	1 / 1	1 / 1	7.39	--	--	--	--	13.3	--	--	--	--
Silver	0 / 1	0 / 1	0.022	2.02	60.5	<1	<1	0.022	2.02	60.5	<1	<1
Sodium	1 / 1	1 / 1	1.85	--	--	--	--	7.88	--	--	--	--
Strontium	1 / 1	1 / 1	0.078	--	--	--	--	0.312	--	--	--	--
Thallium	0 / 1	0 / 1	12.5	--	--	--	--	12.5	--	--	--	--
Vanadium	0 / 1	0 / 1	0.006	0.344	1.7	<1	<1	0.006	0.344	1.7	<1	<1
Zinc	1 / 1	1 / 1	904	66.1	171	**14**	**5.3**	10502	66.1	171	**159**	**61**

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NC - Not calculated
NA - Not analyzed

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E-73.
Hazard Quotients for the Mallard at Sample Location WW-F

			Spring Exposure Scenario					Fall Exposure Scenario				
Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ	Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ
Aluminum	1 / 1	1 / 1	154	109.7	--	**1.4**	--	118	109.7	--	**1.1**	--
Antimony	0 / 1	0 / 1	0.006	--	--	--	--	0.574	--	--	--	--
Arsenic	0 / 1	0 / 1	0.057	2.24	4.51	<1	<1	0.142	2.24	4.51	<1	<1
Beryllium	0 / 1	1 / 1	0.007	--	--	--	--	0.020	--	--	--	--
Cadmium	1 / 1	1 / 1	4.65	1.47	6.35	**3.2**	<1	18.9	1.47	6.35	**13**	**3.0**
Calcium	1 / 1	1 / 1	4.17	--	--	--	--	16.3	--	--	--	--
Chromium	0 / 1	0 / 1	2.33	2.66	15.6	<1	<1	2.87	2.66	15.6	**1.1**	<1
Copper	0 / 1	1 / 1	2.88	4.05	34.87	<1	<1	5.31	4.05	34.87	**1.3**	<1
Iron	1 / 1	1 / 1	0.045	--	--	--	--	0.306	--	--	--	--
Lead	1 / 1	1 / 1	51.9	1.63	44.63	**32**	**1.2**	384	1.63	44.63	**235**	**9**
Magnesium	1 / 1	1 / 1	0.472	--	--	--	--	1.38	--	--	--	--
Manganese	1 / 1	1 / 1	0.064	179	377	<1	<1	0.710	179	377	<1	<1
Mercury (Inorganic)	0 / 1	NA	0.626	0.45	0.9	**1.4**	<1	NC	0.45	0.9	--	--
Nickel	0 / 1	0 / 1	0.022	6.71	18.6	<1	<1	0.035	6.71	18.6	<1	<1
Potassium	1 / 1	1 / 1	0.314	--	--	--	--	0.662	--	--	--	--
Selenium	0 / 1	0 / 1	0.978	0.290	0.82	**3.4**	**1.2**	1.20	0.29	0.82	**4.2**	**1.5**
Silica	1 / 1	1 / 1	4.43	--	--	--	--	7.94	--	--	--	--
Silver	0 / 1	0 / 1	0.046	2.02	60.5	<1	<1	0.852	2.02	60.5	<1	<1
Sodium	1 / 1	1 / 1	1.11	--	--	--	--	4.72	--	--	--	--
Strontium	1 / 1	1 / 1	0.047	--	--	--	--	0.187	--	--	--	--
Thallium	0 / 1	0 / 1	11.6	--	--	--	--	11.6	--	--	--	--
Vanadium	0 / 1	0 / 1	0.004	0.344	1.7	<1	<1	0.004	0.344	1.7	<1	<1
Zinc	1 / 1	1 / 1	1246	66.1	171	**19**	**7.3**	10677	66.1	171	**162**	**62**

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NC - Not calculated
NA - Not analyzed

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E-74.
Hazard Quotients for the American Dipper at Sample Location WW-E

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario					Fall Exposure Scenario				
			Spring Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ	Fall Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ
Aluminum	1 / 1	1 / 1	450	109.7	--	**4.1**	--	544	109.7	--	**5.0**	--
Antimony	0 / 1	0 / 1	0.014	--	--	--	--	0.014	--	--	--	--
Arsenic	0 / 1	0 / 1	0.146	2.24	4.51	<1	<1	0.146	2.24	4.51	<1	<1
Beryllium	0 / 1	1 / 1	0.018	--	--	--	--	0.036	--	--	--	--
Cadmium	1 / 1	1 / 1	18.2	1.47	6.35	**12**	**2.9**	101	1.47	6.35	**68**	**16**
Calcium	1 / 1	1 / 1	11.4	--	--	--	--	53.2	--	--	--	--
Chromium	0 / 1	0 / 1	5.97	2.66	15.6	**2.2**	<1	5.97	2.66	15.6	**2.2**	<1
Copper	1 / 1	1 / 1	12.5	4.05	34.87	**3.1**	<1	24.8	4.05	34.87	**6.1**	<1
Iron	1 / 1	1 / 1	0.131	--	--	--	--	0.807	--	--	--	--
Lead	1 / 1	1 / 1	231	1.63	44.63	**142**	**5.2**	1599	1.63	44.63	**981**	**36**
Magnesium	1 / 1	1 / 1	1.26	--	--	--	--	4.38	--	--	--	--
Manganese	1 / 1	1 / 1	0.184	179	377	<1	<1	2.45	179	377	<1	<1
Mercury (Inorganic)	0 / 1	NA	1.61	0.45	0.9	**3.6**	**1.8**	NC	0.45	0.9	--	--
Nickel	0 / 1	0 / 1	0.056	6.71	18.6	<1	<1	0.056	6.71	18.6	<1	<1
Potassium	1 / 1	1 / 1	0.874	--	--	--	--	1.99	--	--	--	--
Selenium	0 / 1	0 / 1	2.51	0.290	0.82	**8.7**	**3.1**	2.51	0.29	0.82	**8.7**	**3.1**
Silica	1 / 1	1 / 1	12.1	--	--	--	--	22.0	--	--	--	--
Silver	0 / 1	0 / 1	0.119	2.02	60.5	<1	<1	0.119	2.02	60.5	<1	<1
Sodium	1 / 1	1 / 1	3.06	--	--	--	--	15.5	--	--	--	--
Strontium	1 / 1	1 / 1	0.129	--	--	--	--	0.606	--	--	--	--
Thallium	0 / 1	0 / 1	29.9	--	--	--	--	29.9	--	--	--	--
Vanadium	0 / 1	0 / 1	0.009	0.344	1.7	<1	<1	0.009	0.344	1.7	<1	<1
Zinc	1 / 1	1 / 1	4883	66.1	171	**74**	**29**	50655	66.1	171	**766**	**296**

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NC - Not calculated
NA - Not analyzed

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E-75.
Hazard Quotients for the Muskrat at Sample Location WW-E

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario					Fall Exposure Scenario				
			Total EDD (mg/kg bw-day)	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**
Aluminum	1 / 1	1 / 1	39.5	1.93	19.3	**20**	**2.0**	47.7	1.93	19.3	**25**	**2.5**
Antimony	0 / 1	0 / 1	1.26	0.059	2.76	**21**	<1	1.26	0.059	2.76	**21**	<1
Arsenic	0 / 1	0 / 1	0.251	1.04	4.55	<1	<1	0.251	1.04	4.55	<1	<1
Beryllium	0 / 1	1 / 1	0.024	0.532	0.67	<1	<1	0.049	0.532	0.67	<1	<1
Cadmium	1 / 1	1 / 1	1.76	0.770	6.87	**2.3**	<1	9.74	0.77	6.87	**13**	**1.4**
Calcium	1 / 1	1 / 1	15.9	--	--	--	--	73.9	--	--	--	--
Chromium	0 / 1	0 / 1	3.75	2.40	58.17	**1.6**	<1	3.75	2.4	58.17	**1.6**	<1
Copper	1 / 1	1 / 1	0.780	5.60	82.7	<1	<1	1.55	5.6	82.7	<1	<1
Iron	1 / 1	1 / 1	0.183	--	--	--	--	1.12	--	--	--	--
Lead	1 / 1	1 / 1	33.3	4.70	186.4	**7.1**	<1	231	4.7	186.4	**49**	**1.2**
Magnesium	1 / 1	1 / 1	1.75	--	--	--	--	6.09	--	--	--	--
Manganese	1 / 1	1 / 1	0.256	51.4	146	<1	<1	3.41	51.4	146	<1	<1
Mercury (Inorganic)	0 / 1	NA	0.842	1	--	<1	--	NC	1	--	--	--
Nickel	0 / 1	0 / 1	0.054	1.70	14.77	<1	<1	0.054	1.7	14.77	<1	<1
Potassium	1 / 1	1 / 1	1.22	--	--	--	--	2.76	--	--	--	--
Selenium	0 / 1	0 / 1	1.57	0.143	0.66	**11**	**2.4**	1.57	0.143	0.66	**11**	**2.4**
Silica	1 / 1	1 / 1	16.8	--	--	--	--	30.6	--	--	--	--
Silver	0 / 1	0 / 1	1.82	6.02	119	<1	<1	1.82	6.02	119	<1	<1
Sodium	1 / 1	1 / 1	4.25	--	--	--	--	21.6	--	--	--	--
Strontium	1 / 1	1 / 1	0.179	263	--	<1	--	0.843	263	--	<1	--
Thallium	0 / 1	0 / 1	12.8	0.0074	0.074	**1723**	**172**	12.8	0.0074	0.074	**1723**	**172**
Vanadium	0 / 1	0 / 1	0.013	4.16	9.44	<1	<1	0.013	4.16	9.44	<1	<1
Zinc	1 / 1	1 / 1	992	75.4	298	**13**	**3.3**	10293	75.4	298	**137**	**35**

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NC - Not calculated
NA - Not analzyed
TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E-76.
Hazard Quotients for the Belted King Fisher at Sample Location WW-E

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario: Total EDD (mg/kg bw-day)	Spring Exposure Scenario: No Effect-based TRV	Spring Exposure Scenario: Effect-based TRV	Spring Exposure Scenario: No Effect-based HQ	Spring Exposure Scenario: Effect-based HQ	Fall Exposure Scenario: Total EDD (mg/kg bw-day)	Fall Exposure Scenario: No Effect-based TRV	Fall Exposure Scenario: Effect-based TRV	Fall Exposure Scenario: No Effect-based HQ	Fall Exposure Scenario: Effect-based HQ
Aluminum	1 / 1	1 / 1	0.203	109.7	--	<1	--	0.245	109.7	--	<1	--
Antimony	0 / 1	0 / 1	0.050	--	--	--	--	0.050	--	--	--	--
Arsenic	0 / 1	0 / 1	0.143	2.24	4.51	<1	<1	0.143	2.24	4.51	<1	<1
Beryllium	0 / 1	1 / 1	0.016	--	--	--	--	0.031	--	--	--	--
Cadmium	1 / 1	1 / 1	2.99	1.47	6.35	**2.0**	<1	16.6	1.47	6.35	**11**	**2.6**
Calcium	1 / 1	1 / 1	7.39	--	--	--	--	34.3	--	--	--	--
Chromium	0 / 1	0 / 1	0.024	2.66	15.6	<1	<1	0.024	2.66	15.6	<1	<1
Copper	1 / 1	1 / 1	1.50	4.05	34.87	<1	<1	2.98	4.05	34.87	<1	<1
Iron	1 / 1	1 / 1	0.085	--	--	--	--	0.521	--	--	--	--
Lead	1 / 1	1 / 1	0.009	1.63	44.63	<1	<1	0.062	1.63	44.63	<1	<1
Magnesium	1 / 1	1 / 1	0.813	--	--	--	--	2.83	--	--	--	--
Manganese	1 / 1	1 / 1	0.119	179	377	<1	<1	1.58	179	377	<1	<1
Mercury (Inorganic)	0 / 1	NA	0.177	0.45	0.9	<1	<1	NC	0.45	0.9	--	--
Nickel	0 / 1	0 / 1	0.098	6.71	18.6	<1	<1	0.098	6.71	18.6	<1	<1
Potassium	1 / 1	1 / 1	0.565	--	--	--	--	1.28	--	--	--	--
Selenium	0 / 1	0 / 1	0.162	0.290	0.82	<1	<1	0.162	0.29	0.82	<1	<1
Silica	1 / 1	1 / 1	7.82	--	--	--	--	14.2	--	--	--	--
Silver	0 / 1	0 / 1	0.022	2.02	60.5	<1	<1	0.022	2.02	60.5	<1	<1
Sodium	1 / 1	1 / 1	1.97	--	--	--	--	10.0	--	--	--	--
Strontium	1 / 1	1 / 1	0.083	--	--	--	--	0.392	--	--	--	--
Thallium	0 / 1	0 / 1	12.5	--	--	--	--	12.5	--	--	--	--
Vanadium	0 / 1	0 / 1	0.006	0.344	1.7	<1	<1	0.006	0.344	1.7	<1	<1
Zinc	1 / 1	1 / 1	1380	66.1	171	**21**	**8.1**	14312	66.1	171	**217**	**84**

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NC - Not calculated
NA - Not analyzed
TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E-77.
Hazard Quotients for the Mallard at Sample Location WW-E

			Spring Exposure Scenario					Fall Exposure Scenario				
Analyte	**Spring Frequency of Detection**	**Fall Frequency of Detection**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**
Aluminum	1 / 1	1 / 1	175	109.7	--	**1.6**	--	128	109.7	--	**1.2**	--
Antimony	0 / 1	0 / 1	0.006	--	--	--	--	0.574	--	--	--	--
Arsenic	0 / 1	0 / 1	0.057	2.24	4.51	<1	<1	0.142	2.24	4.51	<1	<1
Beryllium	0 / 1	1 / 1	0.007	--	--	--	--	0.029	--	--	--	--
Cadmium	1 / 1	1 / 1	7.08	1.47	6.35	**4.8**	**1.1**	24.0	1.47	6.35	**16**	**3.8**
Calcium	1 / 1	1 / 1	4.43	--	--	--	--	20.6	--	--	--	--
Chromium	0 / 1	0 / 1	2.33	2.66	15.6	<1	<1	2.87	2.66	15.6	**1.1**	<1
Copper	1 / 1	1 / 1	4.86	4.05	34.87	**1.2**	<1	5.54	4.05	34.87	**1.4**	<1
Iron	1 / 1	1 / 1	0.051	--	--	--	--	0.312	--	--	--	--
Lead	1 / 1	1 / 1	89.9	1.63	44.63	**55**	**2.0**	416	1.63	44.63	**255**	**9**
Magnesium	1 / 1	1 / 1	0.487	--	--	--	--	1.69	--	--	--	--
Manganese	1 / 1	1 / 1	0.071	179	377	<1	<1	0.948	179	377	<1	<1
Mercury (Inorganic)	0 / 1	NA	0.626	0.45	0.9	**1.4**	<1	NC	0.45	0.9	--	--
Nickel	0 / 1	0 / 1	0.022	6.71	18.6	<1	<1	0.035	6.71	18.6	<1	<1
Potassium	1 / 1	1 / 1	0.338	--	--	--	--	0.769	--	--	--	--
Selenium	0 / 1	0 / 1	0.978	0.290	0.82	**3.4**	**1.2**	1.20	0.29	0.82	**4.2**	**1.5**
Silica	1 / 1	1 / 1	4.68	--	--	--	--	8.53	--	--	--	--
Silver	0 / 1	0 / 1	0.046	2.02	60.5	<1	<1	0.85	2.02	60.5	<1	<1
Sodium	1 / 1	1 / 1	1.18	--	--	--	--	6.00	--	--	--	--
Strontium	1 / 1	1 / 1	0.050	--	--	--	--	0.235	--	--	--	--
Thallium	0 / 1	0 / 1	11.6	--	--	--	--	11.6	--	--	--	--
Vanadium	0 / 1	0 / 1	0.004	0.344	1.7	<1	<1	0.004	0.344	1.7	<1	<1
Zinc	1 / 1	1 / 1	1902	66.1	171	**29**	**11**	14550	66.1	171	**220**	**85**

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NC - Not calculated
NA - Not analyzed

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E-78.
Hazard Quotients for the American Dipper at Sample Location W-I

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario					Fall Exposure Scenario				
			Spring Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ	Fall Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ
Aluminum	1 / 1	1 / 1	515	109.7	--	**4.7**	**--**	217	109.7	--	**2.0**	**--**
Antimony	0 / 1	0 / 1	0.014	--	--	**--**	**--**	0.014	--	--	**--**	**--**
Arsenic	0 / 1	0 / 1	0.146	2.24	4.51	<1	<1	0.146	2.24	4.51	<1	<1
Beryllium	0 / 1	0 / 1	0.018	--	--	**--**	**--**	0.018	--	--	**--**	**--**
Cadmium	1 / 1	1 / 1	13.7	1.47	6.35	**9.3**	**2.2**	53.0	1.47	6.35	**36**	**8.4**
Calcium	1 / 1	1 / 1	7.88	--	--	--	--	19.0	--	--	--	--
Chromium	1 / 1	1 / 1	7.33	2.66	15.6	**2.8**	<1	7.47	2.66	15.6	**2.8**	<1
Copper	1 / 1	1 / 1	9.44	4.05	34.87	**2.3**	<1	9.71	4.05	34.87	**2.4**	<1
Iron	1 / 1	0 / 1	0.108	--	--	**--**	--	0.095	--	--	--	**--**
Lead	1 / 1	1 / 1	170	1.63	44.63	**104**	**3.8**	108	1.63	44.63	**66**	**2.4**
Magnesium	1 / 1	1 / 1	0.852	--	--	--	--	1.89	--	--	--	--
Manganese	1 / 1	1 / 1	0.051	179	377	<1	<1	0.103	179	377	<1	<1
Mercury (Inorganic)	0 / 1	NA	1.61	0.45	0.9	**3.6**	**1.8**	NC	0.45	0.9	--	**--**
Nickel	0 / 1	0 / 1	0.056	6.71	18.6	<1	<1	0.056	6.71	18.6	<1	<1
Potassium	1 / 1	1 / 1	0.856	--	--	--	**--**	1.33	--	--	**--**	**--**
Selenium	0 / 1	0 / 1	2.51	0.290	0.82	**8.7**	**3.1**	2.51	0.29	0.82	**8.7**	**3.1**
Silica	1 / 1	1 / 1	14.5	--	--	--	--	19.4	--	--	--	--
Silver	0 / 1	0 / 1	0.119	2.02	60.5	<1	<1	0.119	2.02	60.5	<1	<1
Sodium	1 / 1	1 / 1	2.69	--	--	--	--	6.08	--	--	--	--
Strontium	1 / 1	1 / 1	0.065	--	--	**--**	**--**	0.174	--	--	**--**	**--**
Thallium	0 / 1	0 / 1	29.9	--	--	**--**	**--**	29.9	--	--	**--**	**--**
Vanadium	0 / 1	0 / 1	0.009	0.344	1.7	<1	<1	0.009	0.344	1.7	<1	<1
Zinc	1 / 1	1 / 1	3291	66.1	171	**50**	**19**	13065	66.1	171	**198**	**76**

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NC - Not calculated
NA - Not analyzed

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E-79.
Hazard Quotients for the Muskrat at Sample Location W-I

Analytes	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario: Total EDD (mg/kg bw-day)	Spring: No Effect-based TRV	Spring: Effect-based TRV	Spring: No Effect-based HQ	Spring: Effect-based HQ	Fall Exposure Scenario: Total EDD (mg/kg bw-day)	Fall: No Effect-based TRV	Fall: Effect-based TRV	Fall: No Effect-based HQ	Fall: Effect-based HQ
Aluminum	1 / 1	1 / 1	45.2	1.93	19.3	**23**	**2.3**	19.0	1.93	19.3	**9.9**	<1
Antimony	0 / 1	0 / 1	1.26	0.059	2.76	**21**	<1	1.26	0.059	2.76	**21**	<1
Arsenic	0 / 1	0 / 1	0.251	1.04	4.55	<1	<1	0.251	1.04	4.55	<1	<1
Beryllium	0 / 1	0 / 1	0.024	0.532	0.67	<1	<1	0.024	0.532	0.67	<1	<1
Cadmium	1 / 1	1 / 1	1.33	0.770	6.87	**1.7**	<1	5.14	0.77	6.87	**6.7**	<1
Calcium	1 / 1	1 / 1	10.95	--	--	--	--	26.37	--	--	--	--
Chromium	1 / 1	1 / 1	4.60	2.40	58.17	**1.9**	<1	4.69	2.4	58.17	**2.0**	<1
Copper	1 / 1	1 / 1	0.590	5.60	82.7	<1	<1	0.607	5.6	82.7	<1	<1
Iron	1 / 1	0 / 1	0.150	--	--	--	--	0.132	--	--	--	--
Lead	1 / 1	1 / 1	24.5	4.70	186.4	**5.2**	<1	15.6	4.7	186.4	**3.3**	<1
Magnesium	1 / 1	1 / 1	1.185	--	--	--	--	2.623	--	--	--	--
Manganese	1 / 1	1 / 1	0.071	51.4	146	<1	<1	0.143	51.4	146	<1	<1
Mercury (Inorganic)	0 / 1	NA	0.842	1	--	<1	--	NC	1	--	--	--
Nickel	0 / 1	0 / 1	0.054	1.70	14.77	<1	<1	0.054	1.7	14.77	<1	<1
Potassium	1 / 1	1 / 1	1.190	--	--	--	--	1.848	--	--	--	--
Selenium	0 / 1	0 / 1	1.57	0.143	0.66	**11**	**2.4**	1.57	0.143	0.66	**11**	**2.4**
Silica	1 / 1	1 / 1	20.12	--	--	--	--	26.96	--	--	--	--
Silver	0 / 1	0 / 1	1.82	6.02	119	<1	<1	1.82	6.02	119	<1	<1
Sodium	1 / 1	1 / 1	3.73	--	--	--	--	8.46	--	--	--	--
Strontium	1 / 1	1 / 1	0.091	263	--	<1	--	0.241	263	--	<1	--
Thallium	0 / 1	0 / 1	12.8	0.0074	0.074	**1723**	**172**	12.8	0.0074	0.074	**1723**	**172**
Vanadium	0 / 1	0 / 1	0.013	4.16	9.44	<1	<1	0.013	4.16	9.44	<1	<1
Zinc	1 / 1	1 / 1	669	75.4	298	**8.9**	**2.2**	2655	75.4	298	**35**	**8.9**

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NC - Not calculated
NA - Not analyzed
TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E-80.
Hazard Quotients for the Belted King Fisher at Sample Location W-I

Analytes	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario					Fall Exposure Scenario				
			Total EDD (mg/kg bw-day)	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**
Aluminum	1 / 1	1 / 1	0.232	109.7	--	<1	--	0.098	109.7	--	<1	--
Antimony	0 / 1	0 / 1	0.050	--	--	--	--	0.050	--	--	--	--
Arsenic	0 / 1	0 / 1	0.143	2.24	4.51	<1	<1	0.143	2.24	4.51	<1	<1
Beryllium	0 / 1	0 / 1	0.016	--	--	--	--	0.016	--	--	--	--
Cadmium	1 / 1	1 / 1	2.26	1.47	6.35	**1.5**	<1	8.73	1.47	6.35	**5.9**	**1.4**
Calcium	1 / 1	1 / 1	5.09	--	--	--	--	12.3	--	--	--	--
Chromium	1 / 1	1 / 1	0.030	2.66	15.6	<1	<1	0.030	2.66	15.6	<1	<1
Copper	1 / 1	1 / 1	1.13	4.05	34.87	<1	<1	1.16	4.05	34.87	<1	<1
Iron	1 / 1	0 / 1	0.070	--	--	--	--	0.061	--	--	--	--
Lead	1 / 1	1 / 1	0.007	1.63	44.63	<1	<1	0.004	1.63	44.63	<1	<1
Magnesium	1 / 1	1 / 1	0.551	--	--	--	--	1.22	--	--	--	--
Manganese	1 / 1	1 / 1	0.033	179	377	<1	<1	0.066	179	377	<1	<1
Mercury (Inorganic)	0 / 1	NA	0.177	0.45	0.9	<1	<1	NC	0.45	0.9	--	--
Nickel	0 / 1	0 / 1	0.098	6.71	18.6	<1	<1	0.098	6.71	18.6	<1	<1
Potassium	1 / 1	1 / 1	0.553	--	--	--	--	0.858	--	--	--	--
Selenium	0 / 1	0 / 1	0.162	0.290	0.82	<1	<1	0.162	0.29	0.82	<1	<1
Silica	1 / 1	1 / 1	9.35	--	--	--	--	12.5	--	--	--	--
Silver	0 / 1	0 / 1	0.022	2.02	60.5	<1	<1	0.022	2.02	60.5	<1	<1
Sodium	1 / 1	1 / 1	1.74	--	--	--	--	3.93	--	--	--	--
Strontium	1 / 1	1 / 1	0.042	--	--	--	--	0.112	--	--	--	--
Thallium	0 / 1	0 / 1	12.5	--	--	--	--	12.5	--	--	--	--
Vanadium	0 / 1	0 / 1	0.006	0.344	1.7	<1	<1	0.006	0.344	1.7	<1	<1
Zinc	1 / 1	1 / 1	930	66.1	171	**14**	**5.4**	3691	66.1	171	**56**	**22**

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NC - Not calculated
NA - Not analyzed

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E-81.
Hazard Quotients for the Mallard at Sample Location W-I

			Spring Exposure Scenario					Fall Exposure Scenario				
Analytes	**Spring Frequency of Detection**	**Fall Frequency of Detection**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**
Aluminum	1 / 1	1 / 1	200	109.7	--	**1.8**	--	50.9	109.7	--	<1	--
Antimony	0 / 1	0 / 1	0.006	--	--	--	--	0.574	--	--	--	--
Arsenic	0 / 1	0 / 1	0.057	2.24	4.51	<1	<1	0.142	2.24	4.51	<1	<1
Beryllium	0 / 1	0 / 1	0.007	--	--	--	--	0.014	--	--	--	--
Cadmium	1 / 1	1 / 1	5.34	1.47	6.35	**3.6**	<1	12.7	1.47	6.35	**8.6**	**2.0**
Calcium	1 / 1	1 / 1	3.05	--	--	--	--	7.34	--	--	--	--
Chromium	1 / 1	1 / 1	2.86	2.66	15.6	**1.1**	<1	3.59	2.66	15.6	**1.4**	<1
Copper	1 / 1	1 / 1	3.68	4.05	34.87	<1	<1	2.17	4.05	34.87	<1	<1
Iron	1 / 1	0 / 1	0.042	--	--	--	--	0.037	--	--	--	--
Lead	1 / 1	1 / 1	66.2	1.63	44.63	**41**	**1.5**	28.2	1.63	44.63	**17**	<1
Magnesium	1 / 1	1 / 1	0.330	--	--	--	--	0.730	--	--	--	--
Manganese	1 / 1	1 / 1	0.020	179	377	<1	<1	0.040	179	377	<1	<1
Mercury (Inorganic)	0 / 1	NA	0.626	0.45	0.9	**1.4**	<1	NC	0.45	0.9	--	--
Nickel	0 / 1	0 / 1	0.022	6.71	18.6	<1	<1	0.035	6.71	18.6	<1	<1
Potassium	1 / 1	1 / 1	0.331	--	--	--	--	0.514	--	--	--	--
Selenium	0 / 1	0 / 1	0.978	0.290	0.82	**3.4**	**1.2**	1.20	0.29	0.82	**4.2**	**1.5**
Silica	1 / 1	1 / 1	5.60	--	--	--	--	7.50	--	--	--	--
Silver	0 / 1	0 / 1	0.046	2.02	60.5	<1	<1	0.852	2.02	60.5	<1	<1
Sodium	1 / 1	1 / 1	1.04	--	--	--	--	2.35	--	--	--	--
Strontium	1 / 1	1 / 1	0.025	--	--	--	--	0.067	--	--	--	--
Thallium	0 / 1	0 / 1	11.6	--	--	--	--	11.6	--	--	--	--
Vanadium	0 / 1	0 / 1	0.004	0.344	1.7	<1	<1	0.004	0.344	1.7	<1	<1
Zinc	1 / 1	1 / 1	1282	66.1	171	**19**	**7.5**	3753	66.1	171	**57**	**22**

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NC - Not calculated
NA - Not analyzed
TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E-82.
Hazard Quotients for the American Dipper at Sample Location W-J

Analytes	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario					Fall Exposure Scenario				
			Spring Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ	Fall Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ
Aluminum	1 / 1	1 / 1	2139	109.7	--	**20**	--	171	109.7	--	**1.6**	--
Antimony	0 / 1	0 / 1	0.014	--	--	--	--	0.014	--	--	--	--
Arsenic	1 / 1	0 / 1	0.386	2.24	4.51	<1	<1	0.146	2.24	4.51	<1	<1
Beryllium	0 / 1	0 / 1	0.018	--	--	--	--	0.018	--	--	--	--
Cadmium	1 / 1	1 / 1	37.9	1.47	6.35	**26**	**6.0**	54.3	1.47	6.35	**37**	**8.5**
Calcium	1 / 1	1 / 1	8.47	--	--	--	--	19.3	--	--	--	--
Chromium	1 / 1	1 / 1	7.21	2.66	15.6	**2.7**	<1	7.28	2.66	15.6	**2.7**	<1
Copper	1 / 1	0 / 1	23.6	4.05	34.87	**5.8**	<1	7.40	4.05	34.87	**1.8**	<1
Iron	1 / 1	0 / 1	0.603	--	--	--	--	0.095	--	--	--	--
Lead	1 / 1	1 / 1	1430	1.63	44.63	**877**	**32**	200	1.63	44.63	**123**	**4.5**
Magnesium	1 / 1	1 / 1	1.05	--	--	--	--	2.00	--	--	--	--
Manganese	1 / 1	1 / 1	0.132	179	377	<1	<1	0.078	179	377	<1	<1
Mercury (Inorganic)	0 / 1	NA	1.61	0.45	0.9	**3.6**	**1.8**	NC	0.45	0.9	--	--
Nickel	0 / 1	0 / 1	0.056	6.71	18.6	<1	<1	0.056	6.71	18.6	<1	<1
Potassium	1 / 1	1 / 1	1.26	--	--	--	--	1.37	--	--	--	--
Selenium	0 / 1	0 / 1	2.51	0.290	0.82	**8.7**	**3.1**	2.51	0.29	0.82	**8.7**	**3.1**
Silica	1 / 1	1 / 1	17.8	--	--	--	--	20.9	--	--	--	--
Silver	1 / 1	0 / 1	0.201	2.02	60.5	<1	<1	0.119	2.02	60.5	<1	<1
Sodium	1 / 1	1 / 1	2.95	--	--	--	--	6.14	--	--	--	--
Strontium	1 / 1	1 / 1	0.076	--	--	--	--	0.174	--	--	--	--
Thallium	0 / 1	0 / 1	29.9	--	--	--	--	29.9	--	--	--	--
Vanadium	0 / 1	0 / 1	0.009	0.344	1.7	<1	<1	0.009	0.344	1.7	<1	<1
Zinc	1 / 1	1 / 1	8364	66.1	171	**127**	**49**	15087	66.1	171	**228**	**88**

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NC - Not calculated
NA - Not analyzed

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E-83.
Hazard Quotients for the Muskrat at Sample Location W-J

Analytes	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario: Total EDD (mg/kg bw-day)	Spring: No Effect-based TRV	Spring: Effect-based TRV	Spring: No Effect-based HQ	Spring: Effect-based HQ	Fall Exposure Scenario: Total EDD (mg/kg bw-day)	Fall: No Effect-based TRV	Fall: Effect-based TRV	Fall: No Effect-based HQ	Fall: Effect-based HQ
Aluminum	1 / 1	1 / 1	188	1.93	19.3	**97**	**9.7**	15.0	1.93	19.3	**7.8**	<1
Antimony	0 / 1	0 / 1	1.26	0.059	2.76	**21**	<1	1.26	0.059	2.76	**21**	<1
Arsenic	1 / 1	0 / 1	0.667	1.04	4.55	<1	<1	0.251	1.04	4.55	<1	<1
Beryllium	0 / 1	0 / 1	0.024	0.532	0.67	<1	<1	0.024	0.532	0.67	<1	<1
Cadmium	1 / 1	1 / 1	3.67	0.770	6.87	**4.8**	<1	5.26	0.77	6.87	**6.8**	<1
Calcium	1 / 1	1 / 1	11.78	--	--	--	--	26.83	--	--	--	--
Chromium	1 / 1	1 / 1	4.53	2.40	58.17	**1.89**	<1	4.57	2.4	58.17	**1.9**	<1
Copper	1 / 1	0 / 1	1.47	5.60	82.7	<1	<1	0.462	5.6	82.7	<1	<1
Iron	1 / 1	0 / 1	0.838	--	--	--	--	0.132	--	--	--	--
Lead	1 / 1	1 / 1	206	4.70	186.4	**44**	**1.1**	28.8	4.7	186.4	**6.1**	<1
Magnesium	1 / 1	1 / 1	1.460	--	--	--	--	2.775	--	--	--	--
Manganese	1 / 1	1 / 1	0.183	51.4	146	<1	<1	0.109	51.4	146	<1	<1
Mercury (Inorganic)	0 / 1	NA	0.842	1	--	<1	--	NC	1	--	--	--
Nickel	0 / 1	0 / 1	0.054	1.70	14.77	<1	<1	0.054	1.7	14.77	<1	<1
Potassium	1 / 1	1 / 1	1.749	--	--	--	--	1.907	--	--	--	--
Selenium	0 / 1	0 / 1	1.57	0.143	0.66	**11**	**2.4**	1.57	0.143	0.66	**11**	**2.4**
Silica	1 / 1	1 / 1	24.72	--	--	--	--	29.06	--	--	--	--
Silver	1 / 1	0 / 1	3.08	6.02	119	<1	<1	1.82	6.02	119	<1	<1
Sodium	1 / 1	1 / 1	4.10	--	--	--	--	8.53	--	--	--	--
Strontium	1 / 1	1 / 1	0.106	263	--	<1	--	0.242	263	--	<1	--
Thallium	0 / 1	0 / 1	12.8	0.0074	0.074	**1723**	**172**	12.8	0.0074	0.074	**1723**	**172**
Vanadium	0 / 1	0 / 1	0.013	4.16	9.44	<1	<1	0.013	4.16	9.44	<1	<1
Zinc	1 / 1	1 / 1	1699	75.4	298	**23**	**5.7**	3066	75.4	298	**41**	**10**

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NC - Not calculated
NA - Not analyzed

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E-84.
Hazard Quotients for the Belted King Fisher at Sample Location W-J

Analytes	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario					Fall Exposure Scenario				
			Total EDD (mg/kg bw-day)	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**
Aluminum	1 / 1	1 / 1	0.966	109.7	--	<1	--	0.077	109.7	--	<1	--
Antimony	0 / 1	0 / 1	0.050	--	--	--	--	0.050	--	--	--	--
Arsenic	1 / 1	0 / 1	0.379	2.24	4.51	<1	<1	0.143	2.24	4.51	<1	<1
Beryllium	0 / 1	0 / 1	0.016	--	--	--	--	0.016	--	--	--	--
Cadmium	1 / 1	1 / 1	6.24	1.47	6.35	**4.2**	<1	8.94	1.47	6.35	**6.1**	**1.4**
Calcium	1 / 1	1 / 1	5.47	--	--	--	--	12.5	--	--	--	--
Chromium	1 / 1	1 / 1	0.029	2.66	15.6	<1	<1	0.029	2.66	15.6	<1	<1
Copper	1 / 1	0 / 1	2.83	4.05	34.87	<1	<1	0.888	4.05	34.87	<1	<1
Iron	1 / 1	0 / 1	0.389	--	--	--	--	0.061	--	--	--	--
Lead	1 / 1	1 / 1	0.055	1.63	44.63	<1	<1	0.008	1.63	44.63	<1	<1
Magnesium	1 / 1	1 / 1	0.678	--	--	--	--	1.29	--	--	--	--
Manganese	1 / 1	1 / 1	0.085	179	377	<1	<1	0.051	179	377	<1	<1
Mercury (Inorganic)	0 / 1	NA	0.177	0.45	0.9	<1	<1	NC	0.45	0.9	--	--
Nickel	0 / 1	0 / 1	0.098	6.71	18.6	<1	<1	0.098	6.71	18.6	<1	<1
Potassium	1 / 1	1 / 1	0.813	--	--	--	--	0.886	--	--	--	--
Selenium	0 / 1	0 / 1	0.162	0.290	0.82	<1	<1	0.162	0.29	0.82	<1	<1
Silica	1 / 1	1 / 1	11.5	--	--	--	--	13.5	--	--	--	--
Silver	1 / 1	0 / 1	0.037	2.02	60.5	<1	<1	0.022	2.02	60.5	<1	<1
Sodium	1 / 1	1 / 1	1.90	--	--	--	--	3.97	--	--	--	--
Strontium	1 / 1	1 / 1	0.049	--	--	--	--	0.112	--	--	--	--
Thallium	0 / 1	0 / 1	12.5	--	--	--	--	12.5	--	--	--	--
Vanadium	0 / 1	0 / 1	0.006	0.344	1.7	<1	<1	0.006	0.344	1.7	<1	<1
Zinc	1 / 1	1 / 1	2363	66.1	171	**36**	**14**	4263	66.1	171	**64**	**25**

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NC - Not calculated
NA - Not analyzed

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E-85.
Hazard Quotients for the Mallard at Sample Location W-J

Analytes	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario: Total EDD (mg/kg bw-day)	Spring: No Effect-based TRV	Spring: Effect-based TRV	Spring: No Effect-based HQ	Spring: Effect-based HQ	Fall Exposure Scenario: Total EDD (mg/kg bw-day)	Fall: No Effect-based TRV	Fall: Effect-based TRV	Fall: No Effect-based HQ	Fall: Effect-based HQ
Aluminum	1 / 1	1 / 1	833	109.7	--	**7.6**	--	40.0	109.7	--	<1	--
Antimony	0 / 1	0 / 1	0.006	--	--	--	--	0.574	--	--	--	--
Arsenic	1 / 1	0 / 1	0.150	2.24	4.51	<1	<1	0.142	2.24	4.51	<1	<1
Beryllium	0 / 1	0 / 1	0.007	--	--	--	--	0.014	--	--	--	--
Cadmium	1 / 1	1 / 1	14.8	1.47	6.35	**10**	**2.3**	13.0	1.47	6.35	**8.8**	**2.0**
Calcium	1 / 1	1 / 1	3.28	--	--	--	--	7.47	--	--	--	--
Chromium	1 / 1	1 / 1	2.81	2.66	15.6	**1.1**	<1	3.50	2.66	15.6	**1.3**	<1
Copper	1 / 1	0 / 1	9.18	4.05	34.87	**2.3**	<1	1.65	4.05	34.87	<1	<1
Iron	1 / 1	0 / 1	0.233	--	--	--	--	0.037	--	--	--	--
Lead	1 / 1	1 / 1	557	1.63	44.63	**342**	**12**	52.0	1.63	44.63	**32**	**1.2**
Magnesium	1 / 1	1 / 1	0.406	--	--	--	--	0.772	--	--	--	--
Manganese	1 / 1	1 / 1	0.051	179	377	<1	<1	0.030	179	377	<1	<1
Mercury (Inorganic)	0 / 1	NA	0.626	0.45	0.9	**1.4**	<1	NC	0.45	0.9	--	--
Nickel	0 / 1	0 / 1	0.022	6.71	18.6	<1	<1	0.035	6.71	18.6	<1	<1
Potassium	1 / 1	1 / 1	0.487	--	--	--	--	0.531	--	--	--	--
Selenium	0 / 1	0 / 1	0.978	0.290	0.82	**3.4**	**1.2**	1.20	0.29	0.82	**4.2**	**1.5**
Silica	1 / 1	1 / 1	6.88	--	--	--	--	8.09	--	--	--	--
Silver	1 / 1	0 / 1	0.078	2.02	60.5	<1	<1	0.852	2.02	60.5	<1	<1
Sodium	1 / 1	1 / 1	1.14	--	--	--	--	2.38	--	--	--	--
Strontium	1 / 1	1 / 1	0.029	--	--	--	--	0.067	--	--	--	--
Thallium	0 / 1	0 / 1	11.6	--	--	--	--	11.6	--	--	--	--
Vanadium	0 / 1	0 / 1	0.004	0.344	1.7	<1	<1	0.004	0.344	1.7	<1	<1
Zinc	1 / 1	1 / 1	3257	66.1	171	**49**	**19**	4334	66.1	171	**66**	**25**

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NC - Not calculated
NA - Not analyzed
TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 86.
Hazard Quotients for the American Dipper at Sample Location RG 2 - Maximum EPC

			Spring Exposure Scenario					**Fall Exposure Scenario**				
Analyte	**Spring Frequency of Detection**	**Fall Frequency of Detection**	**Spring Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**	**Fall Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**
Aluminum	4 / 4	4 / 4	1916	109.7	--	**17**	--	346	109.7	--	**3.2**	--
Antimony	0 / 4	NA	0.014	--	--	--	--	NC	--	--	--	--
Arsenic	0 / 4	0 / 4	0.146	2.24	4.51	<1	<1	0.146	2.24	4.51	<1	<1
Beryllium	0 / 4	0 / 4	0.018	--	--	--	--	0.018	--	--	--	--
Cadmium	0 / 4	0 / 4	1.378	1.47	6.35	<1	<1	1.378	1.47	6.35	<1	<1
Calcium	4 / 4	4 / 4	4.96	--	--	--	--	8.7	--	--	--	--
Chromium	2 / 4	4 / 4	6.54	2.66	15.6	**2.5**	<1	10.9	2.66	15.6	**4.1**	<1
Copper	0 / 4	1 / 4	7.40	4.05	34.87	**1.8**	<1	11.78	4.05	34.87	**2.9**	<1
Iron	4 / 4	4 / 4	0.482	--	--	--	--	0.219	--	--	--	--
Lead	4 / 4	1 / 4	2.376	1.63	44.63	**1.5**	<1	2.26	1.63	44.63	**1.4**	<1
Magnesium	4 / 4	4 / 4	0.885	--	--	--	--	1.523	--	--	--	--
Manganese	4 / 4	4 / 4	0.024	179	377	<1	<1	0.017	179	377	<1	<1
Mercury (inorganic)	0 / 4	NA	1.607	0.45	0.9	**3.6**	**1.8**	NC	0.45	0.9	--	--
Nickel	0 / 4	0 / 4	0.056	6.71	18.6	<1	<1	0.1	6.71	18.6	<1	<1
Potassium	4 / 4	4 / 4	1.183	--	--	--	--	1.703	--	--	--	--
Selenium	0 / 4	0 / 4	2.512	0.29	0.82	**8.7**	**3.1**	3	0.290	0.82	**8.7**	**3.1**
Silica	4 / 4	4 / 4	14.8	--	--	--	--	21.3	--	--	--	--
Silver	0 / 4	0 / 4	0.119	2.02	60.5	<1	<1	0	2.02	60.5	<1	<1
Sodium	4 / 4	4 / 4	1.608	--	--	--	--	3.19	--	--	--	--
Strontium	4 / 4	4 / 4	0.050	--	--	--	--	0.069	--	--	--	--
Thallium	0 / 4	0 / 4	29.9	--	--	--	--	30	--	--	--	--
Vanadium	0 / 4	0 / 4	0.009	0.344	1.7	<1	<1	0.009	0.344	1.7	<1	<1
Zinc	2 / 4	0 / 4	41.5	66.1	171	<1	<1	36	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA- Not analyzed
NC- Not calculated
TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 87.
Hazard Quotients for the American Dipper at Sample Location RG2 - Average EPC

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario					Fall Exposure Scenario				
			Spring Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ	Fall Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ
Aluminum	4 / 4	4 / 4	1741	109.7	--	**16**	--	333	109.7	--	**3.0**	--
Antimony	0 / 4	0 / 0	0.007	--	--	--	--	NC	--	--	--	--
Arsenic	0 / 4	0 / 4	0.073	2.24	4.51	<1	<1	0.073	2.24	4.51	<1	<1
Beryllium	0 / 4	0 / 4	0.009	--	--	--	--	0.009	--	--	--	--
Cadmium	0 / 4	0 / 4	0.689	1.47	6.35	<1	<1	0.689	1.47	6.35	<1	<1
Calcium	4 / 4	4 / 4	4.88	--	--	--	--	8.60	--	--	--	--
Chromium	2 / 4	4 / 4	4.72	2.66	15.6	**1.8**	<1	10.56	2.66	15.6	**4.0**	<1
Copper	0 / 4	1 / 4	3.70	4.05	34.87	<1	<1	5.72	4.05	34.87	**1.4**	<1
Iron	4 / 4	4 / 4	0.447	--	--	--	--	0.213	--	--	--	--
Lead	4 / 4	1 / 4	2.160	1.63	44.63	**1.3**	<1	1.32	1.63	44.63	<1	<1
Magnesium	4 / 4	4 / 4	0.872	--	--	--	--	1.507	--	--	--	--
Manganese	4 / 4	4 / 4	0.023	179	377	<1	<1	0.017	179	377	<1	<1
Mercury (inorganic)	0 / 4	NA	0.803	0.45	0.9	**1.8**	<1	NC	0.45	0.9	--	--
Nickel	0 / 4	4 / 4	0.028	6.71	18.6	<1	<1	0.0	6.71	18.6	<1	<1
Potassium	4 / 4	0 / 4	1.164	--	--	--	--	1.693	--	--	--	--
Selenium	0 / 4	4 / 4	1.256	0.290	0.82	**4.3**	**1.5**	1	0.290	0.82	**4.3**	**1.5**
Silica	4 / 4	0 / 4	14.6	--	--	--	--	21.2	--	--	--	--
Silver	0 / 4	4 / 4	0.059	2.02	60.5	<1	<1	0	2.02	60.5	<1	<1
Sodium	4 / 4	4 / 4	1.596	--	--	--	--	3.15	--	--	--	--
Strontium	4 / 4	0 / 4	0.049	--	--	--	--	0.069	--	--	--	--
Thallium	0 / 4	0 / 4	14.9	--	--	--	--	14.9	--	--	--	--
Vanadium	0 / 4	0 / 4	0.005	0.344	1.7	<1	<1	0.005	0.344	1.7	<1	<1
Zinc	2 / 4	0 / 0	29.7	66.1	171	<1	<1	18	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA-Not analyzed
NC- Not calculated
TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 88.
Hazard Quotients for the Muskrat at Sample Location RG 2 - Maximum EPC

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario					Fall Exposure Scenario				
			Total EDD (mg/kg bw-day)	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**
Aluminum	4 / 4	4 / 4	168	1.93	19.3	**87**	**8.7**	30.4	1.93	19.3	**16**	**1.6**
Antimony	0 / 4	NA	1.256	0.059	2.76	**21**	<1	NC	0.059	2.76	--	--
Arsenic	0 / 4	0 / 4	0.251	1.04	4.55	<1	<1	0.251	1.04	4.55	<1	<1
Beryllium	0 / 4	0 / 4	0.024	0.532	0.67	<1	<1	0.024	0.532	0.67	<1	<1
Cadmium	0 / 4	0 / 4	0.133	0.770	6.87	<1	<1	0.133	0.770	6.87	<1	<1
Calcium	4 / 4	4 / 4	6.891	--	--	--	--	12.14	--	--	--	--
Chromium	2 / 4	4 / 4	4.11	2.40	58.17	**1.7**	<1	6.82	2.40	58.17	**2.8**	<1
Copper	0 / 4	1 / 4	0.462	5.60	82.7	<1	<1	0.736	5.60	82.7	<1	<1
Iron	4 / 4	4 / 4	0.671	--	--	--	--	0.305	--	--	--	--
Lead	4 / 4	1 / 4	0.343	4.70	186.4	<1	<1	0.326	4.70	186.4	<1	<1
Magnesium	4 / 4	4 / 4	1.231	--	--	--	--	2.117	--	--	--	--
Manganese	4 / 4	4 / 4	0.033	51.4	146	<1	<1	0.024	51.4	146	<1	<1
Mercury (Inorganic)	0 / 4	NA	0.842	1	--	<1	--	NC	1	--	--	--
Nickel	0 / 4	0 / 4	0.054	1.70	14.77	<1	<1	0.054	1.70	14.77	<1	<1
Potassium	4 / 4	4 / 4	1.644	--	--	--	--	2.367	--	--	--	--
Selenium	0 / 4	0 / 4	1.571	0.143	0.66	**11**	**2.4**	1.571	0.143	0.66	**11**	**2.4**
Silica	4 / 4	4 / 4	20.51	--	--	--	--	29.59	--	--	--	--
Silver	0 / 4	0 / 4	1.819	6.02	119	<1	<1	1.819	6.02	119	<1	<1
Sodium	4 / 4	4 / 4	2.236	--	--	--	--	4.432	--	--	--	--
Strontium	4 / 4	4 / 4	0.069	263	--	<1	--	0.096	263	--	<1	--
Thallium	0 / 4	0 / 4	12.8	0.0074	0.074	**1723**	**172**	12.8	0.0074	0.074	**1723**	**172**
Vanadium	0 / 4	0 / 4	0.013	4.16	9.44	<1	<1	0.013	4.16	9.44	<1	<1
Zinc	2 / 4	0 / 4	8.44	75.4	298	<1	<1	7.40	75.4	298	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA- Not analyzed
NC- Not calculated

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 89.
Hazard Quotients for the Muskrat at Sample Location RG 2 - Average EPC

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario: Total EDD (mg/kg bw-day)	Spring Exposure Scenario: No Effect-based TRV	Spring Exposure Scenario: Effect-based TRV	Spring Exposure Scenario: No Effect-based HQ	Spring Exposure Scenario: Effect-based HQ	Fall Exposure Scenario: Total EDD (mg/kg bw-day)	Fall Exposure Scenario: No Effect-based TRV	Fall Exposure Scenario: Effect-based TRV	Fall Exposure Scenario: No Effect-based HQ	Fall Exposure Scenario: Effect-based HQ
Aluminum	4 / 4	4 / 4	153	1.93	19.3	**79**	**7.9**	29.2	1.93	19.3	**15**	**1.5**
Antimony	0 / 4	NA	0.628	0.059	2.76	**11**	<1	NC	0.059	2.76	--	--
Arsenic	0 / 4	0 / 4	0.126	1.04	4.55	<1	<1	0.13	1.04	4.55	<1	<1
Beryllium	0 / 4	0 / 4	0.012	0.532	0.67	<1	<1	0.012	0.532	0.67	<1	<1
Cadmium	0 / 4	0 / 4	0.067	0.770	6.87	<1	<1	0.067	0.770	6.87	<1	<1
Calcium	4 / 4	4 / 4	6.779	--	--	--	--	11.96	--	--	--	--
Chromium	2 / 4	4 / 4	2.961	2.40	58.17	**1.2**	<1	6.63	2.40	58.17	**2.8**	<1
Copper	0 / 4	1 / 4	0.231	5.60	82.7	<1	<1	0.357	5.60	82.7	<1	<1
Iron	4 / 4	4 / 4	0.621	--	--	--	--	0.297	--	--	--	--
Lead	4 / 4	1 / 4	0.312	4.70	186.4	<1	<1	0.190	4.70	186.4	<1	<1
Magnesium	4 / 4	4 / 4	1.213	--	--	--	--	2.094	--	--	--	--
Manganese	4 / 4	4 / 4	0.032	51.4	146	<1	<1	0.023	51.4	146	<1	<1
Mercury (inorganic)	0 / 4	NA	0.421	1	--	<1	--	NC	1	--	--	--
Nickel	0 / 4	0 / 4	0.027	1.70	14.77	<1	<1	0.027	1.70	14.77	<1	<1
Potassium	4 / 4	4 / 4	1.617	--	--	--	--	2.354	--	--	--	--
Selenium	0 / 4	0 / 4	0.785	0.143	0.66	**5.5**	**1.2**	0.785	0.143	0.66	**5.5**	**1.2**
Silica	4 / 4	4 / 4	20.28	--	--	--	--	29.46	--	--	--	--
Silver	0 / 4	0 / 4	0.909	6.02	119	<1	<1	0.909	6.02	119	<1	<1
Sodium	4 / 4	4 / 4	2.219	--	--	--	--	4.372	--	--	--	--
Strontium	4 / 4	4 / 4	0.068	263	--	<1	--	0.096	263	--	<1	--
Thallium	0 / 4	0 / 4	6.38	0.0074	0.074	**862**	**86**	6.38	0.0074	0.074	**862**	**86**
Vanadium	0 / 4	0 / 4	0.007	4.16	9.44	<1	<1	0.007	4.16	9.44	<1	<1
Zinc	2 / 4	0 / 4	6.03	75.4	298	<1	<1	3.70	75.4	298	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA- Not analyzed
NC- Not calculated
TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 90.
Hazard Quotients for the Belted King Fisher at Sample Location RG 2 - Maximum EPC

			Spring Exposure Scenario					Fall Exposure Scenario				
Analyte	**Spring Frequency of Detection**	**Fall Frequency of Detection**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**
Aluminum	4 / 4	4 / 4	0.865	109.7	--	<1	--	0.156	109.7	--	<1	--
Antimony	0 / 4	NA	0.050	--	--	--	--	NC	--	--	--	--
Arsenic	0 / 4	0 / 4	0.143	2.24	4.51	<1	<1	0.143	2.24	4.51	<1	<1
Beryllium	0 / 4	0 / 4	0.016	--	--	--	--	0.016	--	--	--	--
Cadmium	0 / 4	0 / 4	0.227	1.47	6.35	<1	<1	0.227	1.47	6.35	<1	<1
Calcium	4 / 4	4 / 4	3.20	--	--	--	--	5.64	--	--	--	--
Chromium	2 / 4	4 / 4	0.026	2.66	15.6	<1	<1	0.044	2.66	15.6	<1	<1
Copper	0 / 4	1 / 4	0.888	4.05	34.87	<1	<1	1.413	4.05	34.87	<1	<1
Iron	4 / 4	4 / 4	0.312	--	--	--	--	0.142	--	--	--	--
Lead	4 / 4	1 / 4	0.0001	1.63	44.63	<1	<1	0.0001	1.63	44.63	<1	<1
Magnesium	4 / 4	4 / 4	0.572	--	--	--	--	0.984	--	--	--	--
Manganese	4 / 4	4 / 4	0.015	179	377	<1	<1	0.011	179	377	<1	<1
Mercury (Inorganic)	0 / 4	NA	0.177	0.45	0.9	<1	<1	NC	0.45	0.9	--	--
Nickel	0 / 4	0 / 4	0.098	6.71	18.6	<1	<1	0.098	6.71	18.6	<1	<1
Potassium	4 / 4	4 / 4	0.764	--	--	--	--	1.100	--	--	--	--
Selenium	0 / 4	0 / 4	0.162	0.290	0.82	<1	<1	0.162	0.290	0.82	<1	<1
Silica	4 / 4	4 / 4	9.53	--	--	--	--	13.7	--	--	--	--
Silver	0 / 4	0 / 4	0.022	2.02	60.5	<1	<1	0.022	2.02	60.5	<1	<1
Sodium	4 / 4	4 / 4	1.039	--	--	--	--	2.059	--	--	--	--
Strontium	4 / 4	4 / 4	0.032	--	--	--	--	0.045	--	--	--	--
Thallium	0 / 4	0 / 4	12.5	--	--	--	--	12.5	--	--	--	--
Vanadium	0 / 4	0 / 4	0.006	0.344	1.7	<1	<1	0.006	0.344	1.7	<1	<1
Zinc	2 / 4	0 / 4	11.7	66.1	171	<1	<1	10.3	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of bo TRV - Toxicity Reference Value
COPECs - Chemicals of Potential Ecological (HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
EDD - Estimated Daily Dose -- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated
NA- Not analyzed
NC-Not concentrated

Table E - 91.
Hazard Quotients for the Belted King Fisher at Sample Location RG 2 - Average EPC

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario: Total EDD (mg/kg bw-day)	Spring Exposure Scenario: No Effect-based TRV	Spring Exposure Scenario: Effect-based TRV	Spring Exposure Scenario: No Effect-based HQ	Spring Exposure Scenario: Effect-based HQ	Fall Exposure Scenario: Total EDD (mg/kg bw-day)	Fall Exposure Scenario: No Effect-based TRV	Fall Exposure Scenario: Effect-based TRV	Fall Exposure Scenario: No Effect-based HQ	Fall Exposure Scenario: Effect-based HQ
Aluminum	4 / 4	4 / 4	0.786	109.7	--	<1	--	0.150	109.7	--	<1	--
Antimony	0 / 4	NA	0.025	--	--	--	--	NC	--	--	--	--
Arsenic	0 / 4	0 / 4	0.071	2.24	4.51	<1	<1	0.071	2.24	4.51	<1	<1
Beryllium	0 / 4	0 / 4	0.008	--	--	--	--	0.008	--	--	--	--
Cadmium	0 / 4	0 / 4	0.113	1.47	6.35	<1	<1	0.113	1.47	6.35	<1	<1
Calcium	4 / 4	4 / 4	3.15	--	--	--	--	5.56	--	--	--	--
Chromium	2 / 4	4 / 4	0.019	2.66	15.6	<1	<1	0.043	2.66	15.6	<1	<1
Copper	0 / 4	1 / 4	0.444	4.05	34.87	<1	<1	0.686	4.05	34.87	<1	<1
Iron	4 / 4	4 / 4	0.289	--	--	--	--	0.138	--	--	--	--
Lead	4 / 4	1 / 4	0.0001	1.63	44.63	<1	<1	0.0001	1.63	44.63	<1	<1
Magnesium	4 / 4	4 / 4	0.563	--	--	--	--	0.973	--	--	--	--
Manganese	4 / 4	4 / 4	0.015	179	377	<1	<1	0.011	179	377	<1	<1
Mercury (Inorganic)	0 / 4	NA	0.088	0.45	0.9	<1	<1	NC	0.45	0.9	--	--
Nickel	0 / 4	0 / 4	0.049	6.71	18.6	<1	<1	0.049	6.71	18.6	<1	<1
Potassium	4 / 4	4 / 4	0.752	--	--	--	--	1.094	--	--	--	--
Selenium	0 / 4	0 / 4	0.081	0.290	0.82	<1	<1	0.081	0.290	0.82	<1	<1
Silica	4 / 4	4 / 4	9.42	--	--	--	--	13.7	--	--	--	--
Silver	0 / 4	0 / 4	0.011	2.02	60.5	<1	<1	0.011	2.02	60.5	<1	<1
Sodium	4 / 4	4 / 4	1.031	--	--	--	--	2.032	--	--	--	--
Strontium	4 / 4	4 / 4	0.032	--	--	--	--	0.045	--	--	--	--
Thallium	0 / 4	0 / 4	6.25	--	--	--	--	6.25	--	--	--	--
Vanadium	0 / 4	0 / 4	0.003	0.344	1.7	<1	<1	0.003	0.344	1.7	<1	<1
Zinc	2 / 4	0 / 4	8.39	66.1	171	<1	<1	5.15	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of bo TRV - Toxicity Reference Value
COPECs - Chemicals of Potential Ecological (HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
EDD - Estimated Daily Dose -- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated
NA- Not analyzed
NC- Not concentrated

Table E - 92.
Hazard Quotients for the Mallard at Sample Location RG 2 - Maximum EPC

			Spring Exposure Scenario					**Fall Exposure Scenario**				
Analyte	**Spring Frequency of Detection**	**Fall Frequency of Detection**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**
Aluminum	4 / 4	4 / 4	746	109.7	--	**6.8**	--	81.3	109.7	--	<1	--
Antimony	0 / 4	NA	0.006	--	--	--	--	NC	--	--	--	--
Arsenic	0 / 4	0 / 4	0.057	2.24	4.51	<1	<1	0.142	2.24	4.51	<1	<1
Beryllium	0 / 4	0 / 4	0.007	--	--	--	--	0.014	--	--	--	--
Cadmium	0 / 4	0 / 4	0.536	1.47	6.35	<1	<1	0.329	1.47	6.35	<1	<1
Calcium	4 / 4	4 / 4	1.92	--	--	--	--	3.38	--	--	--	--
Chromium	2 / 4	4 / 4	2.55	2.66	15.6	<1	<1	5.22	2.66	15.6	**2.0**	<1
Copper	0 / 4	1 / 4	2.88	4.05	34.87	<1	<1	2.63	4.05	34.87	<1	<1
Iron	4 / 4	4 / 4	0.187	--	--	--	--	0.085	--	--	--	--
Lead	4 / 4	1 / 4	0.925	1.63	44.63	<1	<1	0.59	1.63	44.63	<1	<1
Magnesium	4 / 4	4 / 4	0.343	--	--	--	--	0.59	--	--	--	--
Manganese	4 / 4	4 / 4	0.009	179	377	<1	<1	0.007	179	377	<1	<1
Mercury (Inorganic)	0 / 4	NA	0.626	0.45	0.9	**1.4**	<1	NC	0.45	0.9	--	--
Nickel	0 / 4	0 / 4	0.022	6.71	18.6	<1	<1	0.035	6.71	18.6	<1	<1
Potassium	4 / 4	4 / 4	0.458	--	--	--	--	0.66	--	--	--	--
Selenium	0 / 4	0 / 4	0.978	0.290	0.82	**3.4**	**1.2**	1.20	0.290	0.82	**4.2**	**1.5**
Silica	4 / 4	4 / 4	5.71	--	--	--	--	8.24	--	--	--	--
Silver	0 / 4	0 / 4	0.046	2.02	60.5	<1	<1	0.85	2.02	60.5	<1	<1
Sodium	4 / 4	4 / 4	0.622	--	--	--	--	1.23	--	--	--	--
Strontium	4 / 4	4 / 4	0.019	--	--	--	--	0.027	--	--	--	--
Thallium	0 / 4	0 / 4	11.6	--	--	--	--	11.6	--	--	--	--
Vanadium	0 / 4	0 / 4	0.004	0.344	1.7	<1	<1	0.004	0.344	1.7	<1	<1
Zinc	2 / 4	0 / 4	16.2	66.1	171	<1	<1	10.5	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA- Not analyzed
NC -Not calculated
TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 93.
Hazard Quotients for the Mallard at Sample Location RG 2 - Average EPC

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario					Fall Exposure Scenario				
			Total EDD (mg/kg bw-day)	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**
Aluminum	4 / 4	4 / 4	678	109.7	--	**6.2**	--	78.1	109.7	--	<1	--
Antimony	0 / 4	NA	0.003	--	--	--	--	NC	--	--	--	--
Arsenic	0 / 4	0 / 4	0.028	2.24	4.51	<1	<1	0.071	2.24	4.51	<1	<1
Beryllium	0 / 4	0 / 4	0.004	--	--	--	--	0.007	--	--	--	--
Cadmium	0 / 4	0 / 4	0.268	1.47	6.35	<1	<1	0.164	1.47	6.35	<1	<1
Calcium	4 / 4	4 / 4	1.89	--	--	--	--	3.33	--	--	--	--
Chromium	2 / 4	4 / 4	1.84	2.66	15.6	<1	<1	5.08	2.66	15.6	**1.9**	<1
Copper	0 / 4	1 / 4	1.44	4.05	34.87	<1	<1	1.28	4.05	34.87	<1	<1
Iron	4 / 4	4 / 4	0.173	--	--	--	--	0.344	--	--	--	--
Lead	4 / 4	1 / 4	0.841	1.63	44.63	<1	<1	0.58	1.63	44.63	<1	<1
Magnesium	4 / 4	4 / 4	0.338	--	--	--	--	0.006	--	--	--	--
Manganese	4 / 4	4 / 4	0.009	179	377	<1	<1	NC	179	377	--	--
Mercury (Inorganic)	0 / 4	NA	0.313	0.45	0.9	<1	<1	0.017	0.45	0.9	--	--
Nickel	0 / 4	0 / 4	0.011	6.71	18.6	<1	<1	0.66	6.71	18.6	<1	<1
Potassium	4 / 4	4 / 4	0.450	--	--	--	--	0.60	--	--	--	--
Selenium	0 / 4	0 / 4	0.489	0.290	0.82	**1.7**	<1	8.20	0.290	0.82	**28.3**	**10**
Silica	4 / 4	4 / 4	5.65	--	--	--	--	0.426	--	--	--	--
Silver	0 / 4	0 / 4	0.023	2.02	60.5	<1	<1	1.22	2.02	60.5	<1	<1
Sodium	4 / 4	4 / 4	0.618	--	--	--	--	0.027	--	--	--	--
Strontium	4 / 4	4 / 4	0.019	--	--	--	--	5.81	--	--	--	--
Thallium	0 / 4	0 / 4	5.81	--	--	--	--	0.002	--	--	--	--
Vanadium	0 / 4	0 / 4	0.002	0.344	1.7	<1	<1	0.002	0.344	1.7	<1	<1
Zinc	2 / 4	0 / 4	11.6	66.1	171	<1	<1	5.23	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA- Not analyzed
NC- Not calculated

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 94.
Hazard Quotients for the American Dipper at Sample Location RG 4 - Maximum EPC

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario: Spring Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ	Fall Exposure Scenario: Fall Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ
Aluminum	4 / 4	4 / 4	1952	109.7	--	**18**	--	318	109.7	--	**2.9**	--
Antimony	0 / 4	NA	0.014	--	--	--	--	NC	--	--	--	--
Arsenic	0 / 4	0 / 4	0.146	2.24	4.51	<1	<1	0.146	2.24	4.51	<1	<1
Beryllium	0 / 4	0 / 4	0.018	--	--	--	--	0.018	--	--	--	--
Cadmium	0 / 4	3 / 4	1.378	1.47	6.35	<1	<1	2.113	1.47	6.35	**1.4**	<1
Calcium	4 / 4	4 / 4	5.12	--	--	--	--	9.46	--	--	--	--
Chromium	0 / 4	4 / 4	5.97	2.66	15.6	**2.2**	<1	10.5	2.66	15.6	**3.9**	<1
Copper	0 / 4	0 / 4	7.40	4.05	34.87	**1.8**	<1	7.40	4.05	34.87	**1.8**	<1
Iron	4 / 4	4 / 4	0.468	--	--	--	--	0.196	--	--	--	--
Lead	4 / 4	4 / 4	11.4	1.63	44.63	**7.0**	<1	6.12	1.63	44.63	**3.8**	<1
Magnesium	4 / 4	4 / 4	0.903	--	--	--	--	1.551	--	--	--	--
Manganese	4 / 4	4 / 4	0.025	179	377	<1	<1	0.018	179	377	<1	<1
Mercury (Inorganic)	0 / 4	NA	1.607	0.45	0.9	**3.6**	**1.8**	NC	0.45	0.9	--	--
Nickel	0 / 4	0 / 4	0.056	6.71	18.6	<1	<1	0.056	6.71	18.6	<1	<1
Potassium	4 / 4	4 / 4	1.183	--	--	--	--	1.703	--	--	--	--
Selenium	0 / 4	0 / 4	2.512	0.290	0.82	**8.7**	**3.1**	2.512	0.290	0.82	**8.7**	**3.1**
Silica	4 / 4	4 / 4	15.0	--	--	--	--	21.5	--	--	--	--
Silver	0 / 4	0 / 4	0.119	2.02	60.5	<1	<1	0.119	2.02	60.5	<1	<1
Sodium	4 / 4	4 / 4	1.693	--	--	--	--	3.47	--	--	--	--
Strontium	4 / 4	4 / 4	0.051	--	--	--	--	0.075	--	--	--	--
Thallium	0 / 4	0 / 4	29.9	--	--	--	--	29.9	--	--	--	--
Vanadium	0 / 4	0 / 4	0.009	0.344	1.7	<1	<1	0.009	0.344	1.7	<1	<1
Zinc	4 / 4	4 / 4	186	66.1	171	**2.8**	**1.1**	517	66.1	171	**7.8**	**3.0**

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA- Not analyzed
NC - Not calculated

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 95.
Hazard Quotients for the American Dipper at Sample Location RG 4 - Average EPC

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario: Spring Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ	Fall Exposure Scenario: Fall Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ
Aluminum	4 / 4	4 / 4	1786	109.7	--	**16**	--	297	109.7	--	**2.7**	--
Antimony	0 / 4	NA	0.007	--	--	--	--	NC	--	--	--	--
Arsenic	0 / 4	0 / 4	0.073	2.24	4.51	<1	<1	0.073	2.24	4.51	<1	<1
Beryllium	0 / 4	0 / 4	0.009	--	--	--	--	0.009	--	--	--	--
Cadmium	0 / 4	3 / 4	0.689	1.47	6.35	<1	<1	1.579	1.47	6.35	**1.1**	<1
Calcium	4 / 4	4 / 4	4.99	--	--	--	--	9.42	--	--	--	--
Chromium	0 / 4	4 / 4	2.985	2.66	15.6	**1.1**	<1	10.2	2.66	15.6	**3.8**	<1
Copper	0 / 4	0 / 4	3.70	4.05	34.87	<1	<1	3.70	4.05	34.87	<1	<1
Iron	4 / 4	4 / 4	0.443	--	--	--	--	0.191	--	--	--	--
Lead	4 / 4	4 / 4	10.1	1.63	44.63	**6.2**	<1	5.21	1.63	44.63	**3.2**	<1
Magnesium	4 / 4	4 / 4	0.877	--	--	--	--	1.544	--	--	--	--
Manganese	4 / 4	4 / 4	0.024	179	377	<1	<1	0.017	179	377	<1	<1
Mercury (inorganic)	0 / 4	NA	0.803	0.45	0.9	**1.8**	<1	NC	0.45	0.9	--	--
Nickel	0 / 4	0 / 4	0.028	6.71	18.6	<1	<1	0.028	6.71	18.6	<1	<1
Potassium	4 / 4	4 / 4	1.133	--	--	--	--	1.689	--	--	--	--
Selenium	0 / 4	0 / 4	1.256	0.290	0.82	**4.3**	**1.5**	1.256	0.290	0.82	**4.3**	**1.5**
Silica	4 / 4	4 / 4	14.7	--	--	--	--	21.3	--	--	--	--
Silver	0 / 4	0 / 4	0.059	2.02	60.5	<1	<1	0.059	2.02	60.5	<1	<1
Sodium	4 / 4	4 / 4	1.644	--	--	--	--	3.41	--	--	--	--
Strontium	4 / 4	4 / 4	0.050	--	--	--	--	0.074	--	--	--	--
Thallium	0 / 4	0 / 4	14.9	--	--	--	--	14.9	--	--	--	--
Vanadium	0 / 4	0 / 4	0.005	0.344	1.7	<1	<1	0.005	0.344	1.7	<1	<1
Zinc	4 / 4	4 / 4	178	66.1	171	**2.7**	**1.0**	507	66.1	171	**7.7**	**3.0**

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NA- Not analyzed

NC- Not calculated

TRV - Toxicity Reference Value

HQ - Hazard Quotient, calculated by dividing the EDD by the TRV

-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 96.
Hazard Quotients for the Muskrat at Sample Location RG 4 - Maximum EPC

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario					Fall Exposure Scenario				
			Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ	Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ
Aluminum	4 / 4	4 / 4	171	1.93	19.3	**89**	**8.9**	27.9	1.93	19.3	**14**	**1.4**
Antimony	0 / 4	NA	1.256	0.059	2.76	**21**	<1	NC	0.059	2.76	--	--
Arsenic	0 / 4	0 / 4	0.251	1.04	4.55	<1	<1	0.251	1.04	4.55	<1	<1
Beryllium	0 / 4	0 / 4	0.024	0.532	0.67	<1	<1	0.024	0.532	0.67	<1	<1
Cadmium	0 / 4	3 / 4	0.133	0.770	6.87	<1	<1	0.205	0.770	6.87	<1	<1
Calcium	4 / 4	4 / 4	7.114	--	--	--	--	13.15	--	--	--	--
Chromium	0 / 4	4 / 4	3.75	2.40	58.17	**1.6**	<1	6.57	2.40	58.17	**2.7**	<1
Copper	0 / 4	0 / 4	0.462	5.60	82.7	<1	<1	0.462	5.60	82.7	<1	<1
Iron	4 / 4	4 / 4	0.651	--	--	--	--	0.272	--	--	--	--
Lead	4 / 4	4 / 4	1.650	4.70	186.4	<1	<1	0.883	4.70	186.4	<1	<1
Magnesium	4 / 4	4 / 4	1.256	--	--	--	--	2.157	--	--	--	--
Manganese	4 / 4	4 / 4	0.035	51.4	146	<1	<1	0.025	51.4	146	<1	<1
Mercury (Inorganic)	0 / 4	NA	0.842	1.00	--	<1	--	NC	1	--	--	--
Nickel	0 / 4	0 / 4	0.054	1.70	14.77	<1	<1	0.054	1.70	14.77	<1	<1
Potassium	4 / 4	4 / 4	1.644	--	--	--	--	2.367	--	--	--	--
Selenium	0 / 4	0 / 4	1.571	0.143	0.66	**11**	**2.4**	1.571	0.143	0.66	**11**	**2.4**
Silica	4 / 4	4 / 4	20.91	--	--	--	--	29.85	--	--	--	--
Silver	0 / 4	0 / 4	1.819	6.02	119	<1	<1	1.819	6.02	119	<1	<1
Sodium	4 / 4	4 / 4	2.354	--	--	--	--	4.826	--	--	--	--
Strontium	4 / 4	4 / 4	0.071	263	--	<1	--	0.104	263	--	<1	--
Thallium	0 / 4	0 / 4	12.8	0.0074	0.074	**1723**	**172**	12.8	0.0074	0.074	**1723**	**172**
Vanadium	0 / 4	0 / 4	0.013	4.16	9.44	<1	<1	0.013	4.16	9.44	<1	<1
Zinc	4 / 4	4 / 4	37.8	75.4	298	<1	<1	105	75.4	298	**1.4**	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA- Not analyzed
NC- Not calculated

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 97.
Hazard Quotients for the Muskrat at Sample Location RG 4 - Average EPC

			Spring Exposure Scenario					Fall Exposure Scenario				
Analyte	**Spring Frequency of Detection**	**Fall Frequency of Detection**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**
Aluminum	4 / 4	4 / 4	157	1.93	19.3	**81**	**8.1**	26.1	1.93	19.3	**14**	**1.4**
Antimony	0 / 4	NA	0.628	0.059	2.76	**11**	<1	NC	0.059	2.76	--	--
Arsenic	0 / 4	0 / 4	0.126	1.04	4.55	<1	<1	0.126	1.04	4.55	<1	<1
Beryllium	0 / 4	0 / 4	0.012	0.532	0.67	<1	<1	0.012	0.532	0.67	<1	<1
Cadmium	0 / 4	3 / 4	0.067	0.770	6.87	<1	<1	0.153	0.770	6.87	<1	<1
Calcium	4 / 4	4 / 4	6.933	--	--	--	--	13.10	--	--	--	--
Chromium	0 / 4	4 / 4	1.874	2.40	58.17	<1	<1	6.40	2.40	58.17	**2.7**	<1
Copper	0 / 4	0 / 4	0.231	5.60	82.7	<1	<1	0.231	5.60	82.7	<1	<1
Iron	4 / 4	4 / 4	0.615	--	--	--	--	0.266	--	--	--	--
Lead	4 / 4	4 / 4	1.455	4.70	186.4	<1	<1	0.751	4.70	186.4	<1	<1
Magnesium	4 / 4	4 / 4	1.219	--	--	--	--	2.147	--	--	--	--
Manganese	4 / 4	4 / 4	0.034	51.4	146	<1	<1	0.024	51.4	146	<1	<1
Mercury (Inorganic)	0 / 4	NA	0.421	1.00	--	<1	--	NC	1	--	--	--
Nickel	0 / 4	0 / 4	0.027	1.70	14.77	<1	<1	0.027	1.70	14.77	<1	<1
Potassium	4 / 4	4 / 4	1.575	--	--	--	--	2.347	--	--	--	--
Selenium	0 / 4	0 / 4	0.785	0.143	0.66	**5.5**	**1.2**	0.785	0.143	0.66	**5.5**	**1.2**
Silica	4 / 4	4 / 4	20.42	--	--	--	--	29.62	--	--	--	--
Silver	0 / 4	0 / 4	0.909	6.02	119	<1	<1	0.909	6.02	119	<1	<1
Sodium	4 / 4	4 / 4	2.285	--	--	--	--	4.734	--	--	--	--
Strontium	4 / 4	4 / 4	0.069	263	--	<1	--	0.103	263	--	<1	--
Thallium	0 / 4	0 / 4	6.38	0.0074	0.074	**862**	**86**	6.38	0.0074	0.074	**862**	**86**
Vanadium	0 / 4	0 / 4	0.007	4.16	9.44	<1	<1	0.007	4.16	9.44	<1	<1
Zinc	4 / 4	4 / 4	36.1	75.4	298	<1	<1	103	75.4	298	**1.4**	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA- Not analyzed
NC- Not calculated

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 98.
Hazard Quotients for the Belted King Fisher at Sample Location RG 4 - Maximum EPC

			Spring Exposure Scenario					**Fall Exposure Scenario**				
Analyte	**Spring Frequency of Detection**	**Fall Frequency of Detection**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**
Aluminum	4 / 4	4 / 4	0.881	109.7	--	<1	--	0.143	109.7	--	<1	--
Antimony	0 / 4	NA	0.050	--	--	--	--	NC	--	--	--	--
Arsenic	0 / 4	0 / 4	0.143	2.24	4.51	<1	<1	0.143	2.24	4.51	<1	<1
Beryllium	0 / 4	0 / 4	0.016	--	--	--	--	0.016	--	--	--	--
Cadmium	0 / 4	3 / 4	0.227	1.47	6.35	<1	<1	0.348	1.47	6.35	<1	<1
Calcium	4 / 4	4 / 4	3.31	--	--	--	--	6.11	--	--	--	--
Chromium	0 / 4	4 / 4	0.024	2.66	15.6	<1	<1	0.042	2.66	15.6	<1	<1
Copper	0 / 4	0 / 4	0.888	4.05	34.87	<1	<1	0.888	4.05	34.87	<1	<1
Iron	4 / 4	4 / 4	0.302	--	--	--	--	0.126	--	--	--	--
Lead	4 / 4	4 / 4	0.0004	1.63	44.63	<1	<1	0.0002	1.63	44.63	<1	<1
Magnesium	4 / 4	4 / 4	0.584	--	--	--	--	1.002	--	--	--	--
Manganese	4 / 4	4 / 4	0.016	179	377	<1	<1	0.011	179	377	<1	<1
Mercury (Inorganic)	0 / 4	NA	0.177	0.45	0.9	<1	<1	NC	0.45	0.9	--	--
Nickel	0 / 4	0 / 4	0.098	6.71	18.6	<1	<1	0.098	6.71	18.6	<1	<1
Potassium	4 / 4	4 / 4	0.764	--	--	--	--	1.100	--	--	--	--
Selenium	0 / 4	0 / 4	0.162	0.290	0.82	<1	<1	0.162	0.290	0.82	<1	<1
Silica	4 / 4	4 / 4	9.71	--	--	--	--	13.9	--	--	--	--
Silver	0 / 4	0 / 4	0.022	2.02	60.5	<1	<1	0.022	2.02	60.5	<1	<1
Sodium	4 / 4	4 / 4	1.094	--	--	--	--	2.242	--	--	--	--
Strontium	4 / 4	4 / 4	0.033	--	--	--	--	0.048	--	--	--	--
Thallium	0 / 4	0 / 4	12.5	--	--	--	--	12.5	--	--	--	--
Vanadium	0 / 4	0 / 4	0.006	0.344	1.7	<1	<1	0.006	0.344	1.7	<1	<1
Zinc	4 / 4	4 / 4	52.6	66.1	171	<1	<1	146	66.1	171	**2.2**	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA- Not analyzed
NC- Not calculated

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 99.
Hazard Quotients for the Belted King Fisher at Sample Location RG 4 - Average EPC

			Spring Exposure Scenario					Fall Exposure Scenario				
Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ	Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ
Aluminum	4 / 4	4 / 4	0.806	109.7	--	<1	--	0.134	109.7	--	<1	--
Antimony	0 / 4	NA	0.025	--	--	--	--	NC	--	--	--	--
Arsenic	0 / 4	0 / 4	0.071	2.24	4.51	<1	<1	0.071	2.24	4.51	<1	<1
Beryllium	0 / 4	0 / 4	0.008	--	--	--	--	0.008	--	--	--	--
Cadmium	0 / 4	3 / 4	0.113	1.47	6.35	<1	<1	0.260	1.47	6.35	<1	<1
Calcium	4 / 4	4 / 4	3.22	--	--	--	--	6.09	--	--	--	--
Chromium	0 / 4	4 / 4	0.012	2.66	15.6	<1	<1	0.041	2.66	15.6	<1	<1
Copper	0 / 4	0 / 4	0.444	4.05	34.87	<1	<1	0.444	4.05	34.87	<1	<1
Iron	4 / 4	4 / 4	0.286	--	--	--	--	0.123	--	--	--	--
Lead	4 / 4	4 / 4	0.0004	1.63	44.63	<1	<1	0.0002	1.63	44.63	<1	<1
Magnesium	4 / 4	4 / 4	0.567	--	--	--	--	0.997	--	--	--	--
Manganese	4 / 4	4 / 4	0.016	179	377	<1	<1	0.011	179	377	<1	<1
Mercury (Inorganic)	0 / 4	NA	0.088	0.45	0.9	<1	<1	NC	0.45	0.9	--	--
Nickel	0 / 4	0 / 4	0.049	6.71	18.6	<1	<1	0.049	6.71	18.6	<1	<1
Potassium	4 / 4	4 / 4	0.732	--	--	--	--	1.091	--	--	--	--
Selenium	0 / 4	0 / 4	0.081	0.290	0.82	<1	<1	0.081	0.290	0.82	<1	<1
Silica	4 / 4	4 / 4	9.49	--	--	--	--	13.8	--	--	--	--
Silver	0 / 4	0 / 4	0.011	2.02	60.5	<1	<1	0.011	2.02	60.5	<1	<1
Sodium	4 / 4	4 / 4	1.062	--	--	--	--	2.200	--	--	--	--
Strontium	4 / 4	4 / 4	0.032	--	--	--	--	0.048	--	--	--	--
Thallium	0 / 4	0 / 4	6.25	--	--	--	--	6.25	--	--	--	--
Vanadium	0 / 4	0 / 4	0.003	0.344	1.7	<1	<1	0.003	0.344	1.7	<1	<1
Zinc	4 / 4	4 / 4	50.2	66.1	171	<1	<1	143	66.1	171	**2.2**	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA- Not analyzed
NC- Not concentrated

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 100.
Hazard Quotients for the Mallard at Sample Location RG 4 - Maximum EPC

			Spring Exposure Scenario					Fall Exposure Scenario				
Analyte	**Spring Frequency of Detection**	**Fall Frequency of Detection**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**
Aluminum	4 / 4	4 / 4	760	109.7	--	**6.9**	--	74.5	109.7	--	<1	--
Antimony	0 / 4	0 / 1	0.006	--	--	--	--	NC	--	--	--	--
Arsenic	0 / 4	0 / 4	0.057	2.24	4.51	<1	<1	0.142	2.24	4.51	<1	<1
Beryllium	0 / 4	0 / 4	0.007	--	--	--	--	0.014	--	--	--	--
Cadmium	0 / 4	3 / 4	0.536	1.47	6.35	<1	<1	0.504	1.47	6.35	<1	<1
Calcium	4 / 4	4 / 4	1.98	--	--	--	--	3.66	--	--	--	--
Chromium	2 / 4	4 / 4	2.33	2.66	15.6	<1	<1	5.03	2.66	15.6	**1.9**	<1
Copper	0 / 4	0 / 4	2.88	4.05	34.87	<1	<1	1.65	4.05	34.87	<1	<1
Iron	4 / 4	4 / 4	0.181	--	--	--	--	0.076	--	--	--	--
Lead	4 / 4	4 / 4	4.45	1.63	44.63	**2.7**	<1	1.59	1.63	44.63	<1	<1
Magnesium	4 / 4	4 / 4	0.350	--	--	--	--	0.600	--	--	--	--
Manganese	4 / 4	4 / 4	0.010	179	377	<1	<1	0.007	179	377	<1	<1
Mercury (Inorganic)	0 / 4	NA	0.626	0.45	0.9	**1.4**	<1	NC	0.45	0.9	--	--
Nickel	0 / 4	0 / 4	0.022	6.71	18.6	<1	<1	0.035	6.71	18.6	<1	<1
Potassium	4 / 4	4 / 4	0.458	--	--	--	--	0.659	--	--	--	--
Selenium	0 / 4	0 / 4	0.978	0.290	0.82	**3.4**	**1.2**	1.20	0.290	0.82	**4.2**	**1.5**
Silica	4 / 4	4 / 4	5.82	--	--	--	--	8.31	--	--	--	--
Silver	0 / 4	0 / 4	0.046	2.02	60.5	<1	<1	0.852	2.02	60.5	<1	<1
Sodium	4 / 4	4 / 4	0.655	--	--	--	--	1.34	--	--	--	--
Strontium	4 / 4	4 / 4	0.020	--	--	--	--	0.029	--	--	--	--
Thallium	0 / 4	0 / 4	11.6	--	--	--	--	11.6	--	--	--	--
Vanadium	0 / 4	0 / 4	0.004	0.344	1.7	<1	<1	0.004	0.344	1.7	<1	<1
Zinc	2 / 4	4 / 4	72.5	66.1	171	**1.1**	<1	149	66.1	171	**2.2**	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA-Not analyzed
NC- Not calculated
TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 101.
Hazard Quotients for the Mallard at Sample Location RG 4 - Average EPC

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario: Total EDD (mg/kg bw-day)	Spring: No Effect-based TRV	Spring: Effect-based TRV	Spring: No Effect-based HQ	Spring: Effect-based HQ	Fall Exposure Scenario: Total EDD (mg/kg bw-day)	Fall: No Effect-based TRV	Fall: Effect-based TRV	Fall: No Effect-based HQ	Fall: Effect-based HQ
Aluminum	4 / 4	4 / 4	695	109.7	--	**6.3**	--	69.7	109.7	--	<1	--
Antimony	0 / 4	NA	0.003	--	--	--	--	NC	--	--	--	--
Arsenic	0 / 4	0 / 4	0.028	2.24	4.51	<1	<1	0.071	2.24	4.51	<1	<1
Beryllium	0 / 4	0 / 4	0.004	--	--	--	--	0.007	--	--	--	--
Cadmium	0 / 4	3 / 4	0.268	1.47	6.35	<1	<1	0.377	1.47	6.35	<1	<1
Calcium	4 / 4	4 / 4	1.93	--	--	--	--	3.65	--	--	--	--
Chromium	0 / 4	4 / 4	1.16	2.66	15.6	<1	<1	4.90	2.66	15.6	**1.8**	<1
Copper	0 / 4	0 / 4	1.44	4.05	34.87	<1	<1	0.825	4.05	34.87	<1	<1
Iron	4 / 4	4 / 4	0.171	--	--	--	--	0.074	--	--	--	--
Lead	4 / 4	4 / 4	3.93	1.63	44.63	**2.4**	<1	1.36	1.63	44.63	<1	<1
Magnesium	4 / 4	4 / 4	0.339	--	--	--	--	0.597	--	--	--	--
Manganese	4 / 4	4 / 4	0.009	179	377	<1	<1	0.007	179	377	<1	<1
Mercury (Inorganic)	0 / 4	NA	0.313	0.45	0.9	<1	<1	NC	0.45	0.9	--	--
Nickel	0 / 4	0 / 4	0.011	6.71	18.6	<1	<1	0.017	6.71	18.6	<1	<1
Potassium	4 / 4	4 / 4	0.438	--	--	--	--	0.653	--	--	--	--
Selenium	0 / 4	0 / 4	0.489	0.290	0.82	**1.7**	<1	0.602	0.290	0.82	**2.1**	<1
Silica	4 / 4	4 / 4	5.68	--	--	--	--	8.24	--	--	--	--
Silver	0 / 4	0 / 4	0.023	2.02	60.5	<1	<1	0.426	2.02	60.5	<1	<1
Sodium	4 / 4	4 / 4	0.636	--	--	--	--	1.32	--	--	--	--
Strontium	4 / 4	4 / 4	0.019	--	--	--	--	0.029	--	--	--	--
Thallium	0 / 4	0 / 4	5.81	--	--	--	--	5.81	--	--	--	--
Vanadium	0 / 4	0 / 4	0.002	0.344	1.7	<1	<1	0.002	0.344	1.7	<1	<1
Zinc	4 / 4	4 / 4	69.2	66.1	171	**1.0**	<1	146	66.1	171	**2.2**	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA- Not analyzed
NC- Not calculated

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 102.
Hazard Quotients for the American Dipper at Sample Location RG 8 - Maximum EPC

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario: Spring Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ	Fall Exposure Scenario: Fall Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ
Aluminum	4 / 4	4 / 4	1932	109.7	--	**18**	--	322	109.7	--	**2.9**	--
Antimony	0 / 4	NA	0.014	--	--	--	--	NC	--	--	--	--
Arsenic	0 / 4	0 / 4	0.146	2.24	4.51	<1	<1	0.146	2.24	4.51	<1	<1
Beryllium	0 / 4	0 / 4	0.018	--	--	--	--	0.018	--	--	--	--
Cadmium	0 / 4	3 / 4	1.378	1.47	6.35	<1	<1	2.154	1.47	6.35	**1.5**	<1
Calcium	4 / 4	4 / 4	5.36	--	--	--	--	9.93	--	--	--	--
Chromium	1 / 4	4 / 4	6.38	2.66	15.6	**2.4**	<1	10.9	2.66	15.6	**4.1**	<1
Copper	0 / 4	0 / 4	7.40	4.05	34.87	**1.8**	<1	7.40	4.05	34.87	**1.8**	<1
Iron	4 / 4	4 / 4	0.461	--	--	--	--	0.190	--	--	--	--
Lead	4 / 4	4 / 4	11.7	1.63	44.63	**7.2**	<1	6.44	1.63	44.63	**4.0**	<1
Magnesium	4 / 4	4 / 4	0.921	--	--	--	--	1.533	--	--	--	--
Manganese	4 / 4	4 / 4	0.026	179	377	<1	<1	0.016	179	377	<1	<1
Mercury (Inorganic)	0 / 4	NA	1.607	0.45	0.9	**3.6**	**1.8**	NC	0.45	0.9	--	--
Nickel	0 / 4	0 / 4	0.056	6.71	18.6	<1	<1	0.056	6.71	18.6	<1	<1
Potassium	4 / 4	4 / 4	1.201	--	--	--	--	1.693	--	--	--	--
Selenium	0 / 4	0 / 4	2.512	0.290	0.82	**8.7**	**3.1**	2.512	0.290	0.82	**8.7**	**3.1**
Silica	4 / 4	4 / 4	15.4	--	--	--	--	21.7	--	--	--	--
Silver	0 / 4	0 / 4	0.119	2.02	60.5	<1	<1	0.119	2.02	60.5	<1	<1
Sodium	4 / 4	4 / 4	1.760	--	--	--	--	3.45	--	--	--	--
Strontium	4 / 4	4 / 4	0.052	--	--	--	--	0.074	--	--	--	--
Thallium	0 / 4	0 / 4	29.9	--	--	--	--	29.9	--	--	--	--
Vanadium	0 / 4	0 / 4	0.009	0.344	1.7	<1	<1	0.009	0.344	1.7	<1	<1
Zinc	4 / 4	4 / 4	187	66.1	171	**2.8**	**1.1**	528	66.1	171	**8.0**	**3.1**

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA- Not analyzed
NC - Not calculated

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 103.
Hazard Quotients for the American Dipper at Sample Location RG 8 - Average EPC

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario					Fall Exposure Scenario				
			Spring Total EDD (mg/kg bw-day)	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**	**Fall Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**
Aluminum	4 / 4	4 / 4	1777	109.7	--	**16**	--	280	109.7	--	**2.6**	--
Antimony	0 / 4	NA	0.007	--	--	--	--	NC	--	--	--	--
Arsenic	0 / 4	0 / 4	0.073	2.24	4.51	<1	<1	0.073	2.24	4.51	<1	<1
Beryllium	0 / 4	0 / 4	0.009	--	--	--	--	0.009	--	--	--	--
Cadmium	0 / 4	3 / 4	0.689	1.47	6.35	<1	<1	1.413	1.47	6.35	<1	<1
Calcium	4 / 4	4 / 4	5.09	--	--	--	--	9.89	--	--	--	--
Chromium	1 / 4	4 / 4	3.83	2.66	15.6	**1.4**	<1	10.4	2.66	15.6	**3.9**	<1
Copper	0 / 4	0 / 4	3.70	4.05	34.87	<1	<1	3.70	4.05	34.87	<1	<1
Iron	4 / 4	4 / 4	0.436	--	--	--	--	0.180	--	--	--	--
Lead	4 / 4	4 / 4	10.6	1.63	44.63	**6.5**	<1	5.70	1.63	44.63	**3.5**	<1
Magnesium	4 / 4	4 / 4	0.877	--	--	--	--	1.521	--	--	--	--
Manganese	4 / 4	4 / 4	0.024	179	377	<1	<1	0.015	179	377	<1	<1
Mercury (Inorganic)	0 / 4	NA	0.803	0.45	0.9	**1.8**	<1	NC	0.45	0.9	--	--
Nickel	0 / 4	0 / 4	0.028	6.71	18.6	<1	<1	0.028	6.71	18.6	<1	<1
Potassium	4 / 4	4 / 4	1.154	--	--	--	--	1.682	--	--	--	--
Selenium	0 / 4	0 / 4	1.256	0.290	0.82	**4.3**	**1.5**	1.256	0.290	0.82	**4.3**	**1.5**
Silica	4 / 4	4 / 4	14.9	--	--	--	--	21.5	--	--	--	--
Silver	0 / 4	0 / 4	0.059	2.02	60.5	<1	<1	0.059	2.02	60.5	<1	<1
Sodium	4 / 4	4 / 4	1.689	--	--	--	--	3.42	--	--	--	--
Strontium	4 / 4	4 / 4	0.050	--	--	--	--	0.073	--	--	--	--
Thallium	0 / 4	0 / 4	14.9	--	--	--	--	14.9	--	--	--	--
Vanadium	0 / 4	0 / 4	0.005	0.344	1.7	<1	<1	0.005	0.344	1.7	<1	<1
Zinc	4 / 4	4 / 4	180	66.1	171	**2.7**	**1.1**	522	66.1	171	**7.9**	**3.1**

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA- Not analyzed
NC - Not calculated

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 104.
Hazard Quotients for the Muskrat at Sample Location RG 8 - Maximum EPC

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario					Fall Exposure Scenario				
			Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ	Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ
Aluminum	4 / 4	4 / 4	170	1.93	19.3	**88**	**8.8**	28.3	1.93	19.3	**15**	**1.5**
Antimony	0 / 4	NA	1.256	0.059	2.76	**21**	<1	NC	0.059	2.76	--	--
Arsenic	0 / 4	0 / 4	0.251	1.04	4.55	<1	<1	0.251	1.04	4.55	<1	<1
Beryllium	0 / 4	0 / 4	0.024	0.532	0.67	<1	<1	0.024	0.532	0.67	<1	<1
Cadmium	0 / 4	3 / 4	0.133	0.770	6.87	<1	<1	0.209	0.770	6.87	<1	<1
Calcium	4 / 4	4 / 4	7.456	--	--	--	--	13.81	--	--	--	--
Chromium	1 / 4	4 / 4	4.00	2.40	58.17	**1.7**	<1	6.82	2.40	58.17	**2.8**	<1
Copper	0 / 4	0 / 4	0.462	5.60	82.7	<1	<1	0.462	5.60	82.7	<1	<1
Iron	4 / 4	4 / 4	0.640	--	--	--	--	0.264	--	--	--	--
Lead	4 / 4	4 / 4	1.685	4.70	186.4	<1	<1	0.930	4.70	186.4	<1	<1
Magnesium	4 / 4	4 / 4	1.281	--	--	--	--	2.130	--	--	--	--
Manganese	4 / 4	4 / 4	0.036	51.4	146	<1	<1	0.022	51.4	146	<1	<1
Mercury (Inorganic)	0 / 4	NA	0.842	1.00	--	<1	--	NC	1	--	--	--
Nickel	0 / 4	0 / 4	0.054	1.70	14.77	<1	<1	0.054	1.70	14.77	<1	<1
Potassium	4 / 4	4 / 4	1.670	--	--	--	--	2.354	--	--	--	--
Selenium	0 / 4	0 / 4	1.571	0.143	0.66	**11**	**2.4**	1.571	0.143	0.66	**11**	**2.4**
Silica	4 / 4	4 / 4	21.43	--	--	--	--	30.1	--	--	--	--
Silver	0 / 4	0 / 4	1.819	6.02	119	<1	<1	1.819	6.02	119	<1	<1
Sodium	4 / 4	4 / 4	2.446	--	--	--	--	4.800	--	--	--	--
Strontium	4 / 4	4 / 4	0.072	263	--	<1	--	0.103	263	--	<1	--
Thallium	0 / 4	0 / 4	12.8	0.0074	0.074	**1723**	**172**	12.8	0.0074	0.074	**1723**	**172**
Vanadium	0 / 4	0 / 4	0.013	4.16	9.44	<1	<1	0.013	4.16	9.44	<1	<1
Zinc	4 / 4	4 / 4	38.0	75.4	298	<1	<1	107	75.4	298	**1.4**	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA- Not analyzed
NC- Not calculated
TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 105.
Hazard Quotients for the Muskrat at Sample Location RG 8 - Average EPC

			Spring Exposure Scenario					Fall Exposure Scenario				
Analyte	**Spring Frequency of Detection**	**Fall Frequency of Detection**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**
Aluminum	4 / 4	4 / 4	156	1.93	19.3	**81**	**8.1**	24.6	1.93	19.3	**13**	**1.3**
Antimony	0 / 4	NA	0.628	0.059	2.76	**10.6**	<1	NC	0.059	2.76	--	--
Arsenic	0 / 4	0 / 4	0.126	1.04	4.55	<1	<1	0.126	1.04	4.55	<1	<1
Beryllium	0 / 4	0 / 4	0.012	0.532	0.67	<1	<1	0.012	0.532	0.67	<1	<1
Cadmium	0 / 4	3 / 4	0.067	0.770	6.87	<1	<1	0.137	0.770	6.87	<1	<1
Calcium	4 / 4	4 / 4	7.071	--	--	--	--	13.74	--	--	--	--
Chromium	1 / 4	4 / 4	2.406	2.40	58.17	**1.0**	<1	6.55	2.40	58.17	**2.7**	<1
Copper	0 / 4	0 / 4	0.231	5.60	82.7	<1	<1	0.231	5.60	82.7	<1	<1
Iron	4 / 4	4 / 4	0.606	--	--	--	--	0.251	--	--	--	--
Lead	4 / 4	4 / 4	1.535	4.70	186.4	<1	<1	0.822	4.70	186.4	<1	<1
Magnesium	4 / 4	4 / 4	1.219	--	--	--	--	2.114	--	--	--	--
Manganese	4 / 4	4 / 4	0.033	51.4	146	<1	<1	0.021	51.4	146	<1	<1
Mercury (Inorganic)	0 / 4	NA	0.421	1.00	--	<1	--	NC	1	--	--	--
Nickel	0 / 4	0 / 4	0.027	1.70	14.77	<1	<1	0.027	1.70	14.77	<1	<1
Potassium	4 / 4	4 / 4	1.604	--	--	--	--	2.337	--	--	--	--
Selenium	0 / 4	0 / 4	0.785	0.143	0.66	**5.5**	**1.2**	0.785	0.143	0.66	**5.5**	**1.2**
Silica	4 / 4	4 / 4	20.78	--	--	--	--	29.92	--	--	--	--
Silver	0 / 4	0 / 4	0.909	6.02	119	<1	<1	0.909	6.02	119	<1	<1
Sodium	4 / 4	4 / 4	2.347	--	--	--	--	4.757	--	--	--	--
Strontium	4 / 4	4 / 4	0.070	263	--	<1	--	0.102	263	--	<1	--
Thallium	0 / 4	0 / 4	6.38	0.0074	0.074	**862**	**86**	6.38	0.0074	0.074	**862**	**86**
Vanadium	0 / 4	0 / 4	0.007	4.16	9.44	<1	<1	0.007	4.16	9.44	<1	<1
Zinc	4 / 4	4 / 4	36.5	75.4	298	<1	<1	106	75.4	298	**1.4**	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA- Not analyzed
NC-Not calculated
TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 106.
Hazard Quotients for the Belted King Fisher at Sample Location RG 8 - Maximum EPC

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario					Fall Exposure Scenario				
			Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ	Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ
Aluminum	4 / 4	4 / 4	0.872	109.7	--	<1	--	0.145	109.7	--	<1	--
Antimony	0 / 4	NA	0.050	--	--	--	--	NC	--	--	--	--
Arsenic	0 / 4	0 / 4	0.143	2.24	4.51	<1	<1	0.143	2.24	4.51	<1	<1
Beryllium	0 / 4	0 / 4	0.016	--	--	--	--	0.016	--	--	--	--
Cadmium	0 / 4	3 / 4	0.227	1.47	6.35	<1	<1	0.355	1.47	6.35	<1	<1
Calcium	4 / 4	4 / 4	3.46	--	--	--	--	6.42	--	--	--	--
Chromium	1 / 4	4 / 4	0.026	2.66	15.6	<1	<1	0.044	2.66	15.6	<1	<1
Copper	0 / 4	0 / 4	0.888	4.05	34.87	<1	<1	0.888	4.05	34.87	<1	<1
Iron	4 / 4	4 / 4	0.298	--	--	--	--	0.123	--	--	--	--
Lead	4 / 4	4 / 4	0.0005	1.63	44.63	<1	<1	0.0002	1.63	44.63	<1	<1
Magnesium	4 / 4	4 / 4	0.595	--	--	--	--	0.990	--	--	--	--
Manganese	4 / 4	4 / 4	0.017	179	377	<1	<1	0.010	179	377	<1	<1
Mercury (Inorganic)	0 / 4	NA	0.177	0.45	0.9	<1	<1	NC	0.45	0.9	--	--
Nickel	0 / 4	0 / 4	0.098	6.71	18.6	<1	<1	0.098	6.71	18.6	<1	<1
Potassium	4 / 4	4 / 4	0.776	--	--	--	--	1.094	--	--	--	--
Selenium	0 / 4	0 / 4	0.162	0.290	0.82	<1	<1	0.162	0.290	0.82	<1	<1
Silica	4 / 4	4 / 4	9.96	--	--	--	--	14.0	--	--	--	--
Silver	0 / 4	0 / 4	0.022	2.02	60.5	<1	<1	0.022	2.02	60.5	<1	<1
Sodium	4 / 4	4 / 4	1.136	--	--	--	--	2.230	--	--	--	--
Strontium	4 / 4	4 / 4	0.033	--	--	--	--	0.048	--	--	--	--
Thallium	0 / 4	0 / 4	12.5	--	--	--	--	12.5	--	--	--	--
Vanadium	0 / 4	0 / 4	0.006	0.344	1.7	<1	<1	0.006	0.344	1.7	<1	<1
Zinc	4 / 4	4 / 4	52.8	66.1	171	<1	<1	149	66.1	171	**2.3**	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA- Not analyzed
NC- Not calculated

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 107.
Hazard Quotients for the Belted King Fisher at Sample Location RG 8 - Average EPC

			Spring Exposure Scenario					Fall Exposure Scenario				
Analyte	**Spring Frequency of Detection**	**Fall Frequency of Detection**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**
Aluminum	4 / 4	4 / 4	0.802	109.7	--	<1	--	0.126	109.7	--	<1	--
Antimony	0 / 4	NA	0.025	--	--	--	--	NC	--	--	--	--
Arsenic	0 / 4	0 / 4	0.071	2.24	4.51	<1	<1	0.071	2.24	4.51	<1	<1
Beryllium	0 / 4	0 / 4	0.008	--	--	--	--	0.008	--	--	--	--
Cadmium	0 / 4	3 / 4	0.113	1.47	6.35	<1	<1	0.233	1.47	6.35	<1	<1
Calcium	4 / 4	4 / 4	3.29	--	--	--	--	6.38	--	--	--	--
Chromium	1 / 4	4 / 4	0.015	2.66	15.6	<1	<1	0.04	2.66	15.6	<1	<1
Copper	0 / 4	0 / 4	0.444	4.05	34.87	<1	<1	0.444	4.05	34.87	<1	<1
Iron	4 / 4	4 / 4	0.282	--	--	--	--	0.117	--	--	--	--
Lead	4 / 4	4 / 4	0.0004	1.63	44.63	<1	<1	0.0002	1.63	44.63	<1	<1
Magnesium	4 / 4	4 / 4	0.566	--	--	--	--	0.982	--	--	--	--
Manganese	4 / 4	4 / 4	0.016	179	377	<1	<1	0.010	179	377	<1	<1
Mercury (Inorganic)	0 / 4	NA	0.088	0.45	0.9	<1	<1	NC	0.45	0.9	--	--
Nickel	0 / 4	0 / 4	0.049	6.71	18.6	<1	<1	0.049	6.71	18.6	<1	<1
Potassium	4 / 4	4 / 4	0.745	--	--	--	--	1.086	--	--	--	--
Selenium	0 / 4	0 / 4	0.081	0.290	0.82	<1	<1	0.081	0.290	0.82	<1	<1
Silica	4 / 4	4 / 4	9.65	--	--	--	--	13.9	--	--	--	--
Silver	0 / 4	0 / 4	0.011	2.02	60.5	<1	<1	0.011	2.02	60.5	<1	<1
Sodium	4 / 4	4 / 4	1.091	--	--	--	--	2.210	--	--	--	--
Strontium	4 / 4	4 / 4	0.032	--	--	--	--	0.047	--	--	--	--
Thallium	0 / 4	0 / 4	6.25	--	--	--	--	6.25	--	--	--	--
Vanadium	0 / 4	0 / 4	0.003	0.344	1.7	<1	<1	0.003	0.344	1.7	<1	<1
Zinc	4 / 4	4 / 4	50.8	66.1	171	<1	<1	147	66.1	171	**2.2**	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA- Not analyzed
NC- Not calculated
TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 108.
Hazard Quotients for the Mallard at Sample Location RG 8 - Maximum EPC

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario: Total EDD (mg/kg bw-day)	Spring: No Effect-based TRV	Spring: Effect-based TRV	Spring: No Effect-based HQ	Spring: Effect-based HQ	Fall Exposure Scenario: Total EDD (mg/kg bw-day)	Fall: No Effect-based TRV	Fall: Effect-based TRV	Fall: No Effect-based HQ	Fall: Effect-based HQ
Aluminum	4 / 4	4 / 4	753	109.7	--	**6.9**	--	75.6	109.7	--	<1	--
Antimony	0 / 4	NA	0.006	--	--	--	--	NC	--	--	--	--
Arsenic	0 / 4	0 / 4	0.057	2.24	4.51	<1	<1	0.142	2.24	4.51	<1	<1
Beryllium	0 / 4	0 / 4	0.007	--	--	--	--	0.014	--	--	--	--
Cadmium	0 / 4	3 / 4	0.536	1.47	6.35	<1	<1	0.51	1.47	6.35	<1	<1
Calcium	4 / 4	4 / 4	2.075	--	--	--	--	3.84	--	--	--	--
Chromium	1 / 4	4 / 4	2.483	2.66	15.6	<1	<1	5.22	2.66	15.6	**2.0**	<1
Copper	0 / 4	0 / 4	2.882	4.05	34.87	<1	<1	1.65	4.05	34.87	<1	<1
Iron	4 / 4	4 / 4	0.178	--	--	--	--	0.074	--	--	--	--
Lead	4 / 4	4 / 4	4.55	1.63	44.63	**2.8**	<1	1.68	1.63	44.63	**1.0**	<1
Magnesium	4 / 4	4 / 4	0.356	--	--	--	--	0.593	--	--	--	--
Manganese	4 / 4	4 / 4	0.010	179	377	<1	<1	0.006	179	377	<1	<1
Mercury (Inorganic)	0 / 4	NA	0.626	0.45	0.9	**1.4**	<1	NC	0.45	0.9	--	--
Nickel	0 / 4	0 / 4	0.022	6.71	18.6	<1	<1	0.035	6.71	18.6	<1	<1
Potassium	4 / 4	4 / 4	0.465	--	--	--	--	0.655	--	--	--	--
Selenium	0 / 4	0 / 4	0.978	0.290	0.82	**3.4**	**1.2**	1.20	0.290	0.82	**4.2**	**1.5**
Silica	4 / 4	4 / 4	5.97	--	--	--	--	8.38	--	--	--	--
Silver	0 / 4	0 / 4	0.046	2.02	60.5	<1	<1	0.852	2.02	60.5	<1	<1
Sodium	4 / 4	4 / 4	0.681	--	--	--	--	1.34	--	--	--	--
Strontium	4 / 4	4 / 4	0.020	--	--	--	--	0.029	--	--	--	--
Thallium	0 / 4	0 / 4	11.6	--	--	--	--	11.6	--	--	--	--
Vanadium	0 / 4	0 / 4	0.004	0.344	1.7	<1	<1	0.004	0.344	1.7	<1	<1
Zinc	4 / 4	4 / 4	72.8	66.1	171	**1.1**	<1	152	66.1	171	**2.3**	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA - Not analyzed
NC- Not calculated

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 109.
Hazard Quotients for the Mallard at Sample Location RG 8 - Average EPC

			Spring Exposure Scenario					Fall Exposure Scenario				
Analyte	**Spring Frequency of Detection**	**Fall Frequency of Detection**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**
Aluminum	4 / 4	4 / 4	692	109.7	--	**6.3**	--	65.7	109.7	--	<1	--
Antimony	0 / 4	NA	0.003	--	--	--	--	NC	--	--	--	--
Arsenic	0 / 4	0 / 4	0.028	2.24	4.51	<1	<1	0.071	2.24	4.51	<1	<1
Beryllium	0 / 4	0 / 4	0.004	--	--	--	--	0.007	--	--	--	--
Cadmium	0 / 4	3 / 4	0.268	1.47	6.35	<1	<1	0.337	1.47	6.35	<1	<1
Calcium	4 / 4	4 / 4	1.968	--	--	--	--	3.82	--	--	--	--
Chromium	1 / 4	4 / 4	1.493	2.66	15.6	<1	<1	5.02	2.66	15.6	**1.9**	<1
Copper	0 / 4	0 / 4	1.441	4.05	34.87	<1	<1	0.825	4.05	34.87	<1	<1
Iron	4 / 4	4 / 4	0.169	--	--	--	--	0.070	--	--	--	--
Lead	4 / 4	4 / 4	4.14	1.63	44.63	**2.5**	<1	1.48	1.63	44.63	<1	<1
Magnesium	4 / 4	4 / 4	0.339	--	--	--	--	0.588	--	--	--	--
Manganese	4 / 4	4 / 4	0.009	179	377	<1	<1	0.006	179	377	<1	<1
Mercury (Inorganic)	0 / 4	NA	0.313	0.45	0.9	<1	<1	NC	0.45	0.9	--	--
Nickel	0 / 4	0 / 4	0.011	6.71	18.6	<1	<1	0.017	6.71	18.6	<1	<1
Potassium	4 / 4	4 / 4	0.447	--	--	--	--	0.65	--	--	--	--
Selenium	0 / 4	0 / 4	0.489	0.290	0.82	**1.7**	<1	0.60	0.290	0.82	**2.1**	<1
Silica	4 / 4	4 / 4	5.78	--	--	--	--	8.33	--	--	--	--
Silver	0 / 4	0 / 4	0.023	2.02	60.5	<1	<1	0.426	2.02	60.5	<1	<1
Sodium	4 / 4	4 / 4	0.653	--	--	--	--	1.32	--	--	--	--
Strontium	4 / 4	4 / 4	0.019	--	--	--	--	0.028	--	--	--	--
Thallium	0 / 4	0 / 4	5.81	--	--	--	--	5.81	--	--	--	--
Vanadium	0 / 4	0 / 4	0.002	0.344	1.7	<1	<1	0.002	0.344	1.7	<1	<1
Zinc	4 / 4	4 / 4	70.0	66.1	171	**1.1**	<1	150	66.1	171	**2.3**	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA- Not analyzed
NC - Not calculated

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 110.
Hazard Quotients for the American Dipper at Sample Location RG 9 - Maximum EPC

			Spring Exposure Scenario					Fall Exposure Scenario				
Analyte	**Spring Frequency of Detection**	**Fall Frequency of Detection**	**Spring Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**	**Fall Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**
Aluminum	4 / 4	4 / 4	2133	109.7	--	**19**	--	757	109.7	--	**6.9**	--
Antimony	0 / 4	0 / 1	0.014	--	--	--	--	0.007	--	--	--	--
Arsenic	0 / 4	0 / 4	0.146	2.24	4.51	<1	<1	0.146	2.24	4.51	<1	<1
Beryllium	0 / 4	0 / 4	0.018	--	--	--	--	0.018	--	--	--	--
Cadmium	0 / 4	3 / 4	1.378	1.47	6.35	<1	<1	2.948	1.47	6.35	**2.0**	<1
Calcium	4 / 4	4 / 4	5.31	--	--	--	--	10.2	--	--	--	--
Chromium	0 / 4	4 / 4	5.97	2.66	15.6	**2.2**	<1	11.3	2.66	15.6	**4.3**	<1
Copper	0 / 4	0.0 / 4	7.40	4.05	34.87	**1.8**	<1	7.40	4.05	34.87	**1.8**	<1
Iron	4 / 4	4 / 4	0.474	--	--	--	--	0.273	--	--	--	--
Lead	4 / 4	4 / 4	13.6	1.63	44.63	**8.4**	<1	5.88	1.63	44.63	**3.6**	<1
Magnesium	4 / 4	4 / 4	0.916	--	--	--	--	1.542	--	--	--	--
Manganese	4 / 4	4 / 4	0.026	179	377	<1	<1	0.019	179	377	<1	<1
Mercury (Inorganic)	0 / 4	NA	1.607	0.45	0.9	**3.6**	**1.8**	NC	0.45	0.9	--	--
Nickel	0 / 4	0 / 4	0.056	6.71	18.6	<1	<1	0.056	6.71	18.6	<1	<1
Potassium	4 / 4	4 / 4	1.249	--	--	--	--	1.712	--	--	--	--
Selenium	0 / 4	0 / 4	2.512	0.29	0.82	**8.7**	**3.1**	2.512	0.290	0.82	**8.7**	**3.1**
Silica	4 / 4	4 / 4	15.8	--	--	--	--	21.8	--	--	--	--
Silver	0 / 4	0 / 4	0.119	2.02	60.5	<1	<1	0.119	2.02	60.5	<1	<1
Sodium	4 / 4	4 / 4	1.807	--	--	--	--	3.51	--	--	--	--
Strontium	4 / 4	4 / 4	0.052	--	--	--	--	0.077	--	--	--	--
Thallium	0 / 4	0 / 4	29.9	--	--	--	--	29.9	--	--	--	--
Vanadium	0 / 4	0 / 4	0.009	0.344	1.7	<1	<1	0.009	0.344	1.7	<1	<1
Zinc	4 / 4	4 / 4	192	66.1	171	**2.9**	**1.1**	499	66.1	171	**7.6**	**2.9**

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA- Not analyzed
NC - Not calculated

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 111.
Hazard Quotients for the American Dipper at Sample Location RG 9 - Average EPC

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario: Spring Total EDD (mg/kg bw-day)	Spring Exposure Scenario: No Effect-based TRV	Spring Exposure Scenario: Effect-based TRV	Spring Exposure Scenario: No Effect-based HQ	Spring Exposure Scenario: Effect-based HQ	Fall Exposure Scenario: Fall Total EDD (mg/kg bw-day)	Fall Exposure Scenario: No Effect-based TRV	Fall Exposure Scenario: Effect-based TRV	Fall Exposure Scenario: No Effect-based HQ	Fall Exposure Scenario: Effect-based HQ
Aluminum	4 / 4	4 / 4	1916	109.7	--	**17**	--	398	109.7	--	**3.6**	--
Antimony	0 / 4	0 / 1	0.007	--	--	--	--	0.007	--	--	--	--
Arsenic	0 / 4	0 / 4	0.073	2.24	4.51	<1	<1	0.073	2.24	4.51	<1	<1
Beryllium	0 / 4	0 / 4	0.009	--	--	--	--	0.009	--	--	--	--
Cadmium	0 / 4	3 / 4	0.689	1.47	6.35	<1	<1	1.742	1.47	6.35	**1.2**	<1
Calcium	4 / 4	4 / 4	5.25	--	--	--	--	9.96	--	--	--	--
Chromium	0 / 4	4 / 4	2.985	2.66	15.6	**1.1**	<1	9.83	2.66	15.6	**3.7**	<1
Copper	0 / 4	0 / 4	3.70	4.05	34.87	<1	<1	3.70	4.05	34.87	<1	<1
Iron	4 / 4	4 / 4	0.452	--	--	--	--	0.200	--	--	--	--
Lead	4 / 4	4 / 4	12.4	1.63	44.63	**7.6**	<1	5.33	1.63	44.63	**3.3**	<1
Magnesium	4 / 4	4 / 4	0.903	--	--	--	--	1.518	--	--	--	--
Manganese	4 / 4	4 / 4	0.025	179	377	<1	<1	0.015	179	377	<1	<1
Mercury (Inorganic)	0 / 4	NA	0.803	0.45	0.9	**1.8**	<1	NC	0.45	0.9	--	--
Nickel	0 / 4	0 / 4	0.028	6.71	18.6	<1	<1	0.028	6.71	18.6	<1	<1
Potassium	4 / 4	4 / 4	1.197	--	--	--	--	1.684	--	--	--	--
Selenium	0 / 4	0 / 4	1.256	0.290	0.82	**4.3**	**1.5**	1.256	0.290	0.82	**4.3**	**1.5**
Silica	4 / 4	4 / 4	15.4	--	--	--	--	21.5	--	--	--	--
Silver	0 / 4	0 / 4	0.059	2.02	60.5	<1	<1	0.059	2.02	60.5	<1	<1
Sodium	4 / 4	4 / 4	1.752	--	--	--	--	3.44	--	--	--	--
Strontium	4 / 4	4 / 4	0.051	--	--	--	--	0.074	--	--	--	--
Thallium	0 / 4	0 / 4	14.9	--	--	--	--	14.9	--	--	--	--
Vanadium	0 / 4	0 / 4	0.005	0.344	1.7	<1	<1	0.005	0.344	1.7	<1	<1
Zinc	4 / 4	4 / 4	186	66.1	171	**2.8**	**1.1**	495	66.1	171	**7.5**	**2.9**

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA- Not analyzed
NC - Not calculated

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 112.
Hazard Quotients for the Muskrat at Sample Location RG 9 - Maximum EPC

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario					Fall Exposure Scenario				
			Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ	Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ
Aluminum	4 / 4	4 / 4	187	1.93	19.3	**97**	**9.7**	66.5	1.93	19.3	**34**	**3.4**
Antimony	0 / 4	0 / 1	1.256	0.059	2.76	**21**	<1	1.256	0.059	2.76	**21**	<1
Arsenic	0 / 4	0 / 4	0.251	1.04	4.55	<1	<1	0.251	1.04	4.55	<1	<1
Beryllium	0 / 4	0 / 4	0.024	0.532	0.67	<1	<1	0.024	0.532	0.67	<1	<1
Cadmium	0 / 4	3 / 4	0.133	0.770	6.87	<1	<1	0.286	0.770	6.87	<1	<1
Calcium	4 / 4	4 / 4	7.377	--	--	--	--	14.20	--	--	--	--
Chromium	0 / 4	4 / 4	3.75	2.40	58.17	**1.6**	<1	7.11	2.40	58.17	**3.0**	<1
Copper	0 / 4	0 / 4	0.462	5.60	82.7	<1	<1	0.462	5.60	82.7	<1	<1
Iron	4 / 4	4 / 4	0.659	--	--	--	--	0.380	--	--	--	--
Lead	4 / 4	4 / 4	1.964	4.70	186.4	<1	<1	0.848	4.70	186.4	<1	<1
Magnesium	4 / 4	4 / 4	1.273	--	--	--	--	2.143	--	--	--	--
Manganese	4 / 4	4 / 4	0.036	51.4	146	<1	<1	0.026	51.4	146	<1	<1
Mercury (Inorganic)	0 / 4	NA	0.842	1.00	--	<1	--	NC	1	--	--	--
Nickel	0 / 4	0 / 4	0.054	1.70	14.77	<1	<1	0.054	1.70	14.77	<1	<1
Potassium	4 / 4	4 / 4	1.736	--	--	--	--	2.380	--	--	--	--
Selenium	0 / 4	0 / 4	1.571	0.143	0.66	**11**	**2.4**	1.571	0.143	0.66	**11**	**2.4**
Silica	4 / 4	4 / 4	21.96	--	--	--	--	30.2	--	--	--	--
Silver	0 / 4	0 / 4	1.819	6.02	119	<1	<1	1.819	6.02	119	<1	<1
Sodium	4 / 4	4 / 4	2.512	--	--	--	--	4.879	--	--	--	--
Strontium	4 / 4	4 / 4	0.072	263	--	<1	--	0.106	263	--	<1	--
Thallium	0 / 4	0 / 4	12.8	0.0074	0.074	**1723**	**172**	12.8	0.0074	0.074	**1723**	**172**
Vanadium	0 / 4	0 / 4	0.013	4.16	9.44	<1	<1	0.013	4.16	9.44	<1	<1
Zinc	4 / 4	4 / 4	38.9	75.4	298	<1	<1	101	75.4	298	**1.3**	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA- Not analyzed
NC- Not calculated
TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 113.
Hazard Quotients for the Muskrat at Sample Location RG 9 - Average EPC

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario					Fall Exposure Scenario				
			Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ	Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ
Aluminum	4 / 4	4 / 4	168	1.93	19.3	**87**	**8.7**	34.9	1.93	19.3	**18**	**1.8**
Antimony	0 / 4	0 / 1	0.628	0.059	2.76	**11**	<1	0.628	0.059	2.76	**11**	<1
Arsenic	0 / 4	0 / 4	0.126	1.04	4.55	<1	<1	0.126	1.04	4.55	<1	<1
Beryllium	0 / 4	0 / 4	0.012	0.532	0.67	<1	<1	0.012	0.532	0.67	<1	<1
Cadmium	0 / 4	3 / 4	0.067	0.770	6.87	<1	<1	0.169	0.770	6.87	<1	<1
Calcium	4 / 4	4 / 4	7.292	--	--	--	--	13.84	--	--	--	--
Chromium	0 / 4	4 / 4	1.874	2.40	58.17	<1	<1	6.17	2.40	58.17	**2.6**	<1
Copper	0 / 4	0 / 4	0.231	5.60	82.7	<1	<1	0.231	5.60	82.7	<1	<1
Iron	4 / 4	4 / 4	0.629	--	--	--	--	0.278	--	--	--	--
Lead	4 / 4	4 / 4	1.784	4.70	186.4	<1	<1	0.768	4.70	186.4	<1	<1
Magnesium	4 / 4	4 / 4	1.256	--	--	--	--	2.111	--	--	--	--
Manganese	4 / 4	4 / 4	0.034	51.4	146	<1	<1	0.021	51.4	146	<1	<1
Mercury (Inorganic)	0 / 4	NA	0.421	1	--	<1	--	NC	1	--	--	--
Nickel	0 / 4	0 / 4	0.027	1.70	14.77	<1	<1	0.027	1.70	14.77	<1	<1
Potassium	4 / 4	4 / 4	1.663	--	--	--	--	2.341	--	--	--	--
Selenium	0 / 4	0 / 4	0.785	0.143	0.66	**5.5**	**1.2**	0.785	0.143	0.66	**5.5**	**1.2**
Silica	4 / 4	4 / 4	21.40	--	--	--	--	29.92	--	--	--	--
Silver	0 / 4	0 / 4	0.909	6.02	119	<1	<1	0.909	6.02	119	<1	<1
Sodium	4 / 4	4 / 4	2.436	--	--	--	--	4.787	--	--	--	--
Strontium	4 / 4	4 / 4	0.071	263	--	<1	--	0.103	263	--	<1	--
Thallium	0 / 4	0 / 4	6.38	0.0074	0.074	**862**	**86**	6.38	0.0074	0.074	**862**	**86**
Vanadium	0 / 4	0 / 4	0.007	4.16	9.44	<1	<1	0.007	4.16	9.44	<1	<1
Zinc	4 / 4	4 / 4	37.7	75.4	298	<1	<1	101	75.4	298	**1.3**	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA- Not analyzed
NC- Not calculated

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 114.
Hazard Quotients for the Belted King Fisher at Sample Location RG 9 - Maximum EPC

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario					Fall Exposure Scenario				
			Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ	Total EDD (mg/kg bw-day)	No Effect-based TRV	Effect-based TRV	No Effect-based HQ	Effect-based HQ
Aluminum	4 / 4	4 / 4	0.963	109.7	--	<1	--	0.342	109.7	--	<1	--
Antimony	0 / 4	0 / 1	0.050	--	--	--	--	0.025	--	--	--	--
Arsenic	0 / 4	0 / 4	0.143	2.24	4.51	<1	<1	0.143	2.24	4.51	<1	<1
Beryllium	0 / 4	0 / 4	0.016	--	--	--	--	0.016	--	--	--	--
Cadmium	0 / 4	3 / 4	0.227	1.47	6.35	<1	<1	0.485	1.47	6.35	<1	<1
Calcium	4 / 4	4 / 4	3.43	--	--	--	--	6.60	--	--	--	--
Chromium	0 / 4	4 / 4	0.024	2.66	15.6	<1	<1	0.046	2.66	15.6	<1	<1
Copper	0 / 4	0 / 4	0.888	4.05	34.87	<1	<1	0.888	4.05	34.87	<1	<1
Iron	4 / 4	4 / 4	0.306	--	--	--	--	0.177	--	--	--	--
Lead	4 / 4	4 / 4	0.001	1.63	44.63	<1	<1	0.0002	1.63	44.63	<1	<1
Magnesium	4 / 4	4 / 4	0.591	--	--	--	--	0.996	--	--	--	--
Manganese	4 / 4	4 / 4	0.017	179	377	<1	<1	0.012	179	377	<1	<1
Mercury (Inorganic)	0 / 4	NA	0.177	0.45	0.9	<1	<1	NC	0.45	0.9	--	--
Nickel	0 / 4	0 / 4	0.098	6.71	18.6	<1	<1	0.098	6.71	18.6	<1	<1
Potassium	4 / 4	4 / 4	0.807	--	--	--	--	1.106	--	--	--	--
Selenium	0 / 4	0 / 4	0.162	0.290	0.82	<1	<1	0.162	0.290	0.82	<1	<1
Silica	4 / 4	4 / 4	10.2	--	--	--	--	14.1	--	--	--	--
Silver	0 / 4	0 / 4	0.022	2.02	60.5	<1	<1	0.022	2.02	60.5	<1	<1
Sodium	4 / 4	4 / 4	1.167	--	--	--	--	2.267	--	--	--	--
Strontium	4 / 4	4 / 4	0.033	--	--	--	--	0.049	--	--	--	--
Thallium	0 / 4	0 / 4	12.50	--	--	--	--	12.5	--	--	--	--
Vanadium	0 / 4	0 / 4	0.006	0.344	1.7	<1	<1	0.006	0.344	1.7	<1	<1
Zinc	4 / 4	4 / 4	54.2	66.1	171	<1	<1	141	66.1	171	**2.1**	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA- Not analyzed
NC- Not calculated

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 115.
Hazard Quotients for the Belted King Fisher at Sample Location RG 9 - Average EPC

			Spring Exposure Scenario					Fall Exposure Scenario				
Analyte	**Spring Frequency of Detection**	**Fall Frequency of Detection**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**	**Total EDD (mg/kg bw-day)**	**No Effect-based TRV**	**Effect-based TRV**	**No Effect-based HQ**	**Effect-based HQ**
Aluminum	4 / 4	4 / 4	0.865	109.7	--	<1	--	0.180	109.7	--	<1	--
Antimony	0 / 4	0 / 1	0.025	--	--	--	--	0.025	--	--	--	--
Arsenic	0 / 4	0 / 4	0.071	2.24	4.51	<1	<1	0.071	2.24	4.51	<1	<1
Beryllium	0 / 4	0 / 4	0.008	--	--	--	--	0.008	--	--	--	--
Cadmium	0 / 4	3 / 4	0.113	1.47	6.35	<1	<1	0.287	1.47	6.35	<1	<1
Calcium	4 / 4	4 / 4	3.39	--	--	--	--	6.43	--	--	--	--
Chromium	0 / 4	4 / 4	0.012	2.66	15.6	<1	<1	0.040	2.66	15.6	<1	<1
Copper	0 / 4	0 / 4	0.444	4.05	34.87	<1	<1	0.444	4.05	34.87	<1	<1
Iron	4 / 4	4 / 4	0.292	--	--	--	--	0.129	--	--	--	--
Lead	4 / 4	4 / 4	0.0005	1.63	44.63	<1	<1	0.0002	1.63	44.63	<1	<1
Magnesium	4 / 4	4 / 4	0.584	--	--	--	--	0.981	--	--	--	--
Manganese	4 / 4	4 / 4	0.016	179	377	<1	<1	0.010	179	377	<1	<1
Mercury (Inorganic)	0 / 4	NA	0.088	0.45	0.9	<1	<1	NC	0.45	0.9	--	--
Nickel	0 / 4	0 / 4	0.049	6.71	18.6	<1	<1	0.049	6.71	18.6	<1	<1
Potassium	4 / 4	4 / 4	0.773	--	--	--	--	1.088	--	--	--	--
Selenium	0 / 4	0 / 4	0.081	0.290	0.82	<1	<1	0.081	0.290	0.82	<1	<1
Silica	4 / 4	4 / 4	9.94	--	--	--	--	13.9	--	--	--	--
Silver	0 / 4	0 / 4	0.011	2.02	60.5	<1	<1	0.011	2.02	60.5	<1	<1
Sodium	4 / 4	4 / 4	1.132	--	--	--	--	2.224	--	--	--	--
Strontium	4 / 4	4 / 4	0.033	--	--	--	--	0.048	--	--	--	--
Thallium	0 / 4	0 / 4	6.25	--	--	--	--	6.25	--	--	--	--
Vanadium	0 / 4	0 / 4	0.003	0.344	1.7	<1	<1	0.003	0.344	1.7	<1	<1
Zinc	4 / 4	4 / 4	52.5	66.1	171	<1	<1	140	66.1	171	**2.1**	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA- Not analyzed
NC-Not calculated

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 116.
Hazard Quotients for the Mallard at Sample Location RG 9 - Maximum EPC

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario: Total EDD (mg/kg bw-day)	Spring: No Effect-based TRV	Spring: Effect-based TRV	Spring: No Effect-based HQ	Spring: Effect-based HQ	Fall Exposure Scenario: Total EDD (mg/kg bw-day)	Fall: No Effect-based TRV	Fall: Effect-based TRV	Fall: No Effect-based HQ	Fall: Effect-based HQ
Aluminum	4 / 4	4 / 4	831	109.7	--	**7.6**	--	178	109.7	--	**1.6**	--
Antimony	0 / 4	0 / 1	0.006	--	--	--	--	NC	--	--	--	--
Arsenic	0 / 4	0 / 4	0.057	2.24	4.51	<1	<1	0.142	2.24	4.51	<1	<1
Beryllium	0 / 4	0 / 4	0.007	--	--	--	--	0.014	--	--	--	--
Cadmium	0 / 4	3 / 4	0.536	1.47	6.35	<1	<1	0.70	1.47	6.35	<1	<1
Calcium	4 / 4	4 / 4	2.053	--	--	--	--	3.95	--	--	--	--
Chromium	0 / 4	4 / 4	2.325	2.66	15.6	<1	<1	5.44	2.66	15.6	**2.0**	<1
Copper	0 / 4	0 / 4	2.882	4.05	34.87	<1	<1	1.65	4.05	34.87	<1	<1
Iron	4 / 4	4 / 4	0.183	--	--	--	--	0.106	--	--	--	--
Lead	4 / 4	4 / 4	5.30	1.63	44.63	**3.3**	<1	1.53	1.63	44.63	<1	<1
Magnesium	4 / 4	4 / 4	0.354	--	--	--	--	0.60	--	--	--	--
Manganese	4 / 4	4 / 4	0.010	179	377	<1	<1	0.007	179	377	<1	<1
Mercury (Inorganic)	0 / 4	NA	0.626	0.45	0.9	**1.4**	<1	NC	0.45	0.9	--	--
Nickel	0 / 4	0 / 4	0.022	6.71	18.6	<1	<1	0.035	6.71	18.6	<1	<1
Potassium	4 / 4	4 / 4	0.483	--	--	--	--	0.66	--	--	--	--
Selenium	0 / 4	0 / 4	0.978	0.290	0.82	**3.4**	**1.2**	1.20	0.290	0.82	**4.2**	**1.5**
Silica	4 / 4	4 / 4	6.11	--	--	--	--	8.42	--	--	--	--
Silver	0 / 4	0 / 4	0.046	2.02	60.5	<1	<1	0.85	2.02	60.5	<1	<1
Sodium	4 / 4	4 / 4	0.699	--	--	--	--	1.36	--	--	--	--
Strontium	4 / 4	4 / 4	0.020	--	--	--	--	0.030	--	--	--	--
Thallium	0 / 4	0 / 4	11.6	--	--	--	--	11.6	--	--	--	--
Vanadium	0 / 4	0 / 4	0.004	0.344	1.7	<1	<1	0.004	0.344	1.7	<1	<1
Zinc	4 / 4	4 / 4	74.7	66.1	171	**1.1**	<1	143	66.1	171	**2.2**	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA- Not analyzed
NC- Not calculated

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated

Table E - 117.
Hazard Quotients for the Mallard at Sample Location RG 9 - Average EPC

Analyte	Spring Frequency of Detection	Fall Frequency of Detection	Spring Exposure Scenario: Total EDD (mg/kg bw-day)	Spring: No Effect-based TRV	Spring: Effect-based TRV	Spring: No Effect-based HQ	Spring: Effect-based HQ	Fall Exposure Scenario: Total EDD (mg/kg bw-day)	Fall: No Effect-based TRV	Fall: Effect-based TRV	Fall: No Effect-based HQ	Fall: Effect-based HQ
Aluminum	4 / 4	4 / 4	746	109.7	--	**6.8**	--	93.3	109.7	--	<1	--
Antimony	0 / 4	0 / 1	0.003	--	--	--	--	0.287	--	--	--	--
Arsenic	0 / 4	0 / 4	0.028	2.24	4.51	<1	<1	0.071	2.24	4.51	<1	<1
Beryllium	0 / 4	0 / 4	0.004	--	--	--	--	0.007	--	--	--	--
Cadmium	0 / 4	3 / 4	0.268	1.47	6.35	<1	<1	0.416	1.47	6.35	<1	<1
Calcium	4 / 4	4 / 4	2.029	--	--	--	--	3.85	--	--	--	--
Chromium	0 / 4	4 / 4	1.163	2.66	15.6	<1	<1	4.73	2.66	15.6	**1.8**	<1
Copper	0 / 4	0 / 4	1.441	4.05	34.87	<1	<1	0.825	4.05	34.87	<1	<1
Iron	4 / 4	4 / 4	0.175	--	--	--	--	0.077	--	--	--	--
Lead	4 / 4	4 / 4	4.81	1.63	44.63	**3.0**	<1	1.39	1.63	44.63	<1	<1
Magnesium	4 / 4	4 / 4	0.350	--	--	--	--	0.587	--	--	--	--
Manganese	4 / 4	4 / 4	0.009	179	377	<1	<1	0.006	179	377	<1	<1
Mercury (Inorganic)	0 / 4	NA	0.313	0.45	0.9	<1	<1	NC	0.45	0.9	--	--
Nickel	0 / 4	0 / 4	0.011	6.71	18.6	<1	<1	0.017	6.71	18.6	<1	<1
Potassium	4 / 4	4 / 4	0.463	--	--	--	--	0.651	--	--	--	--
Selenium	0 / 4	0 / 4	0.489	0.290	0.82	**1.7**	<1	0.602	0.290	0.82	**2.1**	<1
Silica	4 / 4	4 / 4	5.96	--	--	--	--	8.33	--	--	--	--
Silver	0 / 4	0 / 4	0.023	2.02	60.5	<1	<1	0.426	2.02	60.5	<1	<1
Sodium	4 / 4	4 / 4	0.678	--	--	--	--	1.33	--	--	--	--
Strontium	4 / 4	4 / 4	0.020	--	--	--	--	0.029	--	--	--	--
Thallium	0 / 4	0 / 4	5.81	--	--	--	--	5.81	--	--	--	--
Vanadium	0 / 4	0 / 4	0.002	0.344	1.7	<1	<1	0.002	0.344	1.7	<1	<1
Zinc	4 / 4	4 / 4	72.3	66.1	171	**1.1**	<1	142	66.1	171	**2.1**	<1

mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
NA- Not analyzed
NC- Not Calculated

TRV - Toxicity Reference Value
HQ - Hazard Quotient, calculated by dividing the EDD by the TRV
-- - A hazard quotient could not be calculated because no TRV was available or no EDD was calculated